Univerza v Ljubljani

BOKU

PIKTORAMA

Erasmus+

UNESCO

United Nations
Educational, Scientific and
Cultural Organization

uniTwin

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

4th WLF 2017
4th World Landslide Forum
LJUBLJANA SLOVENIA EU

INTERNATIONAL SUMMER SCHOOL

NATURAL DISASTERS

Ljubljana, Slovenia
May 21st –June 10th, 2017

Catastrophic flood in Bosnia in 2014 (archive UL FGG)

UNIVERZA V LJUBLJANI / UNIVERSITY OF LJUBLJANA

International Summer School, Natural Disasters

Academic Committee: M. Šraj (SI), G. Grossi (I), F. Lobnik (SI), J. Hübl (A), M. Mikoš (SI)
Task force Summer school: A. Žgajnar Gotvajn (SI), J. Hübl (A), R. Ranzi (I), M. Brilly (SI), M. Lobnik (SI), K. Sapač (SI)
Head of School: M. Šraj
Deputy Head: M. Brilly
Video production: M. Lobnik
Organization: K. Sapač, M. Šraj, M. Brilly, M. Mikoš, M. Lobnik,
Wording: M. Šraj, K. Sapač, F. Lobnik, M. Lobnik, A. Žgajnar Gotvajn

Invited live lectures:
T. Faisal Fathani, Universitas Gadjah Mada, Indonesia
V. Vilímek, Charles University in Prague, Czech Republic
P. Frattini, University of Milano-Bicocca, Italy
R. Ranzi, University of Brescia, Italy
J. Hübl, University of Natural Resources and Life Sciences –BOKU, Austria
S. Barontini, University of Brescia, Italy
M. Brilly, University of Ljubljana, Slovenia

Invited video lectures:
B. Bhattacharya, UNESCO-IHE Delft Institute for Water Education, The Netherlands
R. Ranzi, University of Brescia, Italy
B. Gunnarsson, University of Akureyri, Iceland
M. Mikoš, University of Ljubljana, Slovenia
M. Brilly, University of Ljubljana, Slovenia
M. Dolšek, University of Ljubljana, Slovenia
T. Verbovšek, University of Ljubljana, Slovenia
K. Oštir, University of Ljubljana, Slovenia
M. Brenčič, University of Ljubljana, Slovenia
A. Žgajnar Gotvajn, University of Ljubljana, Slovenia
G. Kalčíková, University of Ljubljana, Slovenia
S. Schnabl, University of Ljubljana, Slovenia
M. Radak, University of Ljubljana, Slovenia
K. Zupan, University of Ljubljana, Slovenia

Fieldtrip:
Vipava valley and Kobarid, 4th WLF 2017 and University of Ljubljana, Slovenia

Photos: Archives of the Department Of Environmental Civil Engineering, University of Ljubljana, Slovenia
Graphics and printing: University of Ljubljana
Editors: M. Šraj, F. Lobnik, A. Žgajnar Gotvajn, K. Sapač

Publisher: University of Ljubljana
50 copies

CIP - Kataložni zapis o publikaciji
Narodna in univerzitetna knjižnica, Ljubljana

504.4(082)

INTERNATIONAL Summer School Natural Disasters (2017 ; Ljubljana)
International Summer School Natural Disaster, Ljubljana, May 21st – June 10th, 2017 / [editors M. Šraj ... et al.]. - Ljubljana : University, 2017

ISBN 978-961-6410-50-2
1. Dodat. nasl. 2. Šraj, Mojca, gradbenica
290316544

"This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein."

Erasmus+

www.let-group.com

@EplsEPND

https://www.wlf4.org/

Dear Student,

You are invited to the 2nd International Summer School on

Natural Disasters

which will be held in Ljubljana, Slovenia
from May 21st–June 10th, 2017

Natural disasters in recent decades have caused significant economic damage and claimed millions of lives worldwide. Even though natural disasters cannot be avoided completely, their potential damage can be minimized through various preventive measures and appropriate response measures during the disaster.

Our Natural Disasters summer school will bring together well-motivated, postgraduate or advanced graduate students from several countries with at least four years of academic experience, regardless of their fields of study to experience this new and, hopefully, rewarding opportunity. It is going to be organized as blended learning supported by e-classroom (first week) and face-to-face learning (second and third weeks). The second week will be organized as a part of 4th World Landslide Forum. The main topics to be discussed in the summer school are: floods, droughts, landslides and earthquakes.

This summer school is a joint initiative of University of Ljubljana (Slovenia), University of Brescia (Italy) and University of Natural Resources and Life Sciences - BOKU (Austria). It brings together students and academic staff from partner and other institutions in the beautiful city of Ljubljana to study and discuss natural disasters issues in an interactive and intensive way.

Be part of this summer school and join this attractive, innovative, and active way of gaining knowledge and sharing experiences, where various aspects of natural disasters will be covered (engineering, natural sciences, sociology, and economy). The summer school corresponds to 5 ECTSs.

If you have any additional questions do not hesitate to contact our representatives: Klaudija Sapač (klaudija.sapac@fgg.uni-lj.si) or Assist. Prof. Mojca Šraj (mojca.sraj@fgg.uni-lj.si).

All universities involved are encouraged to grant their student's academic recognition for their participation in this intensive seminar.

The total workload is measured at 5 ECTS credits. This includes attendance at all lectures and seminars, presentation and successful completion of the final assay.

GENERAL INFORMATION

Target group

About 25 students will be selected to participate in the summer school. The target group will consist of postgraduate or advanced graduate students from several countries with at least four years of academic experience, regardless of the fields of study. Major selection criteria will be a clear indication as to the motivation and expectations the program will bring and the impact on your further study.

Working language and language proficiency

The working language of the Summer school is English. In order to assure active participation of all students, a good skills in English in all of its aspects (spoken, written and comprehension) is a prerequisite.

Fees

This Summer school is a joint initiative of Ljubljana, Brescia and Vienna (BOKU) universities and company Piktorama under the Erasmus+ program (KA2-HE-14-15 Contract) Environmental Protection (2016) and Natural Disasters (2017) project which made possible, to organize summer school 2017 at the University of Ljubljana. 20 students from partner universities are free of tuition. For the rest tuition is 900 Euro and covers 4th World Landslide Forum student fee, study materials for the Summer school, organized field trips and accommodation with breakfast and lunch. For those which will not be present at summer school but are participating on long distance, 300 Euro must be paid.

Application procedure

Students can apply before 5 May, 2017. Please complete the application form available on http://www.let-group.com/online/application-form.php

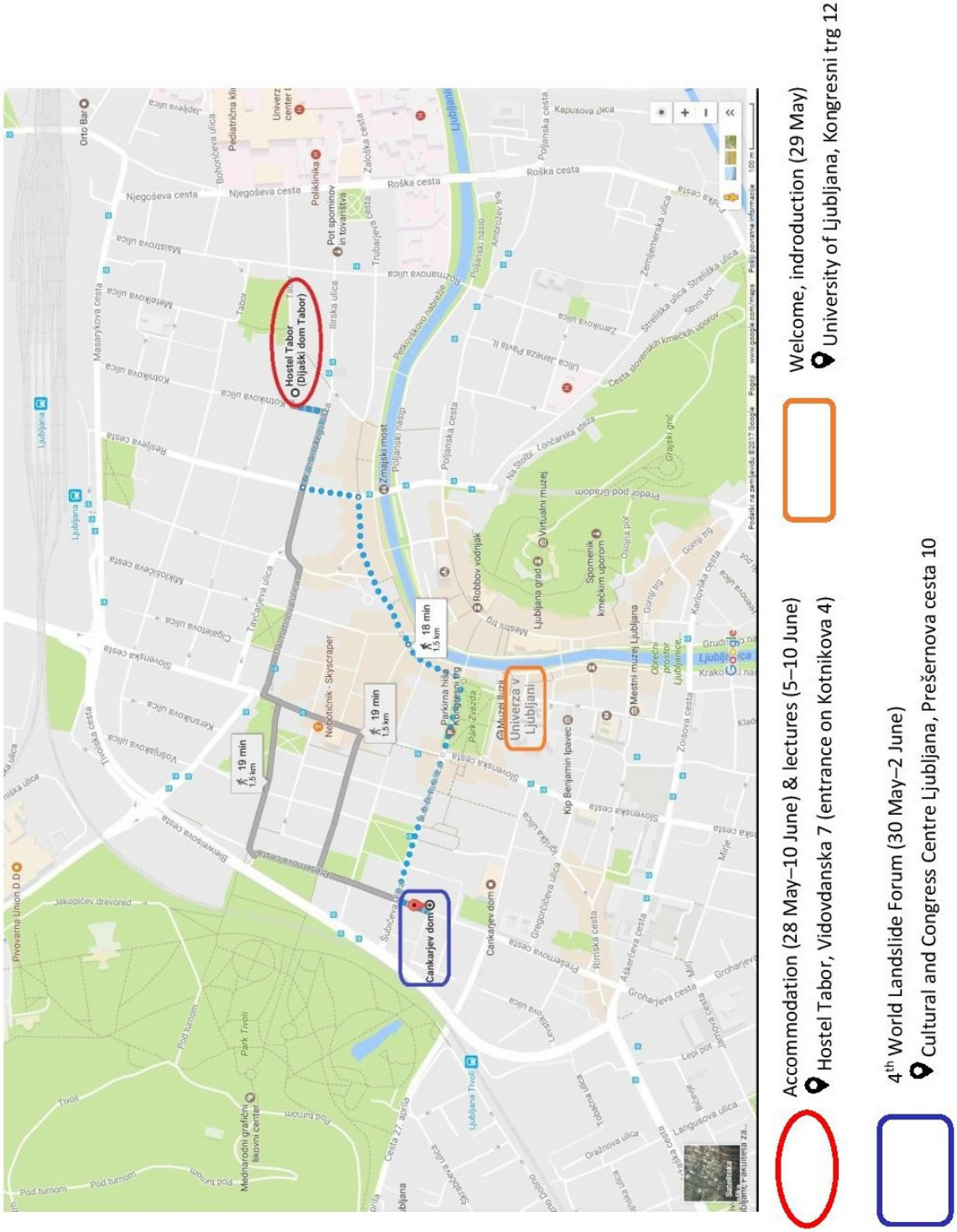
A confirmation letter and full information package will be addressed to all selected students before the summer school. It will include practical information as well as reading material available at http://www.let-group.com as an essential preparation for successful attendance of the program.

Lecturers from different countries will hold courses amounting to a workload of 5 ECTS credits.

We invite you to apply and look forward to meet you in Ljubljana!

Students are requested to contact the international relations office of their University in order to apply for a potential scholarship. Universities are encouraged to contribute by making an extra small student grant available for those which are over the number of the twenties free of charge of tuition.

Map of the event locations



PROGRAMME

Natural disasters in recent decades have caused significant economic damage and claimed millions of lives worldwide. All the technical knowledge in the world does not necessarily lead societies to change their behavior. Even though natural disasters cannot be avoided completely, their potential damage can be minimized through various preventive measures and appropriate response measures during the disaster.

The credit system in Europe is allowing a much more intensive student exchange program and Summer Schools are effective tools for getting students together from different cultural and social surroundings. The Summer School 2017 Programme will provide short topic - centered lectures on natural disasters relevant areas. This will reflect the fact that students will approach their subject matter from a great variety of different disciplinary backgrounds; not just within natural and technical sciences, but from social sciences and humanities too. And for those students who may not be familiar with the background to some of the topics, they will be intensively co-opted via video lectures and in the workshop programme, which will be guided by the lecturers. To achieve the right mix of flexibility, depth and breadth, and volume, as with most modular courses, the program is designed carefully to create maximum accessibility from a variety of backgrounds.

Each lecture leads into its topics by giving an adequate introduction, and each leads out by pointing towards complexities and areas for further development and study. Data, case studies, overview diagrams, summary charts and self-check questions and exercises are some of the pedagogical methods that will be found.

We hope that Summer School 2017 will provide sufficient depth to maintain the interest of students with relevant backgrounds because programme will cover various aspects of natural disasters (engineering, natural sciences, sociology, and economy). The main topics to be discussed in the summer school will be floods, droughts, landslides and earthquakes related to the water management, climate change, early warning systems, remote sensing earth observations, flood risk maps, spatial analyses and the use of GIS in environmental management, public policies, human resources management, environmental conflicts, etc. Additionally, you will be introduced also with other natural disasters as wildfires and hurricanes.

Programme of "Natural Disasters" Summer School

University of Ljubljana

May 21 – June 10, 2017, Ljubljana, Slovenia

http://www.let-group.com/summerschool.html

May 21 – May 27 **Sunday–Saturday**		**DISTANCE LEARNING** **Video Lectures and quizes**
May 28 **Sunday**		**Arrivals** **Hostel Tabor, Vidovdanska 7, Ljubljana**
May 29 **Monday**	10:00–10:15	**OFFICIAL OPENING AND WELCOME** **University of Ljubljana (Hribar hall), Kongresni trg 12, Ljubljana** Prof. dr. Goran Turk, Prorector of the University of Ljubljana
	10:15–10:30	**Welcome** Mojca Šraj, Head of the Summer School »Natural disasters«
	10:30–11:30	**Introduction to the "Natural disasters" Summer school** Mojca Šraj, Mitja Brilly, Andreja Žgajnar Gotvajn, Franc Lobnik University of Ljubljana, Slovenia
	12:00–13:30	Lunch
	13:30–15:30	Ljubljana site seeing tour
May 30 **Tuesday**	09:00–09:50	**WLF4 OPENING CEREMONY** **Cankarjev dom (Linhart Hall), Prešernova 10, Ljubljana**
	10:00–12:00	**INVITED WLF4 FORUM LECTURES**
	12:00–13:30	Lunch
	13:30–15:45	WLF4 High-level panel discussion
	15:45–16:00	Coffe break
	16:00–17:30	Recognition of ICL and IPL activities
	18:00–20:00	**WLF4 Welcome Reception** **Cankarjev dom, Grand Reception Hall**
May 31 **Wednesday**	08:30–12:00	**WLF4 MORNING SESSIONS**
	12:00–13:30	Lunch
	13:30–17:00	**WLF4 AFTERNOON SESSIONS**
	19:00–21:00	WLF4 Banquet, Ljubljana castle (Bus transfer will be organized. Departure from Cankarjev dom, Erjavčeva Street, at 18.30 , returning at 21.00.)
June 1 **Thursday**	08:30–12:00	**WLF4 MORNING SESSIONS**
	12:00–13:30	Lunch
	13:30–17:00	**WLF4 AFTERNOON SESSIONS**
June 2 **Friday**	08:30–12:00	**WLF4 MORNING SESSIONS**
	12:00–13:30	**WLF4 OPEN SESSION III** **"Landslide risk management, an integrated approach in time"** **An event organised especially for the participants of the Summer school** **(room Club CD)**
	12:00-13:30	Lunch box
	13:30–15:00	WLF4 Round table discussion
	15:30–16:30	WLF4 Closing ceremony
June 3 **Saturday**	07:00–19:00	**FIELD TRIP** **Ljubljana – Vipava Valley – Kobarid**
June 4 **Sunday**		Break

June 5 Monday	9:00–10:00	**The Adige river in Trento flooding map, 1892** Roberto Ranzi, University of Brescia, Italy
	10:00–10:45	Roberto Ranzi: Discussion/Case studies
	10:45–11:15	Coffe break
	11:15–12:15	**An integrated methodology to develop a standard for landslide early warning systems** Teuku Faisal Fathani, Gadjah Mada University, Indonesia
	12:15–13:00	Teuku Faisal Fathani: Discussion/Case studies
	13:00–14:30	Lunch
	14:30–15:30	**Probabilistic landslide hazard analysis** Paolo Frattini, University of Milano-Bicocca, Italy
	15:30–16:15	Paolo Frattini: Discussion/Case studies
	16:15–16:30	Coffe break
	16:30–17:30	**Instructions for student presentations**
	18:30	Official Summer school diner
June 6 Tuesday	9:00–10:00	**Multilevel integrated flood management aproach** Mitja Brilly, University of Ljubljana, Slovenia
	10:00–10:45	Mitja Brilly: Discussion/Case studies
	10:45–11:15	Coffe break
	11:15–12:15	**The research on Glacial Lake Outburst Floods in the Cordillera Blanca, Peru** Vít Vilímek, Charles University, Faculty of Science, Czech Republic
	12:15–13:00	Vít Vilímek: Discussion/Case studies
	13:00–14:30	Lunch
	14:30–15:30	**Issues on desertification and soil degradation: Climatic and anthropogenic drivers** Stefano Barontini, University of Brescia, Italy
	15:30–16:15	Stefano Barontini: Discussion/Case studies
	16:15–16:30	Coffe break
	16:30–18:00	**Preparation of presentations**
June 7 Wednesday	9:00–10:00	**From desert to oasis: The role of the traditional irrigation techniques** Stefano Barontini, University of Brescia, Italy
	10:00–10:45	Stefano Barontini: Discussion/Case studies
	10:45–11:15	Coffe break
	11:15–12:15	**Monitoring of debris flows** Johaness Hübl, BOKU, Austria
	12:15–13:00	Johaness Hübl: Discussion/Case studies
	13:00–14:30	Lunch
	14:30–18:00	**Preparation of presentations**
June 8 Thursday	9:00–10:00	**Torrential (Flash) flood Analysis: Examples of Wölzerbach and Simbach, Bavaria** Johaness Hübl, BOKU, Austria
	10:00–10:45	Johaness Hübl: Discussion/Case studies
	10:45–11:15	Coffe break
	11:15–12:00	**Preparations for the final test**
	12:00–13:00	**FINAL TEST**
	13:00–14:30	Lunch
	14:30–16:00	**Student presentations with discussion** Mitja Brilly, Johaness Hübl, Stefano Barontini, Mojca Šraj, Andreja Žgajnar Gotvajn, Franc Lobnik
	16:00–16:15	Coffe break

	16:15–17:30	**Student presentations with discussion** Mitja Brilly, Johaness Hübl, Stefano Barontini, Mojca Šraj, Andreja Žgajnar Gotvajn, Franc Lobnik
June 9 **Friday**	09:00–10:45	**Student presentations with discussion** Mitja Brilly, Johaness Hübl, Stefano Barontini, Mojca Šraj, Andreja Žgajnar Gotvajn, Franc Lobnik
	10:45–11:15	Coffe break
	11:15–13:00	**Student presentations with discussion** Mitja Brilly, Johaness Hübl, Stefano Barontini, Mojca Šraj, Andreja Žgajnar Gotvajn, Franc Lobnik
	13:00–14:30	Lunch
	14:30–16:00	**Student presentations with discussion** Mitja Brilly, Johaness Hübl, Stefano Barontini, Mojca Šraj, Andreja Žgajnar Gotvajn, Franc Lobnik
	16:00–16:15	Coffe break
	16:15–17:00	**The granting of certificates** Mojca Šraj, Head of the Summer School »Natural disasters«
June 10 **Saturday**	8:00–10:00	Departure

We reserve the right to change the programme if necessarly.

First week of the summer school (May 21 – May 27, 2017) – distance learning

Summaries of video recorded lectures

INTRODUCTION TO FLOOD RISK ASSESSMENT & MANAGEMENT (Video lecture)
Biswa Bhattacharya, UNESCO IHE Delft Institute for Water Education, The Netherlands
Why floods are observed worldwide and damage cause by floods increase sharp in past years. Floods differ up to origin from rainfall- runoff floods, riverine, flush up to coastal floods. There is risk expenditure cycle from no floods, pass complacency, reduced expenditure, increasing risk to mayor floods and than go through damage, review, expenditure, reduce risk and close circle on no floods. Managing flood start by pre flood activity, operational flood activity and post flood activity. Flood risk management should be integrated. Absolute flood protection is illusion. Flood risk originates from different sources. We should adapt of the characteristics of flood, future development and include climate change. To analyse the floods we need probability analysis, hydraulics modelling of flooded area, vulnerability maps to produce flood risk map. For operational flood management communication and understand the uncertainty are essential.

RISK MANAGEMENT AND MOUNTAIN NATURAL HAZARDS (Video lecture)
Matjaž Mikoš, University of Ljubljana, Slovenia
The topic is divided into 5 chapters: after a short introduction we will discuss the risk management cycle and the risk management cone and the difference of the both. The main part of the talk will be a closer look at the single elements of the risk management cycle, where the focus will be on the preventive part of the cycle. We will conclude with some outlooks and a short list of suggested further reading and useful links to study the topic presented. The focus of the today's topic is natural disasters. We know quite many different sorts of natural disasters or catastrophes, caused by natural forces such as landslides, floods, tsunamis, earthquakes etc. Since we are oriented towards mountainous regions, we will not discuss tsunamis or pyroclastic flows, and will stay bound to torrents and flash floods, landslides, avalanches, rock falls etc.

The Stože debris flow devastated the village of Log pod Mangartom (archive UL FGG, 2000)

NATURAL HAZARDS, MITIGATION STRATEGIES, AND POLICIES RELATED TO REGIONAL SUSTAINABLE DEVELOPMENT (Video lecture)

Bjorn Gunnarsson, University of Akureyri, Iceland

Europe experiences all types of natural hazards, with the probability of these hazard events turning into disasters rapidly increasing - volcanic eruptions, earthquakes, severe storms and flooding, wild fires, avalanches, and landslides name only a few. The increasing risk and damages from natural hazards are directly related to population growth, uncontrolled urban expansion and growth of mega-cities, improperly located and/or constructed critical facilities, development in the coastal zone, poverty, and environmental degradation.

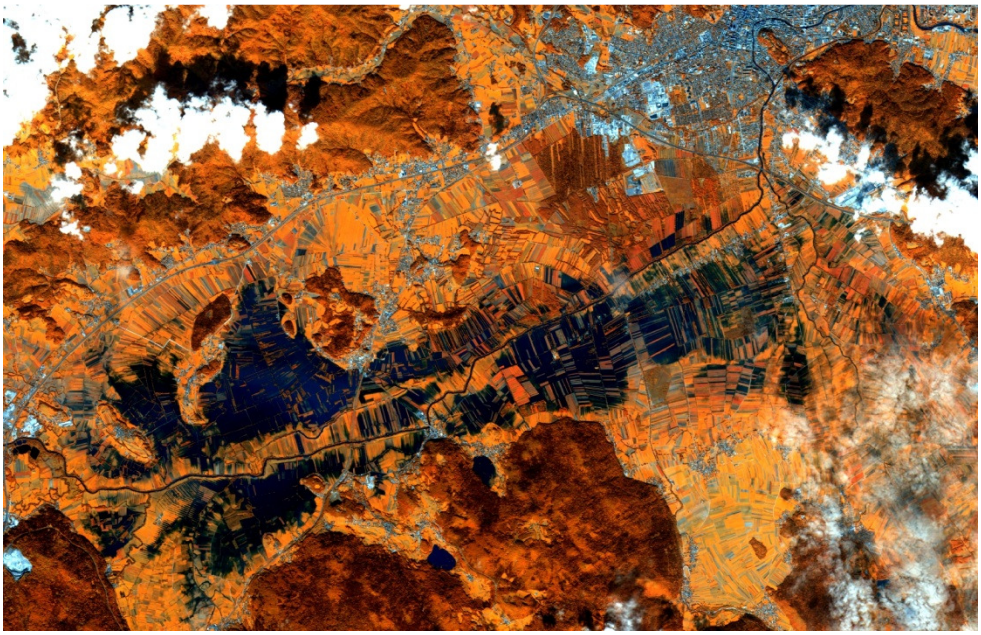
Natural hazards are not by themselves, disasters. What classifies these events as disasters are the subsequent impacts on the social, economic, and environmental dimensions of a society. Depending on the severity of the event, these impacts can reach catastrophic proportions, in terms of lives lost, economic losses, and environmental destruction, inhibiting progress toward sustainable development. The World Meteorological Organization and other independent organizations such as the Intergovernmental Panel on Climate Change have confirmed an increase in the frequency and severity of climate-related hazards.

Although nothing can be done to prevent most natural hazards from occurring, this course examines how the consequences can be significantly minimized through the adoption of sustainable disaster mitigation strategies. The success of restoring a community after a disaster, in large part depends on the mitigation efforts and the training and preparedness that have occurred beforehand. Local residents of communities at risk have to be given access to the latest scientific and technological advances in monitoring and prediction; early warning and evacuation planning; hazard and risk mapping and assessments; and strategies for sustainable land-use practices which minimize risk and loss of life. A comprehensive understanding and implementation of hazard mitigation strategies, and associated management of natural resources, are essential in moving a society toward achieving a state of sustainable development.

Opportunity to learn (Gunnarsson, 2006)

APPLICATION OF EARTH OBSERVATION FOR NATURAL DISASTERS OBSERVATION (Video lecture)
Krištof Oštir, University of Ljubljana, Slovenia

Disasters like earthquakes, landslides, storms, and floods are causing huge loss both in human lives and economical terms. They should be the focus of research with all means in disaster science, disaster mitigation and prevention. Earth observation is one of the most important methods for observation and monitoring of natural disasters. In the presentation, we will present the historical background of remote sensing systems and methods. Characteristics of space (satellites, ISS) and airborne platforms (airplanes and unmanned aerial vehicles, UAVs) will be analysed. We will focus on the technological advancement in optical and radar imaging and (automatic) data processing. The European Union's Copernicus system, including its Sentinel satellites and s Emergency Management Service, with be presented in more detail. Several case studies from different parts of the world, different disasters and different methods, will be demonstrated and discussed. An outlook of development trends and applications will be given at the end.



2010 Slovenia floods – RapidEye satellite image (Oštir, 2017)

ENVIRONMENTAL SECURITY: THE IMPACTS OF CLIMATE CHANGE IN THE ARCTIC (Video lecture)
Bjorn Gunnarsson, University of Akureyri, Iceland

This lecture discusses some of the environmental changes which have occurred in the Circumpolar Arctic as a result of Arctic warming, as well as further changes which are likely to occur in the next few decades. The information presented is largely based on the results of the Arctic Climate Impact Assessment (ACIA, 2004) and the Intergovernmental Panel of Climate Change assessments (e.g., IPCC, 2007) which predict an average 3-9 °C temperature rise in the Arctic over the next 100 years, or twice as high as the Earth's average. The environmental changes in the Arctic being highlighted include various effects of higher temperatures (particularly winter temperatures) in the northern part of the Russian Federation; increased river flows of Siberian rivers and flooding; reduced Arctic Ocean sea ice thickness and extent; effects of thawing of previously frozen ground (permafrost); increases in storm surges and coastal erosion; environmental impacts of increased natural resource utilization and shipping in the Arctic Ocean; as well as effects of local and trans-boundary pollution on human health, and on Arctic ecosystems in general.

The rapid increase in the exploitation of oil and gas in the Arctic increases the danger of serious oil spills and other industrial accidents. Recent studies suggest that the effects of oil spills in a high-latitude, cold ocean environment last much longer and are far worse than first suspected. Oil breaks down very slowly and is difficult to clean up in ice-covered waters, and oil can be transported with

drifting ice over long distances. The overall strategy for Arctic oil spills must therefore be preventative. Transportation and industry in the Arctic will increasingly by disrupted by the shortening of the periods during which ice roads and tundra are frozen sufficiently to permit travel. As frozen ground thaws, many Arctic population centers, buildings, roads, railroads, pipelines, airports, river terminals, oil and natural gas production complexes, power stations, and other industrial facilities are likely to be increasingly destabilized, requiring substantial rebuilding, maintenance, and investment. Permafrost thawing is also likely to adversely affect sanitation infrastructure and drinking water quality, limit efficient delivery, and cause direct damage to facilities and lead to adverse impacts on human health.

Winds, rivers and ocean currents bring contaminants into the Arctic. Contaminants emitted from industrial sites in Western Europe, North America and South-East Asia are transported to the Arctic where they may become concentrated as they move up the food chain (bioaccumulation). As temperature rise, snow and ice accumulated over the years and decades will melt, and the contaminants stored within will be released in melt water. POPs and heavy metals (mercury) become increasingly concentrated as they move up the food chain, resulting in high levels in polar bears, Arctic fox and various seals, whales, fish, seabirds, and birds of prey. Arctic people that eat those species are thus exposed to potentially harmful levels of these pollutants. Same applies to radioactive pollutants, e.g. leakage from old military installations, nuclear test sites, weapon storage sites, waste sites, and reprocessing plants.

Thinner, less extensive sea ice creates more open water, allowing stronger wave generation by winds, thus increasing wave-induced erosion along Arctic shores. When the buffer provided by the shore ice has been lost, the full force of ocean waves are allowed to surge against the coastline and coastal villages. Sea-ice decline, sea-level rise, storm surges, and thawing coastal permafrost are very likely to force the relocation of some coastal villages and create increasing stress on others, causing substantial social impacts. Coastal erosion will pose increasing problems for many ports, tanker terminals, and other industrial and transportation facilities. Attempts to control this erosion will become increasingly expensive as the surrounding coastline continues to retreat. Many current coastal sites could become uninhabitable. Low-lying coastlines experiencing land subsidence are particularly vulnerable. Soil slopes are made less stable by thawing permafrost, and this will result in more landslides. In general, Arctic coastal infrastructure will be impacted with more frequent floods, mudslides, rockslides and avalanches. These events are closely associated with heavy precipitation events, high river runoff and elevated temperatures.

Arctic (Gunnarsson, 2006)

PRIVATE OR PUBLIC RISK TRANSFER? THE ADIGE RIVER IN TRENTO FLOODING MAP, 1892 (Video lecture)

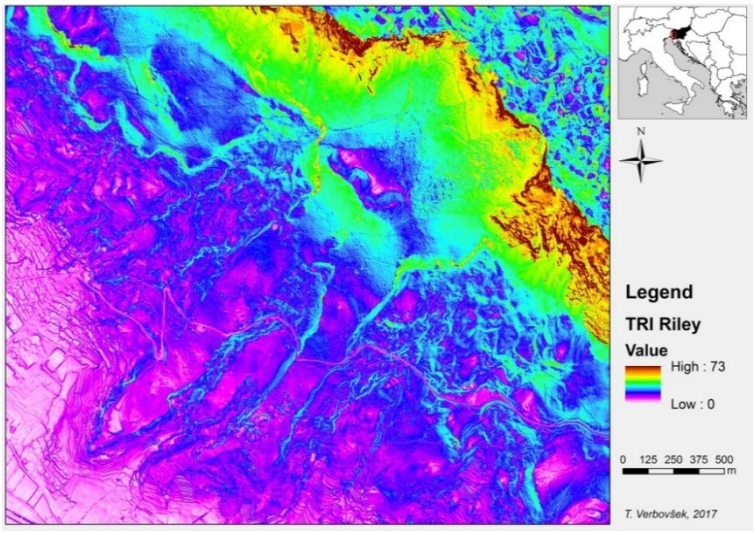
Roberto Ranzi, University of Brescia, Italy

A pioneering 'flood risk' map for the Adige river in Trento, Italy, was published already in 1892, taking into account in detail both hazard intensity in terms of velocity and depth, frequency of occurrence, vulnerability and economic costs for flood protection with river embankments. This map is likely to be the reinterpreted certainly as a pioneering, and possibly as the first flood risk map for an Italian river and worldwide. Risk levels were divided into three categories and seven sub-categories, depending on flood water depth, velocity, frequency and damage costs. It is interesting to notice the fact that at that time the map was used to share the cost of levees' reparation and enhancement after the severe September 1882 flood as a function of the estimated level of protection of the respective areas against the flood risk. The sharing of costs between public bodies, the railway company and private owners was debated for about 20 years and at the end the public sustained the major costs. This shows how already at that time the economic assessment of structural flood protections was based on objective and rational cost-benefit criteria, that hydraulic risk mapping was perceived by the society as fundamental for the design of flood protection systems.

LIDAR DEM-BASED TERRAIN ROUGHNESS ANALYSIS FOR LANDSLIDE CHARACTERIZATION (Video lecture)

Timotej Verbovšek, University of Ljubljana, Slovenia

Several morphological techniques exist for the analysis of the terrain surface. Recently, the most accurate digital elevation models (DEMs) of the terrain are obtained by the LiDAR airborne scanning, which produces a high-resolution DEM. Apart from the high 1x1m resolution, the most important aspect is the possibility to remove vegetation and artificial objects, resulting in bare ground-only DEM. Such surface is of great importance for geological analyses, including the landslide recognition and characterization and precise calculations of area and volumes. Apart from visual inspection of shaded relief, several numerical methods of surface roughness can be also performed on the DEMs to aid the characterization of landslides: Standard Deviation of Elevation, Slope Variability, Height variability, Basin-scale Ruggedness, 2D Area:3D Area Ratio, Melton Ruggedness Number, Topographic Ruggedness Index (TRI; Riley and Nellemann), RIX Site Ruggedness Index, Standard Deviation of Slope and First Derivative of Flow Direction. Usage of these methods in GIS will be discussed, with emphasis of advantages and disadvantages of each method. Results are presented in the form of GIS maps, and areas with different roughness values can be attributed to different landslide properties. The Vipava Valley region, SW Slovenia, will be used as the study area.



Visualization of surface roughness, quantified by the Terrain Ruggedness Index for the fossil rock landslide Podrta Gora in the Vipava Valley, SW Slovenia (Verbovšek, 2017)

HURRICANE READINESS AND ENVIRONMENTAL RISKS (Video lecture)
Gabriela Kalčíková and Andreja Žgajnar Gotvajn, University of Ljubljana, Slovenia

The Atlantic hurricane season is the period in a year when hurricanes are usually formed in the Atlantic ocean. Hurricanes are cyclones with the most severe meteorological conditions (heavy winds and rain). They usually appear in late summer, where there is the highest difference in temperature between air and water surface. They have caused many times severe consequences regarding human and material casualties, especially in New Orleans, Louisiana, USA. The aim of our lecture will be to introduce how preparation for hurricane, evacuation, emergency and communication plans is organized in the City of New Orleans. Furthermore we will talk about possibilities to reduce hurricane impact by restoration and remediation of the Bayou Bienvenue wetlands by sustainable engineering approaches.

Public awareness (photo: Sean Gardner)

ADAPTION TO CLIMATE CHANGE IN WATER ENGINEERING (Video lecture)
Roberto Ranzi, University of Brescia, Italy

In this lecture a contribution of the IAHR-International Association for Hydro-Environment Engineering and Research Working Group on Climate Change to the scientific and technical debate on this global challenge in the water sector is summarized. Some experts in different fields reviewed and recommended structural and non-structural adaptation measures being taken or to be taken in the hydro-environment engineering community to mitigate the impact of climate change on humans, nature and infrastructures. Results on trend analyses on precipitation and runoff are presented together with downscaling and adaptation methods to urban hydrology, case studies on the impact of time shifts and runoff volume changes in mountain watersheds on hydropower generation. Examples of adaptation in groundwater management and drought management will be shown.

DESIGN OF STRUCTURES IN SEISMIC AREAS: PAST, PRESENT AND FUTURE (Video lecture)
Matjaž Dolšek, University of Ljubljana, Slovenia

The aim of this lecture is to give a brief overview of the development of concepts of design of structures in seismic areas. Firstly, selected seismic events, which caused severe damage and losses are presented. It is shown that it took quite a lot of time, that the understanding of the design of structures in seismic region developed to the current state of practice. In the second part of the lecture, some concepts of seismic design are described with an emphasis on explaining the differences how the problem was solved in the past, present and how it may be solved in the future. The concept of design is demonstrated by means of an eight storey building in order to discuss which design factors has the largest influence of the strength and deformation capacity. In the last part of the lecture one possible metrics for performance requirements of structures is presented and discussed.

BASIC OF DECISION (Video lecture)

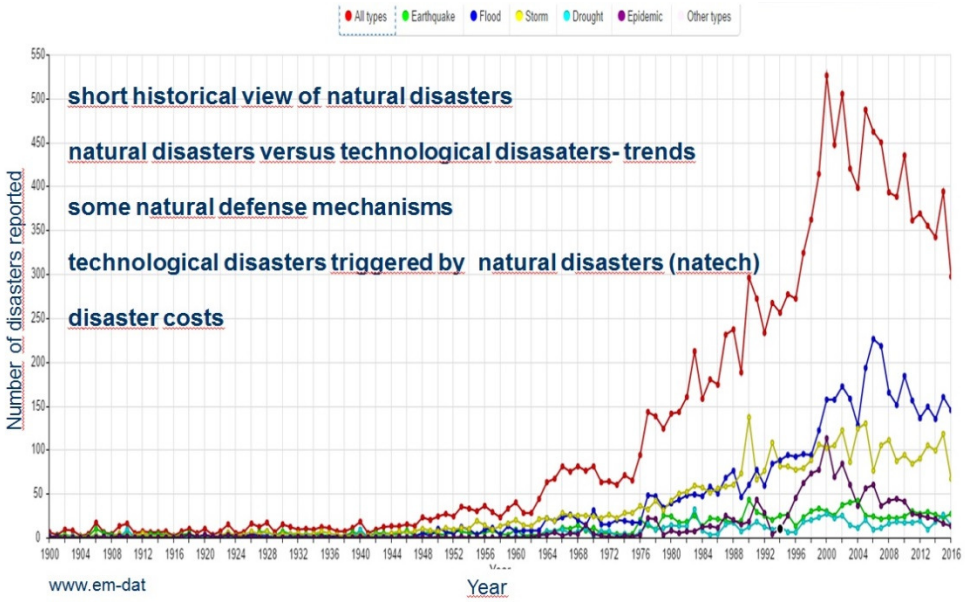
Mitja Brilly, University of Ljubljana, Slovenia

Our decisions are related to our interests that could be personal, organizational and general by origin. Personal interests are quit complex related to the care of our family, income and welfare. There are also depending our filing, knowledge and background. Than we are employs in enterprises or supporters of NGO and such organisations also have some particular interests and there are establish to support such interests. And list but not last we have overall general interests that are supports from all of us to live in clean and healthy environment that support life on the globe. Cleverness of decision making is optimisation and harmonization of personal, organisational and general interests that should fit together. Troubles are if there are in conflicts and results of development are not proper. That is reason why analysis of interests is so important from the beginning. For proper decision we need some knowledge and support by decision making system. Some examples will be presented. How manage decision is also related to the nature of the problem.

NATURAL DISASTERS PATTERN CHANGE (Video lecture)

Klementina Zupan, University of Ljubljana, Slovenia

Natural disasters have adversely affected humans since the beginning of our existence. The statistical number of disasters per year appear to indicate that, over time, the number of significant interactions between man and nature is increasing, resulting in fatalities, injuries and loss of property. There are two possible explanations for the increasing number of annual disasters. First reason is growing population with the increased settlement in more vulnerable areas. The second explanation without a doubt is climate change and environmental degradation. Sectors that are closely related to climate, such as agriculture, tourism, and water supply, are facing a great challenge by extreme events. Natural disasters can also trigger technological disasters, and these concomitant events (also known as natechs) may pose tremendous risks to countries and communities that are unprepared for such risks. In the present lecture the reasons for growing number of natural disasters not only in view of global climate change but also other man related factors influencing the number and the magnitude of natural disasters will be highlighted.



Natural disasters pattern change (Zupan, 2017)

INTRODUCTION TO WILDFIRES (Video lecture)

Simon Schnabl and Marko Radak, University of Ljubljana, Slovenia

A wildfire or wildland fire is a fire in an area of combustible vegetation that occurs in the countryside or rural area. Depending on the type of vegetation where it occurs, a wildfire can also be classified more specifically as a brush fire, bush fire, desert fire, forest fire, grass fire, hill fire, peat fire, vegetation fire, or veld fire. Wildfires can be characterized in terms of the cause of ignition, their physical properties, the combustible material present, and the effect of weather on the fire. Wildfires can cause damage to property and human life, but they have many beneficial effects on native vegetation, animals, and ecosystems that have evolved with fire. Thus, within this lecture we define wildfire and distinguish it from other kinds of fire. We discuss two ways of describing the morphology of a wildfire by shape and by relative spread direction. Then, we define four primary, quantitative wildfire behavior characteristics: flaming front spread rate, heat per unit area, fireline intensity, and flame size and introduce the five major influences on wildfire behavior simulations: fuelbed structure, fuel moisture content, slope characteristics, wind characteristics, and relative spread direction. At the end, some tips are given, such as cellular automata, how to model the wildfire as a natural disaster.

QUANTITATIVE ANALYSIS OF HISTORICAL DROUGHTS (Video lecture)

Mihael Brenčič, University of Ljubljana, Slovenia

Drought is natural phenomena affecting environment and human activities. There are various drought definitions and quantitative indices; among them standardized precipitation index – SPI is not at least important. In the drought investigations historical events are poorly characterised and not many data about them are available. To decipher past appearances of drought in the region of south-eastern Alps with focus on Slovenia precipitation from HISTALP data set were taken to identify extreme drought events from the second half of 19th century to the present day. Several long term extreme drought crises were identified in the region (between years 1888 – 1896; after World War One, during and after World War Two). After year 1968 drought pattern detected with SPI changes, shorter extreme droughts with different time pattern are appearing. SPI indices of different time span are showing correlated structure in space and between each other indicating structured relations.

Second week of the summer school (May 28 – June 3, 2017) – 4th World Landslide Forum

Sunday May 28th
ARRIVAL

Monday May 29th
OFFICIAL OPENING AND WELCOME
Ljubljana tour

Tuesday May 30th – Friday June 2nd
This week will be organised as a part of 4th World Landslide Forum with the welcome reception on Tuesday and obligatory open session discussion on Friday.

Friday, June 2nd 12:00 to 13:30 (during lunch time), room Club CD, Forum venue (TBC):
WLF4 Open Session III - "Landslide risk management, an integrated approach in time" (Conveners: Mitja Brilly, Roberto Ranzi)

Saturday June 3th
1-day field trip.

Ljubljana – Vipava Valley – Kobarid (field trip)
Study tour takes us to Vipava Valley where we will observe complex Pleistocene to recent slope mass movements. Combination of unfavourable geological condition and intense short or prolonged rainfall periods lead to formation of different types of complex landslides from large-scale deep-seated rotational and translational slides to shallow landslides, slumps and sediment gravity flows in the form of debris or mudflows. Participants will first learn about the geological structure of the broader area, and then specifically present the sliding process and engineering geological investigation of the Rebernice area, where a section of the motorway was constructed across several unstable slopes and is still affected by mass movements. Technical solutions for the motorway construction over unstable slopes will be shown. At the next stop we will present the Stogovce landslide, a still active large deep-seated landslide in flysch, induced by rainfall in the last decades. In the afternoon we will visit the Slano Blato landslide, known for more than 200 years and still active today. It was previously remediated, but reactivated in November 2000 primarily due to prolonged rainfall. Experiences of emergency planning strategy will be introduced by the local representatives of civil protection while the landslides experts will present the results of investigations and monitoring, conditions for sliding, mitigation and remediation measures.

Vipava Valley (https://www.wlf4.org/)

Third week of the summer school (June 5 – June 10, 2017) – face to face lectures

Monday June 5th

AN INTEGRATED METHODOLOGY TO DEVELOP A STANDARD FOR LANDSLIDE EARLY WARNING SYSTEMS (Invited lecture)

Teuku Faisal Fathani, Gadjah Mada University, Indonesia

The implementation of early warning systems is in line with the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030. One of the four priorities of the Sendai Framework for Action emphasizes the improvement of preparedness in response to a disaster by developing a simple and low-cost early warning system and by improving its dissemination. A new proposal of a global standard for community-based/people-centred landslide early warning systems has been promoted to the International Organization for Standardization (ISO) by Universitas Gadjah Mada, in corporation with the Indonesian Standardization Agency and the Disaster Management Authority. The standard will serve to empower individuals and communities who are vulnerable to landslides to act in sufficient time in appropriate ways to reduce the possibility of injuries, loss of life and damage to property and the environment. It is designed to encourage communities to play a much more active role for their own protection. The guidelines adopted the concept of people-centred early warning system by UNISDR (2006) and will be used by communities vulnerable to landslides, and by government agencies and non-governmental organizations at central, provincial, municipality/district, sub-district, and village levels. The recommendations include: (1) Risk assessment; (2) Dissemination and communication; (3) Formation of disaster preparedness teams; (4) Development of evacuation maps; (5) Development of standard operating procedures; (6) Monitoring, early warning, and evacuation drills; (7) Commitment of the local government and community to operate and maintain the system. The standard will be developed by ISO/TC 292 Security and resilience, with the participation of 43 countries in the committee's work and another 14 as observers.

Evacuation dril (Fathani, 2017).

THE ADIGE RIVER IN TRENTO FLOODING MAP, 1892

Roberto Ranzi, University of Brescia, Italy

A pioneering 'flood risk' map for the Adige river in Trento, Italy, was published already in 1892, taking into account in detail both hazard intensity in terms of velocity and depth, frequency of occurrence, vulnerability and economic costs for flood protection with river embankments. This map is likely to be the reinterpreted certainly as a pioneering, and possibly as the first flood risk map for an Italian river and worldwide. Risk levels were divided into three categories and seven sub-categories, depending on flood water depth, velocity, frequency and damage costs. It is interesting to notice the fact that at that time the map was used to share the cost of levees' reparation and enhancement after the severe September 1882 flood as a function of the estimated level of protection of the respective areas against the flood risk. The sharing of costs between public bodies, the railway company and private owners was debated for about 20 years and at the end the public sustained the major costs. This shows how already at that time the economic assessment of structural flood protections was based on objective and rational cost-benefit criteria, that hydraulic risk mapping was perceived by the society as fundamental for the design of flood protection systems.

PROBABILISTIC LANDSLIDE HAZARD ANALYSIS (Invited lecture)

Paolo Frattini, University of Milano-Bicocca, Italy

In this speech, a general framework for probabilistic landslide hazard analysis is presented. With respect to other quantitative hazard assessment approaches, this probabilistic landslide hazard analysis has the advantage to provide hazard curves and maps, and to be applicable to all typologies of landslides, if necessary accounting for both their onset and transit probability.

The method is based on the assessment of a landslide onset frequency, a runout frequency for long-runout landslides, and on the local definition of landslide intensity, which can be expressed through different parameters, according to landslide typology. For long runout landslides, the runout and spatially-varying intensity and uncertainty are considered. Examples for rockfalls and debris flows will be presented and discussed.

Tuesday June 6th

MULTILEVEL INTEGRATED FLOOD MANAGEMENT APROACH

Mitja Brilly, University of Ljubljana, Slovenia

There is a lot of talk on integral approach, but a little is done and very rarely it's used. More or less we could only a partially integrated two, three factors or processes. The full integration is difficult because we should connect too many things in a complex system, but it is the task of the engineering profession that connects together at least the main factors in related to the case. Different solutions have advantages and disadvantages and should be implemented in combination according to local conditions. The best solution must fit to natural, legal and social conditions. We should no forget to integrate different strategies in solution also.

Integrity includes action on:

The Integrity flood safety inside river basin, including the safety downstream along the main stream,

The integrity of the hydrology of water regime, including medium and low flows

The integrity of the river regime including, the regime of sediments, morphology and geology

The integrity of the water regime with ekohidrologijo and including land use

Integrity of all activities on and around the water

The integrity of the implementation of measures by monitoring before, during and after the action

The integrity of the implemented measures with actual scenarios in forecasted events including management system and taking into account the uncertainties in the

The integrity of action in the planning of structural measures,

The Integrity of action with planning and supporting non-structural measures,

The Integrity of flood protection and spatial planning and

The Integrity in time, taking into account the long-term changes in vulnerability that affects risk.

THE RESEARCH ON GLACIAL LAKE OUTBURST FLOODS IN THE CORDILLERA BLANCA, PERU (Invited lecture)

Vít Vilímek, Charles University, Faculty of Science, Czech Republic

High mountain areas are considered as regions of exceptional risk for human population. These areas are also very sensitive during global climate changes. Our research on Glacial Lake Outburst Floods (GLOFs) consists from several steps hold in last 10 years and is mainly dedicated to the Cordillera Blanca in Peru. Apart of different case studies dealing with hazardous GLOF events we tried to solve also some more general topics: inventory of lakes in Cordillera Blanca, new methodology for hazard evaluation and establishing of GLOFs database. We also tried to sum all different parameters which influence the GLOFs hazard evaluation. Due to the fact that slope movements are the main triggering factor for GLOFs in Cordillera Blanca we tried to go more detailed into this phenomena. Because of several regional differences we decided to establish the worldwide GLOFs Database. The research on GLOFs is an example of topic which needs a complex approach across geosciences.

Glacial lake (photo: Vít Vilímek)

ISSUES ON DESERTIFICATION AND SOIL DEGRADATION: CLIMATIC AND ANTHROPOGENIC DRIVERS

Stefano Barontini, University of Brescia, Italy

Desertification is regarded to as a cross-cutting issue induced by other degradation processes, viz erosion, organic matter decline, and salinization. It does not necessarily spread from a desert and arid region, but is a ‘slowly creeping phenomenon’ (Şen 2008) which can take place in any area, starting from localized spots, even far from arid conditions, and essentially due to land degradation. Temperature increase has the direct effect of exposing the soil to degradation, by means of drawbacks on the main soil processes, namely, organic matter decomposition, leaching, and soil water regimes. An increase in temperature will trigger an increased water demand for evapotranspiration. Climatic changes are accompanied in many areas by human and social changes, which lead to an increase of agricultural and sanitary water demand, due to population growth, and induce a reduction of the soil capacity of storing water as a consequence of urbanization and bad soil management policies. During the lecture some of these topics will be addressed with particular reference to the Mediterranean basin and the Iranicated areas.

Wednesday June 7th

FROM DESERT TO OASIS: THE ROLE OF THE TRADITIONAL IRRIGATION TECHNIQUES
Stefano Barontini, University of Brescia, Italy
Water availability and management are structural for agricultural purposes and therefore for food security. At the same time, they are key aspects of most soil conservation issues. A cultivated land is an anthropized environment in which natural resources and anthropogenic activities symbiotically act to guarantee the food production and ultimately the food security. These relationships are structural in areas in which, due to the adverse climatic or soil conditions, only the alliance between man and nature allows the building of living, autopoietic and coevolutive ecosystems. An important case, regarded to as the key to understand these relationships, is that of the oasis. Thanks to the equilibrium between natural resources and anthropogenic activity, oases are settled and survive in arid areas, in most of which the original organic activity of the soil is practically absent and the preliminary steps of soil development are inhibited by wind erosion. During the lecture the key role played by traditional irrigation techniques for soil conservation in arid and semiarid environments, and their cultural importance, will be addressed on the basis of examples chosen in the Mediterranean basin and the Iranicated areas.

MONITORING OF DEBRIS FLOWS
Johaness Hübl, University of Natural Resources and Life Sciences –BOKU, Austria
This lecture deals with practical guidelines on installing and running monitoring of debris flows, based on two decades of experiences in selected instrumented debris flow catchments in Europa. Starting with definitions and aims of any debris-flow monitoring system, especially those being part of an early warning system, the chain of perception, monitoring and warning is presented. Measuring debris-flow signals, the lecture focusses on issues regarding the positioning of measuring devices in the triggering, transport, and depositions areas. Different debris-flow data are recorded, communicated and archived, and all that needs stable energy supply. The lecture ends with a short review of installed debris-flow monitoring systems in Europe (with suggested further reading) and a short description of a important items that have to be taken into account in designing a monitoring or warning system.

Monitoring of debris flows (Hübl, 2017)

Thursday June 8th

TORRENTIAL (FLASH) FLOOD ANALYSIS: EXAMPLES OF WÖLZERBACH AND SIMBACH, BAVARIA
Johaness Hübl, University of Natural Resources and Life Sciences –BOKU, Austria

Within the last years several disastrous floods occurred in prealpine and alpine regions. On the base of 2 examples flash flood documentation and flash flood analysis is presented. The basics of event documentation and hazard analysis will be discussed to find a common standard in these topics. Shortcomings and benefits of methodological approaches should be analysed and summarized. One example deals more with a fluvial process, the other one with a more sediment dominated process. This enables the comparison of these two events.

Torrential (flash) flood analysis: Examples of Wölzerbach and Simbach, Bavaria (Hübl, 2017)

LJUBLJANA – European Green Capital 2016

Ljubljana is a people-friendly city and it has become European Green Capital 2016. It will surprise you and probably exceed your expectations in terms of hospitality and quality of life. It is smaller than one would expect for a capital with a government and parliamentary building, all administrative services, foreign embassies, the head offices of banks and companies, university and many cultural institutions.

Legend relates that the Argonauts fled with the Golden Fleece from the Black Sea to the Adriatic along the river Ljubljanica. A history however speaks of the Romans and the town of Emona, which was established here at the turn of the 1st century A.D. and flourished until its destruction by the Huns. The town was first recorded as Luwigana in 1144. From 1335 this town with a Slavic soul acquired Germanic administrative feature and life style, because the Habsburgs ruled here until the First World War, except a few years as an Illyrian province and centre under Napoleon.

Ljubljana has an important geographical position with heavy frequented road and railway crossing, linking the Mediterranean and inner of European continent. Traffic, commercial, administrative and cultural centre and life form a modern image of the town. The streets under castle and along the Ljubljanica river were fostered by the Baroque style, while Romanic cultures were revered by the founders of the Academia Operosorum, the first intellectual club and precursor of the subsequent Academy of Arts and Science. In 1701, this was followed by the Academia Philharmonicorum, the predecessor of the present-day Slovene Philharmonic. The city is also seat of the Ljubljana archdiocese. A new middle European image got the town in renewal after earthquake in 1895. From 1918 up to present urban development of Ljubljana increased fourfold in population.

Ljubljana lies in the southern part of the Ljubljana basin, crossing the moor on the south and the north of Ljubljana field. The area of the city has a long history of various flood protection measures (e.g. first waterworks in the Ljubljanica River channel by the Romans, Grubar flood canal excavation in 1780 for diversion of Ljubljanica moor floodwaters away from the city center, weir construction on the Ljubljanica River in 1950s for floodwater manipulation). However, despite the abovementioned flood protection efforts, many parts of the urban area of the City of Ljubljana is presently heavily threatened by the floods as the one experienced in September 2010.

Franc Lobnik, Avguštin Lah, Mitja Brilly

More at:
http://www.greenljubljana.com/
https://www.ljubljana.si/en/

Ljubljanica River in the city center of Ljubljana (photo: Šraj, 2009)

INTERNATIONAL SUMMER SCHOOL

NATURAL DISASTERS

Ljubljana, Slovenia
May 21st–June 10th, 2017

Ljubljana (source: http://www.greenljubljana.com/)

NOTES

NOTES

NOTES

NOTES