



10th Anniversary of ICL Adriatic-Balkan Network and 5th Regional Symposium on Landslides

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Abstract

The Adriatic-Balkan Network (ABN) was established in January 2012 as one of regional networks in the framework of International Consortium on Landslides (ICL) and its 10th Anniversary was concluded with 5th Regional Symposium on Landslides in Adriatic-Balkan Region (ReSyLAB) in Rijeka, Croatia, in March 2022. The Adriatic-Balkan Network was formally established during the 14th Serbian Symposium on Engineering Geology and Geotechnics in Belgrade in September 2012 based on the Proposal of the ICL Adriatic-Balkan Network that was approved at the 10th Anniversary Meeting of ICL held in Kyoto, Japan, in January 2012. The main outcome of the Adriatic-Balkan Network activity is organization of biannual Regional Symposiums on Landslides, organized in Zagreb, Croatia, 2013; Belgrade, Serbia, 2015; Ljubljana, Slovenia, 2017; Sarajevo, Bosnia and Herzegovina, 2019; and the last one in Rijeka, Croatia in March 2022. In this paper, the establishment, objectives and activities of Adriatic-Balkan Network (ABN) within last ten years were presented as well as main outcomes of the 5th ReSyLAB held in Rijeka, Croatia, in March 2022.

Keywords

ICL • Adriatic-Balkan regional network • Regional symposium • ReSyLAB • Croatian Landslide Group

1 Introduction

International Consortium on Landslides (ICL) Adriatic-Balkan Network was established in January 2012 as one of eight regional and thematic ICL networks to promote activities of the International Consortium on Landslides and the International Programme on Landslides based on the Proposal of the ICL Adriatic-Balkan Network that was approved at the 10th Anniversary Meeting of ICL held in Kyoto, Japan, in January 2012. The Adriatic-Balkan Network was formally established during the 14th Serbian Symposium on Engineering Geology and Geotechnics in Belgrade in September 2012 when seven organizations, current members of ICL, signed the Letter of intent and Declaration of the regional cooperation and International Consortium on Landslides' Adriatic-Balkan Network constitution. These seven initial members of the Adriatic-Balkan Network were University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering, Zagreb, Croatia; and University of Rijeka, Faculty Civil Engineering, Rijeka, Croatia; University of Belgrade, Faculty Mining and Geology, Belgrade, Serbia; University of Ljubljana, Faculty Civil Engineering and Geodesy, Ljubljana, Slovenia; Geological Survey of Slovenia, Ljubljana, Slovenia, Albanian Geological Survey, Tirana, Albania and City of Zagreb, City Office of Emergency Management, Zagreb, Croatia. In the Declaration was highlighted that ICL ABN is open to adopt new members those can be: inter-governmental organizations, non-governmental organizations, governmental organizations and public organizations or other organizations and entities, ICL members and non-members, those express the interest to join ICL Adriatic-Balkan Network' activities.

The general objective of the ICL Adriatic-Balkan Network is advancing landslide science and its practical application in the region for the benefit of society and the environment. Specific objectives are: (i) to set up scientific and legislative background for regional cooperation; (ii) regional unification of information about landslides and

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landslide research at national levels; and (iii) development of landslide science by capacity building at regional level and practical applications of outcomes to societies in the region.

The first and the most important ICL ABN initiative was organization of the 1st Regional Symposiums on Landslides in Adriatic-Balkan Region, entitled *Landslide and Flood Hazard Assessment*, organized in Zagreb, Croatia, in March 2013, organized by Croatian Landslide Group, member of ICL, consisted of Scientists from University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering, Croatia; and University of Rijeka, Faculty Civil Engineering, Croatia, together with the 3rd Workshop of the Croatian-Japanese Project Risk Identification and Land-Use Planning for Disaster Mitigation of Landslides and Floods in Croatia. More than 110 participants from 12 countries presented 77 scientific and professional papers about landslides and floods hazard assessment as well as other topics related to the landslide science and praxis (Arbanas et al. 2014). The importance of the 1st ReSyLAB for development of landslide science and regional cooperation was recognized by all ICL ABN members and it was adopted that organization of biannual Symposiums will be the most important chain in the maintaining ICL Adriatic–Balkan Network’ activities. The 1st ReSyLAB was followed by next four Symposiums held in Belgrade, Serbia, 2015; Ljubljana, Slovenia, 2017; Sarajevo, Bosnia and Herzegovina, 2019; and the last one in Rijeka, Croatia in March 2022.

2 Establishment of ICL ABN and Regional Cooperation

Regional cooperation in Adriatic–Balkan Region was initiated during the First Workshop of the bilateral Japanese-Croatian Project ‘Risk Identification and Land-Use Planning for Disaster Mitigation of Landslides and Floods in Croatia’, which was held in Dubrovnik (Croatia) in November 2010 (Mihalić and Arbanas 2012). This workshop was an opportunity for scientists in the fields of geological and geotechnical engineering and risk management to share knowledge through presentations of work and research of regional institutions, scientists and professionals. The workshop addressed a range of topics in the fields of investigation of the project members and 25 regional guest experts from eight universities, two geological surveys and four institutes from Bosnia and Herzegovina, Bulgaria, Macedonia, Serbia and Slovenia (Mihalić et al. 2012).

The Ministry of Foreign Affairs of Japan (MOFA) enhanced the regional cooperation on landslides by organizing a workshop for South-Eastern European countries on disaster management in December 2010 in Tokyo. The main result of this workshop was an initiative of the invited participants from Albania, Bosnia and Herzegovina, Croatia,

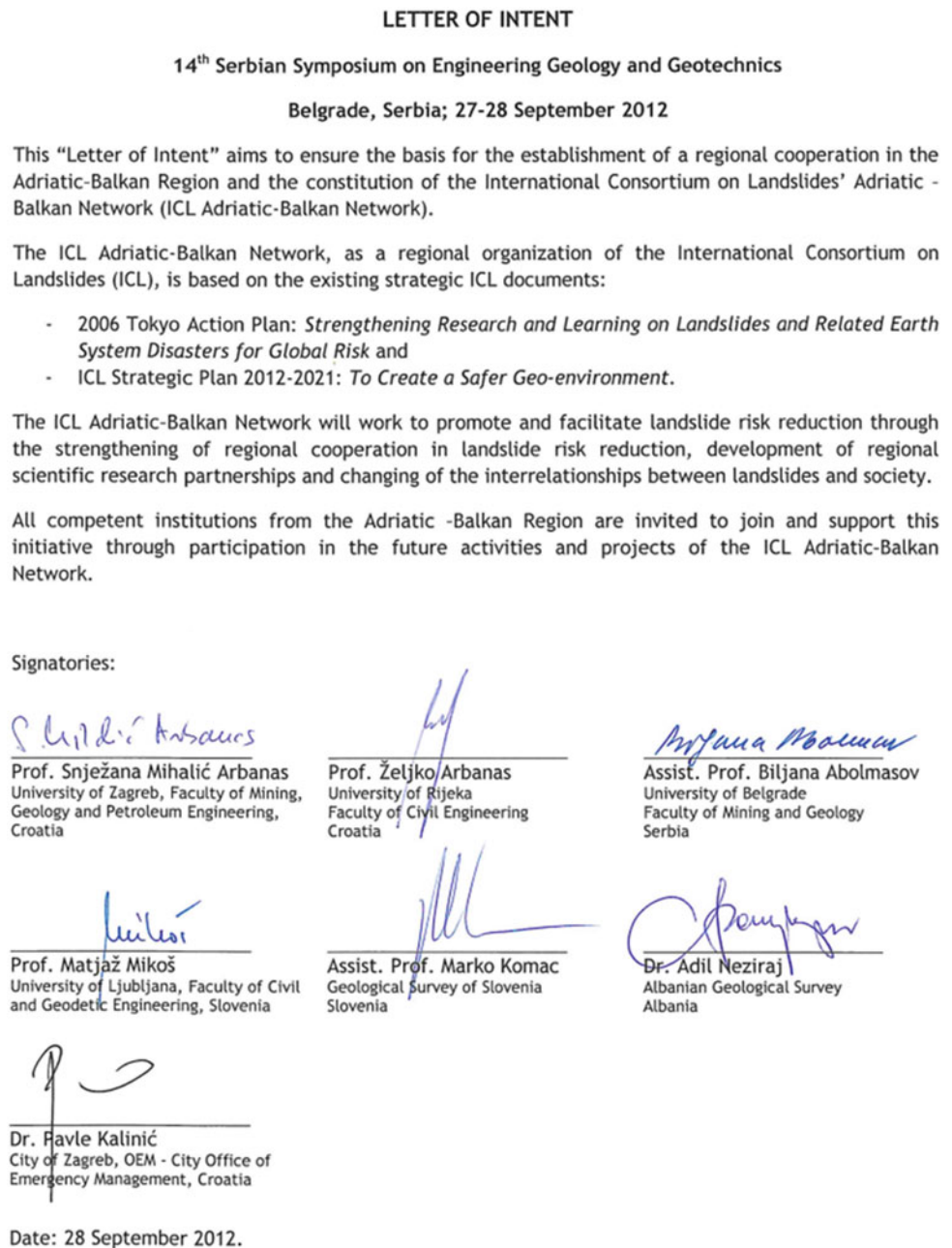
Montenegro, Serbia and Slovenia to establish a regional Adriatic-Balkan Network on Landslides to increase the capacity in landslide disaster risk reduction through regional collaborative work within the ICL. The International Programme on Landslides of ICL (IPL ICL) discussed the establishment of regional consortiums on landslides at the secretarial meeting in Kyoto in January 2011, at the IPL-ICL Session at the Global Platform for Disaster Risk Reduction 2011 in Geneva in May 2011 and at the secretarial meeting in Rome in October 2011 during the 2nd World Landslide Forum. The round table discussions in Geneva and Rome enabled sharing of ideas with other participants and considered an integrated action plan for building the resilience of nations and communities in landslide disaster risk reduction.

General concept of the organization of regional Adriatic-Balkan Network was discussed within the ICL members (Croatian Landslide Group from Faculty of Civil Engineering, University of Rijeka, Rijeka, Croatia and Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Zagreb, Croatia; University of Belgrade, Faculty Mining and Geology, Belgrade, Serbia; University of Ljubljana, Faculty Civil Engineering and Geodesy, Ljubljana, Slovenia; Geological Survey of Slovenia, Ljubljana, Slovenia, Albanian Geological Survey, Tirana, Albania and City of Zagreb, City Office of Emergency Management, Zagreb, Croatia) during the Second Workshop of the Bilateral Japanese-Croatian Project in Rijeka (Croatia) in December 2011. Regional ICL meeting was also organized for non-members willing to contribute with advice: the City of Zagreb (local government authority), scientific institutions from Bosnia and Herzegovina and representatives from Kosovo.

According to the preliminary proposal, the common interests to establish this regional Adriatic-Balkan Network on Landslides were: (i) alignment of professional and scientific resources at the regional level by initiating and implementing joint bilateral or multilateral regional projects; (ii) sharing of information and knowledge (e.g., organization of regional workshops and conferences, establishing a newsletter of the regional research network; development of a multilingual landslide glossary using languages of the countries in the region); (iii) enhancing education and training by exchanging scientists and professionals between regional institutions, establishing courses and schools on landslides for young researchers, and educating the public and local administrations; and (iv) development of regionally harmonized strategies for landslide hazard/risk prevention and mitigation (Mihalić Arbanas et al. 2012).

At the 10th Anniversary Meeting held in Kyoto, Japan, in January 2012 ICL has encouraged the establishment of thematic and regional networks in the framework of its ten-year strategic Plan and one of eight proposed regional

Fig. 1 Letter of Intent signed in Belgrade on 28 September 2012



and thematic ICL networks was Adriatic-Balkan Network. The Adriatic-Balkan Network was formally established during the 14th Serbian Symposium on Engineering Geology and Geotechnics in Belgrade in September 2012 when seven organizations, current members of ICL, signed the Letter of intent (Fig. 1) and Declaration of the regional cooperation and International Consortium on Landslides' Adriatic-Balkan Network constitution (Fig. 2). These seven initial members of the Adriatic-Balkan Network were University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering, Croatia; University of Rijeka, Faculty Civil Engineering, Croatia; University of Belgrade, Faculty

Mining and Geology, Serbia; University of Ljubljana, Faculty Civil Engineering and Geodesy, Slovenia; Geological Survey of Slovenia, Ljubljana, Slovenia, Albanian Geological Survey, Tirana, Albania and City of Zagreb, City Office of Emergency Management, Croatia.

ICL Adriatic-Balkan Network is constituted as a regional International Consortium on Landslides organization based on the existing strategic International Consortium on Landslides' documents: 2006 Tokyo Action Plan: Strengthening Research and Learning on Landslides and Related Earth System Disasters for Global Risk Preparedness (Sassa 2006a, b) and ICL Strategic Plan 2012-2021: To Create a

DECLARATION OF THE REGIONAL COOPERATION AND INTERNATIONAL CONSORTIUM ON LANDSLIDES' ADRIATIC-BALKAN NETWORK CONSTITUTION

14th Serbian Symposium on Engineering Geology and Geotechnics, Belgrade, Serbia; 27-28 September 2012

Based on the *Proposal of the International Consortium on Landslides Adriatic Balkan Network* that was approved at the 10th Anniversary Meeting of the International Consortium on Landslides held on 17-20 January 2012 in Kyoto, Japan; and the *Letter of Intent* signed at the 14th Serbian Symposium on Engineering Geology and Geotechnics, held on 27-28 September 2012 in Belgrade Serbia, the representatives of the following seven International Consortiums on Landslides' members organizations decided to establish a regional cooperation in the field of landslide science and practice and to constitute the International Consortium on landslides' Adriatic-Balkan Network (ICL Adriatic-Balkan Network):

- University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering, Croatia;
- University of Rijeka, Faculty of Civil Engineering, Croatia;
- University of Belgrade, Faculty of Mining and Geology, Serbia;
- University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia;
- Geological Survey of Slovenia, Ljubljana, Slovenia;
- Albanian Geological Survey, Tirana, Albania; and
- City of Zagreb, OEM - City Office of Emergency Management, Zagreb, Croatia.

The International Consortium on Landslides' Adriatic-Balkan Network is constituted as a regional International Consortium on Landslides organization based upon the existing strategic documents of the International Consortium on Landslides: '2006 Tokyo Action Plan: Strengthening Research and Learning on Landslides and Related Earth System Disasters for Global Risk' and 'ICL Strategic Plan 2012-2021: To Create a Safer Geo-environment'. The International Consortium on Landslides' Adriatic -Balkan Network is established to promote and facilitate landslide risk reduction through the strengthening of regional cooperation in landslide risk reduction, development of regional scientific research partnerships and the changing of interrelationships between landslides and society in the region.

The general objective of the International Consortium on Landslides' Adriatic-Balkan Network is the advancement of landslide science and its practical application in the region for the benefit of society and the environment. The specific objectives are: (i) to set up a scientific and legislative background for regional cooperation; (ii) regional unification of information about landslides and landslide research at national levels; and (iii) the development of landslide science by capacity building at regional levels and practical applications of outcomes to societies in the region. The implementation and realization of the general and specific objectives should be defined in the *ICL Adriatic-Balkan Network Action Plan* that will be prepared and adopted biannually.

The authority of the ICL Adriatic-Balkan Network is the Network Committee that consists of the representatives of the Member's organization. The executive authority of the ICL Adriatic-Balkan Network is the Network Board, that consists of one Coordinator and two Co-coordinators chosen from the Network Committee. The Network Committee should hold a Network Committee Meeting each year in order to prepare and adopt the ICL Adriatic-

Balkan Network Action Plans and/or to control the Action Plans implementation and progress. All decision should be confirmed by all members of the Network Committee.

The initial ICL Adriatic-Balkan Network organizations are the following seven ICL member organizations: University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering, Croatia; University of Rijeka, Faculty of Civil Engineering, Croatia; University of Belgrade, Faculty of Mining and Geology, Serbia; University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia; Geological Survey of Slovenia, Ljubljana, Slovenia; Albanian Geological Survey, Tirana, Albania; and City of Zagreb, OEM - City Office of Emergency Management, Zagreb, Croatia. ICL Adriatic -Balkan Network is open to adopt new members, which can be: Inter-governmental organizations, Non-governmental organizations, Governmental organizations and public organizations or other organizations and entities, ICL members and non-members or those expressing an interest to be involved in ICL Adriatic-Balkan Network' activities. Acceptance of new members into the ICL Adriatic -Balkan Network must be confirmed by all the members of the Network Committee. Any member can make the decision to withdraw their membership from the ICL Adriatic-Balkan Network.

The ICL Adriatic -Balkan Network will stop its activities if the Network Committee concludes that there is no interest for further joint activities; or if the number of active members of the ICL Adriatic -Balkan Network falls to less than three.


Signatories:

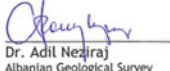

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Date: 28 September 2012.

Fig. 2 Declaration of the regional cooperation and International Consortium on Landslides' Adriatic-Balkan Network constitution signed in Belgrade on 28 September 2012

Safer Geo-environment (Sassa 2012). ICL Adriatic-Balkan Network is established to promote and facilitate landslide risk reduction through strengthening of regional cooperation in landslide risk reduction, developing of regional scientific research partnership and changing of interrelationships between landslides and society in the region.

The general objective of the ICL Adriatic-Balkan Network is advancing landslide science and its practical application in the region for the benefit of society and the environment. Specific objectives are: (i) to set up scientific and legislative background for regional cooperation; (ii) regional unification of information about landslides and landslide research at national levels; and (iii) development of landslide science by capacity building at regional level and practical applications of outcomes to societies in the region.

The objectives and planned activities were defined based on analyses about basic information about landslides in the Region and evaluation and mitigation of landslide hazard in the Region (Mihalić Arbanas et al. 2013).

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Member's organization. Executive authority of the ICL Adriatic-Balkan Network is Network Committee consisted of one Coordinator and two Co-coordinators chosen from the Network Committee. All decision should be confirmed by all the members of the Network Committee.

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Emergency Management was attached to other city offices (2021) and is not included in Network activities. Currently, ICL Adriatic-Balkan Network is consisted of five full ICL members and two ICL associates.

3 Regional Symposiums on Landslides in Adriatic-Balkan Region

The most important ICL ABN outcome, organization of biannual landslide Symposiums, started with organization of the 1st Regional Symposiums on Landslides in Adriatic-Balkan Region, held in Zagreb, Croatia, in March 2013, organized by Croatian Landslide Group. The 1st ReSyLAB was organized together with the 3rd Workshop of the Croatian-Japanese Project “Risk Identification and Land-Use Planning for Disaster Mitigation of Landslides and Floods in Croatia”, and the title of Symposium was “Landslide and Flood Hazard Assessment”. The Symposium attended 111 participants from 12 countries (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Japan, Kosovo, Macedonia, Romania, Russia, Serbia, Slovenia, Vietnam) and presented 77 scientific and professional papers about landslides and floods hazard assessment as well as other topics related to the landslide science and praxis (Arbanas et al. 2014). All reviewed papers were published in Symposium Proceedings (Fig. 3) (Mihalić Arbanas and Arbanas 2014). The Symposium technical sessions were accompanied by series of side events: round tables, photo exhibition, field trip and book promotion. Two round tables were organized entitled: “Application of Croatian-Japanese Project Results in the Systems of Land-Use Planning, Construction and Civil Protection in Croatia” and “Discussion and Endorsement in the Course of the ICL Adriatic-Balkan Network Activities”. The photo exhibition “Living with Landslides”

presented 35 photos of landslides and was exhibited ZgForum Gallery and Multimedia Center located in the downtown of the Zagreb city and it was published in the photo exhibition brochure. The field trip was organized to the Kostanjek Landslide Observatory for Landslide Monitoring, observatory of the biggest landslide in Republic of Croatia, equipped within the Croatian-Japanese Project “Risk Identification and Land-Use Planning for Disaster Mitigation of Landslides and Floods in Croatia”.

The importance of the 1st ReSyLAB for development of landslide science and regional cooperation was recognized by all ICL ABN members at the round table in Zagreb “Discussion and Endorsement in the Course of the ICL Adriatic-Balkan Network Activities” and it was adopted that organization of biannual Symposiums will be the most important chain in the maintaining ICL Adriatic-Balkan Network’ activities. The 1st ReSyLAB was followed by next four Symposiums held in Belgrade, Serbia, 2015; Ljubljana, Slovenia, 2017; Sarajevo, Bosnia and Herzegovina, 2019; and the last one in Rijeka, Croatia in March 2022.

The 2nd Regional Symposiums on Landslides in Adriatic-Balkan Region, was held in Belgrade, Serbia, in May 2015, organized by University of Belgrade, Faculty Mining and Geology, Serbia. The Symposium attended more than 80 participants from 13 countries (Albania, Bosnia and Herzegovina, Croatia, Germany, Greece, Italy, Japan, Macedonia, Montenegro, Romania, Russia, Serbia, Slovenia, Switzerland) and presented 49 scientific and professional papers in Symposium sessions related recent case histories, theoretical advances, laboratory and field-testing and design methods beneficial to practitioners, researchers and other professionals. All reviewed papers were published in Symposium Proceedings (Fig. 3) (Abolmasov et al. 2017). The Symposium also included five invited lectures presented by Leonardo Cascini (Italy), Michael Krautblatter

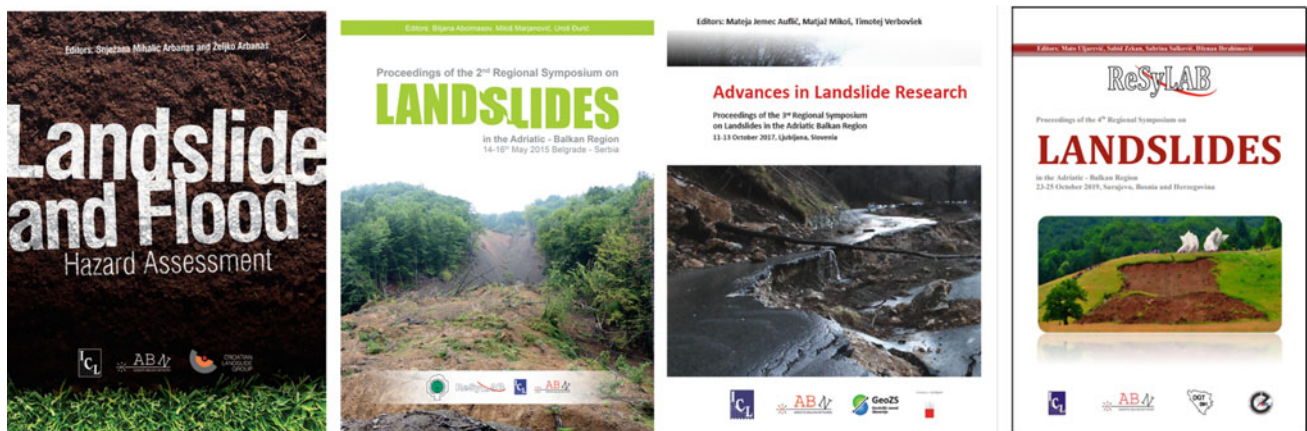


Fig. 3 Cover pages of the Proceedings of the Regional Symposiums on Landslides in Adriatic-Balkan Region: Zagreb (2013), Belgrade (2015), Ljubljana (2017) and Sarajevo (2019)

(Germany), Kyoji Sassa (Japan), Marinos Skempas (Greece) and Janusz Wasowski (Italy). The Symposium technical sessions were accompanied by field trip to the Umka Landslide near Belgrade.

The 3rd Regional Symposiums on Landslides in Adriatic-Balkan Region entitled “Advances in Landslide Research” was held in Ljubljana, Slovenia, in October 2017, organized by Geological Survey of Slovenia and University of Ljubljana, Faculty of Civil and Geodetic Engineering and Faculty of Natural Sciences and Engineering (Jemec Auflič et al. 2017a, b). The Symposium attended 70 participants from 9 countries (Austria, Bosnia and Herzegovina, Croatia, Czech Republic, Italy, Macedonia, Serbia, Slovenia, Spain) and presented 30 scientific and professional papers about landslides disaster risk factors and scenarios, including emerging disaster risks, in the medium and long term; enhance research for local, regional, national applications; support actions by local communities and authorities; and support decision-making with interaction between policy makers and the scientific community. (Jemec Auflič et al. 2018). All reviewed papers (25) were published in Symposium Proceedings (Fig. 3) (Jemec Auflič et al. 2017a, b). The Symposium also included three invited lectures presented by Veronica Tofani (Italy), Lisa Borgatti (Italy) and Miloš Bavec (Slovenia). The Symposium technical sessions were accompanied with round table, photo exhibition and field trips. The round table entitled: “Enhancing cooperation between the landslide science community and end users” moderated by Professor Matjaž Mikoš, Head of the UNESCO Chair on Water-related Disaster Risk Reduction, Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia, covers the topics related to: (1) Disaster risk factors and scenarios, including emerging disaster risks, in the medium and long term; (2) Enhance research for local, regional, national applications; (3) Support actions by local communities and authorities; and (4) Support decision-making with interaction between policy makers and the scientific community. The photo exhibition was organized as a selection of 24 photos from the WLF4 Landslide Photo Contest “Landslides and Mankind” and was exhibited at the Faculty of Civil and Geodetic Engineering of the University of Ljubljana. The field trips were organized to landslides in the Vipava Valley and Potoška planina landslide.

The 4th Regional Symposiums on Landslides in Adriatic-Balkan Region was held in Sarajevo, Bosnia and Herzegovina, in October 2019, organized by Geotechnical Society of Bosnia and Herzegovina, Federal Institute for Geology, Bosnia and Herzegovina and Republic Survey for Geological Researches of the Republic of Srpska (Uljarević et al. 2019a). The Symposium attended about 100 participants from 14 countries (Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Italy, Japan, Serbia, Slovenia, Spain, Switzerland, Turkey,

Ukraine) and presented 41 scientific and professional papers about landslides mapping, investigation, monitoring and mitigation as well as impact to the environment and living. All reviewed papers (41) were published in Symposium Proceedings (Fig. 3) (Uljarević et al. 2019b). The Symposium included five invited lectures presented by Norikazu Shimizu (Japan), Charles Wang Wang (Hong Kong), Alessandro Corsini (Italy), Željko Arbanas (Croatia) and Marina Vivoda Prodan (Croatia). The Symposium technical sessions were accompanied with round table discussion and field trips. The round table entitled: “Enhancing cooperation between the landslide scientist and stakeholders from public bodies dealing with policies or decision making” moderated by Professor Snježana Mihalić Arbanas, Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Croatia, dealing with the existing experiences in cooperation of landslide scientists and stakeholders at local, regional and state levels in landslide risk reduction. The field trip was organized to landslide in the Memorial complex Tjentište inside the Sutjeska National Park, as well as landslides Bogatići and Čemerno located nearby to the route to the Sutjeska National Park.

4 5th Regional Symposium on Landslides in Adriatic-Balkan Region, Rijeka

The last 5th Regional Symposium in Adriatic-Balkan Region, was held in Rijeka, Croatia, in March 2022 (Fig. 4). Previously provided for October 2021, because of Covid-19 pandemic conditions, the Symposium was postponed to March 2022, but existing conditions forced the organizer to prepare Symposium as hybrid conference enabling participants to participate on site or online via Zoom platform. Current pandemic conditions surely affected the reduced interest to Symposium contribution, but, as one of the first landslide conferences that enable online presentation after relaxation of pandemic restrictions, significant number of landslide scientist from the region gathered the Symposium in Rijeka.

The 5th Regional Symposiums on Landslides in Adriatic-Balkan Region, held in Rijeka, Croatia, in March 2022, entitled “Landslide Modelling & Applications” was organized by Croatian Landslide Group at the Faculty of Civil Engineering University of Rijeka. The chairs of the Symposium were Željko Arbanas, University of Rijeka, Faculty of Civil Engineering and Snježana Mihalić Arbanas, University of Zagreb, Faculty of Mining, Geology and Petroleum Engineering. The Symposium attended about 85 participants on site and online from 13 countries (Albania, Austria, Bosnia and Herzegovina, Croatia, Greece, Italy, Mexico, Montenegro, North Macedonia, Russia, Serbia, Slovenia, Switzerland, USA) and presented 46 scientific and

Fig. 4 Poster of the 5th ReSyLAB held in Rijeka Croatia in March 2022



professional papers in oral (30) and poster (16) presentations. In total 41 reviewed papers were published in Symposium Proceedings (Peranić et al. 2022). The main Sessions of the Symposium were Landslide Monitoring (6 papers), Landslide Mapping (2 papers), Landslide Susceptibility (6 papers), Laboratory Testing, Physical and Numerical Modelling of Landslides (9 papers), Landslide Case Studies (3 papers) and Landslide Investigation (4 papers) (Peranić et al. 2022). The most of contributions came from Croatia (12 papers), Italy (11 papers) and Slovenia (9 papers).

Five invited lectures were presented within Symposium sessions: Nicola Casagli (Italy): The International Consortium on Landslides for disaster risk reduction and sustainable development; Michel Jaboyedoff (Switzerland): Failure hazard of rockfall sources: some aspects of the hazard quantification; Binod Tiwari (USA): Physical Modeling of Landslides and Slopes—Advancements and Challenges; Snježana Mihalić Arbanas (Croatia): Landslide evidence and spatial prediction: Application of data and information from landslide maps; Nejc Bezak (Slovenia): Rainfall-induced



Fig. 5 Cover pages of the 5th Regional Symposiums on Landslides in Adriatic-Balkan Region publications; from left to right: Book of Abstracts; Proceedings; Workshop on Landslide Physical and

Numerical Modelling and Field Trip. All publications are available at the Symposium web page: <https://5resylab.uniri.hr/>

landslides and debris flows under the influence of climate change: review of recent Slovenian studies.

The Symposium technical sessions were accompanied by series of side events: workshop on landslide physical and numerical modelling, photo exhibition, round table discussion and post symposium field trip to the Grohovo Landslide and Brus Landslide. All Symposium activities were followed by adequate publications, Fig. 5. All publications are available at the Symposium web page: <https://5resylab.uniri.hr/>.

4.1 Workshop on Landslide Physical and Numerical Modelling

The aim of the Workshop on Landslide Physical and Numerical Modelling was to provide new insights in the behavior of landslides obtained through the research of small scale landslide models at 1g conditions. The more widespread view into available measuring methodologies and techniques leads to further development in the field of physical modelling, especially in the domain of 1g physical models. By sharing the scientific ideas and creative approaches, idea was to provide useful information and insights to the landslide community and facilitate the development of new technologies and methods. This Workshop is organized in the frame of the Project IP-2018-01-1503 “Physical modelling of landslide remediation constructions behavior under static and seismic actions (ModLandRemSS)” and supported by Croatian Science Foundation.

Within the Workshop four presentations were presented: Josip Peranić (Croatia): Small-scale physical landslide models under 1g infiltration conditions and the role of

hydrological monitoring; Nina Čeh (Croatia): Digital image correlation and the use of high-speed cameras for 3D displacement monitoring in 1g small-scale physical models of landslides; Giovanna Capparelli (Italy): Physical modelling investigation and integrated analysis of landslides for defining risk scenarios; and Sabatino Cuomo (Italy): Numerical simulations of landslide physical model experimental results. The Workshop was held as a hybrid event with contribution of about 30 participants on site and online.

As a part of the Workshop, a laboratory test at small scale slope physical model was conducted presenting to the Workshop auditorium behavior of the sandy-clayey slope supported by gabion gravity wall exposed to impact of prolonged artificial rainfall, Fig. 6.

4.2 Photo Exhibition “Take a Look at the Landslide”

The photo exhibition “Take a look at the Landslide” presented 28 photos of landslides and was exhibited at The Faculty of Civil Engineering University of Rijeka and it was published in the photo exhibition brochure (Fig. 7). The exhibition presents 28 photos taken by 14 photographers from Croatia and Slovenia.

Every photo is accompanied by a short landslide story. Photo exhibition jury selected the best three photos as follows: 1st prize—Martin Krkač for the photo “Green Landslide” taken in Croatia (Fig. 8); 2nd prize—Martina Vivoda Prodan for the photo “Istrian Desert: Mučan Badland” taken in Istria, Croatia, 3rd prize—Martina Vivoda Prodan for photo “Supporting the landslide” taken in Italy, presenting the part of Corvara Landslide in Badia region, Italy.



Fig. 6 Photo of small-scale model of a slope supported by gabion gravity wall exposed to impact of prolonged artificial rainfall

4.3 Round Table “State of the Art of Landslide Susceptibility Modelling: Application in Adriatic-Balkan Region”

Following the World Landslide Forum 5 (WLF5), Paola Reichenbach and Snježana Mihalić Arbanas, coordinators of the WLF5 Theme 2 “From Mapping to Hazard and Risk Zonation” have organized Round Table with the objective to discuss, between participants of the 5th Regional Symposium on Landslides, good practice on landslide susceptibility modelling and zonation. The topic was applications of landslide susceptibility modelling in countries in the Adriatic-Balkan Region (Croatia, Serbia, Slovenia, North Macedonia, Bosnia and Herzegovina). The Round Table was organized as a hybrid event, starting with three introductory speeches that preceded the discussion of all participants.

Introductory speeches were given by: Mauro Rossi, CNR-IRPI, Italy, “A review of statistical landslide susceptibility modelling”; Sanja Bernat Gazibara, UNIZG-RGNF, Croatia, “Geo-environmental information for landslide susceptibility modelling—Availability of data in Croatia”; Igor

Peshevski, SS. Cyril and Methodius University in Skopje, North Macedonia, “Preliminary regional landslide susceptibility assessment using limited data”.

The Round Table participants were three world-leading landslide scientists from Italy (Paola Reichenbach and Mauro Rossi) and Switzerland (Professor Michel Jaboyedoff) and 14 landslide scientists from Adriatic-Balkan Countries (Bosnia and Herzegovina, Croatia, Serbia, Slovenia, N. Macedonia, Montenegro). The following institutions were represented at the Round Table: CNR/IRPI, Italy; Institute of Earth Sciences, University of Lausanne, Lausanne, Switzerland; Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Croatia; Faculty of Mining and Geology, University of Belgrade, Belgrade; Geological Information Centre, Geological Survey of Slovenia, Ljubljana, Slovenia; Faculty of Natural Sciences and Engineering, University of Ljubljana, Ljubljana, Slovenia; Faculty of Civil Engineering, University SS Cyril and Methodius, Skopje, North Macedonia; Faculty of Mining, Geology and Civil Engineering, University of Tuzla, Tuzla. BIH. The discussion of the Round Table followed the following discussion themes:

Fig. 7 Cover page of the Photo Exhibition brochure “Take a look at the Landslide”



- Recommendations on landslide susceptibility zonation (landslide types, sources of landslide information, sources of geo-environmental information, mapping units and model types, model performance evaluation, use of landslide susceptibility);
- Data and modelling scale and possible applications;
- Future challenges in the Adriatic-Balkan Region;
- Possible contributions to World Landslide Forum 6, Florence, Italy.

5 Conclusions

In this paper the establishment and activities of the Adriatic-Balkan Network (ABN) are presented. The ICL Adriatic-Balkan Network was established as one of eight thematic and regional networks of ICKL at the 10th Anniversary Meeting held in Kyoto, Japan, in January 2012. The Adriatic-Balkan Network was formally established



Fig. 8 The 1st prize Photo Exhibition—Martin Krkač for the photo “Green Landslide” taken in Croatia

during the 14th Serbian Symposium on Engineering Geology and Geotechnics in Belgrade in September 2012 when seven organizations, current members of ICL, signed the Letter of intent and Declaration of the regional cooperation and International Consortium on Landslides’ Adriatic-Balkan Network constitution. The general objective of the ICL Adriatic–Balkan Network is advancing landslide science and its practical application in the region for the benefit of society and the environment. Specific objectives are: (i) set up scientific and legislative background for regional cooperation; (ii) regional unification of information about landslides and landslide research at national levels; and (iii) development of landslide science by capacity building at regional level and practical applications of outcomes to societies in the region.

In realization of planned activities the main advances were reached in the field of information and knowledge sharing through the regional Symposium on Landslides, but in other set activities modest results were achieved, mostly through small bilateral scientific projects (Croatia-Slovenia,

Slovenia-Serbia, Croatia-Serbia) and scientist exchange, but joint contribution in large European projects was absent. Cooperation was additionally reduced in the last three years, caused by Covid-19 pandemic conditions, and just the 5th ReSyLAB organization pointed out on to reviving existing relationships within the Adriatic-Balkan Network.

The 5th ReSyLAB pointed out on importance of regional cooperation in landslide risk reduction through sharing and exchange of knowledge and experience in the region with similar geohazards and risks as well as sharing information related to causes and consequences of landslide disasters caused by climate changes as those significantly impact on the rise of landslide occurrences in the region and over the world.

References

- Abolmasov B, Marjanović M, Đurić U (2017) Proceedings of the 1st regional symposium on landslides in Adriatic-Balkan Region.

- University of Belgrade, Faculty Mining and Geology, Belgrade, 255p. ISBN: 978-86-7352-296-8
- Arbanas Ž, Mihalić Arbanas S, Vivoda M, Martinović K, Bernat S (2014) Landslide knowledge exchange through the regional cooperation in the Adriatic-Balkan Region. In: Sassa K, Canuti P, Yin Y (eds) *Landslide science for a safer geoenvironment*. Springer, Cham, pp 199–205
- Jemec Auflič M, Verbovšek T, Mikoš M (2017a) 3rd Regional Symposium on Landslides in the Adriatic-Balkan Region-Ljubljana, Slovenia. *Landslides* 14:1855–1856. <https://doi.org/10.1007/s10346-017-0863-2>
- Jemec Auflič M, Mikoš M, Verbovšek T (2017b) Advances in landslide research. Proceedings of the 3rd regional symposium on landslides in the Adriatic Balkan Region, 11–13 Oct 2017, Ljubljana, Slovenia. Geological Survey of Slovenia, Ljubljana, 156 p. ISBN: 978-961-6498-58-6
- Jemec Auflič M, Mikoš M, Verbovšek T, Mihalić Arbanas S, Arbanas Ž (2018) 3rd Regional Symposium on Landslides in the Adriatic-Balkan Region (3rd ReSyLAB)—a final report. *Landslides* 15:381–384. <https://doi.org/10.1007/s10346-017-0934-4>
- Mihalić Arbanas S, Arbanas Ž, Abolmasov B, Mikoš M, Komac M (2012a) Regional cooperation in the frame of the ICL Adriatic-Balkan network. In: Sunarić D, Jevremović D (eds) *Proceedings of 14th symposium on engineering geology and geotechnics*, 27–28 Sept 2012, Belgrade, Serbia. Društvo geoloških inženjera i tehničara Srbije, Belgrade, pp 43–56
- Mihalić Arbanas S, Arbanas Ž, Abolmasov B et al (2013) The ICL Adriatic-Balkan Network: analysis of current state and planned activities. *Landslides* 10:103–109. <https://doi.org/10.1007/s10346-012-0364-2>
- Mihalić Arbanas S, Arbanas Ž (2014) Landslide and flood hazard assessment. Proceedings of the 1st regional symposium on landslides in Adriatic-Balkan Region with the 3rd workshop of the Croatian–Japanese project risk identification and land-use planning for disaster mitigation of landslides and floods in Croatia. Croatian Landslide Group Zagreb, 268p. ISBN: 978-953-7479-28-2
- Mihalić S, Arbanas Ž (2012) The Croatian–Japanese Joint Research Project on Landslides: activities and public benefits. In: Sassa K, Rouhban B, Briceno S, He B (eds) *Landslides: global risk preparedness*. Springer, Berlin, Heidelberg, pp 345–361. ISBN: 978-3642220869
- Mihalić S, Arbanas Ž, Mikoš M, Abolmasov B (2012) The ICL Adriatic-Balkan Network: scientific background, opportunities and challenges for regional cooperation. In: Sassa K, Takara K, He B (eds) *Proceedings of IPL symposium*, 20 Jan 2012, Kyoto, Japan. ICL, Kyoto, pp 27–37
- Peranić J, Vivoda Prodan M, Bernat Gazibara S, Krkač M, Mihalić Arbanas S, Arbanas Ž (2022) Landslide modelling and applications. Proceedings of the 5th regional symposium on landslides in Adriatic-Balkan Region. Croatian Landslide Group Zagreb, 257 p. ISBN: 978-953-6953-55-4
- Sassa K (2006a) “2006 Tokyo Action Plan”—strengthening research and learning on landslides and related earth system disasters for global risk preparedness. *Landslides* 3:361–369. <https://doi.org/10.1007/s10346-006-0065-9>
- Sassa K (2006b) ICL strategic plan 2012–2021—to create a safer geo-environment. *Landslides* 9:155–164. <https://doi.org/10.1007/s10346-012-0334-8>
- Uljarević M, Zekan S, Salković S (2019a) 4th Regional Symposium on Landslides in the Adriatic-Balkan Region-Sarajevo, Bosnia and Herzegovina. *Landslides* 16:1821–1822. <https://doi.org/10.1007/s10346-019-01227-2>
- Uljarević M, Zekan S, Salković S, Ibrahimović D (2019b) Proceedings of the 4th regional symposium on landslides in Adriatic-Balkan Region. Geotechnical Society of Bosnia and Herzegovina, Sarajevo, 255 p

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