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PROCEEDINGS

1ST INTERNATIONAL CONFERENCE ON LANDSLIDES RISK REDUCTION AND RESILIENCE - 2019

Thursday, 28th November 2019, The Ashok Hotel, New Delhi, India



Chief Guest and other dignitaries at dais during the Inaugural Session
From left to right: **Dr. Surya Parkash** (NIDM), **Shri Kamal Kishore** (NDMA), **Maj. Gen. Manoj Kumar Bindal** (NIDM), **Chief Guest Shri G. Kishan Reddy** (MoS, MHA), **Shri G. V. V. Sarma, IAS** (NDMA), **Lt. Gen. (Retd.) N. C. Marwah** (NDMA) and **Shri Sanjeev Kumar Jindal** (MHA)

Organized by

NATIONAL INSTITUTE OF DISASTER MANAGEMENT

Ministry of Home Affairs,
Govt. of India

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Ministry of Home Affairs, Govt. of India
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New Delhi - 110001
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1st International Conference on Landslides Risk Reduction and Resilience-2019, Thursday, 28th November 2019, Banquet Hall, 3rd Floor, Hotel The Ashok, New Delhi

© NIDM, New Delhi

Edition: 2019

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Published by

National Institute of Disaster Management (NIDM), Ministry of Home Affairs,
New Delhi- 110001

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Technical Session-II

Mr. Tanmay Uttam Gound & Mr. Thomas Krishna Pegu

Technical Session-III

Mr. Karpooram Pandian & Ms. Anuradha Maurya

Technical Session-IV

Mr. Anil Kathait & Mr. Kamaji Mahesh

Technical Session-V

Ms. Aradhna Moktan & Ms. Thinles Chondol

BACKGROUND

The cosmopolitan distribution with frequent and sudden occurrence portraits landslides as one of the potential hazards that cause catastrophic disasters and wreck havoc on community, human settlements, livestock, livelihoods and environment leading to colossal losses and damages directly or indirectly in a cumulative way. The economic losses plunged by landslides are not only associated with devastation of structures and infrastructures such as buildings, roads, railways, bridges, dams, communication systems and ports but also cultural and natural heritages that are invaluable and irreplaceable for dwellers of the regions and others. The community most vulnerable and affected by landslide disasters are those living in poverty.

Landslides are multifaceted phenomenon having a broad spectrum of magnitude and types that can be triggered by other disasters such as earthquakes, unprecedented precipitation, wildfires, cyclones, floods, glacial lake outburst floods, cloudburst and anthropogenic activities viz., unregulated cutting of hillsides, haphazard constructions of buildings and roads on fragile slopes and mining. Landslides are also responsible for inducing hazards like flash floods and tsunami. Collapse of landslide dammed lakes can generate devastating flash floods. Similarly, episodes of submarine landslides are enough capable of producing huge tsunamis in coastal areas that can be potential threat to community and coastal ecosystem (e.g. Indonesia Tsunami 2018).

INDIAN CONTEXT

India, the seventh-largest country in the world apropos of area, is persistently being knocked by landslides of varied magnitude throughout the history. The vulnerable areas in the nation are spread over 21 States and 4 Union Territories. Though as per available recorded data the history of landslides in India way back to early eighteenth century, yet the devastating potential of landslides got attention of the nation after the episode of Alaknanda tragedy in 1970 in Garhwal Region of Uttarakhand state. The catastrophic event demonstrated its shattering impact right from its initiation point to hundreds of kilometres downstream. The flood completely swept away Belakuchi hamlet in the valley. The other event which turns heads of bureaucrats, thinkers, policy makers and professionals from different fields trading with earth science towards landslides was Malpa landslide in year 1998 in the Pithoragarh district of Uttarakhand that wiped away the entire village of Malpa and killed hundreds of people. Such nightmare scenarios keep haunting the community and its surroundings every now and then.

The construction activities in dearth of proper understanding of the slope dynamics have augmented the number of landslide incidences in the country. The exposure of landmass to different magnitude of earthquake hazards is another key player which facilitates the occurrence of a number of landslide events on fragile slopes.

Landslide hazard management in India had so far been confined to ad hoc solutions of the site specific problems and implementation of immediate remedial measures including debris removal and dumping them either down slope or into the river without calculating further risk of haphazard dumping. Many organizations/agencies are in business to manage the risk imposed by landslides.

GLOBAL CONTEXT

Landslide disasters have fetched global concern in recent years. The ubiquitous disaster cost enormous human fatalities and billions of economic losses around the world. The actual losses due to landslides are still the topic of debate as in the role of secondary player after primary disasters such as earthquakes, floods,

glacial lake outburst floods and others, landslides are not given their due in number of deaths, socio-economic losses and constraint in response, rescue and recovery phase of disaster management. For example, 2015 Gorkha earthquake of Nepal induced numerous landslides which caused major damage to settlements and infrastructure and also hampered the post disaster activities.

Researchers have authenticated the adverse impact of global warming and climate change in increasing the frequency and magnitude of landslides. An increase in the frequency of extreme weather related phenomenon and alteration in timing and periodicity of rainfall, degradation rate of glaciers, and amplification in incidences of wildfire will significantly augment the risk of landslides in many vulnerable countries. Apart from the natural exaggerators, the development activities such as construction of structures and infrastructures in vulnerable areas, deforestation for expansion of urban boundary, negligence of proper slope management will increase the window of number of population exposed to the risk of landslides.

Many countries (to name few like Japan, Hong Kong, Switzerland, Australia and USA) around the world have made good attempts in prevention and management of landslide risk through various measures such as land use, construction and development controls. On global platform, with the mission to pursue prevention, to provide practical solutions, education, communication, and public outreach to reduce landslide disaster risk, Sendai Partnerships 2015-2025 for Global Promotion of Understanding and Reducing Landslide Disaster Risk was established during 3rd World Conference on Disaster Risk Reduction (WCDRR) held at Sendai, Japan in 2015.

INAUGURAL SESSION

Apropos to explore and debate upon the most recent advances in Landslides Risk Reduction and Resilience in India and other countries, National Institute of Disaster Management (NIDM) organised a one day "1st International Conference on Landslides Risk Reduction and Resilience – 2019" at The Hotel Ashok, New Delhi on Thursday, 28th November 2019.

About 200 participants from various prestigious International and National organisations/institutes/universities working in the field of landslides mitigation and management attended the conference. Dr. Surya Parkash initiated the welcome address of the dignitaries, Shri G. Kishan Reddy, Hon'ble Minister of State for Home, Maj. Gen. Manoj Kumar Bindal, Executive Director, NIDM, Shri G. V. V. Sarma (IAS), Member Secretary, NDMA, Shri Sanjeev Kumar Jindal, JS (DM) MHA, Lt. Gen. (Retd.) N. C. Marwah, Member NDMA and Shri Kamal Kishore, Member NDMA. The first of its genre International Conference on landslides in the country was inaugurated by Hon'ble Minister of State for Home, Shri G. Kishan Reddy, followed by the release of "Landslide Preparedness Guidelines for Safety of Buildings on Slopes" and "Abstract Volume" of the International Conference.

The International Conference was carried forward by getting insights on Landslides Risk Reduction and Resilience from Maj. Gen. Manoj Kumar Bindal (ED, NIDM), Shri G. V. V. Sarma, IAS (Member Secretary, NDMA) and Shri G. Kishan Reddy, Hon'ble Minister of State for Home.

Dr. Surya Parkash, Head, GMRD Division, NIDM and International Conference Coordinator welcomed Chief Guest Hon'ble Minister of State (Home), Shri G Kishan Reddy Ji, other dignitaries at the dais and the International and National delegates to the International Conference. Further, he quoted that the International Conference on Landslide Risk Reduction and Resilience is first of its kind after the International Symposium on Landslides (1980), pioneered by Dr. R. K. Bhandari. He also mentioned that

almost after about 40 years we are taking this step forward and focusing on the problems of landslides on hilly states of the country. He thanked ED NIDM for giving this opportunity to organise this conference and also to Shri G Kishan Reddy Ji who motivated to commence this event and also support in all manners and given his valuable time whenever he was asked or requested for. Dr. Parkash also thank Ministry of Home Affairs, Member Secretary and other Members of NDMA for their support and stand in organising the event. He also appreciates the support from 53 Knowledge Partners in organizing the conference. Dr. Surya Parkash concluded his address by welcoming and thanking all the dignitaries and the delegates for their support in organising the International Conference.



Major General Manoj Kumar Bindal, Executive Director, NIDM offered mementos to chief guest and all dignitaries at the dais and started his address with a warm welcome to Hon'ble Minister, dignitaries and all delegates. He added that we at the NIDM are honoured and delighted to host the 1st International Conference on Landslides Risk Reduction and Resilience – 2019. A succinct insight about NIDM and its endeavours to make India disaster resilient was provided by him. He also highlighted institute's activities for landslides risk reduction and resilience. Enlightening about the conference he said that the conference will be directed towards understanding past and present processes of landslides risk reduction and resilience through effective and successful strategies. It will highlight the environmental and emerging issues in context with urbanisation, development and climate change, he added further. ED NIDM assured that this conference will promote greater global, national and local collaboration in landslides related works with vision to achieve the seven strategic targets of Sendai Framework for disaster risk reduction. In the end ofhis address, on the behalf of NIDM he thank Hon'ble Minister, all the chairs, co-chairs, speakers, discussants and delegates for gracing the occasion by their presence.



Shri G. V. V. Sarma, Member Secretary NDMA briefly recollected and shared his experiences of the Malin Village landslide (July, 2014) in Pune district of Maharashtra. He emphasized that Disaster Management Act 2005 has mandated every ministry and every state governments to have a comprehensive disaster management plan which includes all the preventive aspects as well as capacity building, training, so on. While conveying his expectations from the conference he stress on the deliberations which are more action oriented and which will be of practical values so that the state governments, the district level



officials and concern authorities will be able to get at least some kind of advance warnings on which circumstances, in which area, what kind of people need to be evacuated to what extend and what manner beside alternative structural and non-structural measures that have to be taken for reducing landslides risks. He also highlighted the need of field validated maps which are based on multi-hazard risk vulnerability analysis and mainstreaming landslides mitigation and management in all development sectors such as roads, railways, highways, bridges, hydropower, irrigations, buildings as well as tourism and heritages. With his best wishes to NIDM for continuing programmes of this kind, he concluded his speech.



Hon'ble Minister of State for Home, Shri G. Kishan Reddy expressed his contentment to be a part of the International Conference and congratulated the Department of Disaster Management (MHA) and NIDM for their initiatives. Highlighting the quote “Disasters don't just "happen somewhere else, to someone else", he exhorted to develop proper technology to anticipate disasters like landslides and develop infrastructures to quickly respond to minimize the damage. He shared the intervention taken by the Government of India after the adoption of the Disaster Management Act 2005 in the country. Hon’ble Minister discussed the adverse impacts of landslide disasters on progress and prosperity of communities as well as ecosystem and urged to develop the multi prolonged approach to anticipate and prepared for landslide disasters in a manner that the damage can be minimized. He also advocated the need of extensive collaborative progammes involving international community and other stakeholders at national, state and local levels.

Further, he stressed to considered native intelligence and traditional wisdom of the people living in the landslide prone area to reduce and minimize the risks of landslides. He wound up his address with the hope that this International Conference will come up with fruitful deliberations and a well defined roadmap to combat the impacts of landslide disasters.



Dr. Sushma Guleria, Assistant Professor, NIDM concluded the Inaugural Session of the International Conference by expressing gratitude to Hon’ble Minister of State (Home), dignitaries at the dais, Knowledge partners and all the International and National delegates participated in the conference. Further, she extended her thanks to JD NIDM, DC (Trg.) NIDM, logistic support team, YPs and other staff of the NIDM.

OBJECTIVES

The focus of the International Conference was to enhance the understanding of the issues and solutions for landslides risk reduction and resilience. The International conference discussed current practices in the landslides risk assessment, mitigation and monitoring technologies beside community involvement for landslides risk reduction and resilience with case examples. Environmental and emerging issues in context

with urbanization, development and climate change were also highlighted during the conference. A roadmap was developed to address the gaps that were highlighted during the discussions in the technical sessions.

TECHNICAL SESSION I: GOVERNANCE AND ADMINISTRATION

The first session was chaired by Shri Ajit Seth, Former Cabinet Secretary, Government of India and Shri Kamal Kishore, Member, NDMA. Shri P. P. Shrivastav, Member Advisory Board, NDMA was the only speaker in the session with three key discussants namely, Prof. V. K. Sharma, VC SSDMA; Dr. Piyoosh Rautela, Executive Director, DMMC and Dr. S. S. Randhawa, HP-SDMA.



From left to right: **Dr. Surya Parkash** (NIDM), **Dr. Piyoosh Rautela** (DMMC), **Prof. V K Sharma** (SSDMA), **Shri Kamal Kishore** (NDMA), **Shri Ajit Seth** (Former Cabinet Secretary), **Shri P. P. Shrivastav** (Member Advisory Board, NDMA), **Dr. S. S. Randhawa** (HP-SDMA), **Maj. Gen. Manoj Kumar Bindal** (NIDM)

Key points

- The session focused on governance and administration issues in reducing the risks of landslides.
- Multi-hazard dimensions of the landslides.
- Landslide vulnerability of Himalayan states.
- Representatives of three states, Sikkim, Uttarakhand and Himachal Pradesh shared issues and initiatives taken by their respective states to combat landslides risks.
- Dearth of scientific guidelines for appropriate debris disposal.
- The potential of development activities in triggering landslides.



Shri P. P. Shrivastav, Member, Advisory Board, NDMA and Former Member, North Eastern Council described the International Conference day as an auspicious day in the field of disaster management since its theme was based on landslides that are one of the most nagging and annoying disasters. He touched the multi-hazard dimensions of the landslides and recalled his nightmare experiences pertaining to the disasters. He urged to abandon the prevailing subjective quick-fix approach to the management of landslides and to considered treatment of each landslide as a separated research project. He also advocated the implementation of 12 specific recommendations framed by top level domain experts under the Indian National Academy of Engineers (INAE). In the end, he suggested to sensitize and enhance the awareness of local communities regarding the vulnerability of their areas towards landslides and preventive measures to save one's life.



Prof. V. K. Sharma, VC SSDMA highlighted that states have big role in mitigation and preparedness for landslide disasters. While citing the high vulnerability of Sikkim for landslides, he requested to take necessary action to minimize life and economic losses due to the disasters. He also notified delegates about the adverse impacts of climate change in increasing the intensity and frequency of landslides. The initiatives of Sikkim state government at panchayat level for enhancing the capacity of the local communities were also shared by him. Further, he stated that earthquakes (e.g. Sikkim earthquake 2011) along with anthropogenic activities such as road constructions and other development deeds are main reasons for landslide disasters in the hill areas. He also mentioned the efforts of Sikkim government in mainstreaming development with DRR. Emphasizing on role of science and technology particularly early warning system, he asked delegates to assist in making Sikkim a role model state from which other states can learn preparedness and mitigation strategies for landslides.



Dr. Piyoosh Rautela, Executive Director, DMMC unveiled that landslides are often considered as local events, unlike earthquakes, cyclones and floods as they distress small area. He urged to have a dedicated institute for landslides risk reduction and resilience as presently no institute/organization is solely dedicated for research in the field of landslides. He also mentioned that we have linked the development to the last mile connectivity and people involved in these activities have no provisions for slope protection and disposal of water as well as debris. In addition he suggested making geotechnical studies and proper pre-planning of debris and water disposal a must before any development endeavours.

Dr. S. S. Randhawa, HPSDMA shared the vulnerability profile of Himachal Pradesh for landslides and other hazards. Further, he added that landslides in the state are either due to geological attributes or monsoon rainfall. The details of Kotrupi landslide in Mandi district and Lukupali landslide in Kullu district were also highlighted by him. He highlighted the dearth of database repository and suggested to craft a nodal agency either at national or state level which have database of research done regarding landslides and other disasters in Himalayan region. He also advocated enhancing the capacity of the state government to undertake DPR.





Shri Ajit Seth, Former Cabinet Secretary, Government of India highlighted the key outcomes of the session. He also enlightened delegates about the Corporate Social Responsibility (CSR) and Scientific Social Responsibility (SSR) and also mentioned that later one (SSR) is not much recognized in the country. The Former Cabinet Secretary also pointed out to sensitize children, youth and other citizens for landslidesrisk reduction and resilience as anthropogenic activities are one of the triggers of landslides. He also raised the concern of data dissemination and said people are working in isolation. The wealth of data is available but doesn't get shared and utilized, he added.

Shri Kamal Kishore, Member, NDMA discussed the take away from the session and mentioned that we talk about landslides after they are occurred but don't considered the potential of development activities in triggering those disasters. He also pointed out the governance issue of proper city planning and dearth of scientific guidelines for appropriate debris disposal. He urged scientific communities to materialize holistic solutions with integration of local knowledge to decipher the issues of landslides. Further, he suggested creating a central database not only at national or state level but at local level as well.



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TECHNICAL SESSION II: SCIENCE & TECHNOLOGY FOR LANDSLIDES RISK REDUCTION AND RESILIENCE



From left to right: **Dr. Surya Parkash** (NIDM), **Dr. Pankaj Gupta** (CRRI), **Dr. Akshay K. Mishra** (GSI), **Dr. S. Raju** (GSI), **Maj. Gen. Manoj Kumar Bindal** (NIDM), **Dr. R. K. Bhandari** (Varnes Medal Awardee), **Dr. D. P. Kanungo** (CBRI), **Dr. Andrew Kos** (Terrasense Switzerland Ltd.), **Dr. V. Nandakumar** (NCESS), **Dr. Giulia Tessari** (SARMAP) and **Dr. S. L. Chattoraj** (IIRS)

Dr. R. K. Bhandari, Varnes Medal Awardee and Dr. S. Raju, ADG, NMH-IV, GSI chaired the second session. Dr. Akshay K. Mishra Director, Landslide Studies Division, GSI; Dr. Pankaj Gupta, Senior Principal Scientist, CRRI; Dr. D. P. Kanungo, Senior Principal Scientist, CBRI and Dr. Andrew Kos, Terrasense Switzerland Ltd. were the speakers of the session. The key discussants were Dr. Giulia Tessari, Earth Observation Specialist, SARMAP; Dr. V. Nandakumar, Scientist G, NCESS and Dr. S. L. Chattoraj, Scientist, IIRS.

Key Points

- Modern tools of science and technology for landslides risk reduction and resilience were discussed during the session.
- History of landslide studies in the country.
- Role of Geological Survey of India, the nodal agency in the country for landslides studies and management.
- Case Study on Landslides Risk Reduction and Resilience.
- Key discussants share their experiences on the theme of session.

Dr. R. K. Bhandari, Varnes Medal Awardee briefed the theme of the session and shared the memories of International Symposium on Landslides pioneered by him in the year 1980. He illustrated the history of landslide studies in the country and emphasized on the need of large scale maps that are user friendly, credible with appropriate strategies to update them time to time through modern science and technology. He also stressed on holistic multi-hazard perspective for landslides and to enhance the capacity of investigation in accordance with international standards along with real time monitoring of the landslides.





Dr. S. Raju, ADG, NMH-IV, GSI acquainted the audience with the work done pertaining to the landslide hazard zonation mapping by the Geological Survey of India, the nodal agency in the country for landslides studies and management. He also enlightened about the future initiatives of the organization to provide large scale landslide hazard zonation maps of the vulnerable states. The collaborative work done and future strategies for landslides early warning was also conveyed by him.

Dr. Akshay K. Mishra Director, Landslide Studies Division, GSI gave a brief presentation on "Tools and Techniques for Landslides Risk Management". The speaker highlighted the initiatives taken by the Geological Survey of India for mapping the landslides vulnerable areas of the country. The rationale of small scale (1:50,000) mapping was to have best landslide susceptible map for the nation, he added. Dr. Mishra urged that each landslide investigation must have a purpose and the scale of mapping should be adopted based on the requirements (for site specific activities-large scale map and small scale map for regional planning). He pointed out the need of people centric landslide early warning system.





Dr. Pankaj Gupta, Senior Principal Scientist, CRRI talked about the "Landslide Investigation: Gaps and Way Forward". He briefly introduced the interventions taken by his organisation since its inception in the field of landslides risk reduction and resilience. He suggested focusing not only to stabilize particular landslide site but also the catchment and surrounding area of that landslide.

Besides using hereditary knowledge and technology with modern science and technology, he also exhorted collaborative and multidisciplinary research for landslides management.

Dr. D. P. Kanungo, Senior Principal Scientist, CBRI focused on real time aspects of landslides monitoring and instrumentation during his presentation on "Landslide Monitoring for Early Warning". He briefed the pros and cons of drone based LEWS and ground instrumentation based LEWS. Dr. Kanungo emphasized on geo-integrated rainfall threshold model for spatio-temporal landslide early warning system. Further, he suggested developing indigenous low cost LEWS that will have paramount societal relevance for temporal prediction of landslide disasters in Himalayan States of India and will reduce risks of landslides disasters.





Dr. Andrew Kos, Terrasense Switzerland Ltd. presented a "Case Study on Landslides Risk Reduction and Resilience". The case study demonstrated the intervention taken by his organisation for Rainfall Threshold based Landslide Early Warning System on the transport/pilgrim route between Uttarkashi and Gangnani in the Bhagirathi Valley of Uttarakhand state. He stressed on consideration of soil/rock properties, vegetation and precipitation in LEWS as these are the governing factors for landslides. Besides enhancing the alert-response communication system, he also mentioned escalating the bars of community preparedness in LEWS.

Dr. Giulia Tessari, Earth Observation Specialist, SARMAP shared expertise and experience of her organization gained through monitoring of landslides and surface deformations affecting Nainital municipality in Uttarakhand state. She also pointed out the importance of remote sensing technologies such as Space-borne Synthetic Aperture Radar (SAR) in the study of landslides. One of the key points she highlighted was the integration of shared knowledge and information along with optimization of resources.





Dr. V. Nandakumar, Scientist G, NCESS talked about his past experiences acquired from post-mortem studies of landslides and the challenges he faced. Further, he stated that it is difficult pin pointing out the landslide disaster that had occurred on a 1:50,000 scale map and mentioned that a high-resolution map of larger scale is the need of hour. The role of community and community based early warning system in reducing and mitigating risks of landslides were also emphasized by the speaker.

Dr. Kamal Jain, Professor, Dept. of Civil Engineering, IIT Roorkee mentioned that in addition to large scale mapping (such as 1:500, 1:1000 maps), we should also focus on 3D mapping of the landslide areas. The virtual 3D mapping and real time videography will enhance better understanding of the topography of landslide site and surroundings. He also highlighted that IIT Roorkee has been working in the field of 3D digitization, mapping and real time videography.





Dr. S. L. Chattoraj, Scientist, IIRS shifted the focus from real time monitoring to space base technology by talking about case examples of landslide events occurred in the state of Uttarakhand. Emerging space base technology integrated with geophysical investigations and numerical triangulation models are crucial in assessing the dynamic nature of landslides, he stated.

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TECHNICAL SESSION III: ENVIRONMENTAL AND EMERGING ISSUES



From left to right: **Dr. Surya Parkash** (NIDM), **Shri Mriganka Ghatak** (GSI), **Maj. Gen. Manoj Kumar Bindal** (NIDM), **Dr. P.C. Nawani** (Former NIRM), **Dr. Alexander Strom** (Russia), **Dr. R. Baskar** (GJUST) and **Dr. P. K Champati Ray** (IIRS)

The third session was chaired by Dr. Alexander Strom, Expert from Russia and Dr. P.C. Nawani, Former Director, NIRM. Dr. Alexander Strom along with Dr. Santosh Kumar, Professor, NIDM were the speakers of the session. The key discussants include dignitaries namely, Dr. P. K Champati Ray, Group Head, GDMG, IIRS; Shri Mriganka Ghatak, Director, DGCO, GSI and Dr. R. Baskar, Professor, GJUST.

Key Points

- Environmental and emerging issues in context of landslides risk reduction and resilience.
- Geodynamically active and seismically sensitive Himalayan region.
- Potential of rockslide dams as a source of trans-boundary disasters.
- Insights of Post Disaster Need Assessment (PDNA) tool in the assessment of impacts of disasters.
- Key discussants shared initiatives and interventions carried out by their respective organisations/institutes.



Dr. Alexander Strom, Expert from Russia discussed the potential of rockslide dams as a source of transboundary disasters. He mentioned that such dams are more disastrous than the rockslides that form them since the outburst floods caused by breaching of rockslide dams can devastate the entire river valley. Moreover, such outburst flood that initiates in one country, can affect the neighbouring state(s), causing the cross-border disasters, he added with examples of catastrophes reported in the Central Asia region. He ended his talk with few suggestions to prevent/diminish such cross-border disasters and the suggestions include, identifying potential sites, monitoring and early warning of such sites and relevant and economically efficient technical measures preventing accumulation of large amount of water and of the catastrophic outburst floods.



Dr. Santosh Kumar, Professor, NIDM provided insights of Post Disaster Need Assessment (PDNA) tool in the assessment of impacts of disasters. He said that the PDNA tool is classic, scientific and dynamic and will be helpful in countering questions such as, what kind of direct damages has occurred in terms of infrastructures, structures and life loss; how the disaster is disrupting theflow of economy; total collective losses to individuals, households, community and environment. The tool will also assist in assessing the future impact of disaster on people and the need to overcome those consequences. Further, he recommended to include PDNA as assessment tool for future in planning for landslides risk mitigation and management, have capacity development programmes integrated with landslides management with PDNA, integration of scientific data, assigning of relocation should also consider economy of scale and incentivizing risk reduction will probably work as a tool itself.



Dr. P.C. Nawani, Former Director, NIRM provided insights about the geodynamically active and seismically sensitive Himalayan region. He targeted unscientific development activities in hill areas for creating new risk zones of landslides. He also exhorted the need of large scale maps along with scientific mitigation programmes for landslides.

Dr. P. K Champati Ray, Group Head, GDMG, IIRS shared the initiatives and interventions taken by his institute in last three decades in the field of landslides research. He urged to achieve zero casualty status for landslides in nation as done so in case of cyclone (Phailin and Feni). He fostered to use UAVs and satellite images to monitor landslides and to have a people centric simple landslide hazard mitigation programme. He also emphasized on LEWS and low cost preventive measures to contain landslides.





Shri Mriganka Ghatak, Director, DGCO, GSI appreciated the consideration of PDNA tool as it brings economic and social sector in landslides studies. The indirect losses due to landslides such as detouring cost and slow subsidence zones that are not clearly visible to naked eyes are often neglected, he mentioned. Further, he emphasized to focus not only on large landslides but also on small landslides due to encroachment and development activities in urban settlements.

Dr. R. Baskar, Professor, GJUST suggested to revised the curriculum and make it more focused on landslides. Secondly, he urged to increase the research to link climate change impacts such as change in precipitation patterns or dry spell periods to landslides incidences. And the last suggestion by him was community involvement in landslide preparedness through the involvement of youth from NSS and NCC.



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TECHNICAL SESSION IV: COMMUNITY BASED LANDSLIDES RISK REDUCTION AND RESILIENCE



From left to right: **Ms. Meera Kaintura** (DDM, Haridwar), **Mr. T. K. Roy** (IRCS), **Ms. Vibha Arora** (IIT Delhi), **Dr. Surya Parkash** (NIDM), **Maj. Gen. Manoj Kumar Bindal** (NIDM), **Mr. Sarabjit Singh Sahota** (UNICEF), **Dr. R. Sreedhar** (Media Expert), **Mr. Abhishek Narayanan** (WTI) and **Vikrant Mahajan** (Sphere India)

Dr. Surya Parkash, Associate Professor, NIDM and Mr. Sarabjit Singh Sahota, Emergency Specialist, UNICEF chaired the session on "Community based Landslides Risk Reduction and Resilience". Dr. R. Sreedhar, Media Expert and Dr. Surya Parkash, Associate Professor, NIDM were the speakers. Key discussants include Ms. Meera Kaintura, Disaster Management Officer, DDM, Haridwar; Mr. T. K. Roy, Special Advisor, IRCS; Ms. Vibha Arora, Associate Professor, IIT Delhi, Mr. Abhishek Narayanan, Manager and Head, WTI and Vikrant Mahajan, CEO, Sphere India.

Key Points

- The session discussed the role of community in reducing the risks of landslides in their respective areas.
- Lack of awareness of community towards risks of various disasters.
- Role of community radio in preparedness and response phase of landslide disaster management.
- Key discussants shared their respective views in the theme.

Mr. Sarabjit Singh Sahota, Emergency Specialist, UNICEF emphasized the need for multi-hazard integrated risk management strategies. He also highlighted the role of haphazard development activities in increasing the number of disaster events particularly at hill areas. He urged simpler, more community based ideas which are important such as first aids, search and rescue, capacity buildings, considering animals as an integrated part of vulnerability assessment and the need to involve community radio as partners in disaster management. He also stressed that man, woman, children, senior citizen, disabled should be looked upon differently while formulating landslide risk management.





Dr. Surya Parkash, Associate Professor, NIDM stressed on community based interventions for landslides risk reduction and resilience. He stated that communities are the first victim as well as responders in any landslide event; therefore, enhancing their cognizance regarding preparedness for landslide will assist to reduce and mitigate its adverse impacts. In addition, traditional indigenous knowledge of communities about their areas can also be utilized to strengthen the mitigation strategies of landslides. He suggested considering community as partners in managing the landslide disasters rather than their participatory engagement. He also emphasized to cultivate holistic multi-hazard approach in landslides risk reduction and resilience.

Dr. R. Sreedhar, Media Expert highlighted the role of community radio in preparedness and response phase of landslide disaster management. Community Radio is the third tier of Radio Broadcasting media which is easy to operate and reaches the targeted audience directly during disasters and even in complete blackouts. He acknowledged the work done by Community Radio in Uttarakhand and Assam in association with the DisasterManagement Authorities for landslides risk reduction and resilience. He exhorted to develop curriculum on Community Radio at educational campuses to enhance the human resource using the technology in case of any disaster.





Ms. Vibha Arora, Associate Professor, IIT Delhi stated that the locals have the rich indigenous practice knowledge which is different from the scientific knowledge but which has got very strong practical implications for their survival and somewhere that link has been broken. She also briefed that most of the time when we estimate disaster, we magnitude in terms of human life loss, loss of properties, livestock but the entire landscape which has got ravaged because of landslide due to human development interventions like hydropower projects in River

Tista, in particular, are mostly unattended. She pointed out that the role of the administration comes to the forefront, when we are planning these huge massive projects in these fragile and volatile landscapes.



Mr. T. K. Roy, Special Advisor, IRCS Roy shared the disaster management initiatives taken by his organisation all over the country. Several programmes regarding disaster response, preparedness, climate risk resilient, health-related and so on are being organised by IRCS, he added. The speaker further added that Indian Red Cross also provides training to volunteers in first aids which are very crucial in disaster scenarios such as flood, earthquake, landslide etc. In case where early warnings are available, Indian Red Cross tries to communicate the information to the community that is expected to be affected to minimize the loss of life wherever possible.



Ms. Meera Kaintura, Disaster Management Officer, DDM, Haridwar shared her practical experiences in the field of disaster management. She highlighted the lesson learned from Kaliasaur landslide at km 147 on NH-58, Ukhimath disaster (2012) and Kedarnath tragedy (2013). While talking about the Kaliasaur landslide she communicated the challenges they face in convincing the affected villager to relocate to safe area. Appropriate rehabilitation and relief strategies helped them to successfully manage the aftermath of Ukhimath disaster in the year 2012. Further, she mentioned that a lot of lessons can be learned from the Kedarnath tradegy (2013). She urged to sensitize local commuters, tourists and trekkers about the geographical attributes and hazards risk profile of the state for better preparedness in case of any disaster.



Mr. Abhishek Narayanan, Manager and Head, WTI put forward the role of Wildlife Trust of India in disaster management such as search and rescue of animals, providing veterinary assistance to victim animals. He highlighted the importance of considering animal safety during disaster events. He mentioned that wild animals are more resilient to disaster scenario as compared to the domesticated animals. He concluded his talk with a suggestion to consider loss of livestock in post disaster assessment.



Vikrant Mahajan, CEO, Sphere India initiated his speech highlighting lack of awareness of community towards risk to various disasters. He cited the example of Kerala where the reconstruction activities started in the same location where landslide has occurred in the past. He highlighted the feeble condition of displaced communities under poverty which are forced to settle at places which are more vulnerable to landslides or other disasters. He further added that from a technical point of view, water and drainage are the key factor

which triggers landslides and spreading knowledge about these factors will help in proper designing and solutions to landslides risk reduction and resilient.

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TECHNICAL SESSION V: STRATEGIES, NETWORKING AND COORDINATION



From left to right: **Dr. Surya Parkash** (NIDM), **Prof. Shakeel Ramshoo** (UoK), **Dr. Piyoosh Rautela** (DMMC), **Lt Gen (Retd.) N. C. Marwah** (NDMA), **Dr. Ravinder Singh Bora** (NDMA), **Ms. Mona Chhabra** (ADPC) and **Maj. Gen. Manoj Kumar Bindal** (NIDM)

Lt Gen (Retd.) N. C. Marwah, Member, NDMA chaired the last session of the International Conference. Dr. Piyoosh Rautela, Executive Director, DMMC, Dr. Ravinder Singh Bora, Senior Consultant, NDMA and Dr. Surya Parkash, Associate Professor, NIDM share their experiences as speakers. Prof. Shakeel Ramshoo, Professor, University of Kashmir and Ms. Mona Chhabra, Program Manager, ADPC also provided their inputs as key discussants.

Key Points

- National and local strategy for landslides risk reduction and resilience.
- Template for preparation of landslides risk management.
- Challenges faced by states in implementation of national strategies/guidelines at local level.
- Nature-based strategies and solution for landslide risk management.



Lt. Gen. (Retd.) N. C. Marwah, Member, NDMA inaugurated the session stating that when talking about landslide risk mitigation, it is one area where we as a nation have not done enough. He also provided insights about the National Landslide Risk Management Strategy published by NDMA in the year 2019 and urged the delegates to go through the document which provide a road map of what is to be done, how it should be done and who will do it.

Member NDMA also stressed on enhancing the capacity to provide early warning of landslide hazards. Very indiscriminately the hillsides are exploited for construction activities, he mentioned.

Dr. Ravinder Singh Bora, Senior Consultant, NDMA elaborated the three-year journey of NDMA in formulating the National Landslide Risk Management Strategy document published in the year 2019. He discussed the landslides vulnerable regions in the nation beside thrust area and major components of the strategy document. Further, he highlighted the gaps identified, future strategies and outcomes of the each six sub-groups created under the National Landslide Risk Management Strategy.





Dr. Piyoosh Rautela, Executive Director, DMMC discussed the challenges faced by local administration and local government due to landslides. State government particularly the department of disaster management has neither technical expertise nor the manpower to apply the report and other technical reports what is deceive from various sources, and institutions. He also highlighted the hindrance in locating dead bodies when they are carried away by the debris and consequently difficulties in providing financial relief to the deceased family. While portraying the landslides risk profile of the state, he also mentioned the negative impacts of road construction activities in escalating the incidences of landslides and constrains in clearing the road blockade. He concluded with an urge to have a holistic approach to landslide risk management.

Dr. Surya Parkash, Associate Professor, NIDM in his presentation briefly discussed that NIDM has been working in the direction of develop a thematic landslide management plan. He revealed that national, state and district level plans are actually not specifically addressing the issues particularly related to the landslides and are in general accommodated with other disasters. He suggested that if we proceed by adding a template it will help the administration at the local level in landslides risk reduction and resilience. He concluded stating



that we need to convert the issues that are pending into solution so that the people do not suffer and their life can be saved and it can take an actually practical solution for their safety of life structures and infrastructures.



Prof. Shakeel Ramshoo, Professor, University of Kashmir started his speech pointing out that we still lack the strategies, robust networks and coordination at the national and state level. He raised the challenges faced by states in implementation of national strategies/guidelines at local level. We have the technology in this country where we can basically put in systems, mechanism that can reduce the risk of people and property to landslide, he added. He suggested strengthening the network of hydro-meteorological stations in hilly areas so that operational early warning system can be put in place. Dr Shakeel Ramshoo also discussed dearth of Environmental Impact Assessment (EIA) in major highway projects made the situation more severe in hill areas.



Mona Chhabra, Program Manager, ADPC discussed three projects she is currently involved with. The first one relates to landslide risk management where she highlighted the nature-based strategies and solution for landslide risk management in Sri Lanka, a World Bank funded project, where some very interesting outcomes of capacity and policy formation were observed. Secondly, she discussed landslide risk assessment integrated with climate change adaptation, a pilot project in Myanmar. The third and final project she discussed was "RECLAIM" i.e., Regional capacity enhancement for landslide impact management in the region.

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VALEDICTION



From left to right: **Dr. Surya Parkash** (NIDM), **Maj. Gen. Manoj Kumar Bindal** (NIDM), **Lt Gen (Retd.) N. C. Marwah** (NDMA) and **Lt. Col. Dinesh Chander Vashista** (NIDM)

Valediction Session was graced with presence of Lt. Gen. (Retd.) N. C. Marwah, Member, NDMA, Maj. Gen. Manoj Kumar Bindal, ED NIDM, Dr. Surya Parkash, Associate Professor, NIDM, and Lt. Col. Dinesh Chander Vashista, JD NIDM



Dr. Surya Parkash, Associate Professor, NIDM summarised the outcomes of all five technical sessions in his address during the valediction. One of the key points that were distilled in discussions was the systematic landslide data collection and dissemination. The need of large scale map was another issue highlighted throughout the conference. Dr Surya Parkash mentioned that regarding governance and administration issues we need to have specific rules, procedures and laws related to landslide regulation for resilience and safety. There was unanimous view regarding the involvement of community as partners in landslides risk reduction and resilience. He further highlighted the need for robust practical networking, linkage, coordination and collaboration among different stockholders including institutions and individualexperts to share exchange and disseminate the information and knowledge. He stated that NIDM will endeavour to establish such network. Some other key points highlighted include follow up action related to disaster management policies, guidelines, strategies and plans, funds, gaps in all aspect of landslide studies which need to filled, mainstreaming of climate change in landslides research and use of mass media commutation at the local level for awareness, advocacy, prevention, mitigation, preparedness and response.

Major General Manoj Kumar Bindal, ED NIDM summarized that the international conference was filled with the torrent of ideas, information, statistics, interpretations and visions with a large number of lively and stimulating practical suggestions, recommendations, lessons learned and ways forward. Further, he conveyed that NIDM will promote specific research on gaps and outcomes discussed in every session to find out scientific ways to combat the risks of landslides. He further assured that the vital information shared during the conference will be documented to formulate a road map for future plan and action. He also acknowledged the scientific contributions from international and national eminent experts, scientists and researchers for sharing their original research work via International Conference's Abstract Volume. He also pointed out that NIDM will be conducting regional workshops in various landslide affected states to ensure more number of stakeholders are connected.





Lt. Gen. (Retd.) N C Marwah, Member NDMA in his valediction speech attempted to response to some of the constraints and issues which has been thrown during the conference. He mentioned that landslides are not purely a natural disaster but also a man-made disaster. So, we have to look inwards and think of preventive measures so that we don't contribute towards creating more landslide prone areas. He emphasised on sharing the good practices of landslides risk reduction and resilience between the International and National stakeholders as well as in India among the States. He also advocates all stakeholders from different streams dealing with the landslides to collaborate under one umbrella to enhance each other capacity by sharing their experiences and wisdom with each other. He emphasized the important role of communities and volunteers in any types of disasters, while enlightening about the NDMA's "Aapda Mitra" scheme. Member NDMA conveyed that funds will always remain a constraint and that challenge hopefully would be addressed. He also mentioned that the revised and enhanced version of National DM Plan will be released very soon. He concluded his talk stating that all of us shouldcontribute towards the preparation of roadmap and its implementation and to build a disaster resilient nation.

Lt. Col. Dinesh Chander Vashista, JD NIDM concluded the International Conference with vote of thanks. He conveyed his heartiest thanks to Hon'ble Minister of State (Home), Shri G. Kishan Reddy, esteem guests, dignitaries, speakers, discussants, DM division MHA, NDMA, knowledge partners, media, delegates and staff of Ashok Hotel for making the event a successful one.



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Key Questions Raised by the Delegates

- Measures and strategies to be taken or followed by medical teams in high risk areas to minimize the death of people or to reduce disabilities after landslide events.
- Mitigation fund for landslides risk reduction and resilience.
- State government initiatives for mitigation of landslides.

Key Suggestions Raised by the Delegates

- To abandon the prevailing subjective quick-fix approach to the management of landslides and to considered treatment of each landslide as a separated research project.
- The need of proper city planning, governance and a holistic approach to tackle landslides.
- Need of a dedicated institute for landslides risk reduction and resilience at national or state level.
- Need of large scale maps that are user friendly, credible with appropriate strategies to update them time to time through modern science and technology.
- To enhance the capacity of investigation in accordance with international standards along with real time monitoring of the landslides.
- To develop indigenous low cost LEWS that will have paramount societal relevance for temporal prediction of landslide disasters in Himalayan States of India
- Potential of rockslide dams as a source of trans-boundary disasters.
- To focus not only on large landslides but also on small landslides due to encroachment and development activities in urban settlements.
- To include PDNA as assessment tool in planning for landslides risk mitigation and management.
- More research to link climate change impacts on landslides incidences.
- To consider community as partners in managing the landslide disasters rather than their participatory engagement.
- To include community radio in preparedness and response phase of landslide disaster management.
- To strengthen the network of hydro-meteorological stations in hilly areas.
- To adopt nature-based strategies and solution for landslide risk management.
- Need of systematic landslide data collection and dissemination.
- To develop robust practical networking, linkage, coordination and collaboration among different stockholders including institutions and individual experts to share exchange and disseminate the information and knowledge.
- To share good practices of landslides risk reduction and resilience between the International and National stakeholders as well as in India among the States.

Way Forward

NIDM will endeavours to promote specific researches on gaps and outcomes discussed in every technical session.

- To promote the implementations of recommendations made by national authorities/organisations for landslides risk reduction and resilience.
- To strengthen governance and administration strategies for proper city planning.
- To establish a dedicated institute for landslides risk reduction and resilience at national or state level.
- To create a centralise platform at national or local level for systematic landslide data collection and dissemination.
- To support development of large scale maps that are credible with appropriate strategies to update them time to time through modern science and technology.
- To promote holistic approach in treatment of landslides and appropriate guidelines for debris disposal.
- To enhance capacity of community to reduce risk of landslides in their respective areas.
- To develop indigenous low cost LEWS that will have paramount societal relevance for temporal prediction of landslide disasters in Himalayan States of India and will reduce risks of landslides disasters.
- To set pace-setting best practices for landslides risk reduction and resilience.
- The network of hydro-meteorological stations in hilly areas should be strengthened for to facilitate landslides early warning system.
- PDNA tool should be considered in planning the strategies for landslides risk reduction and resilience.
- To promote community radio in preparedness and response phase of landslide disaster management.
- Nature-based strategies and solution for landslides risk management should be given priority.
- Small landslides due to encroachment and development activities in urban settlements should also be considered.
- To develop a roadmap for future plan and actions.







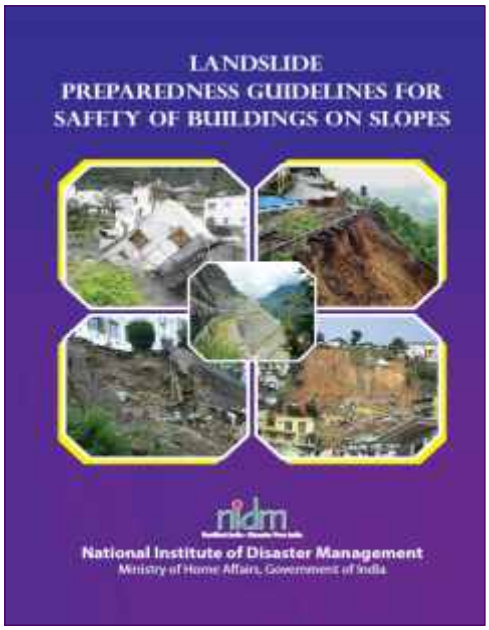
Some of the delegates asking questions from the audience





Delegates of the International Conference

BOOK RELEASED IN THE INTERNATIONAL CONFERENCE



Landslide Preparedness Guidelines for Safety of Buildings on Slopes

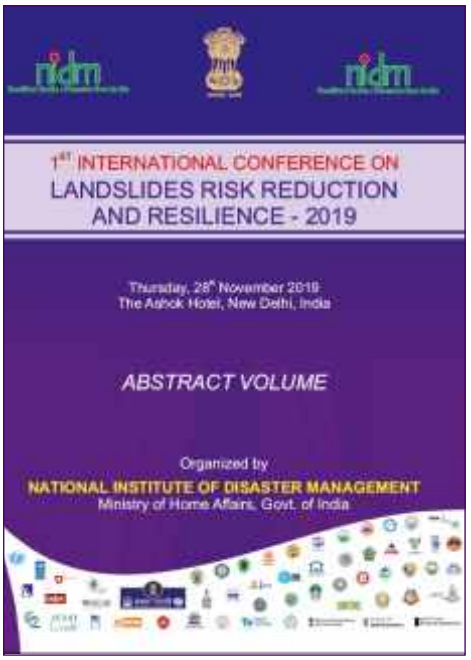
Author: Dr. Surya Parkash, Associate Professor, NIDM

"Landslide Preparedness Guidelines for Safety of Buildings on Slopes" has been prepared to make people aware of landslide and its causes with main focus on avoidance, prevention and mitigation measures, that common people can understand and implement to protect themselves from landslides, especially those who are living on unstable slopes or their surroundings. The document would help to counter the ignorance and human mistakes that give rise to landslide problems. It is an awareness guide with emphasis on better understanding of landslide hazards with their avoidance, prevention and mitigation for planning, development, maintenance and sustenance of slopes, structures, infrastructures and services with reduced risks and enhanced the resilience of people against disasters.

Abstract Volume - 1st International Conference on Landslides Risk Reduction and Resilience – 2019

National Institute of Disaster Management, Ministry of Home Affairs, Govt. of India

The Abstract Volume is the product of contributions from International and National scientists and researchers working in the field of landslides risk reduction and resilience. Around 50 delegates share their original work through this abstract volume.



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ABOUT THE INSTITUTE

National Institute of Disaster Management (NIDM) constituted on 30.10.2006 under The Disaster Management Act 2005 has been entrusted with the responsibility for planning and promoting training and research in the area of disaster management, documentation and development of national level information base relating to disaster management policies, prevention mechanism and mitigation measures. Re-designated from the National Centre for Disaster Management of the Indian Institute of Public Administration on 16th October 2003, NIDM is steadily marching towards the mission of making a disaster resilient India by developing and promoting a culture of prevention and preparedness at all levels.

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Under The Disaster Management Act 2005, the Institute, has been entrusted with the following functions:

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- Formulate and implement a comprehensive human resource development plan covering all aspects of disaster management
- Provide assistance in national level policy formulation
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- Provide assistance to the State Government and State training institutes in the formulation of State level policies, strategies, disaster management framework and any other assistance as may be required for capacity building
- Develop educational materials for disaster management including academic and professional courses
- Promote awareness among stakeholders including college or school teachers and student, technical personnel and others associated with multi-hazard mitigation, preparedness and response measures
- Undertake, organize and facilitate study courses, conferences, lecturers, seminars within and outside the country to promote the aforesaid objectives
- Undertake and provide support for publication of journals, research papers and books as well as establish and maintain libraries etc.

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