

ROLE OF LAND PROFESSIONALS AND SPATIAL DATA INFRASTRUCTURE IN DISASTER RISK REDUCTION: IN THE CONTEXT OF POST 2015 NEPAL EARTHQUAKE: GENERAL REVIEW

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1 BACKGROUND

On September 22, 2014 a meeting was held at Survey Department, which formally opened up an idea of organizing an international event in Nepal. The meeting was participated by the Presidents and some members of Nepal Institution of Chartered Surveyors (NICS) and Nepal Remote Sensing and Photogrammetric Society (NRSPS), Officials from Survey Department, Professors, and veteran freelancers from Surveying and Mapping sector. The presidents of NICS and NRSPS shared the idea of organizing the event jointly which came after a number of informal discussions and meetings at home as well as abroad. The meeting endorsed the title of the event as "International Workshop on Strengthening Education for Land Professionals and Opportunities for Spatial Data Infrastructure Development", which was discussed informally prior to that meeting. The event was to be organized as a joint event of the Commission 2 of the International Federation of Surveyors (FIG) and Technical Commission IV; Working Group 4 (WG IV/4) of the International Society for Photogrammetry and Remote Sensing (ISPRS). The date was also endorsed as November 25-27, 2015. This meeting was the first formal step to move ahead in the line of organizing the event. Several committees were proposed, and some important jobs were allocated for preparatory works.

The joint meeting of NICS and NRSPS held on October 23, 2014 formalized and endorsed all the preparatory works as well as different committees such as Advisory Board, Steering Committee, Organizing Committee, and Technical Committee. Secretariat was established in the Survey Department Complex and accordingly all the preparatory works began. Everything was going smoothly. Suddenly, in the midday of April 25, 2015, the country was hit by the traumatic earthquake of M 7.6. The earthquake was followed by several aftershocks and one of which was of M 6.8 on May 12. Aftershocks are still continuing and more than 400 of them greater than 4.0 magnitudes have been recorded so far.

This traumatic earthquake greatly devastated the central part of the country killing more than 8000 people and injuring thousands, and causing a great loss to the country. That situation made the organizers to re-think if it was possible to organize the event. Consultations were made with the FIG Commission 2 and ISPRS WG IV/4 if it was possible for them to change the theme of the event. Their response was more motivating than the organizers expected. Several discussion and consultations were held at local level. After receiving encouraging responses from all those who were consulted, the organizers decided to move ahead with the same spirit but aligning the theme of the event with the changed context and further efforts were put forwarded.

Different committees worked hard for making necessary preparations for the event. In the meantime, the country faced political unrest in the terai region as well as economic blockade from India, which greatly affected the preparatory works. However, the strong efforts from the determined group of people made it possible to bring things under control.

2 INTRODUCTION

As mentioned above, the theme of the event was aligned with the changed situation that brought by the devastating earthquake and the title of the event was reformulated as "International Workshop on the Role of Land Professionals and Spatial Data Infrastructure (SDI) in Disaster Risk Reduction (DRR): in the Context of 'Post 2015 Nepal Earthquake'"

Main objective of the event was set to exploit the international expertise for enhancing professional capacity to contribute in the effort of DRR in the situation like currently in Nepal. The event further aimed to explore opportunities for strengthening and promoting good practices in professional geospatial education and advancing SDI concepts and spatially enabled societies. The workshop specifically focused on role of land professionals and SDI in rehabilitation of devastation caused due to recent earthquake and its aftershock.

Apart from NICS and NRSPS, the event was greatly supported by the Ministry of Land Reform and Management (MoLRM), Survey Department and Land Management Training Center (LMTTC) of Government of Nepal as the co-organizers. A number of organizations supported in a way or another to make the event a success. The list of the supporters is given in the following sections.

Approximately 355 participants including professors, researchers, experts, survey professionals, students, young surveyors, entrepreneurs and media persons participated the workshop from Nepal and abroad including India, China, Bangladesh, Bhutan, Japan, South Korea, Taiwan, Malaysia, Singapore, Australia, New Zealand, Turkey, The Netherlands, Austria, Switzerland, France, United Kingdom, Macedonia and United States of America.



3 INAUGURAL SESSION

The event began with the Inaugural session on the 25th of November, 2015. The event was inaugurated by Hon' Deputy Prime Minister Mr. Kamal Thapa, who also holds the portfolio of the Ministry of Foreign Affairs. In his inaugural address, Hon' Thapa extended warm welcome to all the international and national guests and participants, and expressed his gratitude to the organizers for organizing such a great event in the difficult situation.



Ms. Liza Groenendijk, Chair Commission II (FIG), Vice President of ISPRS Prof. Dr. Marguerite Madden, President of NICS Mr. Buddhi N. Shrestha, President of NRSPS Mr. Rabin K. Sharma and Chair of the Advisory Board Mr. Babu Ram Acharya deliberated their speeches, whereas Chair of Organizing Committee, Mr. Ganesh Prasad Bhatta delivered his welcome speech.

The distinguished speakers of the session expressed happiness on organizing such a useful event in the difficult times in the country and wished for its grand success.



There was the presence of high level Government officials in this session including the Minister for Land Reform and Management Hon' Ram Kumar Subba, State Minister Hon' Bikram Bahadur Thapa, Assistant Minister Hon' Dinesh Shrestha, Secretaries and Joint Secretaries of different ministries, dignitaries from different universities, professors, professionals, media persons and registered participants.

The chief guest of the session Hon' Thapa and high level officials visited the exhibition stalls upon the conclusion of the inaugural session.

4 KEYNOTE SESSION

The inaugural session was followed by Keynote session. Prof. em. Dr. Armin Gruen (ETH Zurich, Switzerland), Prof. Dr. Arbind Man Tuladhar (ITC, the Netherlands), and Mr. Rajan Aiyer (Trimble, India) were the keynote speakers.

Prof. em. Dr. Gruen deliberated on "Image based modelling for emergency management". He talked about a large spectrum of different sensors, operating from a variety of platforms like satellites (optical, radar), aerial (images, LiDAR, helicopters, UAVs) and terrestrial (Mobile Mapping systems, flying "mosquito" robots) which can be used both for simulation of events, risk analysis and for the empirical analysis of events and prevention, and for the monitoring of actual

events. According to him the true challenge today lies not so much in sensing, but in data processing, especially if on-line processing and real-time responses are required.

Dr. Tuladhar under his presentation entitled "Land Issues and Geo-information: Responding Post Disaster Earthquakes in Nepal" elaborated the issue of land as a fundamental to the recovery process. He further stated that access to land for shelter, security of tenure and protection of land rights, livelihood and early recovery from the earthquakes are the important land issues to be incorporated into an action-oriented framework for recovery.

Mr. Rajan Ayier, under his presentation on "Geospatial Technologies for a Disaster Resilient Community" deliberated on innovative geospatial technologies available today to respond the disaster.

5 PLENARY SESSIONS

Two plenary sessions were conducted in the beginning second and third day each. Altogether nine presentations were held from the plenary speakers namely; Dr. Amod Mani Dixit (NSET, Nepal), Prof. Dr. Marguerite Madden (USA, the Second Vice President of ISPRS), Prof. Dr. Alexander Densmore (UK), Prof. Dr. Kevin McDougall (Australia), Associate Professor Dr. Donald Grant (RMIT University, Melbourne, Australia / Former Surveyor General of New Zealand), Mr. Chee Hai Teo (Immediate Past President of FIG / Honorary President of FIG, Malaysia), Mr. Alistair Greig (New Zealand), Dr. Christopher Pearson (New Zealand) and Mr. Igor Cvetkovski (Disaster Management Expert from International Organization for Migration, IOM).



Dr. Dixit highlighted, while delivering the lessons learnt from the devastating earthquake, the strong need of empowering local community to exploit local knowledge and resources not only to respond the present situation effectively but also for future disasters. He further highlighted some safety measures that were found effective to save schools and hospitals, those were retrofitted in the past.

Prof. Dr. Madden discussed the role of geospatial technologies for disaster preparation, response and recovery. She presented some case studies how multi-temporal imagery from satellite, airborne and unmanned aerial systems platforms can be used to document present conditions and establish baselines for assessing future changes. She stressed that easy access to the geospatial data should be ensured as it is the most important component of disaster management.

Dr. Grant shed light on the lessons learnt from earthquake disasters of Haiti and New Zealand. He presented key land administration challenges faced during the recovery and reconstruction, such as priorities for tenure security, land use planning, and property valuation.

Mr. Greig presented the lessons learnt from the recovery efforts of Christchurch earthquake in 2011. He stressed the importance of geospatial professionals to support the prompt response to the disaster, with examples how the professional supported the rescue efforts made by Urban Search and Rescue, Civil Defense, Police and Army. He further informed that the importance of surveyors and GIS experts increased as the emergency response turned into recovery and to rebuild the city.

Prof. Dr. Densmore presented specific case of Nepal. He highlighted that lack of adequate data hampered the efforts of land slide mapping caused due to the recent devastating earthquake in the country. He stressed that availability of cloud-free imagery would have helped them in identifying seismic landslides. He also found lacking in coordination between the different teams, data providers, and potential end-users. Their team reviewed the earthquakes and the patterns of co-seismic landsliding, emphasising the key role of satellite imagery in allowing rapid assessment of the landslide hazard, and also described the longer-term effects of the earthquake on landslide occurrence in the region, focusing in particular on the Upper Bhote Koshi valley, Sindhupalchok, as a representative example of the wider earthquake-affected area.

Prof. Dr. McDougall presented that crowd support and crowd generated spatial data have the potential to speed up disaster management actions and disaster mitigation activities. He mentioned that OpenStreetMap, Google Maps or Bing Maps can be considered as commonplace for crowd sourced mapping. He further discussed the role of crowd sourced mapping during disasters, the challenges, data quality and credibility, the opportunities that crowd sourced data presents, and the role of government agencies in spatial data access in support of disaster management.

Dr. Pearson, who was studying the effect of the earthquake in the national geodetic network of the country, presented a preliminary velocity field developed by his team by taking published velocities

for Nepal and adjacent parts of China and India from five previous studies and aligning them to the ITRF. He mentioned that they were working on developing patches for the co-seismic part of the deformation using published dislocation models. He highlighted that those models could be improved by developing revised grids that would incorporate increased GPS and INSAR measurements of the deformation field. He further highlighted that top level control would be based on a CORS network based around the existing Nepal GPS Array. Coordinates for existing lower order coordinates would be determined by readjusting existing measurements and these would be combined with a series of new control stations spread throughout Nepal. Mr. Cvetkovski highlighted the importance of land and property rights in responding to the effects of disaster. He stressed that balance between the needs and the rights of affected population, existing legal frameworks and societal demands, and available resources should be found out. He further stressed that there should be adequate institutions for addressing housing, land and property issues before, during and after the natural disasters.

Mr. Teo highlighted the role of surveying professionals, especially in addressing the Development Goals set by United Nations and other issues related to humanitarian concerns including climate change.

6 TECHNICAL SESSIONS

There were held altogether nine technical sessions at which 56 technical papers were presented. The sessions were categorized into six different themes: Spatial Planning and Environment, SDI Development, Responding Disaster, Geospatial Technology, Professional Development, and Land Administration and Management. All the presentations were focused on role of the land professionals and SDI in disaster risk reduction in the context of recent Nepal earthquake. Besides this, the presentation were also on the use of technologies for relief support during disaster, probable challenges in rehabilitation and reconstruction, need of land use planning for management of disaster prone area, other probable disaster after earthquake and their management, challenges in land administration and management of disaster affected region etc.

Some other fields covered in the presentation were new technologies in SDI developments, geo-information and climate change, public participation in geo-information, role of satellite science in geo-information, opportunities for land professionals, challenges and issues in 3D cadaster etc.



7 SIDE EVENTS

7.1 Pre-conference Event

A one day tutorial on Spatial Data Infrastructure (SDI) was organized on November 24 at Kathmandu University as a Pre-conference event. The event was supported by Global Spatial Data Infrastructure Association (GSDIA). Land Management Training Center was one of the local supporters of the event. About 50 students and young surveyors participated the event. Distinguished experts including Prof. Dr. Marguratte Madden, Prof. Dr. Kevin McDougall, Dr. Dev Raj Puadel, among others deliberated on the SDI issues.

7.2 Business Exposition and Exhibition

A business exposition was organized during the event. All the branded sponsors Trimble (Platinum Sponsor), Hexagon Group (Gold Sponsor), Digital Globe Group (Silver Sponsor), JAXA and Topcon (Bronze Sponsors) made presentations about their products and geospatial technologies including their applications. The exposition was attended by all the participants including representatives from the Government of Nepal.

At the same time, the branded sponsors and some supporters made exhibition of their products parallel throughout the event.

7.3 FIG Young Surveyors' Network Session

FIG Young Surveyors Network organized a special session for the Nepalese young surveyors. The session was attended by more than 50 young surveyors. The session was chaired by Eva-Maria Unger and supported by Paula Dijkstra. In groups, four disaster risk reduction 'tools' were proposed and elaborated and 'pitched' in a so-called market place.

8 CLOSING SESSION

The event ended with the closing ceremony held on the 27th of November 2015. Minister for Land Reform and

Management Hon' Ram Kumar Subba were the Chief Guest of the Ceremony. Hon' Subba congratulated the organizers on the success of the event and extended sincere thanks to all the distinguished presenters and participants of the event. Ms. Liza Groenendijk, Chair FIG Commission II, Dr. Dev Raj Puadel, Co-chair of ISPRS WG IV/4, Mr. Buddhi N. Shrestha, Mr. Rabin K. Sharma (Chair of the Session), Mr. Babu Ram Acharya deliberated their closing remarks. They expressed their happiness on the grand success of the event and extended thankfulness to all the supporters. Mr. Ganesh Prasad Bhatta, the Chair of Organizing Committee, acknowledged all the supporters, sponsors and contributors.



Based on the presentations during the event, some key points that would contribute in the initiative of the Government of Nepal in Building Back Better were drawn as workshop resolution, which was presented at the closing ceremony. Main points of the resolution, that recommended the Government of Nepal for necessary actions, are as follows:

- formulate, enact and implement a comprehensive land and land use policy in order to address pertaining land issues brought forth by the disaster
- design a multi-stakeholder and action oriented framework which ensures clear and crisp action points, responsibility allocation, implementation time and monitoring system in order to avoid duplication of efforts and resources to respond the disaster
- adopt fit-for-purpose land administration and tools developed by Global Land Tool Network (GLTN) in order to ensure tenure security and adequate rehabilitation of the households residing in informal/non-formal settlements
- adopt appropriate tools and technique for accurate and timely geo-information acquisition, processing, visualization and dissemination and as well as strengthen Spatial Data Infrastructure (SDI) technique in

order to facilitate effective and efficient data sharing and use

- carry out capacity building activities for continuous professional development in order to support Disaster Risk Reduction (DRR) in long term

The resolution was submitted to the Government of Nepal through the Minister for Land Reform and Management at the closing session of the event. The detailed resolution can be accessed at workshopnepal2015.com.np.

9 SUPPORTERS, SPONSORS AND CONTRIBUTORS

The workshop was supported by internationally recognized organizations. Dutch Kadaster of the Netherlands and Faculty of Geo-information Science and Earth Observation (ITC), University of Twente, the Netherlands were the *Prime Supporters* of the event.



Trimble, an internationally recognized organization for new and updated technology and equipment in the field of surveying and mapping supported the *Platinum Sponsor*. Similarly, other organization well known for technology and equipment in the field of Surveying and Mapping and development of Land Information System, the Hexagon group supported as *Gold Sponsor* whereas, the satellite image provider, Digital Globe supported as *Silver Sponsor*. Japan Aerospace Exploration Agency (JAXA), Government of Japan, and Topcon, a leading equipment producer in the field of surveying and mapping, sponsored as *Bronze Sponsors*.

Besides this, International Centre for Integrated Mountain Development (ICIMOD), International Organization for Migration (IOM), United Nations Development Program (UNDP), United Nations Human Settlements Program (UN-HABITAT) and Nepal Academy of Science and Technology (NAST) supported as *Strategic Partners*. ICIMOD, IOM, UNDP and UN-HABITAT not only supported as strategic partners but also financially.

Similarly, the event also supported by Institute of Engineering (TU), Central Department of Geography (TU), School of Engineering (KU), Nepal Surveyors Association and CAN Federation as **Institutional Partners**. Similarly, Global Spatial Data Infrastructure Association (GSDIA), Coordinates, GIM International and Geo-Spatial Media and Communications supported as **Media Partners**.

Ministry of Land Reform and Management coordinated with other line agencies for the participation in the workshop. Survey Department played extraordinary role to make the event a grand success not only by supporting its management part but also providing financial support. The Department sponsored the welcome reception among other supports.

Different committees were formed for successful organization of the workshop. Advisory board was chaired by Mr. Baburam Acharya, former Secretary of Government of Nepal. Steering Committee was chaired by Mr. Buddhi Narayan Shrestha, former Director General of Survey Department and Chair of NICS and co-chaired by Mr. Rabin K. Sharma, former Director General of Survey Department and Chair of NRSPS. Similarly, Organizing Committee was chaired by Mr. Ganesh Prasad Bhatta, Deputy Director General of Survey Department, and Technical Committee was chaired by Prof. Dr. Hikmat Raj Joshi. Joint Secretary of MoLRM, Mr. Nagendra Jha, then Director General of Survey Department Mr. Madhusudan Adhikari, and then Executive Director of LMTC Mr. Krishna Raj B.C. provided invaluable support to the management of the workshop. Chief Survey Officer Mr. Susheel Dangol and Survey Officers Ms. Shanti Basnet and Mr. Ram Kumar Sapkota supported from starting till the end of the workshop. Similarly, Mr. Janak Raj Joshi, Under Secretary, Ms. Laxmi Thapa, Ms. Eliza Shrestha, Mr. Mahesh Thapa, Mr. Prashant Ghimire and other staff provided the volunteer service which helped a lot in successful conduction of the workshop. The conduction of this workshop in Nepal has proved that Nepal is capable of conducting big international events. Conduction of the event despite the devastating earthquake during the preparation of the event and economic blockade and participation of scientist and experts from different countries concludes that the event is grand success.



10 REVIEW REMARKS ON THE EVENT FROM SOME OF THE DIGNITARIES

Chryssy Potsiou; President, FIG

I really wish to congratulate the organizers of that great event! I really admire them. They deserve all our support, love and respect. I am thankful for their contribution and their willingness to share their experience and knowledge with us. They are great professionals.

Prof. Dr. Marguratte Madden, the Second Vice President, ISPRS

Dear Ganesh, [...] but I left with a better appreciation of the strength and potential of your people...] I really enjoyed Nepal and one of the best organized and informative conferences I have ever attended. Best of all was meeting the students, researchers and decision makers of Nepal. As a country you have many challenges, but I left with a better appreciation of the strength and potential of your people. Thank you so much for making my stay such a wonderful experience. I am sure we will meet again!

Liza Gronendijk; Chair, FIG Commission II

[...] Considering the difficult situation in Nepal after the 2015 Earthquake and the recent fuel crisis in the country the organizers have achieved the almost impossible. In particular the chair of the local organizing committee, Ganesh Prasad Bhatta, did a tremendous job, beyond expectations. He really deserves an 'honorable membership' of our FIG Commission 2.

[http://fig.net/news/news_2015/2015_11_nepal.asp]

Dr. Donald Grant, former Surveyor General of New Zealand

Dear Ganesh, [...] Thank you also for the invitation to the excellent workshop and congratulations for managing a very successful international meeting in such an engaging and professional manner.

Kees de Zeeuw; Director, Kadaster International, the Netherlands

Dear Mr Ganesh Prasad Bhatta,

On behalf of Kadaster I would like to congratulate you and your team for organising an excellent 'Workshop on the role of land professionals and SDI in disaster risk reduction: in the context of the post 2015 Nepal Earthquake'.

Mrs. Paula Dijkstra and Mrs. Christelle van den Berg who participated the workshop, informed me about the well organised workshop and the relevance of the keynote speakers and technical sessions to the topic of the workshop. It is impressive to deliver such a high

level event shortly after such devastating earthquakes in Kathmandu earlier this year.

As land professionals of Nepal you have raised the bar for other international workshops of FIG and ISPRS. As I understood an event with the size and quality like this, should be considered as a conference rather than a workshop.

[...]

Dr. Rishi Raj Datta, Asian Disaster Prevention Center, Bangkok

Congrats to ganeshji and his enthusiastic team of dynamic young professionals of surveyors who with their exceptional hard work and perseverance have made this International Workshop a grand success. As I have said earlier, the response to the workshop has actually taken the event along the lines of a conference. Great job and good luck to you and your team once again.

Eva- Maria Unger, FIG Young Surveyors' Network

... and this is a special thanks to Ganesh [...] ! Ganesh as chair of the LOC did an amazing job in organising the workshop! and you could really feel the heart he put into it! But he is not just an organiser he is a friend and his heart warming hospitality made it even more special!

11 CONCLUSION

The devastating earthquake of April 25, May 12 and consecutive aftershocks have caused a great human as well as economic loss to the country. It is a responsibility of all sectors of society to contribute to the Government's efforts in recovering from this difficult situation. The same applies to the land, and surveying and mapping professionals. This workshop was considered as a tiny contribution in this respect. It could not contribute much but remained instrumental in acquiring some examples of international best practices as well as knowledge that a land professional can apply in his or her professional career, especially in the current situation of the country. The presentation made were very useful for the targeted professionals. The international speakers placed the Nepalese experiences in a broader international context; while at the same time Nepalese experiences showed new approaches and tools in support of disaster risk reduction that were not used before. It is expected that professors, researchers, professionals, policy makers, students must have been benefited in their professional capacity development. Young students and surveyors were expected to receive information about the new technology and ideas as well as helpful in their professional capacity development.

The country was facing difficult situation, not only due to aftermath of the earthquake disaster but also economic blockade, during the event. Despite such situation, the organizers and organizing committee

worked hard to make the event a success. Their tireless effort and hard work made it possible to organize the event successfully. The participation was beyond the expectation not only from the country but also from abroad. The expressions from the international guests as well as national dignitaries were highly encouraging. The details about the event and proceedings are available at www.workshopnepal2015.com.np , which will remain alive at least for two years.

In nut shell, the event was successful in achieving its objectives and was a great success!



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