



**International Conference on
Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Changing Climate**
November 27-29, 2013, Kathmandu, Nepal

**Proceeding of the
Conference on Climate Change, Water Resources and Disasters in Mountainous
Regions: Building Resilience to Changing Climate**

**International Conference
on
Climate Change, Water Resources & Disasters in Mountainous Regions : Building
Resilience to Changing Climate**
27-29 November, 2013
Kathmandu, Nepal

Organized Jointly by:
Society of Hydrologists and Meteorologists Nepal (SOHAM-Nepal)
Department of Hydrology and Meteorology (DHM), Government of Nepal
UNESCO International Hydrological Programme Nepal (IHP), National Committee

In association with
Department of Irrigation/Adaptation to Global Change in Agricultural Practices (DoI/AGloCAP)
International Association of Hydrological Sciences (IAHS)
International Water Management Institute (IWMI)
Nepal Development Research Institute (NDRI)

Supported by :

**Prepared by:
Society of Hydrologists and Meteorologists Nepal
(SOHAM-Nepal)**

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Conference Summary

This summary captures a three-day programme of presentations, discussions and interactive dialogue at the “International Conference on Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Changing Climate”, which took place from 27-29 November 2013 at Everest Hotel, New Baneshwor, Kathmandu, Nepal. The conference was jointly organized by the Society of *Hydrologists and Meteorologists Nepal (SOHAM-Nepal)*, *Department of Hydrology and Meteorology (DHM)*, *Government of Nepal*, and *United Nation Educational, Scientific and Cultural Organization International Hydrological Programme - Nepal (UNESCO IHP-Nepal)*, in association with the *International Association of Hydrological Sciences (IAHS)*, *International Water Management Institute (IWMI)*, *Central Department of Hydrology and Meteorology Tribhuvan University*, *Department of Irrigation/Adaptation to Global Change in Agricultural Practices (DoI/AGloCAP)*, *Nepal Development Research Institute (NDRI)*, *Feed the Future Innovation Labs*, *Colorado University*, *United State and United Nation Development Programme (UNDP)* with the support of *International Center for Integrated Mountain Development (ICIMOD)*, *Kathmandu University*, *Practical Action*, *OXFAM*, *Real Time Solution*, *World Wildlife Fund (WWF)*,

The conference commenced with the inaugural ceremony watering a plant by Mr. Parmananda Jha, Vice President of Nepal, who graced the opening ceremony as the Chief Guest. The conference was chaired by Mr. Jagat Kumar Bhusal, Chairperson of the Conference and SOHAM Nepal. The opening continued with key note speeches, interactive presentations, discussions, and briefings on topics of interest to the future environment leader. It concluded with Kathmandu declaration followed by the closing ceremony.

The event brought together some 275 professional scientists, young researchers, students, and key officials from almost 25 countries to discuss and share ideas on latest research findings and to address current and future climate change challenges particularly in mountainous regions. Several invited keynote speeches were delivered by distinguished scientists from renowned

universities and institutions on pertinent issues, such as *opportunities for high mountain research within a new decade of research* by Gordon Young, *challenges related to global changes and water resources* by Stefan Uhlenbrook, *South Asian monsoon systems* by Robert Gillies, *water security in the Asian Pacific region* by Shabhaz Khan, *climate change insights from IPCC 5th assessment report* by Kirk Smith, *contribution to high Asian runoff from ice and snow* by Richard Armstrong, and *overview of 7th world water forum* by Soontak Lee. Further 73 scientific papers focused mainly on the mountainous regions t extended geographically from Iran to China. These papers focused on climate variability and changes, water resources management, flood, drought, food security, river basin modelling, land degradation, hazards, disaster risk reduction, cryospheric changes and its impacts on water resources. This conference provided a valuable networking opportunity and set the stage for further cooperation among government and non-governmental organizations in Nepal and beyond, including developed and developing countries.

1. Introduction and Aim of the Conference

Climate variability and climate change are the concern for all the levels of society including the organizations and individuals involved in planning and policy formulation. Developing countries are more vulnerable to climate change because of their inadequate capacity and resources to cope its adverse effects. Scientific discussions and knowledge sharing on different aspects of climate change are essential to understand its complex nature. Water is one of the vital resources required for sustainable development, environmental integrity and the eradication of poverty and hunger. Changes in climate have been adversely affecting various water bodies including surface water and groundwater. Changes in hydrological regimes and natural ecosystems have become global concerns. The situations are more alarming in mountainous areas.

In order to address the issues of climate change in mountainous regions, an International Conference on Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Changing Climate will be organized in Kathmandu, Nepal during 27-29 November, 2013. The Conference was jointly organized by the Society of Hydrologists and Meteorologists-Nepal (SOHAM-Nepal), Department of Hydrology and Meteorology (DHM), Government of Nepal (GoN), and United Nation Educational, Scientific and Cultural Organization International Hydrological Programme Nepal (UNESCO IHP-Nepal) *in association with the International Association of Hydrological Sciences (IAHS), International Water Management Institute (IWMI), Central Department of Hydrology and Meteorology Tribhuvan University, Department of Irrigation/Adaptation to Global Change in Agricultural Practices (DoI/AGloCAP), Nepal Development Research Institute (NDRI), Feed the Future Innovation Labs, Colorado University, United State and United Nation Development Programme (UNDP) with the support*

of International Center for Integrated Mountain Development (ICIMOD), Kathmandu University, Practical Action, OXFAM, Real Time Solution, World Wildlife Fund (WWF),.

The conference aims to invite scientists, engineers, planners, development workers as well as experts on related fields providing a platform for presenting their research outcomes, on observations, findings and innovative ideas. The conference targets to gather more than two hundred participants both national and international with more than 100 papers. Keynote speakers were invited to deliver presentations on specific burning issues. Selected peer reviewed papers are in the process to publish in the Journal of Hydrology and Meteorology published by SOHAM-Nepal.

3. Inaugural Session

The conference inaugurated with the inaugural ceremony watering a plant by Mr. Parmananda Jha, Vice President of Nepal, who graced the opening ceremony as the Chief Guest. The inaugural session was chaired by Mr. Jagat Kumar Bhusal, Chairperson of the Conference and SOHAM Nepal.



Three-Day International Conference

Climate Change, Water Resources and Disaster in Mountainous Regions: Building Resilience to Changing Climate

Organized by

Department of Hydrology and Meteorology, Society of Hydrologists and Meteorologists and
International Hydrology Program - UNESCO



Hon'ble Vice-President Mr Paramanada Jha

Inaugural Address by

Chairperson of this Inaugural Session

Hon'ble Minister

Ladies and Gentlemen

- 1) It is my great pleasure to inaugurate this international conference in the beautiful city of Kathmandu, this morning, to discuss remedial measures of the burning problems faced by the mountainous countries.
- 2) Furthermore, I would like to express my sincere thanks to the organizers and other contributors for organizing such an important event in Nepal, which is a country facing problems related to global warming and environmental changes along with the global communities.

- 3) Nature is not only our common resource but also a lifeline of the Earth, since the existence of human beings solely depends on conducive environment provided by nature as there is an intimate relationship between man and nature.
- 4) Development and implementation of appropriate and useful technologies for accelerated physical prosperity are the goals of all countries these days. In this context, human beings have been successful to reap the benefit of innumerable natural resources and natural gifts. On the contrary, the exploitation of nature has also caused negative impacts imposing climatic and environmental challenges faced by the world.
- 5) You belong to the scientific communities that have amply clarified the facts that climate change, loss of biodiversity, soil loss and ever increasing magnitude of water induced disasters are causing negative impacts on living beings and plants on the Earth. Existence of life and vegetation are in peril in the absence of timely mitigative measures.
- 6) Climate change as a result of environmental imbalance may cause accelerated snowmelt glacial lake outburst floods, avalanche, landslides and soil erosion. In addition, loss in agricultural productivity and appearance of new diseases have been anticipated in the scenarios of increasing floods, intense precipitation, isolated precipitation, droughts and extreme temperatures.
- 7) Negative impacts are of greater concern particularly for mountainous countries like Nepal where adverse impacts are not limited to environmental imbalance but extend to agriculture productivity, economic development and other developmental activities. In this regards, it is the primary duty of all of us to contribute to maintain the balance of environment and development.
- 8) The resources provided by nature are adequate to meet human needs. However, it is of utmost importance for all of us to understand that human's desire has led to a situation that the environment can hardly cope. In this context, we need to stop over exploiting the nature considering our dependence on environment. In addition, it is extremely important for us to concentrate on the establishment of effective policies, planning and implementing effective activities targeting towards environmental safeguard.
- 9) Climate change is considered to be the result of excessive greenhouse gas emission. Nepal is not at all responsible but is forced to bear its negative impacts. Nepal has already initiated programs targeted to the adaptation and resilience development in this regard. I believe the outcome of the conference will provide recommendations and upgraded knowledge base useful to tackle negative impacts faced by countries like Nepal.
- 10) We have endorsed and implemented several activities related to the major international conventions, accords, agreements and treaties established to address climate change, water resources management and disasters. I understand this conference is one more activity in this regards. I feel, our efforts to draw attention of industrialized countries should be continued for mitigating the negative impacts of climate change.
- 11) Nepal has made some progress in the management of climate change impacts. Nepal has already implemented Climate Change Policy 2011. Despite limited resources, Nepal has paid adequate attention in the areas of climate, water resources and disasters.

These days, Nepal is implementing climate change adaptation activities supported by the Climate Investment Fund. Nepal is presently at the early stage of drafting constitution. I believe, the new constitution will also address issues related to the environment, climate change impact mitigation, adaptation and the development of resilience.

- 12) Private sectors, civil societies, non-governmental organizations, stakeholders and general public have important roles to play in climate change adaptation and impact mitigation. If all of us adopt activities that contribute to climate change adaptation and disaster mitigation in our life style, habits and dealings, we can ensure our livings in healthy, clean and safe environment.

To end, I wish all the best for successful deliberations in the conference and believe that the outcomes of the conference will be fruitful in promoting environment conservation.



Vote of Thanks and Chairperson's Closing Remarks

Chief Guest of this Inaugural Ceremony, Right Hon'ble Vice President of Nepal, Parmananda Jha,

Hon'ble Minister, Uma Kanta Jha, Ministry of Science. Technology and Environment;

Ministry of Energy and; Ministry of Irrigation.

Respected Dr. Som Lal Subedi. Secretary, Ministry of Ministry of Science. Technology and Environment,

Dr. Rishi Ram Sharma, Director General, DHM, Dr. Axel Plathe, UNESCO Representative to Nepal, Distinguished guests, participants from various countries, participants from Nepal, representatives from different organizations, Media persons, Ladies and Gentlemen.

Good Morning and Namaste.

It is indeed a great pleasure for me to be here to deliver vote of thanks in the opening ceremony of a three day International Conference on Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Changing Climate". Before offering thanks, let me allow a few words to recall that climate variability and climate change are talk of the town today at all levels of society, individuals, organizations and institutions. All of us admit that the global climate is extremely complex

and has undergone significant changes in the distant past. Situations with us as observed and as predicted consequences by climate change are more alarming in mountainous countries. This event, a joint effort, will also address the issues of climate change in mountainous regions as already expressed by Right Hon'ble Vice President Parmanand Jha, Hon'ble Minister Uma Kanta Jha, Dr. Som Lal Subedi, and Dr. Axel Plathe and also highlighted by Dr Rishi Ram Sharma. We, scientists, engineers, planners, development practitioners and experts on various fields, are gathered here with a common aim to share our respective research outcomes, observations, findings and innovative ideas, and in conclusion to come with lessons.

Right Hon'ble Vice President of Nepal is genius personality whose charitable and philanthropic deeds are widely appreciated and acknowledged. As a matter of fact, he has a very busy schedule to be attended to, but he has graciously consented to inaugurate the conference. I am deeply grateful to him. On behalf of organizing committee, associating partners and supporting organizations as well as participating institutions, I would like to express gratitude to him for his remarkable opening speech and for inaugurating the conference and wish to make the conference fruitful and success. Similarly, I would like to thank Hon'ble Minister who, in spite of his very busy schedule, kindly manages time to deliver valuable remarks to this session. I would like to thank Dr. Som Lal Subedi, Secretary, MoSTE for his advisable remarks. I would like to thank Dr. Axel Plathe, UNESCO Representative to Nepal for his remarks and Dr. Rishi Ram Sharma, Director General of the Department of Hydrology and Meteorology for his welcome address and highlights of the conference.

I would like to thank to all foreign delegates who accepted our invitation, travelled a long distance to participate and to present paper on different themes. I wish a pleasure and comfortable stay of our foreign guests in Nepal. At the end, I would like to thank all national participants, invitees to this opening session, media persons, security persons, hotel managements and to all colleagues. With this, I would like to declare the session closed.

Thank you very much

Jagat K. Bhusal

Chairman of the organizing committee, and chairperson of SOHAM Nepal

Opening remarks by the Minister

In the opening session

Hon'ble minister Uma Kanta Jha,

Ministry Science, Technology and Environment, Government of Nepal

His Excellency Chief Guest Vice President,

Chairperson,

Distinguished guests in the dash,

International participants, Nepalese participants, Guests, ladies and gentlemen,

First and foremost, let me take this opportunity to express my gratitude to organizer for organizing this international conference on "**Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Climate Change**" in Nepal. Let me also register my gratitude to the organizing Committee for opening remarks on this important conference.

Since the beginning of 21st century climate change is the subject of worldwide concern. Today I am very much pleased to find me amongst scientists, and experts working on climate change, hydrology, meteorology and related fields. The reams and rivers originating from the Himalayas provide sufficient fresh water in the south Asian region. Global warming is believed to be the cause of glacier retreating in the Himalayan region. Climate change and climate variability in the region is enhancing the extreme events resulting the disaster. Therefore, this "**International Conference on Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Climate Change**" and its themes are pertinent and timely. The Himalayas is also called the third pole. The countries lying at the sea level are concerned from sea level rise due to melting of polar ice. Similarly, Nepal, a country in mountainous areas is concerned about the dangers of changing of year round snow-covered mountains to the bare rocky mountains due to increase in global warming.

Nepal like other countries is also concerned to the threat of excessive rainfall and drought and it's the consequences to water resources, agriculture and other life cycles due to increase of green house emissions globally. The research in the Polar Regions was initiated with the launch of the first International Polar Year. In Nepal, data collection and research on hydrology and water resources started institutionally only after 1960 A.D. It is also crucial that the findings of researches on climate change and know how of adaptation measures need to be reached to the community level as well.

I hope conferences like this will provide encouragement and create opportunities for Nepal scientists and professionals to share knowledge and conduct collaborative research with international scientists and experts. Nepal had ratified the Kyoto Protocol and had also prepared National Communication Report under the UNFCCC. The Ministry for Science, Technology and Environment has prepared policy regarding the climate change. As the government of Nepal has many other priority areas, especially the poverty alleviation and so the government might not be able to provide sufficient resources to the research on climate change. However, the government will always encourage and support your efforts to tap international resources.

I am hopeful that concrete suggestion and recommendations will be gathered that would be helpful to the government to formulate policies and to implement programs for the benefit of the country and the region. Finally I would like to wish our international participants an enjoyable stay and thank the organizers and supporters of the conferences.

Thank you

Opening Remarks by Secretary

His Excellency Chief Guest Vice President,
Hon'ble minister Uma Kanta Jha, Ministry of Science Technology and Environment,
Respected Experts and representatives from various organizations and countries,
Ladies and Gentlemen

The role and importance of climate and hydrology for the existence of life in this planet cannot be ignored. Any disturbance in the climate must have corresponding impact in the hydrological cycle, and for that matter, corresponding impacts in everything upon which life is depending. So, we must be careful with what we do with the climate. We have two options: improve it for better living or destroy it. Naturally then, you will agree with me in opting for better living not only for the present, but also for betterment for the future generations. If so, then we must do something for improving the climatic conditions of this planet, which has been tampered with towards global warming through the increase in greenhouse gases like CO₂, CH₄, N₂O, and others because of uncontrolled human activities.

As is evident, the climate change scenario will have a major impact especially on regional water resources. Hence, we need to understand and materialize the concept of integrated water resources management in the present context of climate change. We need to understand the effects of climate change on the hydrological regimes. Then we need to understand the inevitable role of both mitigation and adaptation measures. Whatever the measures are taken, we must understand that they

are achievable. The sharing of knowledge and expertise is very much needed. In Nepal, based on the data from the Department of Hydrology and Meteorology, during the 32year long period from 1975 to 2006, there has been an increase of 1.8° C that means 0.056°C increase per year. Number of days with precipitation of 100 mm or more is increasing. Even changes in the time and period of precipitation are being noticed. According to the climate change study that was started from 1994 in Nepal, a shift in the peak discharge was noticed from August to July. Due to warming effect, snow and glacier melt is taking place, thereby increasing the sizes of glacier lakes, thus increasing the possible dangers of glacier lake outburst floods known as GLOFs. Thus, the adverse effects of climate change are being noticed in Nepal as well. Hence, preventive measures need to be taken through timely monitoring and reporting and other mitigation measures along with other corrective measures including management and adaptation. Moreover, collaboration and cooperation are needed among all countries both in sharing knowledge and implementing suitable practices. In the context of Nepal, the mountainous areas are vulnerable to the climate change impacts. I hope the present conference would address these problems of vulnerability to climate change so as to enable the countries concerned to take up the appropriate preventive/mitigation and adaptation measures. I believe that your active participation and deliberation will make this international conference successful in achieving its goal; and I am confident that we can come up with some fruitful summaries and constructive output in the matters of climate change issues in relation to the water resources and disasters in the most fragile mountainous areas. I wish you a grand success in this conference, and wish our international participants and presenters an enjoyable stay in Nepal!

Thank you!

Opening Remarks by Director General, Department of Hydrology and Meteorology

His Excellency Vice President and chief guest

Hon'ble Minister

Chairperson

Distinguished guests in the dais

International participants, Nepalese participants, media persons, ladies and gentlemen,

Very Good morning and Namaste all of you

First of all I would like to welcome you all in this international conference on Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Climate Change. The conference is being jointly organized by the Society of Hydrologists and Meteorologists-Nepal, Department of Hydrology and Meteorology, Government of Nepal and United Nations Educational, Scientific and Cultural Organization (UNESCO) International hydrological Program Nepal (IHP-Nepal) in association with Department of Irrigation/Adaptation to Global Change in Agricultural Practices (DoI/AGloCAP)

International Association of Hydrological Sciences (IAHS) and International Water Management Institute (IWMI),

Ladies and Gentlemen,

Climate variability and climate change are the concern for all the levels of society including the organizations and individuals involved in planning and policy formulation. Developing countries are more vulnerable to climate change because of their inadequate capacity and resources to cope its adverse effects. Scientific discussions and knowledge sharing on different aspects of climate change are essential to understand its complex nature. Water is one of the vital resources required for sustainable development, environmental integrity and the eradication of poverty and hunger. Changes in climate have been adversely affecting various water bodies including surface water and ground water. Changes in hydrological regimes and natural ecosystems have become global concerns. The situations are more alarming in mountainous areas.

In order to address the issues of climate change in mountainous regions, this International Conference is going to organize. This conference aimed to invite scientists, engineers, planners, development workers as well as experts on related fields providing a platform for presenting the research outcomes, on observations, findings and innovative ideas. I am pleased to share you that scientists and researcher from 22 countries are participating in this conference. After this inauguration, this three day conference is scheduled into 12 technical sessions where more than 60 international participants and more than 50 national participants are going to delivers the results based on their findings. Keynote speakers are invited to deliver presentations on specific burning issues. Selected peer reviewed paper will be published in the Journal of Hydrology and Meteorology published by SOHAM-Nepal. At the end of the conference, during the closing session, there will be Kathmandu declaration where key findings, concerns, and issues of climate change, Water Resources and Disasters in Mountainous Regions towards Building Resilience to Climate Change will be issued.

In this regard, I welcome you once again. We organizer are very much happy to see this big volume of national and international scientists, researchers and professional. We really appreciate your keen interest to devote your life in climate and water sciences to build climate resilient society.

4. The Technical Sessions

Day-1

Session I: Climate Variability and Changes

The first session of the conference was chaired by Dr. MadanLal Shrestha, Academician, Nepal Academy of Science and Technology (NAST). Mr. Ram Chandra Karki and Mr. Sami Kunwar contributed as rapporteur. ,

This session consisted of two invited talks and three paper presentations. The first keynote speaker, Prof. Gordon Young, Past President of the International Association of Hydrological Sciences made a presentation on, “Opportunities for high mountain research within a new decade of research.” He shared new scientific decade (2013-2022) research entitled, “Panta Rhei” meaning, “Everything flows” conducted in 2013 by the International Association of Hydrological Society (IAHS). The research includes two main issues: “hydrological change” and “hydrology and society”.

Another key note speaker Dr. Prof. Stefen Uhlenbrook, UNESCO-IHE and Delft University of Technology, Delft, The Netherlands presented a paper on, “Challenges related to global changes and water resources.” The talk highlighted on issues and challenges related to the impacts of climate change and other global changes on hydrology, water and water resources.

The first presenter, after the invited talks, Prof. Yongqin David Chen, Department of Geology and Resource Management, Chinese University of Hong Kong, Hong Kong delivered a talk on, “Spatial-temporal changes of precipitation structure over the past fifty years in the Pearl River basin, South China.” He talked about the modified Mann-Kendall trend test used for analyzing total precipitation amount, annual total rainy days, annual precipitation intensity and annual mean rainy days using daily precipitation data covering 1960-2005 from 42 stations across the Pearl River basin. He finds decreasing precipitation in the middle and upper Pearl River basin. The basin is characterized by increasing precipitation intensity in the middle and the eastern parts.

Prof. Robert R. Gillies, Utah State University presented the second paper of the session on, “Pakistan’s two-stage monsoon and links with the recent climate change.” The paper highlights the meteorological conditions related to the Pakistan floods of 2010 in the context of monsoon dynamics and large-scale circulations.

The last presenter of the session Mr. Dharma Veer Singh delivered his talk on, “GCMs derived projection of precipitation and analysis of spatio-temporal variation over N-W Himalayan region.” He explained the appropriateness of two global climate models in N-W Himalayan

region with CGCM3 model performing better than HadCM3 model for simulation of precipitation. .

Session II: Climate Variability and Changes

The second technical session was chaired by Dr. Janak Lal Nayava along with two rapporteurs Dr. Madan Sigdel and Mr. Bimal Gyawali. The session was opened by Prof. Robert R. Gillies from Utah State University delivering his presentation on, “Intensification of pre-monsoon tropical cyclones in the Bay of Bengal and its impacts on Myanmar.” He presented multiple global reanalysis and precipitation datasets in order to explain the dynamic mechanisms that lead to the intensification of the monsoon trough and tropical cyclone over the Bay of Bengal during pre-monsoon periods. His analyses of the Community Earth System Model single-forcing experiments suggest that tropospheric warming and a deepening of the monsoon trough can be explained by two discrete anthropogenic causes: an increase in absorption due to aerosol loading and an increase in the land-ocean thermal contrast that results from increased greenhouse gases. In reply to a question regarding input of aerosol in the model, Mr. Gillies replied that he was not sure about the input of aerosol whether it was a black carbon dust or something else.

The second presentation by Mr. Sunil Kumar Pariyar on, “Three decadal Pacific ocean oscillations and its tele-connections with Tropical Hadley, Walker and Monsoon circulations” focused on inter-annual variability of South Asian Summer Monsoon (SASM), which is influenced by various boundary conditions including Pacific Sea Surface Temperature anomalies, Zonal Walker circulation and Meridional Hadley Circulation. His team finds that the interaction between inter-annual oceanic oscillation and associated SASM teleconnections under current warming scenario is still not clear. The presentation, based on the time series of all three circulations indicates intensification of tropical circulation under global warming scenarios.

The third presenter of the session, Dr. Shoji Kusunoki, Meteorological Research Institute, Japan on, “Future precipitation change over Nepal projected by 20-km mesh atmospheric global model” presented time-slice experiments conducted using a 20-km mesh atmospheric global method. This model has very high horizontal resolution (20 km) as compared to other climate models used for global warming projection. The model represents the orography of high mountains in the northern part of Nepal reasonably well.

Another presentation by Mr. Ramchandra Karki, Department of Hydrology and Meteorology, Nepal on, “Inter comparison of snowfall measured by weighing and tipping bucket precipitation gauges at Jumla Airport, Nepal compares data from weighing and tipping bucket systems without heating facility measured during snowfall events in Jumla (2375m).

The presentation of the session by Mr. Ujjwal Tiwari, College of Applied Science-, Tribhuvan University, Nepal on, “Summer monsoon precipitation in Nepal driven by multi-decadal large scale oceanic oscillation draws a relationship among sea surface temperature anomalies, ENSO and Summer Monsoon Precipitation in Nepal over the past three decades. The study was based on interpolated data provided by the Department of Hydrology and Meteorology, Nepal.

Session III: Special Session: Nepal/AGlocCAP Research on Climate Change

This special session was chaired by Mr. Uttam Timilsina, Deputy Director General, Department of Irrigation, with two rapporteurs Mr. Damoder Bagale and Mr Ram Prasad Awasthi. Mr. Dinesh Bhatt, UNESCO-IHE, Netherlands/DOI Nepal in his presentation on, “Impact of climate trends on crop production and potential adaptation options in a Himalayan River Basin of Nepal” discussed the increasing temperature trends, which has a distinct negative impact on crop yields in areas below 1600 m amsl. He finds some positive impacts of warming in higher altitude zones with increase in rice and maize yields. In addition, his observations indicate that the impacts due to temperature rise are generally greater than the increase in precipitation. Increasing precipitation trends show a gain in crop yields. Growing season mean temperature variability is negatively associated with wheat yield. Precipitation variability during the flowering stage explains about 40% variability in rice yield and 58% variability in maize yield.

Mr. Anshul Agarwal's presentation on, "Estimating the impacts and uncertainty of climate change on hydrology and water resources of the Koshi River basin." discusses the results based on SWAT model. Temperature is expected to rise in the study basin in future periods with relatively higher increase in winters compared to summers. The projected warming increases along with the range of uncertainty with time for different GCMs and SRES scenarios. The variance in annual precipitation increases with time, indicating greater year to year variability. Potential ET and actual ET are projected to increase although uncertainty exists in the magnitude of change under all three scenarios.

The third presentation on, "Variability of cropping system and crop production in different agro-ecological zones in the Indrawati River basin, Nepal" by Mr. Suman Sijapati highlighted different cropping system in different elevation zones. He explained different coping mechanisms developed by the farming community, such as shifting cropping patterns, change in cropping calendar, changes in input level, etc. In response to a query, Mr Sijapati responded that both the traditional and conventional methods are the adaption mechanisms used by the farmers.

Prof. Shreedhar Maskey, UNESCO-IHE Institute for Water Education, Netherland, talked about the project, "Global change in agricultural practices (AGloCAP)." This project is jointly implemented by the UNESCO-IHE Netherlands, AIT Thailand and Department of Irrigation, Nepal in order to develop adaptation strategies to global changes for agriculture and water management. His paper on, "Challenges of hydrological modeling for climate change studies in the Koshi River basin in Nepal" suggests that the observed precipitation data with the inverse-distance interpolation applied with detailed elevation bands and temperature lapse rates improves the performance of hydrological models, both in runoff simulations and water balance assessment.

The presentation by Mr. Hu Yurong on, "Impact of climate change on the source region of the Yellow River basin in China sheds light on downscaling techniques. Statistical Downscaling Model (SDSM) for temperature downscaling, Non-homogeneous Hidden Markov Model

(NHMM) for Rainfall Downscaling, Multisite Model, and the Water Balance Simulation Model (WaSiM) are used in his research work.

The last presentation of the session on, “Assessment of impacts of climate change and adaptation measures for maize production in east Sikkim, India” was delivered by Mr. Proloy Deb. The paper assesses the impacts of climate change on maize yield and evaluates the agro-adaptation measures. His findings show that SDSM simulated climate is in good agreement with observed climate for the baseline period. In response to a query, Mr Deb responded that projected carbon dioxide concentration was also used for the projected increase of temperature.

Session IV: River Basin Modeling for Impact Assessment

This session was chaired by Prof. Shreedhar Maskey, UNESCO-IHE Institute for Water Education, Netherlands, supported by two rapporteurs Mr. Dhiraj Gaywali and Mr. Rocky Talchabhadel. Dr. Dilip K. Gautam, RIMES, Bangkok delivered the first presentation of the session on, “Comparison of rainfall-runoff models for predictions of inflow to Bhumibol Reservoir in Thailand.” The presenter highlighted the major components of the multipurpose project, such as irrigation, water supply, flood control and power generation (749 MW at Bhumibol and 500 MW at Sirikit). Discussions on the paper included: need of modification in conventional approach of reservoir operation, and application of inflow forecasting models, such as empirical, conceptual lumped and semi distributed models and Rainfall Runoff Library Model Tools. Additional discussion was directed towards the response to a query regarding the results during verification period which was better than calibration period.

Another presentation on, “Comparison of satellite products for precipitation” estimation for Nepal by Tarendra Lakhankar attempted to use datasets from DHM, PARDYP, and high elevation data from SHARE Project of the country. Comparisons are made among TRMM of 0.25° Vs GSD of 0.1° Vs CMORH of 0.25° Vs PERSIANN of 0.04° Vs and APHRODITE of 0.25° resolution. TRMM reasonably captures variability of monthly precipitation than others. Dr. Madan Sigdel

asked: Does TRMM fit for Nepal better than APHRODITE? In response to a query by Dr Madan Sigdel Mr. Lakhankar explained that APHRODITE and TRMM are different in terms of basic concept. Unlike TRMM APHRODITE is interpolated gridded data from point observation data.

The last presentation on, “Simulation of river discharge by statistical downscale model of precipitation data of Bagmati River at Kathmandu Valley Nepal” by Mr. Tirtha A dhikary highlights the results obtained from HEC-HMS model used for the Bagmati River at Khokana. Observed meteorological data from nine different stations discharge at Khokna indicate mostly decreasing trends. Downscaled extreme rainfall on daily basis did not compare well with observed values. During discussions, Dr. Dilip Gautam asked about the mismatch between lumped and gridded input. The response was that the gridded input was used as point input. Dr Shreedhar Maskey advised to compare the results with other studies in the Bagmati basin. Similarly, Mr. Ashish Bhadra Khanal, suggested to establish synergy with an project at the Department of Irrigation.

Session V: Climate Change Impact on Hydrometeorology

Dr. Keshav P. Sharma, Former Director General, Department of Hydrology and Meteorology chaired this session supported by two rapporteurs Dr. Prasamsa Singh and Mr. Sunil Acharya. The first presenter Dr. Dibas Shrestha, Nepal Academy of Science and Technology (NAST), Nepal delivered his presentation on, “Spatiotemporal variation of rainfall over the central Himalayan Region revealed by TRMM precipitation radar.” The presentation focused on 11-years (1998-2008) high-spatial resolution TRMM PR 2A25 near surface rainfall data which was used to analyze the rainfall elevation relationship in the Central Himalayan Region for pre-monsoon and monsoon seasons. The study indicates a strong relationship between rainfall and elevation during both seasons. The investigation reveals relatively large amount of rainfall over higher elevations during pre-monsoon season. Interestingly, two significant rainfall peaks appear over the southern slope of the Himalayas during summer monsoon season.

The session was followed by three more presentations. The second presentation was on, “Isotopes and hydrologic mixing models in Nepal” by David Michel. The presentation delivered on behalf of Alana M. Wilson, University of Colorado, USA, focused on Himalayan hydrology,

Glaciers, Hydrology, Climate Change and implication for water security. He explained the importance of Asian highlands in terms of water security to two billion people and US national security.

Mr. Achut Parajuli, Himalayan Cryosphere Climate and Disaster Research Center, Kathmandu University, delivered his talk on, “Impact of climate change on precipitation pattern and river discharge; A case from Marshyangdi River basin, Nepal.” The last presenter of this session was Dr. Maya P. Bhatta, Asian Institute of Technology and Management, Nepal. The title of his presentation was, “Export of suspended sediment, dissolved matter, major ions and nutrients from Himalayans River system in central Nepal.” His work concluded that the cationic and silica export rates were controlled primarily by lithology, physical erosion and climate. Further, he added that the weathering advance rate of the Himalayan landscape appeared much higher than the global average.

After the successful five sessions, the conference on the first day followed by a reception dinner.

Day-2

Session VI: Water Resources Management

The first session of the second day was moderated by Prof. Dr. M.S. Babel, Asian Institute of Technology, Thailand. The two rapporteur of this session were Mr. Barun Paudel and Mr. Jeeban Panthi.

The session consisted of two invited talks, the first providing an overview of water security: responses to local, regional, and global challenges with special reference to Asia-Pacific region and the second presenting results from the Intergovernmental Panel on Climate Change (IPCC) assessment report 5.

The featured speaker, Prof. Shab haz Khan, mentioned that the overall theme of the International Hydrological Program (IHP) Phase VIII (2001-2021) was water security. The theme was based on the challenges of water availability, both in quality and quantity, for supplying increasing population and related water demands, and also responding to the needs of

ecosystems. The theme addressed water security challenges at local, regional and global levels. Further he highlighted six thematic areas of IHP Phase VIII: (1) water-related disasters and hydrological change, (2) groundwater in a changing environment, (3) addressing water scarcity and quality, (4) water and human settlement of the future, (5) eco-hydrology, engineering harmony for a sustainable world, and (6) water education. Prof. Khan also emphasized that IHP VIII is very important to the Asia-Pacific region where 60 % of the world's population resides with 38 % of the world's water resources.

The second keynote speaker, Prof. Kirk Smith offered a quick glimpse Intergovernmental Panel on Climate Change (IPCC) assessment report 5 with focus on Chapter 11, which deals with the issues related to health. Prof. Smith started off by explaining that CO₂ levels have risen up higher than any time in the last 400,000 years. He further explained about the exacerbating health problems as a result of climate change with new emerging conditions and extending existing diseases (e.g. food-borne infections) in areas that are presently unaffected.

Seven more paper presentations followed the keynote speech. Mr. Mahesh Patel, Research Scholar, Department of Civil Engineering, Indian Institute of Technology, Guwahati, presented, "Spatio-temporal variation of critical parameters in threshold channel." He talked about incipient motion and its importance. Another presentation on, "Improving our understanding of melting processes of debris-covered glaciers using remote sensing surface characteristics: examples from the Khumbu Himalaya" by Adina Racoviteanu was focused on climate, black carbon and glacier response including the role of debris cover.

Mr. C. Kormann presented a poster relating temperature, glacier characteristics and snow height to streamflow trends in Tyrol, Austria. Similarly, Mr. Zaber Ahmed, Sr. Lecturer, Civil Engineering Dept. MIST, Gazipur, Bangladesh in his presentation on, "Introducing CETP for industrial waste water treatment and its impact on sustainable water resource management" described the case of the river Turag in Gazipur illustrating serious surface water pollution in Bangladesh. The river mainly carries wastewater during dry seasons (November to April) with high level of pollution and toxicity affecting aquatic lives and 3,30,000 people of this city. The situation of country's water sector is further deteriorated due to increasing climate change-

induced impacts, such as sea level rise, drought, salinity intrusion, uneven rainfall distribution, water logging etc.

Mr. Jagat K. Bhusal, Chairperson, Society of Hydrologists and Meteorologists Nepal delivered his presentation on, “Climate change and conflict on water right and share: a case study in mustang, Nepal.” According to his assessment, there is controversy over riparian water right over Lumbuk khola. Water rights and land ownerships are considered separate identity in selling and buying practices. The agro-pastoral life was easy in the past because of smaller population and abundance of virgin natural resources, which are now worsening with time. The only source of water left today is the water from Lumbruk Khola claimed by two villages.

A presentation on, “Recent climate change and long-term fluctuations of river runoff in Terek River basin (North Caucasus)” by Maria Kireeva, Department of Hydrology, Faculty of Geography, Moscow State University, Russia. explores the main climate tendencies in the region, investigates spatial distribution of the main meteorological characteristics in the North Caucasus mountains, identifies the recent climate change, analyzes long-term fluctuation of river flows in relation to climate change and techniques for forecast and calculation of river flow characteristics.

The last presentation of the session by Dr. Santosh Nepal, International Centre for Integrated Mountain Development on, “Impacts of climate variability and land-use change on hydrological regime of the Kosi River basin in the Himalayan region” presented the results based on the J2000 hydrological model. The model represents different discharge components with improved insight into the hydrological dynamics. He finds that land-use changes have minimum impact on hydrological regimes; however deforestation may cause increase in flood magnitudes. The findings indicate change in snowmelt pattern with impacts on water availability in floodplains but increase severity of floods.

Session VII: Special Session (NDRI): Disaster Risk Reduction and Climate Change Adaptation in Koshi River Basin, Nepal

Mr. Yub Raj Bhusal, Member-Secretary, National Planning Commission chaired this special session with two rapporteurs Mr. Surya Narayan Shrestha and Mr. Guanjan Silwal. The first presenter Dr. Laxmi P. Devkota on, “Disaster risk reduction and climate change adaptation in Koshi River basin, Nepal.” talked about the Koshi River, its vulnerability, disaster risk reduction and climate change adaptation policies. The studies conducted on Koshi River Basin consists of five major components: 1. Advancing knowledge on climate change, 2. Revisiting the design standards/values of the proposed Koshi High Dam, 3. Assessment of socio-economic vulnerability, 4. Contribution to policy formulation process and 5. Awareness building.

The six presentations were delivered consecutively by Dibesh Shrestha, Anita Khadka, Laxmi P. Devkota, Dhiraj Gyawali, Manjeshori Singh and Sunil Babu Shrestha. The presentation title were: , “Application of the regional climate model data set for analysis of flow in Koshi River in Nepal”, “Snowmelt driven runoff in response to climate change in Koshi River”, Impact of climate change on the hydrology of the Koshi River basin, Nepal”, “Comparison of flood inundation in the Terai region of the Koshi River basin with and without Climate Change Scenarios”, “Socio-economic vulnerability assessment of Koshi River basin” and “Climate change adaptation policy and strategies for disaster risk reduction in Koshi River basin, Nepal.”

Session VIII: Land Degradation, Hazards and Disaster Risk Reduction

The eighth session, second day of conference, was chaired by Prof. Wouter Buytaert, Imperial College London assisted by. Two rapporteurs Er. Kapil Gyawali, Department of Hydrology and Meteorology, Nepal and Mr. Sujan Subedi, Meteorologist, Ministry of Science, Technology and Environment, Nepal. The first presentation of the session by Richard Armstrong on, “Establishing collaborative efforts to assess the Contribution to High Asian Runoff from Ice and Snow (CHARIS) highlighted the main goal of this study. The goal is to improve understanding of the regional water resources of high Asia including nine different nations with ice and snow resources (Bhutan, Nepal, India, Pakistan, Afghanistan, Kazakhstan, Uzbekistan, Kyrgyzstan, and Tajikistan). To accomplish the objectives, a suite of satellite remote sensing, reanalysis and ground based data are applied as input to specific snow and ice melt models. During discussion, questions were raised by audience regarding types of model used for the study. Seasonal snow

cover is determined generating daily snow cover product over the study region (NSIC “gas filled” and MODIS “snow product”). For glacier, in addition to the application of the GLMS glacier data, the team determined the annual semi-permanent snow and glacier cover across the study area using a single systematic automatic remote sensing method.

Another presentation on, “Climate disaster risk management in Nepal: issues and way forwards” by Mr. Deepak Paudel, General Secretary, SOHAM-Nepal shed light on the challenges and issues associated with disaster response and disaster risk reduction. He also highlighted opportunities and way forwards to risk reduction with the consideration of climate resilience. He proposed plans based on Hyogo Framework for Action (HFA) by identifying priority actions and implementing programs by climate, hydrological scientists and economists coming together.

Dr. Hemu Kafle, Nepal Academy of Science and Technology presented case studies on drought and desertification hazards in the far and mid-western region of Nepal. She finds downward trends of droughts at 10 stations and upward trends of drought at 5 stations. Her conclusions indicate drier climate in the entire Far and Mid-Western Region of Nepal. There are drought hazards in Far and Mid Western Region of Nepal once in every three or four years. Elevation-based assessment was one of the suggestions from participants.

A presentation by Mr. Pitambar Aryal on, “Urban DRR: possibilities and challenges experiences of Nepal Red Cross Society in DRR” gave a brief overview of the Nepal Red Cross Society (NRCS) and its disaster risk reduction initiatives targeting to rural and urban communities. The community based DRR interventions, being implemented by NRCS since more than a decade, are compatible with the endorsement made under HFA and commitments made in national and international forums.

The fifth presenter of the session, Prof. Ajay K Jha, Colorado State University on, “Adaptation to climate changes and resilient rural livelihood in Nepal” showed some challenging scenarios for feeding nine billion by 2050 with the limited resources of present world. He talked about the

appropriateness of several processes and approaches to face the challenges. While talking about Nepal, he emphasized on sustainable rural livelihood model which can be readily replicated and scaled to different climate change vulnerable areas of Nepal where rural economic enterprise can make rural areas grow prosper and develop resiliently.

Similarly, the next presentation by Dr. TekBahadurChhetri, Associate Professor, Tribhuvan University on, “Seasonal variation of stable isotopes at Kathmandu on the southern slopes of central Himalayas” focused on precipitation stable isotopes at Kathmandu Valley on the southern slope of central Himalaya. He analyzed the temporal variation, seasonal depletions and relationship with precipitation. He finds large depletions in isotopes in summer and high values in winter.

Gregory Pierce, Sweden, introduce End-to-End (E2E) model for the management of hydro-meteorological disaster. End-to-End refers to establishing a forecast and warning system that links data via communications to the forecasting center which links to users and to forecast centers issues warnings. The forecasts and warnings reach a person in the floodplain in time to take protective actions. In his talk his philosophical thoughts were shared where he noted Galileo’s quotation, “Nothing is significantly knowable except what is measurable.” According to him, science is not an instrumental goal but its ultimate goal should be service to the society.

Mr. Ranjan Shrestha, delivering the last presentation of the session titled, “Use of internet of things for early warning” explained internet, its development and its application in early warning systems. In response to a query, he explained the space-based system validated by ground-based systems.

Session IX: River Basin Modeling for Impact Assessment

The session was chaired by Prof. Narendra Man Shakya with two rapporteurs Mr. TirthaAdhikari and Ms. Bibhuti Pokharel. The first presentation on, “Development of hydrological equipment for community early warning systems” by Hidetomi Oi, Japan assesses flash floods and geo-hazards (debris flows, landslides, slope failures etc.), which are serious threats in terms of the

increasing number of events and high mortality which are expected to increase further in the scenarios of climate change. Mr Oi explained a community-based early warning system (CBEWS) hydrological equipment suitable for community use in terms of affordability and applicability.

Prof. Wouter Buytaert, Imperial College London, delivered his talk on, “Environmental virtual observatories: managing catchments with willies, sensors and smart phones”, which is based on catchment water balance and participatory monitoring, responding to local knowledge demand.

Climate change impact on Kulekhani Hydropower Project, Nepal, was another presentation delivered by Medha Khatiwada, Asian Institute of Technology, Bangkok, Thailand. The presenter noted that the study quantifies the changes in runoff of Kulekhani watershed due to climate change and examines its impacts on the hydropower.

Mr. Ekaterina Rets, Water Problems Institute, Russian Academy of Sciences, Department of Hydrology, Lomonosov Moscow State University talked on, “Snow and ice melting in high altitude zone: physically based distributed energy balance modelling.” Mr. Rets noted that though it is difficult to use physically based distributed hydrological modelling in the majority or large mountain basins due to scarcity of data, it can be used for certain small catchments that are known to be dangerous in terms of mudflows formation or glacial lake breaks. The model, described by Mr Rets, corresponds to the up-to-date measurement facilities and is oriented on the modelling of hazardous hydrological processes in relatively small high-altitude catchments. Application of the model for the highly glaciated Djankuat River catchment area shows a good reproduction of directly measured melting values for all parts of the basin. The model can simulate changes of the glacier melting rate anticipated in climate change conditions and progressive deglaciation.

In the presentation on, “Development of a flood forecasting model for West Rapti River basin in Nepal using artificial neural networks”, Mr. Rajendra Sharma, Department of Hydrology and Meteorology (DHM), discussed the vulnerability of the Rapti River basin to flood hazards. A functional relationship between catchment rainfall and river discharge has been established by

using Radial Basis Function type artificial neural networks Based on various error indices used for testing the model, the simulated flows, simplicity and minimal data requirement, Mr Sharma concludes that such modeling approach is useful for developing countries like Nepal.

Prof. Seyed Hamid Reza Sadeghi, Department of Watershed Management Engineering, Faculty of Natural Resources, Tarbiat Modares University, Noor, Iran set out some of the finding of the study titled, “Optimal decantation period in connection with different suspended sediment concentrations.” Prof. Sadeghi explained that sediment yield from catchments provides a useful index of land degradation, erosion severity and trends. He explained the importance of information on sediment yield produced from watershed in soil and water resources management.

In his presentation on establishing a collaborative assessment of the impacts of climate change on a hydrological regime of Langtang River Basin, Dr. Rijan B. Kayastha, Principal Investigator- PEER Project Himalayan Cryosphere Climate and Disaster Research Center Kathmandu University, Nepal explained goals of the project in building knowledge on the hydrological regime of glacierized river basins in the Himalaya. Mr. Niraj Shankar Pradhanangha, Kathmandu University, Nepal made his last presentation of the session on, “Statistical downscaling and future projection of temperature of Kathmandu Airport.”

Session X: Attaining Water Security and minimizing risks of geological hazards

Chairing the session Prof. Shabhaz Khan initiated the program welcoming two rapporteurs Mr. Rajendra Sharma and Mr. Suresh Marahththa. The session was initiated by Dr. Rishi R. Sharma, Director General, Department of Hydrology and Meteorology, Nepal, on, “UV index and total ozone column climatology of Nepal Himalaya using TOMS and OMI data.” Dr Sharma described positive effects (vitamin D formation) and negative effects (sunburn, skin aging, DNA damage, cataracts and skin cancer on Human health) of UV radiation. Nepal Himalaya has a very high UV exposure in the world. Difficult to capture the ozone variation by six orders of magnitude within 20 nm of wavelength change. He presented the results based on observations made at Biratnagar, Pokhara, Kathmandu and Lukla during 2008-2009 under the Solar Radiation and

Aerosol in Himalayan Region (SAHR) project implemented by the Institute of Engineering of Pulchowk Campus.

Mr. Raman Maharjan presented, “Coupling hydrological model with Delft-FEWS (Flood Early Warning System) for flood forecasting in Bagmati Basin, Nepal.” He explained the process of simplifying the complexity of full flood forecasting and early warning system from the perspectives of data input, data management and forecasting in an interpretative open standard IT platform developed by Deltares in Delft, Netherlands. He further illustrated an inter-linkage between monitored, forecast or real time data, and hydrological and hydrodynamic models. The model, being used by over 40 countries consists of range of standard visualized tools for data validation, interpolation, and error correction in forecasts.

Water poverty of Indrawati basin was presented by Mr. Bhawani S.Dongol. Water Poverty Index (WPI) was measured on the basis of resource availability and people’s access to the resources. It considers: Resource (R), Access (A), Capacity (C), Use (U) and Environment (E). The WPI in the VDCs within the Indrawati Basin ranges from 40.5 to 62.4, with the lowest value at Nawalpur VDC (40.5) and the highest at Ichok VDC (62.4).

Ms Nirmala Pandey, presentation on, “Improving the resilience of mixed farming systems to pending climate change” Perception, such as change in temperature, drought, rainfall patterns, flooding and landslides were used in the study. The farmers’ major perception, reported in her presentation, are: decreased frequency (count) of snowfall, shrinking snow depth, increased frequency of summer hailstorms and declining winter rainfall. Similarly, disappearance of indigenous species, fodder and forage (*Khasru*, *Pire*, *Babiyo* and *Nigalo*), and increasing invasive species (*Banmara*, *Kuri*) have been reported by the farmers. Local medicinal plants such as *Titepati* and *Asuro* are also in the verge of extinction.

Mr. Bhojan Dhakal, Department of Animal Nutrition and Fodder Production on his presentation titled, “Fodder production and livestock rearing in relation to climate change and possible adaptation measures in Anaslu Conservation Area, Gorkha, Nepal” talked about livestock system in high-hills of Nepal where feeding systems are being disturbed by extreme variation in climatic phenomena. He further expressed concerns regarding the problems of invasive weeds

in rangelands such as ferns and thorny species which have degraded Manaslu Conservation Area. His assessment indicates 25% decrease in fodder species due in the temperature rise scenario of 1.5-2⁰C. .

Day-3

Session XI: Watershed Management and Ecosystem Services

The session chaired by Dr. Dillip K. Gautam, RIMES, consisted of one invited talk and five presentations. Dr. Binod Dawadi and Mr. Binod Parajuli were in the session as rapporteur. Invited talk, delivered by Prof. Soontak Lee, Co-Chair, International Steering Committee of the 7th WWF 2015 and Vice President, UNESCO IHP Intergovernmental Council Governor, introduced the overview of upcoming water event, “World Water Forum, 2015” being held in Daegu Gyeongbuk, South Korea from 12-17 April, 2015. This event will be a platform for debates and exchange on questions that are relevant for improved water management and access to water supply and sanitation.

Mr. Seyed Hamid Reza Sadeghi, from Iran presented, “Trend analysis of suspended sediment concentration and precipitation in a large watershed in Northern Iran.” He highlighted the importance of proper water resources management by creating awareness on suspended sediment concentration and sediment transport in relation to precipitation and its trends. His recommendations include comparative studies and studies in different conditions for proper management practices of water resources.

Mr. Robert R. Gillies, in his presentation on, “Influence of the Pacific Quasi-Decadal Oscillation on the monsoon precipitation in Nepal” finds that Nepal’s precipitation is not correlated with the all-India monsoon precipitation. He used a set of century-long reanalysis and observations of precipitation, spectral and empirical orthogonal function analyses to determine the role of the Pacific Quasi-Decadal Oscillation (QDO) in Nepal’s precipitation regime. He concludes that the lagged relationship between the monsoon precipitation and the Pacific QDO is unique to Nepal, the inclusion of which should improve the predictive ability for the monsoon in Nepal.

The third presentation of this session by Vanisa Surapipith, ICIMOD on, “Data quality control and assurance (QCQA) on eddy covariance flux measurement by the fractional uncertainty analysis” assesses the uncertainty in the measurements of the H, IE, and CO₂ fluxes (Fc) between the biosphere and atmosphere with high spatial and temporal resolutions. The 2-year data from flux measurement station over a sugarcane field in Takfa, Nakorn Sawan, Thailand, allow demonstration of the technique that helps in the estimation of the water and CO₂ budgets within the global hydrological and carbon cycles, and to understand the scope of global climate change and human impacts on the ecosystem.

Session XII(IWMI): Water Resources Management

Professor Robert R. Gillies chaired this special session along with two rapporteurs Dr. Tek Bahadur Chhetri and Mr. Jeeban Panthi. The first presenter, Ms Luna Bharati briefed about the International Water Management Institute (IWMI)Nepal program including the organization’s goal, vision, and objectives.

Mr Utsav Bhattarai presented the application of SWAT model to the Koshi River basin. Mr James Price presented on, “Valuing water storage systems in water scarce environments: a choice experiment in Nepal’s Koshi River.”Floraine Clement, IWMI-Nepal, delivered a talk on, “Assessing vulnerability to climate change: why gender matters?” Her presentation offered a theoretical review of the different conceptual frameworks and methodologies to assess vulnerability. She further explained why and how gender matters on vulnerability to climate change. The film as part of a participatory video project in Nepal conducted by IWMI in 2012-2013, showed during her presentation, reflected the existing gender and climate change issues.

Landslide Hazard Mitigation in The Nilgiris, India – Lessons Learned from past and the present was presented by Dr. G.P. Ganapathy. His study reveals that the people in the Nilgiris area are very much aware of landslides, however, they didn’t give much emphasize on future problems due to landslides.

The last presentation of the conference was delivered by Dr. Kang Yinhong on, “Predicting climate change impacts on maize productivity and water use efficiency in the Loess plateau,

China.” The presentation discussed on changing tendency of water balance components, maize yield and water use indices under rain-fed and irrigated conditions in subareas of the Loess Plateau using SWAGMAN Density model. Dr Yin hong suggested that it is necessary to improve water harvesting technology to meet the increasing crop water requirements with climate change for the rainfed crop, while for the irrigated crop, it is vital to enhance soil water capacity in order to make good use of irrigated water.

5. Closing Session

The session was chaired by Mr. Jagat Kumar Bhusal, Chairperson of the Conference and SOHAM Nepal. Mr. Som Lal Subedi, Secretary, Ministry of Science, Technology and Environment delivered the remarks as a chief guest of the session. Likewise Mr. Laxmi Prasad Dhakal, Joint Secretary, Ministry of Home Affairs (MoHA) delivered the closing remarks. Mr. Dhakal highlighted the importance of integration of climate change in disaster risk reduction. The speakers in the closing session delivered the closing remarks by highlighting the success of the conference.

Closing address of Chairman of the Org. Committee

Chief Guest, Respected Dr. Som Lal Subedi. Secretary, Ministry of Science, Technology and Environment; Special Guest, Mr. Laxmi Prasad Dhakal, Joint Secretary, Ministry of Home Affairs, Distinguished guests on the dias, Respected participants, representatives from various organizations, media persons, Ladies and Gentlemen,

Very good afternoon and Namaskar

This Conference is a second event initiated by the Society of Hydrologists and Meteorologists-Nepal (**SOHAM-Nepal**). Department of Hydrology and Meteorology (**DHM**). and United Nations Educational, Scientific and Cultural Organization International Hydrological Programme Nepal (**UNESCO IHP-Nepal**). In type, this conference is an amalgamated effort of a professional society, a government organization and a UN Agency and, this endeavor was energized by various relevant research institutes, development organizations and stakeholders.

Participants from 23 countries including different organizations, universities, NGOs/INGOs and private companies has not only encouraged us, but has also to build networking. On behalf of

organizing committee, I would like to request you all to keep and continue such solidarity in the next conference

I would not repeat what earlier speakers have said but still remind a brief relevant history.

We know that climate change is not a new process. The only present concern is whether the global warming continues as we have been experiencing and observing since last century. Relationship between we, “THE HUMAN BEING” and our environment, “THE EARTH’S CLIMATES” dates back over thousands years. But there was lack in understanding and still there are knowledge gaps in visualizing the inherent process undergoing on ecosystem due on climate variations and climate cycles. Scientists have assumed the various stages of human development from “Apes” to the present “Intelligent Man” by development of human anatomy and capacity build up in coping the hares climate, is essence the very important message of the eminent biologist and thinker Richard Dawkins’ “Fit in the Nature to Survive”. Nature takes its own course that is why IPCC has been insisting to reduce the Green House Gas Emissions and to build resilience communities to changing climate globally

In conclusion of three days’ presentations, deliberations and discussions; I do hope that you all will agree with me, the conference have fulfilled its objectives that would definitely help in building resilient societies to climate change. I would not describe all but would like to mention the “KATHMANDU DECLARATION-2013 “as an important outcome of the conference.

I, on behalf of the organizing committee, would like to express my gratitude to International Association of Hydrological Sciences (**IAHS**), the Department of Irrigation/Adaptation to Global Change in Agricultural Practices (**DoI/AGloCAP**), International Water Management Institute (**IWMI**) and Nepal Development Research Institute (**NDRI**). Similarly, I would also like to thank to our supporting partners **Feed the Future Innovation Lab USA** International Centre for Integrated Mountain Development (**ICIMOD**), World Wildlife Fund(**WWF**), United Nations Development Programme **which also includes DHM/Glof project, OXFAM, PRACTICAL ACTION**, without their support such this august gathering and participation would not have possible.

I am very much indebted to the respected secretary Dr. Som Lal Subedi. Secretary, Ministry of Ministry of Science. Technology and Environment for his invaluable time given to us and by encouraging address. I would also like to thank Mr. Laxmi Prasad Dhaka, Joint Secretary, Ministry of Home Affairs and Dr. Rishi Ram Sharma DG, DHM for their remarks, Dr. Laxmi Prasad Devakota for reading “KATHMANDU DECLARATION-2013” and Dr. K. P. Sharma for three days’ highlights.

I am also grateful Prof Gordon young, Prof Shahbaz Khan, Prof Kirk Smith, Prof Urlan Brook and Prof Sontak lee for their keynote speeches. Without naming, I wish to whole-heartedly express my thankfulness to all participants for your active participation and deliberation that have in this international conference successful in achieving its goal.

I would like to thank you very much to chairs, cochairs and members of advisory and scientific committees. Also, I would like to Mr. Deepak Paudel and his supporting members for their restless works.

Finally, I hope that our international participants have had their enjoyable stay in Nepal and also wish their comfortable return with good memories from Nepal.

With this I declare the conference closed.

Jagat K. Bhusal

Chairman of the organizing committee, and chairperson of SOHAM Nepal

Vote of Thanks

The Vote of Thanks for the conference was delivered by Mr. Deepak Paudel, Member Secretary of the Conference.

Respected Chairperson, Mr. Jagat K. Bhusal

Chief Guest, Dr. Som Lal Subedi, Secretary of Science, Technology and Environment

Special Guest, Mr. Laxmi Prasad Dhakal, Joint Secretary, Ministry of Home Affairs

Dr. Rishi Ram Sharma, Director General, Department of Hydrology and Meteorology

Dr. Laxmi Prasad Devkota, Chairman, UNESCO IHP National Committee Nepal

Dr. Keshav P. Sharma, Chairperson, Scientific Committee of the Conference

Ladies and Gentlemen,

The organizing committee has marked a grand success of the conference- on "Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Changing Climate held during 27-29 November, 2013 in Kathmandu, Nepal". The conference has come to this stage through the months of rigorous works of several committees in this conference, sharing and coordinating with different collaborative partners, supporting agencies and paper contributors, presentators, key note speakers, chief guests, guests, session chairs, participants, media, volunteers, rapporterus and management of the hotel.

We are honored to receive Honorable Parmananda Jha, Vice President of Nepal despite his busy schedule. We are very grateful Honorable Umakant Jha, Minister, Ministry of Science, Technology and Environment, Mr. Som Lal Subedi, Secretary, Ministry of Science, Technology and Environment, Mr. Laxmi Prasad Dhakal, Joint Secretary, Ministry of Home Affairs and Dr. Axle Plathe, Representative UNESCO to Nepal for their time and speech in inaugural and closing sessions of the conference.

We are thankful to all associate partners including Department of Irrigation/Adaptation to Global Change in Agricultural Practices, International Association of Hydrological Sciences (IAHS), International Water Management Institute (IWMI) and Nepal Development Research Institute (NDRI) for their collaboration in the conference. Without their support and mutual agreement to work with us would not have been possible to bring this conference to a successful conclusion.

We sincerely thank United Nation Development Programme (UNDP), International Center for Integrated Mountain Development (ICIMOD), Kathmandu University, Central Department of Hydrology and Meteorology Tribhuvan University, Practical Action, OXFAM, Real Time Solution, World Wildlife Fund (WWF), Feed the Future Innovation Labs for their technical and financial support in the conference.

Our special thanks goes to international guests and national participants for their presence in the conference. We are also equally thankful to all session chairs and rapporteurs for their time and cooperation in running parallel sessions smoothly and effectively. We are thankful to chairs, co-chairs, contributors and editors whose substantial contribution assisted us to shape the conference abstract. We also thank to all the chairs, co-chairs and members of national and international advisory committees for their significant suggestion and inputs from the stage of initiation to this stage. We thank our volunteers, media persons, press, hotel staff and those who directly and indirectly helped us to bring the conference at this stage. I, personally, as a General Secretary of SOHAM, would like to thank my colleague of Executive Committee and life member of the society and the staffs of DHM for their valuable help, significant time and inputs to the success of the conference.

Lastly but not least, once again, we are grateful to you all for being with us from beginning to the end of the conference.

Thank you very much! Namaste!

Mr. Deepak Paudel
Member Secretary of the Conference!
SOHAM Nepal
deepaksoham2012@gmail.com
deepakndmf@yahoo.com
29 November 2013
The Everest Hotel, Kathmandu, Nepal

6. The Conference Declaration

The conference declaration was presented by Dr. Laxmi Prasad Devkota, Co-Chairperson of the Conference. The declaration was prepared by the participants of the conference based on the issues raised in the several sessions. The declaration is given below.

The Kathmandu Declaration 2013

on

Climate Change, Water Resources and Disasters in Mountainous Regions

Building Resilience to Changing Climate

The international conference on Climate Change, Water Resources and Disasters in Mountainous Regions: Building Resilience to Changing Climate” was held on 27-29 November 2013 in Kathmandu, Nepal. More than 270 participants from 24 countries including representatives from international organizations attended and effectively contributed to the conference. The participants of the Conference unanimously adopted the “The Kathmandu Declaration 2013”

Reaffirming

- the basic rights of people living in mountainous regions to water, food, and energy;
- the prosperity of the people with socio-economic transformations;
- the impact of climate change on natural resources and hazards;
- the challenges of building societies adaptive and resilient to climate change under uncertainties;

Recognizing the need of sound scientific and indigenous knowledge base and human resource to resolve sustainably the existing and future challenges of water resources and disaster management especially in the context of changing climate in mountainous regions ;

Noting the significance of well equipped institutions for knowledge advancement, skill development and for the development of innovative technologies with emphasis on integrated water resources management; and

Realizing the importance of data and knowledge sharing among regions, institutions and scientific communities;

With above, we call relevant government authorities, multi/bilateral agencies and non-government organizations:

To strengthen networks of scientists and institutions, with the goal of promoting interdisciplinary information and knowledge exchange, enhancing public awareness, influencing enabling policies and contributing to capacity building;

To establish a well equipped Mountainous Climate and Water Research Centre in Nepal to carry out high quality scientific research with mechanism for disseminating research findings down to the community level, conduct trainings/workshops, contribute to policy development incorporating climate change issues, and coordinate with relevant global and regional institutions; and

To facilitate organizing international conferences to share information on the state of the knowledge on water resources, disasters and climate change in mountainous regions on a regular basis

The Conference Glimpse





