Proceedings/Book of Abstracts

of

Joint ASNEngr/CAN-USA Conference 2012

(5th ASNEngr Annual Conference and Meeting and 5th CAN-USA Annual Development Conference)

"Bringing Engineering, Scientific and Technological Communities Together for a Better World"

Edited by

Ramesh B. Malla, Ph.D.; Nabin Khanal; Rajendra Shrestha, Ph.D.; and Amod Pokhrel, Ph.D.

Conference Organized By

American Society of Nepalese Engineers (ASNEngr)
P. O. Box 39524, 4904 York Road
Baltimore, Maryland 21212-9998, USA
Email: info@ASNEngr.org / Web: www.ASNEngr.org
and
Computer Association of Nepal, USA (CAN-USA)
PO Box 105, Pleasanton, California 94566, USA
Email: info@can-usa.org / Web: www.can-usa.org

Conference Hosted By

The Greater Washington, D.C. Chapter of ASNEngr

Venue

Holiday Inn Leesburg, 1500 E. Market Street, Leesburg, VA 20176, U.S.A.

Date

May 26-27, 2012 (Memorial Day weekend)

Foreword and Acknowledgments

The Fifth Joint Annual Conference of the American Society of Nepalese Engineers (ASNEngr) and Computer Association of Nepal-USA (CAN-USA) was held in Leesburg, VA (Greater Washington, D.C.) May 26 - 27, 2012. The Greater Washington, D.C. (GWDC) Chapter of ASNEngr, the first chapter of the Society, was proud to host this one and a half day conference for the first time. This conference was the third joint endeavor for these two organizations. This conference was yet another remarkable achievement for these two organizations in that it was organized stand-alone, independent of other Nepali organizations, for the second time in their history.

The theme of the joint conference was "*Bringing Engineering, Scientific and Technological Communities Together for a Better World*" with an objective of bringing the engineers, scientists, students and professionals in related areas together on a common platform for sharing and disseminating knowledge and experience with each other and with broader scientific and engineering communities.

The technical program included four sessions with 15 presentations among which three were presented from Nepal via the Skype connection. The sessions included "Joint ANMF/ASNEngr/CAN-USA Initiative on Earthquake Preparedness and Disaster Relief in Nepal," "Earthquake Safety Engineering and Information Communication Technologies," "Energy and Environmental Issues and Concepts," and "Recent Advances in Engineering and Science Topics." Each of these sessions featured individual presentations discussion and sharing of scientific and engineering knowledge and experience among participating engineers, scientists and professionals. The presenters and participants came from a broad base of the academia, government agencies, and private and multinational industries.

Another special attraction at the conference this year was two professional development presentations on the second day of the Conference. One was given by the representative from. Fibrwrap Construction Services, Inc. on use of Fiber Reinforced Polymers for Structural Strengthening and the other by the representative from Simpson Strong-Tie Company on Lateral System for Wood Design. The attending professionals earned one Professional Development Hour (PDH) credit from each of the industry presentations.

Furthermore, ASNEngr held its Annual General Membership meeting on the 2nd day. The Conference was concluded with the award of Certificates of Appreciation from ASNEngr to all members of the Conference Organizing Committees, sponsors/donors, volunteers, and outgoing Officers and members of the Board of Directors of the Society. In addition to the technical program and the professional meetings, the GWDC Chapter of ASNEngr organized dinner and cultural program in the evening of the first day and a tour of Washington, D.C. area following the second day's program.

As an added novel attraction to this conference, the following three Best Papers/Presentations were selected based on the evaluation by a panel of judges and duly recognized at the Conference venue: "*Understanding the Structural Behavior of your Home*" by *Raj Tamang*, PE, LEED AP; BEI Structural Engineers, Fairfax, VA.; *"Advances in Technology Aid Production*

from Unconventional Petroleum Resources" by *Rajendra K. Shrestha, Ph.D.,* ConocoPhillips Company, Houston, TX; and *"Natural Frequency Determination of a Proposed Lunar Habitat Subjected to Diurnal Cycle Extreme Temperatures"* by *Kevin Brown and Ramesh B. Malla,* Ph.D., University of Connecticut, Storrs, CT.

About 160 participants, including 110 practicing engineers, scientists, technologists, academicians, and students from private and multinational industries, government agencies, and academia, and 50 accompanying guests, attended the conference. The conference drew participants from 15 States in the U.S. (including Arizona, California, Connecticut, Florida, Maryland, New Jersey, New Mexico, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, Virginia, Washington, D.C.), Canada, and Nepal.

We would like to express our heartfelt gratitude to the authors who submitted their abstracts and shared their research and knowledge to the conference attendees. We believe that the presentations and forum for discussion at the conference gave all participants ample opportunities to share their knowledge and experience of research, practice, and development in the pertinent areas and provided a common discussion ground for further enhancement of their professional growth and enrichment of knowledge.

We would like to extend deep appreciations to the conference attendees, His Excellency Ambassador of Nepal to the U.S. Dr. Shankar P. Sharma, and other distinguished invited guests for taking valuable time in participating and supporting the conference. Thanks are also due to the tireless efforts of the organizing committee members, especially colleagues at the GWDC Chapter of ASNEngr. Sincere thanks are also due to the members of the Board of Directors of ASNEngr and Executive Committee of CAN-USA for their valuable suggestions. Last but not least, we would like to express our deep appreciations and thanks to all sponsors/donors for their generous support contributing to the success of this conference. It was an honor and privilege to each of us to have the opportunity to serve on our respective positions for the Conference.

With warm regards,

June, 2012

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Table of Contents

Technical Session II:

Earthquake Safety Engineering and Information Communication Technologies

Technical Session III:

Energy and Environmental Issues and Concepts

Technical Session IV:

Recent Advances in Engineering and Science Topics

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Overall Program Schedule At-a-Glance

Saturday, May 26, 2012

7:30 AM – 4:00 PM	**On-Site *Registration***	Ball Room
8:30 AM – 9:30 AM	***Conference Opening***	Ball Room
9:35 AM – 10:55 AM	***Technical Session I***	Ball Room

Session Title: *Joint ANMF/ASNEngr/CAN-USA Initiative on Earthquake Preparedness and Disaster Relief in Nepal*

11:05 AM – 12:25 AM	***Technical Session II***	Ball Room

Session Title: *Earthquake Safety Engineering and Information Communication Technologies*

12:25 PM- 1:45 PM	**Luncheon**	Ball Room
1:45 PM – 2:45 PM	***Technical Session III***	Ball Room

Session Title: *Energy and Environmental Issues and Concepts*

2:55 PM –4:15 PM	***Technical Session IV***	Ball Room

Session Title: *Recent Advances in Engineering and Science Topics*

6:00 PM – 7:00 PM	**Networking Hour**	Ball Room
7:00 PM – 8:30 PM	**Cultural Program**	Ball Room
8:30 PM – 10:30 PM	**Dinner and Entertainment**	Ball Room

Sunday, May 27, 2012

8:30 AM-10:00 PM	**ASNEngr General Membership and BOD Meeting**.	Loudoun Room
10:10 AM -11:10 AM	***Professional Development Presentation I***	Loudoun Room

Topic: "Use of Fiber Reinforced Polymers for Structural Strengthening"

(The attendee will earn one hour of Professional Development Hour-PDH)

11:20 AM - 12:20 PM ***Professional Development Presentation II***

Topic: "Lateral System/Wood Shear Wall Design"

(The attendee will earn one hour of Professional Development Hour-PDH)

12:20 PM-1:45 PM	**Lunch and Closure**	Loudoun Room
2:00 PM – 5:00 PM	**Tour & Sight-Seeing (if enough interest)**	Meet at Hotel Lobby

Tour Event: *Sight-seeing of point of interest in Washington D.C. (This event will be held only if there is enough interest in advance.)*

Detail Program Schedule

Saturday, May 26, 2012

On-Site Registration & Name Badge pick-up 7:30 AM – 4:00 PM Ball Room

Conference Opening * 8:30 AM – 9:30 AM Ball Room

Conference Welcome and Program/Organization Introduction –

by ***Ramesh B. Malla, Ph.D***., Conference General Co-Chair and President, American Society of Nepalese Engineers (ASNEngr); and ***Nabin Khanal***, Conference General Co-Chair and President, Computer Association of Nepal-USA (CAN-USA).

Welcome from the Greater Washington, D.C. (GWDC) Chapter of ASNEngr –

by ***Thakur Dhakal, P.E***., President-Elect/current Vice President, GWDC Chapter of ASNEngr.

Local Organizing Committee Welcome –

by ***Shashi Dahal, P.E.*** Chair, Local Conference Organizing Committee, ASNEngr.

Welcome Remarks –

by ***His Excellency Honorable Shankar Prasad Sharma, Ph.D.,*** Ambassador of Nepal to the United States**,** Washington, D.C.

Overall Conference Program Overview –

by ***Ramesh B. Malla, Ph.D***., Conference General Chair and President, American Society of Nepalese Engineers (ASNEngr).

Technical Program Overview –

by ***Rajendra K. Shrestha, Ph.D***., Conference Technical Co-Chair and Vice President, ASNEngr and ***Amod K. Pokhrel, Ph.D.*** ,Conference Technical Co-Chair, CAN-USA.

Vote of Thanks –

by ***Jagannath Ghimire, P.E***., Conference Logistic Chair and General Secretary, ASNEngr.

Break 9: 30 AM – 9:35 AM

**Emcee: Raj K. Tamang, P.E., GWDC Chapter of ASNEngr*

Technical Session I 9:35 AM – 10:55 PM Ball Room

Session Title: *Joint ANMF/ASNEngr/CAN-USA Initiative on Earthquake Preparedness and Disaster Relief in Nepal*

Session Chairs: ***Upendra Karna, D.Eng., P.E.,*** U & S Engineers, P.C. , *Lambertville, NJ;* and ***Prakash C. Khanal,*** Parsons Brinckerhoff, Cockeysville, MD.

9:35 AM – 9:50 AM

"General Overview of the Joint ANMF/ASNEngr/CAN-USA Initiative on Earthquake Preparedness and Disaster Relief in Nepal" by ***Ramesh B. Malla, Ph.D***., President, American Society of Nepalese Engineers (ASNEngr); University of Connecticut, Storrs, CT.

9:50AM – 10:05 AM

"Earthquake Preparedness and Disaster Relief in Nepal –Physical Infrastructure" by **Kanhaiya *Kayastha, S.E., P.E***., La Habra (Los Angeles), CA; and ***Ramesh B. Malla, Ph.D.,*** President, American Society of Nepalese Engineers (ASNEngr); University of Connecticut, Storrs, CT.

10:05 AM – 10:20 AM

Earthquake Preparedness and Disaster Relief in Nepal – Medical and Public Health" by ***Sunil Sharma, M.D***., President, America Nepal Medical Foundation (ANMF), Winchester, VA.

10:20 AM – 10:35 AM

Earthquake Preparedness and Disaster Relief in Nepal – Information Technology and Communication" by ***Suresh Ojha***, Computer Association of Nepal –USA (CAN-USA), San Francisco, CA.

10:35 AM – 10:55 AM

"Preparing for a Major Earthquake in Nepal: Achievements and Lessons" by ***Amod Mani Dixit,*** National Society for Earthquake Technology - Nepal (NSET), Kathmandu, Nepal; ***Yogeshwar K. Parajuli***, TAEC Consult Pvt. Ltd., Kathmandu, Nepal; *and* ***Surya Narayan Shrestha***., NSET, Kathmandu, Nepal.

Break 10:55 AM – 11:05 AM

Technical Session II 11:05 AM – 12:25 PM Ball Room

Session Title: *Earthquake Safety Engineering and Information Communication Technologies*

Session Chairs: ***Bipin Pathak, Ph.D., P.E.,*** District Department of Environment, Washington, D.C.*;* and ***Deependra Pokharel****, Orbital Science, Chantilly, VA.*

11:05 AM - 11:25 AM

"Change in Cost and Performance with Variation in Codal Parameters in the Design of Earthquake Resistant Buildings in Nepal" by ***Jishnu K. Subedi, Ph.D.,*** Institute of Engineering, Pulchowk, Nepal.

11:25 AM – 11:45 AM

"Amateur Radio for Emergency Communication in Nepal" by ***Khadga Sen Oli,*** **Ganesh Kumar Jimee** and **Amod Mani Dixit**; National Society for Earthquake Technology - Nepal (NSET), Kathmandu, Nepal.

11:45 AM -12:05 AM

"Development and Investment of Utility Scale Grid Connected Renewable Energy in Nepal" by ***Santosh Dhakal;*** Pecon LLC, Waldorf, Maryland

12:05 AM-12:25 PM

"*Localization of ICT for Empowering the Rural Masses and the Differently-abled in Nepal*" by ***Bal Krishna Bal***; Kathmandu University, Kavre, Nepal

Lunch & Networking	12:25 PM-1:45 PM	Ball Room

Technical Session III	1:45 PM – 2:45 PM	Ball Room

Session Title: *Energy and Environmental Issues and Concepts*

Session Chairs: ***Shyam Sharma, Ph.D., P.E.***, American Association of State Highway Officials (AASHTO), Falls Church, VA**;** and ***Yubaraj Budhathoki, P.E. LEED AP***, Mt. Everest Engineering LLC, Fairfax VA.

1:45 PM – 2:05 PM

"A Review of Renewable Energy Practices in US and Nepal" by ***Mangal Maharjan, P.E.;*** Everest Energy, Washington DC*;* ***Dilli Neupane, P.E.,*** Everest Energy, Washington DC*;* and ***Bipin Pathak, P.E., P. Eng., Ph. D.*** Fairfax, VA.

2:05 PM – 2:25 PM

R&D in Energy Technology and Challenges in Nepal: A Case Study of KAPEG by ***Pramod Ghimire;*** KAPEG, Dhulikhel, Nepal; ***Peter Freere***, World Vision Australia; ***Ghanshyam Shrestha, Ph.D.***, ABB Inc., Rayleigh, NC.; ***Chudamani Lamichhane,*** AkerSolutions, Norway; ***Ranjan Sharma***, Siemens, Denmark; and ***Rakesh Sinha,*** Wind Power System, Aalborg University, Denmark.

2:25 PM – 2:45 PM

"Addressing the Environmental Burden shifting of Biofuels in the Context of Developing Countries" by ***Anil Baral***, ***Ph.D.,*** The International Council on Clean Transportation, Washington, DC.

Break 2:45 PM – 2:55 PM

Technical Session IV 2:55 PM – 4:15 PM Ball Room

Session Title: *Recent Advances in Engineering and Science Topics*

Session Chairs*: Rishi Baral, P.E., CFM,* Stafford County Government, Stafford, VA *and* ***Kulmani Acharya,*** Kalika Conctruction Group USA, Parkville, MD.

2:55 PM - 3:15 PM

"*Understanding the Structural Behavior of your Home*" by ***Raj Tamang,*** PE, LEED AP; BEI Structural Engineers, Fairfax, VA.

3:15 PM – 3:35 PM

"Design and Implementation of Advanced Technology for the Highway Infrastructure development" by ***Upendra L. Karna, D.Eng, P.E.***; U&S Engineers, P.C., Lambertville, NJ.

3:35 PM – 3:55 PM

"Advances in Technology Aid Production from Unconventional Petroleum Resources" by ***Rajendra K. Shrestha, Ph.D.,*** ConocoPhillips Company, Houston, TX.

3:55 PM – 4:15 PM

"Natural Frequency Determination of a Proposed Lunar Habitat Subjected to Diurnal Cycle Extreme Temperatures" by ***Kevin Brown and Ramesh B. Malla,*** **Ph.D**., University of Connecticut, Storrs, CT.

Networking Hour	6:00 PM – 7:00 PM	Ball Room
Cultural Program	7:00 PM – 8:30 PM	Ball Room
Dinner and Entertainment	8:30 PM-10:30 PM	Ball Room

Special Attraction - Best Paper/Presentation Awards: This will be a new attraction for this year's conference. A panel of judges will evaluate the presentations delivered at the Conference. Top three best presentations/papers will be selected and recognized.

Sunday, May 27, 2012

ASNEngr General Membership Meeting. 8:30 AM-10:00 AM Loudoun Room

Annual General Body Meeting of the American Society of Nepalese Engineers (ASNEngr)

Break 10:00 AM – 10:10 AM

Professional Development Presentation I 10:10 AM – 11:10 AM Loudoun Room

Topic: *"Use of Fiber Reinforced Polymers for Structural Strengthening"* by ***Carla A. Ramos***, Sales Engineer, Fibrwrap Construction Services, Inc., Chantilly, VA 20151

(The attendee will earn one hour of Professional Development Hour-PDH)

Break 11:10 AM – 11:20 PM

Professional Development Presentation II 11:20 AM – 12:20 PM Loudoun Room

Topic: *"Lateral System for Wood Design"* by ***Michael Wolfe***, Simpson Strong-Tie Company, Columbus. OH

(The attendee will earn one hour of Professional Development Hour-PDH)

Lunch and Closure 12:20 PM – 1:45 PM Loudoun Room

Tour & Sight-Seeing 2:00 PM - 5:00 PM Meet at the Hotel Lobby

Tour Event: Sight-seeing of point of interest in Washington D.C. *(This event will be held only if there is enough interest in advance.) (For accompanying guests and spouses, the tour will be available from the morning if there is enough interest)*

Technical Presentation Abstracts

Joint ANMF/ASNEngr/CAN-USA Initiative on Earthquake Preparedness and Disaster Relief in Nepal

Ramesh B. Malla, Ph.D.[1]; Kanhaiya Kayastha, S.E[2]
American Society of Nepalese Engineers (ASNEngr)

Sunil Sharma, M.D.[3], America Nepal Medical Foundation (ANMF) and

Suresh Ojha[4], Computer Association of Nepal-USA (CAN-USA)

ABSTRACT

Nepal lies in one of the most active earthquake region in the world. Nepal's existing non-earthquake-resistant infrastructures including essential facilities, hospitals, schools, building, and bridges in the Kathmandu Valley and the nation, the capabilities of the existing communication networks to communicate nationally and with the outside world, during and immediately after an earthquake episode, and the present status of earthquake preparedness in medical sector to face challenges imposed by earthquake, are the major threats to the safety of lives and properties in Nepal.

To help Nepal in its effort to address above challenges, a joint initiative to prepare a position/concept paper on Earthquake Preparedness in Nepal, led by the three leading professional organizations of Nepali Diaspora in the U.S.: American Society of Nepalese Engineers (ASNEngr), America-Nepal Medical Foundation (ANMF), and Computer Association of Nepal-USA (CAN-USA), was launched on March 31. 2010, and was fully supported by the general Nepali Diaspora and Nepali organizations/associations in USA. The position paper briefly outlines the challenges that Nepal could face, in case of an earthquake similar to the devastating January 16, 1934 Nepal-Bihar earthquake of magnitude 8.25 in the Richter scale is repeated in the near future. The most recent September 18, 2011 earthquake of magnitude 6.8, bordering Sikkim, India, that hit hard in the far-eastern region of Nepal as well as rattled the Kathmandu Valley causing some losses of human lives and properties, has reinforced the need for Nepal to vigorously prepare for impeding earthquakes. The position paper is currently in the final stage of completion..

This presentation highlights some of the activities accomplished under the above joint initiative and recommendations provided in the joint initiative paper. The recommendations listed within the paper are in the areas of structural evaluation and disaster mitigation of existing infrastructures, including schools and hospitals; preparedness in medical sector, and establishment of effective emergency communication systems in the country, to minimize the catastrophic effects in all respects from earthquake and associated hazards. Normally, in a large earthquake, the communication networks are expected to be destroyed or severely overwhelmed, thus restricting the communication abilities between various vital public and private institutions and life-saving organizations inside and outside the country. The rescue operations would also be severely hindered by the collapsed buildings and damaged infrastructures. However, as a result of several studies and national benchmarks on emergency preparedness set by the organizations (such as, World Health Organization and Nepal Disaster Risk Consortium) availability of structural-retrofitting techniques, new developments and advancements in an integrated disaster communication system and the mass media, including the greater awareness in general public, Nepal has made steady progress toward earthquake preparedness.

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Preparing for a major earthquake in Nepal: Achievements and Lessons

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ABSTRACT

The earthquake risk of Nepal is very high and is increasing alarmingly due to rapid urbanization, poor construction practices, and lack of awareness and preparedness. Despite the knowledge on historical seismicity and the risk, public awareness on earthquake hazard and risk was minimal until a few decades back and organized approaches for earthquake risk management (ERM) was not practiced. Only after a massive destruction and a loss of 721 human lives due to an earthquake in 1988, the need for an organized approach was realized in all sectors. During 1992-1994, National Building Code Development Project (NBCDP) was implemented which served as an important milestone towards this direction. Likewise, the establishment of National Society for Earthquake Technology – Nepal (NSET) in 1993 was another key step. Since then, several innovative initiatives on ERM were implemented. These successful efforts made by Nepalese institutions with support from bi-lateral agencies and the UN system, have generated a sense of hope among the communities as well as the official circles.

Such efforts pertain to mitigation and also preparedness. The efforts are centered on raising awareness and building capacity of communities and authorities through risk assessment, action planning, training programs and through demonstration projects. One of the very successful and comprehensive programs is the Nepal Earthquake Risk Management Program (NERMP) being implemented by NSET. Key components of the program consist of a) massive awareness campaign for educating people on impending earthquake risk and ways of reducing the risks, b) capacity building of people, professionals and institutions through training and capacity building programs, and c) assisting municipalities and authorities in implementing building code and institutionalizing ERM. Several Community Based Disaster Management (CBDM) programs are being conducted. More recently, a coordinated and comprehensive program for risk management has been initiated by Nepal Risk Reduction Consortium (NRRC) lead by the UN System in Nepal. Five flagship programs are included under the NRRC; the five program activities being some of the key activities identified by the National Strategy for Disaster Risk Management in Nepal (NSDRM) formulated in 2009. A national strategy for improving seismic safety of all schools of Nepal has also been formulated based on the community based School Earthquake Safety Program (SESP) implemented by NSET in various parts of the country. All these programs have significantly contributed to raise earthquake awareness, enhance local capacities and prepare the communities to cope with earthquake emergencies. Large cross-section of the country starting from communities at the bottom to the authorities at the top is being successfully drawn into these efforts. Success of these initiatives gave confidence and opened new possibilities for replication largely because of wider participation of communities, private sector and the municipalities.

This paper describes the social, economic and political aspects of such successful initiatives for ERM in Nepal.

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Change in Cost and Performance with Variation in Codal Parameters in the Design of Earthquake Resistant Buildings in Nepal

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ABSTRACT

This study presents effect of variation of parameters in earthquake resistant building codes in the level of lateral force applied to the building, change in design requirements, change in the cost of the building and performance of the buildings. The provisions of current building code in many countries, including India and Nepal, are based on the philosophy to prevent complete collapse of the building. Therefore, even a building designed with earthquake resistant codal provisions is expected to have substantial damage in major earthquakes requiring huge investment in post-earthquake repair cost. The investors in building demand the risk their building is exposed to in the future. The current prescriptive codes do not have provision to assess performance of buildings and provisions for investing in the building cost at the initial stage in order to avoid future losses. As the construction industry expands, there will be demand from the investors on additional cost at the initial stage so as to reduce future loss. The issue needs to be addressed in the codal provisions itself which will form the basis of performance based design codes. In order to address the transition between prescriptive codes of present and performance based design codes of future, a detailed analysis of effect on performance and cost due to change in design parameters is essential first step.

In this study different types of residential buildings are analyzed and designed with changing lateral force parameters and their cost implication and change in performance are assessed. The results show that with marginal change in investment at the initial stage, a substantial cost in the post-earthquake repair cost can be saved.

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Amateur Radio for Emergency Communication in Nepal

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ABSTRACT

Nepal faces a variety of natural hazards with increasing frequency and intensity. The extent of earthquake hazard of Nepal is believed to be similar to that of California. Earthquake risk, in terms of human casualty and building damage is several times more in Nepal than that in California or Japan. The country's long history of destructive earthquakes is conspicuously spotted with high mortality and extensive damage to buildings and other infrastructures.

Such high level of earthquake risk demands a high level of emergency preparedness. While Nepal has steadily been trying to develop capacities for effective preparedness for disasters, there remains a lot of work to be done. There is a conspicuous gap in terms of post disaster communication. For example, the aftermath of the recent disasters - the Himalayan earthquake of September 2011, and the Seti River Landslide dam burst have shown the importance of early warning and communication, let alone its importance for provision of effective rescue, relief, and recovery.

After a large-scale earthquake, the existing communications systems may not be available either due to physical damage or system overload. Telephone wires may be damaged and cellular phone towers and antennas may fail or lose power. Even in a moderate shaking of September 18, 2011, communication congestion of the cellular and landline phone network was acutely faced in Kathmandu and many parts of the country. Emergency Communication Systems which are pivotal in managing disasters should have not only appropriate technology and adequate infrastructure, but it should also have proper backup and redundancy mechanisms. Amateur Radios also known as Ham Radios are found globally as one of the best options in such adversities. Nepal can also benefit from this zero-operation-cost technology particularly in case of emergencies not only due to earthquakes but in all types of disaster situations.

Although started first in 1955, Nepal until recently had only five licensed HAM operators. This paper presents how the understanding and synergy developed between Nepal Amateur Relay League (NARL), the National Society for Earthquake Technology – Nepal (NSET), Department of Electronics and Computer Engineering, Pulchowk Campus, IOE, and the Computer Association of Nepal- USA (CAN-USA), resulted in additional 21 HAM operators in Nepal. With the technical assistance of CAN-USA, a functional cross band repeater has now been installed at NSET and it has mainstreamed HAM radio into its plans for strengthening the emergency communications network in the Kathmandu Valley and countrywide.. As a logical consequential effort, an Integrated Disaster Communication Consortium (IDCC), involving all major stakeholders, including major hospital networks in the Kathmandu valley has been established. With the technical and financial assistance from the CAN-USA, which provided nine hand held radio sets to operators, the group has recently organized several training programs and drills in hospitals using HAM network. The main objective of this drill was to check how emergency communication could be established from health facilities during a major disaster. Major five hospitals namely; Teaching Hospital, Army Hospital, Civil Hospital, Bir Hospital and the Chhetrapati Free Clinic collaborated and participated in this drill.

Nepal has thus made a significant stride in developing a redundant system for disaster communication. Thanks to the enthusiasm and efforts of the first and solitary leaders of HAM process in Nepal, and various supporting organizations for providing technical assistance that is instrumental in accelerating the capacity enhancement.

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Development & Investment of Utility Scale Grid Connecticut Renewable Energy in Nepal

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ABSTRACT

It is true that Nepal, although a small country, has one of the world's highest hydro power electricity production capacities with above 40,000 MW and the total electricity generated as of now is only 705.57 MW. Despite having these huge sources of energy, it is an irony that Nepalese have to live with up to 14 hours of load shedding. It is also true that the production of electricity from big hydro storage system with mega reservoirs and dams is a complicated process and will require huge financial resources and decade of construction even if we decide to build all these structures and capitalize all the power.

Energy is the back bone of development, and the world is more power hungry than any time before. This is an era of all the innovations and discoveries and we cannot discuss about energy efficiency and imagine producing the gadgets of innovations without having the power to run them. All the developed as well as developing countries are pumping in resources and investments in the search of new and innovative source of power. Nepal has to join this race to help develop the country as well as to uplift the quality of life of Nepalese people.

This paper presents about an actual project that has been designed for Nepal "Damak Solar Field" and is submitted for Power purchase agreement (PPA) to the Nepal Electricity Authority (NEA). The presentation includes both technical and financial models of the project using different software including RetScreen, SAM, and PVWatts. The analysis shows technical and financial viability of developing utility scale, grid connected solar photo voltaic power generation. With global horizontal irradiance (GHI) of 4.5 to 6.0 KWH/m^2/Day and 300 sunny days in a year, Nepal is an ideal country for electricity generation using Solar PV systems. Due to the technological advances in the photo voltaic industry, the price of PV is at historical low levels making this project more feasible with above 20% IRR and less than 10 years of ROI.

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Localization of ICT for Empowering the Rural Masses and the Differently-abled in Nepal

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ABSTRACT

With the rapid development of ICT and its widespread use in almost all sectors of the society globally, Nepal is also trying to move along with the adoption of ICT and thus getting benefitted from the many transformations that it can bring about. However, it should be noted that the mission in itself is not that easy, especially keeping into consideration that only a small fraction of the total population of Nepal are connected to the internet and the rural population is not very proficient in English. In this context, special considerations would need to be made while deploying ICT among the rural masses and the differently-abled community so that issues like the language barrier caused by the English language, a major interfacing language of almost all ICT, insufficient or almost none local content, user-friendliness in applications, trust issues over online transactions etc. are addressed in advance prior to deployment.

Hence, more than the internet connectivity or infrastructure, which might seem more pertinent at first glance, it is in fact the "soft" aspects that need to be addressed, these being - making the software applications available in the local language, developing local content, working on developing Speech and Natural Language Processing Applications like the Machine Translation Systems, Text-to-Speech Applications, Spell-checker Applications, Optical Character Recognition Systems, Dictionaries etc. In addition to this, proper Use Models of Technology addressing sustained use of technology and sustainability of the programs and sites is equally crucial. Sustained use of technology involves ensuring that the users are properly oriented, trained on the applications as well as convinced about the benefits of the applications in their daily lives. It is only when we are able to remove the technology fears prevailing among the people, help to build trust over the ICT applications, that we would be able to make people accept technology and thus ensure increased use of technology.

In this paper, we discuss the different ICT Research and Development initiatives on Localization in Nepal, which have potentials for empowering the rural masses and the differently-abled community by providing uniform access to ICT. We also include some success stories and share the stories of change brought about by the introduction of technology on some local users.

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A Review of Renewable Energy Practices in US and Nepal

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ABSTRACT

More than a billion people in the world are still living without electricity. The renewable energy technology could be a solution to providing electricity to them. Sustainability and greener technologies have been the buzzwords of these days. Renewable energy technologies such as solar, geothermal, biofuels, wind and micro-hydropower are more sustainable, green (no pollution) and are becoming more financially feasible due to cost reductions through technological improvements. Federal, State and Local (county) governments have been providing direct (subsidies / rebates) and indirect financial benefits (tax breaks) to the users of these renewable energy systems. Market also provides some benefits such as renewable energy credits to the users of renewable energy.

This review analyzes the technical, financial and policy aspects of renewable energy developments, practices and potential applications in US and in Nepal with special focus on few most popular technologies such as solar PV, solar thermal, and geothermal heat pumps, This review is aimed at providing useful practical information to engineers, scientists, homeowners and renewable energy professionals in the US and in Nepal.

Utilization of solar energy is being done in two basic ways – Solar electric or photovoltaic (PV) and solar thermal such as water heating and concentrating solar power (CSP). PV converts sunlight directly to DC electric power while solar thermal uses the heat of the sun to heat water or generates electricity by heating a media that can run a steam engine. Solar PV technology has become very popular in US these days. The cost of the major components of the system such as solar panels has drastically gone down in recent years. A typical PV system costs around $4-5 per peak watt installed depending on its actual size. In US, 1,855 MW of PV power was installed in 2011, representing 109 percent growth over 2010. The U.S. now has over 4.46 GW of installed solar electric capacity. Similarly 507 MW of solar thermal energy has been installed in US to date. Around 65,000 solar water heating systems were installed in 2010. A typical solar hot water system for a family of four has approximately 100 sq. ft. of collector and a 120 gallon storage tank. This systems costs around $10,000 to install. Direct and indirect financial help from government are available for installation of this system as well. Solar PV technology has emerged as an immediate option to electrify rural and remote places in Nepal. Solar thermal technology (solar water heating system) is mostly installed in urban parts of Nepal while solar dryer and cookers are used for drying and cooking the food. Nepal has approximately 15 MW of PV power installed to date. Similarly, to date in Nepal, More than a million square feet of solar collectors have been installed for water heating.

Geothermal Heat Pumps (GHPs) have been used for space heating and cooling in US since 1980. Approximately 50,000 of them are installed in the US each year. In winter, GHPs pull the heat from the earth and in the summer, it discharges heat to the earth through a ground heat exchanger. The initial capital cost of GHPs is higher than conventional systems. However GHPs consume less energy, with minimal operation and maintenance cost resulting in a net savings over its life. GHPs are more beneficial if the earth temperature is in a range of 50 to 90°F. A typical single family home would use a four ton unit that costs around $20,000-25,000 in equipment and installation. Despite the huge technical potential, installations of GHPs installation are still limited in residential use due to financial barriers. No geothermal system has been installed to date in Nepal. This part of review focus on GHPs knowledge, product information, site evaluation, selection criteria, economics, government's incentives, challenges and growth potential in US and in Nepal when utilizing geothermal heat pump for residential, commercial, institutional and industrial purposes.

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R&D in Energy Technology and Challenges in Nepal: A Case Study of KAPEG

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ABSTRACT

Despite having abundant natural energy resources in Nepal, the country is heavily suffering from energy crisis. The local materials have not been explored to adapt new energy technologies. The prospective for research and development is very high to identify indigenous technologies and use local materials in an innovative way to develop cheaper technologies. Small scale power generation systems cost little and the communities may take immediate benefit to increase their livelihood. An intensive research is required to identify suitable local materials and develop the low cost technology. Kathmandu Alternative Power and Energy Group (KAPEG) has been working on the development of low cost small scale energy technologies since 2006 in small wind turbine, pico/ micro hydro system, lighting technologies, solar timber drying, energy efficiency improvement etc in Nepal. The basic research is costly and the specialized equipments required to operate the experiments are not readily available in the local market. The laboratory tests equipments need to develop and which is challenging to meet the test results required by international standards. The whole process takes time to develop it into research outcome into development phase. So far, Nepal government has no any strategic plan to support local industries for research and development activities. The issues and constraints on research and development; and some of the impacts of the development work in the society will be highlighted. Many of the fresh Nepalese engineering graduates are not able to meet the skill required for the research and product development company. The possible graduate training programme will be discussed. Finally, the challenges for the product development and manufacturing issues will be presented in the paper.

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Addressing the Environmental Burden Shifting of Biofuels in the Context of Developing Countries

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ABSTRACT

Following in the footsteps of developed countries, emerging economies such as China and India are aiming for ambitious biofuel mandates with the intention of curbing GHG emissions from transportation, improving energy security, and strengthening the rural economy. For example, India currently requires 5% ethanol blending and is targeting a goal of 20% biofuel blending by 2017. However, the experience of developed countries with biofuels should provide a cautionary tale about the consequence of mandating biofuels without circumspection.

Biofuels are viewed as a panacea for climate change due to the assumption of carbon neutrality associated with renewability of biofuels. However, the purported climate mitigation benefits of biofuels, particularly first generation biofuels, have come under intense scrutiny. It has now been established that biofuels can cause indirect land use change (ILUC) through market-mediated effects such as crop displacement and change in crop trade contributing to higher land use GHG emissions. An IFPRI study (1) shows that biodiesel from palm oil, rapeseed, and soybean may offer negative GHG savings when ILUC is included.

In addition, there are other human health and environmental impacts of biofuels. For example, corn ethanol increases NOx emissions leading to an increase in ozone-related human health hazards. An environmental impact assessment of the Renewable Fuel Standard (RFS2), which sets an ambitious target of 36 billion gallons of biofuel by 2022, shows that the mandate may likely increase the use of nitrogen and phosphorous fertilizers leading to an increase in eutrophication in the Gulf of Mexico in the US (2).

Biofuel policies that focus solely on climate change mitigation may run the risk of shifting environmental burdens away from climate change to other non GHG-related environmental impacts. Recently organizations such as the Roundtable on Sustainable Biofuels (RSB) have developed sustainability criteria to minimize the potential of biofuels for problem shifting. The Renewable Energy Directive (RED) in the EU has included minimal sustainability criteria to govern the production of biofuels. Countries such as India and China are making some efforts in this direction by discouraging the use of food crops for biofuels, encouraging biofuel production from waste and agricultural residues, and supporting biofuel crops grown in marginal land.

We analyze the methodology for evaluating biofuel options and discuss the tradeoff in choosing biofuels versus petroleum fuels. We synthesize and recommend the appropriate policy actions for developing countries to devise a holistic framework to reduce the environmental burden shifting of biofuels.

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Understanding the Structural Behavior of Your Home

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ABSTRACT

Purchasing a house is a large financial and emotional investment in your family's future. For most it can be the single most important investment you ever make. Serious and recurrent structural problems in houses are not very common, but when they occur they can be problematic and costly to repair.

This presentation will primarily focus on the external forces and stresses that act on a house structure, and how a structure behaves under the application of these forces and stresses. A force on a structure is the weight or pressure exerted on a structure but it can be further defined to the type of force. This may be in the form of gravity, i.e. the weight of a building and its contents, or natural forces such as wind, snow or earthquakes. Extreme heat and cold temperatures, depending on where it is located, may also act on the house and exert thermal stresses causing cracks and other unpleasant cosmetic deformations on the structural and non-structural elements. The structural stability of the building is dependent upon the structure's ability to resist these forces and stresses.

We will also discuss the concept of "load path continuity". Continuous load path is a method of construction that uses a system of wood, metal connectors, fasteners and shear walls to connect the structural frame of the house together from the roof to the foundation. Load path provides a prescribed route for the forces acting on the house to follow from the roof to the foundation.

The presentation will further explore home construction and its structural components, and provide guidelines for deciphering different types of defects. Some of the common structural issues in a home include separations at exterior walls and entries, cracks around the edges of doors and windows, sagging lintels, cracks in the floor and wall drywall finishes, basement foundation wall cracks, differential settlement of foundations, etc. These guidelines will not turn you into a home inspector, but it will give you some of the common indicators of structural concerns and when to seek the advice of a professional structural engineer to investigate further.

The presentation will only focus on single family residential homes built in the United States and Northern America. These homes are mostly wood frame construction with concrete or masonry basement walls and concrete foundation system.

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Design and Implementation of Advanced Technology for the Highway Infrastructure Development

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ABSTRACT

Infrastructure is defined as the basic facilities, services and installations for the functioning of a community such as transportation and utility systems, communication systems and public institutions that all human being rely on in daily life. Engineers of the 21st century face the formidable challenge of developing and modernizing the fundamental structures that support civilization. American Society of Civil Engineers (ASCE) has estimated that it will require more than 1.2 trillion dollars to upgrade the nation's crumbling infrastructures. In this economic harsh time, civil engineers have to play a formidable role to either safeguard the quality of life in the developed countries or uplifting the quality of life in the underdeveloped countries. Understanding and utilization of advanced technology for the infrastructure design and development is a necessity. By utilizing advanced technology, a structure can be designed efficiently and economically. For a project located in the urban area, the use of advanced technology acts as catalyst by saving construction times and by causing less nuisance to the public.

This paper discusses the realization of the new technology and its implementation that has been successfully demonstrated by the design of some highway infrastructure development projects. This discusses the advanced technology that has been used for the bridge foundation design in deep water with deep soft materials by using a concept of "Floating Foundation System". This also discusses the realization of pile foundation capacity increase with time called "soil setup" that has saved a lot of time and money for the project. Within a week, the pile foundation capacity increased by about 2 times than the initial capacity. This also discusses the designing a large diameter drilled shaft suitable for a bridge design in high velocity tidal deep sea shore area and implementing a unique multi staged load testing program that saved a significant project cost and time. An example is also discussed that demonstrate the use of new anchor technology for the design of high retaining wall in an environmental constraints area along a river expected to produce a high scour in a flood condition. A new bridge design technology named as "integral abutment" bridge design system is also discussed. Finally, this paper discusses the technology used for roadway construction constructed on a100 feet thick environmentally sensitive compressible clay soil that exhibited about 6.5 feet of settlements for 15 feet of roadway embankment. Understanding and designing of advanced technology made possible to construct this roadway within about 18 months, normally it would have taken more than 20 years to consolidate the thick clay layer. Without using this advanced technology the project cost would have been about 3 times higher. Characteristics of a particular advanced technology used for a project is discussed and presented with relevant construction photographs, design charts and graphs to make it easier to understand it's relevance by common engineering professionals.

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Advances in Technology aid Production from Unconventional Petroleum Resources

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ABSTRACT

Recent advances in drilling and completion technology have been able to unlock tremendous potential of unconventional petroleum resources such as shale gas, shale oil and oil sand, and open a whole new avenue in the oil and gas industry. The tapping of these resources, which seemed insurmountable until a few years ago, has been made possible thanks to the development in the horizontal drilling, stimulation of the reservoir rock by multi-stage hydraulic fracturing, and steam-assisted gravity drainage (SAGD) techniques.

According to the Annual Energy Outlook 2011 of the U.S. Energy Information Administration (EIA), the U.S. shale gas resource potential is estimated at 862 trillion cubic feet (TCF), which is 34 percent of the domestic natural gas resource base of 2,543 TCF. Moreover, this data does not account for the liquid hydrocarbons contained in the unconventional Eagle Ford Shale, Woodford Shale and Utica Shale that add significant value to these resources. As reported by Advanced Resources International Inc., based on a global study conducted for EIA, 32 countries around the world not including the U.S. have shale gas resources of 22,016 TCF and technically recoverable potential of 5,760 TCF. A shale resource system is any continuous organic-rich source rock that can be made to produce naturally generated petroleum. Shale reservoirs are different from the conventional sandstones or carbonates in that they have significantly low permeability – the ability to transmit fluids through the rock - in the order of nanoDarcies, although their occurrence is widespread. Therefore, production from the unconventional resources invariably depends on the induced fracture system to enhance its permeability that can be achieved through hydraulic fracturing. Horizontal Drilling serves to expose significantly more rock to the well bore than the conventional vertical drilling, contributing to a substantial increase in production from these reservoirs. In addition, the advent of micro-seismic technique has provided a tool to estimate the growth and orientation of the fractures induced by hydraulic stimulation, thereby affording an indispensable aid to horizontal well planning.

Oil sands have very low API gravity (a measure of viscosity or internal resistance of a fluid to flow) equal to or below 10^{o} and contain bitumen that is highly viscous, occur at shallow depths, and require heating to enable them flow. A sophisticated technique known as "Steam-assisted Gravity Drainage (SAGD)" is applied to produce oil from oil sands when they occur subsurface. In the SAGD process, two horizontal wells with lateral section of 500 to 1,000 m are drilled at a distance of 5 m between the upper and lower wells, the oil sands are heated by injecting high-temperature, high-pressure steam into the upper well, which heats up the bitumen around the well bore causing it to drip into the lower well as oil to be produced.

The advances in breakthrough drilling and stimulation technologies have helped exploitation of vast reserves of unconventional petroleum reserves including shale gas and shale oil in the past few years, steering the nation towards energy independence and, most importantly, energy security. It goes without saying that natural gas is an environment-friendly clean-burning fuel. Furthermore, it is abundant and very affordable at the current trading price, and has helped create tens of thousands of jobs in this country.

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Natural Frequency Determination of a Proposed Lunar Habitat Subjected to Diurnal Cycle Extreme Temperatures

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ABSTRACT

The ambient environmental factors on the Moon pose the most difficult challenges for long term lunar colonization. The extreme temperature variation ranging from -233ºC (night time low) to 123ºC (day time high) combined with the long diurnal cycle endangers human life greatly. Also the radiation levels on the lunar surface far exceed those allowable for sustained human life. Furthermore, the lack of atmosphere allows hypervelocity micrometeoroid bombardment to the lunar surface. In order to maintain a shirt sleeve environment, adequate shielding and internal pressure containment must be provided to protect the habitat and those inside from these factors. The high cost of transportation and the distant location of the Moon necessitate the use of local materials to help reduce the overall cost of the mission. Lunar regolith is believed to provide many benefits including its use as a shielding material for radiation, temperature and micrometeorite impact.

This study presents the frequency determination of a proposed lunar habitat (Fig. 1) made of a 3-dimensional structural frame with a Kevlar membrane lining inside which uses lunar regolith as a radiation, temperature, and impact shield. The frame-membrane structure analyzed during this study harnesses the idea of in-situ resource utilization (ISRU) and creates a strong yet lightweight design to maximize the benefits of lunar colonization. The internal pressurization of load varied from 0.0 kPa (no pressure) to 96.5 kPa (14 psi). The external temperature varied from -233ºC to 123ºC to simulate the lunar environment while maintaining an internal temperature of 20ºC.

With an adequate depth of regolith shielding and internal pressure applied, the frequency of the lunar structure was determined from the finite element modeling using the ABAQUS code. Results from a static analysis showed reduced stress and deflection levels throughout the structure because of the regolith cover which counteracted a portion of the internal pressure load effectively reducing its magnitude. The natural frequencies of vibration were also greatly reduced as a function of the increased mass from the regolith shielding. The extreme night time cold temperatures caused the structural elements to contract creating significant amounts of local membrane vibrations and very low natural frequencies with the membrane attached. The extreme day time high temperatures caused the structural elements to expand and the membrane to inflate promoting global vibrations and slightly increased natural frequencies. When considering the frame alone there was very little difference seen with the change in temperature due to a lack of structural restraint at the top of the structure. The results obtained from this study should lead to a new and updated habitat design.

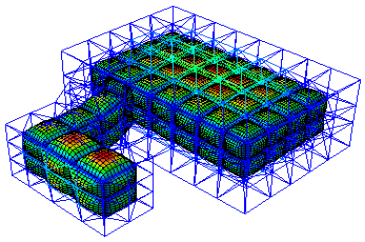

Fig. 1 Proposed Lunar Habitat

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