ASNEngr
American Society of Nepalese Engineers
Founded in 2007
http://www.ASNEngr.org
info@ASNEngr.org

Proceedings/Book of Abstracts

of the

Tenth (10th) American Society of Nepalese Engineers (ASNEngr) Annual Conference and Meeting

"Innovation in Engineering and Scientific Knowledge for Tomorrow"

Edited by

Ramesh B. Malla, Ph.D., F. ASCE, F. ASNEngr
University of Connecticut, Storrs, CT

Upendra L Karna, D.Eng., P.E., F. ASNEngr
U & S Engineers, P.C., Lambertville, NJ
and
Rabin Bhattarai, Ph.D., M. ASNEngr
University of Illinois, Urbana-Champaign, IL

Conference Organized by

American Society of Nepalese Engineers (ASNEngr)
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Conference Hosted by

ASNEngr Greater Washington, D.C. Chapter

Venue

Best Western Battlefield Inn
10820 Balls Ford Road, Manassas, Virginia 20109, USA

Date

June 24 - 25, 2017

Conference Website

www.ASNEngr.org

Foreword and Acknowledgment

The American Society of Nepalese Engineers **(**ASNEngr) held its Tenth (10th) Annual Conference and General Membership Meeting on June 24 - 25, 2017 in Manassas, Virginia, U.S.A. The Conference was attended by approximately 150 participants, practicing engineers, scientists, technologists, academicians, students, and industry leaders. The conference drew participants and speakers from the U.S. and Nepal.

The conference, with the theme "*Innovation in Engineering and Scientific Knowledge for Tomorrow*" deliberated on how state-of-the-art innovation in engineering, applied science, information and communication technology, renewable energy, and engineering economics could be utilized to address problems in developed as well as developing countries, including Nepal in the future. The conference featured an Opening program with 4 distinguished guest speakers, one keynote lecture, one plenary technical session with 3 distinguished speakers, and 3 more technical sessions, including one poster and two oral presentation sessions. Altogether 20 technical presentations were delivered at this year's conference.

The conference kicked off in the morning of Saturday, June 24, 2017 with a welcome note from Ramesh B. Malla, Ph.D., F. ASCE, F. ASNEngr, Conference General Chair. Jagannath Ghimire, P.E., President of ASNEngr welcomed the attendees and presented a brief introduction of the organization highlighting the Society's scopes, activities and achievements. Following this Upendra L. Karna, D.Eng., P.E., F. ASNEngr, Conference Technical Chair provided an overview of the conference program. Mangal Maharjan, Local Organizing Committee Chair, welcomed the participants on behalf of the Local Organizing Committee.

The Conference Opening program featured several distinguished invited guest speakers: His Excellency Dr. Arjun Karki, Nepalese Ambassador to the United States, Washington, D.C.; His Excellency Mr. Scott DeLisi, former US Ambassador to Nepal and currently Executive Director, Soarway Foundation - Engage Nepal in Canonsburg, PA ; His Excellency Mr. Durga Prasad Bhattarai, Permanent Representative, Permanent Mission of Nepal to the United Nations, New York, NY; and Dr. Tri Ratna Bajracharya, Dean, Institute of Engineering, Tribhuvan University, Lalitpur, Nepal.

During the opening program the guest speakers spoke about the role and need for sharing of Engineering and Scientific knowledge between America and Nepal. Distinguished Chief Guest, His Excellency Dr. Arjun Karki presented Inaugural Remarks, wished a successful conference, and. expressed Embassy's interest to work with Nepali engineering community in the USA for better development of Nepal. His Excellency Mr. Scott DeLisi spoke on "Earthquake Preparation in Nepal and Potential Partnership Going Forward," His Excellency. Durga Prasad Bhattarai on "Permanent Mission of Nepal to the UN and Nepali Diaspora," and Dr. Tri Ratna Bajracharya on the "Collaboration between ASNEngr and Institute of Engineering in Nepal." The opening program was concluded with a vote of thanks from Dilli Neupane, P.E., President of ASNEngr Greater Washington D.C. (GWDC) Chapter.

The keynote address on a very timely and important topic "Building Resilience in Nepal's Healthcare System" was presented by Distinguished speaker Prof. Judith Mitrani-Reiser, Director, Disaster & Failure Studies Program, Engineering Laboratory, National Institute of Standards and Technology, Gaithersburg, MD; and Assistant Professor of Civil Engineering and Emergency Medicine and Co-Director, Center for Systems Science and Engineering, Johns Hopkins University, Baltimore, MD. This presentation addressed the overall quality of buildings in healthcare system after the recent 2015 earthquake in Nepal.

The four regular technical sessions (1 poster and 3 oral) of the day consisted of technically and scientifically insightful and enriching presentations, and were well received with active participation from the audience.

The first session (*Invited Plenary*) chaired by Bimal Devkota, P.E. and Sukh Gurung, Ph.D., P.E. had three distinguished invited speakers–Ayhan Irfanoglu, Ph.D. from Purdue University, West Lafayette, IN; Mr. Matthew Francis, P.E. from AECOM, Salt Lake City, UT, and, Mr. Govinda Timilsina, Ph.D. from The World Bank, Washington, D.C. They presented respectively on topics "Field Survey and Guidelines for Preliminary Evaluation of Reinforced Concrete Buildings in Nepal," "The UN Disaster Resilience Scorecard for Nepal Earthquake Recovery," and "Policy Paper: Financing Hydropower for Economic Development in Nepal."

The second session was *a poster and interaction session* moderated by Ananda Paudel, Ph.D., Metropolitan State University of Denver, CO and Ram C. Poudel, Institute of Engineering, Tribhuvan University, Nepal (currently at University of Massachusetts, Amherst, MA). These poster presentations were given by professional engineers and students. The eight technical posters (including 3 by the engineering students) presented on topics such as Accelerated Bridge Construction (ABC), Nanomechanical Properties of Cement Paste, Geotechnical Investigation in Extreme Terrain, Analysis of Water Vapor Retrievals from Ozone Monitoring Instrument, Maximizing Ozone Generation for Water Purification, and Heart Beat/Pulse Detector. Also two were invited posters from Nepal on Application of Roof Top based Solar Electricity for Reducing Trade Deficit in Nepal, and Wind Solar Hybrid Minigrid System for Rural Electrification of Remote Village in Nepal.

The poster presentation on "Maximizing Ozone Generation for Water Purification" by student Ms. Sarahana Joshee of University of Maryland at Baltimore County, Baltimore, MD was voted to be the best poster by a panel of judges. Ms. Joshee was awarded the best poster certificate with a $100 check.

The third technical session titled *"Energy and Recent Advances in Engineering and Sciences"* was chaired by Shyam KC, Ph. D., The World Bank, Washington, DC and Rajendra Shrestha, P.E., City of Pearland, Pearland, TX. Prof. Tri Ratna Bajracharya of Institute of Engineering, Lalitpur, Nepal presented an invited paper co-authored with Sagar Gnawali of Nepal Electricity Authority on the Estimation of Bagasse Based Grid Connection Cogeneration Potential in Nepal and Impact Analysis. The paper discussed about the contribution, Bagasse based cogeneration plants could make acting as a firm power source in reducing load shedding from Nepal. Other papers in this session discussed on recent advances on various state-of-the-art engineering, scientific and technology topics, including Smart Grid, Quantification of Snow and Glacier melt in Higher Asian Mountains and Identification of Sub-Population of Cells from Single Cell Transcriptome Data.

The fourth and the final technical session titled "*Advances in Infrastructure Research, Development, Design and Analysis"* was chaired by Upendra Poudel, Ph.D., P.E., SK&A MD | Structural Engineers and Rishi Baral, P.E., Stafford County Government, VA. There were four papers presented in this session that discussed on advances made in the field of infrastructure research and development and, how these advances could be incorporated into development projects in Nepal. The topics addressed on Earthquake Geotechnical Characterization Kathmandu Valley with reference to the Gorkha Earthquake, Tunneling in Difficult Grounds, Current Practices of Bridge Condition Evaluation Program in the United States and its Applicability in Nepal and, Resonance Analysis of Railway Bridge under High Speed Train Load.

After the final technical session, ASNEngr held a discussion, comments and feedback forum moderated by Thakur Dhakal, P.E. Fairfax County Government, VA and Janak Thapa, P.E., CH2M, Houston, TX. A very live and fruitful discussion took place regarding the lessons learned at this year's conference and what can be improved at the next annual conference. The participants overwhelmingly provided positive comments on various aspects of the conference. Also discussed were the various potential activities ASNEngr can carry in the future. A pre-dinner networking event was organized after the discussion in an open forum where, the participants interacted with each other and discussed further on the topics presented during the conference. This networking session provided participating young engineers/students a chance to interact with professionals in their field and get an insight into the current job market. The first day of the event was concluded with dinner and cultural program.

On the first day of the conference, ASNEngr also presented prestigious Society level awards to 3 individuals. Two "Society Leadership" awards were given, one to Dr. Ramesh B. Malla of Storrs, CT (Founding President, 2007-2012) and another to Dr. Rajendra Shrestha, Houston, TX (Immediate Past President, 2012-2016) for their leadership and outstanding contribution to the Society during their respective tenure serving as the Presidents of ASNEngr. Prof. Malla received the award from His Excellency Nepalese Ambassador to the U.S., Dr. Arjun Karki. Since Dr. Shrestha was unable to attend the conference, Dr. Upendra Karna (Vice President of ASNEngr) accepted the award in his behalf from His Excellency Durga Bhattarai, Permanent Representative to the Permanent Mission of Nepal to the U.N. ASNEngr President, Mr. Jagannath Ghimire, P.E. presented the Society's "Outstanding Performance Award" to Mr. Pujan Joshi of Storrs, CT for outstanding contribution in website and database management during 2010-2017 as Website/Database Chair. He also served as the Society's Information Secretary for 2 terms during 2010-2014. These awards were presented in the form plaques.

The Conference concluded with a general membership meeting in the morning of the second day (June 25 9:00 AM - 12:00 PM). Several topics that are vital to the Society were discussed at the meeting. Members expressed their deep satisfaction with this year's conference and discussed how ASNEngr could increase membership participation and further enhance the conference in the future. Amidst warm hospitality and effective and flawless execution by the Conference Organizing Committees, the highly successful 2017 ASNEngr 10th Annual Conference concluded on a very high note with significant enthusiasm and momentum for the next conference.

ASNEngr and the conference leaders extend their sincere appreciation and gratefully acknowledges the many hours of voluntary time and efforts contributed by the members of the various Conference Organizing Committees, with special appreciation to members of the Local Organizing Committee and volunteers, including who participated in the cultural program, to make the conference a grand success. They also deeply appreciate and acknowledge the generous support provided by all sponsors/donors.

Last but not least, sincere thanks and deep appreciation are due to authors/presenters, session chairs, invited guests, and conference attendees without whose participation the Conference would not have been possible and successful.

Sincerely,

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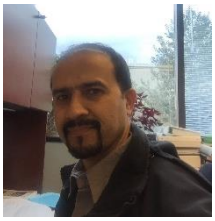

Dilli Neupane, P.E.,
Local Committee Co-Chair
Sustainable Engineering for Energy & Environment, Falls Church, VA

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Overall Program Schedule- at-a-Glance

Saturday, June 24, 2017

		Venue/Room
7:45AM – 8:45 AM	***Breakfast***	*(Conference Hall)*
7:45 AM – 1 PM*	***On-Site Registration***	*(Conference Hall)*
**Note: For evening programs, registration is open 5:30 PM -7:30 PM*		
8:45 AM – 10:05 AM	***Conference Opening & Guest Speakers***	*(Conference Hall)*
10:05 AM – 10:45 AM	**Keynote Lecture (Invited)**	*(Conference Hall)*
10:45 AM – 10:55 AM	**Break**	
10:55 AM – 12:10 PM	**Technical Session *I***	*(Conference Hall)*
	Session Title: **Plenary Session** *(Invited Speakers)*	
	(3 Presentations)	
12:10 PM – 12:55 PM	***Luncheon***	*(Conference Hall)*
12:55 PM – 1:55 PM	***Technical Session II***	*(Conference Hall)*
	Session Title: Poster Session and Interaction	
	(8 Presentations)	
1:55 PM – 3:20 PM	***Technical Session III***	*(Conference Hall)*
	Session Title: *Energy and Recent Advances in Engineering and Sciences*	
	(4 Presentations)	
3:20 PM – 3:40 PM	**Refreshment Break**	
3:40 PM – 5:00 PM	***Technical Session IV***	*(Conference Hall)*
	Session Title: *Advances in Infrastructure Research, Development, Design and Analysis*	
	(4 Presentations)	
5:00 PM – 5:15 PM	***Break***	
5:15 PM – 6:30 PM	***Open Discussion and Feedback Forum***	*(Conference Hall)*
6:15 PM – 7:30 PM	***Pre-dinner Networking Program***	*(Conference Hall)*
7:30 PM – 10:00 PM	***Dinner and Cultural Program***	*(Conference Hall)*

Sunday, June 25, 2017

8:00 AM – 9:00 AM	***Breakfast***	*(Conference Hall)*
9:00 AM – 12:00 PM	***ASNEngr Annual Membership Meeting***	*(Conference Hall)*
	(*All non-member conference attendees welcomed as Guests*)	
12:00 PM	***Conference Closure***	
12:30 PM	**Sight-seeing of Greater Washington DC Area (for those interested)**	

Detail Conference Program Schedule

Saturday, June 24, 2017

On-Site Registration **7:45 AM – 1:00 PM*** *Conference Hall*

*Note: For evening programs, registration is open 5:30 PM -7:30 PM.

Breakfast **7:45 AM – 8:45 AM** *Conference Hall*

Conference Opening **8:45 AM - 10:05 AM** *Conference Hall*

Conference Opening, Welcome, Introduction of Invited Guests, and Overall Program Overview –
by ***Ramesh B. Malla, Ph.D., F. ASCE, F. ASNEngr,*** Conference General Chair and Founding President, ASNEngr

Conference Technical Program Overview –
by ***Upendra L. Karna****,* ***D. Eng. P. E.,*** Conference Technical Chair and ***Rabin Bhattarai, Ph.D.,*** Technical Co-Chair

Local Organizing Committee Welcome –
by ***Mangal Maharjan,*** Chair, Conference Local Organizing Committee

ASNEngr Welcome and Organization Introduction–
by ***Jagannath Ghimire, P.E.,*** President, American Society of Nepalese Engineers (ASNEngr)

Invited Guest Speakers:

• ***His Excellency Arjun Karki, Ph.D.,*** Nepalese Ambassador to the United States of America, Washington, D.C.
"Inaugural Welcome Remarks"

• ***His Excellency Scott DeLisi,*** Former U.S. Ambassador to Nepal; currently Executive Director, Soarway Foundation - Engage Nepal, Canonsburg, PA
"Earthquake Preparation in Nepal and Potential Partnership Going Forward"

• ***His Excellency. Durga Prasad Bhattarai,*** Permanent Representative, Permanent Mission of Nepal to the United Nations, New York, NY
"Permanent Mission of Nepal to the UN and Nepali Diaspora"

• ***Tri Ratna Bajracharya, Ph.D.,*** Dean, Institute of Engineering (IOE), Tribhuvan University, Kathmandu, Nepal
"Collaboration between ASNEngr and IOE"

Vote of Thanks –
by Dilli Neupane, P.E., President, ASNEngr Greater Washington D.C. (GWDC) Chapter.

Keynote Speech 10:05 AM - 10:45 AM *(Conference Hall)*

"Building Resilience in Nepal's Healthcare System"

By **Judith Mitrani-Reiser, Ph.D**., Director, Disaster & Failure Studies Program, Engineering Laboratory, National Institute of Standards and Technology, MD; Assistant Professor of Civil Engineering and Emergency Medicine and Co-Director, Center for Systems Science and Engineering, Johns Hopkins University, Baltimore, MD

(Introduced by: ***Ramesh B. Malla, Ph.D., F. ASCE, F. ASNEngr****;* Founding President, ASNEngr; University of Connecticut, Storrs, CT*)*

Keynote Speaker Dr. Judith Mitrani-Reiser:

Dr. Mitrani-Reiser is the Director of the Disaster and Failure Studies Program at the National Institute of Standards and Technology (NIST) and an Assistant Professor of Civil Engineering and Emergency Medicine at Johns Hopkins University (JHU). Her research is focused on disaster metrology, the performance assessment of critical infrastructure, the safety and economic impact of hazards on the built environment, the effective communication of these risks to the public, informed decision making for use in emergency management and policy making, and the interaction of humans with the built environment. She is leading a multidisciplinary staff responsible for conducting fact-finding investigations of structural failures and disasters that resulted in substantial loss of life or that posed significant potential for substantial loss of life; promoting the implementation of recommendations from those studies to improve codes, standards and practices; and carrying out the statutory responsibilities assigned by the National Construction Safety Team (NCST) Act.

Dr. Mitrani-Reiser is an Associate of the Center for Refugee and Disaster Response (CRDR), a member of the American Society of Civil Engineers (ASCE), the Earthquake Engineering Research Institute (EERI), the Seismological Society of America (SSA), and the World Association for Disaster and Emergency Medicine (WADEM). She is the Vice Chair for ASCE's Subcommittee on Multi-Hazard Mitigation, and is a member of ASCE's Committee on Disaster Resilience of Structures and of the Committee of Critical Facilities in ASCE's Infrastructure Resilience Division, and a member of EERI's Learning From Earthquakes Committee.

Break 10:45 AM – 10:55 AM

Technical Session I 10:55 AM – 12:10 PM *(Conference Hall)*

Session Title: Plenary Session (INVITED)

Session Chairs: ***Bimal Devkota, P.E.,*** City of Baltimore, Baltimore, MD ***and Sukh Gurung, Ph.D., P.E***., Langan Engineering, Manhattan, NY.

(*Note: Presenter's name is underlined in a paper with multiple authors*)

10:55 AM – 11:20 AM
"*Field Survey and Guidelines for Preliminary Evaluation of Reinforced Concrete Buildings in Nepal*" by ***Santiago Pujol*, Ph.D.; *Prateek Shah;*** and ***Ayhan Irfanoglu*, Ph.D.,** Purdue University, W. Lafayette, IN.

11:20 AM – 11:45 AM
"***The UN Disaster Resilience Scorecard for Nepal Earthquake Recovery***" by ***Mr. Mathew Francis*, P.E., F. EERI,** AECOM, Salt Lake City, UT; ***Michael Whitworth, Ph.D.***, AECOM, Plymouth, U.K.; ***Judith Mitrani-Reiser, Ph.D.,*** Johns Hopkins University, Baltimore, MD; ***Suman Manandhar, Ph.D.***, Lumbini International Academy of Science & Technology, Lumbini Buddhist University, Lumbini, Nepal; and ***Anup Gautam, PMP***, AECOM Richmond, VA

11:45 AM – 12:10 PM
"*Policy Paper*: *Financing Hydropower for Economic Development in Nepal"* by ***Govinda Timilsina, Ph.D.,*** Environment & Energy Development Research Group, The World Bank, Washington, D.C.

Luncheon 12:10 PM – 12:55 PM *(Conference Hall)*

Technical Session II 12:55 PM – 1:55 PM *(Conference Hall)*

Session Title: *Poster Session and Interaction*

Session Chairs: *Ananda Paudel, Ph.D.,* Metropolitan State University of Denver, Denver, Co. and ***Ram C. Poudel,*** Institute of Engineering/Pulchowk, Tribhuvan University, Nepal (Currently at University of Massachusetts, Amherst, MA.)

(Note: Presenter's name is underlined in a paper with multiple authors)

(Invited) *"Application of Roof Top based Solar Electricity for Reducing Trade Deficit in Nepal"* by ***Jagan Nath Shrestha, Ph.D.,*** Center for Energy Studies, Institute of Engineering, Tribhuvan University, Nepal; and ***Debendra Bahadur Raut***, Advanced College of Management and Engineering, Purbanchal University, Nepal.

(Invited) "*Wind Solar Hybrid Minigrid System for Rural Electrification of Remote Village in Nepal*" by ***Mr. Prakash Aryal,*** Senior Officer/Program Manager, Alternative Energy Promotion Center (AEPC), Ministry of Population and Environment, Government of Nepal, Khumaltar, Lalitpur, Nepal.

"Accelerated Bridge Construction (ABC) Technology" by ***Purna Dahal*, P.E.,** RK&K, King of Prussia, PA; and ***Sudha Bhsual, P.E.,*** Geo-Explorers, Inc, Limerick, PA.

"Geotechnical Investigation in Extreme Terrain" by ***Rakam Tamang*, P.E.** and ***Michael Byle***, Tetra Tech, Inc., Langhorne, PA.

"***Nanomechanical Properties of Cement Paste***" by ***Kaushal Jha, Ph.D., P.E.,*** Raba Kistner, Inc. Houston, TX; and ***Nakin Suksawang, Ph.D., P.E.,*** Florida Institute of Technology, Melbourne, FL.

"Analysis of Water Vapor Retrievals from Ozone Monitoring Instrument" by ***Sahara Joshee,*** Towson University, Towson, MD (*Student Poster*).

"Maximizing Ozone Generation for Water Purification" by ***Sarahana Joshee,*** University of Maryland, Baltimore County, Baltimore, MD (*Student Poster*).

"Heart Beat/Pulse Detector" by **Sujana Khakural**, Senior, Electrical Engineering, George Mason University, Fairfax, Virginia, Electrical Engineering, George Mason University, Fairfax, VA (*Student Poster*)

Technical Session III 1:55 PM – 3:20 PM (*Conference Hall)*

Session Title: *Energy and Recent Advances in Engineering and Sciences*

Session Chairs*: Shyam KC, Ph.D*, The World Bank, Washington, DC and ***Rajendra Shrestha,*** **P.E**., City of Pearland, Pearland, TX

(Note: Presenter's name is underlined in a paper with multiple authors)

1:55 PM – 2:20 PM

(Invited) *"Estimation of Bagasse Based Grid Connection Cogeneration Potential in Nepal and Impact Analysis"* by ***Prof. Tri Ratna Bajracharya***, Dean, Institute of Engineering, Tribhuvan University, Kathmandu, Nepal; and ***Sagar Mani Gnawali***, Nepal Electricity Authority, Kathmandu, Nepal.

2:20 PM – 2:40 PM

"***Power: Renewables, Smart Grid and Me***" by ***Surya Lamsal, P. E.***, New York University & New York Power Authority, NY.

2:40 PM – 3:00 PM

"***A Tool for Quantifying the Snow and Glacier Melt in Higher Asian Mountains***" by ***Vinod Mahat, Ph.D.***, Stantec, Laurel, MD.

3:00 PM – 3:20 PM

"Identification of Sub-Population of Cells from Single-Cell Transcriptome data" by ***Pujan Joshi; Seung-Hyun Hong, Ph.D.;*** and ***Dong-Guk Shin, Ph.D.***, Department of Computer Science and Engineering, University of Connecticut, Storrs, CT.

Break 3:20 PM – 3:40 PM

Technical Session IV 3:40 PM – 5:00 PM (*Conference Hall)*

Session Title: ***Advances in Infrastructure Research, Development, Design, and Analysis***

Session Chairs*: Upendra Poudel, Ph.D., P.E.,* SK&A MD | Structural Engineers, Potomac, MD; and ***Rishi Baral, P.E.***, Stafford County Government, Stafford, VA

(Note: Presenter's name is underlined in a paper with multiple authors)

3:40 PM – 4:00 PM

"Earthquake Geotechnical Characterization Kathmandu Valley with Reference to the 2015 Gorkha Earthquake (Mw 7.8)" by ***Deepak Chamlagain, Ph.D.,*** Tri-Chandra M. Campus, Tribhuvan University, Kathmandu, Nepal; ***Giuseppe Lanzo, Ph.D.,*** Sapienza University of Rome, Rome, Italy; ***Alessandro Pagliaroli, Ph.D***., University of Chieti-Pescara, Pescara, Italy; ***Nakhorn Poovarodom, Ph.D.,*** Thammasat University, Pathumthani, Thailand; and ***Bibek Giri***, Tribhuvan University, Kathmandu, Nepal.

4:00 PM – 4:20 PM

"Conventional Tunneling in Difficult Ground" by ***Sandeep Pyakurel, Ph.D., P.E.,*** Gall Zeidler Consultants, Ashburn, VA.

4:20 PM – 4:40 PM

"Importance of Bridge Condition Evaluation Programs, Current Practices in the United States and It's Applicability in Nepal" by ***Upendra L. Karna, D. Eng., P. E.*** and ***Dinesh Dhakal,*** U&S Engineers, PC, Lambertville, NJ.

4:40 PM – 5:00 PM

"Resonance Analysis of a Railway Bridge under High Speed Train Load" by ***Suvash Dhakal; David Jacobs, P.E.*** *and* ***Ramesh B. Malla, Ph.D.,*** Department of Civil & Environmental Engineering, University of Connecticut, 261 Glenbrook Road, Storrs, CT.

Break **5:00 PM – 5:15PM**

Open Discussion, Comments, and Feedback Forum **5:15 PM – 6:30 PM** (*Conference Hall*)

Moderators: ***Thakur Dhakal, P.E.,*** Fairfax County Government, Fairfax, VA and **Janak Thapa, P.E.,** CH2M, Houston, TX.

Pre-dinner Networking Dinner **6:30 PM – 7:30 PM** *(Conference Hall)*

Dinner and Cultural Program **7:30 PM – 10:00 PM** *(Conference Hall)*

Sunday, June 25, 2017

Breakfast **7:30 PM – 10:00 PM** *(Conference Hall)*

ASNEngr Annual Membership Meeting **7:30 PM – 10:00 PM** *(Conference Hall)*
(All non-member conference attendees welcomed as Guests)

Conference Closure 12:00 Noon

Sightseeing Tour 12:30 PM (Start time)
(For those interested). *Locations: Greater Washington DC* area

Technical Presentation Abstracts

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Field Survey and Guidelines for Preliminary Evaluation of Reinforced Concrete Buildings in Nepal

Santiago Pujol, Ph.D.[1]; Prateek Shah[2]; and Ayhan Irfanoglu, Ph.D.[3]

Lyles School of Civil Engineering, Purdue University,
West Lafayette, IN, USA

ABSTRACT

Following the 2015 April Gorkha Earthquake, engineers from Purdue University collaborated with Nepalese engineers and the Department of Urban Development and Building Construction of the Ministry of Urban Development to survey reinforced concrete (RC) buildings in Kathmandu. The reconnaissance effort, funded by the American Concrete Institute (ACI) and carried over two weeks in June 2015, resulted in data about 176 buildings in the capital. 30 of these RC buildings were high-rise (8 to 17 stories) while the remaining 146 were low-rise (7 or fewer stories). Observations made in Kathmandu, along with those made after earthquakes in Japan, Turkey, Haiti, and China, and insight from ACI 314 ("Guide to Simplified Design for RC Buildings") were used to develop a set of guidelines for preliminary evaluation of RC buildings in Nepal.

"Priority Index" (Hassan and Sozen, 1997) which ranks RC buildings in relative vulnerability against earthquake ground motions is used to compare surveyed buildings with those surveyed in Turkey after the 1999 earthquakes and those surveyed in Haiti after the 2010 earthquake. It is found that the mean Priority Index (PI) of low-rise buildings surveyed in Kathmandu was 0.19% while PI was 0.32% for buildings surveyed in Turkey and 0.24% for those surveyed in Haiti.

A summary of the field data and observations made in Kathmandu, and their comparison with those made elsewhere, will be given. The aforementioned guidelines for preliminary evaluation of RC buildings will be presented.

All data gathered during the reconnaissance are publicly available through the DataCenterHub at datacenterhub.org.

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The UN Disaster Resilience Scorecard for Nepal Earthquake Recovery

Mathew Francis, P.E.[1]; Michael Whitworth, Ph.D.[2]; Judith Mitrani-Reiser, Ph.D.[3]; Suman Manandhar, Ph.D.[4]; and Anup Gautam, PMP[5]

[1]AECOM Salt Lake City, UT, USA
[2]AECOM Plymouth, UK
[3]National Institute of Standards & Technology, MD, USA
[4]International Center for Disaster Studies, Lumbini Buddhist University, Lumbini, Nepal
[5]AECOM Richmond, VA, USA

ABSTRACT

Developed as part of a collaborative effort by AECOM and IBM with USAID, the UN Disaster Resilience Scorecard provides a holistic basis for planning and organizing institutional and social capacity building, emergency planning, capital resource allocation and investment (AECOM et. al. 2017). Ten essentials of resilience with scoring criteria have been organized and refined by pilot studies in more than two dozen cities around the globe to provide sharing of examples and lessons learned.

Following the Nepal 2015 Earthquake, a team of AECOM engineers took a series of field missions to understand the impact of the earthquake on key infrastructure facilities. The UN Disaster Resilience Scorecard provides a basis for evaluation Disaster Risk Reduction (DRR) benefits through the Sendai Protocol, to the UN Global Goals for Sustainable Development and UN Risk Sensitive Investment Program aimed at better-prioritizing DRR strategies, risk metrics, training, and ensuring resilience (UNISDR, 2015). AECOM and collaborating partners have been implementing the UN Disaster Scorecard in a variety of mountain settings including Kathmandu, Nepal; Quito, Ecuador; Phoenix, AZ; Denver, CO and Salt Lake County, UT.

This presentation will provide perspectives for earthquake disaster resilience in Nepal drawing on observed parallels with other mountainous and seismic areas. We will report on specific activities underway or completed in Nepal using the Scorecard Ten Essentials to address physical and operational resilience and capacity development across the disaster cycle. Activities include UK funded integrated recovery planning geospatial data collection and management platform planned for localizing the PDNA/PDRF across all affected areas of Nepal, event observation data, and lessons learned in fast track integrated Nepal rural community reconstruction.

References:

AECOM, IBM, USAID & UNISDR, 2017. The Ten Essentials for Making Cities Resilient, Cancun 2017.
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UNISDR, 2015. Sendai Framework for Disaster Risk Reduction 2015-2030, World Conference on Disaster Risk Reduction, Sendai, Japan. https://sustainabledevelopment.un.org/frameworks/sendaiframework

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Policy Paper: Financing Hydropower for Economic Development in Nepal

Govinda Timilsina, Ph.D.[1]

Environment & Energy Development Research Group, World Bank
Washington, DC 20433, USA

ABSTRACT

This presentation will provide an assessment of current status of hydropower development in Nepal including currently operational projects, under construction projects and distribution of hydropower construction licenses. This will be followed by a discussion on market barriers to Nepal's hydropower development. Based on an existing study by the same author, the presentation will then highlight how a creation of South Asia regional electricity grid would help exploit Nepal's hydropower resources and contribute to country's economic development. Finally, the presentation will discuss potential financial mechanisms for hydropower development in Nepal including experience from other countries like Bhutan and Ethiopia.

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Application of Roof Top based Solar Electricity for Reducing Trade Deficit in Nepal

Jagan Nath Shrestha, Ph.D.[1] and Debendra Bahadur Raut[2]

[1]Center for Energy Studies, Institute of Engineering, Tribhuvan University, Nepal
[2]Advanced College of Management and Engineering, Purbanchal University, Nepal

ABSTRACT

Nepal Electricity Authority (NEA) is importing electrical energy worth NRs. 15 Billion in the current fiscal year from India. There is almost no load-shedding/power outage due to this import resulting in significant trade deficit of Nepal with India. How can this trade deficit be reduced using clean energy sources available locally? The paper focusses to address this question. This paper assesses the PV market potential and feasibility of urban roof top solar PV system focussing on the three major cities of Nepal namely Kathmandu valley, Pokhara and Biratnagar. The number of samples for field survey taken was 202 in residential sector in Kathmandu Valley and 42 samples each for Pokhara and Biratnagar cities. All primary data were collected based on three sets of questionnaires.

Based on the findings from the field survey, the gross roof top area of residential buildings was found to be 76 m^2, 51 m^2 and 91 m^2in Kathmandu, Pokhara and Biratnagar cities respectively, out of which 14.5 m^2, 12.45 m^2 and 19 m^2 of rooftop area are available for PV installation in the respective cities. The PV installation area, based on the respondents, was estimated as 30% of the shadow free area in the residential buildings. It is estimated that about 810 MWp roof top PV systems can be installed in Kathmandu Valley, 96.5 MWp in Pokhara city and 63.5 MWp in Biratnagar city and total potential in all three cities comes out to be 970 MWp.

For the feasibility study, the PV sizes ranging from 200 Wp to 5 kWp has been designed and accordingly cost is estimated. It is found that 200 Wp PV system can be installed in almost all residential Buildings in the selected cities where as 1.5 kWp system can be installed in 350,295 residential Buildings in Kathmandu, 35,070 Buildings in Pokhara and 32,288 buildings in Biratnagar city. The total potential with installation of 200 Wp PV system is 134 MWp, 315 MWp with 500 Wp, 626 MWp with 1.5 kWp. The average cost of 1.5 kWp PV system is estimated as NRs 418,032 in backup mode and NRs 322,186 in feed in mode. The per unit energy cost of 1.5 kWp PV system in backup mode (40 % backup) is found to be NRs 19.6 with 60 EMI and 2.25 % interest rate. Similarly, in feed in mode about NRs 6/kWh is estimated with the same subsidy as in the backup mode.

The LCOE value changes significantly, when residential electrical loads such as from basic lighting only to full load devices such as lights, TV/computers, small friezes, rice cooker, microwave, water pumping and the ironing (but not all of these used at a time), from NRs 8/kWh to NRs 20/kWh. If all the residential buildings totaling 667,525 numbers in all three cities were installed with PV rooftop system, 35% of the NEA electricity sold in FY 2014/15 (i.e. 3,743.75 GWh) could be saved. This indicates the significant annual saving of about NRs. 10.8 billion.

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Wind Solar Hybrid Minigrid system for rural electrification of remote village in Nepal

Prakash Aryal

Alternative Energy Promotion Center (AEPC), Ministry of Population and Environment
Khumaltar, Lalitpur, Nepal

ABSTRACT

Ample and reliable accessibility of usable energy sources is one of the prerequisites for social and economic development of a country. Nepal is facing a big challenge to provide the energy to meet the basic needs of people due to poor infrastructure development and lack of fund for investment in the generation and management of energy sources. The majority of people are still dependent on inefficient use of traditional biomass energy sources. Portfolio of renewable energy is in increasing order contributing sustainable energy solution. As compared to 2005 data only 0.6% of total energy consumption was supplied from renewable energy resources, this data reached to 3% in 2016.

The technical design of an off-grid hybrid wind-solar minigrid system implemented at Dangibada, Tatopani Village of Jumla District, Mid-Western development region of Nepal was targeted for rural electrification of at least 140 rural Households. Alternative Energy Promotion Center has proposed this village as one of the sub-projects in minigrid (wind/solar) category because of lack of access of energy sources in the village despite of having tremendous potential of wind energy resources in the village (Fig. 1 and 2). The village is located in Tatopani VDC ward no 5 of Jumla district, Karnali, Nepal. The geographical coordinate (WGS 1984) of the proposed site is 29°16'33.41"N, 81°11'0.12"E and elevation 2306 m above sea level.

Figure 1: Wind Potential in the at Village

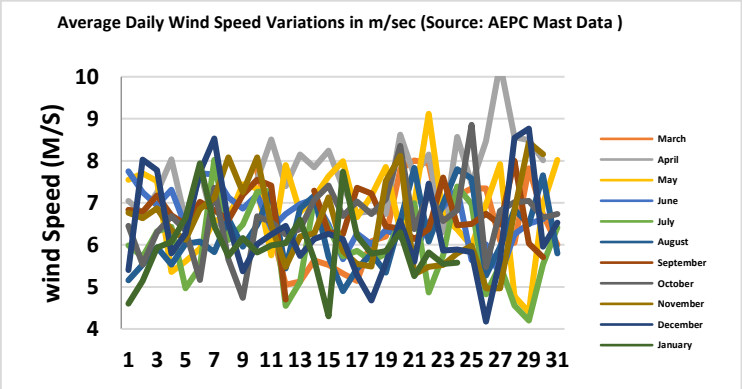

Figure 2: Average Daily Wind Speed Variation

The wind-solar hybrid minigrid system design allocates 220 W per household plus about 7 kW for productive end use activities among 140 households in the Dangibada village including a primary school. Proportion of productive end use is about one fifth of the proposed installation to facilitate commercial activities in the village.

A wind solar hybrid system of total capacity 45 kW has been designed to meet base year (2016) and

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forecasted electricity demand of 140 households until 2019. The grid compatible minigrid distribution system spans approximately 1620 m out of which 350 m is 3 phase distribution system to support entrepreneur activities in the village.

Table 1 presents technical configuration of the proposed generation system. The cost of the 45 kW wind solar hybrid system is estimated at $ 301,879 that amount to $ 6,708 per kW of the system on all-cost-basis. This cost includes warranty and operation and maintenance management cost for period of three years for the date of commissioning. As compared to the traditional kerosene lamp based lighting solution, which cost USD 3 per month per HH, the lifecycle cost (including government subsidy) of wind solar hybrid system is estimated to be USD 2.5 per month per HH. However, other additional socio-economic benefits of wind-solar hybrid electrification includes employment opportunities for local people, computer education for children, proper lightning facilities on village, commercial agriculture development, development of this area as small market center, empowerment of local indigenous people and female and improved health condition of women, children and HH residents.

Table 1: Technical Configuration of Proposed Generation System

Component	QTY	Unit	Total
Wind Turbine	2	15 kW + 5 kW	20 kW
Solar PV	90	280 Wp	25.2 kWp
Battery Bank	220	2V/1000 Ah	220V/2000 Ah
DC/AC Inverter	1	45 kVA	45 KVA

The project is environmentally viable since it doesn't have severe impacts on existing environmental condition and many efforts can be to minimize and mitigate environmental footprint of the project. Hence wind solar hybrid system act as major source of energy for rural electrification in such isolated remote villages in mountain region of Nepal.

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Accelerated Bridge Construction (ABC) Technology

Purna Dahal, P.E.[1] and Sudha Bhusal, P.E.[2]

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ABSTRACT

United States bridges are continuing to aging and 4 out of 10 bridges are 50 years or older. ASCE infrastructure report card - 2017 shows 9.1% of the bridges nationally are structurally deficient requiring close attention for bridge replacement or major rehabilitation to the structure. Bridges in rural area where there is less traffic are usually constructed using conventional staged construction method. For those heavily trafficked bridges where extended road closures are practically impossible, an innovative method of construction called accelerated bridge construction (ABC) has been popular these days.

This paper will identify the current method of ABC and its future prospective. Many US states are promoting ABC methods because of innovative planning, design, materials use, minimum traffic disruption, improved work zone safety and reduced on-site environmental impacts. This method speeds up the bridge construction in a unique way. Most of the bridge elements will be prefabricated off-site or adjacent to the site and installed them using heavy lifting crane or Self-Propelled Modular Transporters (SPMT). Prefabricated substructure components of the bridge are connected using splice couplers with grout that can provide 100% specified minimum tensile strength of connecting steel bar. The deck will be casted with beam. Either whole superstructure or portions of superstructure are assembled off the bridge site, brought back to the bridge site and lifted to the place for connecting to the other components. Ultra-High Performance Cement (UHPC) is used in deck closure pour. UHPC is proven to have compressive strength of 20 to 30 ksi with flexural strength of 3 to 7 ksi thereby transferring full moment from one member to another.

There will not be a break time once the construction starts. The construction worker and the design team need to work in multiple shifts from the beginning to the end of construction. Currently there are limited contractors to take this innovative technique in place. Though ABC reduces the traffic delays and hazards to the travelling public, it relatively has higher direct construction cost. However, considering secondary costs such as traffic disruption time, lane closure cost, time spent by people and goods stuck in traffic, detour travel time, impact during construction period to the local economics, the incurred savings on these costs will overcome the increased direct construction costs of ABC. An extensive training to the contractors and guidelines to the planners, designers and fabricators are required for the successful completion of ABC projects.

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Geotechnical Investigation in Extreme Terrain

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ABSTRACT

In spite of the challenging geographical condition, the infrastructure such as roads, bridges, buildings, dams, etc. are required to be constructed in extreme hilly terrain to improve the quality of life and economic condition of the locality. For the sustainable design of infrastructure, it is crucial to understand the geological, geotechnical and hydrogeological characteristics of the soil and rock in the project area. Those properties of soil and rock can be obtained from geotechnical investigation, which helps to understand the geological interaction of the soil and rock system, and provide an important basis for the engineering design and evaluation. Geotechnical investigation in extreme terrain is challenging due to accessibility and safety issue. Therefore, it may require special equipment and safety measures. The steps of the geotechnical investigation in extreme terrain will be discussed in this presentation focusing on challenges and issues that may be encountered during the geotechnical investigation, and necessary precautions and steps to be undertaken during the geotechnical investigation. The important steps of the geotechnical investigation includes site reconnaissance, preparation of work plan, equipment set up, and finally field investigation. Normally, field investigation includes traditional soil boring, rock coring, and geophysical testing such as optical and acoustic tele viewer, parallel seismic, sonar survey, three-dimensional sonar imaging, hydrogeological testing such as packer testing, slug tests, and geotechnical instrumentation. Due to steep topography the site may not be accessible to regular truck and track mounted drill rigs. At those project sites, skid mounted drill rigs can be used, which are required to be transported via helicopter, crane or by labor force after dissembling into several components. For the purpose of setting up drill rigs, special platforms are required to be constructed at the anticipated borehole locations, where the components of drill rig can be reassembled. Crane basket can be used to access the site with the use of a fall restraint system for safety.

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Nanomechanical Properties of Cement Paste

Kaushal Jha, Ph.D., P.E.[1] and Nakin Suksawang, Ph.D., P.E.[2]

[1]Raba Kistner, Inc. Houston, TX
[2]Florida Institute of Technology, Melbourne, FL

ABSTRACT

Multiscale material modeling of structural concrete requires the measurement of mechanical properties such as reduced elastic modulus and hardness of its nano-constituents: C-S-H, unhydrated clinker etc. These quantities are normally measured with the help of an experiment called nanoindentation. The elastic modulus and hardness of nano-constituents are then extracted from the load-displacement curves obtained from this experiment. In this paper, an energy based nanomechanical properties of cement that facilitates their evaluation in a more meaningful way will be presented. Energy parameters can be directly read off from the load displacement curve obtained from the nanoindentation experiment. Although in this work, cement paste was used as a target material, the proposed method can be applied to any heterogeneous material. The main advantage of the proposed method is that the physical quantities used in the determination of mechanical properties such as initial unloading stiffness and hardness can be expressed as the function of energy dissipated and recovered during indentation and is particularly best suited for composite materials where large number of indentation called grid indentation is required to be performed. Finally, the efficacy of the proposed method will be demonstrated with the results from materials having wide range of strength and stiffness properties.

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Analysis of Water Vapor Retrievals from Ozone Monitoring Instrument

Sahara Joshee[1]

Towson University, Towson, MD

ABSTRACT

Information about water vapor (H2O) obtained from the Ozone Monitoring Instrument (OMI) from July 15, 2006 was analyzed using Interactive Data Language (IDL). H2O data were retrieved from two independent algorithms developed at NASA Goddard Space Flight Center and Smithsonian Astrophysical Observatory (SAO). The objectives are to characterize the two products, the air mass factors, and the comparison between the two products.

The OMI detects solar backscatter radiation in the visible and ultraviolet spectra, the instrument provides hyperspectral imaging in a push-broom mode. The spectral range on the OMI measurements allows observations of different trace gases (e.g. Ozone, nitrogen dioxide, water vapor), separation of the differences in aerosol types (i.e. smoke, dust, and sulfates), and information on cloud pressure and coverage. The OMI on sun-synchronous polar orbit provides measurement with a daily global coverage with 14-15 orbits. Here, we use the Differential Optical Absorption Spectroscopy (DOAS) technique to derive H2O column (the number of H2O molecules between the surface and the top of the atmosphere) from the OMI instrument. Retrieval is performed in the spectral range center around 444 nm. As compared to the SAO algorithm, the NASA algorithm uses smaller fitting window to derive slant column (column along the light path) density. Figure 1 shows a comparison of H2O retrievals by SAO and NASA algorithm for orbit 10627. Data from the two algorithms are broadly consistent. As expected, there is more water vapor over water in comparison to land. Minor differences that can be seen are on the Pacific Ocean to the left of New Zealand and to the left of Alaska in the first map. Figure 2 shows AMFs, the enhancement factors, required to convert slant to vertical column densities. The AMF is calculated using radiative transfer model. Figure 3 shows a scatter plot comparing the two retrievals.

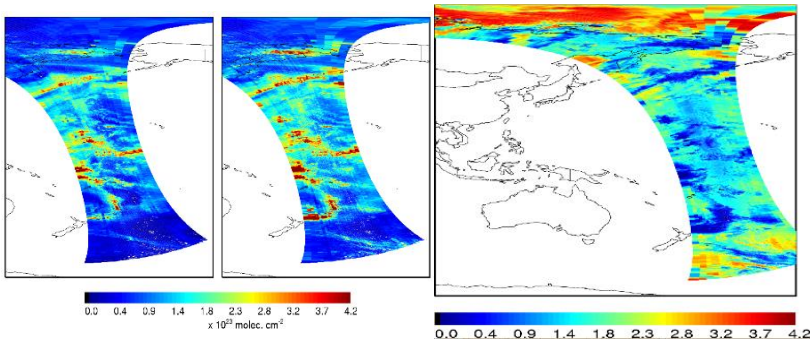

Figure 1 Figure 2 Figure 3

Water vapor is significant because it contributes to atmospheric chemistry, affects the retrieval of numerous trace gases, is the most abundant greenhouse gas, and is a key factor for the weather. The finalized maps display results that puts both SAO and NASA data in general agreement. As expected, water vapor was found to be more abundant over ocean in comparison to land. Overall, NASA data are higher than SAO data. Comparison of SAO data with collocated observations from GPS suggest that SAO data are biased low. This implies that NASA data better compare with GPS observations. Future work should focus on comparing NASA retrievals with other independent datasets to fully characterize NASA H_2O data.

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Maximizing Ozone Generation for Water Purification

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ABSTRACT

Ozone is a gas that occurs naturally in Earth's upper atmosphere and at times, on the ground. In the atmosphere, it acts as a shield from the sun's rays, however; it acts as a pollutant on the ground. Despite its harmful effects, ozone has proven as an effective disinfectant against bacteria, as well as a powerful oxidizing agent against metals. These characteristics of O3 enable it to be used as an efficient water purifier. Other than natural production, O3 can be manufactured through a variety of means. To determine what input conditions will produce the most amount of O3, we constructed our own ozone generator that utilized the Corona Discharge method. We then tested three conditions: water temperature at 0°C and 21°C, humidity level at 54% and 86%, and exposure time at either 5 or 10-minutes. A total of eight combinations were tested. At the end of each exposure, the amount of ozone produced was determined using O3 test strips and then quantified using RGB color-matching. After conducting research, we hypothesized that the lower water temperature, lower humidity, and higher exposure time would yield the highest ozone generation. However, we found the optimal O3 generation to be 0.2136 ppm ozone at 21°C H2O and 86% humidity at a 5-minute exposure time. Because this combination of factors was the opposite of our initial hypothesis, we concluded that this was due to our system. We were potentially generating too little ozone and there was not enough air flow coming into the system. To improve our system, we plan on increasing the air flow feeding into the Corona Discharge method by using different types of insulators and varying the voltage being put into the system. To confirm that our system was the reason why our results contradicted our hypothesis, we used a lab grade generator to test our factors. We were only able to test temperature and exposure time with the lab grade generator, as the inlet was fixed as pure oxygen. Using an indigo dye solution, we could quantify our ozone concentration through spectrophotometry. The results we found with the lab grade generator backed up our hypothesis.

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Heart Beat/Pulse Detector

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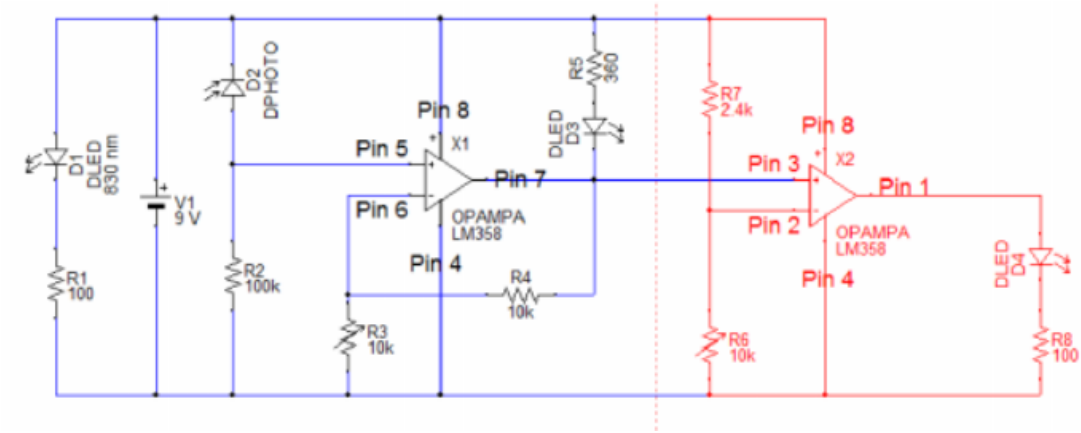
ABSTRACT

The heart beat detector is one of the most important discoveries of mankind. Modern pulse detectors play a very significant role, especially in medical field. Patient's heart beat must be monitored while undergoing a treatment.

The circuit presented here is a simplified version of such detector. This circuit shows the pulse in a finger. It uses a photo diode and an Infrared LED to measure the slight changes in light, causing an LED to flicker. These changes in light are caused by the light movement of the vein in the finger, hence display the heart pulse. When there is nothing between the Infrared LED and the photodiode, the LED turns off and another LED is lit to indicated that nothing is there to measure.



A demo is available at the following link:
https://www.youtube.com/watch?v=S6mYjRPo2xQ&feature=youtu.be

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Estimation of Bagasse Based Grid Connection Cogeneration Potential in Nepal and Impact Analysis

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ABSTRACT

This paper outlines the grid connected cogeneration potential of Nepalese sugar mills and its impact on Integrated Nepalese Power System (INPS). Bagasse based cogeneration plants could contribute as firm power source in INPS and take some base load of the system continuously in their crushing season (December to March); the most four dry months in Nepal. Total sugarcane crushing in major 12 sugar mills of Nepal was collected in collaboration with sugar mills association Nepal. By generating Bagasse to energy, conversion formula, total grid connected cogeneration potential is estimated. Based on this study, 69 MW of electricity can be added to national grid in most four dry months of winter season in current sugarcane crushing capacity and it can go up to 94 MW in full crushing capacity of sugar mills; which is 10% and 13% energy of the day based on 14 Feb 2017. By addition of cogeneration in current crushing mode, the load shedding could be reduced to peak four hours of the day with reduction of unmet demand from 2488 MWh to 978 MWh. Similarly, the load shedding could reduce to peak two hours of the day with reduction of unmet demand from 2488 MWh to 350 MWh in full crushing capacity. Because of grid-connected cogeneration, the Peak Run off River Plants of Nepal Electricity Authority (NEA) could operate in maximum capacity in peak hours. Load flow analysis of all twelve-sugar mills in Integrated Nepalese Power System found that voltage profile of bus and branches in Tarai region of Nepal was greatly improved and tends towards 1 p.u. The overall transmission loss of grid was decreased by 0.1%.

Adopting cogeneration in sugar mills has multidimensional benefits in Nepal. Sugarcane farmers can get timely and better payment, the sugar mills can earn more money by power sell, NEA could get firm power at most dry period of the year and the Nation would get a sustainable source of energy from own resources.

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Power: Renewables, Smart Grid and Me

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New York Power Authority & New York University, NY

ABSTRACT

This presentation summaries the status of renewable energy resources in United States with an example from New York for Hydro – with Wind and Solar across the nation – and their current state of integration into the Grid to the distribution level serving their customers.

Development of hydropower projects in United States is associated with a strategic and political need but later added significant values in the progressive growth of renewable energy resources. Challenges associated with the operation and management of hydropower projects exist. Means and methods to overcome the challenges are exemplary and may add lesson-learned values to the future projects.

United Nation's goals to combat climate change have motivated nations, including United States, and changed their policies towards setting up clean energy objectives. Renewable Portfolio Standards have driven each State of United States towards achieving its clean energy goals. Wind and Solar, as major two aggressively multiplying resources of renewable energy, United States is investing drastically towards achieving its renewable energy goals.

Emerging technologies, renewable energy policies and availability of energy resources have changed the topography of existing network – that carries power from its sources to consumers – leading towards Smart Grid. A need for safety and security is significant to ensure reliability, an important system parameter in electrical industry.

Electricity market is driven by consumers as an ultimate beneficiary of electricity. Consumers participate in market such that the price is competitive, renewable energy resources are properly integrated, economic values of electricity is assured, and mostly, power availability is guaranteed.

This presentation, at its end, outlines challenges in development of hydropower projects in USA and compares that with the one in Nepal.

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A Tool for Quantifying the Snow and Glacier Melt in Higher Asian Mountains

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Stantec, Laurel, MD

ABSTRACT

Snow and glacier melt contributes a significant amount of flow to the Himalayan rivers originating from the high Mountains of Nepal. Quantification of the shares of snow and glacier melt in the rivers of Nepal is very important as water is the basis for much economic development, including industry, transportation, irrigation and energy production. Poor infrastructures and difficult terrain of Nepal have made the monitoring of snow and glacier melt outflow very challenging, thus a modeling based technique may offer the potential for providing information related to snow and glacier melt, which can be used for water resources management and decision making. Existing modeling approach either uses a simple air temperature based degree day approach or highly simplified energy balance approach to quantify snow and glacier melt.

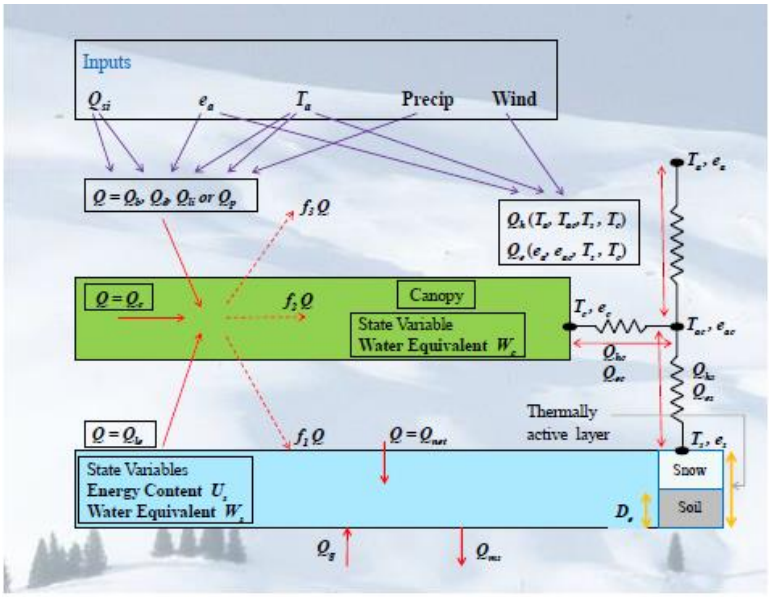

Figure 1 Schematic of Utah Energy Balance Snowmelt model

Either approach inadequately represents the energy transfer process that is very important to consider in snow glacier melt modeling. This paper develops a model that addresses those limitations and has a capacity of informing decisions on water resource management in a changing climate regime in the high Mountain Asia region, including Nepal. Snow and glacier melt is driven by the balance of energy at the interface between glacier and atmosphere, which is controlled by meteorological conditions (temperature and radiation) above the snow or glacier and the physical properties of the snow or glacier itself. To perform a complete energy balance, this study starts with spatially distributed Utah Energy Balance (UEB) (Figure 1) snowmelt model that is widely used to study the snow in the Mountains of North America. The model is then enhanced to make it suitable for use for the higher Himalayan region. The model quantifies the snow and glacier melt based on the physically-based calculations of the radiative, sensible, latent and advective heat exchanges (i.e., exchanges, or fluxes, of energy due to incoming and outgoing short- and long-wave radiation, thermal or heat conduction, evaporation and condensation, and horizontal heat transport), driven by the inputs of air temperature, precipitation, wind speed, and humidity.

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Identification of Sub-Population of Cells from Single-Cell Transcriptome data

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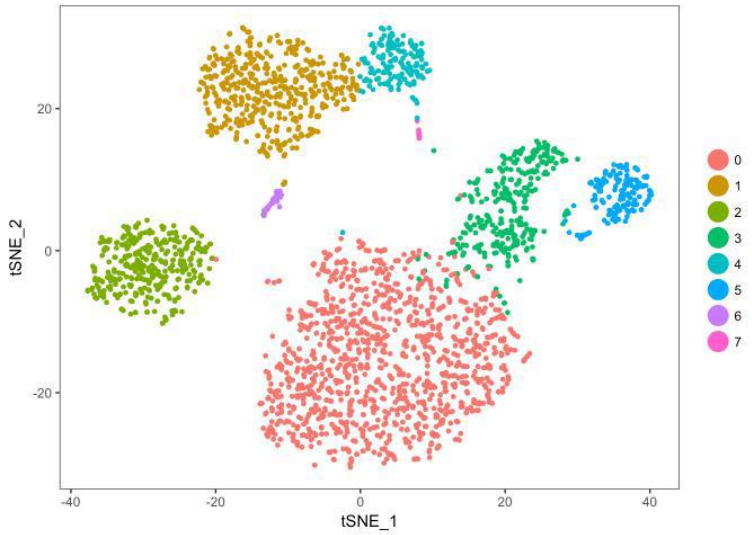
ABSTRACT

Genome wide transcriptome analysis has been widely used for the past few decades to understand genomic behavior in different tissue samples. Multi-cellular organisms consist of various cell types with different roles and behavior. Additionally, cells in homogenous mixture can show different profile due to stochastic variation and differences in their cell-cycle stages or local environment. The traditional whole-tissue transcriptomics provide expression profiles that are averaged over all the cells in the tissue. To overcome this "average-out" effect, scientists are gradually moving towards single-cell level transcriptome analysis. Recent advancements in single-cell technology enable simultaneous measurement of expression levels of thousands of genes in hundreds or even thousands of cells. This precision and efficiency in generation of high dimensional single cell transcriptomics data has made it possible to deepen our understanding of the cellular heterogeneity in homogeneous population.



Now that we have gene expression profile from hundreds of cells, direct comparison between every possible pairs of cells may not be very useful because of their natural differences. However, identification of cell sub-population in tissues adds an essential milestone in single-cell analysis to understand the regenerative behavior and various cell cycle stages. Furthermore, identification of cell sub-population in a tissue will help understand the intricacies (differentiation, polymorphism etc.) and will enable design of precise drug treatments to target specific cell types while keeping other cells undisturbed. In this study, we have devised a novel graph based clustering approach that uses relevant pathway information to assign weighted scores to edges between the nodes. We use Euclidean distance to compute Shared Nearest Neighbor (SNN) graph, then update the edge scores by assigning more weights to related genes in relevant pathways. We then repeatedly combine near-complete sub-graphs until the edges pass a distance threshold. The resulting sub-graphs are our clusters which will represent various sub-population of cells. We will discuss outcomes from various case studies and comparison with other existing methods.

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Earthquake Geotechnical Characterization Kathmandu Valley with Reference to the 2015 Gorkha Earthquake (Mw 7.8)

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ABSTRACT

The Kathmandu Valley is an intermontane basin bounded by Main Central Thrust to the south and an out of sequence thrust in the north. Geologically, it is composed of fluvio-lacustrine deposits of thickness up to about 650 m in the central part. The northern part of the valley is mainly made of sand dominated sequences, whereas southern part is mainly characterized by black sticky clay of lacustrine environment. The valley is basically composed of unconsolidated to semi-consolidated alternating layers of sand, clay, silty clay and is underlain by sequence of sand and gravel deposits sourced from the peripheral hills.

On April 25, 2015 at 11:56 AM, the Mw 7.8 Gorkha earthquake jolted the eastern part of the central Himalayan seismic gap. The epicentre was located near the Barpak village of Gorkha district, about 77 km NW of Kathmandu valley. Successive aftershocks on April 26 (Ml 6.9) and May 12 (Ml 6.8) hit the ruptured area towards the east of main shock. The seismic sequence is characterized by the eastward migration of aftershock partly encompassing the Kathmandu valley causing the disproportional damages throughout the rupture zone including Kathmandu Valley. The local geology and geotechnical properties of the particular site greatly modifies the ground motion characteristics at surface hence the damage pattern. During the Gorkha seismic sequence it was observed that the modification of the seismic wave due to local geology greatly contributed to the damage intensity in the Kathmandu Valley. The resulting strong non-linearity effects of the soft soils of the valley have given the differential damage patterns. Therefore, in this contribution geotechnical characterization of low-plasticity silty soils retrieved in the Kathmandu valley is presented based on cyclic tri-axial laboratory tests. In addition, strong ground motion characteristics and ambient noise measurement data are also presented to complement the geotechnical characteristics. Further, the seismic site effects analysis in the representative areas have clearly reflected de-amplification

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Conventional Tunneling in Difficult Ground

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ABSTRACT

Difficult ground conditions in tunneling is referred as either soft ground or hard rock which may result instability issues and high deformations. This also includes ground with highly variable stress and squeezing conditions. Other difficult situations include tunneling in running and flowing ground, tunneling under high water pressure, mixed face conditions and complex geometrical configurations having multiple intersecting galleries along with presence of above ground sensitive and fragile buildings. Tunneling through such ground is technically challenging among others due to impractically heavy support requirements and there is also need to explore new and implement proven technologies that will provide safe design and minimize construction risks.

Engineers have adapted to other existing knowledge and technologies to deal with such difficult situations, often on a case-by-case basis. They have developed technical approaches and implementation techniques, and established sophisticated collaboration in the field among various parties for successful implementation. Innovations in yielding support design allow the tunnel support to undergo high deformations in a controlled manner while maintaining the structural integrity. Similarly, development in ground freezing technologies have allowed to excavate in very weak soft ground and often considered as preferred method due to their reliability and capability of positively managing risks.

This paper provides an overview of conventional tunneling methods and discusses design aspects of relatively new and proven tunneling methods including implementation of yielding support system and ground freezing technologies to mitigate risk associated with structural failure while tunneling in difficult ground conditions. Four project specific case histories will be used to demonstrate the applicability of the new methods in projects ranging from 160 million to approximately 500 million. The paper also highlights potentiality of adopting such new methods for tunneling in Himalayas where complex geology, highly variable stress conditions from regional seismicity and soft ground like conditions from faulting prevail making tunneling a challenging task.

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Importance of Bridge Condition Evaluation Programs, Current Practices in the United States and It's Applicability in Nepal

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ABSTRACT

Bridges are the long-term investment of the highway agencies. One of the focuses of the highway agencies is to trade-off between serviceability/reliability of the bridge structures and associated investment throughout the design service life of bridge structures. The effective bridge condition evaluation program would improve public safety as well as provide optimum economic benefits to the highway agencies in long-term; however, suitable bridge evaluation practices and its management is important. Federal Highway Administration (FHWA) has mandated to all states and local bridge owners to evaluate the condition periodically and document in the national database system. American Association of State Highway and Transportation Officials (AASHTO), Transportation Research Board (TRB), Universities and other research organizations have been constantly working in association with FHWA to develop a highly effective bridge condition evaluation system.

This paper will highlight the current bridge condition evaluation programs and practices that are being employed nationwide in the United States. Also, this paper will briefly present the bridge condition evaluation system and practices that are currently being considered by New Jersey Department of Transportation (NJDOT) in state and local level. Important field collected information and findings will be presented to elaborate the importance of the bridge condition evaluation. By having an effective condition evaluation program, highway agencies have been able to plan preservation, maintenance, repair, rehabilitation and replacement of bridge structures by saving significant amount of money and lives. Many of the structurally deficient bridges are in service condition with applying effective maintenance and innovative repair techniques results an extended life of bridge structures.

Also, the benefits of implementing the bridge condition evaluation program in Nepal along with challenges and modifications based on the existing resources in Department of Road, Nepal (DOR), existing bridge types, bridge location and exposure environment will be discussed. The effectiveness current bridge condition evaluation practices employed in Nepal will be evaluated and discussed. The relevant bridge condition evaluation program that could be suitable and applicable for the implementation with the condition of Nepal will be explored, discussed and recommended.

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Resonance Analysis of a Railway Bridge under High Speed Train Load

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ABSTRACT

Amtrak's Northeast Corridor (NEC) between Washington D.C. and Boston, MA is one of the highest priority routes in the country chosen for upgrade to high speed rail. There are 64 major open deck truss bridge spans in the NEC alone and except for three spans, all bridges are close to or more than hundred years old. Nationwide, there are significant number of open deck truss railroad bridges. Open deck trusses are an extremely common railroad bridge design nationwide, especially for spans greater than roughly 150 ft. The series of axle loads passing through the bridge will act like a periodic loading, inducing vibration on the bridge and if that frequency matches with the natural frequency of the bridge it might lead to the phenomenon of resonance, causing the response of the bridge to increase significantly posing a threat to the safety of the bridge, trains and the passengers.

This paper investigates the resonant characteristics of a steel railroad bridge when high-speed trains pass through it, determination of critical speed at which the resonance occurs and the safe speed of the train to avoid phenomenon of resonance. Finite element analysis and field experiment was carried on a historic 111 year old steel open deck through truss Railroad Bridge over Housatonic river in Connecticut, U.S.A. It's design is typical of several bridges under operation and hence would be a good representation of bridge responses under train loads. The bridge has two tracks and is traversed by both freight and passenger trains, including Amtrak Acela trains, however the scope of this paper is limited to the response analysis of the bridge under passenger trains only.

One of the spans next to the abutment was modeled in Finite element (FE) package and Modal, Static, Static moving load and dynamic moving vehicle load analysis were performed. The loading chosen for analysis were based on axle load, axle configurations of passenger trains and the time of entry of the loads. The mode shapes and natural frequency along with the time history of various nodal displacements and stress of members were computed and compared with field tests. The FE model was then calibrated to have some coherence with the response obtained from field experiments. The updated FE model was then used to obtain the response of the bridge under different types of trains moving at speeds higher than currently allowable maximum speed for train operation on the bridge. The results from the FE model show that at some range of speeds, the displacement of certain nodes increased significantly.

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