



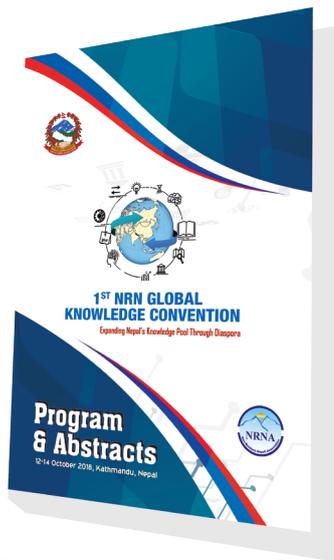
# 1<sup>ST</sup> NRN GLOBAL KNOWLEDGE CONVENTION

12-14 October 2018, Kathmandu, Nepal

**Expanding Nepal's Knowledge Pool Through Diaspora**

# Program & Abstracts





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प्रधानमन्त्री

शुभकामना

नेपाल सरकार तथा गैर-आवासीय नेपाली संघद्वारा यही असोज २६ देखि २८ गतेसम्म राजधानीमा पहिलो एनआरएन ग्लोबल नलेज कन्भेन्सनको आयोजना गर्न लागिएको थाहा पाउँदा खुसी लागेको छ। यस कार्यक्रममा भाग लिन देश विदेशबाट आउनु भएका सम्पूर्ण विज्ञहरुलाई स्वागत गर्दछु।

संघीय लोकतान्त्रिक गणतन्त्र संस्थागत भइसकेको अबको परिप्रेक्ष्यमा देशको आर्थिक सामाजिक रुपान्तरण गर्दै विकासको गतिलाई तीव्र बनाउन आवश्यक छ। त्यसका लागि हामीले ज्ञानमा आधारित अर्थतन्त्रको निर्माण गर्न जरुरी छ। 'समृद्ध नेपाल सुखी नेपाली'को राष्ट्रिय लक्ष्य हासिल गर्न हामीले तीव्र गतिमा प्राविधिक तथा आर्थिक प्रगति हासिल गर्ने पर्दछ। यस सन्दर्भमा गैर-आवासीय नेपाली संघद्वारा आयोजित ग्लोबल नलेज कन्भेन्सनमा गहन छलफलका माध्यमबाट निस्कने निष्कर्ष अत्यन्त उपयोगी हुने विश्वास मैले लिएको छु।

म गैर-आवासीय नेपालीहरुले विदेशमा हासिल गरेका सीप र ज्ञानलाई नव-प्रवर्द्धनात्मक रूपमा राष्ट्र निर्माणका लागि प्रयोग गर्ने पहलको विशेष प्रशंसा गर्दछु। नेपाल सरकार परदेशमा रहेर पनि देशको माया र चिन्ता गर्ने सबै विज्ञहरुले मातृभूमिको अर्थिक-सामाजिक रुपान्तरणको प्रयत्नलाई आफ्नो ज्ञान, सीप र क्षमताको प्रयोग गर्दै सघाउनु हुने छ भन्ने कुरामा विश्वस्त छु। हामी गैर-आवासीय नेपालीहरुबाट हुने त्यस प्रकारका प्रयत्नहरुलाई प्रोत्साहित गर्न प्रतिवद्ध छौं।

अन्त्यमा विश्वका विभिन्न भू-भागबाट यस कार्यक्रममा भागलिन आउनु भएका समस्त सहभागीहरुको नेपाल बसाई सुखमय होस् भन्ने कामना गर्दै ग्लोबल नलेज कन्भेन्सनको पूर्ण सफलताको कामना गर्दछु।

२६ असोज, २०७५

के.पी. शर्मा ओली



Government of Nepal

Minister for Foreign Affairs

Ministry of Foreign Affairs  
Singha Durbar  
Kathmandu, Nepal

October 07, 2018

### Message

It gives me an immense pleasure to know that the Non-Resident Nepali Association (NRNA) is publishing the abstracts of the First NRN Global Knowledge Convention being held in Kathmandu on 12-14 October in partnership with the Government of Nepal. It is a commendable initiative to provide a good platform to educational and research institutes, private sectors and various stakeholders of Nepal as they all will have the opportunity to engage in the discussion and the cross-fertilization of ideas and knowledge benefitting all.

This convention is the first convention of its kind that brings together Nepali and foreign researchers to exchange their research outcomes for the benefit of Nepal. The ideas, insights and research results presented in plenary, poster, parallel symposium and other sessions by the researchers all over the world are expected to contribute to the further enrichment of knowledge in a way to be relevant and useful to all stakeholders involved in this field. In this context, I congratulate the NRNA and the organizing committees for convening such an important convention in Kathmandu.

The present Government of Nepal has been working towards realizing the vision of “**Prosperous Nepal, Happy Nepali**”. This will be possible only when we make appropriate policy measures in support of the prosperity goal. Better policies will definitely contribute to transferring knowledge and technology for the acceleration of our development process.

I underline that the Government of Nepal is committed to promoting brain gain for nation building and, I hope, this convention will be a momentous event for this purpose. Being the focal Ministry of NRN, it is the expectation of the Ministry of Foreign Affairs from the First NRN Global Knowledge Convention that it will come up with useful policy recommendations.

I extend my warm greetings and best wishes to all the researchers, convention organizing committees, session's coordinators, panellists and NRN members for the grand success of convention and the publication as well.

Pradeep Kumar Gyawali



# Non-Resident Nepali Association (NRNA)

## गैरआवासीय नेपाली संघ

The national wealth of a nation is determined, to a very large extent, by the ability of her people to produce income and create wealth. After all Japan is rich not because she has abundance of natural wealth and Sub Saharan African nations are not so rich, even though they have natural resources in abundance. The rank of nations based on human capital index, broadly coincides with the rank of nations based on their per-capita national income. Human Capital Report of the World Economic Forum has put Nepal in the lowly rank of 106 among 124 economies of the world. Economists and Analysts seem to agree that it is the human capital that is the key to nations' progress and prosperity. The Non-Resident Nepali Association since its very inception has realized the value of human capital or the capacity of the people to produce wealth and income and has put the mobilization of the resources including the knowledge and skills of the diaspora community for well-being of Nepali people back home. We all realize that developing human capital is a complex process which involves knowledge sharing and working together to create new knowledge and develop newer skills.



Our society had a very rich tradition of knowledge sharing. In our scriptures the gifting of knowledge or "Vidya Dan" is considered to be better than even gifting of land or "Bhoo Dan". In modern times, gifting can be considered to be more of a sharing. The nations, communities and individuals indulging in sharing do get maximum benefits. Unlike the in donating tangible assets like land, your assets value does not get diminished by gifting your knowledge. The NRN Global Knowledge Convention is a small step taken by the NRNA in encouraging knowledge sharing and expansion of knowledge pool. Such convention will be held every second year, so that this will not be a one off affair, but a continued process to enrich the knowledge pool of Nepal. Although the convention is being organized for the first time and with a preparation of a very limited period we are extremely pleased by the amount of interest it has generated both in Nepal and abroad especially among the professionals and experts. This is evident from the number of abstracts we have received and the profile of the contributors. 196 persons are making presentation in some form or other in this convention. 150 abstracts from equal number of researchers and experts is included this compendium.

Many persons have worked relentlessly to make this conference happen. I take this opportunity to thank chairs of the organizing committee, Mr. Kumar Pant, Vice President NRNA and Dr. Hem Raj Sharma, Advisor NRNA who have spent many sleepless nights in organizing this conference. I would also like to express NRNA's sincere appreciation of Dr. Hari Dahal from American Physical Society, without whose total commitment this conference would not have been possible and who took the most tedious and thankless job of editing the abstracts. I also thank all participants, supporters and contributors sharing their knowledge and creation.

This publication contains the edited abstracts contributed by various experts. I am confident the readers will find the book very useful and would lead to enrichment of the knowledge pool. After all, all parties involved gain from sharing especially knowledge sharing.

**Bhaban Bhatta**  
President

*Date: 03 October, 2018*



# Non-Resident Nepali Association (NRNA)

## गैरआवासीय नेपाली संघ

Dear International Experts, Non-Resident Nepali Friends, and Colleagues:

On behalf of the organizing committee, namaste and welcome to the First NRN Global Knowledge Convention being held in Kathmandu, Nepal.

The Non-Resident Nepali Association (NRNA), an organization of millions of Nepalese residing around the world, is an active partner of the Government of Nepal (GoN) and of Nepali people in advancing the country's aspirations for socio-economic development. Since its inception in 2003, NRNA has attempted to bring together diaspora resources to assist in Nepal's development efforts. In pursuit of this, It has organized numerous conferences at international and national level to explore areas of collaboration with the Nepali Government. We believe that the current convention organized in partnership with the Government of Nepal will add another dimension to the unconditional support extended by the Nepal diaspora to their native soil.



With the establishment of stable government, Nepali Diaspora is eager to help our country of origin to achieve rapid and sustainable economic growth. While the domestic economy still relies heavily on traditional way of thinking, planning and using resources, Nepal's immediate and distant neighbors are securing faster growth largely due to the technological advancement and partly supported by their own diaspora population. It is time for us also to embrace knowledge-based economy and help Nepal move in this direction. A large fraction of Nepali trained workforce, like ourselves, has migrated to developed country in search for further education and training. Despite living far from motherland, no matter for how long, we are 'Once a Nepal, Forever the Nepali'. Therefore, we need to devise reverse flow of drained-brains, and utilize the gained-brains to build prosperous Nepal. Non-Resident Nepali Association would like to take the lead in collating the expertise of diaspora community and channelizing them for knowledge-based development of Nepal. We aim to transform this Knowledge Convention into a complementary undertaking of NRNA in achieving this goal. We plan to organize future episodes of this Convention, hopefully in expanded forms, once in every two years. We are indebted to the enthusiastic support of the international, national and NRN experts to this motion. We are specifically thankful to all advisors, session coordinators, invited speakers, panelists, paper contributors, conference participants, sponsors, supporters and well-wishers. In addition we acknowledge their enthusiastic participation of knowledge experts in NRNA ICC Regional Conferences that we organized for preparing strong base for this global convention.

We have put together a comprehensive and tight program for the first ever convention of this type and size in Nepal. We look forward to having a very productive discussions during this event. We hope you will find some extract time to experience the beautiful nature and unique culture surrounding you, and we wish you a pleasant time during your stay in Nepal.

*Sincerely,*

**Kumar Panta**  
Vice President  
Non-Resident Nepali Association Chair  
Conference Organizing Committee

**Hem Raj Sharma, Ph.D.**  
The University of Liverpool, UK  
Chair, Conference Organizing  
Committee

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# About the Convention

The 1st NRN Global Knowledge Convention will be held in Kathmandu, Nepal from 12 to 14 October 2018. The convention is organized by the Non-Resident Nepali Association (NRNA) in partnership with the Government of Nepal (GoN). Nepal's education and research institutes, private sectors and various stakeholders are the convention supporters. The convention aims to bring together experts of various disciplines from Nepal and Nepali diaspora and explore Nepal's needs for expert assistance to help the country move towards knowledge-based economy. The Rt. Honorable Prime Minister of Nepal Mr KP Sharma Oli is scheduled to inaugurate the convention on 12 October.

## Objectives

- Discuss GoN's science and technology policies, and ways to update them for encouraging global knowledge investment.
- Understand Nepal's science and technology state-of-the-art, and identify knowledge gap in comparison to nation's developmental aspirations.
- Identify expertise pools in diaspora community, and explore modalities of transferring such expertise to address Nepal's needs.
- Enhance nation's confidence by aligning diaspora's skill, knowledge and innovation to development projects of national priorities.



## PLENARY SESSIONS

### Plenary Session 1: Science and Technology Policy

Science, Technology and Innovation (STI) are universally recognized as key drivers for achieving the development goals. To make STI work for the society, prudent STI policy frameworks are essential. This plenary session is designed to discuss: lack of adequate STI policy in Nepal and modalities to integrate STI in development mainstream; options for development of an STI research institute of international standard in Nepal; the need for and modalities of increasing R&D investment from its present low state and role of STI policies to accelerate transition to innovative systems.

*Coordinator: Dr Dinesh Raj Bhujju, Nepal Academy of Science and Technology, Nepal*

### Plenary Session 2: Knowledge-based Economy and Developmental Pathways

With the advent of the new era of federal system of governance and expected political stability, Nepal's aspiration for knowledge-based economy has been growing. Although intrinsic human capital is rising, tremendous knowledge gaps still exist which are impediments to long-term development goals. A large population of diaspora is capable and willing to fill some of these gaps. In this context, this session will discuss alternative development pathways that can utilize both in-house and diaspora knowledge and expertise pool to move towards knowledge-based economy.

*Coordinator: Dr Shobhakar Dhakal, Asian Institute of Technology, Thailand*

## Plenary Session 3: Knowledge and Technology Transfer

Knowledge and technological advancement are the key driving forces to economic growth of a country. This plenary session will review the government strategy and policy direction towards knowledge investment and technology transfer. It will cover areas such as federal funding to research and development, and role of research enterprises, start-up companies, intellectual property rights and diaspora expertise, and innovation and technology transfer. The session will also focus on the importance of strategic partnership among universities, industries, private and public financial sectors, entrepreneurs and diaspora community in above areas.

*Coordinator: Dr Raju Adhikari, RMIT University, Australia*

## Plenary Session 4: Role of Nepali Diaspora for Development Policies

Diaspora's participation in development process of their country of origin has gained prominence worldwide. Nepal can also benefit by establishing an efficient link with growing population of its diaspora and harnessing the diaspora expertise. In this regard, NRNA is considering a Policy Institute to channel diaspora expertise for improving the country's long and short-term development policies. The session will focus on identifying Nepal's needs and areas of collaboration. It will also explore viable means for maximizing diaspora contribution to Nepal's development policies.

*Coordinator: Mr Khagendra Dhakal,  
King Mongkut's University of Technology, Thailand*



## SYMPOSIUM SESSIONS

### Symposium 1: Agriculture and Food Security

Agriculture has been the main stay of Nepal's economy and livelihood of majority of its people. Despite previous emphasis on agriculture development in its long-range development plans, the country is increasingly dependent on the imports of food and agriculture inputs. This session will discuss agricultural education, investment on agriculture technology, use of natural resources, production of food and livestock, and marketing and distribution of agricultural commodities to secure sufficient, safe and healthy food throughout the country.

*Coordinators: Dr Drona Rasali, Provincial Health Services Authority, Canada  
Dr Keshav Adhikari, IAAS, Tribhuvan University, Nepal*

### Symposium 2: Disaster Risk Reduction

Nepal's geological setup and meteorological factors make it prone to many natural disasters such as earthquakes, landslides and flood. The country needs to seriously improve on disaster mitigation and implementation policies. Disaster reduction will require enhancing public awareness on disaster preparedness, understanding policy issues, and identify post-disaster reconstruction challenges. This session will discuss disaster related issues from policy and implementation perspectives and suggest disaster mitigation measures.

*Coordinators: Mr Ajaya Dixit, Institute for Social and Environmental Transition, Nepal  
Dr Netra Prakash Bhandari, Ehime University, Japan*

### Symposium 3: Education

Education plays a crucial role in supporting the process of sustainable development of a country. Nepal has made significant progress in the education sector over the last five decades. However, quality of education at all levels is low and in particular, the higher education sector lacks capacities in research, knowledge production and innovations. This session will focus on improvement

in educational governance in federalism, and increased thrust on vocational education, research, innovation and entrepreneurship through local and global partnership.

*Coordinators: Dr Pramod Dhakal, NRNA Academy, Nepal  
Dr Tejendra Pherali, University College London, UK*

## Symposium 4: Environment Pollution

Environment pollution is of rising concern to thriving cities of Nepal. Rapid but unplanned urbanization is adding polluting agents to environment in an alarming rate. Unsafe disposal of hazardous and biomaterials is also worsening the cleanliness of the environment. City inhabitants are already experiencing nontrivial impact of geometric growth of contaminants in air and water. Negative consequences of pollution are now spilling over to sub-urban and village areas. The symposium will mainly discuss the current state of pollution in air and water resources, environmental policies of the government of Nepal and effective environment restoration mechanisms.

*Coordinators: Dr Maheswar Rupakheti,  
Institute for Advanced Sustainability Studies, Germany  
Dr Durga Poudel, University of Louisiana at Lafayette, USA*

## Symposium 5: Financial Policy and Investment

Investment of Nepali diaspora for economic growth of Nepal is accelerating every year. Diaspora population is actively investing in hydropower, hospitality, information technology, banking, health and education sectors. These investments are happening despite some unfriendly investment policies and taxation system. In order to attract more financial and human capitals for investment, Nepal's financial policies need to be revamped. In this session, we will discuss how investment environment for Nepali diaspora can be made conducive by improving on existing legal and administrative structures of the financial system of Nepal.

*Coordinators: Mr Keshab KC, Nepal Rastra Bank, Nepal  
Mr Ranjeet Mahato, Neapolis University Paphos, Cyprus*

## Symposium 6: Health Education and Policy

Nepal has made impressive progress in some health care sectors. Nonetheless disparities exist across wealth quintiles, social groups and geographic locations. Numerous challenges remain in strengthening the domestic, financial, policy and human resource base for providing universal health coverage irrespective of citizens' socio-economic background. The symposium will mainly focus on current health disparity in Nepal, medical education, and health and drug policy of government and its improvement. Publicprivate partnership in bearing health care cost will also be discussed.

*Coordinators: Dr Archana Amatya, IOM, Tribhuvan University, Nepal  
Dr Binod Shah, Albert Einstein College of Medicine, New York,  
USA*

## Symposium 7: Hydropower, Transportation and Utilities

The GoN has prioritized construction of major infrastructure in the next five years. Nepal's record of delivery of larger infrastructure projects is less than encouraging. Improvement in the performance of future projects will require understanding the causes for failure of these projects from policy, project planning and procurement perspectives. This symposium will explore existing project execution and GoN's technical capacities, and recommend policy changes and technical capacity building modalities moving forward.

*Coordinators: Dr Arun Timalisina, IOE, Tribhuvan University, Nepal  
Mr Naresh Koirala, Nepal Library Foundation, Canada*

## Symposium 8: New Frontiers in Physical Sciences and Prosperity

Without putting serious efforts into advancement of Science Education, Research and Innovation, Nepal's technology-based future cannot be secured. This symposium will focus on how best to utilize Diaspora's diverse expertise pool to overcome the knowledge and science & technology policy gaps that are currently hindering national prosperity. It will discuss, in particular, GoN physical science policies, knowledge sharing, funding and experts exchanges, networking and research collaborations, and transforming research to industrial applications.

*Coordinators: Dr Hari Dahal, American Physical Society, USA  
Narayan Adhikari, Central Department of Physics, Tribhuvan University, Nepal*

## Symposium 9: Social Security and Good Governance

Nepal lacks a comprehensive social security system. The issue of social security is shadowed by other development priorities. Due to high unemployment, only a small fraction of population is covered under security options such as pension and retirement funds. Despite a short history and limited experience on hand, Government of Nepal is trying to refocus its attention to this issue. The central desire is to make social security more accessible and sustainable to a wider population. This symposium will bring in the firsthand experience of Nepali diaspora living under diverse forms of economy around the world, and discuss optimal social security models that are suitable for the socio-economic structures of Nepal.

*Coordinators: Mr Prakash Dahal, Ministry of Labour, Employment and Social Security, Nepal*

## Symposium 10: Sustainable Energy

As Nepal seeks to increase the income levels for its citizens, making clean and affordable energy available for industries, firms, commercial establishments and households will be an important task for the government and private sector. Production of clean and sustainable energy requires broad knowledge of engineering, economics, management, policy and environmental conservation approaches. This symposium will assess Nepal's existing policies and technical capacities related to clean energy generation and management, and recommend technologies, economics, policies and mechanisms for ensuring sustainable energy for the country.

*Coordinators: Dr Ambika P Adhikari,  
City of Tempe and Arizona State University, USA  
Dr Subodh Sharma, Kathmandu University, Nepal*

## Symposium 11: Technology Transfer and Innovation

Technological innovation is the foundation of knowledge-based economy. A country's technological advancement is achieved through domestic innovation and learning from technologically more advanced countries through the mechanism of technology transfer. Nepali diaspora has a significant experience in technological innovations and their industrial application. This session will explore how diaspora expertise can be applied in supporting innovation in Nepal. It will also discuss on basic infrastructure needed for technology transfer such as intellectual property patenting and protection.

*Coordinators: Dr Raju Adhikari, RMIT University, Australia  
Dr Rameswor Adhikari, RECAST, Tribhuvan University, Nepal*

## FOCUSSED SESSIONS

### Focussed Session 1: Agro-Food Innovation Supercluster

Government-facilitated strong network of industrial clusters linked through their shared reliance on locally available inputs can harvest innovation. This symposium will focus on potential establishment of Agro-food innovation gateway and role of diaspora in supporting innovation consortium.

*Coordinators: Mr Mahabir Pun, National Innovation Centre, Nepal  
Mr Narayan Ghimire, Flavorcan Inc., Canada*

### Focussed Session 2: Returnee Professionals

This session will showcase how Nepali professionals who have returned from their overseas training are contributing to the development of Nepal. Opportunities seen and challenges faced by returnee professionals will also be shared.

*Coordinator: Dr Devi Basnet, Medytox Inc., South Korea*

### Focussed Session 3: Scholarship and Research Funding

There are many international scholarship and fellowship programs currently available for Nepali citizens. This session will focus on their role in helping education and research of Nepali scholars.

*Coordinator: Dr Nabin Aryal, Aarhus University, Denmark*

### Focussed Session 4: Innovation and Private Investments

One of the focuses of knowledge and technology transfer is to use them for creating innovative products and services for the use of general public. This is going to be a closed-door session in which entrepreneurs with innovative ideas will pitch their ideas to NRN and local private sector investors to explore mutual investment opportunities.

*Coordinator: Dr Hari Dahal, American Physical Society, USA*

## ORGANIZING COMMITTEES

### Chair

Mr Kumar Panta, Non-Resident Nepali Association, Germany  
Dr Hem Raj Sharma, the University of Liverpool, UK

### Member Secretary

Dr Hari Dahal, American Physical society, USA  
Nepal Government's Liaison Officer  
Dr Damaru B. Paudel, Ministry of Foreign Affairs, Kathmandu, Nepal

### Scientific Advisory Board

Dr Ambika Adhikari, Arizona State University, USA  
Prof Bhagawan Koirala, Institute of Medicine, Tribhuvan University, Nepal  
Prof David Gellner, University of Oxford, UK  
Dr Dinesh Bhujju, Nepal Academy of Science and Technology, Nepal  
Dr Drona Rasali, Provincial Health Services Authority, Canada  
Er Ganesh Shah, Nepal Science Olympiad, Nepal  
Dr Kayo Devi Yami, Former Chief of NAST Science Faculty, Nepal  
Prof Kedar Bhakta Mathema, Former VC, Tribhuvan University, Nepal  
Mr Mahabir Pun, National Innovation Centre, Nepal  
Prof Michael Hutt, University of London, UK  
Mr Naresh Koirala, Nepal Library Foundation, Canada  
Dr Pramod Dhakal, NRNA Academy, Nepal  
Dr Raju Adhikari, RMIT University, Australia  
Dr Shobhakar Dhakal, Asian Institute of Technology, Thailand  
Dr Yub Raj Pokharel, South Asian University, New Delhi, India

### Program Committee

All Plenary and Symposium Coordinators

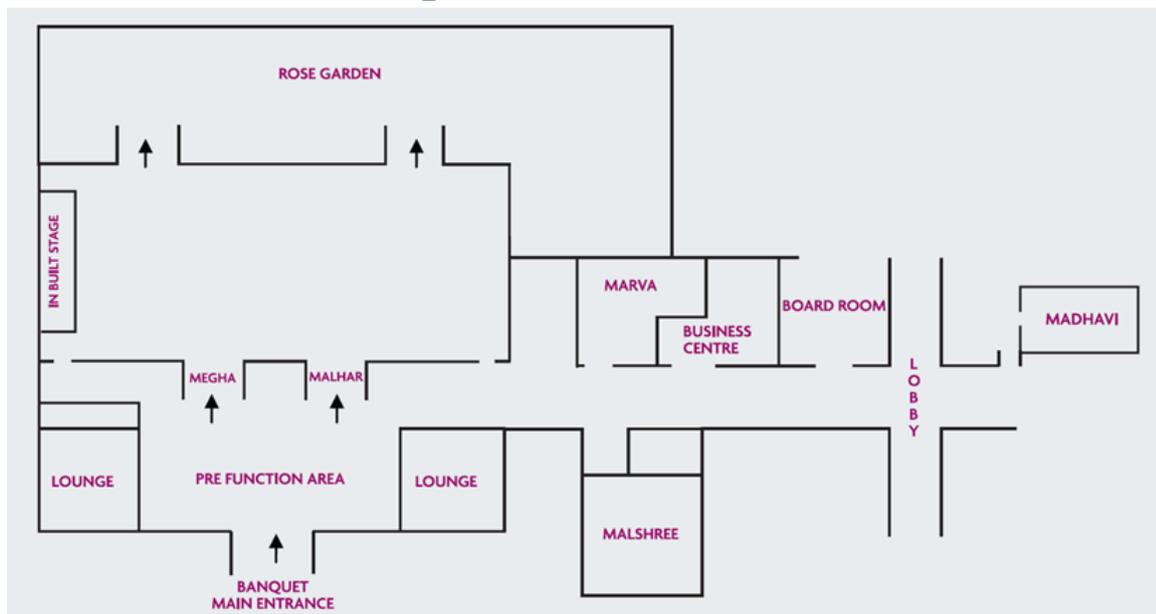
### Management Committee

Mr Kumar Panta, Vice President, NRNA  
Dr Badri KC, General Secretary, NRNA  
Mr Ram P Thapa, Patron, NRNA  
Dr Hemanta Dabadi, CEO, NRNA Secretariat  
Mr Shreeram Ghimire, Secretariat liaison

## PROGRAM OVERVIEW

	12 October	13 October	14 October						15 October	
	Megha Hall	Megha Hall	Malshree Hall	Megha Hall	Malhar Hall	Madhavi Hall	Malshree Hall	Marva Hall	Marva Hall	
08:15-08:40	NRNA BiDHAN SABHA	Tea, networking and registration								
08:40-10:40		Science & Technology Policy		Agriculture & Food Security	Technology Transfer & Innovation	Sustainable Energy	Health	Disaster Risk Reduction	Review & Plan of Action (Invitees Only)	
10:40-11:10		Tea break								
11:10-12:50		Knowledge-based Economy		Agriculture & Food Security	Technology Transfer & Innovation	Sustainable Energy	Health	Disaster Risk Reduction	Meeting with Higher Education Commission (Invitees Only)	
12:50-13:50		Tea break								
13:50-15:30		Knowledge & Technology Transfer		Hydropower, Transportation & Utilities	Agro-food Innovation Supercluster	Returnee Professionals	Education	Social Security		
15:30-16:00		Tea break								
16:00-18:10		Role of Nepali Diaspora for Development Policies	New Frontiers in Physical Sciences	Hydropower, Transportation & Utilities	Environment Pollution	Scholarship & Research Funding	Education	Financial Policy & Investment		
18:10-19:10		Inauguration	Poster Session							
19:30		Welcome Dinner	Innovation & Private Investments (Invitees Only)	Dinner						

## Conference Site Map



## PLENARY SESSIONS

# Plenary Session 1: Science and Technology Policy

13 October 2018, 8:40 -10:40, Megha Hall



*Coordinator: Dr Dinesh Bhujju, Academician, Nepal Academy of Science and Technology*

Science, technology and innovation (STI) are universally recognized as key drivers for achieving the development goals. However, to make STI work for the society, appropriate STI policy frameworks and participatory forms of governance are essential. The plenary session on STI Policies of Government of Nepal for Knowledge Transfer and Investment is designed to discuss on facilitating knowledge transfer and investment in science technology and innovation for the overall national development. Nepal's national plan mentioned about the role of science and technology for the first time in sixth plan (1980-1985). The direction was followed by expansion of S&T related government departments and university institutes, establishment of national research institutions and science ministry, and formulation of S&T policy. A notable achievement has been the production of critical mass of human resources in S&T, which is over three for 1000 population. Nepal's breakthrough in STI, however, is still in waiting. While finding out policies for knowledge transfer and investment, the plenary session will examine some pertinent questions such as:

- Why it is taking time for Nepal to integrate STI in development mainstream since it adopted development plan in 1956, and what lessons that Nepal can learn from the countries like South Korea, Singapore and Sri Lanka which started development course in the same decade of 1950s?
- Why Nepal has not been able to operate an internationally acclaimed higher education system (like IIT and AIT) in spite of producing competent human resources in science and technology?
- What is the status of major actors (universities, research institution/councils, enterprises) in scientific research and technological innovation in Nepal?
- Why STI does not get priority in the Government's programme and budget, and investment in R&D is perennial low?
- Are the STI policies been a factor responsible for lacklustre show or is the political economy hindering the transition towards creating innovation system?

## PROGRAM

<b>Plenary 1: Science and Technology Policies</b>				
<b>13 October 2018, 08:15-10:40, Megha Hall</b>				
<b>Chair: Dr Dinesh Chandra Devkota, Moderator: Dr Dinesh Raj Bhujju</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
08:15-08:40	Registration, tea and networking			
08:40-08:50		Kumar Panta Mr, Hem Raj Sharma Dr	Welcoming remarks by conference chairs	
08:50-09:15	Contributed	Dinesh Raj Bhujju, Dr	Foundation of science and technology in Nepal	Academician, Nepal Academy of Science and Technology, Kathmandu, Nepal
09:15-09:55	Invited	Eduardo Martinez, Dr	Science, technology and innovation federal strategy and policy in Nepal 2019-2022	STI Policy Expert Consultant, UNESCO, Paris, France
09:55-10:30	Panel Discussion and Q&A	Fernando Quevedo, Prof		Director, International Centre for Theoretical Physics (ICTP), Italy
		Ganesh Raj Joshi, Dr		Former Secretary, Government of Nepal
		Malak Shrestha, Prof		Vice Chairman & Director of Aortic Surgery, Hannover Medical School, Germany
		Rejina Maskey-Byanju, Prof		Head, Central Dept. of Environmental Science, Tribhuvan University, Kirtipur, Nepal
		Sharad Onta, Dr		Former Assistant Dean, Institute of Medicine, Kathmandu
10:30-10:40	Summary	Dinesh Chandra Devkota, Dr		Former Vice Chairman, National Planning Commission (NPC)
10:40-11:10	Teak Break			

# Foundations of science and technology in Nepal

■ **Dinesh R Bhuj**

*Academician, Nepal Academy of Science and Technology* ■

Nepal opened up to the outside world in 1950. This opening brought mass awareness in education and development. In 1990, Nepal reinstated multiparty democracy and ultimately embarked on republic in 2008. This historic transformation in the country's social and political set-up is also ushered with the people's escalated aspiration for economic prosperity and national prowess. While the state is committal to the formulation of new constitution, it also has to fulfill the long aspiration of its countrymen. As the role of science and technology (S&T) towards the social and economic transformation has become more important in Nepalese case, preparation of a visionary policy and national strategy on S&T is proposed.

Nepal adopted five-year development plans in 1956. An explicit S&T policy statement was formulated by the Government for the first time in the Sixth Plan (1980-1985), and it was in the Seventh Plan that a separate budget allocation for S&T sector (about 0.14 per cent of the total outlay) was introduced. During the last five decades, the country has created basic infrastructure of science and technology. Institutions for policy formulation, education and training, consultancy services, testing and standardization, research and development, extension services and promotion and dissemination at different levels have been set up. Hundreds of S&T non-governmental organizations and professional societies of many disciplines have emerged and performing various activities. Scientific publication and communication activities are flourishing.

Most significantly, Nepal now possesses a sizeable number of S&T manpower, thanks to the flexible policy adopted by the Government after 1990s. It is estimated that Nepal has nearly 90,000 human resources in S&T. The country is producing high-level manpower, including PhDs, in natural sciences, medicine, agriculture, engineering and forestry. However, there is a growing tendency of migration of this qualified manpower to developed countries. Similarly, with an average investment of 0.3 per cent of GNP over the decades, the investment in S&T is still too low for it to make a visible impact on national economic development.

National Council for Science and Technology (NCST) was the first national body that was established in 1976. In 1982, Nepal Academy of Science and Technology (NAST) established

as an autonomous statutory national organization with an objective to advance scientific and technological capabilities for all-round national development. The Prime Minister is the Chancellor of NAST. The Ministry of Science and Technology was established in 1996, which is now the Ministry of Education, Science and Technology. Beside these, there are over a dozens of departments related to S&T that directly come under the government. Some of these had their existence since long, but most of them were created after 1960. Majority of these departments are service oriented, a few of them are engaged in research while others in exploration activities. A few research laboratories at private initiatives have also emerged in recent years.

The first national policy on S&T was published in 1989. It was replaced with revision in 2004. Nepal has now new constitution. The country has entered into new governance of federal system with seven provinces and 753 local governments. As evinced by their election manifesto, all the major parties are committal to prepare tangible plan for developing S&T. They have singled agriculture sector as the main economic backbone of the country and emphasized on its modernization. They have mentioned about harnessing natural resources and generating hydro-electricity. The political parties have also shown their concern on the increased trend of brain drain especially in the field of S&T. The parties have also called for substantial increment in the investment for scientific research and development.

A visibly seen achievement that Nepal has made in the S&T sector in last five decades is its increased capability to manage various S&T institutions in rendering scientific services to its different development efforts. However, it is yet to assess to what extent the S&T progress has contributed to bringing a comparative improvement in socio-economic indicators like GDP, per capita income, life expectancy, literacy rate, industrial and manufacturing contribution to GDP, communication and energy supply. In the lack of such visible impact of S&T to overcome the problems of invigorating its economy and bringing prosperity for the people, there have been frequent questions about the achievements of S&T.

It is essential that Nepal now develop a visionary national policy of consensus to develop STI (science, technology and innovation) with commitment from the legislatures (political parties), which form government accountable to the people. Such policy will guide in determining areas of national priorities on S&T sector for R&D and formulate strategic plans for the effective and efficient use of internal resources and for supply of industrial technologies per need. Equally important is formulation of strategic plan to develop the national STI capability and enhance its contributions in the overall development of the country. To support the policy formulation, workshops were organized in various parts of the country and S&T communities were consulted. A Pareto graph of the result presented that the four most important factors to be addressed are: research fund, research ecosystem, coordination and human resources. ■

# Science, technology and innovation federal strategy and policy in Nepal 2019-2022

■ **Eduardo Martinez**

*STI Policy Expert Consultant, UNESCO, Paris, France*

## OUTLINE

1. *Basic definitions*
  - *Scientific and technological activities*
  - *Scientific and technological system*
  - *Strategy*
  - *Science, Technology and Innovation Policy (STI)*
  - *Science & Technology institutionalization*
2. Evolution: from Science Policy to Science, Technology and Innovation Policy
  - 2.1 The Precursors
 

[Lewis Mumford (1934), *Technics and Civilization*; John D. Bernal (1939), *The social function of science*; Vannevar Bush (1945), *Science-The endless frontier, A Report to the President on a Programme for postwar scientific research*; Joseph Needham (1954-1995), *Science and civilisation in China*; Radovan Richta (1968), *Civilization at the crossroads: social and human implications of the scientific and technological revolution*; David Landes (1968), *The unbound Prometheus*]
  - 2.2 Science Policy
  - 2.3 Technology, Innovation and Management Policy
  - 2.4 Globalization, transnational corporations, ICT, neoliberal policies, and the market
3. Framework for a Science, Technology and Innovation Policy
 

**Six core elements:**

  - a. People
  - b. Infrastructure and funding
  - c. Scientific and Technological Research
  - d. Science and technology culture and popularisation
  - e. Knowledge mobilization
  - f. Monitoring and Evaluation
4. Funding, cross-sectoral and cross-governmental coordination and co-operation, local Governments,

- Provincial Governments (offices of the Chief ministers from each of the 7 provinces), Ministry of Federal Affairs, NRNA
5. Science, Technology and Innovation Strategy and Policy in Nepal
    - 5.1 Seven Federal Strategic Programmes (2019-2022)  
(in the context of Nepal's SDGs -Sustainable Development Goals, Transforming our World-2030):
      1. Nutrition and Preventive Health Strategic Programme  
(including Medicinal Plants) E. Martinez, Science, Technology and Innovation Strategy and Policy in Nepal 2019-2022 2
      2. Organic (bio) Agriculture and Forest Management Strategic Programme  
(seed bank, compost, organic fertilizers, organic pest control)
      3. Water Cycle Strategic Programme  
(eco-sanitation, water recycling, rainwater recovery, water basin management)
      4. Renewable Energy Strategic Programme  
(micro-hydraulic generation, solar energy, small wind turbines)
      5. Eco-Construction Strategic Programme  
(ecological construction, rural, SEISMIC, low cost thermal insulation in walls and roofs (ecological material), energy efficiency and low cost, eco-sanitation, rainwater recovery, composting latrines, ferro-cement)
    6. Eco-Tourism Strategic Programme  
(rural community-led tourism)
    7. ICT and Electronic Commerce Strategic Programme
    - 5.2 Federal STI in seven provinces (2019-2022)
 

**7 Provinces/Pradesh & Capitals:**

      - Province No. 1 (Koshi), Biratnagar (temporary) •
      - Province No. 2 (•Madhes, Mithila, Bhojpora), Janakpur (temporary)
      - Province No. 3 (•Nepalmandal, Bagmati), Hetauda(temporary)
      - Gandaki Pradesh (Province No. 4), Pokhara •
      - Province No. 5 (Lumbini), Butwal (temporary) •
      - Karnali Pradesh (Province No. 6), Birendranagar
      - Province No. 7 (•Sudur-aschim Bhimdatta Pradesh), Dhangadhi (temporary)
    - 5.3 Federal Strategic Project no. 1 (in each province):  
WomenY-Lab: Women & Youth Eco-Tech Employment and Innovation -  
Women & Youth Training/Service/Innovation (TSI) Workshops

#### ANNEX

WomenY-Lab: Women & Youth Eco-Tech Employment and Innovation Project -Women & Youth Training/

Service/Innovation (TSI) Workshops

[Federal Strategic Project -in each province]

I. WomenY-Lab Objective

II. WomenY-Lab Strategy

III. WomenY-Lab Project's economic and social outcomes

IV. WomenY-Lab Project's expected results

V. WomenY-Lab Project institutional framework

VI. WomenY-Lab Project Execution Unit (local institution) and WomenY-Lab Project main responsibilities (Setting-up and Operational Manual)

VII. Women & Youth Training/Service/Innovation (TSI) Workshops

VIII. WomenY-Lab / TSI Workshops: facilities, services and equipment/training Budget estimates

Women & Youth Training/Service/Innovation (TSI) Basic Workshops:

- Digital skills: Internet Services, e-Commerce, PC & Networks; mobile phones
- Rainwater recovery, Eco-Sanitation (low-cost, zero-energy), and Water recycling
- Mini Solar Photovoltaic Systems
- Ecological construction
- 'Fresh-Fridge : no-energy

refrigerators *E. Martinez, Science, Technology and Innovation Strategy and Policy in Nepal 2019-2022 3*

- Litre of Light and Solar Energy
- Solid waste recycling
- e-Agriculture, e-rural commerce, food security and nutrition
- Biodiversity conservation
- Business Incubator and Co-Working spaces

Women & Youth Training/Service/Innovation (TSI) Optional Workshops:

- Mini Turbo-Hydro Power: low cost, ecological, low-pressure Vortex-Turbine hydro power
- Drones UAV/UAS: maintenance and repair
- Mini-Wind Turbine Systems (VAWT)
- Laser Cutting
- 3D Printing
- Electric Vehicles/Electro-Mechanical Services
- Small maintenance robots (home/office, pools, gardens)



# Plenary 2: Knowledge-Based Economy & Development Pathways

13 October 2018, 11:10 – 12:40, Megha Hall

*Coordinator: Dr Shobhakar Dhakal, Asian Institute of Technology, Thailand*

With the advent of the new era of federal system of governance and expected political stability, Nepal's aspiration for knowledge-based economy has been growing. Although intrinsic human capital is rising, tremendous knowledge gaps still exist which are impediments to long-term development goals. A large population of diaspora is capable and willing to fill some of these gaps. In this context, this session will discuss alternative development pathways that can utilize both in-house and diaspora knowledge and expertise pool to move towards knowledge-based economy.

**Focus:**

Knowledge-based economy, knowledge gaps, long-term development goals, utilization of diaspora resources.

**Background:**

Nepal has entered into a new era of the federal system of governance. There is also an expectation of political stability for next several years, means, we have potentials to provide consistent policy signals which has been a major past challenge. Our in-country human capital is improving. There is presence of large Nepalese diaspora willing to support Nepal on knowledge, technology and finance. Our infrastructure and capacity for information and knowledge access, and our ability to translate them for development is rapidly rising. Therefore, our aspiration for prosperity and development, which has become much repeated phrase in recent times, must now hinge on knowledge-based economy. Knowledge-based economy aspires to

better integrate ‘knowledge’ and ‘technology’ in economic growth going one step ahead of the traditional growth policies and practices. Knowledge-based economy, at one hand must root in evidence-based policies and programs, and in other hand, must embrace emerging drivers, such as, greater access to information and knowledge system due to digitalization for economic growth[1]. Key pillars of knowledge-based economy[2] are: (i) Education, including building a skilled workforce; (ii) National innovation systems, including science and technology, research and development (R&D); (iii) Building networks, including ICT infrastructure and social networks; and (iv) Policy and regulatory environment.

In this context, this plenary session discusses Nepal’s development goals and aspirations and deliberate on modalities of the alternate development pathways of knowledge-economy with critically assessing them. This further elaborates the role of diaspora in translating to knowledge economy.

**Themes:** In line with the objectives of the First NRN Global Knowledge Convention, this session will focus on the follow key questions to be answered by invited speakers and panelists:

**What should be Nepal’s long-term development goals and drivers?**

- What are/should be our development goals, 2030 and beyond? What are our development aspirations?
- What are Nepal’s key drivers for growth (our base: natural resources, human capital; Our economic base: agriculture modernization, service sector (tourism), selective industries; our challenges: energy, infrastructure, human capital, good governance

**What are alternate development pathways to reach there and role of knowledge-based economy?**

- Developmental pathways – what pathways are available to us to reach development goals; what are the pros- and -cons of different pathways; what are pre-requisites for these pathways
- Why knowledge-based economy is needed; what we need to do? What are key instruments we need to employ

**What are our opportunities for leap-frogging using knowledge-based economy for these goals and pathways?**

- Modernizing knowledge based agriculture development
- Improving physical infrastructure
- Innovative financial models
- Knowledge-based decision making and governance

**What are concrete immediate actions needed in view of knowledge-based economy & long-term development pathways, and how diaspora can help?**

## PROGRAM

<b>Plenary 2: Knowledge-based Economy &amp; Development Pathways</b>				
<b>13 October 2018, 11:10-12:50, Megha Hall</b>				
<b>Moderator: Dr Shobhakar Dhakal</b>				
<b>Time</b>		<b>Speaker/panelist</b>	<b>Topic</b>	<b>Institute</b>
11:10-11:30	Invited	Rabindra Adhikari, Hon'ble	Nepal's development plan and knowledge-economy: Where do we stand? Where do we want to reach? Goals and pathways	Minister of Culture, Tourism and Civil Aviation of Nepal
11:30-11:50	Invited	Bindu Nath Lohani, Dr	Asia's development experiences: what that means for Nepal	Former Vice President, Asian Development Bank
11:50-12:40	Panel discussion and Q&A	Baburam Bhattarai, Hon'ble Dr		Former Prime Minister of Nepal
		Swarnim Wagle, Dr		Former Vice Chairman, National Planning Commission, Nepal
		Yankila Sherpa, Mrs		Former State Minister of Tourism and Civil Aviation
		Upendra Mahato, Dr		NRNA Founding President, Belarus
12:40-12:50	Summary	Shobhakar Dhakal, Dr		Department Head, Department of Energy, Environment & Climate Change, Asian Institute of Technology, Bangkok, Thailand
12:50-13:50	Lunch			

# Nepal's development plan and knowledge-economy: where do we stand? Where do we want to reach? Goals and pathways

■ **Rabindra Adhikari**

*Minister of Culture, Tourism and Civil Aviation of Nepal*

# International experiences of alternative development models and what that means for Nepal

■ **Bindu Nath Lohani**

*Former Vice President, Asian Development Bank*

In this presentation, Dr Lohani will provide experiences of development approaches used by the countries in Asia in the past four decades, both successes and failures, and how those experiences could be useful for countries like Nepal. The presentation will also discuss areas for adopting, adapting and leapfrogging opportunities in Nepal.



# Plenary 3: Knowledge and Technology Transfer

**13 October 2018, 13:50 – 15:30, Megha Hall**

*Coordinator: Dr Raju Adhikari, RMIT University, Australia*

With the advent of the new era of federal system of governance and expected political stability, Nepal's aspiration for knowledge-based economy has been growing. Although intrinsic human capital is rising, tremendous knowledge gaps still exist which are impediments to long-term development goals. A large population of diaspora is capable and willing to fill some of these gaps. In this context, this session will discuss alternative development pathways that can utilize both in-house and diaspora knowledge and expertise pool to move towards knowledge-based economy.

## **Focus:**

Knowledge-based economy, knowledge gaps, long-term development goals, utilization of diaspora resources.

## **Background:**

Nepal has had a late start to adapt to science and technology (S&T) and was left out of the social transformation embraced by the rest of the world from the Industrial revolution. Nepal's first S&T policy was started in 1961 with the help from UNESCO which led to setting up government Research and Development (R&D) departments, Royal Drug Research and Agricultural Departments. Tribhuvan University (TU)'s first Research Centre for Science and Technology (RECAST) was established in 1977. Almost a decade later, Nepal Academy of Science and Technology (NAST) was established in 1982 to coordinate overall S&T activities. Nepal Agricultural Research Council (NARC) and National Planning Commission were subsequently established in 1992 and later Ministry of Science and Technology (MoST) to consolidate and modernize S&T activities and bring them under one umbrella. Despite all above initiatives, Nepal has failed to consolidate and use

science and technology effectively as an important tool of prosperity till to-date.

In almost 70-year span, Nepal's failure to change public perception about the importance of science education and S&T is reflected on its S&T commitment of 0.3 % of GDP. Of the current 29 million population, we have less than 200,000 post-graduate/higher education manpower and only 20% of schools teach science at grade 12 level today. World Trade Organization (WTO) has predicted that by 2020, 40% of global employment in any industry, would need at least undergraduate level manpower. Nepal is likely to fare poorly in this arena.

Nepal's skilled youth population is leaving for overseas in large numbers (with 30% annual increase) in search of higher education and likewise highly skilled manpower is also leaving Nepal for a better life in foreign lands. This would create a huge vacuum in the country and Nepal would not have enough skilled human resources to meet the growing industry needs.

Nepal needs to drastically increase the budget for science education and S&T to develop infrastructure and join global race for knowledge and technology innovation, transfer and adaptation. In this endeavor, increased role, investment and contributions from the private sector is equally important. Country's S&T policies needs revisit to develop clear future strategy and direction based on a strong collaborative, partnership and co-investment model with NRNA (Non-Resident Nepali Association) and global institutions to catch up with developing countries. The session's focus will be on above issues and suggest measures how public sectors, donor, local industries and academia sectors could work effectively to make innovation and technology transfer achievable and make a meaningful contribution to nation prosperity.

The Plenary and Symposium sessions will focus on the following five themes

1. Government policies and initiatives on Innovation, Start-ups and Technology transfer
2. Technology transfer and product development through Start-up.
3. Case studies of Diaspora and Nepali S&T Experiences on Biotechnology, Energy, IT, Health disciplines
4. Private sectors and investors perspectives
5. IP portfolio and policies

## PROGRAM

<b>Plenary 3: Knowledge and Technology Transfer</b>				
<b>13 October, 13:50-15:30, Megha Hall</b>				
<b>Chair: Ministry of Education, Science and Technology, Giriraj Mani Pokhrel, Hon; Moderator: Dr Raju Adhikari</b>				
<b>Time</b>		<b>Speaker/panelist</b>	<b>Topic</b>	<b>Institute</b>
13:50-14:10	Invited	Jiba Raj Pokharel Prof	Nepal's S&T investment, policies and challenges	Former Vice Chancellor, Nepal Academy of Science and Technology
14:10-14:30	Invited	Pramod Bahadur Shrestha, Prof	Knowledge, technology transfer, innovation and sustainable development	Institute of Engineering, Pulchowk Tribhuvan University, Nepal
14:30-14:50	Contributed	Raju Adhikari, Dr	Knowledge investment-NRN perspectives	BIORA BIORENEWABLE ALTERNATIVES & RMIT University, Australia
14:50-15:00	Contributed	Narayan Ghimire, Mr	Agro-food innovation supercluster in Nepal	Technical Manager, Scientific Innovation, Flavorcan International Inc, Toronto, Canada
15:00-15:25	Panel discussion and Q&A	Buddhi Ranta Khadge, Dr		Secretary, Nepal Academy of Science and Technology, Kathamndu, Nepal
		Mahabir Pun, Mr		Chairman, Nepal Innovation Center
		Jiba Nath Lamichhane, Mr		Promotor, Sanima Group of Companies, Nepal & Ex-president/patron, NRNA
15:25-15:30	Summary	Giriraj Mani Pokhrel, Hon.		Ministry of Education, Science and Technology, Nepal
15:30-16:00	Tea Break			

# Nepal's science and technology investment, policies and challenges

■ **Jiba Raj Pokhrel**

*Former Vice Chairman, Nepal Academy of Science & Technology*

# Knowledge, technology transfer, innovation and sustainable development dividend

■ **Pramod Bahadur Shrestha**

*Institute of Engineering, Pulchowk Tribhuvan University, Nepal*

‘Knowledge, Technology and Technology Transfer, Innovation and Sustainable Development Dividend’ – These words struck me in the many diverging commentaries and discussions. They also express in a perfect way the ambivalence in relation to the impact of knowledge and technology in our everyday life which is also one of the most important studies in the philosophy, development and roles and impact of knowledge, technology and technology transfer in the last fifty years.

Organizations and societies are becoming knowledge and technology based - that is, the utilization and transfer of state-of-the-art knowledge and technology is now the critical ingredient for survival. When we talk and discuss about ‘Sustainable Development Dividend’, developing better information and communication systems is only part of this challenge. It is also necessary to create collaborative cultures, supportive infrastructure and sensitive measurement system to facilitate the effective and efficient acquisition and deployment of new knowledge and new technology.

In knowledge and technology management, learning and innovation are the critical drivers for achieving excellence. We have to encourage the discovery and utilization of knowledge and technology at every level, making the organization and society more alert, informed, and responsive. Knowledge and technology Management is the preparation, preservation, and exploitation of accumulated knowledge/technology in a manner that expedites the provision of the right information to the right person at the right time. Knowledge and technology are information put to productive use. And is a product of activity, not just a simple process of acquisition. The introduction of technological innovations in any work setting alone does not affect substantial change. It is not the technology, which changes thing; it is the way in which we use the technology that has the potential to change our learning.

# Knowledge investment initiatives – NRNA perspective

■ **Raju Adhikari, Ambika P. Adhikari, Drona P. Rasali, Pramod Dhakal**

*Skill Knowledge and Innovation (SKI), NRNA Academy*

A cross-sectional study by the World Bank using an array of measurable indicators in 92 countries shows that knowledge base is a significant determinant of long-term economic growth [1]. In the last decade, increased speed in the creation and dissemination of knowledge has become a key catalyst for spurring rapid innovation and economic development. Today, emerging Asian economies like Israel, Korea, Taiwan and China spend their GDP's 4.3%, 4.3%, 3.1% and 2.1% respectively on research and innovation [2], and the Bhutan, Israel, Korea, India, Nepal, Bangladesh make government expenditure on education equivalent to 7.3%, 5.7%, 5.1%, 3.8%, 3.7%, 2.5% respectively of their GDP [3]. UNESCO statistics shows that Nepal spends 0.3% of its GDP on Science, Technology and Innovation [4] and a late starter.

Fortunately, Nepal sizable diaspora population engaged in scientific and academic sector, that could be speedily harnessed to address these challenges. Considering this potential, NRNA declaration in 2009 announced the formation of the first Skill Knowledge and Innovation (SKI) Taskforce (subsequently SKI Committee and NRN Academy geared to utilize diaspora skills, knowledge, innovation and experiences for Nepal. Since then, SKI has been instrumental to form a global SKI team network and launched modestly successful collaborative initiatives including the Open University of Nepal Initiative (OUNI), Nepal Science Foundation Trust (NSFT), Road Safety Project, Diaspora SKI inventory, and SKI Brain Drain seminar series [5,6]. In partnership with the Government of Nepal, NRNA has now committed to organize a bi-annual Knowledge Conference in Kathmandu and the First Global Knowledge Convention is being held in 12-14 October 2018. This paper will discuss NRNA's above initiatives and future strategy plans.

1. <https://openknowledge.worldbank.org/handle/10986/14163>,
2. [https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_research\\_and\\_development\\_spending](https://en.wikipedia.org/wiki/List_of_countries_by_research_and_development_spending)
3. <http://data.uis.unesco.org/?queryid=181>
4. <http://uis.unesco.org/en/country/np?theme=science-technology-and-innovation>
5. SKI Reports (various), NRN ICC, [www.nrn.org.np](http://www.nrn.org.np)
6. [en.wikipedia.org/wiki/Nepal\\_Open\\_University](https://en.wikipedia.org/wiki/Nepal_Open_University)

# Agro-food innovation supercluster in Nepal

## ■ Narayan Ghimire

*Scientific Innovation, Flavorcan International Inc,  
Toronto, Canada*

A diaspora backed smart agro-food innovation supercluster is an initiative to partner with Nepal government for shared reliance-based knowledge & partnership that bridges among foreign and domestic laboratories, technology transfer offices, research and academic institutions, small and medium enterprises to ensure global competitiveness of agro-food industries.

By 2050, world population is projected to reach 9.6 billion. Multiple innovative recourses in compensating feeding needs by 2050 have uncovered several value-added potentials of plants and creatures. Within next 20 years people will rely on vegetarian protein for food and feed. The natural and minimally processed agro-based products will be the preferred healthy source for food supplements, health products, ayurvedic, flavourings, colours and protein seasonings as source of vegetarian meat, vegan cheese and eggs. Moreover, cleaners, sanitary supplies, pesticides, insecticides, textile, preservatives and lubricants will in large derived from natural medicinal and aromatic plants and creatures. About 7000 plants and unknown number of value-added creature available in Nepal have great potential to commercialized into those supplements.

Nepal is situated between India and china with market proximity of almost world half population. This presentation is focussing to uncover those potential of underutilized approximate 68% of land of Nepal and focussed in developing diaspora backed but government facilitated agro-food innovation superclusters.

A robust cluster, linked through shared reliance of locally feasible inputs, technologies, talent, and infrastructure can harvest innovation. That energize economic growth, employment and self-employment generation. This presentation will point out a gateway in the field of ayurvedic, medicinal and aromatics plants and microbes (MAPs) commercialisations for agro-food substitutes.

In line with the objectives of the First NRN Global Knowledge Convention, this presentation however will more focus towards institutionalizing diaspora backed smart agro-food innovation supercluster to ensure global competitiveness of ayurvedic, medicinal and aromatic clusters of Nepal.



## Plenary 4: Role of Nepali Diaspora for Development Policies

**13 October 2018, 16:00-18:10, Megha Hall**

*Coordinator: Mr Khagendra Dhakal, King Mongkut's University of Technology, Thailand*

### **Concept:**

Since the late 1990s, diaspora's participation in development process of their home countries has gained increasing prominence. In keeping with the interest of national and international organizations which promote the involvement of diaspora in the development of their home countries, many studies have indicated diaspora organizations as new actors in the development process. Diaspora are perceived as a potential force to shape the development process of the home country

The emigration of people with tertiary education is very high (at 24%) in low income countries. It is even higher in low income small countries, like Nepal. In view of this, it is necessary that diaspora organizations make efforts as to how the expertise of those educated migrants and their global connections can be asset and support to the development of their home country.

Some diaspora organizations are far ahead in tapping such asset, however Nepali diaspora organization, the Non-Resident Nepali Association (NRNA), has recently started playing some significant role. NRNA is mostly engaged in the protection of the interests of the diaspora community. It has also made some investment and engaged in some philanthropic activities in Nepal.

NRNA has grown as a large network, with its 72 country offices throughout the world representing around 6 million population. This provides a great potential to NRNA for mobilizing many diaspora from various countries of the world with varieties of knowledge and skills that can be transmitted to Nepal. Though the significant numbers of Nepali experts are making useful contributions in the global arena, there is not much result-oriented efforts made to utilize such strength for the development of the country,

leaving few individual cases aside. Neither NRNA nor Government of Nepal made serious efforts. NRNA was even criticized for not being able to attract the Nepali diaspora experts and professionals in its core business.

Realizing this after 15 years of its establishment, NRNA has just established Nepal Policy Institute (NPI) early this year in 2018 with the objective of influencing the Government of Nepal (GoN) in the development and implementation of policies. As Nepal is now entering a new phase of political transformation with a federal system of governance, there is a great opportunity to support the government in formulating policies and institutions. NRNA can play an instrumental role in the process of transformation of country. Engaging diaspora professionals through NPI could be one effective way for the GoN to help transform the country. At the same time, establishment of NPI has opened the door for those Nepali

diaspora members who are working in national and international organizations abroad and would like to assist the motherland with their expertise. Against this backdrop, NPI has been developing thematic research teams in social, economic, environmental sustainability, and technology domains to identify the policy gaps and suggest evidence-based policies suitable to the current scenario of the country.

In this context, this plenary session will discuss the kind of means and policies that create an enabling environment to maximize Nepali diaspora contributions to the developmental policies. It will highlight the potential strength of Non-Resident Nepalis (NRNs) and the ways to engage them in supporting policy formulation for the development of Nepal. Drawing on the lessons learned from other relevant diaspora and elsewhere, the session will provide insights on how Nepali diaspora can play an effective role for the development of country. GoN participation can help identify the country's needs and the areas where policy and other support from the diaspora is required. The areas where NRN can potentially contribute at the policy level include (but not limited to) utilization of remittance, effective economic diplomacy (trade, investment and tourism), research-based education, agriculture-based economy, new pathways of sustainable development and knowledge transfer. Covering these areas, the session aims to validate NPI's strategic plan, that is under discussion now, for the development of Nepal.

**Focus:**

Existing development policies, Policy Gaps, NRN's strength, Ways of utilizing diaspora expertise

## PROGRAM

<b>Plenary 4: Diaspora for Development Policies</b>				
<b>13 October 2018, 16:00-18:10, Megha Hall</b>				
<b>Chair: Dr Bhekh Bahadur Thapa, Moderator: Khagendra Dhakal</b>				
<b>Time</b>	<b>Role</b>	<b>Speaker</b>	<b>Topic</b>	<b>Institute</b>
16:00-16:05		Khagendra Dhakal, Mr	Introduction	King Mongkut's University of Technology North Bangkok
16:05-16:25	Invited	Puspa Raj Kadel, Prof	Government's needs and expectation from Nepali diaspora for the development	Vice Chairman, National Planning Commission, Government of Nepal
16:25-16:40	Invited	Bhim Udas, Mr	Diaspora's strengths and possible means to harness them for the development of Nepal	Founding International Coordinator of NRNA
16:40-17:00	Contributed	Sharad Neupane, Mr	Proposition of NRNA policy institute for the collaboration between diaspora and Government of Nepal	Nepal Policy Institute, Thailand
17:00-17:15	Contributed	Krishna Adhikari, Dr	Understanding the Nepali diaspora and connectivity for welfare both inside and outside Nepal	University of Oxford, UK
17:15-17:25	Contributed	Yub Raj Pokharael, Dr	Diaspora entrepreneurs in India: How they can participate in Nepal's development process	South Asian University, New Delhi, India
17:25-17:45	Panel discussion and Q&A	Bhaban Bhatta, Mr		President, Non-Resident Nepali Association
		Madan Kumar Dahal, Dr Prof		Former Head, Central Department of Economics Tribhuvan University
		Sharu Joshi Shrestha, Ms		Former Strategic Partnership Specialist at UN Women
17:45-18:00	Guest Speaker	Pradeep Kumar Gyawali, Hon.		Minister of Foreign Affairs Nepal
18:00-18:10	Summary	Bhekh Bahadur Thapa, Dr		Former Foreign and Finance Minister of Nepal
18:10-19:10	Poster			
19:10	Dinner			

# Government's needs and expectation from Nepali diaspora for the development policies of Nepal

■ **Puspa Raj Kadel**

*Vice Chairman, National Planning Commission, Government of Nepal*

# Harnessing Diaspora's strengths and possible means for the development of Nepal

■ **Bhim Udas**

*Founding International Coordinator of NRNA*

Human resource mobility is an essential feature of today's globalized world. Market economy, knowledge networks and technologies are contributing to the increasing movement of labour, students, professionals and families to other countries. The migrants of yesterday have become today's Diaspora and will be new generation tomorrow.

Since 1990s, Diaspora's participation in development process of country of origin has gained increasing prominence especially, in developing countries. Non-Resident Nepalis (NRNs), part of Nepali Diaspora with its force of around 6 million spreading in 72 countries have risen as a potential actor in development process of the home country. In the past, the impact of Nepali Diaspora was somewhat unplanned, haphazard and occurred by default rather than design. This practice need to be revisited in order to harnessing full potential of NRNs. Nepali diaspora should be considered not just as sources of remittance and finance for development, but also as development partner.

Following the promulgation of new constitution that has captured the aspiration of Nepali people to develop a peaceful and prosperous nation through equitable development. In order to achieve this goal, the country requires a long-term development vision and implementing strategy where NRNs could contribute with their gained knowledge, expertise and experiences. Nepal is endowed with abundant natural resources and biodiversity. The country has not been able to exploit those resources for its development due to lack of skilled manpower, technology and capitals where diaspora community has capability and resources to support the government.

Nepal sits between two regional powers with fastest growing economies in the world. Rapid development of infrastructure, technology and productions have contributed to sustained economic growth in those countries. Nepal cannot remain where it is now (LDC) for a long period of time. It must explore all the potentials and resources both human and capital utilizing diaspora community. They too must have a role to participate in development process, formulating policies and programs, keeping in view of Nepal's national interest.

NRNs can potentially contribute to Nepal's overall development through advocacy and economic diplomacy, capital markets (bonds, remittance and share), direct investment, knowledge networks, philanthropy, tourism and trade, and diaspora corps. Brain drain of 1990s has become today's brain gain for Nepal.

# Proposition of NRNA policy institute for the collaboration between diaspora and Government of Nepal

■ **Sharad Neupane**

*Nepal Policy Institute, Thailand*

This paper examines the potential role of Nepali Diaspora in public policy making in Nepal through Nepal Policy Institute (NPI). NPI was conceived as a global initiative of Non-Resident Nepali Association (NRNA) to unleash the potential of Nepali diaspora to build a prosperous Nepal as guided by 'NRNA Vision 2020 and Beyond'. The conception of NPI was driven by NRNA's comparative advantage and opportunity of mobilizing a large range and number of public policy scholars, researchers, practitioners, experts and consultants across Nepali diaspora as well as their partners and associates in Nepal and globally. NPI will be an international think-tank and a knowledge-platform dedicated to the people-centred and sustainable development of Nepal and Nepali people, including diaspora Nepali

Given the volatile, uncertain, chaotic and ambiguous, yet rapidly changing and hyper-connected world that we live in, NPI will be uniquely placed to provide i) swift and relevant wide ranging and multi-angled perspectives and recommendations towards determining, adapting or implementing suitable public policy in Nepal ii) bring experience or experiments of public policies to Nepal from elsewhere and take Nepali experience and expertise to the global platform thus promoting Nepal globally iii) strengthen think-tank and public policy research, analysis and advocacy ecosystem in Nepal through collaboration, partnership and exchanges.

The proposed founding strategy of NPI has been developed by the interim executive committee with the help of a task-force. It highlights the core focus area of NPI, medium-term priorities, collaborative partnership and funding strategy. This document is informed by several informal consultations with global diaspora professionals, Nepal resident scholars and GoN officials and will be presented for discussion, feedback and endorsement at the First NRNA Global Knowledge Convention to be held in Nepal on 13th October 2018. The revised document informed by the discussions at the Global Knowledge Convention will be, subsequently, presented to the NRNA ICC for final approval and adoption.

# Understanding the Nepali Diaspora and connectivity for welfare both inside and outside Nepal

■ **Krishna Adhikari**

*University of Oxford, UK*

In recent years, there has been exponential rise in the interest in the study of Nepal's international migration, evident in the number of publications crossing four digits. However, studies focussed on the Nepali diaspora are rare and limited to some specific regions only. Although the advent of the Non-Resident Nepali Association (NRNA) has brought to limelight the migration of Nepalis to new destinations, and provided impetus to the link of Nepalis living outside South Asia to their 'homeland', there has so far no scholarly attempt to understand the NRNA movement from a global perspective. So far, the NRNA's priority seems to be overly focussed on making material and financially tangible contributions to Nepal. There appears to be little priority or interest within its rank and file in research as a valuable resource. Nor is there much curiosity to investigate the size, nature and dynamics of the various Nepali diaspora communities. Yet understanding the diaspora in terms of its members' positions, capacities, and resourcefulness (both soft, e.g. knowledge, skills, and hard, e.g. financial, assets) as well as level of diasporic consciousness and intensity of connectivity is critical for any project aimed at assisting their 'home', 'mother', or ancestors' land.

This paper, which partly draws on the recent OUP publication *Global Nepalis: Religion, Culture, Community in a New and Old Diaspora*, edited by DN Gellner and Sondra Hausner, and contributed by 20 prominent researchers, and partly on some other works related to Nepali Diaspora, aims to address this gap to some extent. In this paper, in particular, I would like to present some background information, and, thereby, provoke broader debate on a series of themes: (a) knowledge about diaspora: locating old and new diaspora, their transnational connections (cultural, political, social, institutional, etc.), and understanding the trajectories, sufferings and integration in their new home; (b) diaspora knowledge: NRN's status and priority for research in general and that in particular on the Nepali Diaspora; and understanding Diasporic resource endowment, capacity and potentials (knowledge, skill, materials, etc.); and (c) (potential) role of diaspora in the development of Nepal including policy conditions necessary to activate these potentials.

# Nepali migrants in India and their role in Nepalese economy

■ **Yuba Raj Pokharel**

*South Asian University, New Delhi*

Nepal and India share an open border as per the bilateral treaty signed in 1950. It is estimated that about 4 to 6 million Nepalese citizens are currently living and working in India out of which almost 3 to 5 lacs in Delhi alone. Every year seasonal workers migrate to India, who are working in different sectors like, security services, household servants, restaurants and hotel labours as well as in government job. Very few migrant workers of Nepal working in higher official position of Indian government, even they are working hide their Nepali identity because of the legal procedures. Indian industries hold a large number of Nepalese workers including steel factories, coal factories etc. Every year large no of Nepalese students joined Indian Universities, colleges and different institute personally as well as with government channel but there is no any data base available yet. It is estimated that every year 10-15 thousand of rom Nepal enrolled in CA course every year, Delhi itself holds more than 8 thousand CA and average CA clear rate is 200 to 300 students per year from Nepal. Bangalore only holds more than 3 lacs of students from Nepal in different stream. At present, more than 45 thousand Nepali people are serving in Gurkha regiments of Indian Army. Even there is no exact documents when Nepali people started to migrate to India but India holds second largest Nepali speaking people in the worlds. Though there is long history of migration of Nepalese people to India, there is no clear database available to explain how many people are working in different sectors of India. Nepal suffers very large trade deficit with India-7.3 billion dollars in 2017/18. India enjoys third largest trade surplus with Nepal after USA and UAE. Annually Nepal sent 3 billion dollars remittance to India (100% goes from unofficial channels) but Nepal receives 1 billion dollars from India per year. Nepal is the source of largest foreign student source for Indian Universities account for 20% of total foreign students, and they spent 365 million dollars in 2017/2018 but this does not include CA and other unofficial course students from Nepal. From these simple statistics, we could conclude that this is really interesting that small neighbour Nepal suffering from its own developmental process but supporting 15 billion dollars per year for the development of India instead of getting support of 2 billion dollars from India.



## SYMPOSIUM

# Symposium 1: Agriculture and Food Security

**14 October 2018, 8:40-12:50 PM, Megha Hall**

*Coordinators:*

*Dr Drona Rasali, Provincial Health Services Authority, Canada*

*Dr Keshav Adhikari, IAAS, Tribhuvan University, Nepal*

Agriculture has been the mainstay of Nepal's economy as well as the main source of livelihoods for majority of people in the country from the time immemorial to date. Yet, the country has increasing dependence on the imports of food and agriculture inputs over time. Despite much emphasis put on agriculture development in the periodic plans for nearly half a century now, the capacity to achieve appropriate agricultural education, innovation of technology, multi-sectoral collaboration and investment required thereof have not been adequate to explore the vast potential of diverse agricultural resources in order to secure sufficient, safe and healthy food for the people.

**Focus:**

Agricultural crops and livestock, natural resources, soil and water management, agriculture production, marketing and distribution of agricultural commodities, food security.

**Background:**

By the end of the period of the first long-term agricultural plan of Nepal, Agriculture Perspective Plan (APP), 1995/96 – 2014/15, productivity, infrastructure, food security and poverty situation are known to have improved substantially. However, the status of agriculture development was still considered to be in a “low development stage” due to inability to achieve the level of growth

as anticipated. Despite some subsectors such as dairy processing, poultry, tea, vegetable seed and fisheries showed positive signs, they are not yet sufficient to lift a large number of people engaged in agriculture out of poverty and make a dramatic dent in reducing malnutrition and assure food security of the nation. This has been the assessment during the formulation of the current long-term plan, Agriculture Development Strategy (ADS) that is expected to guide the agricultural sector during strategy period, 2015-2035. Over the period of this two-decade long plan, the structure of the agricultural sector is expected to change considerably, with the agribusiness and non-farm rural activities growing relative to accelerated agricultural growth. The ADS consider the agricultural sector in its complexity, and encompasses not only the production sectors (crops, livestock, fisheries, forestry) but also the processing sector, trade and other services (storage, transportation and logistics, finance, marketing, research, extension).

The ADS outline its expected impacts through accelerated agricultural growth as follows:

- Ensuring food and nutrition security through improving productivity, profitability and competitiveness in agriculture,
- Reducing poverty reduction through accelerated agricultural growth,
- Providing an important source of foreign exchange through agricultural trade surplus,
- Promoting inclusion of disadvantaged groups and regions through an approach to value chain development for higher and more equitable income of rural households
- Providing institutional mechanisms to ensure farmers' rights to participation in the planning, decision making, implementation, and monitoring of the strategy.

All these expected impacts remain only a tall talk if the country does to acquire the required capacity early enough for achieving the expected outputs i.e., improved governance, higher productivity, profitable commercialization and increased competitiveness as projected by the ADS. Importantly, the vast number of the Nepal's current pool of professional expertise remain in foreign lands as Diaspora resources that should be redirected back to the motherland to revitalize innovation and adaptation of technologies as well as multi-sectoral collaboration and investment for transformative leap forward in the agriculture sector. This series of two symposia aims to address these concerns

## PROGRAM

<b>Symposium 1: Agriculture and Food Security</b>				
<b>14 October 2018, 08:15-12:50, Megha Hall</b>				
<b>Session A: Agriculture and Natural Resources Policy Implications for Food Security, Chair: Prof Ishwari Prasad Dhakal</b>				
<b>Time</b>		<b>Speaker/Panellist</b>	<b>Topic</b>	<b>Institute</b>
08:15-08:40	Tea and networking			
08:40-08:45		Keshav Adhikari, Prof Dr	Symposium introductions and welcome	Dean, Institute of Agriculture and Animal Sciences, Tribhuvan University, Nepal
08:45-09:05	Invited	Yubak Dhoj GC Dr	Government current policies on food security	Secretary, Ministry of Agriculture, Land Management and Cooperatives, Government of Nepal
09:05-09:20	Invited	Durga Poudel, Prof Dr	Agriculture and natural resources development and management strategy (video presentation)	Environmental Science Program, University of Louisiana at Lafayette, Louisiana, USA
09:20-09:40	Invited	Krishna Dev Joshi Dr	Transforming rice agri food systems in Nepal: Need for strong international collaboration	Country Representative in Nepal, International Rice Research Institute, Manila, the Philippines
09:40-10:00	Invited	Nanda Prasad Shrestha Dr	Role of livestock sector for improving food and nutrition security of rural Nepalese people	Former Executive Director, Nepal Agricultural Research Council (NARC)
10:00-10:20	Contributed	Drona Rasali, Dr	Securing sustainable, sufficient, safe and healthy food: Principles and practices of food security in Nepal	Director, Provincial Health Services Authority, BC, Canada
10:20-10:35	Contributed	Ram Bhandari	Mountain organic agriculture in the Himalaya: Strengthening partnerships, policies and practices for livelihood, food and ecological security in Nepal	Founding President, IISUMOD-International Institute for Sustainable Mountain Development, Rome, Italy
10:35-10:40	Summary	Ishwari Prasad Dhakal Prof		Agriculture and Forestry University
10:40-11:10	Tea break			

<b>Session B: Agricultural Innovation and Practice for Food Security, Chair: Dr Dil Bahadur Gurung</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
11:10-11:30	Invited	Tek Bahadur Gurung, Dr	Local innovation on enterprise based restoration of degraded lake and fish production by cooperative governance: Working scope to NRNA in agriculture sector for food and nutrition security in Nepal	Principal Scientist and Research head, Livestock and Fisheries Research Nepal Agricultural Research Council, Nepal
11:30-11:50	Invited	Surya Bhattarai, Dr	Alternative fertilizer options for sustainable agriculture in Nepal	Senior Research Fellow, Central Queensland University, Australia
11:50-12:00	Contributed	Bhola Man Singh Basnet	Rice security is food security how to make Nepal self-reliant in rice production?	Retd. Principal Scientist (Agronomy)/Senior Rice Expert Nepal Agricultural Research Council (NARC)
12:00-12:10	Contributed	Dharmendra Kalauni	Pesticide use and its residue status in food crops in Nepal	Agriculture and Forestry University
12:10-12:20	Contributed	Pradeep Wagle, Mr	Global food security through agricultural transformation: How can agricultural expatriates contribute?	Association of Nepalese Agricultural Professionals of Americas, USA
12:20-12:30	Contributed	Ravindra Nyaupane, Mr	Agricultural and integrated economy of GGA	Swansea University, UK
12:30-12:40	Contributed	Purna Kandel, Dr	Technology transfer and utilization to increase productivity of Nepalese agriculture through use of world wide available best technologies	Liam BioChem International, Toronto, Canada
12:40-12:50	Summary	Dil Bahadur Gurung, Dr		Member, National Planning Commission, Nepal
	Poster	Jeevan Bahadur Shahi	Himalayan shrub Dhatelo and its clinical information	Dutelo Agro, Nepal
	Poster	Raju Pandey	Rearing beneficial insects for suppressing pest insect	Citrus Research Board, USA
12:50-13:50	Lunch			

# Government current policies on food security

## ■ Yubak Dhoj GC

*Ministry of Agriculture, Land Management and Cooperatives, Government of Nepal*

Government of Nepal has already committed towards Sustainable Development Goals agenda and Goal 2 of the SDG's goal targets to end hunger, achieve food security and improved nutrition and promote sustainable agriculture. We are also joined with the UN's Zero Hunger Challenge Initiative and have own roadmaps for ending all sorts of hunger by 2025. We are one, among a very few countries, having "food sovereignty" as the fundamental right of people in the Constitution of the country. We have already prepared Agriculture Development Strategy: A visionary document for the next 20 years in agriculture sector, which emphasizes on increased production and productivity, increased competitiveness and commercialization and decrease trade gap with trade surplus in agriculture sector. Moving forward, this strong majority government has set targets for doubling the agriculture production in five years. Ministry of Agriculture and Livestock Development has evaluated this as difficult task but not unachievable.

Because of difficult terrain, agriculture and agribusiness are difficult jobs in Nepal. Land the most important factor inputs are small in size and we are incapable of generating economies of scale. Fragmentation of land due to inheritance pattern and cultures are the major constraints for low level of mechanization and we are unable to harness the benefits from machines. Now we are compounded with problems of labor, another important factor of production. Out migration of active labor force in search of better employment opportunities has been a chronic phenomenon since two decades. The low productivity of agriculture sector and its small returns is the major cause of such migration. Likewise, being the landlocked country, trade has not been an easy jobs particularly the export is difficult when we lack capacities for meeting compliances.

# Agriculture and natural resources development and management strategy

## ■ Durga D. Poudel

*Environmental Science Program, School of Geosciences, University of Louisiana at Lafayette, Louisiana, USA*

Nepalese agriculture provides livelihoods for nearly two third of the nation's population and contributes about 33% to national GDP. Despite over six decades of relentless governmental efforts on agricultural transformation, Nepalese agriculture is experiencing a serious downward spiral. Nepalese agricultural development revolves around five drivers:

1) sustainable commercialization of small-holder mixed farming system, 2) incentivized farmers, buyers, sellers, traders, and agro-entrepreneurs, 3) pro-poor market, 4) strategic public investment on infrastructure, and 5) policies, plans, strategies, rules and regulations, and trade agreements.

Smallholder mixed farming system is the backbone of Nepalese agriculture. Agricultural policies and programs must contribute to sustainable commercialization and development of the smallholder farming system. Timely formulation of appropriate plans and policies, development of rules and regulation, and signing and revising treaties and trade agreements, etc., is necessary for agricultural development. Policy training, research, formulation, and policy implementation should be of high priority.

Agricultural development initiatives must focus on the five drivers of agricultural transformation within a framework of natural resources conservation and development in Nepal. In order to achieve success in agricultural development, natural resources conservation and development programs such as soil and water conservation programs, agro forestry interventions should be implemented in a very coordinated way. Federal level Department of Agriculture should act as a lead agency for providing financial and technical assistance to producers, ranchers, and other stakeholders in relation to agricultural production, and natural resource conservation, development and utilization. Some of the major goals of natural resources planning and development may include preventing land degradation, increasing agricultural productivity, protecting soils, conserving forests, increasing fodder and forages,

etc. Institutional strengthening at the national, regional, and local level is necessary for providing services to farmers, traders, agro-entrepreneurs, and other stakeholders in an efficient way. Agriculture Development Strategy (ADS) presents valuable framework for agricultural development. However, due to several implementation challenges including the federalization of governance and administrative structure associated with the ADS, I suggest an immediate revision of ADS and the development of a comprehensive Agricultural and Natural Resources Development and Management Strategy (ANRDMS) for sustainable agricultural and natural resources development and management in Nepal.

# Transforming rice agri-food systems in Nepal: Need for strong international collaboration

■ **Krishna Dev Joshi**

*International Rice Research Institute, Manila, The Philippines*

Rice is the life line of Nepal contributing to 67% of cereal and 23% of protein consumption. Area under rice is declining and fluctuating between 1.5 and 1.4 million ha and with total rice production 5.2 million tons reported for 2017-18. Nepal is short of around one million tons of milled rice (around 1.8 million tons of unmilled rice). Rice yield growth in last three decades is far from satisfactory in the country and rice yield gap of 50 to 75% in different rice production domains meant that US\$ 250 to 300 million worth of rice is imported every year. As a major contributor to agriculture gross domestic product (AGDP), any decline in rice productivity growth has multiple and serious implications on food and nutritional insecurity, draining of development funds for importing rice, trade imbalance, high inflation, increasing rural poverty and political instability.

Improving and sustaining significant rice productivity growth is vital to contribute to multiple dimensions of development and achieving several of the Sustainable Development Goals (SDGs). This requires concerted efforts in transforming existing conventional production systems into science and technology intensive rice agri food industry. To achieve this, strong international collaboration is needed to introduce and integrate rice science and innovations from rice production through to product development, strengthening critical mass of rice scientists and development professionals, branding and market networking. All these sectors open up vast opportunities for collaborating on research for development, capacity building and investment on various aspects of rice industry. International Rice Research Institute as a credible international organization, knowledge partner and an honest negotiator is very keen to collaborate and network with a largenumber of professional organizations, corporate private sector and interested individuals for transforming rice agri food system in Nepal.

# Role of livestock sector for improving food and nutrition security of rural Nepalese people

■ **Nanda Prasad Shrestha**

*Nepal Agriculture Research Council, Adjunct Professor, HICAST*

Nepal has more than 2/3 of people engaged for livelihood in crop and animal agriculture that contributes to 32 % in national GDP. However, the country has a very high malnutrition rate with 36 % stunted and 27 % of underweight children under five year of age. Women and children suffers from vitamins and mineral deficiencies. The critical period is first 1000 days of live from conception to 24 month of age. The rural poor suffer the most for accessing and utilizing the available food resources in their households.

Eighty-three percent of the total population of Nepal lives in the rural areas and their main sources of livelihood is agriculture and Livestock. Livestock plays significant role in Nepalese economy contributing 11 % to the national Gross Domestic Product. The food habit of Nepalese people is changing and inclusion of more of animal source food is increasing. Thus the demand of animal source food is increasing.

Animal source food help balancing Nepalese diet Dal (Legume) Bhat (rice) and Tarakai (Curry) vegetable supplying bio-available high density of macro and micro nutrient, and amino acids that matched the human needs. Animal Source food enhance the nutrition of mother and infants in the first 100 days of life by making availability of dense nutrients: Milk that improve the children's growth and prevent stunting<sup>1</sup>. Meat improve long term cognitive ability. Adequate diversified nutritious nutrient dense food for lactating mother and 6-243 month old child.

The province-4 has produced highest per capita meat (13.04 Kg) compared to other provinces with least by province-2 (7.63 Kg). In case of milk production, provinces-1 has the highest per capita milk production of 76.8 Kg. The province-2 has also the lowest per capita milk production (45.85 Kg.). The per capita of egg production is highest in province 3 (118 Number) compare to Province 6 with only 11 egg in number. The province-2 has produced highest per capita in fish (5.2 Kg) and the lowest in province-6 (0.04 Kg). These figures provide scope for increasing the production of livestock and fisheries product to improve the food and nutrition security in Nepal.

# Securing sustainable, sufficient, safe and healthy food: Principles and practices of food security in Nepal

■ **Drona Rasali, Prem Bhandari, Megha Parajulee, Raju Adhikari, Ram Acharya, Uma Karki, Lila Karki**

*Provincial Health Services Authority, BC, Canada  
Nepalese Agricultural Professionals of Americas (NAPA)*

Nepal is one of the most food insecure countries in the world, ranking 157th among 187 countries in 2012. In 2010/2011, 38 out of 75 districts were categorized as food insecure districts. This picture suggests that the vast majority of the people living mostly under rural subsistence system are facing serious challenges in sustaining their livelihoods in the current day of advanced technologies and globalized economy. The current state of food system and infrastructure of Nepal is less than optimal to keep them food secure, despite many efforts made for decades by the Government and the international community. To nourish the country's ever-growing population, production, processing, preservation, distribution, marketing, access and consumption of food in sustainable, sufficient, safe, healthy and equitable manner is essential. The whole gamut of these processes that are largely controlled by the market infrastructure and forces can also be considerably influenced by healthy public policies, programs, services and innovative technologies. Realizing the need for comprehensive knowledge on principles and practices for a sustainable food system, the Association of Nepalese Agricultural Professionals of Americas (NAPA) has undertaken a project to publish a book on food security in Nepal authored by experts and practitioners, mostly Nepali professional experts and scholars from the Americas and abroad. Principles and practices of food security and their policy implications will be covered in various book chapters that will encompass the essential components of food security. These components include food sufficiency and sustainability through increased production and crop intensification, soil health and agroecosystem resilience, and associated technologies thereof. Various cross-cutting dimensions such as nutritious food basket, marginalization among people and healthy eating will also be addressed. The target readership of the book is including but not limited to government planners, researchers and academics, policy makers, and decision makers at various levels, non-governmental organization program officers, agricultural officers, food economists, graduate students, civic leaders and intellectuals. The food industries (processing and manufacturing), retailers and suppliers and food hospitality stakeholders may be interested in the know-how of food security and food safety. The book is expected to be a reference read internationally as well.

# Mountain organic agriculture in the Himalaya: Strengthening partnerships, policies and practices for livelihood, food and ecological security in Nepal

■ **Ram Bhandari**

*IISUMOD-International Institute for Sustainable Mountain Development, Rome, Italy*

Rich in biodiversity and home to nutritious crops, mountain ecosystems are threatened by deforestation, soil degradation and erosion, as well as the melting and receding of glaciers. Plant biodiversity including wild and cultivated nutritious crops and related ecosystem services benefit all peoples and geographies worldwide.

The latest indication from the International Panel on Climate Change (IPCC) clearly point towards an even greater impact from climate change, while the demand for food from a growing population worsens the sustainability problem even further. Organic agricultural practices not only help to maximize carbon fixation while minimizing emissions, thus reversing the greenhouse effect, but also provide solutions to problems of health, nutrition, unemployment, poverty, loss of biodiversity, and water quality. Urgent action is needed on all fronts where organic agricultural research, development and movements can be integrated into sustainable mountain development in Nepal. Implementation can begin immediately in collaboration with Non-Residential Nepali Association's movement globally.

Our presentation aims to focus on vision, mission, programs and activities of the Agriculture Promotion Committee (APC) of the Non-Residential Nepali Association (NRNA) and the scope and importance of Mountain Organic Agriculture (MOA) as a science, practice and movement in relation to Nepalese diaspora to strengthen partnerships, policies and practices for sustainable Mountain Development in Nepal will be explored. This paper will examine and highlight how MOA can help tackle pressing issues of mountain people, environment and ecosystems for their livelihood, food and ecological security. We shall offer suggestions for market development that respect indigenous culture and provide benefits at different scales.

# Local innovation on enterprise-based restoration of degraded lake and fish production by cooperative governance: Working scope to NRNA in agriculture sector for food and nutrition security in Nepal

■ **Tek Bahadur Gurung**

*Livestock and Fisheries Research Nepal Agricultural Research Council*

This study elucidates local innovation on enterprise based lake restoration and fish production using cooperative governance for addressing food and nutritional security in Nepal. In the late 1990s a shallow and small Rupa Lake located in Central Nepal of about 100 ha in area and 4.7 m maximum depth was heavily degraded due to sedimentation, agricultural runoff, excessive macrophyte and senescence. Consequently, dissolved oxygen (DO) in the lake water column depleted, causing fish kill - threatening local environment and local food system. This left nearly 100 fisher's family deprived and jobless. To restore the lake and its fishery, an innovative biomanipulation approach was initiated in the year 2001. Where, carp fry of ~2 gm each were stocked and recaptured later after their body weight reached >3 kg. It was assumed that bottom feeder and herbivore carp would control excessive growth of aquatic plants, promote phytoplankton abundance and enhance the DO level. Water temperature, transparency, pH, DO, chlorophyll a, phosphate, total phosphorus, ammonium nitrogen, nitrate and nitrite data including the quantity of fish captured were collected. As assumed, the results showed decrease in macrophytes with gradual dominance of phytoplankton and increase in fish production. Water transparency improved and DO increased from none to 3.4 mg O<sub>2</sub> per liter. Captured fish yield reached up to 60 MT which was about 15 folds higher than earlier years, thus improving nutritional food availability. The governance of cooperative for the project was entrusted to Rupa Lake Restoration and Fisheries Cooperative comprising of marginalized fisher, women and other local communities. A recent survey showed that members in this cooperative increased from 38 in 2001 to 760 in 2017 demonstrating highly successful approach of managing enterprise based restoration of natural resources and commercial production. The present study of small holder's cooperative governance implies that gradually subsisting farming approach in agriculture is transforming into entrepreneurial production for addressing food and nutritional security. This model could be a working scope for organizations like NRNA (Non-Residential Nepalese Association) to address food and nutritional security involving in cooperative, company or contract farming model approach in future in Nepal.

# Alternative fertilizer options for sustainable agriculture in Nepal

■ **Surya Bhattarai 1, Kalyani Tripathi 2, Til C Bhattarai 3 and Durga D. Dhakal 4**

*1 Central Queensland University, Rockhampton, QLD 4702, Australia | 2 Agriculture and Forestry University, Nepal | 3 Pancharatna Group of Industries, Nepal | 4 Nepal Polytechnic Institute, Chitwan, Nepal*

Nepal's twenty-year Agriculture Perspective Plan (APP), started in 1997 identified chemical fertilizer as an engine of agriculture Growth in Nepal. Fertilizer was expected to contribute 64 to 75% of the targeted total agriculture growth. APP envisaged an increase in fertilizer usage from 31 kg/ha of the base year 1995 to 131 kg/ha by 2017. Nepal's annual fertiliser demand stands at 0.7 MT and fertilizer use in 2017 was only 73.8 kg/ha, about half the target. Low fertilizer use results from issues related to managing import and supply, distribution, quality control, on farm use. Considering existing socio-economic, cultural, trade and policy constraints around fertilizer demand and supply, the country desperately need alternative fertilizer options to achieve the desired growth in agriculture.

Seven types of alternative fertilizers provide opportunity for commercial production and use in Nepalese agriculture are: 1. Biofertilizers (e.g. rhizobium, Azotobacter, Azospirillum and blue green algae), 2. Bio-wastes (e.g. manures and biosolids), 3. Green manures (e.g. sweet clover, hairy vetch), 4. Organic materials (compost, biochar, peat, coal dust), 5. Modified fertilizers (e.g. liquid P, phosphoric acid, slow release), 6. Natural minerals (e.g. gypsum, lime, rock phosphates), 7. Nutrient cycle interventions (e.g. permaculture, aquaponics), abbreviated as BBGOMNN.

We also present two case studies based on the results of industry and farmers participatory R&D projects in Nepal (2013-2017) for commercial production of vermicompost using organic wastes from fruits and vegetable markets and granulated organic fertilizer from chicken industry waste. These demonstrate the feasibility of large scale alternative fertilizer production and use in Nepal. Innovation and practice change for the management of fertilizer technologies complemented with organized production, water and irrigation technologies, labor productivity in farming, quality control of food production and processing, markets access and linkage and industry image building (FOWLQMI) are suggested for transformational gains of agriculture productivity and profitability contributing to the government mission statement "Prosperous Nepal, happy Nepalis".

Innovative commercialization is the next step in this process, where we believe organizations such as NRNA could partner in the venture with Nepalese entrepreneurs for sharing knowledge and capital as well as contributing to local capacity building.

# Rice security is food security: How to make Nepal self-reliant in rice production?

■ **Bhola Man Singh Basnet**

Rice is one of the most important and number one cereal crops in Nepal. Not only is rice a key source of food, it is also a major employer and source of income for the poor. There is about 50% contribution of rice in total food production. Rice security is food security in Nepal. The national economy depends on rice production itself. There is approximately 21% share of rice in Nepal's agriculture GDP and 7% in GDP. As per the preliminary estimate of Fiscal Year 2017/2018, the rice crop was grown in 14,69,545 hectares with the production of 51,51,925 metric tons and the productivity was 3.506 ton/ha. There are less possibilities of bringing more lands into production. Therefore, we have to increase the productivity per hectare per day by knowledge- and science-, knowledge- and technology-based rice farming. The promising rice varieties plus successful technologies generated by agriculture research play the pivotal role. The modern varieties can express their yield potentiality only when recommended packages are practiced. Quality seeds alone can contribute 15-20% in yield. Seed selection can be done by following the specific gravity principle. Early paddy and Boro (winter) rice can be used for increasing rice yield by utilizing the higher intensity of solar radiation i.e using sun to boost rice productivity. The system of rice intensification (SRI) is the other agronomic manipulation which can increase rice yield. The plant growth regulators (PGRs) can also be used for increasing rice productivity. However, we should not forget the environmentally-friendly and sustainability issues while increasing the productivity and production. That is why these days we say "Evergreen Revolution" and not "Green Revolution" only. It is said "Grow Paddy with Soil Fertility Wheat with Fertilizers" and also said "Healthy Seedlings are responsible at least for half of the yields". The donor's priority in Nepal is peace. But they can't bypass agriculture-sector because "Hungry man is no peaceful man", "Hungry stomach is restless one" and "Hungry man is angry man". Food security, nutrition security, profitability and sustainability are the major issues at present and future. The Government of Nepal should form a high-level national food security mission, involving field-hardened experts with proven track-record so as to cope with burning problem of food grains in the country. Food self-sufficiency is the urgent demand of present time. Government of India during global food crisis had banned for exporting wheat and non-basmati rice in 2007-08 for 4-5 years. If Nepal is not self-reliant in food grains, the situation may come whereby we cannot buy food grains even if we have money in our pockets. Should we depend on others even to live?

# Pesticide use and its residue status in food crops in Nepal

■ **Dharmendra Kalauni**

*Agriculture and Forestry University*

## **Introduction:**

Insubstantial options for chemical pest management compelled farmers to using synthetic pesticides against crop insect pests that otherwise created vicious circle of increasing high-dose-pesticides applications in environment in country. Pesticide exposure and its repercussion in public health and environment are now detectable.

## **Objective:**

Understanding of prevailed pesticides uses and their state regulation status.

## **Methods:**

Secondary data assembled from national, international journals, expert and state reports, and departmental annual reports. Excel spread sheet used for data analysis.

## **Results:**

Chemical pest management commenced from using Paris green, gamaxone, nicotine sulphate and chlorinated hydrocarbons in 1950s to 117 chemically defined pesticides including bio-pesticides and bio-rational compounds of 2186 formulations from 1960s to 2018 has made obvious changes in pest management scenario in country. Around 352 mt of active ingredient (a.i.) of pesticides is in use in agriculture. Per ha pesticide consumption in Nepal is 396.0 g (a.i.) while in commercial vegetable sector its consumption is as high as 1600 g a.i. per ha. Pesticide residues in fresh vegetables are problems, particularly, in the Kathmandu valley where it is found the highest level of pesticide contamination in root vegetables (11.9%) followed by leaf vegetables (10.9%). Hazardous pesticides, namely aldrin, BHC, chlordane, DDT, dieldrin, endosulphan, endrin, heptachlor, lindane, methyl parathion, mirex, monocrotophos, organomecurial fungicides, phorate, phosphamidon and toxafen, in course of regulation, are banned for marketing them in the country.

## **Conclusion:**

Option dearth but farmers' reliability only in chemical applications in pest management in crop fields has resulted in repercussion of vicious circle of compelled higher dose pesticide applications in crops. Obvious result is scores of multitudes of pesticides crowded in market in the country. Above all, problems of pesticide residues in food grains and green vegetables are emerging.

# Global food security through agricultural transformation: How can agricultural expatriates contribute?

## ■ Pradeep Wagle

*Association of Nepalese Agricultural Professionals of Americas, USA*

The current global food security challenge has been transform agricultural systems, through advanced agricultural innovations, best management practices, and environmentally friendly sustainable agricultural production systems, to ensure sufficient, nutritious, and safe food for ever-increasing world population. Affordability to production resources, widening inequalities, increasing climate variability, changing land-use patterns, and volatile agricultural markets are some of the major constraints in promoting sustainable agriculture. The food security challenges in Nepal are further exacerbated due to high dependency of livelihood in agriculture, low agricultural commercialization, and limited access to improved seeds, new technologies, and market opportunities. The United Nations estimates that developing countries need to double their agricultural production to meet the food demand for nine billion world population by 2050. Considering these facts, NAPA was founded in 2016 by the initiative of Nepalese agricultural and allied professionals from North America with the mission of collaborating with the Government of Nepal, national and international partners, and stakeholders to enhance agricultural productivity and food security to ensure people's 'right to food' that underpins the right of all human beings to be free from hunger, food insecurity, and malnutrition. NAPA's current and near-term scientific endeavors toward that mission include networking and collaboration, capacity building, scientific resources, global expert repository, advisory and expert services, and charitable initiatives. NAPA's First Biennial Scientific Conference (May 2018, USA) showcased the cutting-edge scientific research on virtually all disciplines of agriculture and allied sciences, with nearly 100 abstract submissions for oral and poster presentations from 71 institutions in 10 countries. Considering the acute demand of agricultural teachers in rural schools, NAPA has implemented pilot 'distance teaching' projects in Nepal. In addition, guest lectures, supervision of graduate students, and assessing the collaboration possibility in research projects are underway. NAPA envisions contributing to transformation of agriculture by sharing the vast amount of global expertise through effective collaboration. Therefore, NAPA seeks collaboration and commitment from NRN and concerned institutions and stakeholders 'as collective strength of expatriates' in addressing looming food security challenges in Nepal.

# Agricultural and integrated economy of GGA

## ■ Ravindra Nyaupane<sup>1</sup> and Mike Pretious<sup>2</sup>

*<sup>1</sup> PhD candidate, Swansea University, UK*

*<sup>2</sup> Senior lecturer, Queen Margaret University, Edinburgh*

The greater Gaumukhi area (GGA) comprises about 12 villages of Baglung, Gulmi and Pyuthan districts which is home to Dhorpatan-Madane conservation cluster and most organizational members of the United Network for Social Entrepreneurship international consortium. Similar to other districts or local regions in Nepal, GGA is hilly rural area and an economy that is heavily reliant on subsistence farming supported by limited trade, remittance from migrant workers and foreign aid.

Among other business and organizational models, social enterprises (SE) as a vehicle to advance economic, environmental and social sustainability simultaneously raises doubt on their ability to create social impact in Nepal (Nyaupane, 2016; cf. Pretious, 2016). Similarly, social enterprises, for example, community cooperative bank, farmers market or local tourism are some of the areas where GGA seems to be progressing slowly and steadily, however, they're also immune to social movements associated with welfare, wellbeing and rights of people which are found to have failed in the past (Nyaupane, 2017). The inherent issue of SEs is hybridity in logic and governance therefore suggests tensions to meet expectations of multiple stakeholders in the society (Quelin et al., 2017).

# Technology transfer and utilization to increase productivity of Nepalese agriculture through use of worldwide available best technologies

■ **Purna Kandel 1, Santosh Poudel 2, Tek Sapkota 3, Krishna KC 4, Rachan Devkota 5, Laxmi Panta 6, Tanka Khanal 7 and Hom Gartaula 8**

*1 Liam Bio Chem International, Toronto, Canada, 2 Saskatchewan Ministry of Agriculture, SK, Canada, 3 CIMMYT, New Delhi, India, 4 University of Guelph, ON, Canada, 5 University of Guelph, ON, Canada, 6 University of Guelph, ON, Canada, 7 University of Guelph and 8 University of Winnipeg, MB, Canada*

Two third of Nepal's population depends on agriculture but struggles to produce adequate food for its people and imports around NPR 200 billion worth of food products each year. Inefficient production practices mainly because of lack of technologies resulting into negative margin for majority of the producers. Many farmers, particularly the young farmers are interested to adapt new technologies to reduce drudgery and production cost, to enhance input-use-efficiency and to generate more profit. In addition, due to a higher rate of male out-migration, we should be focussed on a series of technology focussed programs and projects. Some already tested and proven technologies for examples use of genomic selection to enhance plant and livestock productivity, use of remote sensing data to uniform distribution of fertilizers and other farm chemicals, use of sexed semen to produce female calves for higher milk production, precision nutrient and water management technologies, use of scale-appropriate mechanization, disease resistance varieties of plant and animal species are common practices in developed world. As many of these technologies are already tested and proven elsewhere, a small investment and optimization to custom in Nepalese context can bring a big return to Nepalese agriculture. For export, Nepal has a huge potential to produce premium and organic agri-products along with some optimized indigenous technology to export in international markets. New technology, market and risk management need to go together for better results. Government led risk management programs in big sectors like cereals, poultry, dairy and other commercial enterprises would greatly help in increasing efficiency of the sector and encourage new investments. There is also substantial outreach and investment required to smallholder subsistence farms for certifying the premium and organic products. However, the adoption of technologies generated in other countries have potential social, economic, human, animal, and ecosystem health impacts and slow adoption. Nevertheless, through training, investments and mobilization in technology uptake and commercialization may overcome these shortcomings. In conclusion, Nepal can adopt technologies and best practices from around the world to reduce food import while it can also export premium agri-products in international markets.

# Himalayan shrub Dhatelo and its clinical information

■ Jeevan Bahadur Shahi

*Dutelo Agro Nepal*

Dhatelo's botanical name is *Prinsepia utilis* Royl., and it is in the Rosaceae family. It is a Himalayan shrub native to Nepal. It is found at the altitude of 2000 meters to 3200 meters in central to western part of the Nepal, mainly around Karnali and upper part of Far western region. It can grow up to 3 meters tall. It is an evergreen plant which produces flowers from February to March, and fruits from April to May. Dhatelo can be used commercially. Its Fruits can be used to produce Oil, and the deep purple dye extracted from the fruit can be used in production of color. Dhatelo Oil is used for Skin and Hair care products, cosmetic products, pharmaceutical products and cooking Oil. Dhatelo Residue can be used for different types of soap and organic fertilizer.

## बालीमा लाग्ने विनाशीकीरा नियन्त्रणका लागि मित्रकीरा उत्पादन र प्रयोग

■ राजु पाण्डे

हालैका दिनमा फस्टाउँदै गरेको प्लास्टिक घर तथा हरितगृहमा गरिने खेतीको विस्तार सगै तरकारीको उत्पादन बढेकोले बजारमा यसको उपलब्धता पनि बढेको छ। यस्ता बालीमा विभिन्न प्रकारका लाभ, लाभ, सेतेकीरा र सुलसुलेको प्रकोप बढ्दै गएको पाइन्छ, जसले गर्दा तिनको नियन्त्रणका लागि विषादी उपयोग समेत बढ्न गएको पाइन्छ। नेपालमा सरदरमा ३९६ ग्राम प्रति हेक्टर विषादी प्रयोग हुने भए पनि तरकारी बालीमा १४ कि. ग्रा. विषादी प्रति हेक्टरसम्म प्रयोग गरिने गरेका समाचारहरू प्रकाशित भएका छन्। एकातिर स्वस्थ जीवनका लागि तरकारीको उपभोग गर्ने बानी पनि बढेको छ, भने तरकारीमा प्रयोग गरिने विषादिको कारण मानव स्वास्थ्यमा पर्ने असरको चिन्ता पनि बढेको छ। तरकारी उच्च मूल्यको बाली भएको र बजारले आकर्षक देखिने उत्पादन रुचाउने भएकोले बालीलाई विनाशी कीराबाट जोगाउन जरुरी छ। बैकल्पिक नियन्त्रण विधिको अभावका कारण विनाशी नियन्त्रणका लागि किसानहरू खतरनाक विषादी उपयोग गर्न बाध्य छन्। यस्ता समस्या हल गर्न विनाशी नियन्त्रणको बैकल्पिक उपायको खोजी नभए सम्म विषादीको उपयोग र दुरुपयोग घटाउन सकिदैन।

प्रकृतिमा विनाशी कीराहरूलाई तिनका शत्रु (हाम्रा मित्र) किराले नियन्त्रणमा राखेका हुन्छन्। नेपाल जस्तो भौगोलिक विविधता भएको देशमा यस्ता मित्रकीराको सम्भावना भन धेरै हुन्छ। विषादिको प्रयोगले यस्ता मित्र कीरा चाडै मारिने भएकोले प्राकृतिक सन्तुलन विग्रन गै विनाशिको समस्या भन विकराल हुन जान्छ। यिनै मित्रकीरा उत्पादन गरि त्यसको उपयोग गरेमा एकातिर विग्रएको सन्तुलन पुनर्स्थापना गर्न मद्दत गर्दछ, भने अर्को तर्फ विनाशी जिव नियन्त्रण पनि सहज र सरल तरिका बाट गर्न सकिने हुँदा विषादी उपयोग क्रमिक रूपमा घटाउन सकिने छ। यसका लागि यस्ता मित्रजिव उत्पादनका लागि अत्यावश्यक प्रयोगशालाको स्थापना र संचालन गरि बातावरण मैत्रि विधिबाट विनाशी नियन्त्रणगरि स्वस्थ बाली उत्पादन गरेमा आम समुदायमा स्वस्थ तरकारी र फलफुलको आपूर्ती गरि स्वस्थ दीर्घ जिवनको सपना साकार पार्न मद्दत पुग्ने छ। विश्वव्यापीरुमा सर्वाधिक उपयोग गरिएका ट्रिकोग्रामा, ससाना कीराको शिकार गर्ने सुनटिकी, जालीदार कीरा, शिकारी सुलसुले जस्ता मित्रजिवको उत्पादन बाट यस्तो कार्य शुरु गर्नु श्रेयकर देखिन्छ।



## Symposium 2: Disaster Risk Reduction

**14 October 2018, 8:40 PM- 12:50 PM, Marva Hall**

*Coordinators:*

*Mr Ajaya Dixit, Institute for Social and Environmental Transition, Nepal*

*Dr. Netra Prakash Bhandari, Ehime University, Japan*

Nepal faces severe threats from multiple natural hazards which occur with regularity, including earthquakes, floods, and droughts. The country also faces problems related to disease outbreak, wildfire, road accidents, air pollution and uncertainties surrounding the threat of climate change. However, given how challenging it is to account for the influence that mountain regions may have on climatological parameters within climate models, the impacts of climate change are uncertain. Taken together, the known and unknown risks contribute to uncertainty regarding the impacts of future disasters and the government's response posing serious challenges to risk mitigation and the provision of essential services such as electricity, drinking water, basic health and education. We will attempt to highlight the multi hazard context and vulnerability of Nepal by presenting case study of past disasters (both high probability low intensity and low probability high intensity) to draw lesson.

<b>Symposium 2: Disaster Risk Reduction</b>				
<b>14 October 2018, 08:15 - 12:50, Marva Hall</b>				
<b>Session A: Disaster risk reduction policies and strategies, Chair: Mr Sushil Gyawali; moderation, Dr Netra Prakash Bhandary</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
08:15-08:40	Tea & Networking			
08:40-09:00		Ganga Lal Tuladhar, Dr	Dimensions of Newly Formed Disaster Policy in Nepal	Former Minister of Education, Chair of High Level National Commission on Education, Nepal
09:00-09:15	Invited	Banshi Acharya, Mr	Disaster risk reduction policy in Nepal and implementation challenges	Under Secretary, Disaster Management Division, Ministry of Home Affairs
09:15-09:30	Invited	Moti Lal Rijal, Dr	Disaster risk reduction strategy in Chure-Terai region of Nepal	Member, President Chure-Terai Conservation Development Committee & Central Department of Geology, TU
09:30-09:45	Invited	Dinanath Bhandari, Mr	Linkage between climate change adaptation and disaster risk reduction strategy	Practical Action Nepal (Climate Change and DRR)
09:45-10:00	Invited	Surya Bahadur Thapa, Mr	Role of civil society network in disaster risk reduction activities	National Disaster Management Network of Nepal (DiMaNN)
10:00-10:15	Contributed	Madhu Sudan Acharya, Dr	An innovative green solution for the protection of landslides and erosion control in Nepal	University of Natural Resources and Life Science, Vienna, Austria
10:15-10:30	Contributed	Prashant Paudel, Mr	Agro-forestry as a measure to enhance drought adaptation	Agriculture and Forestry University
10:30-10:40	Q&A			
10:40-11:10	Tea break			
<b>Session B: Earthquake, Chair: Mr Sushil Gyawali; moderation: Dr Netra Prakash Bhandary</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
11:10-11:30	Invited	Surya Narayan Shrestha, Mr	Lesson and achievement from earthquake management in Nepal	Executive Member, National Society for Earthquake Technology (NSET)
11:30-11:50	Contributed	Peetambar Dahal, Dr	Immediately implementable complementary Dry-Chain intervention for disasters and normal periods	University of California, USA
11:50-12:05	Contributed	Mukti Suvedi, Mr	Critical success factors for post disaster housing reconstruction and recovery: A community perspective from central hills of Nepal	Humber College, Canada
12:05-12:40	Panel Discussion and Q&A			
12:40-12:50	Summary	Sushil Gyawali		CEO, Reconstruction Authority

## Dimensions of newly formed disaster policy in Nepal

■ **Ganga Lal Tuladhar**

*Chair of High Level National Commission on Education, Nepal*

## Disaster risk reduction policy in Nepal and implementation challenges

■ **Banshi Acharya**

*Under Secretary, Disaster Management Division, Ministry of Home Affairs*

# Disaster risk reduction strategy in Chure-Terai region of Nepal

■ **Moti L. Rijal**

*Chure-Terai Madhesh Conservation Development Board, Government of Nepal/Central Department of Geology, Tribhuvan University, Nepal*

The Chure region is the youngest and the most fragile regions of the country, which is unique in its geological, hydrological and ecological perspectives. All natural and human induced processes and extreme events in this region affect the Terai region of Nepal that ultimately impact more than 50% population of Nepal.

Therefore, Government of Nepal has formed the President Chure-Terai Madhesh Conservation Development Board (PCTMCDB) in 2015. Sustainable management of natural resources in Chure-Terai region through integrated resource management of river systems is the main working framework of PCTMCDB.

Mitigation of natural disasters in Chure-Terai region for building resilient Chure-Terai region is one of the main goals of the PCTMCDB. This presentation highlights main features of Chure-Terai region, ongoing activities and strategies for disaster risk reduction in this region combining upstream and downstream linkages.

## Linkage between climate change adaptation and disaster risk reduction strategy

■ **Dinanath Bhandari**

*Practical Action Nepal (Climate Change and DRR)*

## Role of civil society network in disaster risk reduction activities

■ **Surya Bahadur Thapa**

*National Disaster Management Network of Nepal (DiMaNN)*

## Agro-forestry as a measure to enhance drought adaptation

■ **Prashant Paudel**

*Agriculture and Forestry University*

## Lesson and achievement from earthquake management in Nepal

■ **Surya Narayan Shrestha**

*Executive Member, National Society for Earthquake Technology (NSET)*

# An innovative green solution for the protection of landslides and erosion control in Nepal

■ **Madhu Sudan Acharya**

*University of Natural Resources of Life Science*

Soil nailing is an economical and efficient reinforcement technique used as a remedial measure in unstable natural slopes or as retraining structure for excavated slopes. In comparison with other retaining structures, soil nailing permits to reduce the excavated/fill soil volume, saving construction materials and realization time. The conventional construction sequence of soil nailing in excavated slope is typically excavate, nail and shotcrete the face. Instead of using shotcrete as facing, different types of facing elements made of precast concrete, metals, plastics and geosynthetics are being used at present. All of these facing elements can be classified into three groups; rigid or hard facing (metal, concrete elements), flexible facing (different types of wire mesh) or semi flexible facing (three dimensional grids/mats). There are basically two concerns about the application of soil nailing, first is in its analysis and design and second is about the use of materials. In order to make an innovative construction practice and to make it more cost effective, environment friendly and sustainable, a right choice of facing and an appropriate design of soil nails are very important. Most of the conventional soil nailing with shotcrete, precast concrete or metal facing elements are generally costly and do not offer a “Green” slope. The flexible facing elements do offer some possibilities to grow some plants on the slope but have some disadvantages e.g. bulging or punching at nail heads and are not suitable to control surface erosion and local shear failure. In the above context, the soil nailing system with semi-flexible 3-dimensional galvanised steel mat (KRISMER® system) is a high-quality construction system already in use in Europe, which has proved itself one of the best solutions to stabilize slopes and embankments. KRISMER-System is a three dimensional wire like system for slope stabilization which will be fixed on the slope using soil nails and filled with coarse gravel. On the top of this top soil will be sprayed and vegetation will be implemented to make it green. The company has developed its know-how by successful implementation of various projects in Austria, Germany and all over Europe. It has also conducted some tests and experiments with its system and developed some standards and specifications for its implementation. Some reports on successful projects in Europe can also be found under this link. [http://www.krismer.at/en\\_index.html](http://www.krismer.at/en_index.html). This paper describes the application of an innovative green solution for slope protections and stabilisation works with the use of semi flexible 3-dimensional steel mat (KRISMER® System). The paper describes the present state of the art in soil nailing and the past experience on different projects in Europe. It explains how to enhance the present practice of the construction of soil nailing using KRISMER system through field experiments and measurements, model experiments at laboratory and numerical analysis. Moreover, new areas of application of the system KRISMER has been suggested to promote sustainable landscape/slope construction practices and innovative uses of this technology to make green slopes all over Nepal and beyond.

# Agro-forestry as a measure to enhance drought

■ Prashant Paudel 1, Simant Rimal 2, Pramod Ghimire 3 and Kamana Parajuli 4

*1 Agriculture and Forestry University, 2 Agriculture and Forestry University, 3 Agriculture and Forestry University and 4 Agriculture and Forestry University*

Climate change in the ongoing scenario has exacerbated its adverse effects in the mountainous countries throughout the globe that includes variability in patterns of precipitation, floods, droughts, etc. Increased vulnerability, of communities residing in these part of the world, towards climatic hazards (for instance drought) has forced them to adjust modification in their livelihood that includes various strategies and approaches like agroforestry. Agroforestry system has been regarded as an efficient measure with multiple benefits that can address food security, climate change vulnerability, meet the needs of local communities to cope with the results of climatic changes and thus increasing resilience. With this context, research was carried out in Likhu Rural Municipality, ward number 2 in hilly district of Ramechhap to scrutinize the role of agroforestry system as a measure to enhance drought adaptation and examining its effectiveness as an adaptation strategy. Household survey and field observation methods were employed to collect both quantitative and qualitative data. Trees on the farmland has helped to stimulate ecological resilience against drought through maintaining soil and water quality, as believed by over 90% of the respondents. Agroforestry system was found to be an inseparable portion of adaptation strategy against the drought stress for more than 85% of farmers as they have grown trees mostly in terrace raisers, home gardens, near water resources etc. Moreover, this system has played positive role in terms of financial capital by minimizing risk of being in debt for more than 80% of sampled population. The presence of timber species like *Alnus nepalensis*, *Schima wallichii* etc. and fodder species like *Litsea monepetala*, *Schima wallichii* etc. and the products that can be derived from them has made this system to be a viable option to enhance the declining productivity and adaptive capacity against hazards. The results also show agroforestry system to be promising option to combat climate change through both mitigation and adaptation and to consider this in local adaptation plan has been of an urgent need.

**Keywords:** Adaptive capacity, Agroforestry system, Climate change, Resilience

# Critical success factors for post disaster housing reconstruction and recovery: A community perspective from central hills of Nepal

■ Mukti Suvedi

*Humber College, Canada*

Earthquake in Nepal comes among the top 10 hazards types in Nepal[1]. Devastating earthquake, epicenter in Barpak of Gorkha district on 26th April, 2015 has impacted vast communities in Nepal. Out of 75 districts, 14 districts were badly affected. Nepal as a state and national government agencies struggled to cope with the scale of death and destruction, rescue workers, citizen groups and non-governmental organizations from around the world poured into Kathmandu within few days to provide immediate Search and Rescue and emergency relief. Communities affected by the earthquake received swift search and rescue operation, followed by emergency humanitarian relief response during first few weeks. Later many communities received support from different source for short-term recovery to long-term recovery and reconstruction. Government of Nepal introduced a significant 5 years recovery framework for the recovery of earthquake affected communities. Recovery framework which includes private housing recovery and reconstruction was implemented by Government of Nepal, Nepal Reconstruction Authority and implementing partner's organizations with various mixed results and outcomes. Despite many significant supports and efforts to achieve success in the housing recovery many organizations and Government of Nepal (NRA) is finding it challenging. Different projects implemented in different districts and different communities yielded mixed results. Because of yielding mixed results and disquiet from public, the post-disaster housing recovery is becoming the concerns and dilemmas to many concerned stakeholders in Nepal. Having said that, it is obvious, that private housing recovery is a complex in nature and is a slow process which is knotted with social, economic, and political dimension. The multidimensional nature of housing recovery requires a holistic integrated approach that interprets and weaves its numerous dimensions for achieving success. This study serves as a valuable resource by highlighting the key multi-faced dimensional issues for critical success factors for post-disaster housing reconstruction and recovery. The other hazards include: epidemics, landslide, flood, fire, thunderstorm, accident, cold wave, boat capsizing. The entire territory of Nepal lies in a high seismic hazard zone.

# Immediately implementable complementary Dry Chain intervention for disasters and normal periods

■ **Peetambar Dahal**

*Univeristy of California, Davis, USA*

An unprecedented flood hit Nepal and South Asia in August 2017, costing lives and physical properties. Stored dry food for daily sustenance was damaged by high moisture. Despite devastating floods occurring frequently in South Asia, strategies to secure staple foods from moisture have not been implemented, including feeds in Taiwan.<sup>1</sup> About 20 million tons of grains are lost annually in India<sup>2</sup> and FAO estimates 25% global food loss each year. To minimize this loss, dry food products should be dried sufficiently for milling and sealed in moisture-proof/airtight containers until used. Specifically, the Dry Chain identifies high moisture as the enemy of dry food products and utilizes natural and artificial drying based on weather conditions followed by moisture-proof packaging.<sup>3</sup> In the aftermath of the Gurkha Earthquake disaster in 2015, implementation of Dry Chain was suggested as part of immediate relief efforts and in anticipation of future floods.<sup>4</sup> The first stage of this technology was demonstrated in Kavre by Asta-Ja RDC and UNICEF.<sup>5</sup> Distribution of moisture-damaged foods to Nepalese earthquake victims in 2015 also revealed a stark lack of applied global knowledge in dry food management. More broadly, Nepal would not need to import cereals if storage losses were cut to 1/3 of current national loss. Dry Chain could minimize these losses and help export and enable buffer stocks for droughts and complement to UNSDG2 goals to eradicate hunger.

Toxin-free and nutrient-rich foods are also a pre-requisite for better health in normal periods. Pesticide-free Dry Chain minimizes nutrient loss<sup>6</sup> and damage from insects and toxigenic molds that develop under humid storage. Medical researchers have documented food derived mold toxins in pregnant women and newborns in Sarlahi and Bangladesh, exemplifying invisible health disaster.<sup>7</sup> Since mold toxins develop in absence of rapid drying of foods during the rainy season, we propose deployment of mobile drying systems, similar to Bangladesh.<sup>8</sup> Furthermore, low-quality dry products should not be fed to animals/poultry birds as the toxins are transmitted to high moisture animal protein foods. Annual government programs should implement Dry Chain, monitor food/feed quality and share the technology with neighbors that supply food during lean production and disasters



## Symposium 3: Education

**14 October 2018, 13:50 PM- 18:10 PM, Malshree Hall**

*Coordinators:*

*Dr Pramod Dhakal, NRNA Academy, Nepal*

*Dr TejendraPherali, University College London, UK*

Nepal's 2015 constitution, democratic elections and stable government structures at all levels have given a sense of hope for rapid economic development and improvement in people's lives. The new constitution has provided a new governance structure in the education sector. As jurisdiction over education at various level is distributed to three levels of governments, there is an opportunity to reorganize education to make it relevant to local needs and promote local cultures, values and economy. Aligned with national ambitions of growth and prosperity, Nepal should invest in human capital through drastic improvement in educational governance, increased investment in education and research through new approaches to local and global partnerships and collaborations. Education plays a crucial role in supporting the process of sustainable development not only by producing the relevant workforce but also active citizenry that can contribute positively to country's democratic, economic and intellectual development. Nepal has made significant progress in the education sector over the last five decades, leading to establishment of over 34,000 schools, 1400 colleges, 11 Universities and 4 medical academies. Furthermore, two new universities have been announced in this year's budget. Nepal enrolls about a million students at Grade 1 every year and has made significant strides in basic literacy. However, only one third of children make it to the 10th grade. The quality of education at all levels is low and particularly, the higher education sector lacks capacities in effective teaching and learning, research and knowledge production and innovations. On the one hand, due to poor quality higher education and bleak prospects in the country so far, a large number of students go abroad for higher education, rising this number to 60,000 in 2017 alone. On the other hand, higher education has always remained an elitist domain, which is accessible to socioeconomically privileged groups. In general, Nepal's education needs significant reforms in its structure so as to make it more equitable to ethnic, caste and regional groups. At technical levels, curriculum and pedagogies need to be transformed to meet the demands of the 21st century as well as to address the gap in knowledge, skills, innovation and entrepreneurship. In this symposium, we will discuss a wide range of educational issues and try to explore possibilities for a way forward.

## PROGRAM

<b>Symposium 3: Education</b>				
<b>14 October 2018, 13:50-18:10, Malshree Hall</b>				
<b>Session A: Working Towards Quality Education for All, Chair: Prof Mana Prasad Wagley</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
13:50-14:05	Invited	Kamal Lamichhane, Dr	Inclusion and human capital investment for sustainable development: evidence from some empirical studies on disability	The University of Tsukuba, Ibakari, Japan
14:05-14:20	Invited	Hari Lamsal, Dr	Federalism and education policy in Nepal: challenges, dilemmas and opportunities	Joint Secretary, Ministry of Education, Government of Nepal
14:20-14:35	Invited	Swastika Shrestha and Shisir Khanal	Rethinking teacher development in Nepal	Teach for Nepal, Nepal
14:35-14:50	Contributed	Tejendra Pherali, Dr	The role of education in peacebuilding and social transformation	UCL Institute of Education, University College London, UK
14:50-14:55	Rapid Fire	Laba Prasad Tripathi	Concept of community based technical education and vocational training in developing basic level work force in Nepal	Ministry of Education, Science and Technology, Nepal
14:55-15:00	Rapid Fire	Sushma Basnet, Mrs	Domestic vs foreign degree: An overview of Nepalese student's motivations and experiences studying at UK educational	Brunel University London, UK
15:00-15:05	Rapid Fire	Amrita Sharma	What's next? Perceptions of career among graduates in Nepal	School of Education, Kathmandu University, Nepal
15:05-15:25	Q&A			
15:25-15:30	Summary	Mana Prasad Wagley, Prof		Kathmandu University, Nepal
15:30-16:00	Tea break			

<b>Session B: Reforming Higher Education, Chair: Dr Gangalal Tuladhar</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
16:00-16:10	Contributed	Pramod Dhakal, Dr	Governance of innovation	NRNA Academy, Nepal
16:10-16:30	Invited	Shabnam Koirala-Azad, Prof Dr	Higher education system and entrepreneurial ecosystem of California: The lessons for reorganizing higher education in Nepal	University of San Francisco, USA
16:30-16:45	Contributed	Sriram Bhagut Mathe, Prof Dr	Establishment of world class universities in Nepal: Challenges and opportunities	Nepal Education Foundation-Consortium of Colleges, Nepal
16:45-17:00	Contributed	Drona Rasali, Dr	Reducing inequity in higher education for social justice in Nepal: How can diaspora Help?	Provincial Health Services Authority, BC, Canada
17:00-17:50	Panel Discussion and Q&A	Chaitanya Mishra, Prof Dr	Reforming higher education in Nepal	Tribhuvan University, Nepal
		Pratyoush Onta, Dr		Martin Chautari, Nepal
17:50-18:10	Summary	Gangalal Tuladhar, Dr		Former Minister of Education, Chair of High Level National Commission on Education, Nepal
18:10-19:10	Poster	Rhymes Shakti	An exploration of students' and teachers' experiences on new grading system secondary education examinations	Liverpool John Moores University, UK
19:10	Dinner			

# Inclusion and human capital investment for sustainable development: Evidence from some empirical studies on disability

■ **Kamal Lamichhane**

*Center for research on international cooperation in educational development (CRICED),  
Faculty of human sciences, The University of Tsukuba*

Since 2063, there has been shift in approaches in Nepal's development policies towards inclusion. In a global level, sustainable development goals (SDGs) have also directly addressed this issue toward making development for all. This might be because without inclusive participation of all including those with disabilities in the development efforts and decision making process, lower level of human capital achievement and higher level of poverty and inequality will remain a great threat to the world. Defining the concept of inclusion, In this presentation, I will discuss some of the empirical findings emphasizing on the returns to the investment in education, labor market participation and schooling situation focusing on disability and gender status. If we are to achieve sustainable and inclusive development which will positively affect all people, not just some, providing quality education to persons with disabilities is important not only from human rights perspectives but also its wage returns and other externalities attached.

# Federalism and education policy in Nepal: challenges, dilemmas and opportunities

## ■ Hari Lamsal

*Joint Secretary, Ministry of Education, Government of Nepal*

The Constitution of Nepal 2072 restructures the governance system of the country into three different levels; federal, provincial and local. In addition to the fundamental rights, principles and policies, list of specific authorities for these layers are listed in the schedules of the Constitution. As a result of such provisions, the restructuring of education governance is inevitable. Restructuring process includes formulation of new policies, enactment of new acts, creation of new and merging of existing organizations and redistribution of resources including personnel. Among others, some of the ongoing efforts in this direction are; redefining of the objectives of education, setting up new organizational structure with human resources at the local and provincial level, and downsizing of the existing organizations and institutional arrangements. This is a situation where Ministry of Education, Science and Technology has both opportunities and challenges.

Together with such restructuring process, Nepal also needs to keep its focussed efforts to achieve the targets set in the sustainable development goals. Coordination among three layers of governance and harmonization of their efforts are new agendas in education sector. Despite the significant progress in access to and participation in education that we have achieved over the last five decades, low quality of education is equally alarming for all.

In such context, this presentation covers the achievements made over the years, existing efforts in education governance restructuring, challenges that we are facing, opportunities that we have and way forward for the future

# Rethinking teacher development in Nepal

■ **Swastika Shrestha and Shisir Khanal**

*Teach for Nepal, Nepal*

Since 2013, Teach For Nepal has recruited and placed recent young graduates and young professionals as volunteer teachers in primarily rural public schools to teach Maths, Science and English. These are the three subjects where a huge majority of public school students struggle as evident by failure rates in the SLC. A huge majority of these young participants come from faculties other than Education. They serve in public schools for two years. During the two years, the young participants – called Teach For Nepal Fellows not only work in classrooms but develop projects that inspire students to think and act on social issues, develop small enterprises and work on science/technology.

Over the last five years, about 270 Teach For Nepal Fellows have served in six districts in Nepal demonstrating strong academic outcomes. Majority of the young leaders, who have served as Teach For Nepal Fellows continue to work in education and social sector even after two years.

The presentation shares the experience of Teach For Nepal and implications for strengthening Nepal's public school systems through volunteerism and youth activism.

# The role of education in peace building and social transformation

## ■ Tejendra Pherali

*UCL Institute of Education, University College London, UK*

While there is a plethora of research into the role of education in conflict-affected context, the higher education sector has generally received much less attention in educational debate within post-war governments. This research aims to explore and highlight the role of higher education in peace building in post-conflict Nepal. In doing so, it attempts to analyze socio-economic and political dimensions of higher education in Nepal, relationships between higher education and violent conflict, and how Nepalese higher education could contribute to post-conflict transition and sustainable peace building in Nepal.

Higher education is perceived to be a stabilizing or securitizing factor by providing a positive alternative to youth through opportunities to gain knowledge, skills, and qualifications to lead a stable life. It is argued that equitable access to higher levels of learning addresses the problems of marginalization and economic exclusion of ethnic minorities and indigenous populations who challenge stability (Milton and Barakat, 2016). In Nepal, the onset of an armed rebellion by Maoists is attributed to unequal access of diverse social groups to political and economic domains through the exclusionary nature of higher education system (Bhatta et al, 2008). In the context where access to higher education is minimal; growing privatization of higher education that excludes socioeconomically underprivileged groups; and horizontal inequalities across castes, gender and geographies often create, sustain and undermine equitable access to higher education. In this paper, I will argue that post-conflict reconstruction should adopt a ‘conflict-sensitive’ approach to address the structural issues of educational inequity, social exclusion, and political hegemony of the privileged social groups (Pherali, 2012).

### **References:**

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# Concept of community based technical education and vocational training in developing basic level work force in Nepal

■ **Laba Prasad Tripathee**

*Former Joint Secretary and Spokesperson, Ministry of Education, Science and Technology*

The purpose of this paper is to develop a model of community supported and cost effective technical education and vocational training program through the local government in Nepal. The Council of Technical Education and Vocational Training (CTEVT) responsible for the basic and middle level manpower development has done works on curriculum development, skill tests, technical instructor training and short course on deferent vocations. But the manpower developed so far is not sufficient due to the higher demand of the workforce in the country and oversea employment. The CTEVT run technical schools are also established without survey and mapping. The private run technical colleges under CTEVT are expensive. The new constitution has empowered the local government and is authorized to manage school level education. The Higher Level Education Commission formed by the Government is to recommend education policy in the new context. There is very little research done in the TEVT. Acts and regulations in TEVT are to be revised to clarify the roles of central, provincial and the local governments.

Under the new situation, it is necessary to design technical education and vocational training programs that are cost effective and ownership taken by the local government. It is suggested that there is need to survey and mapping for the need of developing resource based industries and demand of technical education and vocational training at the local level. There is need to clarify the role of CTEVT, local, Provincial, and Central government in developing community based TEVT programs.

It is suggested that the local government should establish cost effective vocational training initially and increase the program to higher level on need basis. To make the programs cost effective partnership with the local NGOs or Cooperatives or Financing Trustees should be developed. The CTEVT be responsible to monitoring, evaluation, researches, Curriculum and standard tests. The NRN can make tremendous impact on TEVT programs by assisting the local government on providing technical input, Finance and volunteer services.

# Domestic vs foreign degree: An overview of Nepalese student's motivations and experiences studying at UK educational institutions

■ **Sushma Basnet**

*Brunel University London*

British universities are renowned for their excellence and high standards in delivering quality education in a diverse, creative and inviting environment and have always attracted international students from across the world including Nepalese students. This study explores the motivations and experiences of international students studying at UK private Further Education (FE) colleges, in particular in the light of the 2009 immigration policy, the Points Based System (PBS). The PBS was introduced by the UK Labour Government to control and monitor so-called 'bogus' colleges and students. The immigration status of international students and the effect of PBS have remained a matter of considerable political controversy and debate to the present day.

The study argues that most Nepalese students at UK private FE colleges are intrinsically and extrinsically motivated to pursue their goals and obtain a UK degree. Based on the fusion of two theoretical approaches, Self-Determination Theory (SDT) and Organismic Integration Theory (OIT), it critically examines the different effects of PBS on Nepalese students coming to the UK to pursue their studies in private FE colleges. But in their experience, they encounter various hardships and challenges due to different external factors such as the immigration policy which determines the motivations of these students who come to UK private FE colleges away from their own country with a dream to obtain a universally recognized degree. In-depth semi-structured interviews were conducted with these students, recruited to the research using snowballing sampling techniques. Their responses have been thematically analysed to give insights into their experiences and implications they faced due to the sharp change in government policy. Further, the study also argues that social environment play a major role in their need to satisfy their psychological needs which can either promote or thwart their personal growth and motivation.

To conclude, this study qualitatively investigates a sample of Nepalese student's experiences while they pursue their studies in UK private FE colleges. It also contributes to the existing literature whereby, the implications of the PBS on Nepalese students and international students in general studying at private FE colleges has not been investigated to the extent as in Higher Education universities and public funded colleges in the UK and Nepal.

# What's next? Perceptions of career among graduates in Nepal

■ **Amrita Sharma**

*School of Education, Kathmandu University*

There is an increasing number of graduates who aim to enter the job market after the completion of a study, however, the educated unemployment issue is alarming. The employer claims that the fresh graduates are not skillful and knowledgeable and there is the shortage of quality human resources whereas many graduates are unemployed. The consequences due to this disjuncture of skills and jobs are a distressing social environment, brain drain as an example. In this context, I assessed the perceptions of graduates from three Universities of Nepal as a major focus and employers' perceptions of Kathmandu, the capital city of Nepal, as an additional support for the analysis of the situation. The major purpose of this study is to provide an overview of how graduates are preparing to enter the job market in the context of Nepal. The major argument here is that majority of graduates are not prepared to meet the skills required by the employers and facing unemployment though they are academically sound. Academic institutions are also not prioritizing it on mainstreaming the skills on curriculum. Face to face interviews were conducted among graduates and analysis is presented in the article.

# Higher education system and entrepreneurial ecosystem of California: The lessons for reorganizing higher education in Nepal

■ **Shabnam Koirala–Azad**

*University of San Francisco, USA*

This presentation seeks to draw some insights from the history and current context of California's Higher Education system. The presentation uses as an example, California's famed Master Plan for Higher Education, to show how state level interventions can both shape and impede the creation of a higher education system that meets the educational needs of youth and young adults while also contributing to the state's socio-economic advancement. The presentation will then seek to extend some relevant learnings to the Nepali context and the development of Nepal's higher education system.

# Establishment of world class universities in Nepal: Challenges and opportunities

■ **Sriram Bhagut Mathe**

*Nepal Education Foundation-Consortium of Colleges*

World-class education is fundamental to create a peaceful, stable and prosperous society. Nepal aspires to be a lower middle-income country by 2030 AD and developed country by 2050 AD. This is possible only by imparting world class education through the establishment of world class universities. Nepal can be a prosperous country if the government creates an enabling environment for all public and private institutions to offer quality education, which produces critical and enlightened thinkers.

The sorry state of our higher education system is exacerbated by the one-sided outward flow of some of our best and brightest students. Intense healthy discussion is required to address this alarming flight of human capital. When excellent world class quality programs are available within the country, the Nepalese students will make educated, informed decisions whether to study in the country or outside.

A paradigm shift in the way Nepal imparts higher education is urgently needed. The paradigm shift will require all politicians, bureaucrat's educationists and all stakeholders to consider education as a "social service" and not "for profit". The government has to promulgate an Umbrella University Act to promote the establishment of world-class "not-for-profit" universities, through a two-pronged strategy: (i) either the state on its own or through public-private partnership modality will establish brand new world class universities, and (ii) public or private entities, with proven academic excellence and track record, can apply to become deemed-to-be universities.

These new or deemed-to-be universities shall be governed by a very accountable and responsible Board of Trustees, who will fill all senior positions through apolitical search committees in a very rigorous and transparent manner. The political patronage and extreme politicization, which has destroyed the public universities, will be avoided through this transparent and merit-based system.

These universities will focus on holistic and innovative academic programs and research and aspire to be within the first 1000 world ranked universities as soon as possible. With all the challenges within the country, higher education also offer a lot of opportunities, if only the politicians, bureaucrats and educationists agree and act proactively on the need of world class education for all Nepalese.

# Reducing inequity in higher education for social justice in

■ **Drona Rasali**

*Provincial Health Services Authority, BC, Canada*

Nepal's transition from the feudal socio-political status quo to creation of a federal democratic system is intentionally pitched to the cause of social justice. The full success of this change can be realized only by breaking the traditional barriers of social justice. Education is the gateway to this change, and especially higher education provides the powerful means to bring about the change that, in turn, translates into social equity, based on social justice for fairness in the modern day societal outcomes. The recent data from the National Demographic and Health Survey (NDHS) 2016 show socio-economic inequities rampant across geographic, demographic and socio-economic factors. For instances, there are disproportionate regional/geographic variations in higher education attainment, while men have higher rate of higher education attainment than women; and 25-29 year olds have higher rate than other age groups. Household wealth index was strongly associated with higher education attainment, while ethnicity had a wide gap showing difference between the lowest and highest rates of higher education attainment ranging from merely 1% in Terai Dalit to 35.5% in Hill Brahmin. Reducing inequity in education, especially in higher education leading to the desired societal outcomes requires huge resources and capacity. The Nepali Diaspora members around the world, on the other hand, have unconditional motivation to give back to the motherland; they have acquired cultural humility to address the issues of socio-economic inequities; and they can indeed help with their heart, mind and money. They harbour a rich knowledge resource in higher education, e.g. many well-known Colleges and Universities in several countries have Nepalese on their faculties. Especially, Nepal can tap on ever increasing number of retiring well-known academics and highly qualified professionals, who can live on their pensions and serve the motherland for significant portion of their retirement life. Other Diaspora members can sponsor higher education for the loved ones in their families back in Nepal. Towards this end, the Government of Nepal should make appropriate environment conducive to attract qualified higher education experts, academics, scientists and professionals among Diaspora to give hands in transforming higher education system with their knowledge transfer.

# An exploration of students' and teachers' experiences on new grading system secondary education examinations in Chitwan district

■ Rhymes Shakti, Susan Kay Flowers, Andrew Kennedy and Claire Hennessey

*School of Education, Liverpool John Moores University, UK*

The School Leaving Certificate (SLC) examinations in Nepal was criticised for the unhealthy competition, for poor evaluation system, non-student friendly environment it has created. The government of Nepal ended the 10-year schooling system SLC that had been in practice for the last 83 years (Mathema and Bista, 2006). In order to reduce the above issues in SLC, recently in June 2016, the government of Nepal has replaced SLC to Secondary Education Examination System (SEE) which has introduced Grading system, developed skills based examinations and student-friendly environment (Office of controller of Examinations, 2018). So, the purpose of this study is to explore the teacher's and student's experiences in SEE implementation as no such study has been conducted in Nepal.

The aim of this study is to explore the opportunities and challenges of SEE through students' and teachers' experiences by:

- understanding how students and teachers are experiencing SEE and exploring what they see as the advantages and disadvantages of the new system.
- investigating the issues and challenges in the new secondary education examination system.
- examining the extent to which issues identified as difficulties in SLC are being resolved
- identifying issues which have arisen in relation to curriculum development, teacher training and assessment in implementing SEE.

This qualitative study adopts a phenomenological approach (Crotty, 1998). The study findings will assist the Ministry of Education in improving the education sector and influence policy formation, contributing directly and indirectly to the key policy documents such as the School Sector Reform Plan (SSRP) and National Education System Plan of Nepal (NESP).

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## Symposium 4: Environment Pollution

14 October 2018, 16:00 - 18:10, Malhar Hall

*Coordinators:*

*Dr Mahesh Rupakheti, Institute for Advanced Sustainability Studies, Germany*

*Dr Durga D. Poudel, University of Louisiana at Lafayette, Louisiana, USA*

*Dr Udhab Raj Khadka, Asta-Ja Research and Development Center, Kathmandu, Nepal*

*Dr Puru Shreshta, Geominmet Consulting Company, Arizona, USA*

Environment pollution is of a serious concern to thriving cities of Nepal. Rapid, but unplanned, urbanization, increasing number of vehicles and energy consumption, emissions from industries, heating, and burning woods and other trash materials, trans-boundary air pollution; chemical uses in agriculture, poor and failing septic systems, exposed ground surfaces leading to excessive dust in the air, poor disposal of solid and hazardous wastes, and other activities are leading to environmental degradation at an alarming rate. Environmental pollution is degrading air, water, and soil quality in addition to damaging wildlife habitat, and deteriorating recreational uses of natural resources. Environmental pollution has not only threatened public health, it is adversely affecting the aesthetics, tourism, ecological integrity, and economic activities in the cities. Unsafe disposal of hazardous and biomaterials is spreading highly toxic substances which are often long lasting in the environment. City inhabitants are already experiencing nontrivial impact of geometric growth of contaminants in air and water, and, there is a strong public call for immediate control on environmental pollution and ecological restoration. Negative consequences of pollution is now spilling over to sub-urban and village areas. The symposium will focus mainly in Kathmandu Valley and its peri-urban areas and will discuss the current state of air, water, and soil pollution; solid wastes, hazardous waste management, sewage treatment, Underground Storage Tanks, storm water management, and relevant policy papers including environmental remediation and restoration. The symposium expects to come up with a comprehensive view of Environmental Pollution of Nepal but focusing on Kathmandu Valley based on scientific findings and eventually lay grounds for future environmental research and develop policy guidelines in a very coordinated and effective way. This symposium intends to bring knowledge, skills and technologies from Nepalese diaspora across the globe to a common platform where Nepalese environmental scientists, researchers, and policy makers and other stakeholders bring their on-the-ground experiences, scientific understandings, remediation measures, and policy issues in relation to environmental pollution and its control.

**Focus:** Environment Pollution, Government Policy for Clean Environment, Policy Gaps, NRN Experts' Role

# Pollution in Nepal: A major challenge to national development goals

■ **Maheswar Rupakheti 1, Yadv P. Joshi 2, Amod Pokhrel 3, Anobha Gurung 4, Rudra P Aryal 5 and Puru Shrestha 6**

*1 Manmohan Memorial Institute of Health Sciences, Solteemode, Kathmandu, Nepal, 2 Institute for Advanced Sustainability Studies, Potsdam, Germany, 3 School of Public Health, University of California, Berkeley, USA, 4 Yale University, USA, 5 Department of Physics, Franklin Pierce University, USA, 6 Geominmet Consulting Company, Arizona, USA*

Air pollution is a major environmental and societal problem of our time. It is associated with a multitude of adverse effects on human health, crop yields, ecosystems, weather and climate change, built environment including archaeological and historical sites, socioeconomic systems and development goals of both developed and developing countries around the world. South Asia is one of the global air pollution hotspots, and it is projected that air pollution in South Asia will continue to worsen until 2050. Nepal is one of the top ten countries vulnerable to the impacts of climate change. In addition to this, it is also being affected by increasing air pollution, including transboundary air pollution. This study reviewed recent scientific studies and policy initiatives put in place by the government of Nepal, and thus reports current scientific understanding of the physical science, including sources and impacts and potential mitigation measures of air pollution in Nepal. For example, according to the 2016 global burden of diseases (GBD) report, air pollution is associated with 35,000 premature deaths and thousands of sickness every year. The socioeconomic cost of air pollution, through its impacts on health care expenditure and workforce productivity is substantial in Nepal, about 4.5% of the GDP according to the 2016 World Bank report. The cost of air pollution impact goes higher when its impacts on crop yields, tourism and other socio-economic systems are taken into account. There is no doubt that scientific studies have put together a strong case for reducing impacts of air pollution in Nepal that cannot be ignored. Air pollution is a clear major threat to Nepal's socioeconomic development goals and sustainable development goals (SDGs). There is a need for putting in place policies and plans swiftly and widely in order to steer current policies and practices towards cleaner solutions that will help achieve Nepal's socio-economic and environmental development goals.

# Environmental effects of nanoparticle exposures: Development of a method for characterization of PM<sub>2.5</sub> produced from biomass burning

■ Shila Maskey

*Department of Environmental Science, Patan Multiple Campus, Lalitpur, Nepal*

Biomass burning, an important source of anthropogenic atmospheric aerosols, has been considered for studies due to its impact on the atmosphere and the environmental air quality, as well as significant effects on human health and global climate change. Most particles emitted from biomass burning are less than 2.5 µm in diameter (WHO, 2003), and formed mainly from condensation of pyrolysis products, atmospheric oxidation of emitted volatile organic gases, and complex growth processes that form chained soot particles (Cachier, 1998). Biomass burning may occur in a field at various wind speeds and burning rates.

In present study, a biomass fuel combustion method is introduced for characterizing the gas and particles produced from burning of biomass fuels. To simulate different environmental conditions, the chamber was designed to allow adjustment of flow rates of air introduced into the chamber. The method applied for characterizing the particles produced from burning of typical agricultural crop residues (rice straw) and forest residues (pine stem) in Korea. The real time measurements was performed to examine combustion condition and efficiency, emission factors, size distribution, hygroscopicity, and volatility of the particles with different burning conditions using various online aerosol monitoring instruments including gas analyzer, condensation particle counter (CPC), dust trak, nano scan scanning mobility particle sizer (nanoscan SMPS), optical particle sizer (OPS), and hygroscopicity and volatility tandem differential mobility analyzer (HV-TDMA). Also, morphology and chemical compositions of the particles were measured using quadrupole aerosol mass spectroscopy (QAMS, online measurement) and transmission electron microscopy coupled with energydispersive X-ray spectroscopy (TEM/EDS, off line measurement) techniques.

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2. Cachier, H. Carbonaceous combustion aerosols. In: R.M. Harrison, and R.E. Van2. Grieken (Eds.), Atmospheric particles Wiley-Interscience, NewYork. 1998.

<b>Symposium 4: Environmental Pollution</b>				
<b>14 October 2018, 16:00-18:10, Malhar Hall</b>				
<b>Chair: Er Ganesh Shah, Moderator: Dr Udhab Khadka</b>				
<b>Time</b>		<b>Speaker/panelist</b>	<b>Topic</b>	<b>Institute</b>
	Guest	Bidya Sundar Shakya, Mr		Mayor of Kathmandu Metropolitan city
16:00-16:20	Invited	Maheswar Rupakheti Dr, Yadav P Joshi Dr	Air pollution in Nepal: A major challenge to national development goals	SusKat, IASS, Berlin, Germany
16:20-16:25	Rapid Fire	Shila Maskey	Environmental effects of nanoparticle exposures: Development of a method for characterization of PM 2.5 produced from biomass burning	Department of Environmental Science, Patan Multiple Campus, Lalitpur, Nepal
16:25-16:30	Rapid Fire	Bhupendra Das	Municipal solid waste open burning and its impact on human health and climate in Nepal	Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal
16:30-16:35	Rapid Fire	Shristi Shrestha	Assessment of indoor air pollution and associated health impacts in households equipped with and without biogas: A case from Amlekhganj, Nepal	Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal
16:35-16:40	Rapid Fire	Ranjit Pariyar	In-vehicle air pollution of passenger vehicles in Kathmandu Valley	Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal
16:40-16:45	Rapid Fire	Rashmita Shakya	Characterization of Ledachate and water samples collected from landfill sites and surrounding water bodies in Kathmandu	Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal
16:45-16:55	Contributed	Nabin Aryal	Biogas upgrading technology in the context of Nepal	Biological and Chemical Engineering, Aarhus University, Hangevej 2, DK-8200 Aarhus N, Denmark
16:55-17:00	Rapid Fire	Nirmal Babu Aryal	Qualitative and quantitative gap assessment of soil waste generation and Disposal in Kathmandu and Lalitpur of Nepal	Kathmandu University
17:00-17:05	Rapid Fire	Sandila Shrestha	Biogas production for organic waste management: A case study of canteen's organic waste management technical support center, Lalitpur, Nepal	Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal
17:05-17:30	Contributed	Sher Bahadur Gurung	Quantification of nonpoint source pollution from urban catchments and evaluation of green technologies to reduce the negative impacts of urbanization	Kongju National University

17:30-17:55	Panel Discussion and Q&A	Bhusan Tuladhar, Mr, Purna Subedi, Maheswar		UN-HABITAT, KATHMANDU, NEPAL
		Bishnu Chapagain, Dr		Nyayik Sansar, Asta Ja RDC, Kathmandu, Nepal
		BN Oli, Dr		Secretary of the Ministry of Forests and Environment
		Keshab Paudel, Dr		Medical Director at Lovelace Health System.
		Udhab Khadka, Dr		Asta Ja, RDC, Kathmandu Nepal
17:55-18:05		Bidya Sundar Shakya, Mr	Special Remarks	Mayor of Kathmandu Metropolitan city
18:05-18:10	Summary	Ganesh Shah, Er		
	Poster	Ashish Singh	Field evaluation of air quality sensor in the Kathmandu Valley	SusKat, IASS, Berlin, Germany
	Poster	Bhupendra Lama	Drinking water quality analysis, community survey and sanitary inspection of Gundu drinking water scheme, Bhaktapur, Nepal	Central Department of Microbiology, IOST, TU
	Poster	Durga D. Poudel, Arjun Aryal, Sahas Shrestha, Prem Bhandari, and Ajay Bhandari	Asta-Ja USA initiative for Kathmandu Valley environmental pollution control	Asta-Ja USA
	Poster	Keshav Parajuli, Dr	Kathmandu's persistent waste problem and how to tackle it	United Nations University, Germany
	Poster	Khadak Mahata	Making invisible visible-emerging ozone pollution in the Kathmandu Valley	SusKat, IASS, Berlin, Germany
	Poster	Maiya Pahari	Current status of solid waste management in Ratnanagar Municipality	Kathmandu University
	Poster	Sujan Sapkota	Impact of climate change on glaciers: A case study of Hidden Valley, Nepal	Kathmandu University
	Poster	Yadav P Joshi, Dr; Maheswar Rupakheti, Dr; Amod Pokhrel, Dr; Anobha Gurung, Dr; Rudra P Arya, Dr; Puru Shrestha, Dr	Air pollution in Nepal: A major challenge to National development goals	NRNA USA
	Poster	Rasmila Kawan, Parth Sarathi Mahapatra, Siva Praveen Puppala, Arnico K. Panday, Rainer Sauerborn	Biomass smoke effects on cardiovascular health of the women in rural villages of Lumbini, Nepal	ICIMOD, Khumaltar, Nepal, Heidelberg Institute of Global Health, University of Heidelberg, Germany
	Poster	Deepak Lohani, Yadav Prasad Joshi, Puru Shrestha	SaGa technology: An effective technique in organic waste management in Nepal	Organic Life, Lazimpat, Kathmandu, Nepal
19:10	Dinner			

# Municipal solid waste open burning and its impact on human health and climate in Nepal

■ **Bhupendra Das**

*Central Department of Environmental Science, Tribhuvan University,  
Kathmandu, Nepal*

Haphazard, open burning of municipal solid waste (MSW) is one of the most toxic sources of air pollution and is of growing concern in cities across South Asia. It has become the common practices in Municipalities of Kathmandu valley too. We attempted to calculate the MSW open burning in municipalities of Nepal through the scientific experimental methods, field based transect walk and available literatures. The most robust estimates of emissions from MSW open burning for Kathmandu valley municipalities were calculated. Open burning of MSW especially during the winter months when the mixing height is lowest could lead to acute and chronic respiratory disease, burning eyes, headaches, nausea, fatigue, dizziness and an allergic hypersensitivity if the dose is high enough. It also enhances local and regional warming because the emitted carbon dioxide (CO<sub>2</sub>) and black carbon (BC) from waste burning have a high global warming potential. Even if it is never burned, the gradual degradation of waste emits methane (CH<sub>4</sub>) which is another potent greenhouse gas.

**Keywords:** Waste burning, air pollutants, health impact, climate change

# Assessment of indoor air pollution and associated health impacts in households equipped with and without biogas: A case from Amlekhganj, Nepal

■ **Shristi Shrestha**

*Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal*

Household's dependency on biomass fuels for cooking and space heating purpose is often linked with poor ventilated kitchen. Incomplete combustion of biomass fuel creates dangerous cocktail of indoor air pollutants like PM, CO and other health damaging pollutants. The study focussed to find concentration of major indoor air pollutants specifically CO, PM<sub>10</sub>, PM<sub>2.5</sub>, CO<sub>2</sub> and RSPM and associated health impacts due to current practice energy use in Amlekhganj VDC of central lowland Nepal. Information on energy dependency of households and associated human health impacts were obtained through household questionnaire survey, KII and FGD. AirVisual's Node based on Laser Sensor principle, Gravimetric analysis, NDIR Spectrophotometer were used to determine PM<sub>2.5</sub> and CO<sub>2</sub> concentration, RSPM and CO respectively. The emission from biogas in terms of CO, PM<sub>2.5</sub> and PM<sub>10</sub> was within limits recommended by national guideline. CO<sub>2</sub> being compared with ASHARE guideline was in safe limit in both cases. Positive relation between PM<sub>2.5</sub> – CO was observed in all households, irrespective of use of biogas. Among the various parameters that could have impact in indoor air quality, only a few parameters were found to be statistically significant. Community members were found to be aware of negative health impact resulting from use of firewood as primary or secondary source of energy whereas biogas was perceived as clean energy source with no health effects. Women were primarily responsible for kitchen drudgery including firewood collection and cooking and reported to have more health problems as compared to other family members. Biogas was found to be better alternative to firewood to maintain better indoor air quality and negative health impacts. Community was found to be specifically interested in biogas plant installation. Study recommends successful implementation of biogas program through pre-requisite planning for minimizing negative human health impacts due to use of firewood.

**Keywords:** CO, Indoor air quality, PM<sub>2.5</sub>, PM<sub>10</sub>

# In-vehicle air pollution of passenger vehicles in Kathmandu Valley

■ **Ranjit Pariyar**

*Central Department of Environmental Science, Tribhuvan University,  
Kathmandu, Nepal*

In-vehicle air pollution assessment studies in the developing countries are important. Recent years have seen an increasing number of traffic-related ambient air pollution exposure studies but indoor assessment data on this topic are still limited. Road widening activities and the growing vehicular traffic congestion, air quality of Kathmandu Valley has been a matter of great concern. In this study, air quality inside public vehicles of Kathmandu Valley was monitored. and analyzed available information on the health effects of Kathmandu's air pollution based on the WHO and Nepal's National IAQ Standards which would help to assess the exposure of public transport users to air pollution and support decision-makers in understanding the relationship between pollution and health to reduce air pollution inside vehicles. Problem of particulate pollution, especially PM<sub>10</sub>, was found severe inside the public vehicles. Carbon monoxide and Carbon dioxide were mostly within acceptable levels but PM<sub>10</sub> and PM<sub>2.5</sub> exceeded the guidelines. A significant difference was found in morning and evening traffic rush hour. The highest level of concentration was found in Ring road section and significant difference among the routes. Mean in-vehicle of CO found highest in Semi urban and lowest in Ring road. CO<sub>2</sub> concentration exceeded the guidelines in few vehicles while remaining CO<sub>2</sub> concentration in most of the samples were well below guideline values. Establishment of an integrated transport system promoting the growth in number of city buses and managed construction, demolition with proper safety measures should be made a priority to reduce on air pollution levels and enable the decongestion of Kathmandu Valley.

**Keywords:** In-vehicle air quality; particulate matter; carbon monoxide, carbon dioxide, health effect

# Characterization of leachate and water samples collected from landfill sites and surrounding water bodies in Kathmandu

■ **Rashmita Shakya**

*Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal*

The landfill site leachate may impact nearby water sources. In this work, I studied physicochemical characteristics and heavy metal composition of leachate and the surface water samples collected from Sisdol landfill site (current landfill), Gokarna landfill site (closed landfill) and Sundarighat river corridor (a former dump). Sample collection started from March 14, 2017 and composite samples were collected from each of the study area with two weeks interval time. These samples were examined for pH, chloride (Cl<sup>-</sup>), total dissolved solids (TDS), total suspended solids (TSS), total hardness (TH), total alkalinity (TA), biological oxygen demand (BOD), chemical oxygen demand (COD), total ammonia (NH<sub>4</sub><sup>+</sup>), nitrate (NO<sub>3</sub><sup>-</sup>), inorganic phosphate (PO<sub>4</sub><sup>-3</sup>) and iron (Fe). Heavy metal analysis is being carried out by XRF and ICP-OES technology in CEST laboratories of University of Notre Dame. High value of BOD, COD, Cl<sup>-</sup>, alkalinity and TDS were recorded from all three landfill sites and low concentration of copper was found in first six leachate samples of all three study areas. Most of the parameters of the collected water samples exceeded the WHO, NDWQS standards and Nepal Water Quality Guidelines for Irrigation Water and Aquaculture.

**Keywords:** Dumping site, Solid waste, Surface water

# Biogas upgrading technology in the context of Nepal

■ **Nabin Aryal**

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Biogas is a mixture of gases consisting methane (CH<sub>4</sub>), and carbon dioxide (CO<sub>2</sub>), trace amounts of hydrogen sulfide (H<sub>2</sub>S), ammonia (NH<sub>3</sub>), hydrogen (H<sub>2</sub>), oxygen (O<sub>2</sub>), nitrogen (N<sub>2</sub>), carbon monoxide (CO), hydrocarbons, volatile organic compound (VOC) and siloxanes. Removal of such impurities is required to utilize the methane as energy source using biogas upgrading technology. Over the years, various biogas-upgrading methods have been commercialized in particular water scrubbing, chemical absorption, pressure swing absorption, membrane separation, cryogenic separation. However, most of these upgrading technologies are energy intensive, corrosion prone for the equipment, and with significant solvent degradation and losses thus adding extra operating cost for methanation. The biological methanation is an attractive cost-saving alternative for methane enrichment because biological methods are often eco-friendly, cost-effective, require low energy, and are flexible for operation and resources can be recovered such as elemental sulfur. During biological methanation, either H<sub>2</sub> can be added directly inside the anaerobic digestion to produce CH<sub>4</sub> by a consortium of mixed microbial species or biogas, H<sub>2</sub> can be injected into the separate bioreactor, where the CO<sub>2</sub> contained in the biogas is coupled with H<sub>2</sub> and converted to CH<sub>4</sub>. Envipower Energy and Fertilisers Pvt Ltd, Nepal's first-ever commercial biogas plant based on German technology is now producing 2 tons of cooking gas daily utilizing membrane upgrading technology. Thus the technical knowledge on biogas production and utilization is significant for economical and sustainable development of biogas plants in Nepal. This research paper will highlight the biogas technology transfer from Denmark to Nepal.

# Qualitative and quantitative gap assessment of soil waste generation and disposal in Kathmandu and Lalitpur

■ **Nirmal Babu Aryal and Bikash Adhikari**

*Kathmandu University*

The waste management is a challenge in the emerging municipalities of Nepal. Household and institutional bodies generate huge amount of solid waste and are sent to landfills without any treatment and can be potentially threat to the environment if not managed well. Organic waste, which comprises almost 50-80 % of the total waste generated from municipality has an excellent potential to be used for energy recovery. This paper highlighted the management of solid waste generated from the Kathmandu and Lalitpur city of Nepal. The quantity and composition of municipal solid waste and the environmental issues associated with its management was also reviewed. The paper shows that generation of 50-75% of municipal solid waste (MSW) is contributed from household. The quantity and composition of sample waste generated from 58 municipalities (old structure) was reviewed. The organic fraction was found to be 65% in sampled waste of household, 43% in commercial sector and 22% in institutional sector. The study shows that 620 tons/day of solid waste in generated from Kathmandu and Lalitpur cities of Nepal. These waste are sent to landfill site located at Sisdoile, Northern part of Kathmandu. The quantity of solid waste reaching landfill is 420 tons/day. 60 tons/day is used for recovery the gap assessment shows that 140 tons/day of solid waste is lost while transporting from source to disposal. Organic waste to Compost and biogas, Paper to recycle and plastic to fuel or energy are major solution for waste volume reduction.

**Keywords:** Environment, Gap assessment, Municipal solid waste, Organic Waste

# Biogas production for organic waste management: A case study of canteen's organic waste management technical support center, Lalitpur, Nepal

■ Sandila Shrestha

*Central Department of Environmental Science, Tribhuvan University, Kathmandu, Nepal*

Management of solid waste is one of the major challenges faced by the municipalities. Solid waste mainly comprises of organic waste. Proper management of organic waste helps minimize solid waste problem. This study was carried out to assess the production of biogas from canteen's organic waste as a solution for management of organic waste in Solid Waste Management Technical Support Centre, Lalitpur using innovative urban biogas plant with capacity 1,275 liters for 48 days. The physicochemical parameters of canteen's waste and bio-slurry were analyzed. Similarly, volume of biogas, volume of methane and carbon dioxide in biogas produced were measured and CO<sub>2</sub> reduction from biogas plant was identified. The average values of physicochemical parameters of canteen's waste lied within the optimum range for biogas production. The biogas plant produced 22.03 liters/kg of waste and 120.47 liters/day of biogas. The produced biogas contained 48.89% methane and 39.11% carbon dioxide on average. The biogas plant could reduce 3.20 tonnes of CO<sub>2</sub> equivalent per annum from 262.50 kg of waste fed for 48 days. The values of nitrogen, phosphorus and potassium of bio-slurry indicated it as a better fertilizer. Shapiro-Wilk test showed that the p-value of collected data were greater than 0.05 indicating normal distribution. Linear regression between ambient temperature and biogas production showed that the p-value less than 0.05 indicating significant relationship between them ( $r^2=0.08$ ). The estimated return period of the invested money was 9.5 months in kerosene substitution or 9.7 months in firewood substitution or 9.5 months in LPG substitution. Similarly, the estimated average rate of return was 125.26% in kerosene substitution or 123.72% in firewood substitution or 125.01% in LPG substitution. These results indicated that biogas production using innovative urban biogas plant is better solution for organic waste management.

**Keywords:** Bio-slurry, CO<sub>2</sub> reduction, fertilizer, methane, urban biogas plant

# Quantification of nonpoint source pollution from urban catchments and evaluation of green technologies to reduce the negative impacts of urbanization

■ **Sher Bahadur Gurung**

*Kongju National University*

Green technologies (GI) are simple, cost effective, decentralized system which can ensure to reduce the impacts of urbanization. Unlike, its application in developed countries these technologies could be valuable tools for the developing countries to mitigate the impacts of non- point sources and problems associated with urbanization. Thus, current research was focussed on quantification of pollutants from urban 100% impervious catchments like road and parking lots, rooftop and parking lots. Furthermore, GI systems such as bioretention, raingarden, wetlands, tree box filter applied in the urban catchments to mitigate the problems were evaluated for pollutants and volume reduction with long term monitoring data. Stormwater runoff from different types of urban catchments and discharge from GI were monitored since 2009 to 2018 located at Kongju National University, Cheonan, South Korea. GI system effectively reduced the runoff volume up to 90% for rainfall depth greater than 30mm for the system with infiltration as a primary function, however, technologies without infiltration function were efficient to attenuate the peak flow rate. On the other hand, TSS concentration from those catchments ranges from 1.56 to 2133 mg/l while maximum was contributed from roads areas. Similarly, Nutrients like TN and heavy metals ranges from 0.10 to 107.24 mg/l and 0.1 to 250 mg/l (Zn, Ni, Cd, and Pb), respectively. In addition, roads and parking contributed higher concentration of sediment and organics while heavy metals were highly contributed by the rooftop area to the nearby water sources. Moreover, TSS reduction efficiency of GI system ranges from 50.5% to 98.01%. Similarly, heavy metals transported from urban catchment removal efficiency of GI system ranges from 28% to 100% depending on to initial concentration and system applied for treatment. Similarly, GI technologies were highly significant to treat pollutants and restoration of

natural hydrological cycle. Finally, GISystem could be a better solution to mitigate the different problems associated with urbanization.

### **Acknowledgment**

This work was supported by Korea Environment Industry & Technology Institute (KEITI) through Public Technology Program based on Environmental Policy Project, funded by Korea Ministry of Environment (MOE) (2016000200002). The authors are also thankful to Non-point source laboratory (Kongju National University) and its members for providing monitoring data for the research.

**Keywords:** Green technologies, pollutants, pollutant reduction, urban catchments, volume reduction

# Field evaluation of air quality sensor in the Kathmandu Valley

■ **Ashish Singh, Erika von Schneidemesser, Maheswar Rupakheti**

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The field performance verification of the low-cost air quality sensors is critical in validating their application in indicative and research monitoring. Despite their inherent sensing limitation, rigorous calibration, and data quality check, such low-cost sensors could be one of the practical ways to determine air quality in the developing countries. In this study, the first field evaluation of three PM (particulate matter) sensors (Plantower PMS1003; Nova SDS011; Alphasense OPC-N2) in the Kathmandu Valley- a highly polluted urban areas in South Asia with strong seasonal emission variability. The sensors were locally configured and assembled into weatherproof housing with data logging and charging functionality. The results of the in-situ calibration of the sensor and data validation techniques will be presented. The role of external factors such as relative humidity (RH) and concentration range in the sensor's response (e.g., linearity) including the mean bias and error to reference measurements was also evaluated. The results from multiple linear regression and supervised machine learning for correcting sensor response will be shown.

# Drinking water quality analysis, community survey and sanitary inspection of Gundu drinking water scheme, Bhaktapur, Nepal

■ **Bhupendra Lama<sup>1</sup>, Ushana Shrestha Khwakhali<sup>2</sup> and Atmaz Kumar Shrestha<sup>3</sup>**

*1 Central Department of Microbiology, IOST, TU (currently) 2 Amrit Campus, IOST, TU 3 Amrit Campus, IOST, TU*

Water is one of the most abundant resources of the earth essential for all living organisms. Assessable, adequate, continuous, affordable and sustainable safe drinking water are prerequisite for the establishment of stable community. This study was designed to assess service indicators (coverage, quantity, continuity, cost and quality) of drinking water supplied by Gundu Drinking Water Scheme during May to July 2017. Physico-chemical parameters (appearance, temperature, pH, conductivity and free residual chlorine) and microbiological parameters (total and faecal coliforms using membrane filtration technique) of 49 samples, including 3 sources, 1 reservoir (5 samples) and 41 distribution taps, were analysed to determine drinking water quality and sanitary condition of supply system was studied by on-site survey. Assessment of combined risk in drinking water from source to distribution point in relation to water quality and sanitary condition was determined according to World Health Organization (WHO). This study showed 97.3% water supply coverage with about 43.8 L/per person per day and 100% continuity of water supply. Before distribution of drinking water, only chlorination was observed. The physico-chemical water quality of analysed parameters was within guideline value except free residual chlorine which was not consistent in 40% of samples from reservoirs and 39% of samples from distribution taps. Total coliform and faecal coliform counts showed that 47 (95.9%) and 24 (49%) samples crossed guideline value ofcfu/100 mL of National Drinking Water Quality Standard and WHO, respectively. In distribution taps, maximum total coliform and faecal coliform counts were found to be  $2.9 \times 10^2$  cfu/100 mL and 27 cfu/100 mL, respectively. All water sources showed very high risk, five water samples from reservoir showed intermediate to high risk, twenty-two taps showed intermediate to high risk, eighteen taps showed low risk and one tap showed no risk to drinking water users. Contamination of drinking water with total coliforms and faecal coliforms in this drinking water scheme indicated low to very high risk to consumers which necessitates purification system of drinking water with proper disinfection in order to minimize risk due to drinking water pollution.

**Keywords:** Coliforms, Community survey, Drinking water quality, Membrane filtration technique, sanitary inspection, Risk assessment

# Asta-Ja USA initiative for Kathmandu Valley environmental pollution control

■ **Durga D. Poudel, Arjun Aryal, Sahas Shrestha, Prem Bhandari, and Ajay Bhandari**

*Asta-Ja USA*

This presentation provides information on Asta-Ja USA initiatives to implement a comprehensive environmental pollution control study project in the Kathmandu Valley, which is one of the fastest growing city of South Asia facing massive environmental pollution. As the largest and the fastest growing city of Nepal, Kathmandu in recent years is experiencing uncontrolled urban growth, rapid expansion of impermeable surfaces, lack of essential wastewater treatment facilities, groundwater pollution and overdraft, subsidence, massive air pollution, high noise pollution and traffic congestion, persistent solid waste management challenges, and increasing point and nonpoint source pollution. Contamination of soils, groundwater, and surface waters due to leaking Underground Storage Tank (UST) is another environmental concern. No need to reiterate, environmental pollution has seriously and negatively affected public health, tourism, ecological integrity, and economic activities. Unsafe disposal of hazardous and biomaterials is spreading highly toxic substances into the environment, which are often long lasting. Available literature suggests extremely polluted water bodies in Kathmandu Valley. For example, Biological Oxygen Demand (BOD) values of as high as 583 mg/L were reported for Tukucha stream at Tripureshwor and Chemical Oxygen Demand (COD) values of as high as 1,000 mg/L were reported for Balaju, Bishnumati, and Tripureshwor areas of Tukucha stream. Similarly, greater than 120 mg/L of Total Kjeldahl Nitrogen (TKN) values were reported for Tripureshwor, Teku, Balkhu, and Chovar regions of the Bagmati River. Exceptionally high level of fecal coliform counts were reported. Recent flooding of Bhaktapur and frequent drainage failures in Kathmandu City suggest an urgency of stormwater management for community resiliency and environmental pollution control. Asta-Ja has been working closely with the farming communities in the Valley for past 10 years and has started collecting information on the use of agrichemicals in food/crop production and its environmental consequences. Asta-Ja, in 2017, collected spring water samples from five locations in Kathmandu and three locations in Lalitpur districts and analyzed various indicators of water qualities such as turbidity, conductivity, pH, calcium, magnesium, bi-carbonate, sulphate, sodium, nitrate, chloride, iron, arsenic, and fecal coliform counts. This water quality dataset is currently undergoing through statistical analyses. Asta-Ja is also planning for launching community awareness activities for environmental pollution control in the near future. Working closely with governmental agencies, academic institutions, private businesses, INGOs, NGOs, community organizations and other stakeholders in Kathmandu Valley,

Asta-Ja USA intends to implement a comprehensive environmental pollution control study project, with a view of developing a comprehensive environmental pollution control guidelines for Kathmandu Valley. These guidelines will help in developing the Kathmandu Valley Environmental Pollution Control Act for sustainable environmental management of the Valley.

# Kathmandu's persistent waste problem and how to tackle it

■ **Keshav Parajuli**

*United Nations University, Germany*

Overflowing landfills, streets full of garbage and finger-pointing among stakeholders are regular phenomena for Kathmandu. Foul smell and bad sight is what gets our attention, but other impacts can be longer-lasting. Kathmandu was crowned as the most polluted Asian City. Besides health and environmental impacts of pollution, such reputation can also harm our tourism-based economy. While the debate goes on for decades, few have tried to understand why waste management issues persist.

This paper diagnoses Kathmandu's waste situation and offers scientific insights for tackling the problems, summarized in following three points:

## **It's not lack of technology, but lack of local knowledge**

Waste management technologies have been around for more than a century. But there is no 'one-size-fits-all' solution. We need customized solutions for the local context. For this, local research is vital. Scientific tools such as waste characterization and material flow analysis help us understand quality/quantity of waste streams. These analyses can then be used for techno-economic assessment of waste management options and for prioritizing between recycling and waste-to-energy or biogas and composting.

## **It's not lack of policies, but lack of wisdom in our policies**

Nepal's Solid Waste Management Act can fine polluters 15000 Rupees but offers no technical details on waste collection and recycling. Informal recyclers are not officially recognized, whereas municipalities spend only on collection-and-dumping of waste that brings zero economic return. We can learn from Europe where the recycling industry provides 2 million jobs and 1% of GDP. Good policies should consider the overall system. Investment in pollution control means savings in health sector, and waste recycling means jobs creation and recovery of valuable resources (metals, plastic). Policies should address waste not as a burden, but as secondary resources.

## **It's not lack of action, but lack of coordination**

Several local clubs, NGOs and informal workers are involved in managing waste. But these actors define their own work areas and operate independently without any collective goal. A 'knowledge center' is needed to bring them together. Authorities and scientists need to involve in brainstorming solutions. Such a Center can serve as a focal point for policy makers and funding agencies to help make better decisions.

# Making invisible visible: Emerging ozone pollution in the Kathmandu Valley

■ **Khadak Singh Mahata 1, 2, Maheswar Rupakheti 1,3, Arnico Kumar Panday 4, 5, Piyush Bhardwaj 6, Manish Naja 6, Ashish Singh 1, Paolo Cristofanelli 7, Deepak Pudasainee 8, Paolo Bonasoni 7, Mark G. Lawrence 1, 2**

- 1 *Institute for Advanced Sustainability Studies (IASS), Potsdam, Germany*
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- 6 *Aryabhata Research Institute of Observational Sciences (ARIES), Nainital, India*
- 7 *CNR-ISAC, National Research Council of Italy – Institute of Atmospheric Sciences and Climate, Bologna, Italy*
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Residents of the Kathmandu Valley experience severe particulate and gaseous air pollution throughout most of the year. Air pollution study in the valley was previously very limited, but is improving rapidly due to several field measurements conducted in the last few years. Thus far, most observations have been limited to short periods and at single locations in the valley. This study extends the past studies by examining the spatial and temporal characteristics of important gaseous air pollutant O<sub>3</sub>. Simultaneous observations were carried out from January 2013 to January 2014 under the framework of international air pollution measurement campaign SusKat-ABC (Sustainable Atmosphere for the Kathmandu Valley – Atmospheric Brown Clouds) at three locations within the valley and on its rim. Supersite Bode is located in the valley center (1345 m above sea level) and two satellite sites, Paknajol (1380 m asl) and Nagarkot (1901 m asl) are in the Kathmandu city center and at a mountain pass on the eastern rim respectively. The O<sub>3</sub> mixing ratio was found to be highest during the pre-monsoon season at all sites, while the timing of the seasonal minimum varied across the sites. The daily maximum 8 hour average O<sub>3</sub> exceeded the WHO recommended guideline of 50 ppb on more days at the hilltop station of Nagarkot (159/357 days) than at the urban valley bottom sites of Paknajol (132/354 days) and Bode (102/353 days), presumably due to the influence of free-tropospheric air at the high-altitude site as well as due to titration of O<sub>3</sub> by fresh NO<sub>x</sub> emissions near the urban sites. About 80% of the exceedance days were during the pre-monsoon period at all sites. The high O<sub>3</sub> mixing ratio observed during the pre-monsoon period is of a high concern for human health and ecosystems, including agroecosystems in the Kathmandu Valley and surrounding regions.

# Current status of solid waste management in Ratnanagar Municipality

■ **Maiya Pahari, Kamala Thapa, Nirmal Babu Aryal, Bikash Adhikari and Sanjay Nath Khanal**

*Kathmandu University*

With rapid population growth, waste generation has drastically increased and has created a big trouble in municipalities of Nepal. Organic fraction of Municipal Solid Waste can be used for the production of biogas to solve the problem of waste treatment. The main objective of the study is to determine current status of solid waste management in Ratnanagar Municipality. The specific objective is to determine per capita household waste generation and waste composition calculation. The quantitative analysis of waste survey showed average daily waste generation on institutional, industrial and commercial areas was 5 kg, 3 kg and 8 kg respectively. The average per household waste generation was 0.81 kg per day. The study showed waste generation varies with economic status of people. The average per household waste generation per day was found to vary from a minimum value of 0.6 kg to maximum value of 0.98 kg. The composition analysis of household waste showed 74% organic waste, 20% plastics and 2% paper and paper products. The composition analysis of institutional wastes comprised of 62% paper/paper products, 10.25% organic wastes, and 17.92% plastics. The study found commercial wastes comprised of 40% organic wastes, 26% paper and paper products, and 22% plastics. The composition of industrial waste comprised of 23% organic wastes, 42% paper/paper products, 22% plastics. The study showed total household waste generation in Ratnanagar Municipality is 13017 kg per day. The organic fraction of total waste is 74% which has good energy recovery potential.

**Keywords:** Municipal Solid Waste; Organic Waste; Quantitative analysis.

# Impact of climate change on glaciers: A case study of hidden Valley, Nepal

■ **Sujan Sapkota, Dinesh Bhatt and Nabin Raj Bhatt**

*Kathmandu University*

The Himalayas which acts as a huge portable for water reservoir is one of the largest concentrations of glaciers outside the polar regions. As Nepal is famous for mountains stretching in different location all over the country, monitoring the glacier is important. The thinning of these glaciers is bringing them nearer to flotation. Hence, there is a need for action, despite the uncertainties of predicted changes; but action requires concrete contexts to facilitate anticipatory measures by the decision makers. In order to see this adverse problem, we aim to work for estimating the volume of ice loss using set of multi-temporal Landsat images from remote sensing analysis technique. Satellite data of Landsat from 1995 to 2016 are used in the investigation. The investigation has shown snow area in glacier from 1.14 sq.km in 1995 to 0.66 sq.km in 2015 of Glacier 4 (G4) and similarly the snow area in glacier from 5.62 sq.km in 1995 to 4.49 sq.km in 2015 of Glacier 5 (G5). Similar result was obtained for Glacier 6 too which showed the snow area in glacier from 2.71 sq.km in 1995 to 1.45 sq.km in 2015. Moreover, the snow area in glacier was seen from 2.12 sq.km in 1995 to 2.02 sq.km in 2015 of Glacier 8 (G8). Finally, Glacier 9 (G9) also brought similar result showing the snow area from 1.4 sq.km in 1995 to 0.97 in 2015. The maximum change in area was seen on Glacier 6 (G6) which showed the reduction in area of 46.5 % and the minimum change in area was seen on Glacier 8 (G8) which showed the reduction the area of 4.8 %. The project also deals with the change in tongue length of five different glaciers as mentioned above.

# Air pollution in Nepal: A major challenge to national development goals

■ **Yadav P Joshi 1, Maheswar Rupakheti 2, Amod Pokhrel 3, Anobha Gurung 4, Rudra P Arya 5 and Puru Shrestha 6**

*1 Manmohan Memorial Institute of Health Sciences, Solteemode, Kathmandu, Nepal, 2 Institute for Advanced Sustainability Studies, Potsdam, Germany, 3 School of Public Health, University of California, Berkeley, USA, 4 Yale University, USA, 5 Department of Physics, Franklin Pierce University, USA, 6 Geominmet Consulting Company, Arizona, USA*

Air pollution is a major environmental and societal problem of our time. It is associated with a multitude of adverse effects on human health, crop yields, ecosystems, weather and climate change, built environment including archeological and historical sites, socioeconomic systems and development goals of both developed and developing countries around the world. South Asia is one of the global air pollution hotspots, and it is projected that air pollution in South Asia will continue to worsen until 2050. Nepal is one of the top ten countries vulnerable to the impacts of climate change. In addition to this, it is also being affected by increasing air pollution, including transboundary air pollution. This study reviewed recent scientific studies and policy initiatives put in place by the government of Nepal, and thus reports current scientific understanding of the physical science, including sources and impacts and potential mitigation measures of air pollution in Nepal. For example, according to the 2016 global burden of diseases (GBD) report, air pollution is associated with 35,000 premature deaths and thousands of sickness every year. The socioeconomic cost of air pollution, through its impacts on health care expenditure and workforce productivity is substantial in Nepal, about 4.5% of the GDP according to the 2016 World Bank report. The cost of air pollution impact goes higher when its impacts on crop yields, tourism and other socio-economic systems are taken into account. There is no doubt that scientific studies have put together a strong case for reducing impacts of air pollution in Nepal that cannot be ignored. Air pollution is a clear major threat to Nepal's socioeconomic development goals and sustainable development goals (SDGs). There is a need for putting in place policies and plans swiftly and widely in order to steer current policies and practices towards cleaner solutions that will help achieve Nepal's socio-economic and environmental development goals.

# Biomass smoke effects on cardiovascular health of the women in rural villages of Lumbini, Nepal

■ **Rasmila Kawan, Parth Sarathi Mahapatra, Siva Praven Puppala, Aranico K Panday, Rainer Sauerborn**

*International Center for Integrated Mountain Development (ICIMOD), Khumaltar, Nepal, 2 Heidelberg Institute of Global health, University of Heidelberg, Germany*

In low-and-middle income countries, people rely on solid fuels for cooking and heating. The inefficient use of such fuels in poorly ventilated conditions results in high levels of indoor air pollution, most seriously affecting women and young children. This study aims to evaluate the effects of long-term exposure of different fuels on cardiovascular health in women exposed to biomass, clean cook stoves, thereby highlighting the effect of exposure of those smoke pollutants, produced during cooking hours by different cook stoves design in the local kitchens. We performed a cross cross-sectional study in the healthy nonsmoking women (aged 25-45 years) living in rural villages who were not diagnosed of any cardiovascular disease in the last 6 months and using biomass fuels and clean cook fuels as LPG for cooking for a minimum period of 5 years. A portable Electrocardiogram, a health questionnaire, oximetry, Sphygmomanometer were used to assess the cardiovascular risk. Among 148 participants, the mean age was  $35.0 \pm 7.0$  years and  $36.4 \pm 7.2$  years in biomass and LPG group respectively. The mean Body mass Index in LPG users was slightly higher ( $25.0 \pm 4.4$ ) than in biomass users ( $22.6 \pm 4.2$ ). Seventy percent of the biomass users and 43% of LPG users were illiterate. The symptoms of chest pain, problems in legs and arms and complains of pain in back, neck, jaw, throat and abdomen were comparatively found higher in biomass users. Biomass users had slightly increased P wave and PR interval than in LPG users. In this study we concluded that there is an urgent need to adopt various strategies to improve indoor air quality. Moreover, the advancement in research tools, measuring technique in particular, is critical for researchers in developing countries to improve their capability to study the emissions for addressing the growing public health concerns.

# SaGa technology: An effective technique in organic waste management in Nepal

■ **Deepak Lohani 1, Yadav Prasad Joshi 2, Puru Shrestha 3**

1 *Organic Life, Lazimpat, Kathmandu, Nepal*

2 *Manmohan Memorial Institute of Health Sciences (MMIHS) Solteemode, Kathmandu, Nepal*

3 *Geominmet Consulting Company, Arizona, USA*

Waste management has become a serious issue in developing countries. In Nepal, about seventy-percent of waste is organic and which is being commonly dumped in landfill sites. This practice is not an environmentally friendly and harm to environment, biodiversity, cultivation and human beings. This demands the recycling of waste. Among the several local waste recycling methods, SaGa is one of the most popular traditional techniques of Newar. In SaGa, the ethnic Newar of Kathmandu valley forms the compost manure from organic waste in the trench. Now, this traditional composting method has been improved by a private company; The Organic Life and is being widely in practice in different districts of Nepal. The organic wastes are kept in a small trench and protected from rainwater and pests. Bacterial extracts are used for waste decay and also to prevent from foul smelling. This technique is being the most popular in cities; most of the females are being able to prepare compost manure from the organic residues released from kitchens. The firm Organic Life has been working in SaGa composting in-and-out of Kathmandu valley. The company has been successfully working in collaboration with more than 25 urban or rural municipalities in Nepal. The results are amazing and peoples are highly motivated towards SaGa composting. Although SaGa composting has proved itself as one of the best traditional composting techniques and effective in organic waste management, the government still has not prioritized its application widely in national waste management issue. Being an easy, effective and environmentally friendly method, we assume that SaGa can become one of the best methods in the management of organic waste in resource-limited settings of Nepal.



## Symposium 5: Financial Policy and Investment

**14 October 2018, Time: 16:00-18:10, Marva Hall**

*Coordinators: Mr Keshab KC, Nepal Rastra Bank, Nepal  
Mr Ranjeet Mahato, Neapolis University Paphos, Cyprus*

**Background:** The home of mountains, sheltering the world's tallest peak Mount Everest, along with birthplace of light of Asia Siddhartha Gautama Buddha is the typical introduction to NEPAL. The home of eight out of tenth tallest mountains in the world, filled with plenty of medicinal herbs, 2nd richest country in the world in terms of water reservoirs with an installed capacity of 48,000 MW hydropower electricity potential, equipped with enormous natural beauties, and all-time favorable climate, nevertheless the country has failed to attract enormous foreign direct investments (FDIs) and thereby Nepal still remains one of the poorest countries in the world.

Nepal started undergoing reforms in the 1990s once multi-party democracy returned after 30 years. The government introduced a 'one window policy' whereby the Department of Industries was designated as the sole agency for all FDI related work. The flow of inward FDI was at peak during mid-1990's however thereafter it declined due to armed conflict faced by the country. However, as the decade-long armed conflict ended, the new constitution was promulgated, and elections are successful conducted, Nepal is creating a peaceful and investment friendly environment for the investors (either domestic, foreign or NRNs). Although the investments are accelerating, the growth rate is not satisfactory and therefore, this session will highlight and recommend constructive policies so as to enhance large inflows of such investments.

There is a saying that finance without strategy is just numbers and strategy without finance is just dreaming. In other words, to kick off any projects, the investments are imperative and that is exactly the case we are facing in terms of project development in Nepal.

Domestic investment in Nepal is not enough to realize double digit growth rates in order to achieve the target of becoming a middle-income country by 2030.

This is where the foreign and NRNs investments will play a big role towards overall economic development for the country.

In order to accelerate investments, the Government of Nepal has to introduce changes on its policies, rules and regulations to create more new and attractive opportunities and further create conducive environment for both foreign and diasporas investments.

(Focus: Foreign Direct Investment, Portfolio Investments, Investment Policies, Financial Reforms, Fiscal Policies, Repatriation)

**Themes :**

This symposium will explore how we can attract more FDI, Portfolio Investments, Diaspora Investments and Human Capital Investments. The theme of this session will be

- To show the correlation between FDI and economic growth
- To understand obstacles to FDI and Portfolio Investments including structural and institutional factors
- To highlight major investment sectors in Nepal
- To present current fiscal policies, existing legal system and changes required thereon
- To propose a number of changes that the government should incorporate in the upcoming revision of Foreign Investment and Technology Transfer Act 1992
- To present policies, trends, and patterns of flow of FDI, and suggest policies and practices adopted by countries having similar level of constraints in relation to investments

<b>Symposium 5: Financial Policy and Investment</b>				
<b>14 October 2018, 16:00-18:10, Marva Hall</b>				
<b>Chair: Bhabani Rana, Moderator: Keshab KC</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
16:00-16:20	Invited	Bhisma Raj Dhungana	Remittance and repatriation	Executive Director, Nepal Rastra Bank
16:20-16:40	Contributed	Ranjeet Mahato	Role of NRNs for FDI and joining Nepal into world's economy	Neapolis University Paphos, Cyprus
16:40-16:50	Contributed	Abhaya Poudel	FDI in Nepal, complication and way forward	Reanda Biz Serve, Kathmandu, Nepal
16:50-17:00	Contributed	Sunil Paudel	Foreign investment through capital market in Nepal: avenues, challenges and solution	Portfolio Manager / Analyst, National Merchant Banker limited
17:00-17:10	Contributed	LN Pandey	Improving reliability of the public financial system	Director, Asmita & Associates Ltd, London, UK
17:10-17:17	Rapid Fire	Sristi Tandukar	Analysis of climate finance	World Renew Nepal
17:17-17:22	Rapid Fire	Dila Kharel	One NCC one project one employment	Innovative Associates, Sydney, Australia
17:22-18:00	Panel Discussion and Q/A	Anal Raj Bhattarai		Ex-CEO, Sanima Bank and Businessman
		Mahesh Shrestha		City Expresss Group, Japan
		Maha Prasad Adhikari		CEO, Nepal Investment Board
		Rajendra Khetan		President, Nepal Britain Chamber of Commerce
18:00-18:10	Summary	Bhabani Rana		FNCCI, President
18:10-19:10	Poster			
19:10			Dinner	

# Remittance and repatriation

■ **Bhisma Raj Dhungana**

*Nepal Rastra Bank*

## Role of NRNs for FDI and joining Nepal into world's economy

■ **Ranjeet Mahato**

*Neapolis University Paphos, Cyprus*

My presentation will fall under Track 5. The objective of the presentation is to propose measures to increase economic activities and thereby economic growth in Nepal. The report will address many areas such as governance, fiscal policy such DTTA, BIPPA, FTA, 2nd generation investments, and policies improvements in relation to attract Foreign Direct Investment (FDI) into Nepal. More specifically, please see below sections that will be discussed in details during the presentation:

1. Expansion of double tax treaties (DTA) and ratification of existing DTA, Bilateral investment Protection Agreement (BIPPA) and Free Trade Agreement (FTA).
2. 2nd generation investments into Nepal
3. Areas that need amendments in the upcoming Foreign Investment Technology Transfer Act (FITTA), due for ratification by the cabinet.
4. Allow outbound investments esp for technology and knowhow and a fixed amount on yearly basis such as 20% of the net assets of the company. This will encourage correct reporting of financial transactions.
5. Allow let say \$10K investments into secondary stock markets and facilitate free repatriation of such capital including its gains at any point of time via commercial banks without requiring central bank approval.
6. Corruption measures, in absence of which will very hard to get listed companies into Nepal due to short sellers attacking listed companies in the host countries
7. Bankruptcy rules are utmost required to be finalized
8. Allow brokerage and wealth management licenses to foreigners and NRNs which will bring investments into Nepal and of course marketing of Nepalese companies into the world's stocks
9. Strict corporate governance rules and regulations for BFIs and securities exchange rules for brokerage and merchant banking
10. Allow Nepalese companies to issue American Deposit Receipts (ADRs) which will be attractive to 2nd generation NRNs

# FDI in Nepal: Complication and way forward

■ **Abhaya Poudel**

*Reanda Biz Serve, Kathmandu, Nepal*

Foreign Direct Investment (FDI) has always played a key role in development of various infrastructure sectors and overall economic growth in Nepal. Even though the government of Nepal has always encouraged the FDI and introduced various directives, policies, rules and regulations to ease the FDI process, it is still a complex process to get FDI approval and bring investment into the country. Despite all the government measures, FDI is still very timely process with various authorities involved and hectic documentation process. This session will identify the major issues related to FDI process in Nepal and remedies to resolves these issues. Uncertain time consumption in getting the FDI process completed has been one of the biggest challenges for the investors and investees to make the plans and decisions. Differences in expectations among various stakeholders have also proven the process to be very tedious and time consuming. These issues and implications in FDI in Nepal have been identified through consultation with industry experts, relevant government authorities and referring to various precendented cases to understand the complications related to FDI processes. Among various reasons behind the FDI process to be hectic, lack of coordination between interconnected government authorities for approval of FDI has been significant. Also, conflicting provisions of existing laws, rules and regulations has made the process even more confusing. Moreover, problems have been faced in implementation of existing laws, rules and regulation. For the FDI process to be favourable among stakeholders, harmonization between existing laws, rules, regulations and its practical implementation is direly needed. Also, standardization of existing laws, rules, regulation and implementation procedure with global requirements and standards must be done. In conclusion, in spite of playing a vital role in economic development of the country, due to various issues and implications involving the FDI, the possible advantages have not been fully utilized. For the FDI to flourish in the country, the government needs to introduce favourable laws, rules and regulations and establish necessary infrastructures to implement these laws, rules and regulations to ease the FDI process in benefits of all stakeholders.

# Foreign investment through capital market in Nepal: Avenues, challenges and solution

■ **Sunil Paudel**

*National Merchant Banker limited*

Foreign Investment Policy 2015 has categorized Non-Resident Nepalese as one of the types of foreign investor. As the policy has opened the door for NRN and foreign institutional investors to enter into Nepalese capital market through portfolio investment as well as direct investment, this could be win-win situation for both foreign investors including NRN and Capital Market of Nepal. Security Exchange Board of Nepal has issued initial draft of Alternative Investment Fund Act 2075 which has opened the door for Alternative Investment in Nepal and Non-resident Nepalese qualifies to invest in such fund. However for other foreign investors the Act is silent. Although there have been some direct investments from NRN and foreign investors in past years especially in the energy, hospitality and manufacturing sectors, many other sectors are still looking for major investment. Agriculture, Tourism, Pharmaceuticals, Banking, Insurance, Tele-Communication, Infrastructure etc. could be some other alternatives for them to invest either directly or through portfolio investment. Private Equity, Venture Capital, Hedge Fund, Investment Management Companies / Merchant Bankers could be the mediums to enter in these sectors.

The sustainable GDP growth rate of country has been more than 6 percent since last two years and is projected to be around 8% in coming years by Nepal Rastra Bank. Also elimination of major problem of load shedding has helped the manufacturing as well as many other sectors to achieve its economy of scale which ultimately contributes for the GDP growth. Diverse geographic location, gradually increasing economic indicators, improving legal framework, political stability, improving technology etc. will have synergetic effect for the economy to reach its new level in coming years. Foreign investment could play a vital role to further strengthen the economic progress as there is more requirement of capital in the economy. If the economy moves as predicted both the country and foreign investors will be better off financially and mutual relationship will be stronger.

The process to bring money into the country is one of the major problems for foreign investor who wants to invest frequently for example in the share market. The monetary limit posed by the policy also discourages the investors who want to invest but could not meet the minimum limitation. Repatriation of dividend and the profit is equally major problem as bringing in the investment. Problem regarding double taxation for them, i.e. tax in Nepal as well as the country of their citizenship, is also considerable. Problem in online trading, simplicity of transaction, money transfer and exchange related problems, corporate

governance of the companies, insider trading, transparency of the fund managers, data security etc. are some other factors to be considered. Nepali capital market itself is going through the liquidity problem which can be seen in the market index level.

In order to address these problems there need to be frequent lobbying as well as meeting with the concerned authorities by forming a committee including the representatives from NRN Association, Foreign Investors, SEBON, NEPSE and other specialists in the investment industry as well as other sectors. The existing problems regarding the bringing in fund and repatriation must be addressed by NRB and concerned authorities so that foreign investors could invest and repatriate profit in hassle free environment. Government of Nepal could work on the treaty regarding double taxation with the countries with major investors or provide tax subsidy. This will help to mitigate the current problem of liquidity in the capital market as well as the problems of foreign investors to invest in Nepal and both the country and foreign investors could take the benefit of the growing economy of the country.

## Improving reliability of the public financial system

■ LN Pandey

*Asmita & Associates Ltd, London, UK*

This paper explores the reason for the Financial Reform in Nepal that could be applied to private sector, in federal government as well as province level in order to strengthen the overall financial system of the country. In the absence of proper regulator in the sector and need harmonization among all provinces for the reporting and control, the paper presents a guideline to contribute by providing a systematic process behind the existing failure and forthcoming challenges. This is based on the practical research in the Nepalese financial scenario triggered by credit crunch, financial reporting and audit environment. This paper discusses on failure of sorting out abuse of system and lack of regulation to intermediaries that is addressed different (not well targeted) resulting jeopardize the economy. The paper also discusses accounting issues in verification (Beruju) in public sector, reducing the chances of corruption by way of financial reform and in the context of overall financial systems improvement in private sector that there is a gap of demand and supply of finance professionals. Paper makes suggestions by introduction of effective compliance and regulators such as reporting council in order to improve the public reliability in financial statements that largely affects the financial markets.

# Analysis of climate finance

## ■ **Sristi Tandukar**

*World Renew Nepal*

The multifaceted nature of environment makes the climate change uncertain. The climate change affects the biological system which is evident that it impacts the economy of country. Nepal being a landlocked country is extremely vulnerable to climate change with climate induced disasters. This makes Climate finance a focal point for development of Nepal. This study describes the importance and scope of Climate finance, the modes of financing and implementation of the policy to the extent of transfer of public and private funds from the developed to developing countries from the national to local levels. The study showed that Public and private actors—development financing institutions, governments, and private sector investors, including financiers and project developers should shift and scale-up their investments in sustainable, low-carbon and climate-resilient development; besides, the effort from international level, to furnish an independent economy.

Nepal requires a new economic model and the strong implementation to make it a success. Different international organizations work on financing climate change action focusing on developing frameworks, tools and analysis to provide guidance to countries in this transition. The study concludes that there needs to be full transparency in the way the resources are used for mitigation and adaptation activities.

# One NCC one investment

## ■ Dila Kharel

*Innovative Associates, Sydney, Australia*

### **Background:**

investment is not sufficient to the need of Nepal and Nepali. Nepal itself now can offer several business opportunities that the global investors are unaware of. The improving political scenario within the country is highly motivating to all of us. We all NRN'S now must consider this situation and need to brainstorm that how we can be of assistance to Nepal for bringing the foreign investment from an entrepreneur to multinational companies. By default, NRN'S are the global advocates of our countryman's. We did talk a lot but the real time came now to serve. Foreign Direct Investment and its Scenario in Nepal

### **Why NRN'S for FDI In Nepal:**

Global NRN'S as an institution and on an individual capacity can do a lot to bring investment in Nepal. The bottom-line or core theme is to generate at least 1 Investment with any amount in Nepal by NRN'S on an individual or institutional Capacity.

How It can be achieved: Every NCC should hold a special meeting and pass a resolution to develop a Permanent team or committee to foster, discuss and implement this concept. ICC must regulate and monitor it.

### **What NRN'S Can do:**

Global NRN's in 82 Countries can educate the interested Individual, group or institution about investment in Nepal from every corner. NRN can facilitate on, how to operate, how implement how to make it happen.

### **Suggestions:**

No doubt Nepal is moving forward for the economic development with political stability soon, If we all As NRN's as well as Government of Nepal considered below factors, we can achieve better results.

### **Government of Nepal**

- Ministry of Foreign Affairs
- Ministry of Industry / Nepal Investment Board
- Ministry of Finance / Nepal Rastra Bank

NRNA ICC

### **Permanent Committee**

- NCCNRNA Each NCC
  - Investment Ambassador
  - Signing More bilateral and multilateral trade agreement



## Symposium 6: Health Education and Policy

14 October 2018, 8:40-12:50, Malshree Hall

### *Coordinators*

*Dr Archana Amatya, IOM, Tribhuvan University, Nepal*

*Dr Binod Shah, Albert Einstein College of Medicine, New York, USA*

The symposium will mainly focus on current health disparity in Nepal, Medical education and health and drug policy of government and its improvement. The coverage of health expenses either by universal coverage or by private payers in healthcare.

### **Focus:**

Health disparity, education and policy, Medical research, Healthcare partnership

### **Background:**

Nepal has made impressive progress in health with positive indicators, in particular achieving significant reductions in both maternal and child mortality rates. However there exist disparities across wealth quintiles, social groups and geographic location. The Nepal Government is committed to form an inclusive society where people of all ethnic groups, gender, caste, religion, political orientation and social economic status enjoy equal rights without discrimination. In a significant step to realizing this commitment, in 2007 the Government endorsed health care as a basic human right in the Interim Constitution.

However numerous challenges remain and strengthening the domestic, financial, policy and human resource base for helping LDCs like Nepal to thrive on their own is a major concern of the global development partnership in the absence of which fulfilling the SDGs remain a challenging task. We have now committed to achieve the goals by 2030, but numerous challenges persist. There is a dire need to prioritize the major development projects with effective knowledge and capacity building to address the complicated the problem of effective resource

distribution. This is to say that although paucity of funds is an issue, more crucial is the aspect of resource management and funds in the best interest of the country's development.

**Themes:**

This symposium will focus on following themes.

1. Disparity in existing health services in different socioeconomic groups and geographic area
2. Sharing of Knowledge in Health policy in Nepal and in other countries
3. Improvement in Medical Research
4. Sharing of knowledge of payers in Health system in Nepal (Universal Healthcare and Public Private Partnership in Healthcare).
5. NRNs Healthcare Professional role in Nepal.

<b>Symposium 6: Health Education and Policy</b>				
<b>14 October 2018, 8:15-12:50, Malshree Hall</b>				
<b>Session A: Dr Gunaraj Lohani, Moderator: Dr Binod Shah</b>				
<b>Time</b>		<b>Speaker</b>	<b>Topic</b>	<b>Institute</b>
08:15-08:40	Tea and networking			
08:40-09:00	Invited	Deepak Sapkota, Mr	Medical rehabilitation after natural disaster and post conflict	Executive Director, Karuna Foundation Nepal
09:00-09:15	Invited	Bisundev Mahato, Dr	Improving mental health of our communities: How Nepal and the USA can help each other	Greater Hudson Valley Health System (GHVHS), NY
09:15-09:30	Invited	Pan Bahadur Kshetry, Dr	Drug policy in Nepal	Orange Regional Medical Center, New York, USA
09:30-09:40	Contributed	Krishna prasad pathak	General practitioners' knowledge, practices, & obstacles in the diagnosis & management of dementia	Department of Neurology, Aristotle University of Thessaloniki, Greece
9:40 - 9:50	Contributed	Kiran Chandra Rayamajhi	Apitherapy : A science based capacity built up to improve sustainable public health in Nepal	Friends for peace building and development, Nepal
09:50-10:00	Contributed	Bharat Nepal	Pilot testing cardiac rehabilitation in Nepal	Australia Nepal Public Link Inc
10:00-10:10	Contributed	Dilli Banjade, Dr	Economic and societal benefits on investment and policy formulation in radiation Oncology Federal Nepal	Center West Cancer Care Center, Orange Hospital, Australia
10:10-10:15	Rapid Fire	Fanindra Panta	Significance of screening for red cell antibodies: a population study in the Nepal	Sanquin Blood Supply Foundation, Amsterdam, The Netherlands
10:15-10:20	Rapid Fire	Indira Tiwari, Dr	Status of assisted reproduction technology in Nepal	Grande city hospital, Kantipath Kathmandu, Nepal
10:20-10:25	Rapid Fire	Nisha Jha, Dr	Drug abuse in Nepal	Swansea, UK
10:25-10:35	Q&A			
10:35-11:40	Summary	Gun Raj Lohani, Dr		Executive Director, Department of Health Services
11:40-11:10	Tea break			

<b>Session B: Medical Education in Nepal, Chair: Prof Bhagawan Koirala; moderator: Dr Archana Amatya</b>				
11:10-11:30	Invited	Sheetal Bhandari Mr, Kedar Baral, Dr Prof	Medical education in Nepal: Way ahead	Rector, Patan Academy of Health Sciences
11:30-11:50	Invited	Jay Shah, Dr Prof	Access to equitable health services in federal Nepal	Patan Academy of Health Sciences
11:50-12:10	Invited	Malakh Lal Shrestha, Prof	Health Education and system: Lessons from Europe	Hannover Medical University (Medizinische Hochschule Hannover) Germany
12:10-12:40	Panel Discussion and Q&A	Dipendra Raman Singh, Dr		Chief, Public Health Administration, Monitoring and Evaluation Division, Ministry of Health and Population
		Mukti Ram Shrestha		President Nepal Medical Association
12:40-12:50	Summary	Bhagawan Koirala, Prof		Tribhuvan University, Teaching Hospital
	Poster	Krishna Prasad Pathak	Alzheimer's disease patients with depression: Rivastigmine and citalopram	Department of Neurology, Aristotle University of Thessaloniki, Greece

# Healthcare/rehabilitation for post-earthquakes and post-conflict victims

## ■ Deepak Raj Sapkota

*Karuna Foundation Nepal*

### **Background:**

Natural and man-made disasters have remained part of human populations and are unparalleled threat to sustainable development. Preparedness, prompt decision making, knowing local context, facilitation and support mobilization are cores to any emergency response.

### **Problem Statement:**

Any disasters/conflicts affect the human health first, thus health becomes the most important intervention in such situations. In particular, due to the earthquake in 2015, the tremor claimed lives of 8,857 individuals while wounding over twenty thousand populations. Almost 5,000 private and public health facilities were destroyed and 3.5 million populations were rendered homeless. Likewise, different conflicts including the decade long Maoist movement took lives of more than 19,000 people and left hundreds wounded. These led to various longer-term problems including physical and mental health.

### **Intervention:**

Despite of less preparedness and unorganized way of working, the Ministry of Health was able to bring all involved parties together to make effective relief. The immediate health needs of the population were carried out effectively. The cooperation from many countries around the world in case of mobilizing immediate relief happened on time. The role of Nepalese people from inside and outside Nepal, was unique one to serve the needy. However, we are facing challenges to meet Rehabilitation and Reconstruction needs.

### **Discussion:**

Despite the interest and commitment of various actors the nation failed to mobilize and utilize the support to the maximum level. In fact, the resources that was pledged and could be persuaded more by acting smartly and promptly has been a lost opportunity. Still severely injured people are left away putting their families into the vicious cycle of poverty. Improper housing and lack of food stock resulted in mental and physical health problems. Psychological and physical trauma is still an issue that needs to be dealt with seriously.

### **Conclusion:**

Nepal needs to concentrate its efforts towards preparedness plans. Building back better envisioning upcoming challenges is of high importance. Post disaster/conflict state building and development needs specific policies with clear vision, strategies and implementation methodologies. Re-construction should re-form our values, beliefs and knowledge to reduce the impact of disaster and conflict.

# Improving mental health of our communities: How Nepal and the USA can help each other

## ■ Bisundev Mahato

*Resident Psychiatrist, Greater Hudson Valley Health System (GHVHS), NY*

All countries are developing countries when it comes to mental health, as the burden of mental health is huge everywhere. Nepal announced a national mental health policy in 1996, but is having difficulty implementing it. The USA spends greater than 50 times more on mental health, and yet the care is only about 6 times better. Effective and transformative treatments exist, but cannot reach those who need them. Moreover, these treatments are not even acceptable to those who will benefit from them. This results in worsening human rights abuses, increased homelessness, increased public violence like shootings, increased prison population, and increased morbidity and mortality, not only directly from mental illnesses, but also from subpar care of other medical conditions. The economic impact of these otherwise productive workforce is huge. So it is not just a health problem, it is a development problem.

Barriers to mental health care in Nepal are similar to that of the west (e.g. the USA) and the communities served by the Greater Hudson Valley Health System (GHVHS), where Dr. Mahato works. Supply side barriers include: lack of skilled providers, barriers to access, and policy makers' misconception that mental health is not a health problem at all and it is just medicalization of every day suffering. Demand side barriers include: what we offer is not acceptable to those who benefit, discrimination and shame from having a psychiatric diagnoses, and public misconception that mental health is not a health problem at all. One strategy would be to focus at the base of the WHO pyramid of mental health, rather than at the tip as we are currently doing. Dr. Mahato will talk about possible ways of doing so, and how Nepal and the west in general, and the USA in particular, can join hands in overcoming the barriers. There is much they can learn from each other. Having a periodic cultural exchange of knowledge and experience, as this one organized by the NRNA in partnership of with Nepal Government, is a good start.

# Drug policy in Nepal

## ■ Pan Bahadur Chhetry

*Orange Regional Medical Center, New York, USA*

Drugs are an important instrument of public health. Guaranteeing the safety, efficacy and quality of drugs available to the public is the main goal of drug regulation. Realizing this fact, Government of Nepal promulgated the Drug Act, 1978 with the objectives to prevent the misuse or abuse of drugs and allied pharmaceutical substances and false or misleading information relating to the efficacy and use of drugs and to control the production, sales, distribution, export, import, storage and consumption of those drugs which are not safe for public consumption, efficacious and standard quality.

The GoN promulgated National Health Policy in 1991 and then promulgated National Drug Policy 1995 in line with the Health Policy. This policy had been a milestone for the development pharmaceutical sectors viz in industrial sector, pharmacy education, drug regulation, etc. Before this, Nepal had to depend on the import of medicines mostly from the neighboring country, India. Now the situation has been changed. About 45% of the country's demand is fulfilled by the domestic industries.

Though great achievements in pharmaceutical sector have been taking place, there is still a lot to do. The national and international scenario have been changed a lot since 1995. To keep in pace with the changing context, the present Drug Policy is considered not to be enough to address the current issues. So, it is highly felt the policy to be reviewed and the revision is underway.

# General practitioners, knowledge, practices, and obstacles in the diagnosis and management of dementia

■ **Krishna P. Pathak & Anthony Montgomery**

*Macedonia University, Greece*

## **Objectives:**

To identify general practitioners (GPs) knowledge, practices, and obstacles with regard to the diagnosis and management of dementia.

## **Methods:**

Standardized questionnaires covering knowledge, practices, and obstacles were distributed among a purposive sample of GPs in Kathmandu, Nepal. Three hundred and eighty GPs responded (response rate = 89%).

## **Results:**

Knowledge of practitioners with regard to the diagnosis and management of dementia was unsatisfactory (<50%). Diagnosis and management barriers are presented with regard to GP, patient, and career factors. Specifically, the results address the following issues: communicating the diagnosis, negative views of dementia, difficulty diagnosing early-stage dementia acceptability of specialists, responsibility for extra issues, knowledge of dementia and aging, less awareness of declining abilities, diminished resources to handle care, lack of specific guidelines, and poor awareness of epidemiology.

## **Conclusions:**

Demographic changes mean that dementia will represent a significant problem in the future. The following paper outlines the problems and solutions that the Nepalese medical community needs to adopt to deal effectively with diagnosis, care, and management of dementia.

# Apitherapy: A science based capacity built up to improve sustainable public health in Nepal.

■ **Kiran Chandra Rayamajhi**

Health scenario of Nepal is in endangered mode. Immunity level of public is in decreasing condition due to Improper nutrition and physical exercise, haphazard use of chemical, injudicious use of antibiotic, climate change, lack of awareness etc. Now, people could not resist even to the simple cold and cough problem. Brain drain, remoteness, less equipped medical facility, improper policy and resources, poorness, environment degradation, less empowered in health concerns etc. are also responsible to seek the meaningful alternative in field of public health. Hence the Apitherapy is the one of the best alternatives from traditional, literacy level, socioeconomic and geographic point of view. It is the therapeutic use of bee hive products and is using in most part of the world historically and traditionally. Being simple in tools and technique there is good chance of adoption for health and immunity improvement and is compatible simultaneously on sustainable ecological, economical upliftment.

Here the paper aims on science -based capacity built up of Nepalese people with proper apply of Apitherapy as a practical manner via the mission- lead, unite and assist for desirable sustainable health and immunity power improvement simultaneously with perspective ecological, economical upliftment .Paper respect the scenario of Nepal and its present Government. Justice, advocacy, research (Participatory and collaborative), in situ awareness and empowerment, self-help promotion, policy /norms/ standards formulation, module development, publication, sectoral development/ networking and mobility (NGO, CBO, GO, IO, Private sector, social unit, affiliated stakeholders), support/ assist (Infrastructure, HRD, welfare material) etc. are working approaches. Science based latest innovation of Apitherapy will be the tools for judicious utilization in a justifiable, scientific and meaningful manner.

*(NGO: Non-Government Organization. CBO: Community based organization. GO:Government Organization, IO: international organization: HRD:Human resour development).*

# Pilot testing cardiac rehabilitation in Nepal

## ■ Bharat Nepal

*ANP Inc*

### **Objective:**

To test acceptability and viability of cardiac rehabilitation (CR) in Kathmandu Nepal

### **Introduction :**

The effectiveness of well-designed and implemented CR program has been well documented in developed countries however low-income countries such as Nepal is yet to formally introduce CR for patients who had cardiac event. In one hand low-income countries are experiencing rapid increment in incidence and prevalence of heart disease while still having to spend significant health budget in communicable disease treatment and prevention which poses greater burden from heart disease. The cost is not only imposed on government health services, it is even higher cost burden on families and society in terms of both the associated cost, loss of productivity and out of pocket expenses. In experiencing this, the most critical component is patients not getting available care and treatment that are evidence based in terms of prevention of further heart attack and other heart disease as well as improved quality of life via lifestyle modification intervention. It is estimated in 2016 that there were approximately 2,000 cardiac surgeries undertaken in Nepal where there is complete lack of cardiac rehabilitation services available or delivered. National Institute for Healthy Life, Nepal is preparing to pilot test 12-week cardiac rehabilitation program in Kathmandu Nepal. It is envisaged to have it ready for implementation by the end of this year or early next year. Details of program implementation is currently being reviewed which will be updated as it comes to hand.

### **Conclusion:**

CR saves lives, improves quality of life of patients. A well designed and prepared CR service is so overdue in Nepal.

# Economic and societal benefits on investment and policy formulation in radiation oncology Federal Nepal

## ■ Dilli Banjade

*Center West Cancer Care Center, Orange Hospital*

Cancer claims about 8 million lives worldwide and about 5 million deaths in Low to Middle Income Countries (LMIC). Mortality rates from cancer are declining in high income countries (HIC) and are increasing in LMICs. Incidence of cancer will increase in Nepal with increased life expectancy and sedentary lifestyle choices.

More than 50% of cancer incidences are treated using radiation therapy making it one of the critical tools in cancer treatment. In developed country contest, Australia with a total population of 26 million has 197 Radiation Treatment Machines (LINAC). In contrast, Nepal with 30 million population has only four functioning LINACs and two old Cobalt machines and there is no cancer plan for federal Nepal to improve this statistic. Nepal has an urgent need toward policy changes to upgrade radiotherapy facility in Nepal.

Access to radiotherapy treatment has a significant improvement in quality of life of cancer patient and carries a positive return on investment. Benefits account for both a person's economic contribution to GDP through increased lifespan, quality of life and also the intrinsic societal value of a life-saving intervention.

The challenges for Nepal are the investment required to establish radiation treatment centers and supporting professional workforce. High end radiotherapy facilities will entice patients to seek treatment in Nepal rather than overseas, with the associated skill and workforce flow-on benefits to the wider population.

However, as a first step government of Nepal should have a policy framework towards dealing with radiotherapy treatment and associate facilities. Nepal has much to learn from Australia, which has a robust private public partnership (PPP) in radiotherapy treatment and a reliable framework on responsibility of federal and state governments. This enables PPP's to focus on big cities and allows state and federal governments to focus on regional and rural areas. There is an opportunity to invest in radiotherapy treatment in Nepal from philanthropy as well as investment opportunity. NRN can play a pivotal role in facilitating investment and provide professional training and support to help Nepal establish radiotherapy centers.

# Significance of screening for red cell antibodies to detect hemolytic disease of the fetus and newborn: A population study in the Nepal

■ **Fanindra Panta**

*BTS TT, NRN Academy, Sanquin Blood Supply Foundation, Ned*

## **Background:**

Hemolytic disease of the fetus and newborn (HDFN) is a severe disease, resulting from maternal red cell (RBC) alloantibodies directed against fetal RBCs. The implementation of a first-trimester antibody screening program for the timely detection of HDFN caused by antibodies other than anti-D has to be introduced in Nepal as the preventive measure in maternal-child health care.

## **Study design and Methods:**

Nationwide, 10,000 pregnant women shall be screened, in the pilot phase, for their consecutive pregnancies during 18 months to find out the possible alloantibodies other than anti-D, which can be detected by a first-trimester antibody screen, shall be included in a prospective index-cohort study. In a parallel-coverage validation study, patients with HDFN caused by antibodies other than anti-D, that were caused due to not implementing the screening program, shall be retrospectively identified.

## **Expected Results:**

To find out the % of prevalence of positive antibody screens at first-trimester screening is X number in 100,00; the prevalence of alloantibodies other than anti-D is Y number in 100,00, of which Z number of 100,00 implied a risk for occurrence of HDFN because the father carried the antigen. Overall, severe HDFN, requiring intrauterine or postnatal (exchange) transfusions, occurred in certain percent of fetuses at risk: for anti-K in X percent; anti-c in X percent; anti-E in X percent; Rh antibodies other than anti-c, anti-D, or anti-E in X percent; and for antibodies other than Rh antibodies or anti-K, in none of the fetuses at risk. All affected children, where antibodies are found, can be promptly treated and healthy at the age of 1 year. This study will show a sensitivity of the screening program of in percent percentage. The factors in missed cases and their caused can be found, the prevention by inducing antigen in pregnant women can be measured.

## **Summary/Conclusion:**

First trimester screening enables timely treatment of HDFN caused by antibodies other than anti D, however, with a sensitivity of certain percent. A second screening at Week 30 of c- women will enhance the screening program. Severe HDFN, caused by antibodies other than anti D, is associated with anti K, anti c, and to a lesser extent with other Rh alloantibodies.

## Status of assisted reproduction technology in Nepal

■ **Indira Tiwari**

*Grande city hospital, Kantipath, Kathmandu, Nepal; Creation and love Women Hospital Gwangju, South Korea*

Assisted reproduction is an established therapy for the treatment of infertility in a multitude of clinical conditions. Infertility is a common condition, affecting 10-15% of reproductive-age couple. It embraces a wide scope of techniques of which intrauterine insemination (IUI), in vitro fertilization (IVF) and intra-cytoplasmic sperm injection (ICSI) are most popular. Year 2003 marks the historic making the first In vitro fertilization technology been adopted in Nepal. Ever since the IVF has been initiated hundreds of couples had benefited from this technology. A number of study shows infertility rate in both male and female partners had been increased drastically in recent years. However, decades after introduction of IVF technology not much progress has been done in terms of technology and team development and reproductive research in Nepal. This study shows the status of fertility rate, technology transfer and skilled expertise developed in the field of ART in Nepal.

## Status of assisted reproduction technology in Nepal

■ **Nisha Jha**

*Swansea, UK*

Drug abuse is a serious pandemic problem affecting all countries including Nepal. Both urban and sub-urban areas of Nepal are badly affected which essentially is a result of easy availability of these harmful substances. It is for this reason many families and the life of adolescents of these areas of Nepal are highly affected and endangered due to the abuse of alcohol, tobacco, marijuana and other pharmaceutical drugs.

The most encouraging and effective strategies for the prevention of alcohol and other drug problems is certainly one of the ways in which drug abuse can be dealt with clearly defined preventative programmes incorporating families, schools and the community participation are not to be ignored. Media – especially the entertainment channel should be banned from glorifying drug abuse. It is important that the vulnerable group are made to understand that drug usage itself is harmful and only then they will stop using them and also prevent other vulnerable people in their peer group from same mistake. o ignored

# Medical education in Nepal: way ahead

■ **Sheetal Bhandari and Kedar Baral**

*Patan Academy of Health Sciences*

## Access to equitable health services in federal Nepal

■ **Jay N Shah**

*patan hospital, patan academy of health sciences, kathmandu, nepal*

Nepal has made progress in health and education with improved life expectancy. Yet, the human development index (HDI) still stands at bottom 144th position among 188 countries (2017). The HDI including “life expectancy, mean years of schooling and gross national income (GNI)-per capita”, widely varies across the region and population of Nepal. One fourth of population (25.16%) among 28.6 million (central bureau of statistics 2016) lives below poverty. The GNI per capita of Nepal at 2,250 purchasing power parity (PPP) US\$ in comparison to the two bordering neighbors, India 6,490 PPP \$ and China 15,500 \$ (2016) speaks clearly.

The universal health coverage is limited to political slogan in Nepal. Three decades ago, the unheard of private for profit hospitals got mushrooming after new national health policy in 1991. The number of government hospitals have remained static, giving opportunities to private enterprises, mostly situated in urban areas. Only 10% of full time doctors are employed by Nepal government of those registered with Nepal Medical Council. This is disregard to equitable service of democratic federal system of recent Nepal. Interestingly, the province-2 in Terai region with abundance of agriculture land has similar HDI to province-6 in the mountain; putting ‘dhanusha, siraha, saptari, sarlahi,..’ districts in same HDI as “jumla, dolpa, jumla, rukum,”. The “science based fragmented policy” that serves “science” in disregard to society needs modification with “socially accountable” system. Policies have failed to include ‘essential surgeries and safe anesthesia’ as public health service, more so in rural marginalized populations. The ‘insufficient, inequitable distributions’ of resources and ‘out of pocket’ payment for health is a burden to the average Nepali.

The capital of province-2, ‘Jnanakpur’ serves 5 mil population of adjoining districts, but has only one poorly functional zonal hospital with, no regular (senior) surgeons, except ob/gyn and the situation is not better in 18 plus private hospitals and a medical college. There is need to map out functional hospital beds, operation theatres, types and number of services provided. Its possible with cooperation and teaming from academia, society and national international support, like NRN. Without health there is no human rights.

# Health education and system: Lessons from Europe

■ **Malakh Lal Shrestha**

*Hannover Medical University (Medizinische Hochschule Hannover) Germany*

In the past three decades, Nepal has seen many changes. We have learnt from the experiences of other countries, including European. Politically, it has moved from an active monarchical system, first to a British West-minister style parliamentary democracy and finally to a republican federal democracy. Although Nepal has made impressive progress in many areas including the Health sector, it still lags far behind compared not only to the industrialized countries but also Asian Countries. On the positive side, the new Nepalese Constitution has recognized health as a basic human right. But on the working level, achieving this goal is going to be a big challenge. As in the political system, Nepal should look at the experiences of other countries, including the European ones.

**Experience of European countries in Health sector:** It is universally accepted that the health system in northern European countries are the best in the world. These countries have been able to offer universal health care to the whole population at a reasonable cost to the economy. Most of these countries spend approx. 12 % of the GDP on health sector. The most importantly they have been able to maintain this by means of sustainable financing mechanism. They have put both health and education under the authority of the state.

**The German system:** Germany has a unique universal health care system, which was started first by Chancellor Bismarck more than a hundred years ago. Every resident of Germany (both citizens and residents) pay about 15% of their pre-tax income as health insurance. This amount is shared split equally between the employee and the employer. This means that the employer pays about 7.5% of their income for health insurance. This insurance scheme covers all the health related costs to the last cent. Even transplantations are totally covered. Moreover, all the non- working spouses and under age children are automatically included in this insurance. This follows the philosophy of “social sharing”. As everyone pays the same 15% of their pre-tax income, people earning more pay a larger amount than those earning less.

**The British system:** After the end of the second world war, the NHS system was established. In the British system, the NHS is financed through the national Budget. Therefore, the tax payers indirectly finance this system.

**Health Education:** Education has been kept under the authority of the state. Germany has a universal free education system which is financed by the tax payers money.

**Lessons for Nepal:** Nepal could learn from these systems. We have to understand that nothing comes free and at the end of the day someone has to pay for this. We have to establish a national health insurance system so that the “basic human right” incorporated in our constitution does not remain on paper. Europeans have shown that quality education system is possible also when the state delivers it. It is not necessary to “Privatise” everything.

# Alzheimer's disease patients with depression: Rivastigmine and citalopram

■ **Krishna Prasad Pathak and Tara Gaire**

*Alzheimer's Related Dementia Society (ARDES-Nepal)*

*Department of Neurology Aristotle University of Thessaloniki, Innovation health science college, Kathmandu*

**Introduction :** Pharmacological treatments for AD and depression in AD are few and of limited efficacy, serving mostly to delay progression and not to cure the disease.

**Methods :** A longitudinal clinical study applied rivastigmine 9,5mg/patch and citalopram 20-40 mg/day over 48 months.

**Results :** Four years after the baseline assessment, there were no significant differences in MMSE between patients treated with rivastigmine alone or combined rivastigmine with citalopram with or without depression ( $p>0.05$ ).

**Conclusion :** The results indicate that there is no better effect of the combination of rivastigmine and citalopram than rivastigmine alone.



## Symposium 7: Hydropower, Transportation and Utilities

**14 October 2018, Time: 13:50-18:10, Megha Hall**

*Coordinators:*

*Dr Arun Timalsina, IOE, Tribhuvan University, Nepal*

*Mr Naresh Koirala, Nepal Library Foundation, Canada*

Availability of quality physical infrastructure is at the heart of a country's economic growth. Cognizant of this, the Government of Nepal (GoN) has prioritized construction of major infrastructure projects as a part of its economic development plan. The history of completion of the GoN's so called "mega projects" or "prestige projects" has been extremely disappointing. The projects are almost invariably mired in contractual disputes. Huge delays and cost overruns have become the norm. Improvement in the performance of future projects will require understanding the causes for these mishaps, developing corrective actions and enforcing them. This symposium will explore GoN's existing policies and technical capacities, which have contributed to the difficulties and recommend policy changes and technical capacity building modalities moving forward.

### **Focus:**

Infrastructure & GoN Policies; Project delays; Policy and technical capacity impediments, Corrective actions.

### **Background:**

A rapid development of the physical infrastructure is essential for economic development of the country. Previous attempts to expand Nepal's physical infrastructure have generally failed to meet project delivery targets, thus costing the nation billions of rupees in lost revenue and more importantly, raising serious doubts on our ability to plan, design, manage and construct such projects to standards considered normal by the rest of the world.

The current government has set ambitious targets for infrastructure development, particularly hydropower and transportation (airports, roads and railways,

utilities). The purpose of the Infrastructure session is to collaboratively and systematically review the reasons for past mishaps by way of open discussions between Nepal's resident experts in specific infrastructure fields, NRNs who have established reputation as experts with input from non-Nepali international experts in relevant disciplines so that future projects also do not end in disappointment.

Infrastructure is a large field on its own and every aspect of infrastructure cannot be covered in a session like this. Our discussion will be limited to three major areas of infrastructure prioritized by the government- Railway, Hydropower, Airport and Utilities. The session will start with a Keynote speaker who will, using a Case Study as an example, identify policy changes and technical capacity building that were completed to successfully deliver a large infrastructure project. The Keynote speech will be followed by presentations on each discipline identified above from an experienced resident Nepali expert and a NRN. The Utilities session will include a presentation on installation of water/ sewer pipes and electrical and telephone cables by a trenchless method. Had this method been adopted, Kathmandu would have been saved from much of the dust that enveloped the city during the recent pipe installation works. This will also be relevant for burying the electrical and telephone cables without excavating Kathmandu's roads.

We will endeavour to have at least two speakers on each discipline, except for the Utilities section. Each presentation will be of 25-minute duration. The presentation in each discipline will be followed by a Q&A period in which session panellists and the audience from the floor will participate. A rapporteur will keep record of the discussions and summarize them including the recommendations at the end of the session. The session shall conclude with a series of recommendations on policy changes and changes project procurement and management modalities so that future projects are completed to international standards and Nepal's capacity in infrastructure project delivery is enhanced.

### **Themes:**

In line with the objectives of the Convention, this section of the Symposium will focus on the following.

1. Identify existing GoN policies and inadequacies in the countries Technical Capacity, which hinder GoN's objective of large infrastructure project delivery to acceptable international standards. In this context Technical Capacity shall mean all aspects of the works from project planning to project delivery.
2. Recommend changes in policies and modalities for expeditious enhancement of Technical Capacity.
3. Identify diaspora resource to assist GoN in Technical Capacity building.
4. Develop post-convention plan of action for collaboration between NRNA and GoN in advancing infrastructure project delivery.

## PROGRAM

<b>Symposium 7: Hydropower, Transportation and Utilities</b>				
<b>14 October 2018, 13:50-18:10, Megha Hall</b>				
<b>Session A: Hydropower and Utilities, Moderator: Naresh Koirala</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
13:50-14:00		Naresh Koirala, Mr	Introduction of session	Trenchless Consultant; NoDigSolutions; BC, Canada
14:00-14:25	Invited	Dipak Gyawali, Prof	Political economy of infrastructure development in Nepal: Impeding drivers and relief pathways	Former Minister of Water Resources, GoN; Nepal Academy of Science and Technology; Chair, Interdisciplinary Analyst
14:25-14:50	Invited	Ram Manohar Shrestha, Prof	Hydropower development in Nepal: Opportunities, present pattern, challenges and policies	Professor Emeritus, Asian Institute of Technology, Bangkok, Thailand
14:50-15:15	Contributed	Naresh Koirala, Mr	Application of trenchless technology for installation of pipes and conduits	Trenchless Consultant; NoDigSolutions; BC, Canada
15:15-15:20	Rapid Fire	Rabin Dhakal, Mr	Prospects of off grid energy generation through low head screw turbine in Nepal, Kathmandu University, Tribhuvan University	Kathmandu University/Tribhuvan University
15:20-15:30	Q&A			
15:30-16:00	Tea break			

<b>Session B: Transportation and Infrastructure, Moderator: Naresh Koirala</b>				
16:00-16:05		Naresh Koirala, Mr	Introduction of session	Trenchless Consultant; NoDigSolutions; BC, Canada
16:05-16:35	Invited	Som Dutt Sharma, Mr	Delhi metro: a success story	Director, Business Development Delhi Metro
16:35-16:55	Invited	Birendra Bahadur Deoja, Mr	Infrastructure for accelerated development	Former Secretary Civil Aviation; Infrastructure Consultant
16:55-17:02	Rapid Fire	Partha Parajuli, Dr	Smart Traffic lights for smart cities of Kathmandu Valley	Sustainable transport and Traffic Solutions Australia
17:02-17:09	Rapid Fire	Madhu Sudan Acharya, Dr	Sustainable public transportation for Kathmandu a model from Vienna, Austria	University of Natural Resources and Life Sciences, Vienna, Austria
17:09-17:16	Rapid Fire	Tharka Sen, Mr	Transport and traffic: Road safety	Gurkha School of Motoring, UK
17:16-18:00	Panel discussion/Q &A	Keshab Kumar Sharma, Er		Joint Secretary, Ministry of Physical Infrastructure and Transport
		Prakash Bhakta Upadhyaya, Er		Former Spokesperson, Department of Railways
		Sushil Bhatta, Er		Member, National Planning Commission
		Tulasi Prasad Sitaula, Mr		National Coordinator, Office of the Millennium Challenge Nepal
18:00-18:10	Summary	Naresh Koirala, Mr		Trenchless Consultant; NoDigSolutions; BC, Canada
	Poster	Narad Bhandari, Mr	Role of effective project engineering and assurance process for railway infrastructure projects	Network Rail, London, UK
19:10	Dinner			

# Political economy of infrastructure development in Nepal: Impeding drivers and relief pathways

## ■ Dipak Gyawali

*Former Minister of Water Resources, GoN; Nepal Academy of Science and Technology; Chair, Interdisciplinary Analysis*

Nepal's public utilities present us with a paradox: despite being endowed with supposedly rich water and hydropower resources and cheap labour, its per unit infrastructure development cost is among the world's highest. Once one excludes the often-mentioned untenable excuses such as lack of technical manpower, lack of finance etc., one is able to focus on other primary drivers such as severe lack of a nexus approach (alternatively, debilitating silo-fication as demonstrated by Kulekhani-1), excessive rent-seeking behaviour, expensive political representation processes, questionable donor conditionalities etc. which contribute to this anomaly. Using examples from hydropower, water supply, transport and other sectors, this presentation will tease out the root causes behind poor infrastructure development in Nepal and the primary tasks of political visioning and subsequent institutional reforms that need to be fulfilled for taking the country's economy out of this entrapment.

# Hydropower development in Nepal: Opportunities, present pattern, challenges and policies

■ **Ram Manohar Shrestha**

*Asian Institute of Technology, Bangkok, Thailand*

Policy makers, hydropower developers and people at large in Nepal seem to have several misunderstandings about the hydropower resource of the country. Despite the existence of relatively abundant hydropower potential, there is a growing concern about the cost competitiveness of the hydropower in Nepal as an energy resource. This presentation will first discuss some of the misunderstandings about the hydropower resource in the country. There also seems to be inadequate understanding about the future demand for electricity in the country and the economically most efficient way of meeting the demand. The presentation will therefore focus on the future demand for electricity under different economic growth scenarios as well as the role of hydropower and its investment requirements. Further it will assess the consistency of government targets for hydropower development from these perspectives. The presentation will then review relevant government laws and policies as well as the present system of hydropower planning and development in the country. Besides, it will share major lessons to be learned from recent experiences in the development/implementation of some major hydropower projects and the role of hydropower governance.

The presentation will also highlight the emerging opportunities for developing hydropower for cross-border trade as well as the associated challenges ahead.

# Application of trenchless technology for installation of pipes and conduits

## ■ Naresh Koirala

*Trenchless Consultant; NoDigSolutions; BC, Canada*

The rising public demand for safe construction with minimal carbon footprint and traffic disruption has made the application of Trenchless Technology for installing utility pipes in urban areas all over the world increasingly popular. Trenchless technology is used both to install new pipes and to rehabilitate/replace aging pipes. It has also been found to be the only technique suitable for installing river crossings in areas of high seismic zones, such as Vancouver, Canada. Kathmandu's traffic disruption and horrendous air pollution during the recent so called "Melamchi Pipe" installation could have been substantially reduced if, along suitable pipe alignment sections, Trenchless methods had been used as an alternative to the conventional open cut installation and if the open cut construction had followed minimum acceptable construction standards.

Kathmandu's municipalities and Utility agencies (telephone companies and Nepal Electricity Authorities) are presently considering burying the existing jumbled forest of overhead telephone and power lines. If these installations are carried out by the conventional method, Kathmandu will go through another phase of road excavation with significant adverse impact on air quality and further worsening of already horrendous traffic jams. Kathmandu's dream of relief from deteriorating air quality and of roads where traffic actually moves will remain elusive for a long time.

This paper will describe various types of trenchless technology and their application to rehabilitate old pipe and install large diameter pipes, electrical and telephone conduits. The focus will be on Horizontal Directional Drilling and Pipe Jacking- two of the most common trenchless methods for new installations. Several case histories of installation of utilities with these methods will be presented. Trenchless technology cannot completely replace open cut method. Much of the dust bowl created by the Melamchi pipe construction could have been avoided by a better quality construction. Some comments on quality of construction will be made and examples of good quality construction presented. Emphasis will be on learning lessons from the past and moving ahead.

# Prospects of off grid energy generation through low head screw turbine in Nepal

■ **Rabin Dhakal**

*Kathmandu University/Tribhuvan University*

Micro hydro power plants installed in Nepal are characterized with medium and high head, which are mainly available in Hilly region for off-grid energy generation. But the development of this kinds of system is very low due to difficulty in construction of civil components in the geographical structure. So this study focus on the prospects of the installation of a low head hydropower system i.e Arcemidian Screw Turbine which need very less civil construction works and has very low head requirement and medium to high discharge condition. In this study we show the comparative study of the various cost component of different micro hydropower system with Arcemidian Screw Turbine. In addition we also study the economic evaluation of integration of this system into existing water infrastructure. Three types of existing water infrastructure are considered applicable for hydropower integration: irrigation canals, reservoirs and weirs. The theoretical designs for the civil works for the low-head Arcemidian Screw Turbine integrated into these structures are given and the costs of construction are estimated. A scalable system is also designed and integrated in a existing irrigation canal for the technical performance evaluation and validate the theoretical economical study. The study concludes that the performance of turbine is mostly suitable for rural electrification and to integrate in cost effective Way, the civil works and installation cost should be greatly reduced.

# Delhi Metro: A success story

■ **Som Dutt Sharma**

*Business Development Delhi Metro*

Delhi has experienced phenomenal growth in population in the last few decades. Its population increased from 1.47 million in 1951 to 13.7 million in 2001 and 16.3 million in 2011. City has also spread physically to distant borders in all directions. The number of vehicles has spiraled physically increasing from a little more than half a million in 1991 to 7.2 million in 2011. Ideally, Delhi should have the metro network of about 400 kms on date. Planning of metro at Delhi was started as early as 1969-70 when Central Road Research Institute mooted a proposal of mass rapid transit system network for the city. Subsequently, number of proposals of Mass Rapid Transit System for Delhi City was made but none finalised. In 1984, Master Plan of Delhi 2001 recommended a multi model transport system comprising of 200 km of light rail transit system, 10 km of tramway, an extension to surface rail system and extensive road network. A major threshold was however achieved only in 1990 by preparing the feasibility report of integrated multi model mass rapid transport system for Delhi. In 1991, Government of National Capital Territory of Delhi commissioned M/s RITES to prepare the Detailed Project Report and tender documents for the first phase of the project. The proposed modified first phase of Delhi Mass Rapid Transit System was finalized with its length of 55.3 km. Target for commissioning entire phase-1 of 55.3 kms was set as March 2005. However, adherence of target dates depended on finalization of funds and investment decisions by March, 1996. A decision to set up a company was taken for the implementation of MRTS project, with its Chairman and 5 full time Directors including MD. The company was registered on 3.5.1995 under the Company Act. This company was to have equal equity participation by the Central Government and the Government of Delhi. This was the unique structure of a Public Sector Undertaking Company first time in India. This was one of the landmark decision to have a company with 50:50 share of two Governments so as to vest no full powers in to either of the two Governments and with full power to Board of Directors.

Main factor of success of Delhi Metro are as under:

- (a) Political will to implement the project;
- (b) Technocrat Leading the company with accountability and responsibility;
- (c) Unique structure of Delhi Metro Rail Corporation as a company;
- (d) Public support;
- (e) Least disturbance to Road traffic with excellent traffic diversion plans;
- (f) Alignment of metro was planned so as to affect minimum private properties.
- (g) Firming up of funding plan and sources to fund the entire cost of the project;
- (h) Judiciary support.;
- (i) Fast and on the spot decisions;
- (j) Full Support by all the Urban Local bodies
- (k) Belief in three pillars of strength namely, knowledge, integrity and Punctuality

With the strength and support as above, a dream was revisited on 25.12.2002 with the commissioning of first section of metro with its length of 8.3 km between Shahdara and Tis Hazari by the then Hon'ble Prime Minister of India Shri Atal Behari Vajpayee. Subsequently, DMRC completed balance of phase-I and Phase-II of metro network with the details as under-

- Phase-I – 65 kms. Cost US \$ 2.5 billion. Completed in 7 years and 3 months (2 years & 9 months ahead of schedule). Phase-I was completed by September 2005.
- Phase-II – 125 kms. Cost US \$ 4.3 billion. Though double the length, completed in half the period taken for Phase-I, and five months ahead of schedule. Phase-II was completed by October 2010

Both the Phases were completed without cost over runs. Implementation of Phase -III was also started in February 2011 and 106 Km is already commissioned with the total network on date as 296 Kms. Balance 82 Kms of Phase - III is under advance stage of implementation and likely to be commissioned by the December 2018. The Total cost of Phase III will be 7.8 billion US \$. Delhi Metro proposal for implementation of 104 km of metro network in Phase- IV with its completion date as March, 2023 is under active consideration of the Government. Today, Delhi Metro network is one of the fastest developing networks in the world except China.

In the end, I can only quote a proverb. "Where there is a Will, there is a Way"

# Infrastructure for accelerated development

## ■ Birendra Bahadur Deoja

*Former Secretary Civil Aviation; Infrastructure Consultant*

Over the 14 national development plans, covering a 62 year period from 1956 to 2018, life expectancy in Nepal rose from 34 years to 69 years. The country's literacy rate increased from about one percent to 89 per cent; per capita GDP from about \$46 to about \$866. Although overall, the numbers look impressive; the rate of development is inimical compared to that of other countries in the region. Nepal remains one of the world's least developed countries. This is primarily because the government has consistently failed to deliver large infrastructure projects in time and under budget. If Nepal's development pace is to match with that of other countries and meet people's development aspirations, there is no substitute to an accelerated economic development. Accelerated development will require effective and efficient transport infrastructure. This paper highlights the background and importance of visionary and high income-growth highways/expressway and international hub airport for Nepal; identifies existing policy impediments in planning, design and implementation of large infrastructure projects. It also discusses public private partnership mechanisms for the delivery of such infrastructures.

# Smart traffic lights for smart cities of Kathmandu Valley

■ **Partha Parajuli**

*Sustainable Transport and Traffic Solutions Australia*

Kathmandu Valley is experiencing an unprecedented growth in both the population and number of motorised vehicles in recent years. Data have shown that in 2000/1, number of registered vehicles was 24,003 and by 2015/16 it has increased to 779,822, an increment by more than 32 times in the last one and a half decade. This has contributed to significant increase in congestion resulting in exponential growth in tail pipe emissions. Kathmandu is now ranked one of the most polluted cities in the world. It is suffering from a potentially serious human health burden from air pollution. By 2030 annual premature deaths in Nepal, due to outdoor air pollution, are expected to be 24,000. Ambient air pollution killed a staggering 9,943 people in Nepal in 2012, shows the WHO data. As many as 36 people out of every 100,000 die in Nepal due to various deadly diseases linked to air pollution. World Health Organization (WHO) also estimates a fatal crash rate of over 17 deaths per 100,000 population for Nepal. The rate of 7 deaths per 100,000 of population derived from the official police records is much lower than WHO figures. Kathmandu Valley absorbs significant proportion of these tail pipe emission related and road use related deaths because of congestion, unsafe driving and poor state of infrastructure including absence of traffic lights to control traffic. This suggests that there is an urgent need for the development and implementation of measures that aims to manage traffic better and curb air pollution in the Valley. Deaths resulting from increased tail pipe emissions from congested traffic and from road crashes can be tackled head on if traffic can be managed better by implementing smart traffic lights in the streets of Kathmandu Valley. The collaborative knowledge and technology transfer project on Smart Traffic Lights for Smart Cities of Kathmandu Valley supports the delivery of better road safety outcomes in Nepal. Recently signed MOUs with MOPIT and NEA by NRNA for collaboration provides robust framework for the delivery of this Project as proposed in this Paper.

# Role of effective project engineering and assurance process for railway infrastructure projects

■ **Narad Bhandari**

*Network Rail, London, UK*

One of the major constituents of engineering failure is quality of design and construction activities due to lack of effective project engineering and assurance process in place. Through a good Engineering Management of Projects (EMP) and Engineering Assurance Process (EAP) a project or product can be delivered effectively and efficiently to relevant standards and governance, reduces project and safety risks, meets the requirements, and optimises the balance between quality, time and cost. This paper focuses on the role of effective EMP and EAP and an Integrated Engineering Life Cycle (iELC) tool, which has recently been developed for conducting EAP for Railway infrastructure projects to improve quality of design and construction activities. The iELC intends to enable more successful delivery projects by ensuring completion of the right engineering activities, assurance and control approach for engineering activities. This approach provides a better relationship between Project Management and Engineering activities in managing engineering processes. The EMP, EAP and iELC process and activities can be tailored to suit to any engineering industries and implemented the similar system and process effectively. Most of the major Infrastructure Projects in Nepal primarily depend on foreign or private investors. The design and construction of these projects are carried out mainly by their own “Design and Build” contractors or selective consultants or contractors. The Government of Nepal (GoN) and its sister organisations do not have full visibility of what Engineering Assurance activities are undertaken by them. This may lead to engineering disasters if compromise in engineering activities were taken by them and leaving insufficient capability in maintaining and operating the infrastructure by the GoN or its sister organisations in long term. The Railway Infrastructure consists of very complex and multidisciplinary infrastructures and sub-systems with many constraints and limitations. Therefore, the structure of Project Engineering and Assurance Team, Review and Acceptance process discussed in this paper and iELC-like tool can be implemented for any Railway Infrastructure development in Nepal to minimise projects risks during design, construction, operation and maintenance. The conceptual methodology of project engineering process explored in this paper can also be implemented in other engineering infrastructure development of Nepal.

# Sustainable public transportation for Kathmandu: A model from Vienna, Austria

■ **Madhu Sudan Acharya**

*University of Natural Resources and Life Sciences, Vienna, Austria*

Rapid urbanization, poor public transport facilities and management, rapid increase in mobility demand due to increasing economic and social activities within Kathmandu valley are some of key factors responsible for the poor urban mobility and congestions in Kathmandu. Due to lack of good public transport facilities, the number of two wheelers and ownership of private cars are increasing rapidly. In this context, this paper presents a sustainable public transport operation model used in Vienna, Austria which is very successful and easily implementable. A similar model may be applicable in Kathmandu. This paper outlines the background information of two cities and compares the existing situation of urban transportation and mobility. The paper highlights some of the key features of urban transportation model used in Vienna and suggest different options for Kathmandu. An appropriate public transport model for Kathmandu is also presented in the paper. Finally some interventions are recommended for concerned authorities for the implementation of the proposed public transportation model for Kathmandu Valley.

# Transport and traffic: Road safety

■ **Tharka Sen**

*Gurkha School of Motoring, UK*

Without safer, better, healthier, quicker, convenience, cheaper, sustainable and enjoyable transport systems, any country cannot move forward in any development. Transport and traffic education to its users is most important to prevent any accidents, any jams, any pollution, anywhere & any time. As a Road transports is Nepal's mostly availability, affordability & reliability to handle tourism, investment, finance, education, health & agriculture but so far, Nepali transport systems are in painful situation that it is so dangerous, dirty, dusty, dark, aggressive, offensive & slow compare to UK/Europe. Every day, on Nepali road in average 7 people dies, 45 injures and loss of billions of rupees which is extra unnecessary burden to surviving family. The result of bad transportation systems, loosing valuable tourist, investor has no confident to invest, creating many types of health hazards by pollution and injury, noise pollution making disturb for education institutions, delivery of agriculture products is too slow means lost value. So we need to make transportation systems safer, better, healthier, quicker, cheaper, convenience and enjoyable for every by 2020 Nepal.

There are 6 pillars of road safety and traffic education which we had researched in about 70 countries, wrote materials for teaching, learning, testing, trial, refreshment, reward and enforcement which systems can be like UK/Europe's level. We have prepared about 7000 pages of documents for safe transportation and traffic education, under NRNA skill, knowledge & technology transfer to mother land Nepal. How it works

# Symposium 8: New Frontiers in Physical Sciences and Prosperity

13 October 2018, 16:00 – 18:10, Malshree Hall



*Coordinators :*

*Dr Hari Dahal, American Physical Society, USA*

*Prof Narayan Adhikari, Central Department of Physics, Tribhuvan University, Nepal*

Without putting serious efforts into advancement of Science Education, Research and Innovation, Nepal's technology-based future cannot be secured. This symposium will focus on how best to utilize Diaspora's diverse expertise pool to overcome the knowledge, and science & technology policy gaps that are currently hindering national prosperity.

## **Focus:**

Physical Sciences & GoN Policies, Knowledge Sharing, Networking & Research Collaboration, Scholarship & Experts Exchanges.

## **Background:**

Various universities offer Physical Science (PS) education in Nepal. There are thousands of Undergraduates, Bachelor's and Master's Degree holders, hundreds of PhD scholars, and many dozens are carrying out PhD research. The interest in all levels of PS education is growing every year. Unfortunately, the methods of teaching and research followed in Nepal are not keeping pace with the approach taken by developed countries. To improve the skills of Nepali experts, we have to upgrade and update our ways of teaching and doing research. Without the advancement in new frontiers of physical sciences, knowledge-based economy and sustainable prosperity is difficult to achieve.

There is a huge potential to develop PS education in Nepal. Nepalese graduates have shown commendable performances and competitive edge in both PS education and research globally, once they are provided with right platform and opportunities. It is now time for us to start creating similar opportunities, and education and research environment in Nepal. It requires revamping Government of Nepal's (GoN) science education, research and technology development policies. It is indubitable that the Nepali Diaspora residing around the globe can play a unique and important role. NRN Diaspora should be an active partner of GoN for achieving

future modernization of Nepal's physical science environment. We plan to organize a symposium on New Frontiers in Physical Sciences to explore and help address Nepal's need in this direction.

**Themes:**

In line with the objectives of the First NRN Global Knowledge Convention, this symposium will focus on the following themes.

1. Inadequacies of GoN's policies pertaining to science education, research and technology development
2. Policy gaps in inviting and encouraging Diaspora knowledge and expertise investment in Nepal for the long-term development of science and technology
3. Physical sciences' current state-of-the-art in Nepal, and knowledge and infrastructure gap compared to where the nation aspires to be
4. Diaspora resources pool in physical sciences and ways to address Nepal's need through networking, knowledge sharing, research collaborations, training, experts exchanges, scholarships, and infrastructure development
5. Diaspora role in helping physical science research transition into industrial application

<b>Symposium 8: New Frontiers in Physical Sciences and Prosperity</b>				
<b>13 October 2018, 16:00-18:10, Malshree Hall</b>				
<b>Session Chair: Prof Dr Tirtha Raj Khaniya, Moderetor: Prof Narayan Adhikari</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
16:00-16:25	Invited	Fernando Quevedo, Prof	Development of fundamental science: way to reduce brain drain in developing countries like Nepal	Director, International Center For Theoretical Physics, Italy
16:25-16:45	Invited	Bhadra Man Tuladhar, Prof	Science, technology and development	Kathmandu University, Nepal
16:45-17:00	Contributed	Bishal Sitoula, Prof	Need for personal transformation in changing Nepal	Norwegian University of Life Science, Norway
17:00-17:10	Contributed	Tara Sigdel, Dr	Harnessing expertise from diaspora and "Big Data" resources in biomedicine for training youth in Nepal	University of California, San Francisco, USA
17:10-17:20	Contributed	Dhaka Ram Bhandari, Dr	Biodiversity, bioresources and development	Justus Liebig University Giessen, Germany
17:20-17:25	Rapid Fire	Madhav Prasad Ghimire, Manuel Richter	Chemical gating of a weak topological insulator	IFW-Dresden, Germany, & Central Department of Physics, Tribhuvan University, Kirtipur, Nepal
17:25-17:30	Rapid Fire	Nashir Ahamad, Mr	Simulation of electric field distribution using COSMOL multiphysics	Indian Institute of Technology, Kanpur, India
17:30-17:35	Rapid Fire	Deependra Parajuli	Entrepreneurship course for scientists and engineers	Department of Physics, College of Science & Technology, Andhra University, Visakhapatnam, India
17:35-18:00	Panel Discussion	Suresh Raj Sharma, Prof		Founding Vice Chancellor, Kathmandu University, Nepal
		Pradeep Pradhan, Prof		Tribhuvan University, Nepal
		Lalu Poudel, Prof		Central Department of Geology, Tribhuvan University, Nepal
		Rajani Malla, Prof		Central Department Of Biotechnology, Tribhuvan University, Kirtipur, Nepal
18:00-18:10	Summary	Tirtha Raj Khaniya, Prof		Vice Chancellor, Tribhuvan University, Nepal
	Poster	Bhojraj Bhandari	An experimental study on phase transition behavior of $(\text{Ba}_{1-x}\text{Mg}_x)\text{TiO}_3$ ( $x= 0.04$ & $0.08$ ) ceramics	Department of Physics, GoldenGate International College; Institute of Engineering, Pulchowk
	Poster	Deepak Pandey	Transport properties of valine in water at different temperatures	Central Department of Physics, Tribhuvan University
	Poster	Deependra Parajuli	Investigations on Mxene as topological insulator	Department of Physics, College of Science & Technology, Andhra University, Visakhapatnam, India

	Poster	Deependra Parajuli	Status of material science, technology and electron microscopy in Nepal	Department of Physics, College of Science & Technology, Andhra University, Visakhapatnam, India
	Poster	Dinesh Kumar Yadav	Co-operative effects of electron-correlation and spin-orbit coupling in double Perovskites SrLaBB'O <sub>6</sub> (B=Ni, Fe; B'=Os, Ru)	Central Department of Physics, Tribhuvan University, Nepal & Condensed Matter Physics Research Center, Butwal, Nepal
	Poster	Mukunda K.C and Jeewan Jyoti Nakarmi	Theoretical study of magnetic field generation due to ponderomotive force in plasma	Department of Physics GoldenGate International College, Kathmandu, Nepal
	Poster	Nashir Ahamad	Advancing EDM through simulation of electric field distribution using different dielectric systems on COMSOL multiphysics software and reducing overcut between tool and workpiece	Indian Institute of Technology, Kanpur, India
	Poster	Nirmala Adhikari	Structural, electronic and magnetic properties of perovskites KTa <sub>1-x</sub> MnxO <sub>3</sub> ; (x = 0, 0.50, 0.67)	Central Department of Physics, Tribhuvan University
	Poster	Rajendra Prasad Koirala	Molecular interaction of O 6-methylguanine base of DNA with DNA repair protein AGT	Central Department of Physics, Tribhuvan University
	Poster	Saran Lamichhane	Molecular adsorption of CO and NO on Graphene/MoS <sub>2</sub> heterostructure	Central Department of Physics, Tribhuvan University
	Poster	Sashi Nepal	Effect of Cr doping on electronic and magnetic properties of inverse heusler alloy Mn <sub>2</sub> CoGa	Central Department of Physics, Tribhuvan University
	Poster	Shyam Prakash Khanal	Molecular dynamics study of diffusion of amoxicillin in water	Central Department of Physics, Tribhuvan University
19:10	Dinner			

# Development of fundamental science: Way to reduce brain drain in developing countries like Nepal

■ **Fernando Quevedo**

*International Center For Theoretical Physics, Italy*

## Science, technology and development

■ **Bhadra Man Tuladhar**

*Kathmandu University, Nepal*

This talk will reflect on the Four Industrial Revolutions that led to the development of the nations. The Technologies that played crucial role in these four steps of industrial revolution will be discussed. The Scientific backgrounds related to these technological advancements are established. The advancements in the various disciplines of Mathematics that pushed the science to these frontiers are illustrated

# Need for personal transformation in changing Nepal

■ **Bishal Sitoula**

*Norwegian University of Life Science*

The failure of humans and our institutions to come to grips with environmental change is increasing felt. This is true particularly in term of affectively and reflectively perceiving the real threat, and cognitively formulating a coherent and flexible response at the individual level. We have learned with many years of published work mainly through conformity or 3rd person experience that dramatic changes in land use have taken place in larger part of Africa, South Asia and other parts of the world, as a result of economic growth and increasing demand for production. Forestlands are converted into agricultural land and are intensified for food production. Our early studies in Nepal and India provide useful data to illustrate only the magnitude and mechanism of the problem but not the source of problem. We have learned a lot by asking how humans contribute to climate change, but we rarely ask why we leave a larger-than necessary carbon footprint. However, due to the urgency of emerging climate crises, incremental change in technology may not address the ecological problem at their source. There is a need for transformative change in our individual consumption behaviour and lifestyle that are linked to demand for choices of food that has an important implication for N fluxes and climate change. To address this better, one must first have reflective thinking on interdependence and the linkages between environmental problems deeply rooted in human wants/ greed and that is manifested in various forms such as biodiversity losses, climate change and land degradation. To address these problems at their source, we attempted to reflect and engage transformative/ contemplative approaches to address human desires and how they can be balanced using mindfulness, contemplative education and notice science of personal transformation. Using an auto ethnographical consciousness I will also illustrate examples of emerging science of Personal Transformation and its translation to education course curricula in universities in Nepal.

# Harnessing expertise from diaspora and “Big Data” resources in biomedicine for training youth in Nepal

■ **Tara Sigdel**

*University of California, San Francisco, USA*

## **Background:**

Recent access to education, communication, and technologies have contributed in training of thousands of Nepali professionals in biomedical fields in the US and other countries. These fields include molecular biology and biochemistry, immunology, cell biology, biotechnology, genetics, pharmacology and many others. This pool of expertise is working in equal footage with other international counterparts. This tremendous resource has remained mostly untapped in the benefit of Nepal. Most of the expertise remains isolated and a need of an organization was felt that would facilitate communication among the biomedical scientists across the globe and Nepali government (institutions). With spontaneous effort of individuals involved in the field, International Nepali Biomedical Society (INBS) was founded in 2006. INBS aims to provide a platform for all Nepali biomedical scientists, to foster an effective communication between nepali and foreign biomedical scientists, and to promote biomedical/biotechnology education and research in Nepal.

## **Objective:**

My presentation will highlight use of publicly available “big data” in health and medicine in training nepali youth. With rapid evolution of computational power and sophistication in genomic data generation, research in biomedical field has taken an unprecedented leap that could be utilized by Nepal. Such publicly available data available through NIH GEO database can be used in meta-analysis by nepali researchers without having to go abroad. Trained mentors from diaspora and Nepal could provide mentorship to nepali young generation to generate research papers that will be published in international reputed journals. This has two fundamental benefits. (1) This data could be used to provide preliminary data to apply for grant money from organizations such as NIH, Bill and Melinda Gates Foundation and Chan Zuckerberg Initiative (CZI). These grants will be used to train more nepali youth in biomedicine and research that will produce data that will further more research in nepal. (2) This initiative will revolutionize concept of research in Nepal and will boost morale of nepali scientists and nepali youth in that they will be able to publish in international high impact journals, present in international meetings and feel they are equally talented and productive

as the scientists in the first or second world. This is in particular very promising as both Bill and Melinda Gates Foundation and Chan Zuckerberg Initiative (CZI) are looking for opportunities to train scientists who are working on third world issues.

**Data:**

Sample data will be presented how a high school student as a summer intern was trained to carry out research in interrogating the role of proteases in kidney transplantation outcome. This will be discussed in the context of training university students in Nepal.

## Biodiversity, bioresources and development

■ **Dhaka Ram Bhandar, Amrit Poudel, Hari Prasad Devkota, Himal Luitel**

*Justus Liebig University Giessen, Germany, Korea Research Institute of Bioscience and Biotechnology, South Korea, Kumamoto University, Japan, Agriculture and forestry University, Nepal*

In the era of knowledge based economy, production, accumulation, transfer and application of knowledge are major factors for nation's development. For the economic prosperity of any country, utilization of its natural resources plays a key role. In the context of Nepal, the altitude variation from 50 m in the south to 8848 m in the north, and the heavy monsoon that varies from east to west contribute to large variation in the climatic conditions. This lead to high abundance of plants with potential medicinal uses. However, this potential has not been fully utilized due to the lack of research and development regarding their conservation, evidence based product development, an academic research body is of immediate need that will dedicated to the discovery and development of new herbal medicines, pharmaceutical, cosmeceutical, nutraceutical and agrochemical technologies based on the chemical diversity of living organisms such as plants, animals and microbes. Hence, an autonomous research center of a Nepalese university in collaboration with the Nepalese diaspora will be great opportunity to create a suitable arena for expansion of research and to develop science and technology. Such research institute can encourage and educate rural people for the cultivation and development of medicinal resources as an income-generating program. Additionally, the collaboration of the research center with academic institutions will help in the manpower development through academic programs to nurture postgraduate and PhD students. Finally, the collaboration with industries will help in the design and development of products that will uplift the economy of the country. In future, research institute can also work along with governmental institutions in policy making for proper utilization of these resources

# Chemical gating of a weak topological insulator

■ **Madhav Prasad Ghimire<sup>1</sup> and Manuel Richter<sup>2</sup>**

*1 IFW-Dresden, Germany & Central Department of Physics, Tribhuvan University, Kirtipur, Nepal and 2 IFW-Dresden, Germany*

In recent years weakly bonded layered systems have become important for the manufacturing of two-dimensional materials. Precise knowledge of the interlayer bonding allows to understand in detail the exfoliation process in these compounds. The compound  $\text{Bi}_{14}\text{Rh}_3\text{I}_9$  has recently been suggested as a weak three-dimensional topological insulator on the basis of angle-resolved photoemission and scanning-tunneling experiments in combination with density functional (DF) electronic structure calculations. These methods unanimously support the topological character of the headline compound, but a compelling confirmation could only be obtained by dedicated transport experiments. The latter, however, are biased by an intrinsic n-doping of the material's surface due to its polarity. Electronic reconstruction of the polar surface shifts the topological gap below the Fermi energy, which would also prevent any future device application. Here, we report the results of DF slab calculations for chemically gated and counter-doped surfaces of  $\text{Bi}_{14}\text{Rh}_3\text{I}_9$ . We demonstrate that both methods can be used to compensate the surface polarity without closing the electronic gap.

## Reference

M. P. Ghimire and M. Richter, *Nano Lett.* 2017, 17, 6363-6308. MPG thanks the Alexander von Humboldt Foundation for financial support through HERMES program.

# Simulation of electric field distribution using COSMOL multiphysics

■ **Nashir Ahamad**

*Indian Institute of Technology, Kanpur, India*

## **Topic:**

Advancing EDM Through Simulation of Electric Field Distribution Using Different Dielectric Systems on COMSOL Multiphysics Software and reducing overcut between tool and workpiece.

The Objective of the research is to get maximum electric field between tool and workpiece in Electric Discharge Machining (EDM) process using different dielectric systems and correlate with breakdown voltage, time required and gap between the tool and workpiece. EDM process is a thermoelectric, non-conventional which involves Multiphysics at multi time scales. The single discharge phenomena in EDM consist of solid, liquid, gas and plasma states confined within a micrometers region and occurs at a time scale of micro-nano seconds. When the electrode and workpiece are separated by a small gap filled with dielectric oil, deionized water or gas; the application of high voltage between these two electrodes (tool, workpiece) results in ionization of the dielectric fluid. This leads to forming of streamers which establish a plasma channel between the electrode and workpiece usually at a spot where the electrostatic potential is strongest, due to micro peaks, small metallic debris and micro-bubbles in the gap. Since, the EDM gap phenomena is very complicated and so the major focus is on advancement in the material removal rate (MRR) with low roughness in the workpiece. Simulation on COMSOL gives the better result of the electric field distribution in electrostatic module by varying supply voltage and the gap between tool and workpiece.

# Entrepreneurship course for scientists and engineers

■ **Deependra Parajuli**

*University of Natural Resources and Life Sciences, Vienna, Austria*

Department of Physics, College of Science & Technology, Andhra University, Visakhapatnam, India

Nepal was good in generating and exporting daily needed products before 1950 AD. Then after, it decreases exponentially due to several reasons. One of them is education system of Nepal. Despite of open economy system in Nepal, the current educational system for scientists and engineers is still traditional that directs the produced manpower into wage employment system after the accomplishment of their course. Instead, the manpower should have developed idea during his study to generate the effective products competing globally. For that, the contextual knowledge of Science, Technology, Innovation and entrepreneurship in students plays an important role. Every researcher should have knowledge of entrepreneurship before starting research work. This can be institutionalize through its proper syllabus in Curriculum. In this paper, a syllabus with 3 CH prepared as a report on, “Entrepreneurship for Scientist and Engineers from Developing Countries” ICTP-2009, Italy is presented. The main objectives of this course is to; understand the entrepreneur and its process, potential of scientists and engineers to contribute as entrepreneurs, identify the steps required to research the potential for a new venture opportunity, obtain sufficient financial literacy and knowledge to write a business plan, learn the “soft skills” required for success in a business environment and the resources available to budding entrepreneurs, the concept of Intellectual Property generation, protection and registration in USPTO, WIPO, EPO, JPO etc., turn an invention into a product, commercialization and marketing, technology transfer, publications, patent right and concepts of incubators which ultimately help for the Prosperous Nepal and Happy Nepalese. The course is expecting for the active participation of the students with several techniques of evaluation.

# An experimental study on phase transition behavior of $(\text{Ba}_{1-x}\text{Mg}_x)\text{TiO}_3$ ( $x=0.04$ & $0.08$ ) ceramics

■ **Bhojraj Bhandari 1 and Bhadra Prasad Pokharel 1, 2**

*1 Department of Physics GoldenGate International College, Kathmandu, Nepal*

*2 Department of Engineering Physics, Institute of Engineering, Pulchowk, Lalitpur, Nepal*

$(\text{Ba}_{1-x}\text{Mg}_x)\text{TiO}_3$  ( $x = 0.04$  and  $0.08$ ) (BMT) powders are synthesized using a dry route involving solid state thermo-chemical reaction in a mixture of  $\text{BaCO}_3$ ,  $\text{MgO}$  and  $\text{TiO}_2$ . The powders were calcined at temperature  $1000^\circ\text{C}$  and are compacted to pellets using hydraulic press. The samples are then sintered at temperature  $1325^\circ\text{C}$  to achieve above 96% of theoretical density. The structure of samples as obtained by XRD is tetragonal. It is observed that BMT samples reveals dielectric anomaly around  $90^\circ\text{C}$  and  $86^\circ\text{C}$  for BMT04 and BMT08 respectively, which are the transition temperature from ferroelectric to paraelectric phase during heating mode at frequency 100 KHz. The peak values of dielectric data in cooling mode are higher than heating mode, which gives the thermal hysteresis of  $2^\circ\text{C}$  and  $1^\circ\text{C}$  for these samples respectively. In BMT04, the decrease in thermal hysteresis with concentration of  $\text{Mg}^{2+}$  indicates the phase transition towards diffuse phase or relaxor. The peak temperature of dielectric data is constant with frequency, which confirms that samples may be regular phase transition. The real part of dielectric data decrease with increase of frequency. The Curie temperature obtained from Curie-Weiss behaviour for BMT are lower than the transition temperature, confirming the transition is first order type. Decrease of activation energy studied on the basis of resistance of BMT samples also confirms the phase transition behaviour changing from FE tetragonal towards PE cubic phase transition with increase of  $\text{Mg}^{2+}$  contents.

**Keywords:** Phase transitions, thermal hysteresis, resistivity, dielectric property

# Transport properties of valine in water at different temperatures

■ **Deepak Pandey and N. P. Adhikari**

*Central Department of Physics, Tribhuvan University, Kirtipur, Kathmandu, Nepal*

Molecular Dynamics simulations of Valine in water and their binary mixtures ( $N_V = 0.003$  &  $N_{\text{water}} = 0.997$ ,  $N$  representing the mole fraction) have been accomplished at temperatures 293.20 K, 303.20 K, 313.20 K, 323.20 K, and 333.20 K using the OPLS/AA force field parameters. The work has been carried out by using GROMACS. The OW-OW, H19-OW, N6-OW and C1/C3-OW radial distribution functions (RDFs) have been estimated. Co-ordination numbers are also determined by the self-coded FORTRAN. The self-diffusion coefficients of Valine and water have been determined by means of mean-square displacement (MSD) using Einstein's relation. The mutual diffusion coefficients of the binary mixtures have been determined using Darken's relation. The values of the diffusion coefficients have been found to agree with the experimental results within 8.54 %. The temperature dependence of the diffusion coefficients have been analyzed and the analysis showed that they follow Arrhenius behavior. Energy estimated from Arrhenius plot agrees with experimental data within 13.04 % for water and 5.34 % for system.

# Investigations on Mxene as topological insulator

■ **Deependra Parajuli**

*Department of Physics, College of Science & Technology, Andhra University, Visakhapatnam, India*

Two dimensional (2D) Mxene is exploited for industrial, biomedical, electronic and energy storage devices. Due to their large spin orbit coupling (SOC) and Dirac like band at Fermi level, it is predicted that Mxene can be used as Topological Insulator- a new state of matter. In this work, we use SEM-EDS for analysing surface and energy spectrum for abundancy, XRD for crystal structure, ESRS for magnetic properties, STM for imaging surfaces at the atomic level, HRTEM for structure & morphology, FTIR for Infrared spectrum and ARPES for electronic structure of solids, solid surfaces & interfaces. The topological surface state of the mxene systems is analysed with the help of calculating the loop variable called  $Z_2$  invariant and Chern Number. We reviewed different theoretical models, material properties and experimental results of Topological Insulators in 2D and 3D phases. Surface electrons in Topological Insulator are superconducting due to absence of their backscattering. So, Mxene can be used in spintronic devices, transistors without dissipation for quantum computers based on QSHE and QAHE and other applications on advanced magnetoelectronic and optoelectronic devices as topological insulator.

# Status of material science, technology and electron microscopy in Nepal

## ■ Deependra Parajuli

*Department of Physics, College of Science & Technology, Andhra University, Visakhapatnam, India*

Ancient history of Nepal before 1950 AD in Rana Regime was dominated by traditional but good science and technology. Then after, it is gradually decreasing with respect to its contemporaries countries. Now, there are 30+ educational and 40+ government institutions in Nepal including 11 universities. Among 11 universities, the research works on material science are hardly carrying on in Tribhuvan University and Kathmandu University. We don't have even an electron microscope and its specialist working in Nepal either in research or investigation in medical field yet, neither we have high computational facilities. It is clear that Government of Nepal and the respective ministries have addressed to develop Science and Technology through plans, acts and policies. But their accomplishment towards outcome and influence to the stakeholder is almost negligible due to several reasons. As remedial, a coordination should be established among the different scientific societies and then with different government and non government national and international agencies related to Science and Technology. Existing research centres should be upgraded and several other advanced research centres at least with electron microscopy, spectroscopy techniques and qualified manpower should be established. The research products from the centres should be transferred to the market following the norms of technological entrepreneurship. This will help to promote the role of science and technology for prosperous Nepal and happy Nepali.

# Co-operative effects of electron-correlation and spin-orbit coupling in double perovskites $\text{SrLaBB}'\text{O}_6$ (B=Ni, Fe; B'=Os, Ru)

■ **Dinesh Kumar Yadav**

*Central Department of Physics, Tribhuvan University, Nepal & Condensed Matter Physics Research Center, Butwal, Nepal*

Recent research is focussed on double perovskites because of exhibiting the novel properties suitable for spintronic applications. We found newly synthesized material with elements consisting of 4d and 5d states that are strongly influenced by spin-orbit coupling (SOC). We investigate the electronic and magnetic properties of these newly synthesized materials  $\text{SrLaBB}'\text{O}_6$  (B=Ni, Fe; B'=Os, Ru) on the basis of density functional theory. The strong electron-correlation effect (U) were considered for the B and B'-sites. We found the antiferromagnetic ground state for  $\text{SrLaNiOsO}_6$ ,  $\text{SrLaFeOsO}_6$  and  $\text{SrLaNiRuO}_6$  with their easy axis along the [001]-direction. Electronic behaviour in  $\text{SrLaFeOsO}_6$  is found to be semimetallic. Upon inclusion of SOC in Os-5d site leads to the opening of the band gap(0.03 eV) which dictates the significant influence of SOC in this compound.  $\text{SrLaNiOsO}_6$  and  $\text{SrLaNiRuO}_6$  on the other hand shows Mott-insulating behavior with band gap of 0.33 eV and 0.58 eV respectively with dominant contributions from Os-5d and Ru-4d bands around the Fermi level. Orbital magnetic moments obtained for  $\text{SrLaNiOsO}_6$  are 0.21  $\mu\text{B}$  for Ni, 0.15  $\mu\text{B}$  for Os while when Ni is replaced by Fe it is found to be 0.09  $\mu\text{B}$  and 0.22  $\mu\text{B}$  for Os. For  $\text{SrLaNiRuO}_6$  orbital magnetic moments are 0.24  $\mu\text{B}$  for Ni, and 0.03  $\mu\text{B}$  for Ru. Our results agree fairly with the experimental finding for these systems. Charge ordering is found to be prominent in these compounds.

# Theoretical study of magnetic field generation due to ponderomotive force in plasma

■ **Mukunda K.C and Jeewan Jyoti Nakarmi**

*Department of Physics GoldenGate International College, Kathmandu, Nepal*

In this dissertation work the phenomenon of ponderomotive force and laser interaction in plasma have been studied. For this, we start from the general expression for the force density (i.e the equation of the motion) of plasma in the electromagnetic field have been derived on the basis of Maxwell equation. The equation of the motion is deduced not only from the ponderomotive force but also from the theory of two fluid model. We consider collisionless plasma because the relation of the equation which is valid when the fast oscillation properties are neglected. The complete equation of the motion can be deduced from the basic equation of the continuum mechanics in relativistic formulation used in the well-known theory of radiation frequencies. In the presence of intense laser light, plasma particles are entrained by the fields of light and hence induced current, which in turn generates magnetic field. The recent work shows that larger order of mega gauss magnetic field is governed by scale length and intensity of light used. From this work we had seen that ponderomotive force arises due to the interaction of drifting electrons produced by the electric vector of the wave with magnetic vector of the wave and due to the gradient of the drift velocity. For the theoretical calculation of B field in plasma we have taken exponential variation in electron density along the axial direction and the Gaussian pulse which has intensity distribution along the radial direction only.

# Advancing EDM through simulation of electric field distribution using different dielectric systems on COMSOL multiphysics software and reducing overcut between tool and workpiece

■ **Nashir Ahamad**

*Indian Institute of Technology, Kanpur, India*

Electric discharge machining (EDM) is an un-conventional machining process which is based on electrical and thermal principles. The EDM has a number of unique advantages such as exerting every small force between the work piece and tool electrode, as well as fabricating hard-to-cut materials. There are a large number of factors influencing the EDM process, but pulse current, pulse duration, duty cycle (defined as the ratio of pulse on time to the total pulse period), and discharge are more important than other parameters. In addition, the effects of various machining parameters on the quality of holes which are created by the EDM process are investigated. Besides a number of unique advantages, this method has some drawbacks, one of which is side overcut. The side overcut is a clearance per side between the electrode and the work piece after the EDM process. Hence, the width of the EDM cavity is always larger than the electrode. Craftsmen and researchers have presented several techniques to reduce side overcut.

# Molecular interaction of O 6-methylguanine base of DNA with DNA repair protein AGT

■ **Rajendra Prasad Koirala 1, Prem Prasad Chapagain 2 and Narayan Prasad Adhikari 1**

*Central Department of Physics, Tribhuvan University, Nepal | 2 Department of Physics, Florida International University, Miami, USA*

Methylation at guanine base of human DNA is one of the causes of cancer. It may be caused by endogenous and exogenous DNA damaging agents. The methyl-DNA (damaged DNA) molecule is supposed to have unstable than that of normal-DNA molecule so that total energy of damaged DNA is expected greater magnitude than normal DNA. O6-alkylguanine DNA alkyltransferase (AGT) is considered as the direct DNA damage reversal protein. AGT protein performs basically three works: recognize the damaged part of DNA, flips out the DNA damaged base and then, removes the methyl-fragment CH<sub>3</sub> from the O6-point of guanine base. The study of mechanism of AGT on the recovery of O6-methylguanine DNA is presently in clinical trial. Here, we have basically classified our work in three main steps. First, the study the mechanism of structural change of damaged DNA during the interaction with DNA repair protein, AGT. Second, the study is extended to identify the amino acid residues that play major roles in the structural and functional variation in DNA and finally, the repair mechanism of damaged DNA, i.e., cure of cancer. We expect that this work will be the landmark in the drug designing against the cancer disease. This work is carried out from the molecular dynamics computational simulation of DNA-Protein complexes.

# Structural, electronic and magnetic properties of perovskites $\text{KTa}_{1-x}\text{Mn}_x\text{O}_3$ ( $x=0, 0.50, 0.67$ )

■ **Nirmala Adhikari and Gopi Chandra Kaphle**

*Central Department of Physics, Tribhuvan University*

$\text{KTa}_{1-x}\text{Mn}_x\text{O}_3$  ( $x = 0, 0.50, 0.67$ ) are perovskites can be used as fuel cells, memories devices, photo-voltaic devices and spintronic applications. In the present work, we have performed the firstprinciples calculations to study the structural, electronic and magnetic properties of pristine  $\text{KTaO}_3$  perovskite and Manganese doped perovskites  $\text{KTa}_{1-x}\text{Mn}_x\text{O}_3$  system along Ta site of super-cell. The calculations were performed in the Density Functional Theory (DFT) under Generalized Gradient Approximation (GGA) implemented on the Quantum ESPRESSO code. Our study based on supercell calculations. Our finding shows that the pure perovskite  $\text{KTaO}_3$  is indirect type band gap semiconductor having band gap 2.13 eV which is close agreement with experimental reported value 2.15 eV within 1% deviation. In the study of Mn doped system, we observed that there is indirect band gap decrease from 2.13 eV to 0.84 eV at 50% Mn doped on perovskite  $\text{KTa}_{0.5}\text{Mn}_{0.5}\text{O}_3$  along Ta site for  $2\text{\AA} \sim 1\text{\AA} \sim 1$  super-cell and 0.81eV at 67% Mn doped on perovskite  $\text{KTa}_{0.33}\text{Mn}_{0.67}\text{O}_3$  along Ta site for  $3\text{\AA} \sim 1\text{\AA} \sim 1$  super cell. Further, we have studied the Density of States (DOS) and we found that there is symmetric distribution of DOS for spin-up and spin-down electron states near the Fermi level indicating the non-magnetic nature of pure perovskite  $\text{KTaO}_3$  having net magnetization zero due to the saturation or paring of valence electrons to it's neighboring atoms. Our further investigations show that antisymmetric distribution of DOS for spin-up and spin-down electronic states for Mn doped perovskite  $\text{KTa}_{1-x}\text{Mn}_x\text{O}_3$  system. The contribution to total DOS is due to 2p-orbital of Oxygen and 3d-orbital of Manganese atom around the Fermi level. This suggest that, there is existence of magnetic behavior and have magnetic moment  $2\mu\text{B}$  and  $4\mu\text{B}$  for  $2\text{\AA} \sim 1\text{\AA} \sim 1$  and  $3\text{\AA} \sim 1\text{\AA} \sim 1$  supercell respectively which is mainly originated from the contributions of 3d-orbital of implemented Mn impurity. Whole doped system behaves as half metallic i. e. majority of the channel shows semi-conducting nature where as minority of the channel shows the metallic nature.

# Molecular adsorption of CO and NO on Graphene/MoS<sub>2</sub> heterostructure

■ **Saran Lamichhane 1, Narayan Prasad Adhikari 1 and Biplab Sanyal 2**

*1 Central Department of Physics, Tribhuvan University, Kathmandu, Nepal | Division of Materials Theory, Department of Physics and Astronomy, Uppsala University, Sweden*

Gases play the decisive-role in directing physical and chemical processes in environment. The zero-band gap problem of graphene and band gapped MoS<sub>2</sub> have motivated to search hetero-structure as a functional material to achieve the desired properties in many practical applications. In this study, the first-principles calculations with density functional theory are employed to investigate the geometry, energetics of MoS<sub>2</sub>/graphene and graphene/MoS<sub>2</sub> heterostructures, taking each constituent on basal plane. The structural properties and electronic structures of heterostructure is followed by the gases adsorption, carried out by choosing different possible adsorption sites. Electronic band structures and density of states calculations suggest that the states around Fermi energy are basically due to Mo-d orbitals. Our results provide a platform for application of heterostructure as a gas sensor for the detection of such environmental harmful gases.

# Effect of Cr doping on electronic and magnetic properties of inverse heusler alloy $Mn_2CoGa$

■ **Sashi Nepal, and Gopi Chandra Kaphle**

*Central Department of Physics, Tribhuvan University*

Heusler compounds have been found to exhibit interesting electronic properties and wide range of magnetic behavior. Many of Heusler compounds have been found to be half-metallic. In this work, we studied the electronic and magnetic properties of inverse Heusler alloy  $Mn_2CoGa$  and the effect induced by doping Cr on those properties. We used plane wave pseudo-potential method withing DFT framework implemented using Quantum ESPRESSO code. The calculation shows that  $Mn_2CoGa$  exhibit weak half-metallicity as indicated by availability of tiny amount of states at fermi level below a gap for spin-down electrons. The calculated total magnetic moment is  $2.01 \mu_B$  /cell which is very close to integral value and thus found to obey established Slater Pauling rule  $M = NV - 24$  for inverse Heusler compounds. We performed doping at two different concentration. The empirical rule for atomic occupation established for Heusler alloys says that Cr will occupy D site, but Cr does not follow usual occupation rule and actually occupies A site. At 25% Cr concentration, calculation shows  $Mn_2CoCr_{0.25}Ga_{0.75}$  is a perfect half-metal with typical metallic behavior for spin-up electrons, but semi-conducting behavior with a gap at fermi level for spindown electrons. This indicates we can have 100% spin polarization at fermi level. The calculated magnetic moment is  $11.0 \mu_B$  /cell. Furthermore the calculation at 50% Cr concentration shows that majority of the channel in DOS still shows metallic nature where as electrons fermi level for the minority channel is slightly shifted into conduction band indicating the loss of half-metallicity.

# Molecular dynamics study of diffusion of amoxicillin in water

■ **Shyam Prakash Khanal and Narayan Prasad Adhikari**

*Central Department of Physics, Tribhuvan University, Nepal*

The knowledge about transport phenomena like diffusion, transport of matter from one part of system to another, has great importance to study about the working mechanism of drugs. In this work, we have performed the classical molecular dynamics simulation to study about the diffusion phenomenon of a system having 2 amoxicillin and 2160 water molecules at different temperature taking SPC/E water model using GROMACS package. We have calculated the self diffusion coefficient of amoxicillin as solute and water as solvent using Einstein's relation and their mutual diffusion coefficient using Darken's relation at temperature 293 K, 298 K, 303 K, 305 K and 310 K and 313 K. Also, we have studied the temperature dependence of diffusion coefficients of solute and solvent; and have calculated the activation energy of amoxicillin and water using Arrhenius formula and effect of system size. The calculated values for solvent are in close agreement with previously reported values. Furthermore, we have also studied the structural properties of the system using Radial Distribution Function (RDF).



## Symposium 9: Social Security

14 October 2018, 13:50 – 15:30, Marva Hall

Symposium 9: Social Security and Good Governance				
14 October 2018, 13:50-15:30, Marva Hall				
Session Chair: Dr Som Lal Subedi				
Time		Speaker/Panelist	Topic	Institute
13:50-14:05	Contributed	Prakash Dahal	Prime Minister Employment program	Joint Secretary, Ministry of Labor, Employment and Security
14:05-14:20	Invited	Krishna Hari Baskota, Mr	Social security policy of Nepal	Former Secretary, Ministry of Finance
14:20-14:35	Contributed	Damaru B Paudel, Dr	Resource management in social security	Under Secretary, Ministry of Foreign Affairs, Nepal
14:35-14:45	Contributed	Shiva Hari Dahal, Dr	Why Nepal is poor?	ACAS (Asia Conflict and Security) Consulting George Mason University
14:45-14:50	Rapid Fire	Baburaja Maharjan	Concept paper: Fighting against corruption	NRNA NZ founding president
14:50-14:55	Rapid Fire	Indira Tripathi	Role of NRN for the economic empowerment to Nepalese women	NRNA NCC, USA
14:55-15:00	Rapid Fire	Bibek Kumar Pandit	Planning local Governance: Thinking globally, acting locally	Kathmandu University
15:00-15:10	Contributed	Kush Raj Shrestha, Dr	Nepal medical exchange program- Orthopedic and Trauma	Royal Darwin Hospital, NT, Australia
15:10-15:20	Q&A			
15:20-15:30	Summary	Som Lal Subedi, Dr	Social security perspective of Nepal	Former chief secretary of Government of Nepal
15:30-16:00	Tea break			

# Prime Minister Employment Program

■ **Prakash Dahal**

*Joint Secretary, Ministry of Labor, Employment and Security*

# Social security policy of Nepal

■ **Krishna Hari Baskota**

*Former Secretary, Ministry of Finance*

# Resource management in social security

■ **Damaru B Paudel**

*Under Secretary, Ministry of Foreign Affairs, Nepal*

# Why Nepal is poor?

## ■ Shiva Hari Dahal

*ACAS (Asia Conflict and Security) Consulting George Mason University*

My presentation is based on my book *China-Nepal-India: The Dark Side of Indo-Nepal Relations*, published by Xlibris, USA. My presentation focuses on the questions: Why Nepal is poor?

A general perception and dominant discourse in Nepal's political and public circle are that the country is poor because of bad governance, rampant corruption, political instability and absence of law and order.

However, I challenge the dominant discourse arguing that they are simply the issues within a border system of hybrid colonialism imposed on the nation. Issues are important to identify root cause of dysfunctional government, society and social structure and individual's mindset for addressing, but they need to be analysed within the broader hybrid system of colonialism. The issues are interlinked with the system, sub-system and the context of Indo-Nepal relation that is historically colonial.

The hybrid colonialism is a product of an interaction between the clients (ruling elites in Kathmandu) and barons (ruling elites in New Delhi). Such an interaction is often coded in the legal system through signing agreements and understandings that allow the colonial authority in New Delhi to control Nepal's natural resources and institutions that perpetuate Nepal's dependency on India. As a result, Nepal as a nation cannot function independently to pursue its development goals and consolidate democracy as a system of governance.

The problem requires a future-oriented solution. In other words, the subject matters need continuous and deeper level of research and understanding, whereas the findings shall feed into the discussion at the policy-making level and community level. Therefore, I propose establishing a separate unit as a research center within the NRNA Academy. The relevance of such a center is that it will conduct research and policy studies on the one hand and, on the other, it will engage the policymakers in dialogue and negotiations for Nepal's development.

# Concept paper-Fighting against corruption

## ■ Baburaja Maharjan

NRNA NZ founding president

Corruption in Nepal has plagued in most of the bureaucratic institutions including government sponsored enterprises. Transparency International ranked Nepal among mid-high corrupted nations and placed in 122 while New Zealand is on the top of the least corrupted countries. This concept paper aims to explore the occurrence of corruption in Nepal, its different faces and reasons of corruption.

The concept paper will highlight the different ways in controlling the corruption in Nepal so that all Nepalese can enjoy as the people of the least corrupted country.

# Role of NRN for the economic empowerment to Nepalese women

■ **Indira Tripathi**

NRNA NCC, USA

## **Introduction:**

The Constitution of Nepal 2015 has safe guard the women rights for the Nepalese women. The Nepalese women are educationally, socially and politically better. Today, the Nepalese women's need is how to be economically empowered themselves. The purpose of this paper is how to make empowerment to the Nepalese women. What role the Nepal government, INGOS, NGOS, local community and NRNA can play in this issue. Women's empowerment is central to the empowerment and prosperity of a community. While the Nepal Government, the United Nations (UN) and Organizations (NGOs) have made some impact in relation to women's needs,

## **Problems:**

Nepali women are born into a patriarchal society. In all cases women's rights are subordinate to those of men. Married early, with little or no education, no land rights or independent income, women are a voiceless section of society, dependent on men for their welfare and bearing the continued weight of cultural and social discrimination and violence against them. If a woman does not feel safe within a society then she cannot be empowered within it. If a woman does not feel safe within a society then she cannot be empowered within it. The Major issues in women and economy are:

- Unpaid family workers in subsistence agriculture.
- Low level of technology and primitive farming practices.
- Long work hours; carrying the double burden of work in the family and farm; their contribution to income generation and economic wellbeing of the family is not recognized.
- Poor access to credit and marketing networks.
- Poor self-confidence.
- Social and cultural barriers such as exclusive responsibility for household work, restrictions on mobility etc.

Women Empowerment Program seeks to improve the quality of life of women. In my initiation a One-day Workshop for 40 Nepalese women from different sectors on "Empowerment for the Nepalese women" was held in Nepal in October 12, 2017 in coordination with the Department of Women & Social Development, Government of Nepal & Women Coordinating Committee of NRNA

NCC USA. The recommendations and conclusion of the workshop was to develop and implement effective Women empowerment programs in the country.

**Conclusions and Proposed actions:**

The NRNA in coordination with the Nepal government, INGOS, NGOS and community organizations should play the following role for the financial empowerment to the Nepalese women:

- Conduct base line survey to find out the possibilities of economic areas by region, ethnic group, target group, marketing of the product produced and occupation wise.
- Conduct research activities on women economic empowerment and maintain good records to avoid duplication of financing the further programs.
- Organize skill training on economic empowerment for the women in coordination with the Council of Technical Education and Vocational Training.
- Organize short courses or provide scholarship to the economically handicap girls.
- Finance short courses on vocational subject to the rural women for developing employable skills.
- Organize and finance entrepreneurship courses for the youth girls who want to establish their own business.
- Coordinate with the government to provide interest free loan to the women who have skill and want to establish business.
- Involve women to participate in higher level training skill to encourage them for further expansion of their business.
- Manage international market for the products produced by the Nepalese women.
- Provide basic health training to the trainees of short courses so that they can transfer the health knowledge to the women group

# Planning local governance: Thinking globally, acting locally

■ **Bibek Kumar Pandit**

*Kathmandu University*

Nepal has adopted a unique three tier government model for the devolution and local government have been given autonomous rights in many regards including local level planning of education, health, security, economy etc. The paper aims to talk about various 'micro' issues related to the development at local level and explores the possible ways to set the notion of 'Think Global, act local'. It emphasizes on why the development model around the world differs but matters and how the Nepali Diaspora can be the catalyst in the process of local development. Bringing from the experience of various municipalities over the globe, the article highlights the pro's and con's of the existing practices related to 'micro' development in Nepal and suggest the necessary intervention approaches to address them so as to strengthen the functioning of local bodies.

# ANMDA, NDA-UK and ANMF Collaboration ANMDA Nepal Medical Exchange Program-Orthopaedic and Traum

■ **Kush Raj Shrestha**

*Royal Darwin Hospital, NT, Australia*

**Background:** Nepal is a developing country which is now trying to lift the standards of service in every field. Health sector is no different. Majority of doctors and health facilities are concentrated in big cities like Kathmandu with little to no service in rural sectors. This is due to number of factors. One of the major limiting factors for local doctors is the limited upskilling opportunities in their fields of speciality. They have limited opportunities to receive further training and updates in their skills. We believe NRN can help in this regard by training local Nepalese doctors in Nepal or by giving them opportunities to visit subspecialist centres overseas. Recently Australasian Nepalese Medical and Dental Association (ANMDA) signed Memorandum of Understandings (MOU) with Nepalese Doctors Association- UK (NDA-UK) and America Nepal Medical Foundation (ANMF) to collaborate in health projects in Nepal. It is an excellent opportunity to build on this collaboration to upskill Nepalese doctors and improve health care in Nepal.

**ANMDA-Orthopaedic Program:** On similar theme, Nepal has around 300 Orthopaedic Surgeons who are very competent trauma surgeons. This is evidenced by the fact that they competently managed earthquake victims. However, subspecialty skills are lacking for e.g. arthroplasty surgery, upper limb surgery and sports surgery. Spine surgery has developed well but the rest of the sub-specialities are lagging behind. There are various reasons behind this for e.g. lack of infrastructure and equipment. One of the reason is the lack of readily available advanced training options in these fields. Because of our low income the surgeons are not able to travel to western countries to gain necessary skills. This ANMDA Nepal Medical Exchange program aims to bring western sub-specialists to Nepal to train the local surgeons. Our aim is to upskill local Orthopaedic Surgeons in these various sub-specialities and eventually make the work force self-sufficient. Following is an example of such a program undertaken in arthroplasty surgery of hips and knees which can be rolled out to every sub-speciality.

Hip and Knee arthroplasty symposium and workshop was held inay 30-31 in collaboration with Nepal Orthopaedic Association (NOA) and Dhulikhel hospital. A 16-member Australian team visited Nepal which included 4 Orthopaedic Surgeons, 1 physiotherapist and 5 nurses, 2 orthopaedic company representatives and

the rest being administrative support personnel. The symposium conducted separate programs for surgeons and nurses. 40 orthopaedic surgeons and 30 nurses participated in the program. The symposium covered principles of hip and knee arthroplasty surgery including basic to advanced principles.

General topics on infection control and sharps management system during surgery were also covered. There was discussion on audit and governance as well. There were practical workshops where the surgeons were shown how to perform these surgeries in saw-bones as well. Both local senior Arthroplasty Surgeons and Visiting Orthopaedic Surgeons collaborated in the teaching and training program and discussed local modification of the techniques. There was active exchange of knowledge and skill between surgeons from two countries. The feedback received was also very encouraging. Every participant gained immense first-hand knowledge from the experts of both countries. This was also unique in a way where there was active participation of faculties from both countries. This was found to be very useful. This program illustrates the effectiveness and benefit of running collaborative program which is aimed at upskilling local surgeons. This was performed in a very cordial manner with mutual respect. At the end of the program we all became a very big family!

**Future possibilities:** The program can be further expanded by performing joint operations and demonstrating these advanced techniques. The program can be expanded to different sub-specialities. With proper co-ordination amongst the four developed countries: Australia, New Zealand, UK and USA, we can upskill and train doctors from every field. There are also opportunities for future collaborative programs in “Trauma and Disaster Preparedness.” Australia has world class National Critical Care and Trauma Response Centre (NCCTRC) in Darwin. This is an Australian Government organisation which is capable of being deployed anywhere in the world within 48 hrs and establish self-sufficient field hospital. The centre did send a small team during Earthquake Disaster in Nepal in 2015. The full team was not required at that time. Dr Kush Shrestha has also received necessary training from this centre allowing him to be able to be deployed at the times of disasters. The centre can be approached to help Nepal in capacity building for future disaster management. The geographic location of Australia and Nepal makes this centre very important for future disasters. In 2015 Earthquake Disaster in Nepal, NRNA –Australia collected fund from all over the country. Dr Kush Shrestha then led a team of medical doctors and visited Nepal 6 weeks later and delivered orthopaedic implants worth of \$100,000. Local Orthopaedic Surgeons were also given training on the use of latest technologies. The programs like this can now be co-ordinated amongst all 4 countries. We are also working very closely with Australian Orthopaedic Association(AOA) in regard to providing further training in Orthopaedic Speciality. AOA has expressed willingness to help out in this regard.

**Summary :** All 3 organisations in active support from NRNA can thus devise collaborative training programs in every medical fields. With the expertise in different sub-specialities we aim to conduct

these training programs as per requirement of Nepal and the medical personnel. These organisations can also be collaborated in the event of disasters by accumulating appropriate subspecialists in various fields. ANMDA, NDA-UK and ANMF can also collaborate with various organisations in their respective countries to bring specialists to Nepal to train local medical staffs. These organisations can also facilitate short term training visits to Australian, UK and US centres for doctors in Nepal. With proper planning between these organisations and Nepalese Government and organisations, the health care sector standards can be significantly improved. These medial organisations and NRNA collaboration will be able to deliver necessary medical skills required for Nepal.



## Symposium 10: Sustainable Energy

14 October 2018, 8:40-12:50, Madhavi Hall

*Coordinators :*

*Dr Ambika P Adhikari, City of Tempe, and Arizona State University, USA*

*Dr Subodh Sharma, Kathmandu University, Nepal*

This symposium will assess Nepal's existing policies and technical capacities related to clean energy generation and management, and recommend technologies, policies and mechanisms towards achieving improved development and management of sustainable energy in the country.

**Focus:**

Sustainable energy, clean energy, environment-friendly energy, energy policies and economics, solar and wind energy, capacity building, research and education

**Background:**

As Nepal seeks to increase the income levels for its citizens, making clean and affordable energy available for industries, firms, commercial establishments and households will be an important task for the government and private sector. Energy is a critical input both for the amplified production targets required to increase the economic activities, and to support the growing industrial, commercial and residential consumption patterns. Ensuring the best use of natural resources to produce energy that is clean and sustainable requires knowledge of a broad spectrum of engineering, economics, management, policy and environmental conservation approaches.

This symposium on “sustainable and environmental-friendly energy production” as a part of the NRNA-organized “First Global Knowledge Convention” in Kathmandu in October 2018 will provide a platform for scholars, professionals and practitioners to present their findings and experience and discuss the topic of energy and environmental technologies that are particularly relevant to Nepal. The central theme of the symposium is to provide participants a platform to share ongoing research and development outcomes, and practices and policies in generating clean energy that support development and environmental goals. For sustainability goals, and to minimize negative impacts on human health, ecosystem and the environment, Nepal needs to devise and apply energy generation technologies and programs that are environment-friendly.

**Themes:**

Consistent with the objectives of the Convention, this section of the Symposium will focus on the following topics.

1. Hydropower development (H): Improving efficiency, mitigating environmental and socio-economic impacts, finding more efficient technologies and best practices
2. Solar Energy (PV and Thermal) (S): Assessing the current situation, programs, technologies, cost-effectiveness, measuring and improving reliability, replacement, recycling of panels, improving battery performances, training technicians
3. Wind Energy (W): Assessing feasibility, identifying potential geographical locations, suitable types of technologies including hybrid system with solar power to maintain stable over the clock energy supply.
4. Biofuels and Bioenergy (B): (including energy from waste)
5. Creating climate-friendly energy (C): environmental management in energy production
6. Economic and financial aspects of energy production (E): energy policies, exploring financing mechanisms to increase clean energy production.

## PROGRAM

<b>Symposium 10: Sustainable Energy</b>				
<b>14 October 2018, 08:15-12:50, Madhavi Hall</b>				
<b>Session A: Energy Policies and Economics, Moderator: Dr Pramod Dhakal</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
08:15-08:40	Tea and networking			
08:40-09:00	Invited	Govinda Timilsina, Dr	Hydropower for sustainable energy supply and economic development in Nepal	World Bank
09:00-09:20	Invited	Jiwan Mallik, Mr	Prospects and future of utility scale solar PV in Nepal	Alternative Energy Promotion Center, Nepal
09:20 - 9:40	Invited	Kushal Gurung, Mr	Prospects of wind power in Nepal	Windpower Pvt. Ltd., Nepal
09:40-09:45	Rapid Fire	Ramhari Poudyal, Mr	Energy crisis of Nepal and sustainable solutions	Swansea University, UK
09:45-09:50	Rapid Fire	Pawan Dhakal, Mr	Vocational and skill training for hydropower development in Nepal	Nepal
09:50-09:55	Rapid Fire	Vijay Jaishwal, Mr	Growth and environmental sustainability in SAARC: A regional initiative	Kathmandu University School of Law, Nepal
09:55-10:35	Panel Discussion and Q&A	Sunil Lohani, Prof	Issues related to energy economics and policies in Nepal	Kathmandu University, Nepal
10:35-10:40	Summary	Pramod Dhakal Dr		
10:40-11:10	Tea Break			
<b>Session B: Clean Energy Production, Moderator: Surya Lamsal</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
11:10-11:30	Invited	Govinda Raj Pokharel, Prof	Promoting clean energy in Nepal	Former Vice Chairperson, National Planning Commission, Nepal
11:30-11:50	Invited	Ram Manohar Shrestha, Prof	Energy security and hydropower development issues in Nepal	Asian Institute of Technology, Bangkok, Thailand
11:50-12:10	Invited	Surya Lamsal, Mr	Infrastructure development for sustainable power supply in Nepal	New York Power Authority
12:10-12:20	Contributed	Badri KC, Dr	Energy efficiency program: A gift from diaspora to Nepal	General Secretary, NRNA ICC
12:20-12:45	Panel Discussion and Q&A	Sunil Lohani, Prof	Issues related to energy economics and policies in Nepal	Kathmandu University, Nepal
12:45-12:50	Summary	Surya Lamsal, Mr		
12:50-13:50	Lunch			

# Hydropower for sustainable energy supply and economic development in Nepal

■ **Govinda Timilsina**

*World Bank*

This presentation highlights the role of hydropower in meeting electricity demand under various scenarios for economic development in Nepal over the next 30 years by 2050. It investigates the potential contribution of hydropower for economic development, particularly through export of surplus electricity generation. It will clarify some misconceptions regarding hydropower development in the country. It presents experiences from some countries to demonstrate the roles hydropower help contribute economic development. Finally, it addresses key challenges for the development of hydropower in Nepal.

# Energy crisis of Nepal and sustainable solutions

■ **Ramhari Poudyal and Pavel Loskot**

*Swansea University, UK*

The research presented in this paper motivates by the challenges we face in our daily lives. Despite having enormous renewable energy resources, Nepal is facing a massive energy crisis. This article illustrates a comprehensive study of the country's renewable energy resources, their potential use as a source of energy, energy efficiency measures and the nation's developing electricity sector. In doing so, it recognizes the barriers to Nepal's development and what is needed to overcome them. Finally, it points suggestion that incorporates into sustainable policy, in order to bring green energy to the people.

# Prospects and future of utility scale solar PV in Nepal

■ **Jiwan Mallik**

*Alternative Energy Promotion Center, Nepal*

Nepal relies on a single power generation source of run-of-river hydropower (accounting 95% of 1074 MW cumulative installed capacity), the state is facing a steady power crisis since 2005. In last year, Nepal made steady progress in easing load shedding in major cities primarily through load management and electricity imports from India. Currently Nepal imports more than 50% energy from India through its cross-border transmission lines. In 2017/18, Nepal's own production from own hydro and Independent Power Producer (IPP) is 4476 GWh whereas import from India account of 2581 GWh. However, this arrangement of heavily reliance on import from India and hydro which is prone to risks and vulnerabilities due to natural calamities is not sustainable solution. There is need of short, medium and long-term energy planning to have reliable, secure and sustainable electricity provided to households, businesses and industries. It's high time to think about power generation mix from the prospective of energy security of Nepal. Even for the hydro rich country like Brazil, it has been seen that the expansion solar power is more cost-efficient than the construction of additional hydroelectric plants. In 2011, the constitutes of wind and solar in Brazil was less than 1 percent. Recently, they have targeted to achieve the share of wind and solar to 9 percent by 2035. This shows how hydro dominated nations are also switching towards increasing generation mix and protecting its energy security through available wind and solar resources. Nepal has opened the door for utility scale solar PV in Nepal with the power purchase agreement (PPA) at the rate of NRs. 7.3 per kWh. It hasn't been commissioned any such utility scale solar PV in Nepal and yet to see financial viability. Since the world's, utilities are rapidly moving from; Analogue to Digital, Fossil to Renewable and Centralized to Distributed System. It's time to think on similar way rather than hydro-centric thought only. And deployment of grid connected solar won't hinder hydro development rather Hydro can still be main stream generation source and solar can complement it.

**Key Words:** Utility Scale Solar PV, Energy Security, Power Generation Mix

# Vocational and skill training for hydropower development in Nepal

■ Pawan Dhakal

*Nepal*

Utilizing renewable resources, many energy sectors are undergoing through low carbon-pathway for rapid and sustainable transformations. In Nepal particularly, hydropower energy not only showcases future-oriented technology choices but it is also promising way for expanding electricity access to a larger population addressing the 7-9% electricity demand per year. The Government of Nepal (GoN) has introduced several hydro power development strategies in every annual budget. Likewise, during the annual budget for FY 17/18, the GoN has introduced an additional strategy to generate 15 GW electricity within next 7 years to switch the position from buyer to a pure seller and promoting rapid economic growth and development. To bolster this transformation process in Nepal and to strengthen the hydropower energy markets, there is a need of capacity to develop, innovate, and operate renewable energy installations. The skills developed for the renewable energy sector has to cover a wide range of different aspects of the value chain of renewable energy projects, depending on the choices of technology for a particular project. This publication evaluates the status quo and advocates the massive need for Technical and Vocational Education and Training (TVET) in Nepal for quality and competitiveness in hydropower. Further, it sheds light on technical skills required in the renewable energy sector primarily hydropower sector demonstrating how it may vary according to technology and type of application as hydropower plants need particular sets of skills in order to develop, build, and operate projects. It thus looks for to provide an assessment of the status quo and emphasize.

# Growth and environmental sustainability in SAARC: A regional initiative

■ **Vijay Jaishwal**

*Kathmandu University School of Law, Nepal*

This thesis examines the inseparable relation between the Growth which is specifically “economic growth” and 21<sup>st</sup> century problem called “sustainable development” in South Asian Region. South Asian Association for Regional Co-operation (hereafter SAARC) has vision since inception (1985) for economic integration with its member for regional development. This regional platform is designed in order to promote regional co-operation among member countries which is rightly inserted in the preamble of SAARC Charter. This section will provide exhaustive discussion of different interpretation of sustainability leading to a critical identification of concept. This thesis will also look in common issues in this region, for which all the member states has to stand together to overcome the problem like, South Asia has the highest density of poverty in the world with an estimated 600 million .South Asians subsisting on less than \$1.25 a day, even small climate shocks can cause irreversible losses and tip a large number of people into destitution, South Asia is endowed with great rivers, which are the lifelines of the regional economy. The ice mass covering the Himalayan-Hindu Kush (HHK) mountain range is the source of the nine largest rivers of Asia, including the Ganges, Brahmaputra, and Indus. Glacial melt coupled with more variable precipitation could severely compromise livelihoods and the future prospects of agriculture and South Asia suffers an exceptionally high number of natural disasters. Between 1990 and 2008, more than 750 million people - 50% of the region’s population - were affected by a natural disaster, leaving almost 60,000 dead and resulting in about \$45 billion in damages. Lastly, this thesis will challenge the conventional structural mechanism of SAARC which is not merely anymore a economic platform but must be considered as the political platform for the political consensus for the common political deadlock in this region. This part will also exemplify the traditional role of member and needs to reframe with global other regional institutions for regional benefit. This part will also give some of the recommendation which shall be a guiding factor for days to ahead.

**Key words:** Climate Change, Reductionist, Environmentalist, Sustainability and Growth

# Energy security and hydropower development issues in Nepal

■ **Ram Manohar Shrestha**

*Asian Institute of Technology, Bangkok, Thailand*

Growing dependence on imported energy is posing a serious challenge to the Nepalese economy. Hydropower has been widely considered as one of the most important national resources and a key to alleviate the country's energy security problem. It is also considered a major component of economic growth and sustainable development strategy. This presentation will first focus on the energy security challenges confronting Nepal under alternative economic growth scenarios in the absence of energy policy interventions. It will then discuss the potential role of hydropower in reducing the country's dependence on imported energy. More specifically, it will discuss implications of selected targets on the reduction of fossil fuel imports in terms of changes in technology-mix, energy-mix and greenhouse gas emissions as well as hydropower capacity and investment requirements. The presentation will also briefly highlight the opportunities for and challenges to hydropower development in Nepal in the face of climate change, emerging regional power market and changing economics of alternative energy technologies.

# Infrastructure development for sustainable power supply in Nepal

■ **Surya Lamsal**

*New York Power Authority, USA*

One of the basic requirements of electrical power is that it must be continuously available to consumers for which the reliability of energy sources and its delivery should be literally guaranteed. With a few additional sustainability parameters- renewable, resiliency and efficient consumption- the importance of energy infrastructure has grown rapidly. It requires massive investment in new forms of energy infrastructure- now are required to be sustainable- to tap the stochastic and diverse energy resources and flexible consumers. With current changes in technology, growing field of artificial intelligence and automation, the energy infrastructure for tomorrow must meet the future demand and also satisfy performance monitoring and regulatory process. Nepal has unique natural resources and development opportunities to accommodate the changing technology and public energy needs. As the world is rushing for intermittent wind, solar and storage, Nepal owns more robust and diverse water resources with favorable setting to harvest and market. Sustainable infrastructure can address the challenges that exist in generation, transmission, consumption, operation and maintenance as well as energy trading. As the energy network is changing from vertically integrated model to distributed and smart macro/micro-grid, the infrastructure that supports the needs should be prepared to address the environmental, social, political, and economic impacts. Investment in sustainable energy infrastructure is an investment in the planet's future and the assets should be justified with values more than just in dollars and cents. This presentation is intended to identify major energy infrastructure with some examples from existing electrical network and their historical transformation towards sustainability.

# Efficiency program: A gift from diaspora to Nepal

■ **Badri KC and Satish Tripathi**

*General Secretary, NRNA ICC*

In the context of growing energy deficit and lack of proper energy supply and management plan of electrification, energy efficiency program can help Nepal government to reduce deficit and to develop suitable and sustainable model for the integrated energy efficiency plan. Nepal has 1 TOE (Tonne of Oil Equivalent) for every \$1,000 of GDP which is lowest among south Asian countries (IEA,2012). This statistic shows the huge potential of energy efficiency. Government of Nepal, via NEA is trying to implement loss reduction and energy efficiency program to cope with the increasing energy deficit. Non- Resident Nepali Association (NRNA) has come forward to help Government of Nepal for the implementation of energy efficiency program by forming dedicated mega project “Ujyalo Nepal”. The replacement of 10 Million conventional bulb with LED light is in its primary focus for year FY 18/19 which can ultimately save 300 MW equivalent energy. Such saving can have immediate impact to improve existing deficit. The phasing out of least efficient lighting sources is primary focus of this project. The team is in process of building of successful implementation modality and hence would like to share idea among expert community to better shape the final model. The investment and distribution model will be discussed in the detail presentation. In addition, various means and methods of energy efficiency, latest technology on energy efficiency, success stories on government led energy efficiency program around the globe will be discussed during presentation.

**Key Words:** Energy Efficiency; Ujyalo Nepal Project; LED Light



## Symposium 11: Technology Transfer and Innovation

14 October 2018, 08:40-12:50, Malhar Hall

*Coordinators :*

*Dr Raju Adhikari, RMIT University, Australia*

*Dr Rameswor Adhikari, RECAST, Tribhuvan University, Nepal*

Technological innovation is the foundation of knowledge-based economy. Technological advancement can be achieved through domestic innovation and technology transferred from other countries. Nepali diaspora has a significant experience in technological innovations, technology transfer and intellectual property protection. This session will explore how diaspora expertise can be utilized in achieving knowledge-based economy in supporting innovation in Nepal.

### **Focus:**

Technological Innovation, Technology Transfer, Updating Government Policies, Intellectual Property Protection.

### **Background:**

Nepal has had a late start to adapt to science and technology (S&T) and was left out of the social transformation embraced by the rest of the world from the Industrial revolution. Nepal's first S&T policy was started in 1961 with the help from UNESCO which led to setting up government Research and Development (R&D) departments, Royal Drug Research and Agricultural Departments. Tribhuvan University (TU)'s first Research Centre for Science and Technology (RECAST) was established in 1977. Almost a decade later, Nepal Academy of Science and Technology (NAST) was established in 1982 to coordinate overall S&T activities. Nepal Agricultural Research Council (NARC) and National Planning Commission were subsequently established in 1992 and later Ministry of Science and Technology (MoST) to consolidate and modernize S&T activities and bring them under one umbrella. Despite all above initiatives, Nepal has failed to consolidate and use science and technology effectively as an important tool of prosperity till to-date.

In almost 70-year span, Nepal's failure to change public perception about the importance of science education and S&T is reflected on its S&T commitment of 0.3 % of GDP. Of the current 29 million population, we have less than 200,000 post-graduate/higher education man-power and only 20% of schools teach science at grade 12 level today. World Trade Organization (WTO) has predicted that by 2020, 40% of global employment in any industry, would need at least undergraduate level manpower. Nepal is likely to fare poorly in this arena.

Nepal's skilled youth population is leaving for overseas in large numbers (with 30% annual increase) in search of higher education and likewise highly skilled manpower is also leaving Nepal for a better life in foreign lands. This would create a huge vacuum in the country and Nepal would not have enough skilled human resources to meet the growing industry needs.

Nepal needs to drastically increase the budget for science education and S&T to develop infrastructure and join global race for knowledge and technology innovation, transfer and adaptation. In this endeavor, increased role, investment and contributions from the private sector is equally important. Country's S&T policies needs revisit to develop clear future strategy and direction based on a strong collaborative, partnership and co-investment model with NRNA (Non-Resident Nepali Association) and global institutions to catch up with developing countries. The session's focus will be on above issues and suggest measures how public sectors, donor, local industries and academia sectors could work effectively to make innovation and technology transfer achievable and make a meaningful contribution to nation prosperity.

The Plenary and Symposium sessions will focus on the following five themes

1. Government policies and initiatives on Innovation, Start-ups and Technology transfer
2. Technology transfer and product development through Start-up.
3. Case studies of Diaspora and Nepali S&T Experiences on Biotechnology, Energy, IT, Health disciplines
4. Private sectors and investors perspectives
5. IP portfolio and policies

## PROGRAM

<b>Symposium 11: Technology Transfer and Innovation</b>				
<b>14 October, 08:15-12:50, Malhar Hall</b>				
<b>Session A: Opportunities in Innovation and Technology Transfer, Moderator: Dr Rameshwor Adhikari</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
08:15-08:40	Tea and networking			
08:40-08:55	Contributed	Dinesh Kumar Gautam, Dr	Challenges and Opportunities of Technology Transfer in Nepal	Executive Director, Probiotech Industries Pvt. Ltd.
08:55-09:15	Invited	Hom Bahadur Basnet, Prof Dr	Role of Technology in Poultry Industry	President, Nepal Poultry Entrepreneurs Forum
09:15-09:35		Sudhakar Jayaram	Medical tourism in Nepal	CEO, Medicity Hospital
09:35-09:45	Contributed	Ravindra M. Sapkota, Dr	Innovation in biotech industry: An introspective view	Shikhar Biotech, Kathmandu, Nepal
09:45-09:55	Contributed	Yogan Khatri, Dr	Fair haired diasporic dandelion fluffs to bridge nation's scientific innovation through technology transfer	University of Illinois, USA, Research Fellow, Life Sciences Institute, University of Michigan, USA
09:55-10:05	Contributed	Rajendra P Pangeni, Mr	Transferring innovation in cancer research, diagnosis and treatment through research driven academic institution in Nepal	Dept of Surgery, City of hope medical centre, CA, USA
10:05-10:15	Contributed	Basant Giri	Development of appropriate low cost technologies for quality screening of food, water, and medicines	Center for Analytical Sciences, Kathmandu Institute of Applied Sciences
10:15-10:25	Contributed	Bimal Bastola	Plastic waste management and utilization through construction of plastic-mixed roads, bricks and flooring tiles	Green Road Waste Management Pvt. Ltd
10:25-10:35	Contributed	Varun Amatya	E-governance based system architecture and its effectiveness in Nepalese civil service	NA
10:35-10:40	Summary	Rameshwor Adhikari, Dr		RECAST, Tribhuvan University, Nepal
10.40-11.10	Tea Break			

<b>Session B: Emerging Technologies and Investor perspectives, Moderator: Dr Raju Adhikari</b>				
11.10-11:30	Invited	Habib Torfi, Dr	How Stem Cells Shape our Lives	CEO & Chairperson Invitrx Therapeutics, CA, USA
11.30-11.50	Invited	Ajaya Bahadur Pradhananga, Dr	Herbs and agro based enterprise in Nepal	Co-founder, Himalayan Climate Initiative. Kathmandu, Nepal
11.50-12:00	Contributed	Rishi Ram Chapagai, Mr	Intellectual property of research center and university: technology transfer, performance and policy implications in Nepal	Boston International College, Chitwan, Nepal
12.00-12.10	Contributed	Daman Ghale	Eye pollution in Kathmandu	CEO, Nepal Eye Hospital, Kathmandu, Nepal
12.10-12.20	Contributed	Shashi Bhattarai	A story of 15 years of bridging knowledge from Nepal to World	Cofounder and chair, Knowledge Holding International
12:20-12:25	Contributed	Kishor Vaidya, Dr	Learning by role modeling: 10 little known business secrets of the most successful diaspora entrepreneurs	University of Canberra, Australia
12:25-12:30	Rapid Fire	Nabin N Munankarmi, Mr	BSN and it role in promotion, development and awareness of biotechnology an life science in Nepal	President, Biotechnology Society of Nepal (BSN), Nepal
12:30-12:35	Rapid Fire	Pashupati Pandey	Experts@atabank, mentoring and internship opportunities with other sustainable short term and long terms projects	NRNA, NCC, USA
12:35-12:50	Dicussion and Summary	Raju Adhikari, Dr		RMIT University, Australia
12:50-13:50	Lunch			

# Challenges and opportunities of technology transfer in Nepal

■ **Dinesh Kumar Gautam**

*Probiotech Industries Pvt. Ltd.*

## Role of technology in poultry industry

■ **Hom Bahadur Basnet**

*Nepal Poultry Entrepreneurs Forum*

## Medical tourism in Nepal

■ **Sudhakar Jayaram**

*Medicity Hospital*

## Innovation in biotech industry: An introspective view

■ **Ravindra M Sapkota**

*Shikhar Biotech, Kathmandu, Nepal*

Antibodies are essential tools for identification of proteins in biomedical research. Shikhar Biotech has been a key player in the manufacture of polyclonal antibodies for research. Over the past few years, the antibody market is slowly changing. This is because researchers are calling for extensive validation of the antibodies before actual application. This has created new opportunities for companies like Shikhar who have developed rigorous methods for antibody validation. Our ability to offer antibody validation on multiple platforms is appreciated by our business partners. Shikhar Biotech is always innovating and coming up with new product ideas and new services. Our next platform is going to be genetically manipulated testing samples using the Crispr/Cas9 technology.

# Fair-haired diasporic dandelion fluffs to bridge nation's scientific innovation through technology transfer

## ■ Yogan Khatri

*University of Illinois, USA, Research Fellow, Life Sciences Institute, University of Michigan, USA*

Brain drain and global migration of Nepalese citizen for working overseas is current astringent-truth, and the remittance of which comprised 28.31% of total GDP in the fiscal year 2017 (World Bank, 2018). Emigration rate of highly educated Nepali was nearly 55.55% in 2011, in which 24.1% and 74.5% were of 15-24 and 25-64 years (OCID, 2015) and is currently escalating. Because of the long haul of diasporas' remarkable education and expertise, they have acquired highly skilled jobs in the international arena of Science Technology and Innovation (STI). However, such resources are still unconcern to our policymakers for STI enhancement. Since development of Science, Technology, Engineering and Math (STEM) education is a backbone for nation's progress and prosperity, it should be prioritized by Nepalese Government and take benefit identifying expert pools of Nepalese diasporas aligning their skills, knowledge and innovations to link countries need. The diaspora's visionary scientific thought and expertise should be exploited by Nepalese public/private sectors to harness our vivid bio-geo-diversity to establish chemical/computational engineering and excavate novel biomolecules of industrial and pharmaceutical significance for drug discoveries. I being a Nepali-diaspora, obtaining 5 years of academic studies in Germany as a DAAD fellow, followed by two years of postdoctoral training in esteemed US University, returning back to Germany for additional 3 years as a senior scientist, and now reappearing back in an eminent US University, make me aware of cutting-age scientific education, training and innovation. Since I have worked in several research grants, done extensive research collaboration among different German public/private R&D and Universities in the United States, Japan, France, Netherland, Australia and Russia obtaining industrial patents and several publications in top tier scientific journals, I want you to walk with me to behold how the "innovation" and the gap for "technology transfer" could be swamped through government/private and national/international collaboration to acquire patent and intellectual property right (IPR). As a representative of diasporic 'Nepali-scientific-dandelion', I want to share and understand how the 'research' and 'resource gap' thought to bridge Nations' scientific interests for the promotion of STI as an individual, group or network of diasporas.

# Transferring innovation in cancer research, diagnosis and treatment through research driven academic institution in Nepal

■ **Rajendra Prasad Pangi and Sanjivan Gautam**

*Department of Surgery, City of Hope National Medical Center, Duarte, CA, USA and Center for Health and Disease Studies, Kathmandu, Nepal and National Cancer Institute, National Institute of Health, Bethesda, MD, USA and Center for Health and Disease Studies, Kathmandu, Nepal*

Cancer has been one of leading causes of deaths worldwide. In recent years, the cancer cases are alarmingly rising, which to an extent could be attributed to diagnostic methods available. Cancer or a malignant tumor is an abnormal mass of cells that originates from a single cell due to genetic defects such as mutations. Tumor in each patient has multiple clones (subpopulation of cells), with unique genetic makeup that makes cancer extremely difficult to treat. Therefore, investigating the genetics changes in multiple patients and comparing them help us to model drug development as well as individualized therapies. In Nepal, Center for Health and Disease Studies (CHDS); Phutung Research Center, Research in Biology and Biotechnology (RIBB), Nepal Applied Mathematics and Informatics Institute for Research (NAMII) and Center for Molecular Dynamics (CMDN) have secured national and international funding to pursue biomedical researches. These institutions have collaborated to form Nepal Research Alliance (NRA) to contribute in research capacity together. Despite some reputed hospitals dedicated to cancer treatment in Nepal, the prognosis, diagnosis and treatment of many cancer types remain poor and the status of cancer research is still far behind an infant stage. Therefore, we, group of Nepalese researchers have come up together to build up an institution that is dedicated to cancer research and research driven academic activities with an ultimate goal to translate scientific findings into therapeutic interventions for patients with cancers with support from local government and community.

# Development of appropriate low cost technologies for quality screening of food, water and medicines

■ **Basant Giri**

*Center for Analytical Sciences, Kathmandu Institute of Applied Sciences*

The World Health Organization (WHO) estimates that almost 1 in 10 people become sick and more than four hundred thousand die every year globally due to contaminated food. Similarly, contaminated drinking water is estimated to cause more than five hundred thousand deaths by diarrhoea alone each year. Unsafe food and water containing harmful bacteria, viruses, parasites or chemicals cause many diseases ranging from diarrhoea to cancers, especially affecting children, elderly and already sick. Moreover, the medicines we take to cure diseases are also found to be substandard or falsified. According to WHO one in ten medical products found in low- and middle-income countries is substandard or falsified. Such drugs are a global problem causing serious illness or even death in addition to wasting individual's time, money and health. Therefore the food and waterborne diseases along with bad drugs impede socioeconomic development by straining health care systems, and harming national economies. The conventional methods for monitoring the quality of food, water, and medicine samples require expensive equipment, sophisticated laboratory facilities, and highly skilled technicians, which limit regular testing of the samples, especially in resource-limited countries like Nepal. In this presentation I will share our lab's efforts to develop low-cost and easy-to-use field based techniques for testing pesticide residue on vegetables, microbial contamination of water, quality of commonly used

Pharmaceutical products. These new techniques are known as paper-based analytical devices (PADs) that are basically modified cellulosic fibers capable of performing targeted colorimetric reactions. The change in color in such devices indicates the presence/absence of target analyte giving qualitative results. We also take images of the colour using regular phone camera and process the images for extracting semi-quantitative and quantitative information. I will showcase selected results from a number PADs projects including pesticide residue, microbial contamination, pharmaceutical screening, salt iodine estimation, wine quality. Our PADs methods are thousand fold cheaper than conventional methods and can be performed in field settings by a user with no science background.

# Plastic waste management and utilization through construction of plastic-mixed roads, bricks and flooring tiles

■ **Bimal Bastola, Nirajan Ghimire, Abinish Bachan, Sunil Prasad Lohani**

*Green Road Waste Management Pvt. Ltd*

Plastic Waste Management is one of the thrust areas for the sustainability and eco-friendly environment in reference to the global scenario. In context to Nepal, every year Metric tons of plastics are disposed improperly, creating the problem of landfilling sites and pollutions. So, to account this problem, the team initiated an objective of “Landfill to Road fill” to use waste plastic for the construction of roads. Deliberately it was found that there was the reduction in cost of making roads, reduced required amount of bitumen, increase in strength and durability than that of the normal Black-Top road with fewer chances of potholes and cracks. So, in these processes, the team collected different types of waste plastic from collection centers, municipalities’ dumping sites, and residential areas. Among them, the thermoplastic like LDPE, HDPE, PP, PET etc. were cleaned, granulated and extruded in pellets form which had been used for making Recycled plastic products, Plastic-Mixed Bricks & Flooring Tiles. Also, Thermosetting plastic can be used for making building blocks by heating and hydraulic compression. Remaining Plastic like Noodle wrapper, Carry Bags, Cups and Thermopolis were used for the construction of plastic roads. By this process, a road of 1 Km length and 3.75m width of the single lane can consume 1 ton of plastic (carry bags, noodle covers, etc.) and the road strength is increased by almost 2.5 times and no potholes for almost ten years. On the respective date of 25<sup>th</sup> – 30<sup>th</sup> Ashad, 2075 at Pokhara the Black-Top Plastic-Road was constructed through premix process with the length of 100m, width of 6m and Area of 600m<sup>2</sup>. In the road construction, 295 Kg of plastic waste was used which saves 250Kg of Bitumen. The totals direct cost saving during construction was found to be NRs. 5750/- per 100m.

**Keywords:** Low-Density Polyethylene (LDPE), High-Density Polyethylene (HDPE) Polypropylene (PP), Polyethylene Terephthalate (PET), Extrusion, Premix

# E-governance based system architecture and its effectiveness in Nepalese civil service

■ **Varun Amatya**

*Nepal*

The approach of e-governance is constantly changing the way government system execute its service to the people. E-service encompasses a series of necessary steps for institutions to develop and administer to ensure successful implementation of services at large. This paper discusses the growth trend of e-service, its effectiveness and challenges to overcome the situation for effective service delivery. Content analysis and survey approach was used to generate data. The study has claimed that the virtual nature of the internet, and its dynamic aspects, can multiply the service of government to the people and novice users to its considerable capacity to align for the do no harm in e-service. The study has concluded

that e-government service is essential for managing future complications and responding to current and past incidents to build trust from people. The insight on reducing current and future inefficiencies, the probabilities of effectiveness, and the costs associated with potential outcomes support their mitigation. Some of the issues related to e-service can be regulatory, legal, technical and procedural measures as well as civil service personnel's education, capacity building and continuous upgrading the technology for sustained future.

**Keywords:** E-governance, Upgrading Technology, Efficiency and Effectiveness, Capacity Building

# How Stem Cells shape our lives

## ■ Habib Torfi

*Invitrx Therapeutics, CA, USA*

Stem cells are intimately tied with our vitality: they are present at birth, active throughout life, and wane with age. Their natural capacity to replace tissue positions stem cells at forefront of regenerative medicine. Stem cells begin as totipotent cells, capable of forming an entire individual. These cells specialize into pluripotent stem cells, which have the capacity to form any tissue type. These cells can further specialization into multipotent stem cells, tissue-specific progenitors. Examples of multipotent stem cells in our bodies at work include skin and gut lining regeneration. This regenerative ability can be utilized to create reparative therapies and threat previously untreatable conditions.

With the recent advances of medicine and increased understanding of the human genome, a one size fits all approach to medicine is no longer the optimal approach for treatment. Personalized medicine takes into account the epigenomic differences between patients and is uniquely tailored for each person's unique biology. Stem cells are well positioned to lead personalized medicine through their capacity to home into areas of need and differentiate into appropriate tissue types. Stem cells are already being used today to treat leukemia patients following chemotherapy through hematopoietic reconstitution. These patients receive a personalized therapy of stem cells that uniquely compatible with their body, where the stem cells naturally find their way to the bone and function just as their original cells did. Personalized medicine is also used for CAR-T therapy. CAR-T utilizes an individual's own cells, and genetically modified them to specifically target CD markers on cancer cells.

The future for regenerative medicine and personalized medicine is very promising. Future therapies are on the horizon for heart disease, diabetes, liver damage, and kidney disease.

# Intellectual property of research center and university: Technology transfer, performance and policy implications in Nepal

■ **Rishi Ram Chapagai**

*Boston International College, Chitwan, Nepal*

This concept paper focuses the policy implication for the transfer and commercialization of the Intellectual property of the Universities and research centers. The recent increase in the rate of technology transfer and commercialization of intellectual property at US and European universities has important performance and policy implications. One of the key ways that publicly funded research can have a productive impact is through it being translated into useable products, processes and services. This is an important aspect of the research and innovation system of a country. Bringing research results and outputs to the market, or otherwise into productive usage, in a timely and effective manner yields tangible benefits from that research, ensuring that it contributes to the economy and to the broader community. It is therefore important for researchers and research institutions to build strong, ongoing connections with industry and investors who can help bring ideas, inventions and innovations to market, or otherwise into economically productive use. In recent decades, almost all research universities all over the developed and developing world have established Technology Transfer Offices (TTOs) or Technology Licensing Office (TLO) to commercialize their intellectual property (IP).

The pattern observed in the USA is part of an international phenomenon, with market increases in licensing, patenting, and university-based start-up companies also evident across Europe, Australia, Canada, and elsewhere. The TTOs serve as an 'intermediary' between suppliers of innovations (university scientists) and those who can potentially (help to) commercialize them, i.e. firms, entrepreneurs, and venture capitalists. TTOs facilitate commercial knowledge transfers of IP resulting from university research through licensing to existing firms or start-up companies of inventions or other forms. The activities of TTOs have important economic and policy implications, since licensing agreements and university-based start-ups (spin-offs) can result in additional revenue for the university, employment opportunities for university-based researchers and graduate students, and local economic and technological spill overs through the stimulation of additional R&D investment and job creation. Thus, it is important that Nepalese universities and research centers must formulate and implement clear and feasible technology transfer/commercialization strategies for the creation and commercialization of the Intellectual Property.

# Eye pollution in Kathmandu

## ■ Daman Ghale

*Nepal Eye Hospital, Kathmandu, Nepal*

Air pollution has been a major problem of 21st century for both developed and developing world. It has a negative impact on various environmental aspect which directly or indirectly affect the quality of human health. Due to rapid urbanization and various infrastructure development projects, Kathmandu valley virtually is in the brink of pollution related health epidemics said by several national and international agencies. Based on Air Quality Index (AQI) measurement, Kathmandu is being one of most unsuitable city for human habitat. Automobile vehicles and brick kilns are major contributors. Children and aged people are more vulnerable to these threats where medical institutions are dealing with respiration and ophthalmic problems most. Another important factor for these challenges is geographical morphology of Kathmandu valley where air rarely shows upstream and downstream movement. Particulate matter (PM) easily floats on atmosphere just above ground nearly about 10-12 hours a day. Motorcycle riders and pedestrians are mostly affected group.

As a pioneer institution in the field of eye care service, Nepal Eye Hospital (NEH) has experienced double digit increment in eye patients between these years. More than two thirds of these patients are city inhabitants and rest are from sub-urban areas. In this regards, NEH wants to develop a research mechanism to find facts and figures on eye problems rooted by air pollution in cities. NEH provides its services to 400-500 eye patients daily with nearly 5,000 eye surgery annually. As a rough estimation eye allergies and other eye problems have increased by almost 50% in the last 15 years mainly due to air pollution. Based on these facts, NEH is looking for joint effort of air pollution expert and eye expert working together to bring real information on the floor with a view to provide recommendations to government authorities and other national and international agencies to initiate effective step for a sustainable remedies on these problems in time and as a part of bringing up skill and technological transformation and innovation in comprehensive research work in eye health project.

# A story of 15 years of bridging knowledge from Nepal to World

■ **Shashi Bhattarai**

*Knowledge Holding International*

The talk is to introduce high-end Multi Criteria Decision Making (MCDM) or Multi Criteria Decision Analysis (MCDA) tools in general and the Analytic Hierarchy Process (AHP) in specific. The talk will focus on gathering AHP application, research and dissemination activities taking place in Nepal and contribution to the world during the period of fifteen years (2003-2018). AHP application in Nepalese context and presence in international forum is reviewed taking as baseline year 2003. Real life applications, published papers and involvement of Nepalese within social media related to AHP has been cited with brief discussion of application of AHP in selected sectors. It is observed that the AHP has been spread not only in research and development decisions, but has been utilized to address wider issues by Nepalese round the globe in the form of professional services to industry and academia. The overview reveals that Nepalese professionals are active in AHP related research and application in diverse context and gaining momentum of popularity in recent time. Nepal is well positioned in global map of AHP application since 2005. Most recently, Nepalese professionals are among the key speakers of the international conference of AHP. Nepalese professionals are being invited by governments to see potential application on its key analysis. The talk will reveal key advantage and potential areas of AHP for Nepal with testimonials from around the world.

# Learning by role modelling: 10 little known business secrets of the most successful diaspora entrepreneurs

■ **Kishor Vaidya**

*University of Canberra, Australia*

When most of the diaspora businesses struggle to survive in a foreign land, only selected few become very successful financially. They are so successful because they are the most hard-working people? Probably not. If the answers are not so obvious, what the secrets, if any? In this paper, I reveal the results of my study as to what makes diaspora entrepreneurs have a very successful business. I researched the lives/businesses of the most successful diaspora entrepreneurs and found some interesting but little-known traits and patterns. I will share those findings in my talk.

It is my hope that sharing and discussing the “secrets” would provide lessons to the emerging entrepreneurs and help them make their business more innovative and successful. Even if you can apply one of the lessons, it will have a significant impact on your business success.

# BSN and its role in promotion, development and awareness of biotechnology and life science in Nepal

■ **Nabin N Munankarmi**

*Biotechnology Society of Nepal (BSN), Nepal*

Biotechnology Society of Nepal (BSN) is an apolitical, non-government, non-profit organization motivated for promotion of Biotechnology in Nepal and beyond, established in 2007. The establishment of society is an endeavor for development of Biotechnology by promotion and dissemination of knowledge about this cutting edge technology. The society will act as an active platform for interchange of academic ideas about the research and theoretical perspective of biotechnology. The motive of the organization is to incorporate all national and cross-national academic institutions, research institutions, companies and individuals sharing interest in development of biotechnology and lifesciences in Nepal and beyond. In order to achieve its objective, BSN continuously organizes talk & interaction program, seminar, symposium, and workshop, training, national and international conferences. Our regular activities include, first Biotechnology journal of Nepal i.e. Nepal Journal of Biotechnology (NJB), First Biotechnology bulletin i.e. BSN Bulletin, Brain Drain to Brain Gain Talk series program, DNA Day celebration. Besides these, on a regular basis we also make approaches on the overall development of students and learners by linking them to the outer world through collaborative efforts. We have solid support from different Universities, government, non-government and private organization

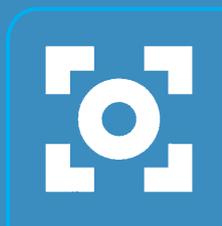
**Keywords:** BSN, Biotechnology, NJB, Bulletin, Nepal

# Experts databank, mentoring and internship opportunities with other sustainable short term and long terms projects

## ■ Pashupati Pandey

*NRNA, NCC, USA*

Non-resident Nepalese Association (NRNA) undoubtedly serves as the biggest community organization and networks for Non-resident Nepalese around the world. In order to transfer essential knowledge and innovation related to science and technology for nation's development, NRNA National Coordination Council USA (NRNA-NCC) formed a Science, Technology, Innovation and Knowledge transfer (STIKT) committee bringing professionals from Nepalese diaspora with diverse fields. At present, STIKT is building experts' databank in NRNA NCC web portal by gathering information using surveys, and other online methods. The data bank will be a common platform for mentoring services to needy Nepalese individuals around the world for building networks, exchanging ideas and collaborating among Nepalese professionals globally as well as bridging Nepal government, other non-government agencies and experts in various fields. Similarly, STIKT has decided to coordinate with Nepalese professionals in US and Nepal to provide young students with internship opportunities in academic/research institutions and industries in various fields. In addition, other sustainable short- and long-term projects include networking with Nepalese community organizations in US to grasp talents and human resources, supporting local government in Nepal for good governance, coordinating with National planning commissions on various projects with NRN-NCCA's expert support, as well as collaboration with academic institutions and Universities in Nepal to provide young students with internship opportunities. The STIKTC plans to organize annual science, technology and innovation conference in US to bring researchers, academicians and technologists in a single venue in order to create a platform at NRNA, USA to transfer knowledge and innovations to Nepal. STIKTC now is working with its goals and is further identifying potential areas where STIKTC could provide experts' opinion through NRNA, USA.



## FOCUSSED SESSIONS

# Focussed Session 1: Agro-Food Innovation Supercluster

**14 October 2018, Time: 13:50-15:30, Malhar Hall**

*Coordinators:*

*Mr. Mahabir Pun, Chairman, Nepal Innovation Center (mahabir@himanchal.org)*

*Mr. Narayan Ghimire, Food Scientist & Flavorist, Flavorcan Inc. Canada*

Without putting serious efforts into advancement of Science Education, Research and Innovation, Nepal's technology-based future cannot be secured. This symposium will focus on how best to utilize Diaspora's diverse expertise pool to overcome the knowledge, and science & technology policy gaps that are currently hindering national prosperity.

A robust cluster, linked through shared reliance of locally feasible inputs, technologies, talent, and infrastructure can harvest innovation. That energize economic growth, employment and self-employment generation. This symposium shall identify a gateway in the field of ayurvedic, medicinal and aromatics plants and microbes (MAPs) commercialisations.

**Focus:** Institutionalizing diaspora backed smart agro-food innovation supercluster to ensure global competitiveness of ayurvedic, medicinal and aromatic clusters of Nepal.

**Background:** Diaspora backed smart agro - food innovation supercluster is an initiative to partner with Nepal government for shared reliance-based knowledge & partnership bridging among foreign and domestic laboratories, technology transfer offices, research and academic institutions, small and medium enterprises to ensure their global competitiveness.

In 2050 world population is projected to reach 9.6 billion. Multiple innovative recourses in compensating feeding needs by 2050 have uncovered several value-added potentials of plants

and creatures. About 7000 plants and creature's available in Nepal have great potential to use as food supplements to next generations' protein, natural health, ayurvedic, flavourings and colours. Cleaners, sanitary supplies, pesticides, insecticides, textile including aromatic preservatives in replacing food dry storage poison etc. are other potential of those plants and creatures. Nepal is situated between India and china with market proximity of almost world half population. This symposium is expected to uncover those potential to develop diaspora backed but government facilitated agro-food innovation superclusters for good causes.

**Themes:** In line with the objectives of the First NRN Global Knowledge Convention, this symposium will focus on the following themes.

1. Uncover where Nepal stand today, where the world is heading in 20 years in MAPs based ayurvedic, medicinal and aromatic innovations disclosing available opportunities to Nepal.
2. Draft proposal for inception of diaspora backed Smart Agri-Food Innovation Supercluster Initiatives under active facilitations of government of Nepal.
3. Explore sustainability of diaspora backed Agro-based Innovation Supercluster in Nepal with Nepal Government (Panel Discussion)

## PROGRAM

<b>Focused Session 1: Agro-Food Innovation Supercluster</b>				
<b>14 October 2018, 13:50-15:30, Malhar Hall</b>				
<b>Chair: Hon. Mr. Chakra Pani Khanal, Minister of Agriculture &amp; Livestock Development, Moderator: Mr Bikash Bidari / Ms. Manju Chhetri</b>				
<b>Time</b>	<b>Time</b>	<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Instituion</b>
13:50-13:55		Mahabir Pun, Mr	Session Introduction	National Innovation Center, Chairperson
13:55-14:10	Invited	Yogendra Kumar Karki and Shanker Sapkota	Agro-food innovation policies	Joint Secretary, Ministry of Agriculture & Livestock Development / Information Officer
14:10-14:25	Invited	Narayan Ghimire, Mr	Agro-food innovation supercluster in Nepal	Technical Manager, Scientific Innovation, Flavorcan International Inc, Toronto, Canada
14:25-14:35	Contributed	Tilak Bhandari	Rubber farming potential & economic sustainability	Executive Director, Institute of Rubber and Jathropa Research, Nepal
14:35-15:00	Panel Discussion	Dev Bhakttta Shakya, Dr		EX. Director Agro Enterprise Center Nepal
		Hikmat Thapa, Mr		NRNA – Food Scientist / Entrepreneurships Development Expert. Senior GM Dagote Group Africa
		Matina Vaidhya, Dr		Department of Food Quality Control (DFQC)
		Poorna Kanta Adhikari, Dr		Director, Gorkha Ayurveda, Chairperson
		Shekhar Golchha, Mr		Senior Vice President, FNCCI, Nepal
15:00-15:20	Q&A			
15:20-15:30	Summary	Mr Chakra Pani Khanal	Closing Remarks	Hon. Minister of Agriculture & Livestock Development
15:30-16:00	Teak break			

# Agro-Food innovation policies of Nepal Government

■ **Yogendra Kumar Karki and Shanker Sapkota**

*Joint Secretary, Ministry of Agriculture & Livestock Development / Information Officer*

**My presentation will focus on following topics:**

- Share of Agriculture sector in GDP
- Average Annual Growth rate of Agriculture sector
- Contribution of AGDP to GDP
- Present Status of National Food
- Availability
- Agro- Based Food Industry: Plans and Policies
- Public Private Partnership
- Industrial Policy

## एग्रो-फुड सुपर क्लस्टरको सार

■ **नारायण धिमिरे**

सन् २०१४ को भूमी सम्बन्धी तथ्यांकअनुसार नेपालको १ लाख ४७ हजार १ सय ८० वर्ग किलोमिटर क्षेत्रफलमध्ये २.६ प्रतिशत पानी छ। लगभग २३ हजार ५ सय ७० वर्ग किलोमिटर भनेको १६ प्रतिशत खेती गरिएको जमिन छ। खेती गरिएको जमिनमध्ये आधामा मात्र सिँचाई सुविधा उपलब्ध छ। यसरी हिसाव गर्दा मात्र ८ प्रतिशत जमिनमा पुस्तौँ-पुस्तादेखि हाम्रो सारा कृषिको जोडबल थुपारिहेका छौं। १६ प्रतिशत खेतीयोग्य भनी मानिएको जमिनमा हाम्रो राष्ट्रको ८० प्रतिशत कृषिको लगानी घोप्टाए पनि कृषकको जीवनपद्धति उँभो लागि रहेको छैन। जंगल भनिएको २४ प्रतिशत र अन्य भनिएको ४४.०८ प्रतिशत गरी जम्मा ६८.०८ प्रतिशत भू-भाग जस्ता छन्, त्यस्तै अवस्थामा सजिलै उम्रने र हुक्ने आयुर्वेदिक, मेडिसिनल, सेनिटरी क्लिनर, एरोमेटिक फुड, फुड सप्लिमेन्ट र अन्य एस्सेसरिज बायोप्रडक्ट लगायतको वनस्पति र जीवाणुहरूको भ्यालु पहिचान, प्रशोधन र व्यावसायिकीकरण गर्न सके नेपालमा कृषिको क्रान्ति नै भित्र्याउन सकिन्छ। त्यसलाई सिम्पोसियममा मेडिसिनल र एरोमेटिक समेत संलग्न 'एग्रो-फुड इनोभेसन' नामकरण गरिएको छ।

एक अध्ययनअनुसार संसारमा १५ हजार प्रजातिका वनस्पति छन्। तीमध्ये ३ हजार ७ सय एरोमेटिक र मेडिसिनल मूल्यांकन भइसकेको छ। नेपालमा पाइने लगभग ७ हजार वनस्पतिमा १ हजार ५ सयको एरोमेटिक र मेडिसिनल मूल्यांकन भएको र कम्तीमा १ सय ४० वनस्पतिको औद्योगिक कारोबार भइरहेको छ। हालसम्मको नेपालका वनस्पति र व्यावसायिक जीवाणुहरूको अध्ययन आयुर्वेदिक महत्वलाई ध्यानमा राखी गरिएको छ। ती वनस्पति र जीवाणुहरूको सिजनड, सेनिटरी, जैविक विषादी, जैविकमल, खाद्य, कस्मेटिक, पोषण सप्लिमेन्ट, लक्ताकपडा, र अन्य प्रयोजन आदिमा औद्योगिकीकरणका लागिइनोभेटिव कल्चर विकासमा नेपालको ध्यान पुगिरहेको छैन। आज संसारले विकसित गरी प्रयोजनमा ल्याएको खाद्य र प्रविधि क्षेत्रको विकास र आजका दिनसम्म गरिएका अनुसन्धानबाट संसारका सचेत नागरिकहरूको बदलिएको जीवन पद्धतिलाई केलाउँदा आजभन्दा मात्र २० वर्षपछि संसारमा उच्च ऋयशक्ति भएका मानिसहरूको दैनिकीलाई चाहिने खाना, लक्ताकपडा, औषधि, कस्मेटिक, इन्धन र अन्यजिविकाका सामग्री प्राकृतिक स्रोतबाट प्राप्त अर्गानिक पदार्थ हुनेछ। ती उच्च मूल्यका बहुसंख्यक सामग्री नेपालको हाल हेल्त्वमा परेको ६८.०८ प्रतिशत भू-भागको सदुपयोग गरी वातावरणलाई बिग्रन नदिई आपूर्ति गर्न सकिने वनस्पति र जीवाणुमा आधारित हुनेछन्। यसलाई समयमै पहिचान गरी सदुपयोग गर्न सके अनुभूति नै हुने गरी नेपाल समृद्धितर्फ जानेछ।

प्राविधिक दृष्टिबाट हेर्दा कृषिबाट देशको विकासमै कायापलट आउने गरी प्रभावदिन सक्ने क्षेत्र एरोमेटिक र मेडिसिनल भ्यालु बोकेका वनस्पति र जीवाणु नै हुन्। नेपाल संसारको आधा जनसंख्या बोकेको भारत र चीनको बीचमा छ। हातमा मनरथे पैसा बोकेका आधाभन्दा बढी युवा रहेको भारतको दुई तिहाइ जनसंख्या शाकाहारी छ। नेपालमा सजिलै बन्ने एरोमेटिक र मेडिसिनल कच्चा पदार्थमा आधारित शाकाहारी र भेगन खाना र कस्मेटिक सामग्रीका लागि भारतमा आश लाग्दो बजार छ। नेपालमा सजिलै उत्पादन गर्न सकिने लेउ, भ्याउ, कीरा, जडिवुटी लगायतका लागि चीन स्वर्ण बजार हो। आजको चीन धनी मात्र हैन, प्रत्येक नागरिकसँग राम्रै डिस्पोजेबल मनी पनि छ। त्यसैले आज अमेरिका, क्यानडा जस्ता मुलुक पनि चिनियाँ बजारमा यिनै सामग्री पैठारी गरी व्यापार व्यवसाय गरिरहेका छन्।

संसारको आधा जनसंख्या रहेका भारत र चीनको बीचमा रहेको नेपालको समस्या एग्रो-फुड इनोभेसनको उत्पादनका लागि बजारको हैन, उत्पादनमा भ्यालुएड गर्ने ज्ञान र गुणस्तरमा नियमितताको व्यवस्थापन गर्न सक्ने क्षमताको हो। त्यसका लागि मुलुक भित्र इनोभेसन संस्कृतिको विकास हुनैपर्छ। त्यसको अनिवार्य शर्त भनेकै स्मार्ट एग्रो-फुड इनोभेसनको सुपर क्लस्टरको परिकल्पना, स्थापना र व्यवस्थापन हो। उक्त खाडल पूर्ति गर्ने अभियानको सुरुवात स्वरूप यो डायस्पोरा-ब्याकएग्रो-फुड इनोभेसनको सुपर क्लस्टरको सिम्पोसियम आयोजना गरिएको छ।

# High Potential of Natural Rubber Farming in Nepal for Economic Sustainability

■ **Tilak Bhandari**

*Institute of Rubber & Jatropha Research-Nepal  
Texas, USA.*

Nepal, the 44th rubber growing country in the world, began farming of natural rubber, *Hevea brasiliensis*, as a pilot project in 1989. The Gorakhkali Rubber Industries, collaborating with the Jhapa-based company M/S Sudha Falrus, imported four types of *Hevea* clones (varieties) from Assam, India in cooperation of Indian Rubber Board, Kerala. Nursery was established in 1989 and experimental fields were planted encompassing 6 hectares at different locations in Jhapa, Morang, Sunsari and lower parts of Ilam districts. Gorakhkali Rubber Industries initiated rubber farming feasibility study in collaboration with Government of Nepal mainly involving Ministry of Forests and Soil Conservation, Ministry of Agriculture Development, and Rubber Board of India. Among the tested clones, RRIM-600 was found the best compared to RR11-105, GT1 and PB-86. Compared to traditional farming, income generation opportunity increased by 100 to 300% to the growers of rubber farming. It is considered a highly profitable enterprise attracting the attention from farmers, forestry users' groups, local companies, cooperatives and other stakeholders. Its major bottlenecks are lack of government support and rubber regulation, lack of technical manpower, unavailability of credit program for rubber farmers, lack of coordination among growers and buyers, lack of rubber institution, marketing agencies and government bodies. Texas-based Institute of Rubber and Jatropha Research-Nepal (IRJR-N) [www.irjr-n.org](http://www.irjr-n.org) was established in 2010 that focuses on coordinating and supporting all relevant agencies in all technical aspects of rubber development and also advising the Government in related matters. Nepal imports \$70-80 million rubber and rubber related products per annum, but the current domestic production is limited to 1,000 hectares (225 rubber gardens) of rubber plantation with annual production of 750 metric ton of dry rubber valued at NRs 150 million. The country has a potential of rubber farming to 15,000 hectares or more, producing 30,000 metric tons of dry rubber to the tune of \$100 million annually at current value for up to 25-27 years of a crop cycle. Commercial rubber farming can bring multiple benefits such as new jobs, new products like rubber honey, rubber wood, rubber oils, along with environmental development and some natural rubber export potential.



## Focussed Session 2, 3: Returnee Professionals, Scholarship and Research Funding

**14 October 2018, Time: 13:50-18:10, Hall: TBC**

*Coordinator: Dr Devi B Basnet, Medytox, Inc., South Korea*

A sizable population of Nepali professionals are pursuing higher education, training and career overseas. After gaining a lot of advanced knowledge and expertise, they are returning to their homeland to continue with their previous careers or to hold new opportunities. This session will highlight the contribution of these professionals in the development of Nepal. It will also bring the real life experience of returnee professionals with regard to the opportunities they see and challenges they face in continuing their research in Nepal.

### **Focus:**

Overseas Education, Returnee Professionals, Contribution to Nation's Development, Opportunities in Nepal, Challenges Faced by Returnee Professionals, Updating Government Policies.

### **Background:**

For many decades, Nepali scholars are traveling to developed countries in pursuit of higher education and advanced trainings. After completing their education and research, they start new careers and provide crucial human resources to the development of these countries. Probably due to the lack of competitive and comparable opportunities in Nepal, an overwhelming majority of them tend to settle there permanently. Fortunately, in recent times, some of them have started coming back to Nepal. One can imagine that the process of coming back and transitioning to continue their research is not easy. This session will invite some of these returnee

professionals to share their real life experiences.

The session will particularly explore the kind of opportunities that are starting to emerge in Nepal and how they are able to attract the highly skilled professionals. It will also discuss the contribution of the returnee professionals on overall development of Nepal.

Nepali citizens embraced significant political changes in the form of democratic Republic and decentralized governance. But, as we all know, we are far behind the economic growth rate of our neighboring countries. To meet the developmental aspirations of the people and to push upward the economic growth of the country, Nepal urgently needs a lot of skilled professionals. If we could encourage the Nepali experts living around the world to comeback and contribute to the Nepali economy, we could make a significant progress. For this to happen, the Government of Nepal has to introduce changes on its policies to create more new and attractive opportunities and create conducive environment for research. The session will also brainstorm this important topic of interest to Nepal.

**Themes:**

This session will showcase how Nepali professionals who have returned from their overseas trainings are contributing to the development of Nepal. The focus of this session will be:

- To assess the geographical distribution of Nepali professionals in the world
- To understand from where around the global these professionals are returning to Nepal
- To highlight the impact of returnee professionals on the development of country
- To share the opportunities seen and challenges faced by them in Nepal
- To suggest ways for creating more opportunities and facilitating smooth transitioning

## PROGRAM

<b>Focussed Session 2, 3: Returnee Professionals, Scholarship and Research Funding</b>				
<b>14 October, 13:50-19:10, Madhavi Hall</b>				
<b>Session A: Returnee Professionals, Opportunities Seen and Challenges Faced in Nepal, Moderator: Dr. Devi B Basnet</b>				
<b>Time</b>	<b>Speaker</b>	<b>Speaker</b>	<b>Topic</b>	<b>Institute</b>
13:50-14:00	Speaker	Narayan Adhikari, Prof	Experience of establishing a world-class research laboratory in Nepal - How diaspora can contribute	Central Department of Physics, Tribhuvan University, Germany Returnee
14:00-14:10	Speaker	Prajwal Rajbhandari, Mr	Opportunity and challenges faced by Nepali researchers and scientists to kickstart and run a research institute in Nepal	Research Institute for Bioscience & Biotechnology
14:10-14:20	Speaker	Rabindra Dhakal, Dr	The knowledge and skill transfer using different appropriate technologies to the communities and academic sectors: Scope for global networking	Nepal Academy of Science and Technology, Nepal, Japan Returnee
14:20-14:30	Speaker	Merina Ranjit	TBA	COO, Chaudhary Foundation, Returnee NSU
14:30-14:40	Speaker	Pratik Adhikari, Dr	Migration for development: Skill transfer, employability and entrepreneurship of returnee labour migrants in Nepal	Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal
14:40-14:50	Speaker	Mohan Shrestha, Mr	Transferring skills learned in Middle East to Nepal	President, Mayur Yatayat Pvt. Ltd.
14:50-15:00	Speaker	Binod Ghimire, Mr	Bringing farming skills from Israel to Nepal	Returnee farmer from Israel
15:00-15:10		Pasma Dahal JHA, Mrs	CIM program migration for development: Harnessing potential of migration for sustainable development	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
15:10-15:30	Discussion and Q&A			
15:30-16:00	Tea break			

## PROGRAM

<b>Session B: Scholarship and Research Funding, Moderator: Dr. Nabin Dahal/Dr Hari Dahal</b>				
<b>Time</b>		<b>Speaker</b>	<b>Topic</b>	<b>Institute</b>
16:00-16:15	Speaker	Rewati Prasad Parajuli, Mr	Overview of overseas scholarships and fellowships program	Under Secretary, Scholarship Section, Ministry of Education, Nepal
16:15-16:25	Speaker	Deepak Kumar Khadka, Dr	Prospecting research funding in higher education of Nepal	University Grant Commission
16:25-16:35	Speaker	Ramila Raut, Mrs	Research funding opportunities offered by NAST	Nepal Academy of Science and Technology
16:35-16:45	Speaker	Kabita Thapa, Ms	DAAD fellowship for academic exchange between Germany and Nepal	Representative from German embassy Nepal
16:45-16:55	Speaker	Sunita Gurung	Australian scholarship and fellowship	Australian Embassy, Nepal
16:55-17:05	Speaker	Ranjan Prakash Shrestha, Mr	Erasmus Mundus program, European Union Nepal mission	European Union
17:05-17:15	Speaker	Saurav Dhakal, Mr	Netherlands Fellowship Program (NFP) for developing country	Netherlands embassy, Kathmandu, Nepal
17:15-17:25	Speaker	Kishor Shakya, Mr	Activities of AIT Alumni	AIT Alumni in Kathmandu, Nepal
17:25-17:35	Speaker	Nahendra Pradhan, Mr	Activities of Russian Alumni	Russian Alumni, Kathmandu, Nepal
17:35-17:40	Speaker	Umed Pun	Activities of Nepal JSPS Association	Nepal JSPS Alumni Association (NJAA)
17:40-18:10	Discussion and Q&A			
18:10-19:10	Poster			
19:10	Dinner			

# Opportunity and challenges faced by Nepali researchers and scientist to kickstart and run a research institute in Nepal

■ **Prajwal Rajbhandari**

*Research Institute for Bioscience & Biotechnology*

Nepal falls under science and technology lagging countries category. Nevertheless it is rich in nature resource and biodiversity where biotechnology can play a role in order to boost its economy in the near future. Being a third world country, science and technology is still at early stage but country is now gearing up for collaborative scientific projects in different field of life sciences from medicine to pharmaceuticals to food science. Along with that, Nepal has taken some steps toward pushing science and technology, research and its applications for the benefits of its citizens through opening of different new departments and allocating a higher budget then before through its line agencies. Talking about establishing a private research institute in the country, it is a daring job but can be achieved, if we can team up and use gained knowledge and networks of diaspora leaving and trained abroad and inside the country. There are few setbacks to achieve this goal but few examples like Everest Biotech, Center for Molecular Dynamics Nepal (CMDN), Research Institute for Bioscience and Biotechnology (RIBB), Prarambha Biotech, Ficus Biotech showed that there is always a ray of hope at the end of the tunnel.

**Keywords:** Nepal, Science and Technology, Biotechnology, Research Institute

# The knowledge and skill transfer using different appropriate technologies to the communities and academic sectors: Scope for global networking

■ **Rabindra Prasad Dhakal**

*Faculty of Technology, Nepal Academy of Science and Technology*

The Nepal Academy of Science and Technology is entrusted with four major objectives: advancement of science and technology for all-round development of the nation; preservation and further modernization of indigenous technologies; promotion of research in science and technology; and identification and facilitation of appropriate technology transfer. Nepal has a history of Technology use for knowledge generation and implementation to serve the society. Hence, NAST took several pioneering initiatives to the nation by introducing several technologies such as ICT, Beehive Briquette, solar water pumping, and currently, biochar initiative, waste plastic to diesel, and lately nano-satellites launching in its own with collaborative works.

The communities always wish to see the unique technologies from the institutions of Science and Technologies like NAST to be implemented for their better livelihood, but they have enough reluctance not to use in long run because of lack of know-how of technologies. Because of lack of basic knowledge of such technologies, many people still think of science as magics. Hence, we believe that Nepal returnee working for communities using several sciences and technologies with pertinent knowledge and skill that make the people further amazed and make them more acceptable, which could be considered as positive point. In contrast, working with academic sectors in Nepal through the machineries like NAST or say government research center is little complicated as there is less collaborative culture among the academicians as hungry graduating students are not in the government agencies, however, they may have better access to the finance. Hence, mitigating both shortcomings is needed to generate the knowledge and implement for the society for the betterment for the nation, which could be anchored by Global network like NRN.

# Migration for development: Skill transfer, employability and entrepreneurship of returnee labour migrants in Nepal

■ Pratik Adhikari

*Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal*

Nepal has seen a dramatic increase in the number of migrants working abroad. Of the 26.5 million total population nearly 4 million are working abroad, primarily in Malaysia, the Middle East and India. Remittance is a mainstay of the Nepalese economy and is currently contributing nearly one third of the total Gross Domestic Product.

This Symposium addresses issues around the new skills, knowledge and ideas acquired from overseas employment and experience over and above the remittances. There is strong evidence that migration experience opens up channels to gain better paid employment and boost entrepreneurship in the country of origin. Skills, experiences and knowledge which the returnee migrants possess, can also be effectively transferred to and incorporated in, the home country through the teaching of new skills by migrants to non-migrants. These possibilities are highly significant to sending countries like Nepal with its vast majority of 'unskilled' or 'low-skilled' migrant workers.

Unfortunately, current migration policies and legislation in Nepal have not adequately recognised upon the potential of returnee migrants to achieve socio-economic related developmental goals. The key migration-related government instruments: Foreign Employment Act 2007; Foreign Employment Policy 2012, all target out-going migrants only. The Foreign Employment Promotion Board (FEPB) is an official government entity to implement skill transfer activities of returnee migrants; however, no significant activities appeared to have been carried out to date.

There is no mechanism for collecting systematic information on skills of returnee migrants and assisting them to re-integrate into the domestic labour market. Furthermore, there has been no research in Nepal on the impact of the out-migration of unskilled, semi-skilled, and skilled workers. This all suggests the need for further research focusing on the positive impacts (skill transfers, entrepreneurship) of returnee migrants as well as the negative impact (skill shortage/skill lost/skill redundancy) of out-migration on the Nepalese labour market.

This Knowledge, Technology Transfer and Innovation Section Symposium will offer current considerations on the relationship between migration and skill transfers/entrepreneurship, viewed through a life course lens and offering research and practice viewpoints.

# Scholarship and Funding

*Coordinator: Dr Nabin Aryal, Aarhus University, Denmark*

Principally, providing scholarship in university/learning institutes to keen/interested scholars have been well know phenomenon around the world to encourages the students in their study/research for personal or organizational or country benefit. Historically, many Nepalese scholars received scholarships through the Colombo Plan, which was established by Commonwealth of Nations in 1951. Since then many scholarships have been offered from different agencies of Nepal and aboard to develop the human resource of different disciplines. Importantly, the scholarship will develop knowledge that will strengthen the capabilities of individuals who carry the pride of one's nation at international levels. Thus, such agency has significant contribution in Nepalese Scientific communities. Furthermore, present generation are also eager to know about the requirement and information of scholarship providing agency/programs. In parallel, most of the scholar decide to stay in developed country rather returning back to Nepal. Hence, NRNA may play role to bring back our scholars along with their earned knowledge after completion of their higher education for shake of nation development with close coordination/monitoring with agencies/country aboard. In the first NRNA First Global Scholar Conference, a session will be conducted, where the role of scholarship agencies to enhance the Nepalese knowledge in diaspora will be discussed. In addition, representative of such agencies will be invited to put forwards their policies.

The session will focus on flowing themes

1. Role of scholarship providing agency to enhance the Nepalese knowledge and its implementation in Nepal.
2. Future prospective
3. Application and requirement to apply scholarship
4. Possible collaboration with Nepalese university to explore scholarship from abroad
5. Opportunity for PhD/Master scholarship in Nepal.

# CIM programme migration for development: Harnessing potential of migration for sustainable development.

■ **Pasma Dahal Jha**

*Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH*

With affordable tuition fees and living costs, Germany has become an attractive destination for Nepalese students since the last decade. However, the academic relationship between Germany and Nepal has a long history with many alumni heading reputed organizations inside and outside Nepal. With its world-wide reputation in science and technology, Germany primarily attracts many young STEM graduates from Nepal in spite of language barrier. As per the data by Statistische Bundesamt, there were around 1597 Nepalese students studying various subjects at the University and University of Applied Sciences in the winter semester of 2017.

Students returning back after the completion of their studies is also a general phenomenon in Germany. The reasons vary from personal choice to difficulty in adapting to foreign language. However, such returnees have been playing an instrumental role in enhancing the knowledge exchange between Germany and Nepal. The graduates from reputed universities in Germany are focussed in utilizing their knowledge and skills to bring about systemic change in their field of expertise, be it agriculture, energy, environment or IT across Nepal.

Apart from students at the universities, Germany also has a strong Nepali diaspora. With an estimation of around 6000 Nepali population living in Germany. The diaspora has been acting as a bridge between Germany and Nepal for knowledge and culture exchange.

Since 2003, CIM Programme Migration for Development has supported more than 200 returnees into successfully reintegrating into the Nepalese job market and has supported diaspora organization in executing short term projects focusing on knowledge exchange.

The presentation aims to showcase the success stories of Returning Experts from Germany as agents of change and successful diaspora collaboration. It highlights how one person in her/his individual capacity can create an impact, as our slogan says “One Person can Make a Difference”

# Prospecting research funding in higher education of Nepal

■ **Deepak Kumar Khadka**

*University Grants Commission, Sanothimi, Bhaktapur, Nepal*

Nepal's higher education needs a massive reformation to make it able to provide highly skilled manpower to nation's developmental need about to be created through popular aspiration and political obligation, and to sustain and progressively advance for future need and opportunities. Research activity in higher education serves to directly enhance the quality of teacher and students and to create the innovation milieu in academia and industry, and is, therefore, an integral part of the quality of higher education. Unfortunately, research is an enterprise pretty neglected by the universities and the state of Nepal. I will present the current status of the need and supply of research funding in higher education, and reform being led by the University Grants Commission. I will make suggestions for immediate and long term reform in research funding, quality assurance and expansion of research in Nepal.

# Mitra Kunj-Alumni association of Soviet graduates and Russia

## ■ Nahendra Pradhan

Diplomatic relation between the then Soviet Union and the Kingdom of Nepal was established in July 9 1956. King Mahendra visited USSR from June 4 to 26, 1958 at the invitation of the then president of USSR Mr.K.E.Voroshilov. Agreement and MoU were carried out between two countries in different disciplines including scholarships for higher education. In 1959, 15 Nepalese students left for Moscow for higher education in the USSR. In 1960, another 15 Nepalese students left for Moscow for higher education in USSR. After this, there were opened many channels students going to USSR for higher studies and no of students were increased.

The first Nepalese graduates were Dr. Hari Man Shrestha and Dr. Anand Bahadur Thapa.

In 1963, Nepalese students studying in the USSR decided to create a library of Russian books in Kathmandu. Students started to raise fund 2 Rubles per year from each student. Library was run by Nepal Soviet Friendship Association in Nepal which was established in Basantapur.

In 1967 Mitra Kunj was established in the leadership of Mr.Nilamber Acharya. This was the first Alumni association in Nepal.

In 1968, Mitra Kunj helped Nepal Soviet Friendship Association to conduct Russian language class for the Nepalese students. Er. Madhav Prasad Sharma and Er. Rajendra Bahdur Adhikari were first tutors of Russian language.

Main objectives of Mitra Kunj are to unite ourselves (graduates from Soviet Union) and put our knowledge in the service of our country and people as well as strengthen friendship between Nepal and the then Soviet Union. Since 1967 to date many changes have taken place over these fifty years, but Mitra Kunj has not deviated from its noble purpose. Moreover, with the growth of the numbers of the graduates from Russia and other countries of the former Soviet Union, their contributions have grown in the nation building.

The contributions of Mitra Kunj members have been very appreciable mostly in the hydropower development sector, education sector, Infrastructure development sector, Agriculture development sector and health sector. Government leaders and officials have appreciated for their pivotal role in the development of Nepal.

Mitra Kunj has taken leadership role in the unity of Soviet graduates and Russia in the world. Mitra Kunj has organized Ist Asia meet program of Soviet graduates in 2004. Mitra Kunj is familiar with Alumni associations of Soviet and Russian graduates of the world. Mitra Kunj had celebrated its 50 years establishment with the international delegates in May,

2017. It has earned excellent image among the delegates of Russian and International alumni associations.

At present, Mitra Kunj is organizing different seminars, workshops with local governmental and Nongovernmental organizations in scientific and humanitarian sector. Last year we had organized scientific seminar on Future Energy in association with Don technical university Rostov, Russia and Nepal academy of Science and technology, Nepal. This year Mitra Kunj is organizing a one day seminar on Future Material and Technology with Kathmandu University and Don technical University Russia. Recently Mitra Kunj had organized seminar on “Knowledge Management and Intellectual Property rights in Nepal “. Mitra Kunj is rich on human resources and specialists in different disciplines. Mitra Kunj in the path of “Think tank Group” of the Nation.



## Focussed Session 4: Innovation and Private Investments

13 October 2018, 19:30-21:10, Marva Hall

*Coordinator: Dr Hari Prasad Dahal, American Physical Society, USA*

The central aim is to develop a Platform for Pitching Innovative Ideas to Solicit all forms of Capital (human, financial, technological,.. ) for skill and knowledge-driven product development and commercialization. The platform will be accessible to any Innovative Projects that will be developed in Nepal and will help Nepali Economy.

### **Focus:**

Innovative Projects, Capital Investment, Product Development, Commercialization

### **Background:**

“The graveyard is the richest place on earth, because it is here that you will find all the hopes and dreams that were never fulfilled, ....., the inventions that were never shared, ....., all because someone was too afraid to take that first step, keep with the problem, or determined to carry our their dream.” Les Brown. It speaks volume to the tremendous difficulties innovators face to bring their ideas into reality. Many innovators fail (due to fear) in that first necessary step by which they could at least share their ideas to somebody else, who could help them convert the ideas trapped in brains into real products. The fear is natural because the innovators asks many questions at once: is my idea of any value? will it work? is it already realized? is it realizable? will anybody help me? who will help me? what are the steps I need to follow? do I have the right expertise? how do I find capital? and so on. The degree of difficulty addressing these questions are much bigger in developing countries like ours.

NRN and National Entrepreneurs are fully equipped to introduce a tangible solution to these challenges. Millions of NRNs scattered around the world already posses tremendous amount of expertise in almost every field of product commercialization, be it Idea Patenting, Patent Law, Corporate

Law, Information Technology, Product Design, Product Prototyping, Product Distribution, Marketing, Accounting, Capital Solicitation, Capital Investment,... Nepali experts live and breath product creation and marketing in the local and/or regional market. We can find answer to every question an innovator faces, and introduce Nepal-made products in local and global markets, if we work collaboratively. All we need now is a platform where the innovators and potential capital investors come together and brainstorm on new ideas. The proposed closed door session aims to achieve this goal. In the future, this platform can be (if successful, will be) expanded/converted into electronic platform that can be accessed remotely and globally.

This type of platforms serve a bigger purpose than just brining innovators and investors together. Successful entrepreneurs (i.e., potential investors) can inspire and enable new and young generation of entrepreneurs by guiding them through the process of establishing a new business. This can not only bring change in somebody's life but also help Nepali economy.

The session is proposed to be organized in a closed-door format to protect the intellectual properties of the innovators, and all financial information of the innovators/capital investors.

**Themes:**

To bring innovators and potential capital investors (NRN & Resident Nepali) together.

**Eligibility criteria:**

All Nepali including NRN innovators are eligible to access this platform. We particularly encourage participation of young innovators who do not have easy access to capital investment. The proposed investments, and products and services development have to be implemented in Nepal.

## PROGRAM

<b>Focussed Session 4: Innovation and Private Investments</b>				
<b>13 October, 19:130-21:10, Marva Hall</b>				
<b>Moerator: Dr Hari Prasad Dahal</b>				
<b>Time</b>		<b>Speaker/Panelist</b>	<b>Topic</b>	<b>Institute</b>
19:30-19:35	Introduction	Hari Prasad Dahal, Dr		American Physical Society
19:35-19:50	Contributed	Manoj Adhikari, Mr	Security through technology	Tribhuvan University, Kathmandu, Nepal
19:50-20:05	Contributed	Hanna Yim, Ms	The Need for enabling remittances as a critical source of development finance for Nepali migrant workers in South Korea	Korea International Cooperation Agency (KOICA)
20:05-20:20	Contributed	Tara Sigdel, Dr	Establishing a “biobank” in Nepal that will serve as a resource of clinical specimen to the rest of the world	University of California, San Francisco, USA
20:20-20:35	Contributed	Ram Rimal & Laxman Rimal	Voting machine and public transport management	Technology sales, Lazimpat, Nepal

# Security through technology

■ **Manoj Adhikari, Monika Prajapati, Utsabi Dangol**

*TU University*

Nepal is one of the most peace loving nations around the globe and renowned for its second to none culture in hospitality. But it is quite surprising to know the statistics released by Nepal Police which shows that the country recorded 31,462 incidents of crimes in the fiscal year 2015-16 compared to 28,070 in the previous fiscal year with an annual increase of 10.15 percent. The records include cases of rapes in majority along with accidental homicides, drug paddling and murder. This has been a topic of prime concern for the whole nation. Recent studies indicate walking alone at night has a moderate risk in Nepal which has contributed to a significant rise in criminal activities. If we can minimize a certain percentage of this risk, it will be possible to contribute in reduction of criminal activities.

ICT has always been addressing different social problems and we cannot deny its use in controlling criminal activities. This paper discusses about an application which would be generated with first hand data collected from secure authorship to help notify users about the density of crime in different regions. This will help the users to choose safe routes with low crime density. In addition, it will also inform the users about the statistics related to crimes such as rapes and robbery in their periphery. It can assist in improving the status of social security in the society to some extent. The research will draw a conclusion based on data collected through various sources including police stations and victims to analyze the frequency and concentration of crime in a specific region. This research aims to avoid the misfortune to anyone and curtails uninvited risks that occurs in crime hotspots. In addition, users will be able to locate nearby hospitals or police stations during emergencies. The listed contacts can also be notified during the hours of necessities. The paper provides the aid to the social security by the approach of efficient research along with the use of applicable technology.

**Keywords:** Social Security, Data Collection and Data Analysis, Crime Prevention Application

# The need for enabling remittances as a critical source of development finance for Nepali migrant workers in South Korea

■ **Hanna Yim**

*Strategy and Policy Planning for Development Programs Department, Korea International Cooperation Agency (KOICA)*

Remittances from Nepali diaspora, particularly those who work abroad and send their income to Nepal, are one of the most important development finance sources. In general, development finance is considered a mixture of diverse financial resources such as official development assistance (ODA), foreign direct investment (FDI), tax revenues and remittances. In case of Nepal, remittances appear to be more critical to its macro-economy since remittances are nearly six times bigger than its received ODA. According to the World Banks data, as of 2016, Nepal received USD 1.065 billion of ODA while USD 6,611 billion (28% of its GDP in 2017, the worlds 5th) of remittances were sent to Nepal. In this regard, Nepali economy greatly depends on its received remittances and foreign employment is one of the livelihood strategies for its people. Majority of Nepali migrant workers have worked in Malaysia and Gulf Cooperation Council (GCC) countries including Saudi Arabia, Qatar, UAE, and Kuwait. However, more recently, South Korea has become a desired destination for Nepali migrant workers. The governments of South Korea and Nepal signed a bilateral agreement on the Employment Permit System (EPS) in 2007.

The Korean government established in 2004 the EPS which is a scheme for unskilled migrant workers to work in SMEs of agriculture, construction and manufacturing industries of South Korea. The EPS is greatly preferred by migrant workers from many developing countries because the EPS guarantees equal conditions for migrant workers, including basic labor rights, employment insurance and legal minimum wages. As a result, the EPS guarantees the workers to earn at least 12,600 US dollars per year which is relatively higher than the wage of a few other countries. According to the Ministry of Employment and Labor, there are 50,837 migrant workers from sixteen countries registered under the EPS. Once migrant workers are permitted by the EPS, they are allowed to legally stay and work in Korea for five years on Average. In addition, The amount transferred by migrant workers in Korea during the recent 5 years to their countries (mainly 9 countries - Nepal, Mongolia, Bangladesh, Vietnam, Sri Lanka, Indonesia, Cambodia, Pakistan, and Philippines) is USD 3.7 billion. On average, 8,000 Nepali migrant workers come to

Korea each year through the EPS. A study carried out by International Organization for Migration (IOM) and Ehwa University and commissioned by Korea International Cooperation Agency (KOICA) in 2015 pointed out some issues around remittances of Nepali workers in Korea. First, 90% of Nepali migrants in Korea are using informal money transfer measures. It is mainly because most of migrant workers in Korea are partially excluded from formal financial services ecosystem in Korea. Many services, both on-and off-line, are only available in Korean or English language. In particular, banks have not been actively making efforts in reducing remittance cost in Korean market. Second, according to the research, one of the major objectives why Nepali migrants in Korea send money, even very regularly, is to save money for starting business when they return.

When Nepali migrant workers return to their home country they are less likely to continue productive economic activities in Nepal. In Korea, Nepali workers normally work in labor-intensive industries mostly in manufacturing facilities. However, manufacture industry is not developed in Nepal. As a result, skills the workers experience and learn in Korea are not utilized in Nepal. In this regard, many, approximately 50%, would like to do their own business after returning to their country. The first problem is currently being solved by some fintechs serving mobile remittance services targeting migrant workers customers in Korea. Such fintechs provide cheaper, faster, more convenient but also safe, as much as banks offer, remittance services for migrant workers in Korea. It would greatly contribute to making changes in money transfer ways most of migrant workers including Nepali workers in Korea previously depended on which is illegally done. While income of Nepali migrant workers is now being formally sent to Nepal, remittances received by their family members are not wisely utilized as a development finance resource. In this aspect, a discussion between public and private sector of Nepal and Korea needs to be initiated in order to find solutions for making better and sustainable development pathways for the future.

# Establishing a “Biobank” in Nepal that will serve as a resource of clinical specimen to the rest of the world.

■ Tara Sigdel

*University of California San Francisco*

## **Background:**

With rapid progress in biotechnology and growing impatience for identifying early detection biomarkers for diseases such as cancer, the world of biomedical research is moving with utilizing resources at an unprecedented pace. There is a consensus in the importance of personalized and precision medicine, which acknowledges differences in individuals and treats patients based on their individual response to the disease and medication. Because of this realization, an increased effort is put in the analysis and interrogation of bio-samples from individuals with diverse demography. Due to the presence of different ethnic communities that ranges from Tharus in the southern plain to Sherpas in the the Himalayan mountains, Nepal offers such population that is unique in the world for biomedical research.

**Method:** A biobank (also known as a biorepository or tissue bank) is a collection of biospecimens and their associated information. A biobank can be comprised of human, animal or environmental (e.g. seeds, viruses, soil etc.) biospecimen. In this proposal, only human biospecimens are considered. There is a global market of billions of dollars for clinical specimens from human. Big pharmaceutical companies are always searching for unique specimens that represents unique human race and ethnicity.

**Proposal:** Since, Nepal is diverse in terms of ethnicity and we clearly present unique population in the global human demography. Clinical samples that are collected for specific hospital/clinic test but are left over after the test could be invaluable resource to save and sell at the global market. That can be done through proper approval from government agencies to protect human privacy and through consenting. NRN and the Government of Nepal (GoN) could invest upfront in establishing a physical structure that can house such specimens. The specimens can be brought to global market through web portal. The revenue generated from this “biobank” could be used to support science research in Nepal.

**Expected Result/Outcome:** This ambitious project is high-risk high gain and needs support from both NRN/diaspora and GoN. Once established and with established connections with pharmaceutical companies in the US and Europe this will be a revenue generating machine for many years and decades to come providing necessary funds for research in Nepal.

# Public Transportation Management System

## ■ Ram Prasad Rimal and Laxman Prasad Rimal

*Technology Sales Pvt. Ltd.*

*Ramlaxman Innovations Pvt. Ltd.*

Transportation is one of the toughest challenge that Kathmandu, Pokhara like cities and regions across the nation are facing. Already today, 6 million of the Country's population lives in Kathmandu. Passenger information is the largest segment at around 4 million in Kathmandu city daily. At the same time, leading public-transport operators in the Nepal, such as Sajha, Mahanagar, Mayur are exploring new opportunities created by digital technology to increase their efficiency and differentiate the passenger experience. Some of the operators are using GPS tracking and location announcement technology for making their service distinct from others and trying to catch.

Connected solutions for shared passenger transport services such as bus, microbus, and tempo includes applications for connected vehicles and related infrastructure, such as passenger information, route information, bus stops, ticketing & payment systems, geographic based on-bus advertisement and many more.

Public transport operators can increase their profitability through higher operational efficiency and new revenue streams that are new for their business. Right now most of the public transport operator are in operational loss due to the cash based payment. We want to collaborate with investors to automate the system which is being run in traditional way.

# Electronic Voting Machine

## ■ Ram Prasad Rimal and Laxman Prasad Rimal

*Technology Sales Pvt. Ltd*

*Ramlaxman Innovations Pvt. Ltd.*

Most of the developing countries have traditional paper based ballot in their election. During the process of election, there are so many flaws, proxy voting and long counting time. Last time in Nepal, some of the voting count takes nearly 1-month period for result. During the tedious counting process, manipulation on result is easily be possible. If candidates want to recount, its impossible to count again in practical ways even there is provision by law. Large number (up to 15%) of votes were void. The expenses of voting in such countries are increasing so much that Nepal spent around 12% of National budget in our election in last year. We have used a paper ballot having size of around 1 square meter. It has a huge environmental impact too . So the need of electronic technology in voting process is must.

We have designed a voting machine and implemented around 61 very complex elections including NRNA for the 2nd time. We would like to expand our production for mass use.

# Knowledge and Innovation Americas Regional Conference Report

NRNA ICC's Regional North and South America Knowledge Conference  
San Francisco, USA  
June 16, 2018

White Paper (Executive Summary) Preparation Committee: Coordinator: Dr. RudraAryal\*; members: Er. Pashupati Pandey, Er. Satish Tripathi, Dr. Tara Sigdel, Dr. Desh Raj Sonyok, Dr. ToyaBaral, Dr. Krishna Hari Gautam, Mr. BhimKarki, Dr. BasantaDhungana;

Advisors: Dr. Puru Shrestha, Dr. Amod Pokhrel, Dr. Yadav Pandit, Dr. Ambika Adhikari, Dr. Shiva Gautam, Dr. Drona Rasali, Mr. Shiva Rai, Mr. Haribol Bhandari, Er. RatanJha, Dr. Laxmi Pathak,

NRNA ICC America regional Coordinators Gauri Joshi, DRC NabinSerchan, NRNA USA chairman Dr. KeshabPaudel and NRNA USA committee members, ICC member DilliBhattarai, NRNA Canada Chairman GopikrishnaKaphle and team members.

*Correspondence: aryalr@franklinpierec.edu*

## **Introduction:**

The first Nepali diaspora's North and South America regional Professional Expert Conference on Skill Knowledge and Technology Transfer in Nepal was held in San Francisco, USA on June 16, 2018. Non-Resident Nepali Association, International Coordination Council (NRNA-ICC) organized this regional conference.

## **The main objectives of the conference were to:**

- Identify and document professional experts in the region.
- Identify professional knowledge and experience that can be tapped and implemented in short and long-term social, scientific, economic and professional growth in Nepal, especially to add value in GDP growth to 8-9 % per annum.
- Identify Nepali skills and Nepali products from Nepal to market abroad, e.g., setting up a Nepal House concept, promote Nepali music and cinema in the region.
- Create a "pathway or process" to implement or develop a partnership for a mutual benefit.

More than 200 participants attended the conference, where some 50 professional/experts from the region presented papers on seven different symposium topics aligned with the National Development Policy of Nepal.

The conference was attended by Government of Nepal (GoN) delegates led by Hon. Minister Rabindra Adhikari, HE Ambassador from Nepal to the United States, Trade & Tourism Representatives from Nepal and the region, and NRNA ICC President Bhavan Bhatta and his entire team including Past President JibaLamichane.

Most of the conference participants have either worked in Nepal or now working in the region on the projects related to Nepal or relevant areas, which do have immediate application to the development of Nepal. Participants were highly enthusiastic, and willing to partner with the Nepali counterpart or vice versa. There was a clear desire to be part of the process to develop a “Path Way” or a “Road Map” so that every member of the diaspora can be part of the process with the help of NRNA.

Presentations and areas of discussions widely covered the important aspects of the socio-economic development of Nepal aligned with a short and long term national planning. This executive summary consists implications of presentations by different speakers, panel discussions, and suggestions offered in different symposiums of the conference. The important components of seven different symposiums are presented as below.

### **i. Symposium of Science Technology**

- Identifying and promoting scientific research to make Nepal a pivot of scientific creativity, innovation and promote the economic growth
- Application of Remote Sensing Technology in Natural Resources Management, Environment, and Climate Change
- Emphasizing the government’s effort to furnish networking and collaboration in between domestic and international science & technology educators and researchers
- Recognizing Country’s science and technology developmental policy as a valuable tool for sustainable socio-economy growth
- Identifying the suitable research topics that are suited for Nepal such as researches in herbal medicine and establishing a biobank that could provide valuable bio-samples to generate revenue that could be used towards supporting biomedical/biotechnological research in Nepal.
- Keeping the government’s high priority on science and technology research funding.
- Establishing a “biobank” in Nepal that will serve as a resource of clinical specimen to the rest of the world
- Developing A science and technology hub of Think Tank in the USA to Build a Partnership with Nepal
- Use of publicly available “big data” in health and medicine
- Technology in Material Engineering, 3D Printing, and Medical Science
- Emphasizing establishment of Integrated Open Data Center and data infrastructure
- Highlighting importance of integrated Planning tool to adopt Next Generation Development Model

### **ii. Symposium of Agriculture**

- Strengthening academic and research activities of counterpart institutions
- Diaspora’s collaboration with Nepali researchers to develop new innovative technology in specific areas such as agriculture biotechnology, seed technology, post-harvest technology-based agriculture

- Export promotional research such as Implementing interdisciplinary value chain approach to reduce hunger by minimizing toxins and nutrient loss in both high and low moisture food/feed products
- Agricultural policy changes such as adopt ecological land use planning and agricultural policy that will create an open and accessible environment to all farmers, agro-industrialists or farmer organizations, and consolidate agricultural land to increase agricultural productivity through the use of modern technology, cooperative and private lease farming.
- Strengthening food trade and increasing food resiliency to flood, drought, earthquakes
- Strengthening academic and research programs through health perspective on agricultural science of counter-part institutions
- Identifying research areas, technology-based agriculture, and new value products
- Developing an agriculture economic model to increase GDP
- New technology to reduce food toxins to complement to United Nations Sustainable Development Goals 2 (UNSDG 2)

### **iii. Symposium for Education and Development**

- Sharing Diaspora's research activities in Nepal
- Connecting Nepali Diaspora's strength to reform the Education Domain of Nepal
- Highlighting student's achievement, student's participation, and mentoring
- Emphasizing the role of teachers and respecting their performances
- Recognizing education for developing skills that enable students to find gainful employment
- Focusing on developing affordable and quality institutes to attract youth
- Education for developing skills that enable students to find gainful employment
- Opening the path for Community Colleges and vocational training

### **iv. Symposium of Urban Planning and Public Safety**

- Opening path for the diaspora to join in planning and developing livable cities
- Adopting public safety for all including for people with disabilities and the elderly People
- Designing to counter natural disaster such as earthquake
- Delivering Billion Dollar Projects – Adopting the American Approach for managing large-scale infrastructure and Development Projects
- Managing a large scale Development Projects and Infrastructure

### **v. Symposium of Health Science**

- Improving Public Health by reforming health policy, a collaboration between America Nepal Medical Foundation (ANMF) and GoN and other relevant institutions.
- Ambulance services and Emphasizing ambulance attendants training
- Underlining importance of translating evidence into practice

- Tackling public health challenges
- Stressing for anew next-generation technology and business model managed the supply chain, delivery of medicine and medical equipment

#### **vi. Symposium of Social Empowerment**

- Harmonizing the plan to prepare active citizen and volunteer
- Developing citizenship curriculum in the school as a credit course
- Training local representatives to empower local people

#### **vii. Symposium of Environment, Renewable Energy, natural resources and Tourism Environment**

- Promoting environmental education, awareness, participation and behavioral change
- Developing and Implementing new policies and technologies to combat degrading air pollution
- Launching public awareness over environmental Injustice, transportation of air pollution, water pollution, soil pollution, over Nepal
- Educating people of impact of environmental pollution on Human life, Industries. Society and National Economy
- Solution and Management - Collaboration and Technology Development
- Developing and Implementing New Policies and Technologies to Combat Degrading pollution over Nepal such as air Pollution
- Launching public awareness over Environmental Injustice, Trans-Boundary air Pollution in Nepal

#### **Renewable Energy**

- Recognizing renewable Energy as acritical component for economic development
- Underlining needs of development, demonstration, and implementation of renewable energy

#### **Tourism**

- Promoting Tourism in Nepal abroad to meet national target 2 million visitors per year by 2020
- Improving Tourism Industry Legislature and improve logistic support
- Emphasizing the role of NRNA for promoting tourism in Nepal

#### **Natural Forestry Resources**

- Understanding Forest Resources and Management – Learning from North America
- High-value low volume medicinal forestry resources, which is great demand in the western world

# Summary of the Oceania Knowledge Conference 2018

The Oceania knowledge conference was held on 15th September 2017 at Park Royal hotel in Sydney in the pretext of NRNA global knowledge conference to be held in Kathmandu from 12-14th October.

The conference provided a great opportunity to Oceania diaspora community to share and exchange ideas on potential projects for Nepal. There were altogether eight presentations on a wide range of topics from Agriculture, health, infrastructure to disaster. The meeting was inaugurated by Her Excellency Lucky Sherpa followed by an opening remark by the Oceania Regional Co-Ordinator (RC) Dharam Raj Adhikari. The conference was initiated by Mr. Dinesh Joshee by welcoming all the guests including Consul General NSW, Mr. Deepak Khadka, NRN ICC General Secretary Dr Badri KC, NRN Australia president Tonnou Gothane. Dr Raju Adhikari, NRN Academy co-chair and member of the organizing global conference committee provided an overview of NRN SKI activities and aim of the global conference. Deputy regional coordinator, Mr. Lok Nath Poudel from New Zealand delivered welcome speech for the session.

The following papers were presented during the afternoon session facilitated by Mr. Hom Pandey and Ms. Babita Shrestha.

1. **Corruption and its control:** The effective way to control corruption is to implement open government policy when Government, civil society and media work together. Democratic and transparency are the key. Presenter- Mr. Babu Raja Maharjan (NZ)
2. **Infrastructure**
  - a) Railway – Strategic projects like East West (heavy haul) will integrate all the states and it should be continued. It provides 5 connections to South, and 2 connections to North preferred. Presenters- Bhupen KC, Dr. Amit Bhattarai
  - b) Smart Traffic Engineering – NRNA Forum can be used to fill skills and knowledge gap required for Smart Traffic Engineering to make a better traffic road system in Nepal. Presenters- Dr. Partha Parajuli, Mr. Ananta Karki
3. **Medical**
  - a) Radiation Oncology - a) Cost effective and better technology to treat Cancer patients in Nepal. Presenter- Dr. Dilli Banjade
  - b) ANMDA Nepal medical Exchange Program. Presenter- Dr. Kush Raj Shrestha
4. **Agriculture**
  - a) Micro seed potato production- Presenter- Dr. Keshav Kandel
  - b) Agriculture Sustainability & Food security in Nepal– By- Dr. Jagadish Timisina
  - c) Provision of crop and livestock insurance for promoting agriculture sector in Nepal.

**Presenter:** Ram Raj Oli (NZ)

At the end of the knowledge sessions, the conference resolution was presented by Ms Babita Shrestha and Hom Pandey. Conference resolution highlighted strong Oceania interest and commitment to present above papers in global conference and encourage Oceania NRNs to take lead to implementing some of the ideas presented.

The meeting also included Youth program led by Mr. Rishi Acharya and Mr. Dharma Adhikari, where Oceania youth shared their vision and issues faced by student and migrant youths globally. NRNA ICC constitution session was run by Ms Janaki Poudel where General Secretary Dr. Badri KC & ICC constitution co-chair Mr. Bhabani Oli presented the proposed amendments and collected feedbacks from the participants.

RC Mr. Dharma Raj Adhikari closed the session with closing remarks and, on behalf of Oceania team, thanked all the ICC team members, presenters, panelists, participants and sponsors for their contribution and help to make this conference a great success.

<b>Technical Session on Knowledge and Skill Transfer</b>			
<b>11th European Regional Meeting, 29-30 July 2018, Luxembourg</b>			
<b>Chair: Hon. Pradeep Gyawali Panel</b>			
<b>members: Dr Baburam Bhattarai, Dr. Surya Pathak, Mr Ram Thapa</b>			
<b>Program</b>	<b>Speaker</b>	<b>Country</b>	<b>Affiliations</b>
Program start and facilitator	Dr. Hem Raj Sharma	UK	
First NRN Global Knowledge Convention	Mr. Kumar Pant	Germany	Vice President NRNA, Advisor NRNA
Welcome speech	Mr. Ram Pratap Thapa	Germany	Hon. Consul General of Nepal, Germany, Patron NRNA
Knowledge, Innovation and Entrepreneurship in Nepal's Cultural Perspective	Dr. Pramod Dhakal	Nepal	Chair NRNA Academy
Local Resources, Appropriate technical and social Innovation Communication	Dr. Denis Blamont	France	Research fellow at CNRS (French National Council for Scientific Research)
Germany's experience with renewable energy - could it be useful for Nepal	Prof. Dr. Ram Chandra Bhandari	Germany	Institute for Technology and Resources Management in the Tropics and Subtropics
Waste management technology transfer in Nepal	Dr. Nabin Aryal	Denmark	Post-Doctoral researcher Aarhus university Denmark
Potential export based Agriculture products and their trade for economic development of Nepal	Mr. Amit Kumar Basukala	Germany	PhD candidate, University of Bonn
Cancer treatment Technology in Belgium; How to transfer in Nepal	Dr. Raju Prasad Srivastava	Belgium	Medical Physicist, University of Ghent
Dual Vocational Education	Er. Pawan Dhakal	Germany	Voith, Germany
Building construction technology transfer from Denmark	Kul Raj Sharma	Denmark	Director, ITOffer. DK Denmark
A road map to Applied Education System, the need for developing countries	D.P. Mainali	Netherlands	
Techno Business management	Mr Roshan Pokharel	Russia	Pokharel Consulting Help developer, Russia



Mr. Frank McGuire

Congratulations on the First Global Knowledge Conference being held in Kathmandu, in October 2018.

Thanks to the organising committee for inviting me to deliver a plenary lecture on Technology and Innovation, which are not just part of my responsibilities in Government but also personal passions. This conference is vital and timely given Nepal and Australia's increasing economic and educational ties.

Australia is internationally acclaimed for leadership in research and development, so the conference is important in providing opportunities to explore further cooperation. Key topics concerning health, manufacturing, agriculture, energy and the environment are crucial to the economic and cultural development of our countries.

A feature of this conference is increasing investment in research and development. This focus is strategically important for Nepal to attract investment and closer ties in skills and technology, providing outstanding opportunities for collaboration with Victoria.

I'd like to acknowledge the collaboration between the Non-resident Nepali Association, academic institutions and the Government of Nepal in delivering this conference.

*Yours faithfully,*

A handwritten signature in black ink that reads "Frank McGuire". The signature is fluid and cursive, with the first name "Frank" being particularly prominent.

FRANK MCGUIRE, MP  
Government of Victoria, Australia  
Member for Broadmeadows  
Parliamentary Secretary for Medical Research  
Parliamentary Secretary for Small Business & Innovation

# Acknowledgements

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Dr Indira Tiwari

Mrs Preeti Sharma

# 1<sup>ST</sup> NRN GLOBAL KNOWLEDGE CONVENTION

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**Kumar Panta**  
NRNA Vice President

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