# Connecting from Space to Village

## Enabling Climate Policy and Actions in the Himalayas

## གནམ་སྟོང་ལས་མི་ཡུལ་བྱི་འབྲེལ་མཐུན་

ཧི་མ་ལ་ཡ་ནང་གནམ་གཤིས་ཀྱི་སྲིད་བྱུས་དང་བྱ་བ་ཚུ་ ལྟོགས་གྲུབ་ཅན་བཟོ་བ།

ICIMOD

FOR MOUNTAINS AND PEOPLE

## International Symposium and Side Event Programme

14-19 November 2011, Thimphu, Bhutan

Climate Summit for a LIVING HIMALAYAS Bhutan 2011

Food Water Energy Biodiversity

Bangladesh Bhutan India Nepal

# Climate Summit for a Living Himalayas

## Bhutan 2011

SERVIR-HIMALAYA

USAID FROM THE AMERICAN PEOPLE

NASA

Bhutanese Youth for Climate Action

Turning a new Leaf

**Published by**
International Centre for Integrated Mountain Development
GPO Box 3226, Kathmandu, Nepal

**Printed by** Hill Side Press (P) Ltd., Kathmandu, Nepal

# About ICIMOD

The International Centre for Integrated Mountain Development, ICIMOD, is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush-Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu, Nepal. Globalisation and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream-downstream issues. We support regional transboundary programmes through partnership with regional partner institutions, facilitate the exchange of experience, and serve as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop an economically and environmentally sound mountain ecosystem to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now, and for the future.

# Contents


| | | |
|---|---|---|
| | Messages | 1 |
| 1 | Overview | 7 |
| 2 | Bhutan Climate Summit Side Events | 7 |
| 3 | Programme at a Glance | 9 |
| 4 | International Symposium | 11 |
| 5 | Exhibition and Showcase | 15 |
| 6 | SERVIR Himalaya Youth Forum | 21 |
| 7 | Special Youth Event | 25 |
| 8 | Exhibition Layout | 27 |
| 9 | General Information | 29 |

# Message from Lyonpo Dr. Pema Gyamtsho, Minister of Agriculture and Forests, Royal Government of Bhutan

The concerns expressed by mountainous countries about various environmental issues have still to gain the attention of the international community. The mountain areas of the Himalayan region are facing grave impacts from climate change, but countries have limited access to the instruments and resources needed to address the challenges of adaptation and mitigation. The countries on the south face of the eastern Himalayas – Bangladesh, Bhutan, India and Nepal – are convening a 'Climate Summit for a Living Himalayas', with the aim of developing a road map for adaptation to climate change. The Summit will address four key themes in the context of climate change, while focusing on cross-cutting issues such as health and disaster risks.

- Ensuring food security and livelihoods
- Securing the natural freshwater systems of the Himalayas
- Securing biodiversity and ensuring its sustainable use
- Ensuring energy security and enhancing alternative technologies

I am very pleased that the International Centre for Integrated Mountain Development (ICIMOD) is organising a series of side events to coincide with the Bhutan Climate Summit under the theme 'Connecting from Space to Village', and including a special programme focusing on youth. I am confident that the discussion and deliberations of the international symposium, the exhibition and showcase, and the youth events will further enrich our efforts towards establishing a road map for climate policy and actions in the eastern Himalayan region.

On behalf of the Royal Government of Bhutan, it gives me great pleasure to welcome the symposium participants and the young people from the region. I would like to say a special thank you to ICIMOD for taking this initiative.

I wish you a fruitful time and enjoyable stay in Bhutan – the Land of the Thunder Dragon!

Tashi Delek !

Lyonpo Dr. Pema Gyamtsho
Minister of Agriculture and Forests
Royal Government of Bhutan

# Message from Dr. Andreas Schild, Director General of ICIMOD

Mountain regions remain often at the margin of international development trends. Globalization and increased climate variability, two major factors of change that are largely propelled by external forces. Mountain communities need to adapt to such externalities. Securing the sustainability of goods and services from the mountains is essential for the sustainable development of downstream areas. In order to make this possible, we need resilient mountain communities. Facing new risks and vulnerabilities but also taking advantage of new opportunities created by change, we must enhance our understanding in a scientifically validated way to assess the impacts of climate change so as to take informed action and plan adaptation measures.

We think Remote sensing and earth observation constitute technologies and instruments giving us the chance to understand better the interrelationship of these factors. They help us to generate information and scenarios. ICIMOD endeavours to promote the understanding of the emerging dynamics, to foster regional cooperation, and tap into increased interest from international space agencies. The purpose is to leverage climate data and information services from remote sensing and in situ measurement to understand climate change and to interpret the information so as to serve the needs of mountain communities – in other words, we want to link 'space to village'.

We are privileged to be able – at the occasion of the Bhutan Climate Summit- to show a follow up of the international conference on the benefits of earth observation organised by ICIMOD in late 2010. While the emphasis in the year 2010 was on the need to show the societal benefit of the modern instruments of earth observation, the examples put together in the summit demonstrate concretization of the principles emphasized in 2010 by showcasing practical applications of direct usefulness to the planners, policy-makers as well as the rural stakeholders.

I am very happy to note that earth observation is gaining increasing importance in a wide spectrum of strategic programmes and proving its direct relevance to mountain development policies and practices. I would also like to underscore the importance of youth and raising awareness among them is indispensable to deal with the immense challenges of the climate change. I am also very happy to inform that in the following this week, we are convening a ICIMOD board of governors and ICIMOD support group meeting in Bhutan and looking forward to carry the outcomes of these events.

At this occasion, I wish to express deep gratitude to the Royal Government of Bhutan and in particular the Bhutan Climate summit Secretariat for their support and guidance to organize the side event. I would also like to express thanks and appreciations for the initiative and leadership to MENRIS colleagues to put together the side events coinciding with the Bhutan climate summit.

I wish you a successful symposium and pleasant stay in Thimpu.

Dr. Andreas Schild
Director General,
ICIMOD

# Message from Mr Basanta Shrestha, Division Head MENRIS, ICIMOD

Earth observation bears a special significance for remote mountainous regions with their challenging topography. Earth observation, combined with modern geospatial tools, is proving to be vital for our improved understanding of climate change, and its trends and impacts, and for predicting future scenarios. It is increasingly used for regional and national level assessment and monitoring of agriculture and food security, biodiversity, and water resources. The spatial analytical framework and the information thus derived enable people to take better and better-informed decisions and actions on the ground.

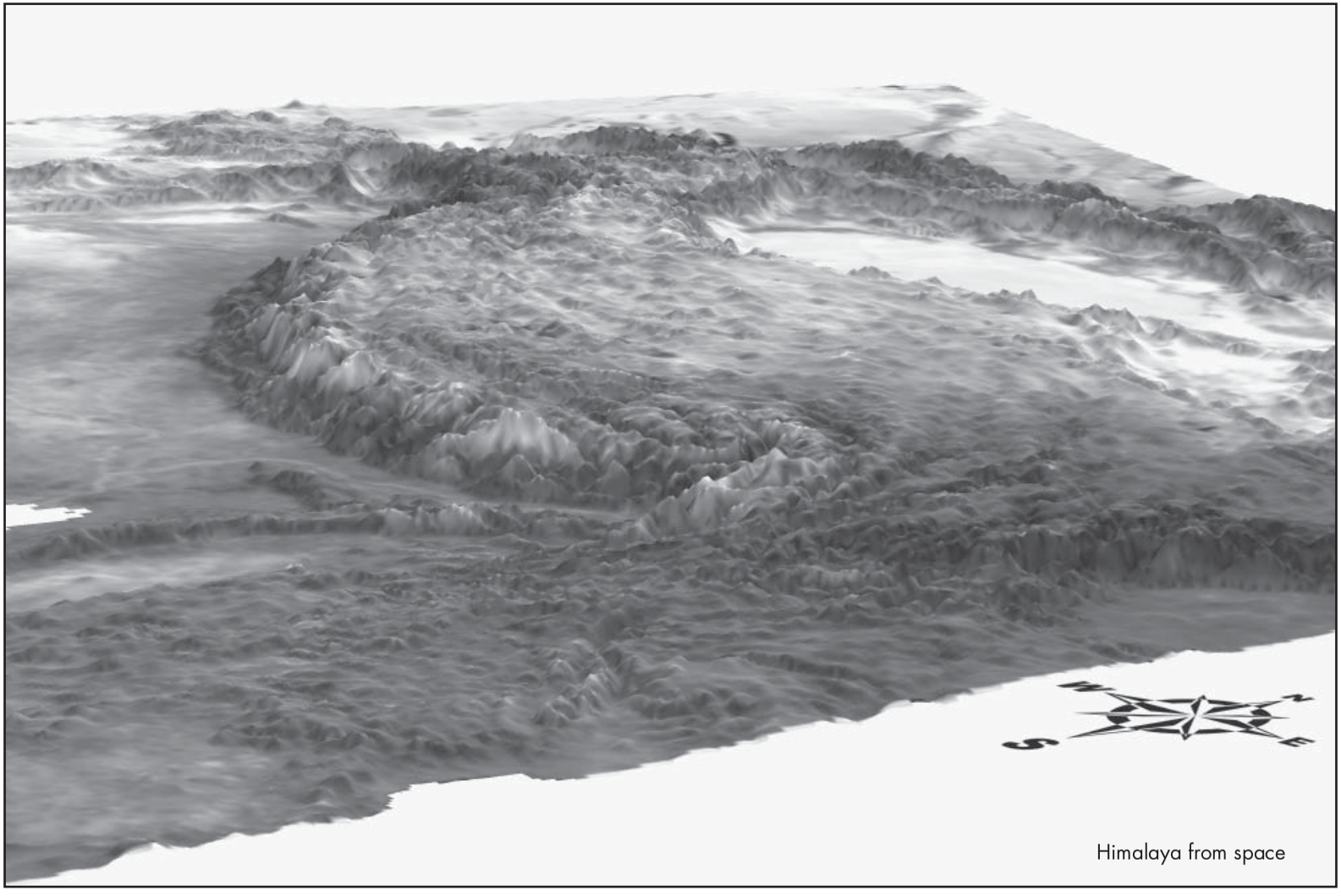
In late 2010, ICIMOD together with regional partners joined hands with USAID and NASA to establish SERVIR-Himalaya. SERVIR is a regional visualisation and monitoring system that integrates Earth observations such as satellite imagery and forecast models together with in situ data and other knowledge to support timely decision making. SERVIR in Spanish means 'to serve'; it aims to link 'space to village', applying the best in science and technology in support of making practical decisions that have a lasting impact on people's lives. The side event 'Connecting from Space to Village' is being organised jointly by ICIMOD, USAID, and NASA, in close cooperation with the Ministry of Agriculture and Forests, Royal Government of Bhutan, and other national and international partners.

There are three interlinked events. The international symposium itself, 'Connecting from Space to Village', will provide a regional platform for sharing experiences of Earth observation applications in line with the Bhutan summit themes. A one-week youth event with participants from the region aims at raising awareness and improving understanding of climate change, thus enabling participants to take meaningful local climate actions in their community; within this, a one-day event on International GIS Day will draw schoolchildren from the areas around Thimpu. Finally, an exhibition and showcase will demonstrate various applications of Earth observation in the frame of the SERVIR-Himalaya initiative under five broad themes: cryosphere and water, ecosystems and biodiversity, disaster risk preparedness and emergency response, transboundary air pollution and black carbon, and agriculture and food security.

I would like to take this opportunity to express my sincere thanks and appreciation to all my colleagues for their untiring efforts, splendid teamwork, and dedication in putting these events together in a meticulous way.

Stay happy ☺!

Basanta Shrestha,
Division Head MENRIS, ICIMOD




Himalaya from space

# Overview

## Climate Summit for a Living Himalayas, Thimphu, Bhutan

In the face of climate change, there is an urgent need for Himalayan nations to build resilience to buffer the impacts of the change and generate resources for adaptation, capacity building, and technology transfer. Such actions can no longer wait for a global agreement. In the Himalayas, where the impacts of the changing global climate are manifesting at a rapid pace, the time for action is running out. Recognising this, the Governments of Bangladesh, Bhutan, India, and Nepal agreed to convene the Bhutan 2011 Climate Summit to adopt and endorse a 10-year road map for adaptation to climate change in the Eastern Himalayan sub-region for ensuring food, water, and energy security while maintaining biodiversity and ecosystem services.

More on the Bhutan Summit: http://bhutanclimatesummit.org.bt

# Bhutan Climate Summit Side Events

International Symposium

## Connecting from Space to Village: Enabling Climate Policy and Actions in the Himalayas

**(17–18 November 2011)**

Earth observation combined with modern geospatial tools is proving to be vital for our improved understanding of climate change, and its trends and impacts, and for predicting future scenarios. Earth observation bears a special significance for remote mountainous regions with their challenging topography. A side event 'Connecting from Space to Village' is being organised by ICIMOD, USAID, and NASA under the framework of SERVIR-Himalaya in close cooperation with the Ministry of Agriculture, Government of Bhutan, and other national and international partners. The aim is to provide a regional platform for mutual sharing and learning on the use of Earth observation and geospatial tools and technologies for improved scientific knowledge and understanding of climate change, in order to support climate policy and actions in the eastern Himalayas. The side event will bring together summit delegates, high level officials from Bhutan, leading authorities, and stakeholders from the region and beyond.

Youth Forum

## Earth Observation: Empowering Youth for Climate Actions in the Himalayas

**(14–19 November 2011)**

The aim of this event is to raise awareness among young people, and help them understand climate change and take appropriate actions in their local communities. The event will include 40 young people from Bangladesh, Bhutan, India, and Nepal. A special interactive event is planned for schoolchildren from the Thimpu region on 16 November to coincide with International GIS Day.

Exhibition/Showcase

## Earth Observation Applications to Enable Decision Making

**(17–19 November 2011)**

An exhibition of posters and demonstrations will showcase key Earth observation applications addressing climate change in the eastern Himalayan region with a particular focus on Bhutan. The applications are being developed largely within the framework of SERVIR-Himalaya, which features web-based access to satellite imagery, decision-support tools, and interactive visualisation capabilities with the aim of providing scientists, environmental managers, and decision-makers with easy access to information. There will be a special exhibition of posters prepared by the youth participants.

# Programme at a Glance

**November 2011**

| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|
| 14 | 15 | 16 | 17 | 18 | 19 |
| **Youth Forum:** Earth Observation: Empowering Youth for Climate Action in the Himalayas | | | | | |
| | | **Special Event for Schoolchildren:** International GIS Day | | | |
| | | | **International Symposium:** Connecting from Space to Village | | |
| | | | **Exhibition:** Earth Observation Applications for Climate Policy and Actions | | |

# International Symposium

## Connecting from Space to Village: Enabling Climate Policy and Actions in the Himalayas

**17–18 November 2011**

Climate change has placed the Himalayan region at the centre of international attention as one of the most vulnerable ecosystems in the world, as the changes are leading to severe impacts on mountain and downstream communities and their environments. The dynamics of the life support systems that rely on mountain ecosystems are threatened, and the traditional adaptation and coping mechanisms of local people are losing their effectiveness.

The aim of this international symposium is to provide a regional platform for mutual sharing and learning on the use of Earth observation and geospatial tools and technologies for improved scientific knowledge and understanding of climate change, in order to support climate policy and actions in the eastern Himalayas. The side event will bring together summit delegates, high level officials from Bhutan, leading authorities, and stakeholders from the region and beyond. The event aims to promote the use of, and access to, Earth observation for improved scientific knowledge and understanding in order to support climate policy and actions in the eastern Himalayan region. The two-day symposium will provide a platform for interaction, and demonstrate the use of Earth observation and geospatial tools and technologies on the key themes of the Bhutan Summit.

The symposium will include an inaugural session, keynote sessions, and technical sessions in line with the Bhutan Climate Summit themes – ecosystems and biodiversity, water and cryosphere, energy and food security, and disaster preparedness and emergency response. The discussion and deliberations will be presented in a valedictory session with a panel discussion with leading authorities and interaction with the summit participants.

### **Programme** (at time of going to press, subject to change)

| **Day 1: 17 November 2011** | |
|---|---|
| 08:00 – 08:30 | Registration |
| **Inaugural Session** | |
| 08:30 – 09:00 | **Marchang Ceremony** |
| 09:00 – 10:30 | **Welcome Address** by the Honourable Lyonpo Dr. Pema Gyamtsho, Minister of Agriculture and Forests, Royal Government of Bhutan<br>**Welcome Address** by Dr. Andreas Schild, Director General, ICIMOD<br>**Overview** by Mr Basanta Shrestha, Division Head MENRIS, ICIMOD – Earth observation for the benefit of mountain communities |

| | |
|---|---|
| | **Keynote Address** by Prof. Bruno Messerli, Professor Emeritus, Switzerland – Climate change in the Himalaya: Conflict or Cooperation?<br>**Inaugural Address** by the Right Honourable Prime Minister Lyonchen Jigme Y Thinley, Royal Government of Bhutan<br>**Vote of Thanks** by Dasho Sherub Gyaltshen, Honourable Secretary, Ministry of Agriculture and Forests, Royal Government of Bhutan, and Member of ICIMOD Board of Governors |
| 10:30 – 11:20 | **Introducing Exhibtion and Showcase** by Birendra Bajracharya, ICIMOD<br>**Inauguration** of Exhibition and Poster Demonstration by the Right Honourable Prime Minister Lyonchen Jigme Y Thinley, Royal Government of Bhutan<br>**Tea break** |
| **Special Session** | |
| 11:20 – 13:00 | **Chair:** Dasho Sherub Gyaltshen, Hon'ble Secretary, Ministry of Agriculture and Forests, Royal Government of Bhutan<br>**Co-chair:** Dr. Madhav Karki, Deputy Director General, ICIMOD<br>**Rapporteur:** Mr Birendra Bajracharya, Sr GIS Specialist, ICIMOD<br>• Linking from 'space to village' – *Ms Carrie Stokes, Geospatial Technology Advisor, USAID, USA*<br>• Mountain agriculture and food security in the Himalayan region – *Dr. Tej Partap, Vice Chancellor, Srinagar University, India*<br>• Space technology and Agenda 21 an Indian perspective – *Dr. V Jayaraman, Satis Dhawan Professor and Senior Scientific Advisor, ISRO, India*<br>• Geospatial technology for sustainable development – *Dr. Tom Snitch, Sr Advisor, GeoEye, USA* |
| 13:00 – 14:00 | Lunch break |
| **Technical Session 1: Ecosystems and Biodiversity** | |
| 14:00 – 15:30 | **Chair:** Dasho Peljor J Dorji, President, Bhutan Ecological Society<br>**Co-chair:** Dr. Tom Snitch, Senior Adviser, GeoEye, USA<br>**Rapporteur:** Mr Sebastian Wesselman, Geospatial Capacity Building Lead, ICIMOD<br>• Linking Remote Sensing to National Forest Inventories, – Dr. C. Kenneth Brewer, USDA, USA<br>• Climate change and biodiversity in the eastern Himalayas – Dr. Nakul Chettri, Biodiversity Specialist, ICIMOD<br>• Remote sensing based approach for biodiversity characterisation of the eastern Himalayas – Dr. PS Roy, Director, Indian Institute of Remote Sensing, Dehradun, India |

| | |
|---|---|
| | • Understanding land cover dynamics in the Himalayan region – Mr Birendra Bajracharya, Sr GIS Specialist, ICIMOD<br>• Discussion (30 minutes) |
| 15:30 – 16:00 | Tea break |
| **Technical Session 2: Disaster Preparedness and Emergency Response** | |
| 16:00 – 17:50 | **Chair:** Dasho Namgay Wangchuk, Director, Department of Disaster Management<br>**Co-chair:** Dr. Ahmadul Hassan, Director, R&D and Training Division, Center for Environmental and Geographic Information Services, Bangladesh<br>**Rapporteur:** Mr Samjwal Bajracharya, RS Specialist, ICIMOD<br>• Space-based technology for disaster preparedness and emergency response – Mr Sudip Pradhan, GIS/DSS Developer, and Mr Bikash Dongol, GIS/Web Programmer, ICIMOD<br>• Sentinel Asia – Disaster management support system – Mr Shinichi Muzumoto, Jaxa, Japan<br>• GLOF early warning system – preparedness for eventuality – Mr Karma Dupchu, Department of Energy, Bhutan<br>• Community-based flood early warning system (Bangladesh) – Mr Giasuddin Ahmed Choudhary, Executive Director, Center for Environment GIS (CEGIS), Bangladesh<br>• Geoinformatics for disater management in mountain environment – Adjunct Professor Hiromichi Fukui, Chubu University, Japan.<br>Discussion (30 minutes) |
| 19:00 | Dinner hosted by the Honourable Lyonpo Dr. Pema Gyamtsho, Minister of Agriculture and Forests, Royal Government of Bhutan and Dr. Andreas Schild, Director General, ICIMOD<br>(Venue: Hotel Motithang) |
| **Day 2: 18 November 2011** | |
| **Technical Session 3: Energy and Food Security** | |
| 09:00 – 10:30 | **Chair:** Mr Giasuddin Ahmed Choudhary, Executive Director, Center for Environment GIS (CEGIS), Bangladesh<br>**Co-chair:** Ms Gwen Artis, Director, International Programs, GDR Consulting Group, USA<br>**Rapporteur:** Mr Rajan Bajracharya, Systems Analyst, ICIMOD<br>• Effects of atmospheric pollution in agriculture – Dr. Maheswor Rupakheti, ABC Coordinator, UNEP Regional Resource Center, Thailand<br>• The Surya Programme: Combating black carbon in India – Dr. Ibrahim H Rehman, Director, The Energy and Resources Institute (TERI), India<br>• Application of Earth observation for food security analysis in the Himalayan region– Mr Faisal Mueen Qamer, RS/GIS Expert, ICIMOD |

| | |
|---|---|
| | • Climate change and food security in Bangladesh – Prof Al-Amin, Institute of Forestry and Environmental Sciences, Chittagong University, and Golam Maainuddin, Bangladesh Center for Advanced Studies (BCAS), Bangladesh<br>**Discussion** (30 minutes) |
| 10:30 – 11:00 | Tea break |
| **Technical Session 4: Assessing Water Resources** | |
| 11:00 – 12:30 | **Chair:**: Dr. David Molden, DG Designate, ICIMOD<br>**Co-chair:** Mr Jason Kessler, Deputy Project Director, MFRC, NASA, USA<br>**Rapporteur:** Mr Mostafa Ali, GIS/Database Specialist, ICIMOD<br>• Understanding the cryosphere dynamics of the Himalayas – Dr. Anil Kulkarni, Distinguished Visiting Scientist, Indian Institute of Sciences, India<br>• Decadal changes and status of glaciers in Bhutan – Mr Samjwal Bajracharya, RS Specialist, ICIMOD<br>• Climate change impact on water resources in the Wangchu Basin in Bhutan – Dr. Ashutosh Limaye, SERVIR Science Application Lead, NASA<br>• Climate information services: Operationalising snow and glacier information systems – Mr Rajan Bajracharya, Systems Analyst, ICIMOD<br>Discussion (30 minutes) |
| 12:30 – 13:30 | Lunch break |
| **Valedictory Session: Responses to Climate Change Challenges in the Eastern Himalayan Region** | |
| 13:30 – 16:00 | **Chair:** Dr. Andreas Schild, Director General, ICIMOD<br>**Co-chair:** Mr Ugen Takchu, Surveyor General, Department of Survey and Land Records, National Land Commission, Bhutan<br>**Rapporteur:** Mr Birendra Bajracharya, Sr GIS Specialist, ICIMOD<br>• Introduction by the Chair<br>• Invited panel members<br>• Technical session summary<br>• Panel discussion<br>• General discussion<br>• Concluding remarks<br>• Vote of thanks |
| 16:00 – 16:30 | High tea and closing |

# Exhibition and Showcase

### Connecting from Space to Village: Enabling Climate Policy and Actions in the Himalayas

**17-19 November 2011**

An exhibition of posters and demonstrations on key Earth observation applications addressing climate change in the eastern Himalayan region, with a focus on Bhutan, will be held for summit delegates, symposium participants, and Bhutan government officials. The applications are being developed largely within the framework of SERVIR-Himalaya, which features web-based access to satellite imagery, decision-support tools, and interactive visualisation, with the aim of providing scientists, environmental managers, and decision-makers with easy access to information. The showcase will provide a wide array of Earth observation applications, with demonstrations of tools and technology that can be accessed by the general public and are useful for scientific analysis and to support policy and decision-making. Within SERVIR's framework to address the broad areas of adaptation to climate change and the GEOSS areas of societal benefit, the applications have mainly been developed on the basis of the preliminary needs assessment carried out by ICIMOD, and are grouped under the following broad themes:

- Cryosphere and water
- Ecosystems and biodiversity
- Disaster risk preparedness and emergency response
- Transboundary air quality and black carbon
- Agriculture and food security

## Cryosphere and Water

Cryosphere in the Himalayan region collectively describes the frozen state that includes snow cover, glaciers, ice caps, and frozen ground (permafrost). It is an integral part of the global climate system with important linkages, and feedbacks generated through its influence on surface energy and moisture fluxes, clouds, precipitation, hydrology, and atmospheric and oceanic circulation. In the mountain context, where snowmelt runoff is the primary input to river discharge, the cryosphere represents the source of the life support system 'water'. The impact of climate change on the cryosphere has already raised concerns about the sustained supply of freshwater. Despite its importance, the lack of long-term data for the Himalayan cryosphere undermines efforts to develop policies and programmes promoting the rational and sustainable use of water resources. ICIMOD has been involved for some years in assessments of the Himalayan cryosphere devising ways and means to bridge the information gap. The applications showcased under this theme include the following.

### 1. Decadal changes of glaciers in Bhutan

Glaciers are repositories of information for climate change studies as they are sensitive to changes in temperature, precipitation, and at-surface solar radiation. Due to increased melting, shrinking, and retreat of glaciers in recent decades, the number of glaciers has increased and the area has decreased in the Himalayas. The application showcases the changes in the glaciers in Bhutan from 1980, 1990, 2000, and 2010. Glacier maps prepared for the decades using a uniform data set and methodology provide a scientific basis for understanding the changes taking place in the glacial environment in the eastern Himalayas.

### 2. Historic changes in glacier and snow cover in the HKH region

Snow constitutes an important component of the cryosphere and, unlike glaciers, is characterised by high inter-annual, intra-annual, and seasonal variability. Snowmelt makes a significant contribution to the water budget in some of the major river systems of the Himalayas. Snow cover maps have been generated using the MODIS 8-day snow product with additional improvements in information such as cloud cover. The data is presented in an interactive environment with basin-wise statistics which will be useful for visualising comparative trends over the last decade.

### 3. Scenario-based climate change impact on water availability and hydrologic flows in the Wangchu basin of Bhutan

Water security is one of the major concerns related to climate change. The application uses a raster-based distributed hydrological model, CREST, for the Wangchu basin in Bhutan to model the water availability under different global climate change scenarios. The model is a hybrid modelling strategy that was recently developed by the University of Oklahoma and NASA. CREST simulates the spatiotemporal variation of water and energy fluxes and storage on a regular grid with the grid cell resolution being user-defined, thereby enabling global- and regional-scale applications.

## Ecosystems and Biodiversity

The HKH region is highly heterogeneous with a wide range of habitats, micro-climates, and ecological conditions resulting in a high biodiversity. The mountains are facing pressures from various global change-related driving forces, including land cover/land use changes. It is generally accepted that appropriate data and information are required to underpin the complex decision-making needed to conserve ecosystems and biodiversity, and attain sustainable development. The Himalayan countries lack sufficient data on land cover and land use to provide a clear picture of the ongoing changes. Several international and national agencies are working on species and protected areas databases and mapping land cover, but these efforts lack coordination and often follow different and inconsistent procedures. The applications under this thematic area are related to land cover dynamics, forest cover density and REDD, and wetland ecosystems.

### 4. Understanding natural resources dynamics in the HKH

Land cover assessment and monitoring of land cover dynamics are essential for the sustainable management of natural resources, environmental protection, biodiversity conservation, and

developing sustainable livelihoods, particularly for the rural communities in the Hindu Kush-Himalayan (HKH) region. The application provides easy access to the harmonised land cover database developed at national levels over different time slices (1990, 2000 and 2010) and provides user friendly tools for generating statistics to understand the change processes and to support the making of informed decisions. The application includes temporal land cover data for Bhutan and Nepal and is able to add data for the remaining countries in the region.

### 5. Resource inventory and assessment of Phobjikha wetland ecosystem

A resource inventory has been prepared for the Phobjikha Valley with special reference to wetland biodiversity as a showcase of the wetland application. It includes an analysis of land cover and land use change at the watershed level. The application provides important information and a basis for management zonation of the valley for conservation efforts. Phobjikha valley in Bhutan is an important wetland and a key habitat for the black-necked crane. The valley has witnessed significant land use change over the past 20 years, from a summer grazing land to a permanent settlement and cultivation. The application has been developed in collaboration with the Royal Society for Protection of Nature (RSPN) of Bhutan which has been involved in research in Phobjikha for many years.

### 6. Estimation of above ground biomass using high resolution satellite images for REDD+

Forests play an important role as carbon sinks. In Nepal, community forestry has proven to be a successful model for protecting forest resources and providing benefits to local people. ICIMOD has collaborated with ITC-Netherlands to develop a methodology for above ground biomass measurement using remote sensing data to support the monitoring, reporting, and verification (MRV) process for REDD+ in Nepal. The activity has empowered local forest user committees to carry out field measurements for accessing carbon funds. Recently ICIMOD has established collaboration with the Forest Resource Assessment (FRA)-Nepal project which has conducted Lidar surveys in these community forest areas. The use of these innovative technologies and approaches has a potential for scaling up in other regional countries such as Bhutan as well as in other mountain regions of the world.

The application demonstrates the case study carried out by ICIMOD in three selected watersheds of Nepal for estimating the biomass in three representative community forest areas to support payment for REDD activities. High resolution GeoEye images and field information were used along with image segmentation tools for deriving relationships between biomass and tree canopy.

## Disaster Preparedness and Risk Management

The HKH region is the youngest and highest mountain range in the world. The weak geological conditions, steep topography, strong hydrodynamics with short and intense seasonal monsoon rainfall, and excessive human intervention have made this region very fragile and unpredictable. The landslides, avalanches, floods, flash floods, debris flows from landslide dammed lakes and glacial lake outburst floods, wildfires, and earthquakes are common hazards in the Himalayan range. With the increasing incidence of natural disasters, the Hindu-Kush Himalayan region can be

considered as a major hotspot in the global disaster map. However, it is highly vulnerable due to the lack of preparedness planning and inadequate knowledge on the availability and use of space-based information during disasters. The applications under this theme deal with forest fires, GLOFs, and earthquake disasters.

### 7. Forest fire detection and monitoring system

Forest fires in recent years have become an environmental concern. They pose a threat both to the forest wealth and to the entire regime of fauna and flora, seriously disturbing the biodiversity and the ecology and environment of a region. The loss of vegetation cover due to forest fires every year across the region is colossal. Bhutan also witnesses forest fires, particularly during the drier winter season. Satellite images have recently been used in the management of forest fires, particularly pickup forest fire events, and for furnishing location details to fire managers and rangers. MODIS images, which map the Earth twice a day at 500m spatial resolution, have been used extensively in mapping active forest fires across the globe. The Fire Information for Resource Management System (FIRMS) integrates remote sensing and GIS technologies to deliver global MODIS hotspot/fire locations and burned area information to natural resource managers and other stakeholders around the world. A satellite-based forest fire detection and monitoring system has been developed in close collaboration with the Forest Departments of Nepal and Bhutan which facilitates automatic SMS alert systems to those concerned in the case of fire incidents at any given location.

### 8. Emergency response system for Kathmandu Valley in the case of an earthquake disaster

Memories are fresh of the massive tremor in Sikkim on 18 September 2011 and the damage caused in the eastern part of Nepal and neighbouring countries. The Kathmandu Valley is one of the highest rated cities around the world in terms of earthquake risks. Several reports suggest that emergency management and response will face enormous challenges in the Kathmandu valley due to lack of proper infrastructure and preparedness. Recently, the Government of Nepal has established a Nepal emergency operation centre under the Ministry of Home.

Emergency management puts very high demands on map-based information from satellites during emergency situations; a variety of outputs are needed according to the changing situation on the ground to support a range of decision-making processes for different stakeholders, including the general public. All functions of emergency management have a strong geographic component and need different facets of geographically tagged information. This showcase presents a geo-visualisation platform for the Kathmandu valley for emergency response in the case of earthquake disasters, and to strengthen the capability of the Emergency Operation Center of Nepal to use space-based information.

### 9. Eye on Eastern Himalayas

The Eastern Himalayas extends from the Kaligandaki Valley in central Nepal to northwest Yunnan in China, and includes Bhutan, North East Indian states and parts of West Bengal in India, southeast Tibet and parts of Yunnan in China, and northern Myanmar. The region has multiple biogeographic

origins and also marks the frontier of the collision between the monsoonal and mountain systems playing an important role in the weather and climate of the whole sub-continent. The Eastern Himalayan region with its mountains, valleys, and flood plains, is physiographically diverse and ecologically rich in natural and crop-related biodiversity. The eocregions provide crucial habitats for wildlife and the vegetation communities are home to hundreds of endangered plant species. The region has also witnessed the impacts of climate change in the form of retreating glaciers and, increased incidences of natural disasters threatening the lives and livelihoods of the people of this region with access to water, biodiversity, and environmental services. The showcase presents a virtual tour of the Eastern Himalayas in Google Earth environment with interactive 3D interface and information layers derived through various studies carried out in the past.

### 10. Mapping haze as an indicator of air quality

The application combines near real-time MODIS visible bands (RGB product), active fires, and AOD (aerosol optical depth) products to generate an air quality index. Information from AERONET stations is integrated into the system. These products are useful for assessing any climate change and the impact of atmospheric air pollution on human health and agriculture.

## Agriculture and Food Security

Agriculture is a major livelihood activity in the HKH region, providing a substantial proportion of rural income and employment opportunities for the estimated 210 million people who live in the hills and mountains. Food security is now emerging as a concern in the Himalayas, with changes in weather patterns, the water cycle, and water availability, due to climate change. Remote sensing provides an effective way of monitoring agricultural fields and providing a synoptic view of the result of field practices, which can then be processed to help agricultural scientists make appropriate decisions.

### 11. Agricultural monitoring based on remote sensing to support food security in the eastern Himalayas

In this application, the phenological patterns in agricultural areas were assessed across Nepal by analysing time series anomalies in the vegetation index for the period 2001 to 2010. The application uses a number of indices from satellite images (MODIS, MTSAT, AMSR-E) to assess the status of agricultural production. These are calibrated and validated using high resolution data and agricultural census data. Based on these, the methodology is applied to assess the food security situation at given geographic locations. The study demonstrates the effective use of remote sensing for identification of short-term drought conditions and long-term changes in agricultural areas.

## Other Applications

In addition to the above, a number of other applications are being showcased which demonstrate the capability of geospatial tools for exploration and visualisation of information to support improved understanding and effective communication with decision makers and the general public at large.

## 12. Mapping GNH indicators

The Centre for Bhutan Studies conducted the Second Gross National Happiness Survey from April to December, 2010, with a sample size of 7142 covering all twenty districts. Thirty three indicators have been used to calculate the GNH index. The GNH index across twenty districts and the percentage contribution to the GNH index by the nine domains and the thirty three indicators have been incorporated into an online interactive application with technical assistance from ICIMOD, Kathmandu. The percentage of Bhutanese enjoying the happiness conditions can also be viewed in a graphical form across different demographic categories.

## 13. Online cadastral database system

The National Land Commission (NLC) is undertaking a country-wide cadastral re-survey which is generating an invaluable database useful for policy formulation and planning purposes. ICIMOD, in collaboration with the NLC, has developed an online data management system with web-based visualisation. The showcase demonstrates a pilot application using sample data from Monggar Dzongkhag (district). The system is aimed at assisting the land records administration in Bhutan.

## 14. Bumthang P3-DM

Participatory 3-dimensional modelling (P3-DM) is gaining importance as a tool to understand geographical dimensions at a local level in support of community-based local level planning and decision-making. The showcase demonstrates the example of a recently completed P3-D model of Bhumthang – a typical mountain landscape. The exercise involved technical support from ICIMOD with active participation of the local community drawn from a cross-section of Bumthang settlements. The model took about two weeks to complete and is now displayed in the Ugyan Wangchuk Institute complex at Brown Swiss Farm, Bathpalathang, Chamkhar Valley, Bumthang. The showcase presents glimpses of the process used to create the Bumthang P3-DM.

# SERVIR Himalaya Youth Forum

## Earth Observation: Empowering Youth for Climate Actions in the Himalayas

**14-19 November 2011**

Climate change is a critical global concern for this generation, and the youth of the region will face enormous challenges in the future. Raising awareness among young people and engaging them in action on the ground will be an important factor in addressing climate change in the Himalayas. Although young people are increasingly adding their voices globally to the call for action on climate change, awareness among the youth of the region is limited. It is important to actively engage young people in areas of preparedness, risk reduction, adaptation, and mitigation. Young people have innovative ideas and abundant energy to undertake local actions. They can play the role of 'agents for change' and act as effective communicators in their communities, and be involved in regional and international arenas.

Earth observation is proving to be a vital tool to improve our understanding of the climate change phenomenon by providing information on the changes in various indicator attributes. Earth observation combined with geographic information systems provides a powerful platform and a visual and interactive aid to help educate people on various issues related to environmental change. Educating and exposing young people to these innovative tools and technologies will help them to understand climate change situations better, and to use a scientific approach in advocacy. A Youth Forum 'Benefiting from Earth Observation: Empowering Youth for Climate Actions' is being organised to coincide with the Bhutan Climate Summit by ICIMOD in close collaboration with the Ministry of Agriculture and Forests, Royal Government of Bhutan and Bhutanese Youth for Climate Action (BYCA) under the framework of the SERVIR-Himalaya Initiative, and supported by the National Aeronautics and Space Administration (NASA) and USAID.

### Aim

The aim of the Youth Forum is to educate and raise awareness among young people about climate change in the Himalayan region. They will be exposed to visual and interactive modern geospatial information and tools in order to enable them to make informed decisions for climate actions in the region. More specifically, the Forum aims to

- Familiarise young people with the potential benefits of information derived from Earth observation;
- Help them learn basic GIS/RS skills through hands-on exercises and a case study approach for understanding climate change related issues;
- Inspire young people through interaction with prominent environmentalists and resource persons from the region and beyond;
- Create a youth network under the theme 'Earth observation and climate change'; and
- Provide a platform for mutual sharing and learning of experiences among young people, including online resources.

## Intended Audience

The Youth Forum will be targeted to young people aged 20 to 30 from the participating countries who are working on, and/or interested in, climate change issues. Some 40 young people from the region will be selected through an open competitive process. In addition, to mark International GIS Day, promoted by National Geographic and ESRI on 16 November, a one-day event will be organised for pupils from schools in and around Thimphu to familiarise them with climate change issues, and Earth observation tools and their use in various applications, through active, participatory, and fun activities and exercises.

### Expected outcomes

The event is expected to lead to

- Better understanding of climate change in the Himalayan region;
- Awareness among young people of the benefits of Earth observation for climate change related issues;
- Basic skills and knowledge in using modern geospatial tools and social media;
- Exposure of the young people to the Bhutan Summit and poster presentations; and
- Formation of a youth network on Earth observation and climate change in the region and beyond.

### Selection process

ICIMOD had announced the call for application to attend the Youth Forum in 2010 and 2011. In each call of application there were more than 800 applicants. From the existing roster to give change to other applicants, participants were selected based on a number of criteria so that there is a balanced participation from different part of the country, age group, educational background and gender. The participants are selected from Bangladesh, Bhutan, India and Nepal.

## **Programme** (at time of going to press, subject to change)

| **Day 1: 14 November 2011** | |
|---|---|
| 09:00 – 09:30 | Registration |
| **Inaugural Session** | |
| 09:30 – 10:00 | **Welcome Remarks** by Mr Basanta Shrestha, Division Head MENRIS, ICIMOD<br>**Training background and Objectives** by Ms. Bidya Banmali Pradhan, ICIMOD |
| 10:00 – 11:00 | Group photograph/ Tea break |
| 11:00 – 12:00 | • Geospatial tools for mountain climate change studies – Mr Birendra Bajracharya, ICIMOD |
| 12:00 – 12:30 | • Too much water too little water – video |
| 12:30 – 13:30 | Lunch |

| | |
|---|---|
| 13:30 – 14:00 | • Pyramid level 0 (Preparing the ground) – Mr Robert Steele, Systainability Asia |
| 14:00 – 16:30 | • Getting started with GIS: Hands on exercise – Mr Sebastian Wesselman, Mr Govinda Joshi, Mr Mostafa Ali, ICIMOD |
| 16:30 – 17:30 | • Pyramid level 1 (Indicators) – Mr Robert Steele, Systainability Asia |
| 17:30 – 18:30 | Visit to Thimphu Dzong |
| **Day 2: 15 November 2011** | |
| 09:00 – 10:00 | • Motivational talk: Space technology for the benefit of human society and conservation of the environment –<br>Dasho Peljor Dorji – President Bhutan Ecological Society<br>Dr. V Jayaraman – Senior Scientific Advisor, ISRO, India<br>Dr. PS Roy – Director, Indian Institute of Remote Sensing, Dehradun, India |
| 10:00 – 10:45 | • Pyramid level 2 (Systems) – Mr Robert Steele, Systainability Asia |
| 10:45 – 11:00 | Tea break |
| 11:00 – 11:30<br>11:30 – 12:30 | • Understanding Earth observation systems and remote sensing tools – Mr Faisal M Qamer, ICIMOD<br>• Understanding RS data – Hands on exercise (Faisal, Sebastian, Mostafa) |
| 12:30 – 13:30 | Lunch break |
| 13:30 – 14:00 | • Exploring spatial information using web resources – Mr Rajan Bajracharya, ICIMOD |
| 14:00 – 16:00 | • Exploring spatial information using web resources – Hands on exercise (Sebastian, Mastafa, Rajan) |
| 16:00 – 17:00 | • Pyramid level 2 (Indicator system mapping) – Mr Robert Steele, Systainability Asia |
| 17:00 | Sight seeing |
| **Day 3: 16 November 2011** | |
| ***International GIS Day celebrated with school students from Bhutan*** | |
| **Day 4: 17 November 2011** | |
| 09:30 – 12:30 | **Opening session 'Connecting from space to village'** |
| 12:30 – 13:30 | Lunch break |
| 13:30 – 15:30 | • Impact of climate change – case studies<br>- Cryosphere and glaciers – Mr Samjwal Bajracharya, ICIMOD<br>- Himalayan case study – Mr Dawa Steven Sherpa<br>- Biodiversity and land cover – Mr Faisal M Qamer, ICIMOD |
| 15:30 – 17:00 | • Pyramid level 3 (Innovation) – Mr Robert Steele, Systainability Asia |
| 18:00 – | Reception dinner |

| **Day 5: 18 November 2011** | |
|---|---|
| 09:00 – 09:45<br>09:45 – 11:05<br>11:05 – 11:30 | • Pyramid level 4 (Strategy) – Mr Robert Steele, Systainability Asia<br>• Bhutanese Youth for Climate Actions (BYCA)<br>• Impact of climate change (land use/cover) – Hands on exercise (Faisal, Sebastian, Mostafa) |
| 11:30 – 11:45 | Tea break |
| 11:45– 12:30 | • Impact of climate change (melting glaciers and snow cover) – Hands on exercise (Sebastian, Mostafa) |
| 12:30 – 13:30 | Lunch |
| 13:30 – 16:00<br>16:00 –17:00 | • Impact of climate change (air quality) – Ms Bidya B Pradhan, ICIMOD<br>• Air quality – Hands on exercise (Bidya, Sebastian)<br>• Pyramid level 4 (Strategy) – Mr Robert Steele, Systainability Asia |
| 17:00 – 18:00 | Visit to Memorial Chorten and Folk Heritage Museum |
| **Day 6: 19 November 2011** | |
| 14:00 – 15:30 | • Pyramid level 5 (Capstone) – Mr Robert Steele, Systainability Asia |
| 15:30 – 16:00 | • Participants perception/ synthesis |
| 16:00 – 16:15 | Tea break |
| 16:15 – 17:00 | **Concluding Session** |

# Special Youth Event

## Earth Observation: Empowering Youth for Climate Actions in the Himalayas

### Celebrating International GIS Day

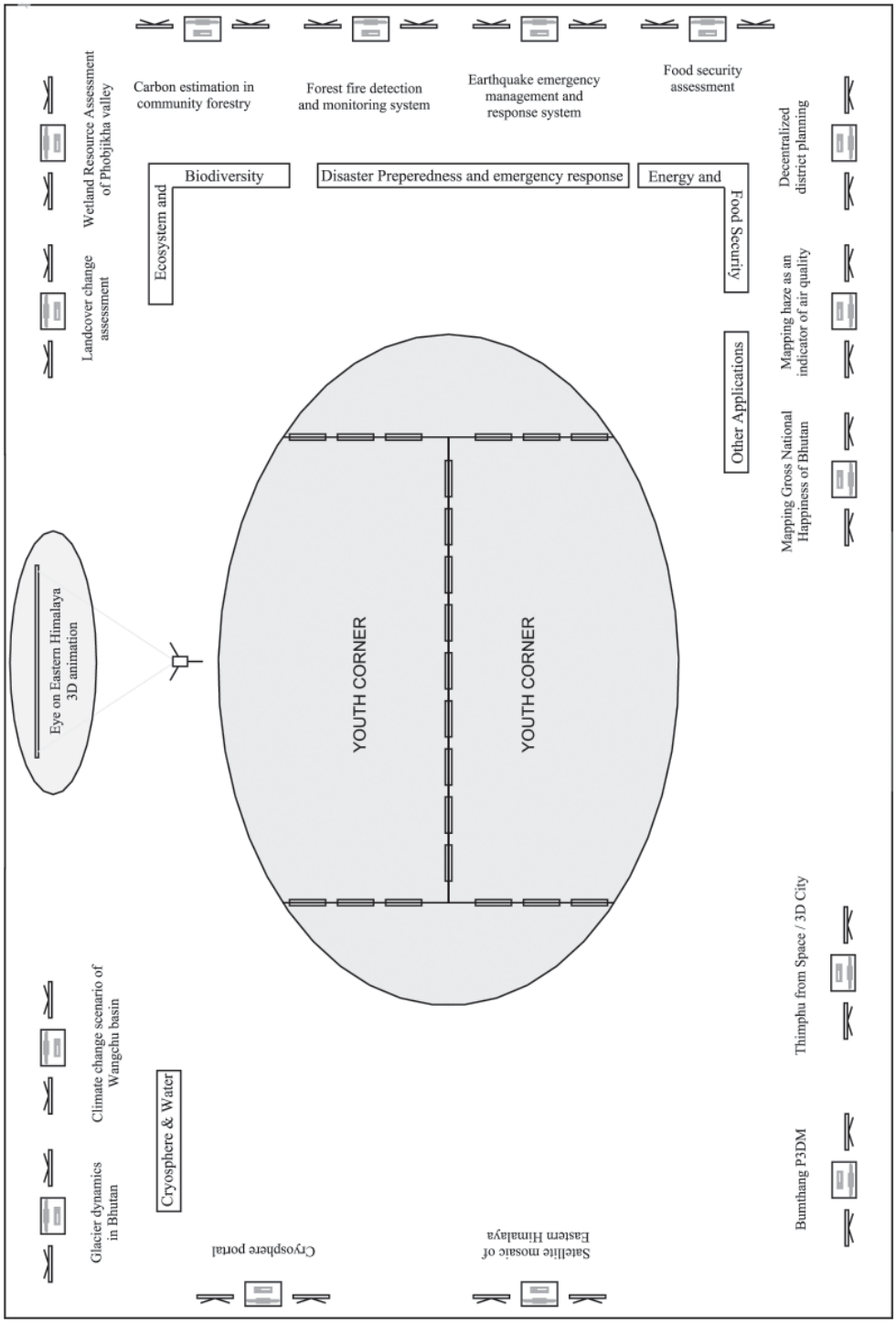
Coinciding with the Youth Forum, and to mark International GIS Day, a one-day event is being organised for schoolchildren from in and around Thimphu to familiarise them with climate change, and Earth observation tools and their use in various applications, through active, participatory, fun activities and exercises.

## **Programme** (at time of going to press, subject to change)

| **16 November 2011** | |
|---|---|
| 08:00 – 08:30 | Arrival |
| **Inaugural Session** | |
| 08:30 – 09:00 | **Marchang Ceremony** |
| 09:00 – 10:15 | **Welcome Address** by Dr. Tashi Samdrup, Director, Council for RNR Research of Bhutan, Ministry of Agriculture and Forests<br>**Welcome Address** by Dr. Andreas Schild, Director General, ICIMOD<br>**Address** by Ms Carrie Stokes, Geospatial Technology Advisor, USAID<br>**Opening Remarks** by the Hon'ble Lyonpo Pema Gyamtsho, Minister of Agriculture and Forests, Royal Government of Bhutan<br><br>**Launch of Herbal Garden Initiative** – **Sighning of MoU** by Dr. Andreas Schild, Director General, ICIMOD and Dr. Tashi Samdrup, Director, CoRRB, MoAF<br>**Handing over of Herbal Garden Kit** to the Hon'ble Lyonpo Pema Gyamtsho, Minister of Agriculture and Forests, Royal Government of Bhutan<br>**Inaugural Address** by HRH Princess Euphelma Choden Wangchuck<br>**Vote of Thanks** by Dr. Madhav Karki, Deputy Director General, ICIMOD<br>**Screening of video on herbal gardens** |
| 10:15–10:45 | Tea break |
| **Keynote Session** | |
| 10:45 –11:45 | • Introduction to the scope of use of Earth observation in climate change science and decision-making – Mr Basanta Shrestha, Division Head, MENRIS<br>• Climate change, is it really happening? – Mr Dawa Steven Sherpa, World Wildlife Fund (WWF) Climate Ambassador<br>• NASA SERVIR for improved environmental management and resilience to climate change – Mr Jason Kessler, Deputy Project Director, MFRC, NASA, USA |

| | |
|---|---|
| 11:45 – 12:30 | **Energiser Game – Woogies and Snoogies**<br>In an imaginary national park, a game of tag takes place between an endangered species, Kiwis, and their predators, Woogies. Through several (3-4) rounds, The national park experiences boundary and land-use changes as more people want to visit the park (e.g. building a Visitor Centre, restaurant, parking lot, bathrooms, roads, lodges, etc.). This limits the habitat size for the two species and affects their behaviour, population size, and more. A discussion follows on the changes, what it felt like to be one of those animals, and how they adapted. A list of pros and cons can be developed on the affects of reducing park land to make buildings and roads. |
| 12:30 – 13:30 | Lunch / Movie show – Melting Himalayas |
| **Activity Session** | |
| 13:30 – 13:45 | **Introduction to afternoon activities and stations**<br>Participants will be divided into five groups. Each group will rotate between the following four stations (indoors and outdoors).<br>***1) Migration headache*** – Students will explore the difficulties faced by migrating birds due to loss of habitat from human activities and climate change, and how GIS can assist with protected area connectivity planning, through an engaging game. (Robert, Mostafa and 5 youth participants)<br>***2) Community risk assessment mapping*** – Students will be divided into small groups and asked to identify key landscape features (such as rivers, glaciers, glacial lakes, forest areas, deforested areas) and human settlement areas using Landsat images. They will record their findings on transparent mylar sheets which will be overlaid to assess potential risk areas and possible options. (Robert, Sebastian and 5 youth participants)<br>***3) Linking systems with the sustainability compass*** – Students will be asked to use the sustainability compass to identify the drivers/causes and responses/effects of climate change in their community. We will then use this information to play a short game to discover the systemic linkages between different factors. (Robert, Samjwal and 5 youth participants)<br>***4) Earth observation tools and climate change*** – Students will be introduced to the basic GIS and Earth observation tools that can be used in providing a wide range of environmental and other information. They can also be used to provide an early warning system to help prepare for and adapt to climate change. (Sudip, Rajan and 3 youth participants) |
| 13:45 – 15:30 | **Station exercises** – approximately 25 minutes at each station |
| 15:30 – 16:00 | Tea break |
| 16:00 – 17:15 | **Motivational talk**<br>• Dasho Karma Ura, President, Center for Bhutan Studies,<br>• Prof. Bruno Messerli, Professor Emeritus, Switzerland<br>• Dr. Tom Snitch, Sr. Advisor, GeoEye, USA |
| 17:15 – 17:30 | **Concluding Remarks** |

# Exhibition Layout



# General Information

## Thimphu

Thimphu, the venue for the 'Climate Summit for a Living Himalayas', is the capital of Bhutan. It is a picturesque city ensconced between snow-clad mountains. With a population of 80,000, Thimphu is a typical mountain town spread out longitudinally in a north-south direction along the west bank of the valley formed by the Wang Chuu, also known as the Thimphu Chuu River. Thimphu lies at an altitude of 2,248 metres (7,375 ft) to 2,648 metres (8,688 ft).

## Weather

The winter season in Thimphu is very cold but dry. The average temperature recorded during winter varies between 5 and 15°C (41 to 59°F). The average high and average low temperatures during the month of November are 17.9° and 4°C respectively. Mountain tops in the vicinity of Thimphu will have snowfall in November. ***Please do not forget to bring warm clothes***.

## Access

Those travelling by air will arrive at Paro, Bhutan's only international airport. Thimphu is 63 km from Paro; an hour's drive.

Those travelling by road will enter Bhutan through Phuntsholing, about 180 km south of Thimphu which is reached by a five-hour drive by car, bus, or taxi through winding roads. There are regular bus services along the Thimphu–Phuntsholing route.

## Visas and Immigration

Indian and Bangladeshi nationals do not need a visa to enter Bhutan, but please carry a valid passport. For other nationalities, please carry with you a printed copy of the visa approval letter issued by the Ministry of Foreign Affairs, Government of Bhutan, when you fly into Bhutan. The visa approval letter is necessary for check in at the port embarkation. Please ensure that there are no discrepancies between your passport details and the visa approval letter. Visas will be stamped at the immigration counter on arrival at Paro international airport, based on the details in the visa approval letter.

A visa fee of USD 20 will be levied for all nationalities.

## Transport

Airport pickup and drop will be arranged by the organisers based on the travel itinerary you provide. Please ensure you provide the correct itinerary. There will be someone waiting for you at the exit.

For those travelling by road, you will have to arrange your own transportation.

## Restrictions on Tobacco

Bhutan is a tobacco free country, thus there are conditions for the import of cigarettes and tobacco. You may bring into the country one bottle of spirits (not larger than one litre) and one carton **of cigarettes** (containing 200 pieces) subject to 100 percent customs duty and 100 percent sales tax. Please do not forget to declare the goods at the customs counter and complete the formalities. Violation of the tobacco import act is a serious offence liable for 3 to 5 years imprisonment.

Smoking in public places is banned.

## Accommodation

### For Symposium participants

For participants coming from outside Bhutan, your room has been booked in Hotel Riverview. It is on the left bank of the Wang Chu with a view of the river and Thimphu city spread across the other side of the river. Participants from within Bhutan should arrange their own lodging.

Lunch will be provided at the venue.

### For Youth Event participants

You will be put up at the Youth Hostel under the Department of Youth and Sports (DoYS) on a twin-sharing arrangement.

### Hotel Riverview

The hotel is situated on the left bank of the Thim Chu river and offers 50 well-appointed rooms all with private balconies offering stunningly beautiful views of Thimphu.

**The hotel accepts payments in USD or Euro but does not have credit card payment facilities.**

### Payment

The currency of Bhutan is the Ngultrum (Nu) which is equivalent to the Indian Rupee (INR). Indian Rupees of lower denominations (100 and below) are also accepted. You are advised not to carry INR of higher denominations (500 and above). Dollars and Euros can be exchanged easily in banks and hotels. Exchange rates are approximately 45 Nu per dollar and 65 Nu per Euro. Banks and hotels in Bhutan do not accept dollar notes issued prior to 1996.

## Venues

### The International Symposium

The Symposium will be held in the Auditorium Hall of the Department of Youth and Sports, about a 15 minute drive from Hotel Riverview. Buses will leave the Hotel at 8:30 am. The hotel drop will be arranged according to the programme at the venue.

### Youth Event

The Youth Event will be held in the Conference Hall of the Department of Youth and Sports.

### Special Youth Event

The Special Youth Event will be held in the Auditorium Hall of the Department of Youth and Sports.

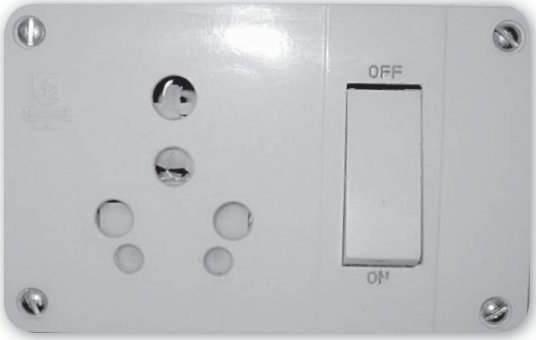
### Exhibition/Showcase

The Exhibition/showcase will be held in the Bhutan Teakwondo Federation Hall.

## Power Supply/Plugs

The electricity supply in Bhutan is 220 - 240 volts AC.

The common socket type in Bhutan, including in Hotel Riverview, is the three-pin round type shown in the photo. Please carry an appropriate converter plug with you if required.




## Dress Code

Please wear business or traditional dress to the Symposium sessions. Young people and participants outside of the sessions should be neatly dressed in a manner that respects the traditional values of Bhutanese society.

## For Private Sightseeing and Tour Please Contact

Ms. Anu Aliyah Ghondey Gurung
Bhutan Himalayan Experience
Changzamtog, Thimphu, Bhutan
Tel: +975 17607944, +975 17604977
Web: www.BhutanGuru.com

## Contact Details

| Name | Contact Number | Email |
|---|---|---|
| Hotel Riverview | +975 – 2 – 325030/325031/325032 | hotelriverview@druknet.bt |
| Mr. Deo Raj Gurung | +975 – 17706669 (Nov. 6 onward) | drgurung@icimod.org |
| Ms. Liza Manandhar | +975 – 17305223 (Nov. 12 onward) | lmanandhar@icimod.org |
| Bhutan Climate Summit Secretariat | +975 – 2 – 324334 | csummit2011@gmail.com |

# Map of Thimphu


| | |
|---|---|
| YDF | Youth Development Fund Complex |
| DoYS | Department of Youth and Sports |
| BTF | Bhutan Teakwondo Federation Hall |



Mountain Environment Natural Resources Information System (MENRIS)
International Centre for Integrated Mountain Development (ICIMOD)
GPO Box 3226, Kathmandu, Nepal
**Tel** +977-1-5003222 **Fax** +977-1-5003299
**Email** info@icimod.org
**Web** www.icimod.org, http://geoportal.icimod.org/