THE HIMALAYA PROJECT

There is an opportunity to consolidate and bring together the multiple sciences and diverse studies that relate to this important region of the world, and thereby build a knowledge system to improve the region's resilience to damage and losses from natural and man-made disasters while improving the quality of life for inhabitants in the many villages, towns and cities downstream.

The Himalayan Mountains have enormous impact on surroundings near and far, with at least 15 nations directly impacted by its unique weather and climactic conditions, its glaciers and rivers, and its overarching biogeophysical expanse.

Although occupying just 11% of the world's land surface, together these15 nations make up 45% of the world's present population. But their cooperation and shared wisdom is unfortunately less than to be desired.

This document contains a project outline that has been conceived to improve communications and future collaboration between the countries involved, and to set them on a course for producing a ***unified knowledge system*** of the region. Our goal is to underpin the long-term creation of ecological civilizations with well harmonised bioregions and eco-cities in an era of changing climate and frequent natural hazards.

The Himalayan Project is a major element in the global vision and mission of Geneva-based, non-political, not-for-profit ***ICES Foundation (International Centre for Earth Simulation)***
www.icesfoundation.org and in cooperation with the following contributing partners, namely:

The Institute for Environmental Science (IES), University of Geneva, from which Professor Martin Beniston led the European Union, funded ACQWA Project – a 5 year project to integrate the multiple water systems and sub-systems of the European Alpine Region.:
http://www.unige.ch/environnement/index_en.html
http://www.unige.ch/climate/Publications/Beniston.html
http://www.unige.ch/climate/Projects/ACQWA.html

The Institute of Global Environment and Society (IGES), George Mason University, from which Professor Jagadish Shukla chairs a post-graduate program in Climate Dynamics, with special emphasis on the impact of a changing climate on the Asian Monsoons:
http://www.iges.org/home.html
http://www.iges.org/people/shukla.html
http://aoes.gmu.edu/climate_dynamics
http://icesfoundation.org/UsersFiles/FCKeditorFiles/file/Asian%20Monsoons%20in%20a%20Changing%20Climate.pdf

and

The Ecological Sequestration Trust (UK), from which Professor Peter Head leads an integrated approach to city-region resilience, holistic planning, and underlying business models:
http://ecosequestrust.org/category/about/
http://ecosequestrust.org/our-people/executive-team/

Other partners are expected to join this effort as soon as the funding mechanisms are secured.

AN OVERVIEW OF THE HIMALAYAS

The Himalayas are a young seismically active mountain range arching across the Tropic of Cancer in Asia with over 100 peaks exceeding 7000m that are still being pushed upwards by the tectonic collision of the northward moving Indo-Australian Plate with the Eurasian Plate. The mountains extend for 2,400 km in length and between 150km in width at the eastern end to 400 km width in the west.

High altitudes have induced the formation of over 35,000 glaciers within the Himalayas, forming the source of major river systems that flow both north and south into neighboring countries. The mountains also play a major role in the flow and direction of large-scale monsoon weather systems that regularly impact the region.

Geologically, the Himalayas and their immediate surroundings are often referred to as a 'Third Pole' of Planet Earth. The region suffers frequent large-scale disasters from earthquakes, avalanches, mudslides, rock falls, floods, and extreme weather events. In addition, the glaciers are in serious retreat due to global warming, and there is a shift in much of the biological makeup of the region due to such warming.

Socio-economically, the Himalayas hugely impact all food, agriculture, energy, transportation, industrial, and public health systems within the countries that depend on its rivers. There is a patchwork of micro and macro climactic conditions created by the mountain range. Because of long-term historical conflicts however, many of these countries do not pro-actively share or coordinate their knowledge of the many physical aspects of mountain life, even though Mother Nature herself functions across national borders in a very fluid and transparent manner.

The 15 nations that have most at stake are listed as follows in order of national population size:

	Population	Land Size
China	1,354.0M (12/2012)	9,569.90M km^2
India	1,210.6M (03/2011)	2,973.19M km^2
Pakistan	183.8M (07/2013)	856.69M km^2
Bangladesh	152.5M (07/2012)	130.17M km^2
Vietnam	88.8M (07/2012)	310.07M km^2
Thailand	65.9M (09/2010)	510.89M km^2
Myanmar	53.2M (07/2013)	653.51M km^2
Malaysia	29.8M (07/2013)	329.61M km^2
Nepal	26.5M (06/2011	140.80M km^2
Afghanistan	25.5M (01/2013)	652.23M km^2
Cambodia	15.1M (07/2013)	176.52M km^2
Tajikistan	8.0M (04/2013)	141.51M km^2
Laos	6.6M (07/2013)	230.80M km^2
Kyrgyzstan	5.6M (07/2012)	191.80M km^2
Bhutan	.7M (07/2012)	47.04M km^2

Regional Population = 3,227M (45% of 7,100M world population according to UCSB world population clock).
Regional Land Size =16,727.M km^2 (11.23% of 148,940M km^2 world land size)

THE TIBETAN PLATEAU

With an average elevation of over 4500m and covering an area of 2,500,000 square kilometers, this region is known as the 'roof of the world' and is the headwaters of most streams in the surrounding region, and is itself surrounded by numerous mountain ranges. Furthermore, the seasonal monsoon wind shift and weather associated with the heating and cooling of the Tibetan Plateau is the strongest such monsoon on Earth.

Such well known rivers as the Yangtze, Yellow, Indus, Brahmaputra, Salween and Mekong originate in the Himalayan and Tibetan Plateau region and supply a lifeline of water, food, transport and energy to neighbouring countries. However, these rivers cross national boundaries and are therefore in high dispute with respect to water usage rights, hydroelectric damming, fishing and pollution control.

Qin Dahe, the former head of the China Meteorological Administration and winner of the 2013 Volvo Environmental prize (http://www.environment-prize.com/) said:

"Temperatures are rising four times faster than elsewhere in China, and the Tibetan glaciers are retreating at a higher speed than in any other part of the world. In the short term, this will cause lakes to expand and bring floods and mudflows. In the long run, the glaciers are vital lifelines for Asian rivers, including the Indus and the Ganges. Once they vanish, water supplies in those regions will be in peril."

DESIGNING ECOLOGICAL CITIES and EXPANDING TRADITIONAL CITIES

In the past 30 years, China's urban population alone has jumped to more than 700 million from less than 200 million, causing violent clashes over expropriation of farmland for development, as well as water shortages, energy shortages, transportation difficulties, air pollution and other problems. The same trends can be observed in many parts of the 15-country region.

Developing smart, intelligent and eco-friendly cities is now the priority in the years ahead, and this will require a far-sighted understanding of local, regional and global climate change, especially with respect to seasonal monsoons, changing mountain snow pack, seasonal snow melt, river flows and lurking seismic hazards.

Protection of eco-services from important bio-regions is an equally important aspect of future development planning, since such bio-regions act to support the health of nearby villages and cities. Long-term water security, food security, public safety and quality of life are all at stake.

UNIFIED KNOWLEDGE SYSTEM

Although a vast amount of local knowledge is currently available, this knowledge is neither systematically compiled nor shared between the countries of the Himalayan Mountain Region. Nor is this knowledge updated with a clear understanding of local impacts from global climate change, global warming, and global sea-level rise. Our proposal is to help create this ***Unified Knowledge System*** by means of a consortium of international, independent, non-political organizations led by the ICES Foundation, and in cooperation with local and international bodies of high repute, such as:

ICIMOD: http://www.icimod.org/?q=abt
SASCOF: http://dhm.gov.np/uploads/getnotice/693527908sascof4_general%20information_nepal.pdf

THE BASIS AND STRUCTURE OF THE UNIFIED KNOWLEDGE SYSTEM (UKS)

The basis of the UKS is a high-resolution digital elevation map (DEM) which provides a surface rendering on the complex geography that can be found throughout the entire Himalaya Region and to which the following multiple layers of additional data are attached: built environment, infrastructure, utility grids, power plants, transportation systems, land cover, farming and agricultural activities.

From this base map, a very large 3D file of information that describes all weather, hydrological and climate variables on a real-time basis will be accessible. This 'big data' file will be kept up-to-date by feeder data-streams coming in from local and regional authorities, and will include identifiable and quantifiable emissions information.

In addition to this surface information, the underlying sub-surface structure of the entire region will be defined and accessible from the base DEM, to the extent to which it is known. This file will contain all soil data, aquifers, geological faults and mineral deposits, as well as localized magnetic readings and historical seismic events.

Areas of local hazard will be of particular importance, and the best multi-physics, multi-science methods will be used to pinpoint the position of most likely occurrences. Hazards such as heavy rain, hail, flood, avalanche, glacial lake outbursts, landslide, mudslide, earthquake, fire, heat-wave, drought and many other hazards will be tracked and identified.

The essence of the UKS is an integrated holistic compilation of all the bio-geo-physical knowledge that is already known throughout the region, along with real-time feeds that keep the dynamic status of the territory available in an openly accessible manner.

A vast amount of satellite-derived Earth Observation data will feed into the system, and will add value to specific user enquires. Such satellite data will emanate from both geo-stationary satellites as well as constellations of microsatellites operated by private companies.

Using such multi-level data captured and available within or linked to the UKS, a modelling, simulation and visualization service will be available that allows the user to drill down, access and visualize all elements of interest on a hyperlocal basis. This is essentially a '*real-time big data predictive visual analytics*' function that will provide 'look ahead' capabilities and project the forward state of the region, or any area of local interest.

Finally, the UKS will ingest and assimilate as much social-economic data as possible so as to project the forward evolution of geographical developments and thereby to understand any harmful impacts on the natural bio-geo-physical system, both short term and long-term. As a consequence, planners will be able to ask 'what if' questions that help clarify the consequences of adding hydro-electric dams to river systems, or changing land cover and agricultural methods, or extending city boundaries and infrastructure.

In particular, the UKS will assist nations to communicate and coordinate their skills on matters of common interest, and to assist each other in such important areas as risk mitigation, and food-water-energy security.

The following films & videos are an excellent introduction to the key role played by the Himalayan Mountains:

Himalayas: water towers of Asia
http://www.bbc.com/future/story/20130122-himalayas-water-towers-of-asia
Mount Everest: how it was made
http://www.youtube.com/watch?v=KnE6S_Mb-mY
K2: climbing the world's highest mountain (part 2)
http://www.youtube.com/watch?v=HgVryHjBmxY
Pakistani Kashmir turns to water to solve power crisis
http://www.youtube.com/watch?v=Rxf9MDRQZaU
BBC: Our World – India's water crisis
http://www.youtube.com/watch?v=jscOuWpw_iU
The Roots of India's Water Crisis
http://www.youtube.com/watch?v=x8kqq1f14vg
The Silent War made by India in Bangladesh
http://www.youtube.com/watch?v=jYYxCwk8thU
The Tipping Points: India Water Crisis
http://www.sbs.com.au/ondemand/video/218607171939

The following articles describe changes in the glaciers and river flows from the Himalayan Mountains:

Multi-decadal mass loss of glaciers in the Everest area (Nepal Himalaya) derived from stereo imagery
http://www.the-cryosphere.net/5/349/2011/tc-5-349-2011.pdf
Region-wide glacier mass balances over the Pamir-Karakoram-Himalaya during 1999-2011
http://www.the-cryosphere.net/7/1263/2013/tc-7-1263-2013.pdf
Glacier mass changes on the Tibetan Plateau 2003-2009 derived from ICESat laser altimetry measurements
http://iopscience.iop.org/1748-9326/9/1/014009/pdf/1748-9326_9_1_014009.pdf
A reconciled estimate of glacier contributions to sea level rise: 2003-2009
http://iopscience.iop.org/1748-9326/8/4/041006/pdf/1748-9326_8_4_041006.pdf
International team maps nearly 200,000 glaciers in quest of sea-level rise estimates
http://www.colorado.edu/news/releases/2014/05/06/international-team-maps-nearly-200000-glaciers-quest-sea-level-rise
Yangtze flood comes one month early
http://news.xinhuanet.com/english/2002-05/20/content_401041.htm
USAID Mekong ARCC climate change impact & adaptation study for the Lower Mekong Basin
http://mekongarcc.net/sites/default/files/mekong_arcc_climate_study_main_report-press_for_web.pdf
Decline of Bronze Age 'megacities' linked to climate change
http://www.cam.ac.uk/research/news/decline-of-bronze-age-megacities-linked-to-climate-change
Uttarakhand's furious Himalayan flood could bury India's hydropower program
http://www.circleofblue.org/waternews/2014/world/uttarakhands-furious-himalayan-flood-bury-indias-hydropower-program/
Hydro-power plants blamed for deadly floods in India
http://in.reuters.com/article/2014/04/29/uk-india-flood-idINKBN0DF10F20140429
The unacknowledged risk of Himalayan avalanches triggering
http://link.springer.com/article/10.1007%2Fs10704-014-9939-3
SANDRP: South Asian Network on Dams, Rivers and People
http://sandrp.wordpress.com/

The following articles describe pollution in cities, towns and villages within the Himalayan Region:

Cities in India among the most polluted, W.H.O.says
http://cn.nytimes.com/world/20140509/c09india/en-us/

Other articles of note regarding the cities, towns and villages in the Himalaya Region:

India's brave new urban world
http://www.unisdr.org/archive/37447
Afghan plea for help on disaster risk reduction
http://www.unisdr.org/archive/37392

The following articles describe the impact of earthquakes within the Himalaya Region:

Human losses expected in Himalayan earthquakes
http://www.wapmerr.org/publication/Wyss_Himalaya_Scenarios2005.pdf
Earthquake loss estimates applied in real time and to megacity risk assessment
http://www.wapmerr.org/publication/ISCRAM_Wyss.pdf

Generalized articles concerning disaster risk management in the Asia Region:

From Aceh to Tacloban – lessons from a decade of disaster
http://www.unisdr.org/archive/37392
ADB's operational plan for integrated disaster risk management 2014-2020
http://www.adb.org/sites/default/files/integrated-disaster-risk-management-operational-plan.pdf
Strengthening climate resilience: approach in Andhra Pradesh and Tamil Nadu in India
http://nidm.gov.in/PDF/pubs/Strengthening%20Climate.pdf

Here is a topological map of the area of interest: