Kailash Sacred Landscape Conservation Initiative

ICIMOD

Guidelines for Development of the Comprehensive Environment Monitoring Plan

FOR MOUNTAINS AND PEOPLE

The Kailash Sacred Landscape Conservation Initiative (KSLCI) is a collaborative effort of the International Centre for Integrated Mountain Development (ICIMOD), the United Nations Environment Programme (UNEP), and the three countries China, India, and Nepal. It was initiated through an extensive consultative process, and launched with an Inception Workshop and Consultation held in Kathmandu in July 2009. The KSLCI will engage regional, national, and local partners, and other stakeholders in a consultative process aimed at facilitating a transboundary, integrated approach to sustainable development and conservation.

These Guidelines are a working document prepared in consultation among all partners for use in the programme.

ICIMOD, Kathmandu, Nepal, June 2010

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Guidelines for Development of the Comprehensive Environmental Monitoring Plan (CEMP)

Background

The Kailash Sacred Landscape (KSL) Conservation Initiative has the stated aim to promote the development of long-term environmental, ecological, climatic, and biodiversity datasets. The Hindu Kush-Himalayan (HKH) region in general has been described by in the IPCC Fourth Assessment (2007) as data deficient, primarily in terms of climate monitoring, however this is similarly true for a range of important environmental parameters. At present the distribution of environmental/ecological monitoring activities in the HKH is scattered and has a sparse spatial distribution considering the variability and biological richness of the region. This is similarly true for the remote KSL region, including a lack of sufficient meteorological stations, ice and glacial monitoring, and other on-going environmental monitoring.

The Kailash Sacred Landscape Conservation Initiative (KSLCI), during the current 18-month initial preparatory phase (Phase One) will develop a Comprehensive Environmental Monitoring Plan (CEMP), as part of the process leading up to the Regional Cooperation Framework (RCF), through the coordinated efforts of national partners from China, India and Nepal, with technical support from ICIMOD and UNEP. The CEMP will be prepared based on the Feasibility Assessment (which includes a Baseline Survey within the Feasibility Assessment, and a Policy and Enabling Environment Analysis), and complement and contribute to the development of the KSL Conservation Strategy.

As per the KSLCI Project Document (and elaborated on in Annex 5 of the Project Document), the CEMP will be developed by the country partners, and will form the basis for regional cooperation, and national strengthening, to enhance, focus, and/or develop a comprehensive environmental and ecological monitoring capacity, and associated institutional and scientific networks. These networks will interface with on-going international monitoring initiatives, aimed at providing baseline and trend data on global change. Existing monitoring efforts in the region (currently these are very sparse, with minimal coverage within the KSL) will be enhanced to form a geographically and ecologically comprehensive sampling frame. The aim will be to provide adequate sampling intensity and spatial distribution to identify and represent the spatial variability within the KSL for a variety of environmentally and ecologically relevant parameters, to establish ecological and climatic baselines, and to identify representative indicators of change.

Purpose of the CEMP

The purpose of the CEMP is to build regional and national capacity for environmental monitoring and long term ecological research, to promote the early identification of and response to potential adverse environmental impacts associated with various on-going processes (including climate change) within the KSL, and to facilitate and encourage regional knowledge sharing and transboundary cooperation. The CEMP will support landscape conservation and ecosystem management approaches, biodiversity conservation and management, and regional cooperation based on better informed decision-making, The development of the CEMP addresses the expressed concerns of the respective regional member countries (RMC's) for improved environmental data and information to better implement environmental programmes and make progress toward sustainable development of the region. It is likewise intended that the enhancement of long-term environmental monitoring and data collection within the KSL area will contribute to reducing knowledge gaps that are a serious impediment to improved understanding, modeling, and prediction of climate change impacts and adaptation, across scales (locally, regionally, and globally) and provide valuable input to the understanding of these processes at both the regional and global levels.

The CEMP, both at the national level and at the regional level, is intended to develop a network of institutions and build capacity to identify and monitor significant changes occurring in the KSL, in the short, medium, and long term. The CEMP, as a core component of the KSL Regional Cooperation Framework, is the document that will lay out the strategy for providing sufficient information for applying ecosystem management approaches in the longer term, as well as addressing critical issues and pressing threats in the shorter term. Requisite research and monitoring needs will be delineated and described, along with how these information and capacity gaps will be addressed by the implementation of the CEMP.

Process for Developing the Environmental Monitoring Plan (CEMP)

The EMP process will develop a common approach and transboundary framework for environmental monitoring and ecological research, with an emphasis on biodiversity conservation and management, as well as local livelihoods and adaptation to climate change. This framework will be based on commonly agreed upon and (as far as possible) internationally accepted protocols. Implementation and approach will seek to both enhance national capacity for regional cooperation and build local capacity for on-going environmental and ecological monitoring. Standardized methods and harmonized protocols for sampling, documenting and analyzing ecological, climatic and other environmental data, including socio-economic drivers of environmental change, will be identified to facilitate transboundary collaboration and knowledge sharing, based upon on-going national efforts and international guidelines.

1. Each of the country partners will develop and outline a country-level CEMP for their respective areas of the KSL, based upon this set of guidelines which were agreed upon through a process initiated at the First KSL Regional Workshop held in Almora, India in mid-April 2010.
2. Country partners have considered, discussed and tentatively agreed upon the aim, scope and basic parameters of the CEMP during the First Regional Workshop at Almora, and agreed to a process, timeline, and way forward which will allow for sufficient consultation, and facilitate joint and interactive collaborative development.
3. A draft CEMP for the each country within the KSL will be presented for discussion at the Second Regional Workshop, tentatively to be held in August 2010. Country partners will agree upon the approach to compile and harmonize the individual country CEMP's into a draft CEMP for the entire KSL, in order to delineate the common framework and identify the agreed upon common standards, protocols, methods, and other specifics,
4. A iterative, participatory and consultative process will be facilitated by ICIMOD to synthesize and develop the final draft of the KSL CEMP, to be presented for agreement upon as part of the RCF at the Third (final) Regional Workshop, to be held tentatively at the end of January 2011.
5. Concurrently, the CEMP process seeks to identify, initiate, and build networks to implement and institutionalize environmental monitoring and ecological research efforts outlined in the CEMP. It is intended that this process promote scientific participation and institutional engagement, and provide sustainability through national ownership and regional cooperation.
6. Concurrently, ICIMOD will develop a set of guidelines and a manual for community-based environmental monitoring, which will seek to include local communities and build local capacity for on-going long-term monitoring efforts. This will form the basis for including local participation within the CEMP. Draft manual for review will be ready and available for discussion and comment at the Second Regional Workshop.

Key Areas of Agreement and Basic Principles

Hierarchical approach

Need for hierarchical approach for holistic picture, similar to multilevel approach, for example taking into account nested approaches such as in situ observations with a larger ecosystems context. At the highest level, Landuse, Land Cover, and Change (LUCC) analysis provides the larger landscape context, within which ecosystem level studies or observation of particular taxa are nested, and through which drivers of external change can be identified and monitored.

Integration with national efforts

The GLOCHAMORE Research Strategy was identified as a useful starting point for discussion the guidelines, however, the need for a regionally-specific approach and development of a set of guidelines appropriate to the conditions of the KSL was highlighted. General points of the Strategy agreed upon as useful tenets included the strategic framework focusing the three aspects of environmental change, i.e drivers of change, impacts on ecosystems, impacts on ecosystem goods and services, regional economies, and health. On-going national efforts by the three respective countries were identified as the initial entry points for identifying common approaches, and in particular, common standards and protocols. In particular, it was pointed out that the Chinese Ecological Research Network (CERN) has 30 research stations, with various on-going monitoring activities based on a set of common protocols. Monitoring efforts must be linked to National Level efforts, and to other government initiatives, e.g. local administration, state forest depts., etc. The CEMP must harmonize with any national plans of the respective countries.

Transparency of CEMP process and stakeholder involvement

Stakeholder involvement increases the clarity of the research, enhances its relevance and acceptability, and improves the efficiency and impact of the data collected and knowledge developed. Consulting local people and the managers of resources within the landscape in the planning and implementation phase is therefore central to the implementation of the CEMP. Policy relevant information should be available to local stakeholders as well as local, national and regional decision makers, and the global research community.

Society and environmental change

Monitoring of socio-economic parameters, cultural change, and the human dimension of adaptation, focusing on mountain communities, is an essential component of the CEMP, and should be framed within the context of climate change and adaptation.

Integration of CEMP with the KSL conservation strategy

The CEMP must fully integrate with the Conservation Strategy. Further, any interventions by the Conservation Strategy, i.e. by KSL Conservation Initiative, should be monitored.

Promotion of regional knowledge sharing and open data exchange

The CEMP will promote transboundary knowledge and data sharing, common formats facilitating open data exchange, and develop a common data sharing framework, which will form the basis for development of a KSL knowledge exchange platform.

Environmental and ecological indicators

There is a need to identify sets of indicators early in the process that will facilitate long-term comparative analysis, and allow for an overall evaluation of ecosystem health and efficacy of conservation efforts. Indices are needed that are sufficiently robust, representative and sensitive to monitor environmental and ecological change and also fulfill the requirement to communicate complex environmental, ecological and biodiversity data to decision-makers and the pubic. Indicators need to be chosen that not just monitor the conservation status of various taxa, but are also relevant to ecosystem functioning and services, and can easily be incorporated into various models.

Ecosystem-specific sampling

A sampling frame should be developed for each set of parameters to be measured that takes into account the spatial and temporal variability of the conditions to be sampled. This implies that there should be an a priori landscape level spatial analysis based on existing geospatial data to stratify the relevant landscape into a reasonable number of strata relevant to the specific set of parameters being sampled. Depending on the sampling, statistical and analytical needs, sampling sites, permanent plots, or weather stations can be sited either to "represent" the average conditions of that strata, or perhaps can be sited along steep ecotones where early indications of change may be more evident. Bias in sampling, e.g. close to roads for accessibility should be avoided, taking into account the inherent trade-offs of cost and time requirements.

Permanent environmental monitoring and ecological research sites

Identification of permanent sites for monitoring of change is valuable method for establishing baseline conditions, and especially for understanding change processes as related to landuse, land degradation, biodiversity, invasive species, ecosystem function. For long term environmental monitoring, representative sites needs to be identified by each participating country, and with specific records of its location and baseline information. The location map, what is being specifically monitored, geographical information of aspects, altitude, latitude/longitude, and related recording will be the starting point, depending on the purposed of the permanent site. Permanent, long-term monitoring sites can have multi-purpose sampling and monitoring uses, and should be co-located with other efforts to maximize efficiencies and allow for collaboration and data collection synergies.

Key Thematic Areas to be Included in the CEMP

Using an initial list based upon the GLOCAMORE Research Strategy, the Working Group identified the following key areas to be included in guidelines. These key areas are indicative and not exclusive, and are intended to form the basis for a comprehensive long term monitoring effort. As such, it was decided they should be broadly inclusive of broad range of important parameters, taking a long term view, even if actual specific monitoring efforts may need to be phased in over an a period of time, or perhaps initiated in a later phase of the project. In the following is described some of these key elements identified by the partners, as could be useful or relevant to long-term environmental monitoring or ecological research within the specific context of the KSLCI.

Climate

- Specific parameters will be identified during the CEMP process, but will be based upon and coherent with international climate monitoring efforts, in particular WMO, GCOS, and in country efforts, e.g. CERN in China.
- Secondary data sources, e.g. NASA data on snowfall, etc., incorporated into climate data base.

Land use change

- Quantifying and monitoring landcover/land use change
  - Use of harmonized legends – LCCS
  - Integrated with existing national efforts
- Historical trend analysis
- Overview and assessment of impacts of landcover/landuse change

The cryosphere

- Glacier extent
- Glacier mass balance
- Melt water yield
- Snow cover
- Snow melt
- Snow gauging
- Permafrost

Water systems

- Water quantity
  - Working group decided delineation of these parameters, e.g. flow, discharge, etc., needs further discussion during CEMP development process.
- Water quality and sediment production
- Extent of water bodies (including potential GLOFs), high altitude wetlands
- Springs – general condition

Ecosystem function and services

- High altitude lakes and wetlands
- Role of various ecosystems in N and water cycles
- Role of forest in C cycle and resource production
- Role of grazing Lands in C, N and water cycles
- Soil systems
- Pollution (indicators to be identified)
- Plant pest and diseases

Biodiversity and ecosystems

- Ecosystem and ecological community change
- Key fauna and flora
- Invasive species
- Forest structure/non-timber forest products
- Culturally dependent species
- Impacts of invasive species
- Agricultural biodiversity and genetic resources

Hazards

- Floods/potential Glacial Lake Flood Outburst (GLOF)
- Drought
- Wildland fire
- Mass movements
  - Landslide/avalanches

Health determinants and outcomes afflicting humans and livestock

- Indicator disease(s) of climate change/vector borne

Mountain economies

- Agroecosystems and livelihoods
- Natural resource based employment and income
- Forest products
- Mountain pastures
  - Livestock numbers and composition
- Valuation of ecosystem services (needs further thought)
- Cross border trade
- Tourism and recreation economies

Society and environmental change

- Governance institutions
- Rights and access to water resources
- Conflict and peace
- Traditional knowledge and belief systems
- Urbanization
- Development (dams, roads, and other infrastructure)
- Development trajectory and vulnerability
- Cross border trade/illegal trade

Some Further Considerations on Key Thematic Areas

Climate

Changes in weather and climate, and the frequency of extreme events, impact mountain ecosystems both structurally and functionally. Understanding the likely impacts of climate change will be important in the KSL, and is dependent on an improved climatic information and meteorological data. Climate/weather monitoring sites in the KSL region need to be expanded and developed, with specific relevance to developing and improving regional climate models.

Meteorological data are required to assess the potential or actual status of the climate and associated processes. In addition, data collection and monitoring should be coherent with global standards and meet minimum requirements for inclusion into global datasets. Meteorological monitoring will form a key part of the CEMP. There are various sources available and many ongoing efforts describing key climatic parameters. In general, these include basic measurements like wind speed and wind direction, temperature (ambient air and soil), solar radiation (total and photosynthetically active), humidity, precipitation (rainfall and snowfall), atmospheric pressure, mist, cloudiness and transpiration, and soil temperatures.

Institutional arrangements are required that provided to sustainability of data collection efforts, based on national ownership, and integrated with national monitoring efforts, programmes, institutions, and networks.

Land use change

Landcover and landuse change is a major driver, and indicator of environmental and other change, impacting mountain ecosystems and the economic activities of people in the KSL. Land cover and landuse is also subject to external factors such as climate and the global market. In the KSL area, present land cover, land use and historical trends are not yet available, however remote sensing approaches can be used to develop this information.

Collecting baseline information is a necessary prerequisite for estimating change, prediction of future trends, and identify areas in need of further research. Monitoring landcover change over time can give clear indications of past and current trends within various ecosystems, and give an overview of ecosystems and their management. This requires (a) preparation of maps based on remote sensing and geospatial analysis for the project sites at different spatial and temporal scales, and (b) documenting the typology of landcover and landuses, and analysis of the land cover change dynamics.

Land use changes can have a large impact on ecosystems and the livelihood of the people dependent on the mountain resources. A method to model land use change incorporating biophysical parameters, climate change, population growth and economic change requires improved data and baseline information. Understanding the mechanism of land use change is important, but will be dependent on the development of a substantive information base delineating landcover/landuse change and trends.

The cryosphere

Many specialized agencies, within the region, and outside, monitoring various aspects of the cryosphere. It will be especially important to coordinate and integrate KSL cryosphere monitoring efforts with existing national research programmes. Many of the parameters to be measured may be time and expertise intensive, however, the importance of improved information about the cryosphere in terms of understanding future trends in water availability, and by extension food and livelihood security, was highlighted by the Working Group. As such, it was decided that the guidelines would include the broad range of essential parameters, even if operationalizing the monitoring of these parameters were difficult to measure or analyse, might need to high level expertise, or may not be feasible to implement in the early stages of the monitoring effort.

Water systems

Mountain areas are repositories of fresh water for human consumption, hydropower generation and regulate hydrological cycles both in mountains and downstream. The impact of climate change could have both the positive and negative impacts on water availability. Understanding relationships between the precipitation, soil moisture, evapo-transpiration, runoff and land use within the basins and drainages will help in developing management plans in landscapes.

Water quality and sediment transfer to downstream, e.g. dams and reservoirs, and in river basins, is important for both human health, and the health of aquatic and terrestrial ecosystems. This requires determining the key pollutants in the designated study sites, analyzing the pollutant loads and developing models to predict pollutant loads and simulation for the future change scenarios.

KSL has important wetland areas that should be included in the environmental monitoring plan. Mountain wetlands and streams are quite sensitive to climate change, atmospheric deposition and weather pattern. Physical, chemical and biological characteristics can serve as good indicators to change. Monitoring requires identifying the natural variability of systems and their responses to change by long-term plan. Monitoring should include the response of the aquatic lives (vertebrate, invertebrates, insects, planktons etc) to different threats such as global warming, acidification, pollutant loads, nutrients, water withdrawal and direct pollution.

Ecosystem function and services

Ecosystem functions are central components to the biogeochemical cycling of elements. The biotic part of alpine and other mountain ecosystems modifies biogeochemical and hydrological process particularly affecting storage and cycling of important nutrients such as nitrogen and phosphorus. Nitrogen fertilizaton can enhance the effects of warming in cold environments. Therefore the changes driven by climate change, land use changes, pollution loads have significant impacts for the services provided downstream. This requires understanding of the biogeochemistry changes under different climate change scenarios, land use dynamics, pollution loads and how these changes are affecting ecosystem services.

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Mountain forest is an important sink for carbon, therefore understanding the amount of carbon sequestrated by different forest types and other land use system will be important for the landscape. This might require setting up experimental plots in rangelands/pasturelands and forested lands' to investigate the carbon balance in the mountain watersheds. This can contribute and provide input to the models which can be applied to investigate both carbon cycling and yields of timber and fuel under scenarios of global change. Forest related resource such as timber, firewood, forage, medicinal and aromatic plants, NTFP's, etc., are potential relevant and/or could be monitored.

More than 60% of the HKH region is under rangelands where transhumance and nomadic livestock rearing is practiced. The KSL similarly has a large portion of area under pastoralism and is likely among the most important economic activities in the landscape. Alpine meadows and pasture lands are critical to both ecological and economic functions. Climate and land use change impacting vegetation and use of such lands affects the carbon, nitrogen and water cycles and stability of steep mountain slopes. In order to predict the future structure and function of the mountain grazing areas, it is important to monitor existing rangelands. This requires mapping existing grazing lands, identification of the characteristics of such lands, their carrying capacity, forage species, animal species, and stock density in the areas. Monitoring the dynamics of agro-pastoralism systems of the landscape is similarly important in

understanding house hold economics. Monitoring and prediction of the likely future characteristics of animal grazing driven by CC, invasive species of plants, alternative use of land and responding to market demands for different livestock products will be useful information.

The mountain ecosystem functioning and productivity of natural resources highly depends on soil quality and fertility. Climate change and land use changes impacts on both the physical and chemical properties of soils. The effects of changes in temperature, precipitation and associated land use changes have impacts on evapo-transpiration, soil organic matter, microbial biomass, carbon storage and soil biodiversity. Monitoring of soil-climate dynamics should be considered.

Biodiversity and ecosystems

Biodiversity assessment and monitoring

Kailash region is rich in biological resources, including many rare, endangered, threatened, and economically important species of flora and fauna. In the area because of high degree of altitudinal variations there is high diversity of habitats engendering the species richness. Traditional land use practices have kept the habitats intact. There is a sparsity of information including lack of inventory on biodiversity and the loss and gain of species. There is a need to establish a baseline for existing biodiversity in both aquatic and terrestrial species/ ecosystems. In order to assess the current biodiversity and to assess future change, a baseline inventory and regular monitoring of key texa (plants, insects, birds and other) is required. Biodiversity assessment should first be stratified based on the ecoregions that have been identified within the landscape, and any subsequent spatial analysis of variability. Changes in species composition and interaction influence ecosystem functions, therefore it is also important to define functions and services associated with biodiversity, and also then develop scenarios on possible effects of climate change.

Impact on the biota in the region by human activity is critical, and which in turn has impacts on biodiversity, ecosystem goods and services and resilience of ecological and economic system. The mountain taxa exists in the fragmented landscape and population; this requires careful attention to prevent the local extension. The role of species interaction needs to be protected. This warrants innovations on adaptive management practices and conducting experiments to determine appropriate management practices for the conservation of biodiversity.

Biodiversity along ecotones and in transitional zones

Large parts of the KSL area fall above the tree line where ecotones (between sub-alpine and alpine) are still under natural states or at semi natural state. This area is very sensitive to climate change and can readily be detected. Further, low temperature limits that ecosystem and therefore warming can have rapid and easily evident impacts. Therefore, monitoring is required to detect and understand the shifts in species abundances and distribution affected by climate change. For this, one option is adoption of GLORIA approach by establishing permanent monitoring sites. This also includes monitoring of shifting of meadow and forest boundaries. There is a need to identify potential protected areas and possible/existing connectivity between protected areas for allowing the migration/adaptation of species in situations where range shifts are forced by climate change.

Key flora and fauna

The KSL has several protected areas, reserves and wetlands of international importance adjacent or included. These areas are declared to protect certain species of plants or wild animals. These species in turn are influenced by the land use change dynamics in the area, currently and in future, and potential impacts of climate change. Within a context of environmental change, how resilient are these important species is relevant to their management. Inventorying of the key species along with the abiotic environmental data and understanding their interaction in terms of management will be crucial. Long term monitoring is required for assessing the biotic interaction while specific studies can be undertaken to assess response and risk of common and rare species in the face of climate change.

Culturally dependent species

Many species in the alpine areas are the result of repeated selection pressure from both herbivores and people, and based on their economic and cultural values. With the wave of modern infrastructure development and globalization there is danger that these species will be threatened. Study on the historical and present land use practices, how these systems determine the landscape and biodiversity components, and how modern agriculture production have influenced the system will be helpful.

Invasive species

Due to global change, alien and invasive plants are increasingly becoming a source of change in the mountains. Understanding how these species colonize new environments, and what are the conditions encouraging their spread are among the key questions that need to be understood for developing control and management methods to address the issue of invasive species. Invasive species brings about substantial changes in the ecosystem structures and function, therefore it is important to monitor this threat and for the development of management strategies. For this element of the monitoring plan there is evident need to develop an improved knowledge base specific to the project area on the pattern, dynamics and impacts of invasive species.

Hazards

In particular, hazards associated with changes in climate, landuse, and environmental conditions should be considered.

Health determinants and outcomes afflicting humans and livestock

In particular, health issues associated with changes in climate, landuse, and environmental conditions should be considered.

Mountain economies

Agriculture in the mountains doesn't operate in isolation but is integrated into comprehensive integrated landuse systems, and typically include significant livestock components. Therefore monitoring of forests, rangeland, water and all the resources including biodiversity have impacts and consequences for agriculture and livelihoods. While keeping in mind the ecological and economic functions of other related topics, agricultural monitoring should be developed. Dynamics of existing agro-pastoral systems need to be investigated, including monitoring a recent trend of land transformation into agriculture in high altitude areas. Monitoring of value chains on the mountain products of the landscape for enhancing the livelihood options of the local communities might also be important.

The KSL area is an important destination for religious and nature tourism. With the globalizing context and developing infrastructures in the area, tourism and recreation will be a major industry in the future. It is important to examine the present trend and to project the future tourism development in the area. This requires analyzing the current state of tourism and assessing the impact of global change on different forms of tourism, with a view to protect the future of tourism and the impact of tourism on the landscape. Assessment of both positive and negative impacts needs to be monitored using the past and present trends. Tourism linked with conservation incentives having pro-poor approach should be assessed for long-term benefits.

Society and environmental change

Appropriate methodologies should be identified to allow for the monitoring of the human dimension of environmental change. In particular, changes associated with livelihood strategies, the integrity of mountain communities and their cultural institutions, changes in demographics, settlements, and migration patterns, and the impact of development and associated infrastructure on mountain society.

Basic Approaches Considered While Developing the CEMP Guidelines

There are a variety of global, international and other regional initiatives that are aimed at improving our understanding of environmental change in mountains and other bio-culturally rich areas. It is proposed that the CEMP process should build upon and utilize these previous and on-going efforts to provide the basis for a comprehensive approach and to ensure coherence with global standards, efforts, and research networks. In particular, many global organizations and networks including the World Meteorological Organization (WMO), the Global Climate Observation System (GCOS), the Global Terrestrial Observation System (GTOS), the World Climate Research Program (WCRP), the World Glacier Monitoring Service (WCMS), Global Biodiversity Information Facility (GBIF), provide guidance and standards for the investigation and monitoring of various environmental parameters, as well as networks for information sharing and global databases. DIVERSITAS, GLORIA, GMBA, GISP and others are engaged in assessing, monitoring and predicting biodiversity change. GEO-BON has the goal to create an internationally coordinated, globally integrated biodiversity monitoring system. For mountains in particular, the Global Change and Mountain Regions (GLOCHAMORE) Research Strategy (2005) is available to provide a starting point, with a basic overview of approach, and a extensive delineation of parameters from which to evaluate for relevancy to the specifics of the KSLCI. The strategy has been developed within the context of existing international global change research programs of the Earth System Science Partnership (ESSP), notably the Global Land Project (GLP) of the International Geosphere – Biosphere Project (IGBP) and the International Human Dimensions Project (IHDP).

Among the core concepts of the GLOCHAMORE Research Strategy is the assumption that sustainable management can only be achieved with stakeholder involvement. It is advocated that stakeholder involvement increases the clarity of the research, enhances its relevance and acceptability, and improves the efficiency and impact of the data collected and knowledge developed. Consulting local people and the managers of resources within the landscape in the planning and implementation phase is therefore central to the implementation of the CEMP. Policy relevant information should be available to local stakeholders as well as decision makers and the global research community. The research strategy focuses first on drivers of change, then on impacts on ecosystems, then on the subsequent impacts on ecosystem goods and services, regional economies, and health. The human dimension emphasizes mountain and lowland people's dependence on mountain goods and services that are affected by both indirect and direct impacts of environmental change.

Process for Moving Forward with CEMP Process

Need national consultation, or other process allowing national partners and other stakeholders to become aware of, review, and provide input into the national CEMP. This is essential, as ownership of various monitoring activities will need to be taken by the various agencies.

- This process will be led by national coordinator, who will also serve as contact and focal point to discussion and iterative review of the regional synthesis process.
- A major outcome will be identification of a National Institutional Framework.

Interactive online site will be operationalized in order to facilitate discussion and collaboration between partners, and include.

- Members only web page, with facility to uploading of documents
- Email group list

Timeline

- ICIMOD will provide revised guidelines (based on input from Almora Workshop) – latest by May 5th
- National partners will provide feedback and input, revisions – by June 3rd
- ICIMOD will continue to develop CEMP guidelines and help to identify common approaches together with the partners

- ICIMOD will facilitate a concurrent process to identify common standards and protocols
- National efforts will provide the starting point for this.

Final draft versions of the national level CEMP will be presented by each of the three countries at the Second Regional Workshop (4 – 6 September 2010) in Jiuzaigou, Sichuan, China.

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