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Environmental Vulnerability Assessment Framework for the Himalayan Ecoregion was Developed and Presented under SUNRAISE in the National Workshop on:

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The vulnerability referred to as susceptibility of a natural and human system to disturbances and loss. This is determined by assessing the exposure of the system to impacts, sensitivity to perturbations, and its capacity to adapt to new conditions. The comprehensive assessment of vulnerability to both short and long-term impacts of climate change is pre-requisite for evolving, formulating and implementing effective climate change adaption strategies from local to regional level. In order to evolve a policy oriented and community centric realistic and holistic framework for climate change vulnerability assessment, the climate change adaptation needs to be considered as one of the integral components of all sectors of development, such as, forest, agriculture, water management, land management, irrigation, horticulture, health, infrastructure and so on.

This is because besides the natural stressors, the vulnerability of communities is determined by the capability, strength and efficiency of different developmental and service sectors. For example, if the water supply, irrigation and agricultural systems are not capable to response to the increasing frequency and severity of winter and spring droughts in the Western Himalayan mountains, the vulnerability of rural communities would increase to both the climate change and climate change induced natural disasters. Whereas, an adaptive developmental system could improve the adaptive capacity of communities both to climate change and natural risks. Moreover, the community vulnerability would increase if all the climate sensitive developmental and service sectors are functioning in a coordinated manner. This underlines the urgent need of integrating climate and disaster risk reduction, and their mainstreaming into overall process of development planning.

Further, the integration of climate adaptation and disaster risk reduction and their mainstreaming would essentially require a geographical space. Watershed being a hydrological unit provides the most scientific space both for the assessment of vulnerability and evolving and efficient adaptive framework to climate change. This is because the hydrological responses of a watershed are

entirely different from that of the adjoining watersheds, and water is not only the most fundamental natural resource and most sensitive to climate change; but it is also determine the vulnerability of the mountain socio-ecological system to climate change and natural disasters to a large extent. The determination of the geographical space and its spatial dimension would provide us with the basic framework, criteria for assessing climate change vulnerability both in spatial and temporal perspectives.

Criteria and Indicators for Determining Climate Vulnerability:

In the Himalayan mountains the vulnerability of local communities particularly those dependent on climate sensitive resource development sectors, such as agriculture and livestock are vulnerable to a variety of natural stressors as well as to a range of economic and social and cultural drivers. This provides the basis of determining the criteria for the assessment of climate change vulnerability of the communities. The 'Key Criteria' for community vulnerability assessment should include:

Natural: The natural stressors primarily expose the communities to a variety of impacts and risks. Depending upon the location of the geographical unit these may include: [i] the level of climate change and variability in terms of temperature, precipitation and weather extremes; [ii] disaster history; and [iii] Terrain conditions including altitude, slope, aspect, natural drainage and the hydrological responses of the area. These criteria could be analyzed at an appropriate spatial level, such as village or mini watershed keeping in view the spatial pattern of population and resource flow and utilization pattern.

Economic: This should include: [i] land use pattern and its dynamics; [ii] agricultural system; [iii] availability of arable land and land holding sizes; [iv] irrigation system and its potential; [v] opportunities of livelihood and income pattern; [vi] availability of and access to food; [vii] availability of credit and insurance. The economic criteria should be analyzed at household level and village level.

Cultural: An interpretation of a range of socio-cultural factors may help in making a comprehensive assessment of community vulnerability. The important cultural criteria may include: [i] population density; [ii] age structure of population; [iii] gender composition, gap and level of equality; [iv] level of community education; [v] community access to resources particularly land and water, information, knowledge and technology; [vi] awareness level; and [vii] community health status.

Institutional: The institutional criteria are very important in identifying community vulnerability as the availability, status, and efficiency of institutional governance not only decide the vulnerability, but also help in building and improving the adaptive capacity of communities. The institutional factors may include: [i] drinking water supply; [ii] community access to drinking water; [iii] irrigation system; [iv] efficiency of and access to health services; [v] level of infrastructure development; [vi] agriculture and horticulture practices and extension services; [vii] communication services; and [vii] climate information services.

The natural [bio-physical] factors primarily determine the level of community exposure; whereas the socio-economic and institutional aspects not only determine the magnitude of vulnerability, but also indicate the level of adaptive capacity of communities.

Geo-Spatial Techniques for Delineation of Vulnerable Communities:

The determination of community vulnerability would require creation and collection data and information on both bio-physical and socio-economic parameters from varying sources employing different tools and technique. The satellite remote sensing could be used as the most efficient, reliable and cost effective technique for the collection, interpretation and mapping of a range data on various aspects of bio-physical, economic as well as institutional determinants of vulnerability. At the same time, Geographic Information System [GIS] platform could be most effectively used for the analysis and integration of data collected from various sources, and to identify and map the magnitude of vulnerability as well as the adaptive capacity of communities in mountain environment.