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Title of the Session: Climate Dynamics, Vulnerability and Disaster Risk Reduction in Mountains and Mega Cities.

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Summary

The linkages between climate dynamics, vulnerability and disaster risk reduction at macro and micro geographical levels have been analysed in changing environments of fragile mountain ecosystem and mega cities ecology. The geospatial mapping of flash floods, glacial lake outbursts, extreme rainfall, excessive soil erosion and landslide monitoring elaborates that disaster risk reduction requires integrated understanding of high and low land relationship where a small change at high and fragile ecosystem can induce devastating changes at low lying areas. The urban mega cities climate are changing microscopically that has been analysed by thermal mapping and monitoring. Population pressure is inducing land use/cover changes and intensifying formation of urban heat island (UHI) where the mitigation and management should proceed with integrated land use planning based on environmental zoning in order to make resilient cities.

Context

The work pivot around Climate Dynamics, Vulnerability and Disaster Risk Reduction, where it has been deduced scientifically that almost the entire globe is experiencing surface warming. The globally averaged combined land and ocean surface temperature data as calculated by the linear trend, showed significant warming of 0.85 (0.65 to 1.06)^oC, over the period 1880 to 2012. The total average increase between 1850-1900 and the 2003-2012 period is 0.78 (0.72 to 0.85) ^oC. The empirical observations exhibit 5 per cent uncertainty in the model analyses variable anthropogenic environmental change with changing differential rate of climate dynamics in urban and rural areas, high altitude and low lying plain, ridge and valley topography together with ecologically fragile and stable areas. The young fold mountain chain "Himalaya" is considered to be highly sensitive, fragile and vulnerable to climate change and variability due to its topography, climate, burgeoning anthropogenic pressure, overgrazing, deforestation, road construction, dam construction and agriculture/horticulture in high slope regions. This region including eastern and western Himalaya is prone to multiple hazards viz. earthquake, landslides, flash floods, etc. The recent flood furies at Leh (2010), Uttarakhand (2013) and Jammu and Kashmir (2014) were induced respectively by cloud burst and intense rainfall for more than 450 mm in 3 days occurred at 62 years of gap where 17 cloud bursts occurred only during 2010-2013. But the spatial impact varied between Leh's flat land topography to high hill region ridge and valley topography in Kedarnath and Kashmir that carried massive devastation in downstream area. The huge amount of rainwater was beyond the Jhelum's catchment capacity added by chocking of drainage system due to extensive soil erosion during the event caused by human activities bringing massive destruction at Kashmir Himalaya. Floods in the Indo-Gangetic Brahmaputra plains are an annual feature but the frequency and occurrence of Glacial Lake Outburst (GLOF) events are also increasing during the second half of the 20th century. There are more than five thousand glacial lakes in the greater Himalaya and about

two hundred lakes are potentially dangerous are forming up due to temperature rise and glacial melting where many of them have been formed within the last 5 decades are continuously resulting in the loss of livestock's, human lives, destruction of houses, bridges, fields, roads and livelihoods.

The analysis on expanding Mega cities been done at TM and ETM-Landsat series of satellites exhibit concentrated and dense haphazard built up zones owing to meet the demands of the burgeoning population, inducing land use/cover changes are intensifying formation of urban heat island (UHI) where the formation is linked with the increase in temperature in the centre in comparison to the peripheral areas in world's mega cities putting more and more lives at risk to disasters of micro climatic changes in Delhi, India.

The integrated mitigation and management for disaster risk reduction from structural and non-structural adaptation and mitigation strategies are required to bring at decentralized level where micro to macro level information, funds and accessibility may increase societal capacity at large. The climate affairs from multi-disciplinary approach that may foster marginalized group of society include women, elderly and school children to come at forefront in intrinsic reduction of disaster risk for capacity building and networking nexus even at micro level planning.