

## **SUSTAINABLE APPROACHES TO INFRASTRUCTURES IN RESILIENCE ERA**

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### **Abstract – Practitioner talk.**

Sendai, Japan, UN World conference 2015 adopted resolutions fixing goals, targets, purposes, and priorities towards disaster risk reductions in respects of mortalities, economic losses, damages of infrastructures and capacity buildings for safer world. Devastating disasters have been caused due to climate changes and related cascading disaster impacts. Paris Agreement 2015 and COP 26 summit Glasgow on climate change highlights the need of mass movement and support. Many areas have been identified as multi-hazard prone in different countries. Global melting of glaciers has increased causing huge loss of ice, growth of ocean and raising sea level. Impact is seen in alteration of global climate enhancing extreme weather related disasters, less fresh drinkable water etc. Events of cloud bursting in mountainous areas with thunder storms are often causing sudden and unpredicted devastating floods in those areas. Events of Cyclones/Tornadoes/Hurricanes with severe wind speed and flood etc. are causing huge loss of life and properties. Climate changes have made many areas of world warmer and causing frequent destructive wildfires. Areas prone to wildfires need to observe strict rules. Considerable damages of properties and loss of life are happening due to failures of non-structural elements and their attachments etc. as well.

In event of earthquakes, earth dams, concrete/gravity dams and embankments are very vulnerable. This is compounded by exposure to unprecedented rainfalls in catchments around the world, to floods and/or cloud bursts. Therefore these structures require more stringent design criteria regarding free board, seismic slope stability and dynamic/ hydrodynamics analysis etc. Nature, frequency and destructive effects of floods have raised the vulnerability. Countries, below or at sea level are vulnerable to floods due to sea rising. Floods due to change in landscape, land use, affects of sizes of river basins/ flood plains are also responsible for severity of floods. Earthquakes and other natural disasters are unpredictable. Major damages occur due to collapse or disaster impacts on buildings and many countries, including India, have thus revised the related building codes. Earthquakes occur and sometimes simultaneously with other disasters or they can be followed in many areas by tsunamis, floods and cyclones. Earthquakes cause destructions of roads/highways/railways/underground transportation systems, as well as bridges and other types of infrastructure. Associated events often with landslides/mudslides, fires/fault ruptures and tsunami in coastal areas, situations become severe. Industrial buildings are also vulnerable to earthquakes and the associated accidents. These buildings are designed in traditional manner as per codes of respective country. India, the IS 1893 code (part IV) contains stipulated criteria for design categorizing different industries depending on their vulnerabilities. Prevailing codes covering criteria for design against single disaster need to stipulate necessary guide lines against multi hazards. Development of Safe infrastructures will enable the world to sustainable resilience. The paper discusses the present status in brief with highlighting the important strategic approaches in respect of above disasters for safe world..

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