Bioengineering for Eco-Safe Rural Roads

CCA, Eco-DRR for Eco-Safe Roads

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Climate Change, Bioengineering for Eco-Safe Roads

- **Over View of the Presentation:**
  - Climate Change Adaptation (CCA);
  - Adaptation verses Mitigation;
  - Ecosystem based Disaster Risk Reduction (Eco-DRR);
  - Eco-Safe Roads;

Climate Change Adaptation:

- **Climate Change Adaptation (CCA):** Adjusting to the unavoidable impacts of anthropogenic & natural climate change.

- **Soil Bioengineering:** is the use of living plant materials to provide some engineering function. It pursues technological, ecological, economic as well as design goals & seeks to achieve soil slope protection primarily by making use of living & inert materials, employing them in near-natural constructions.

Climate Change Adaptation:

- Different terminologies are been using such as: eco-technology, ecosystem based adaptation, Eco-system based Disaster Risk Reduction (Eco-DRR), eco-engineering, green infrastructures (GI), Nature based Solutions (NbS), etc.

- **Ecosystem based Adaptation (EbA):** Ecosystem-based adaptation encompasses a broad set of approaches to adapt to climate change. They all involve the management of ecosystems and their services to reduce the vulnerability of human communities to the impacts of climate change. Wikipedia

Climate Change Adaptation:

- **Eco-DRR:** is the sustainable management, conservation & restoration of ecosystems to provide services that reduce disaster risk by mitigating hazards and by increasing livelihood resilience. Often considered green-grey (Hybrid) construction not only for climate change but also all hazards to be mitigated.

- **Eco-Safe Roads:** road operational year round to ensure economic activities at local level provide better access to the market, healthcare & education & increased the communities' resilience.

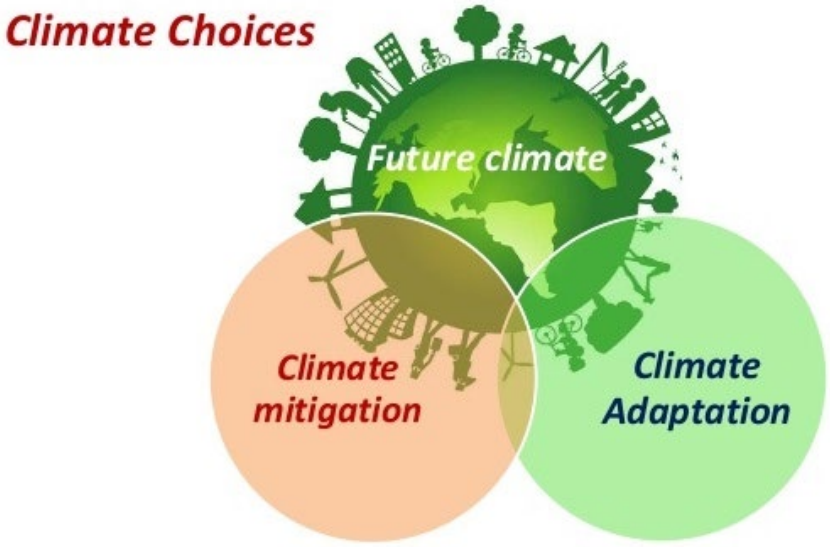
- 'Eco-safe road' approaches, provides sustainable & cost-effective solutions with multiple purposes: reduce environmental degradation; improves livelihoods, thereby addressing CCA, IWRM, DRR, bio-diversity conservation & public-health.

Climate Change Adaptation:

- **Ecosystem based Adaptation (EBA):** involves conservation, sustainable management and restoration of ecosystems are cost-effective solutions that can help people adapt to the impacts of climate change.

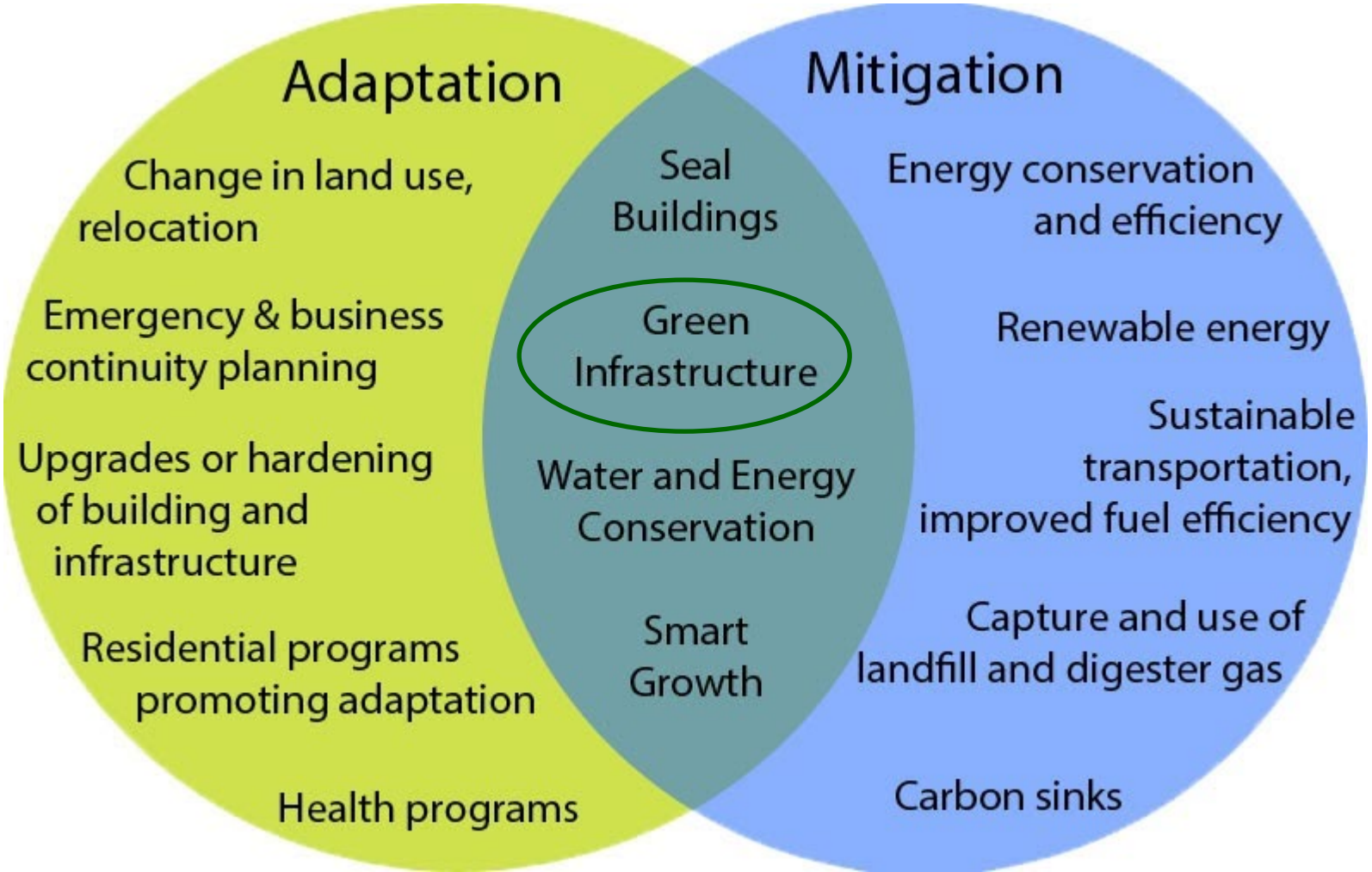
Climate Change Adaptation:

- **Mitigation:** Climate change mitigation consists of actions to limit the magnitude or rate of long-term global warming and its related effects. Climate change mitigation generally involves reductions in human emissions of greenhouse gases. Wikipedia



Climate Change Adaptation:

- **Adaptation Vs. Mitigation:**



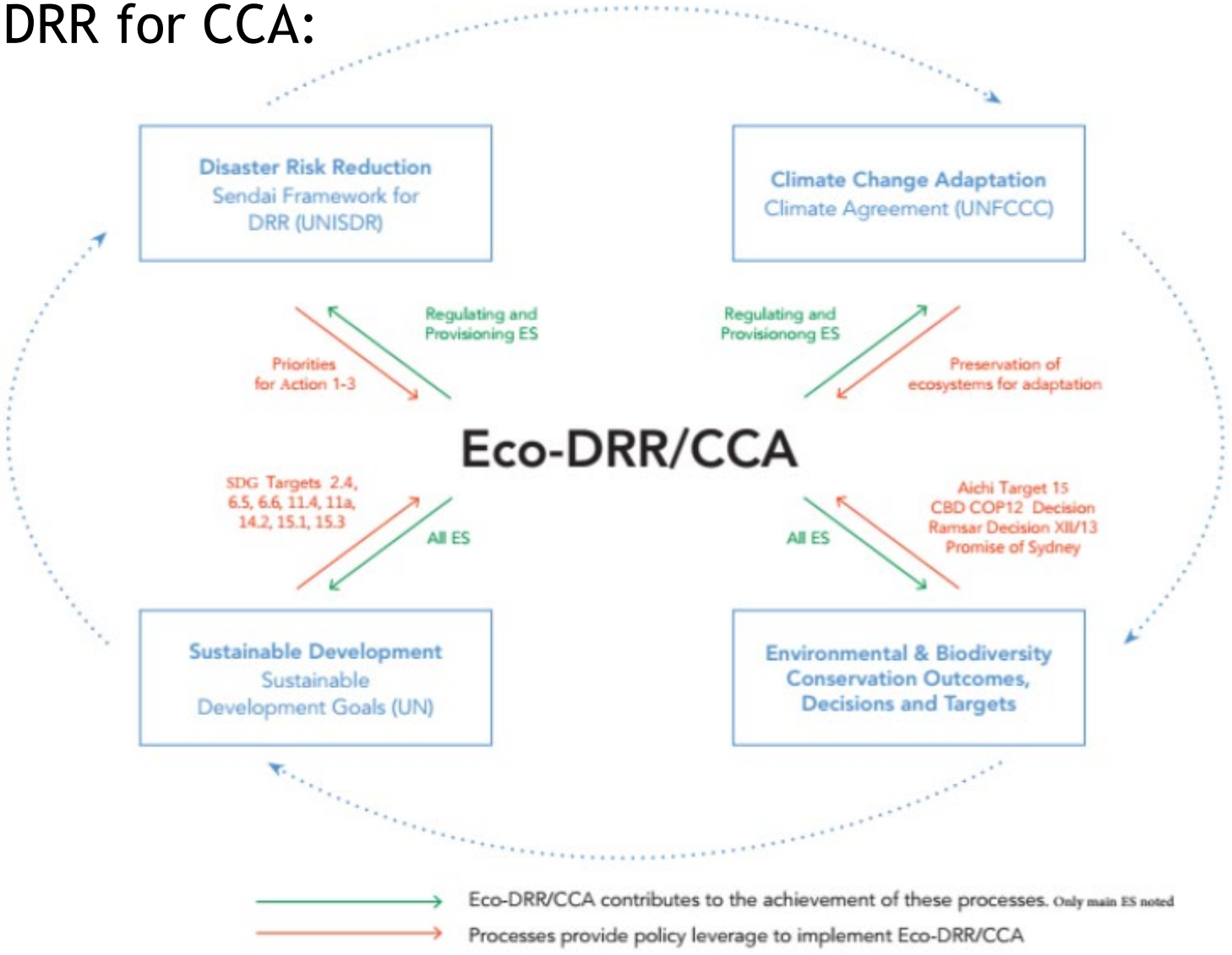
Ecosystem based Disaster Risk Reduction (Eco-DRR):

- **Eco-DRR:** is the sustainable management, conservation and restoration of ecosystem to reduce disaster risk, with the aim to achieve sustainable and resilient development, IUCN.

- **Eco-DRR: is the** sustainable management; conservation and restoration of ecosystems to provide services that reduce disaster risk by mitigating hazards and by increasing livelihood resilience (Estrella & Saalismaa, 2013). The Eco-DRR measures not only reduce the impacts of the disaster events but also provide **co-benefits** (e. g. environmental conservation, functioning of ecosystem services, conservation of water resources, provides livelihood options, etc.).

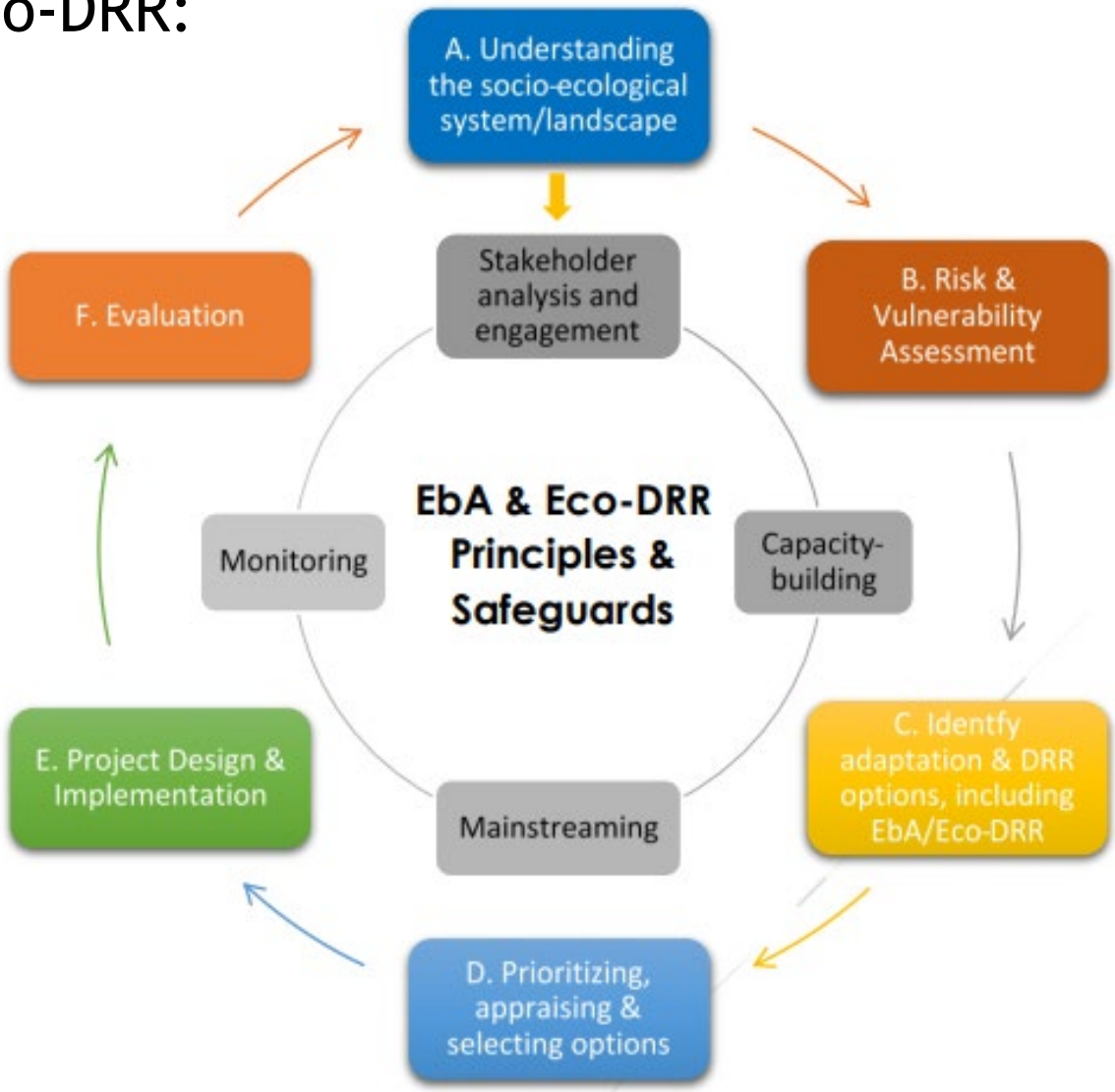
Ecosystem based Disaster Risk Reduction (Eco-DRR):

- Eco-DRR for CCA:

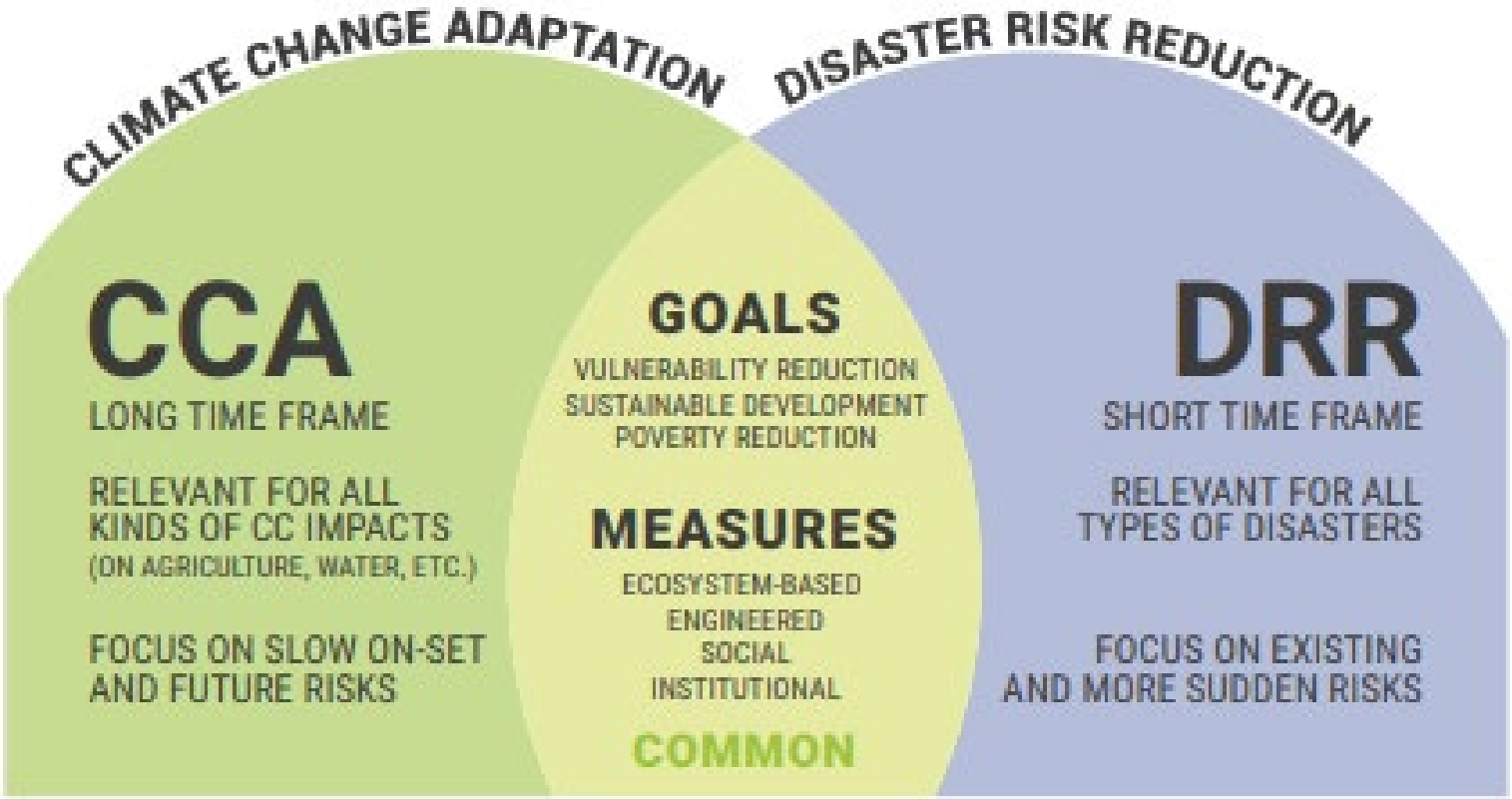


Ecosystem based Disaster Risk Reduction (Eco-DRR):

- EBA & Eco-DRR:

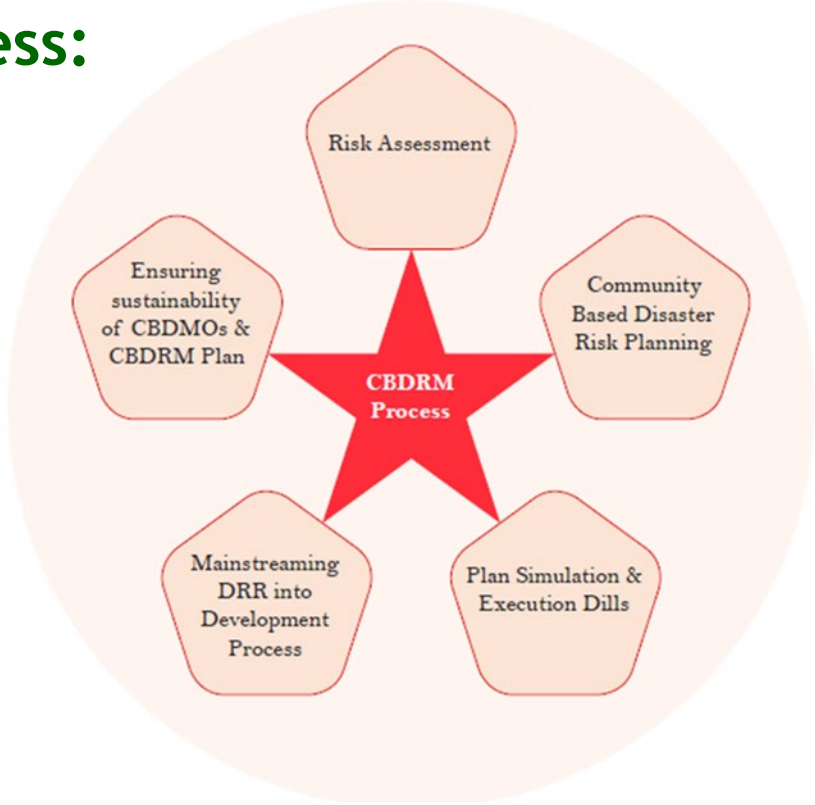


Ecosystem based Disaster Risk Reduction (Eco-DRR):

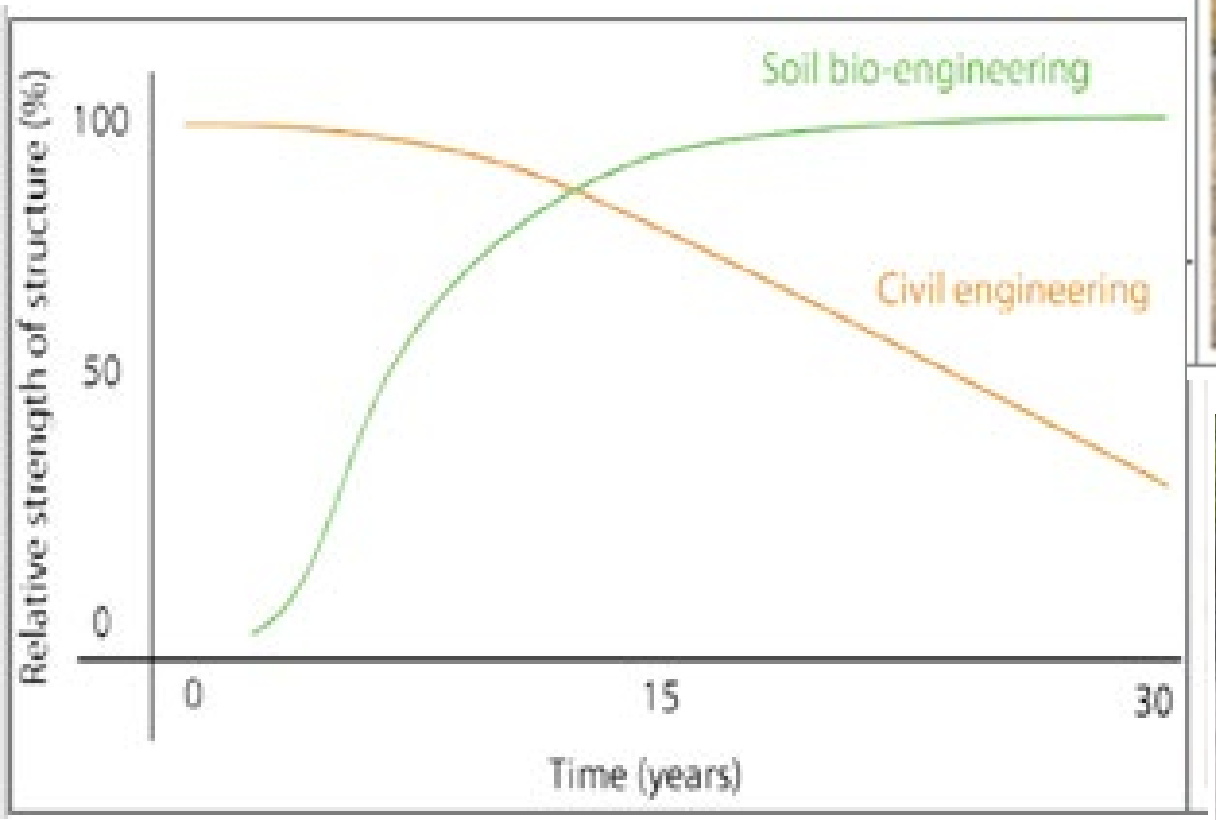


Community based Disaster Risk Management (CBDRM)

- CBDRM: is a participatory process of promoting the involvement of the community in disaster risk management at the local level. In CBDRM communities are actively engaged in the identification, assessment, and treatment and planning for hazards and vulnerabilities of various kinds (Krummacher, 2014).
- **CBDRM Process:**

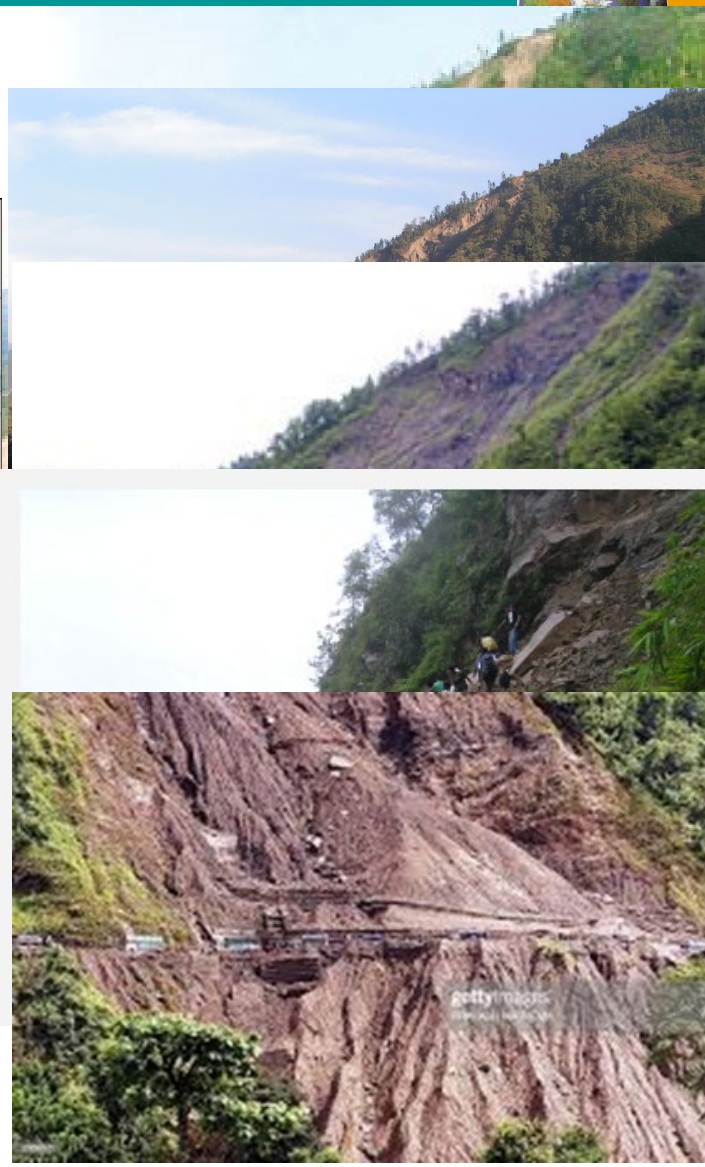


Eco-safe vs. Conventional Eng. Approach for Roadside Slope Protection:



www.youtube.com/watch?v=x20lil6uW8M

Eco-DRR: Case Study – Krishnabhir, Nepal



Eco-DRR: Case Study – Krishnabhir, Nepal

- Krishnabhir landslide was triggered in Aug. 2000 due to prolonged & intense rainfall (triggering factor) & the causal factors were the underlaying soil/geology (e. g. thick colluvium deposits, highly weathered bed-rock, etc.);

- The road was blocked for 11 Days - the only main road connected the capital city Kathmandu to other part of the country & to the nearest border to India;

Eco-DRR: Case Study – Krishnabhir, Nepal

- Many National & International experts visited the sites, who proposed high-tech. & costly measures to open up the roads (e. g. construction of tunnel)

Eco-DRR: Case Study – Krishnabhir, Nepal

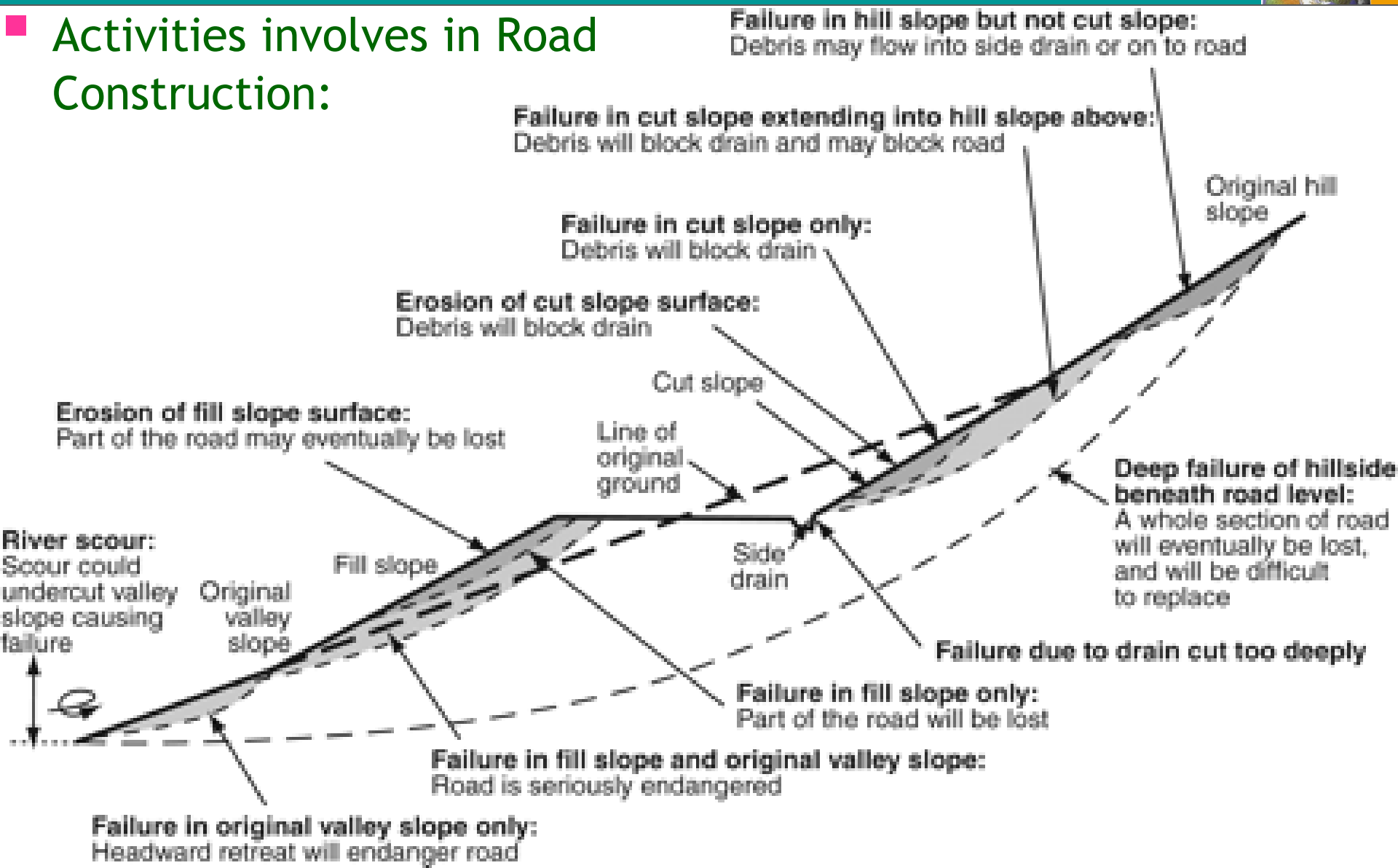
- However, the experts suggested measures were found unfeasible because of **huge cost & environmentally not friendly**.

- The Nepal's Department of Roads along with some experts, **Soil Bioengineering** was initiated utilizing simple civil engineering construction & local plant species (e. g. tree, shrub & grass).

Eco-DRR: Case Study – Krishnabhir, Nepal

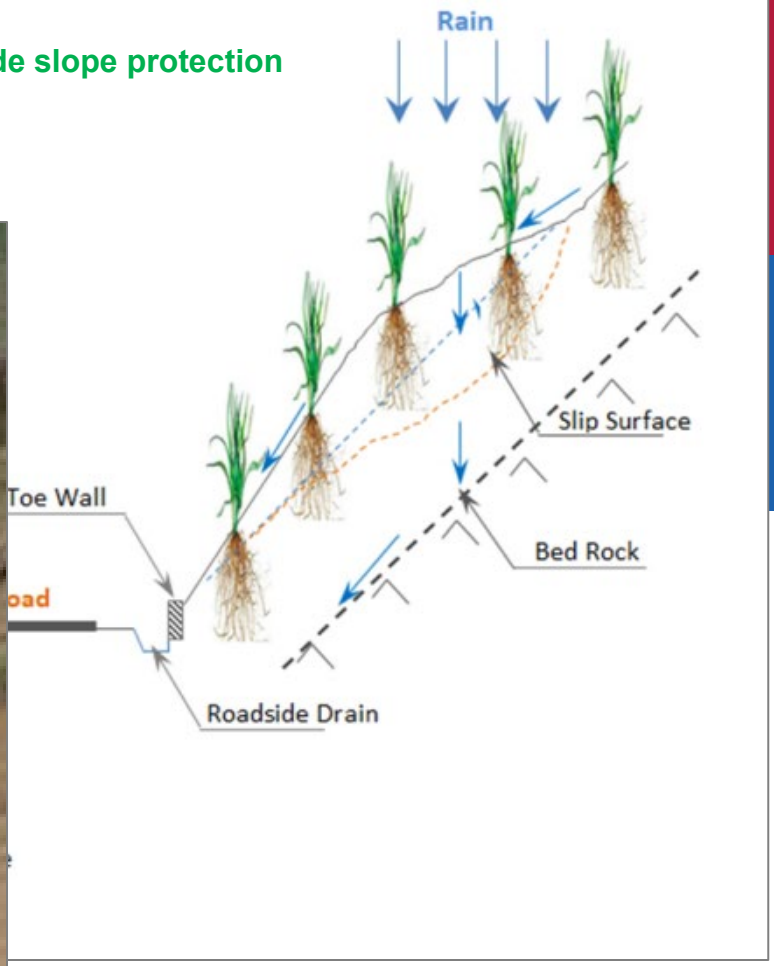
Eco-DRR for Eco-Safe Roads

- Activities involves in Road Construction:



Eco-DRR for Eco-Safe Roads

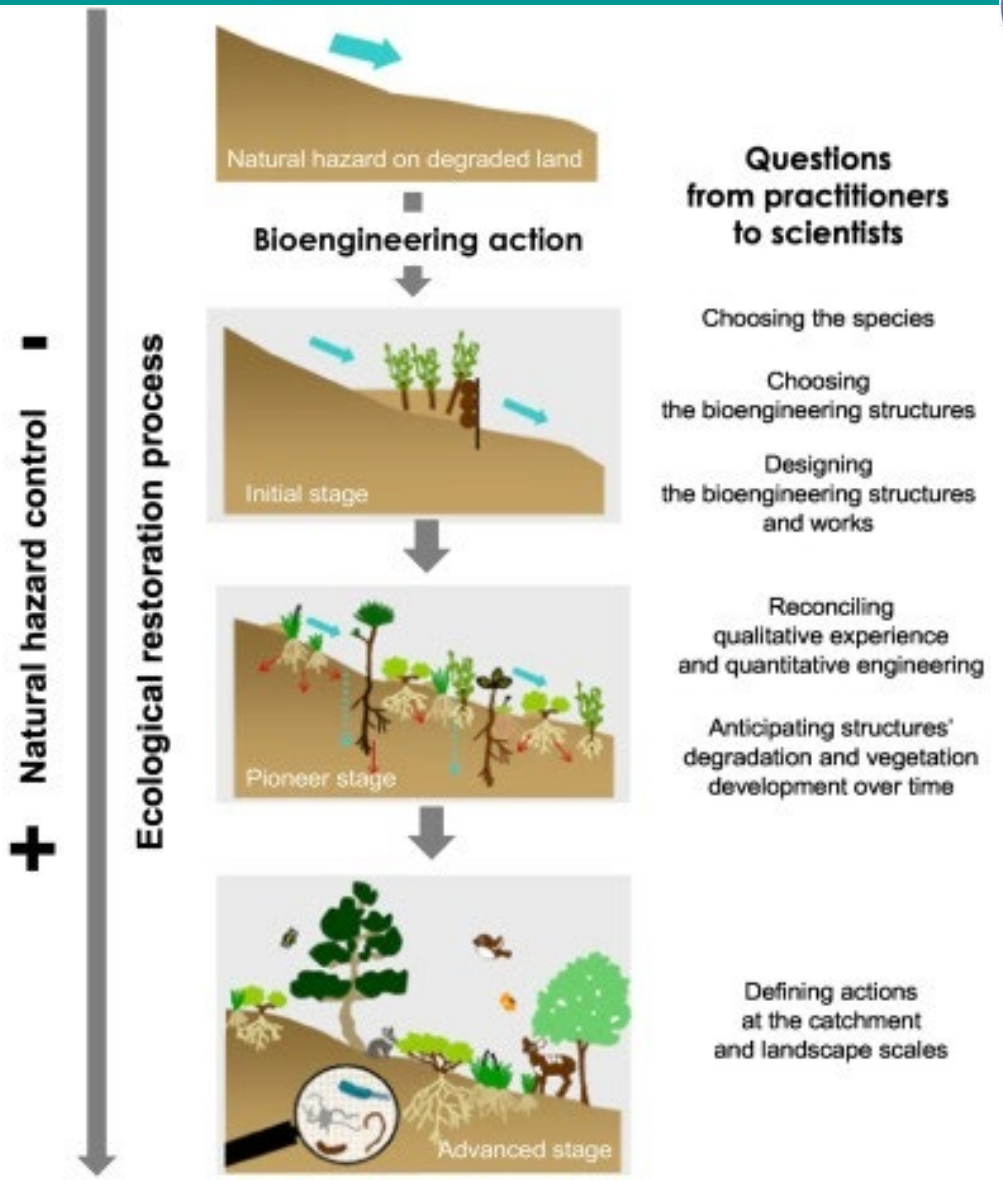
Eco-Safe Road – roadside slope protection



Vegetative check dams for Gully Protection

Community based Disaster Risk Management (CBDRM)

- CBDRM:



Thank You !!!