

# Time to consider the ecological ramifications of droughts in policies



## for attaining sustainability



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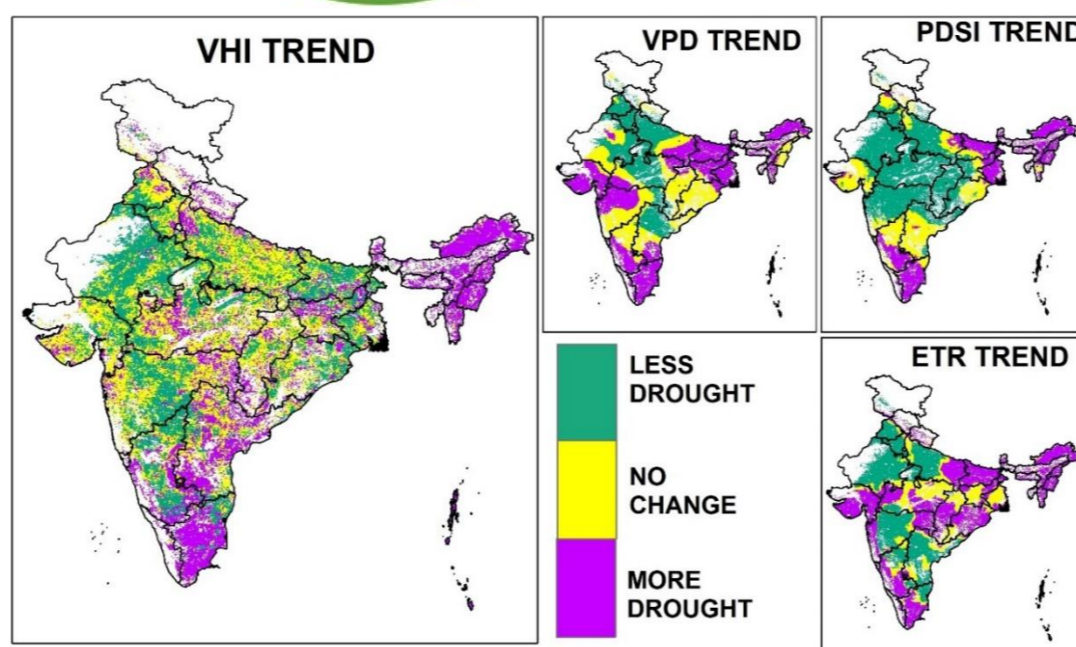
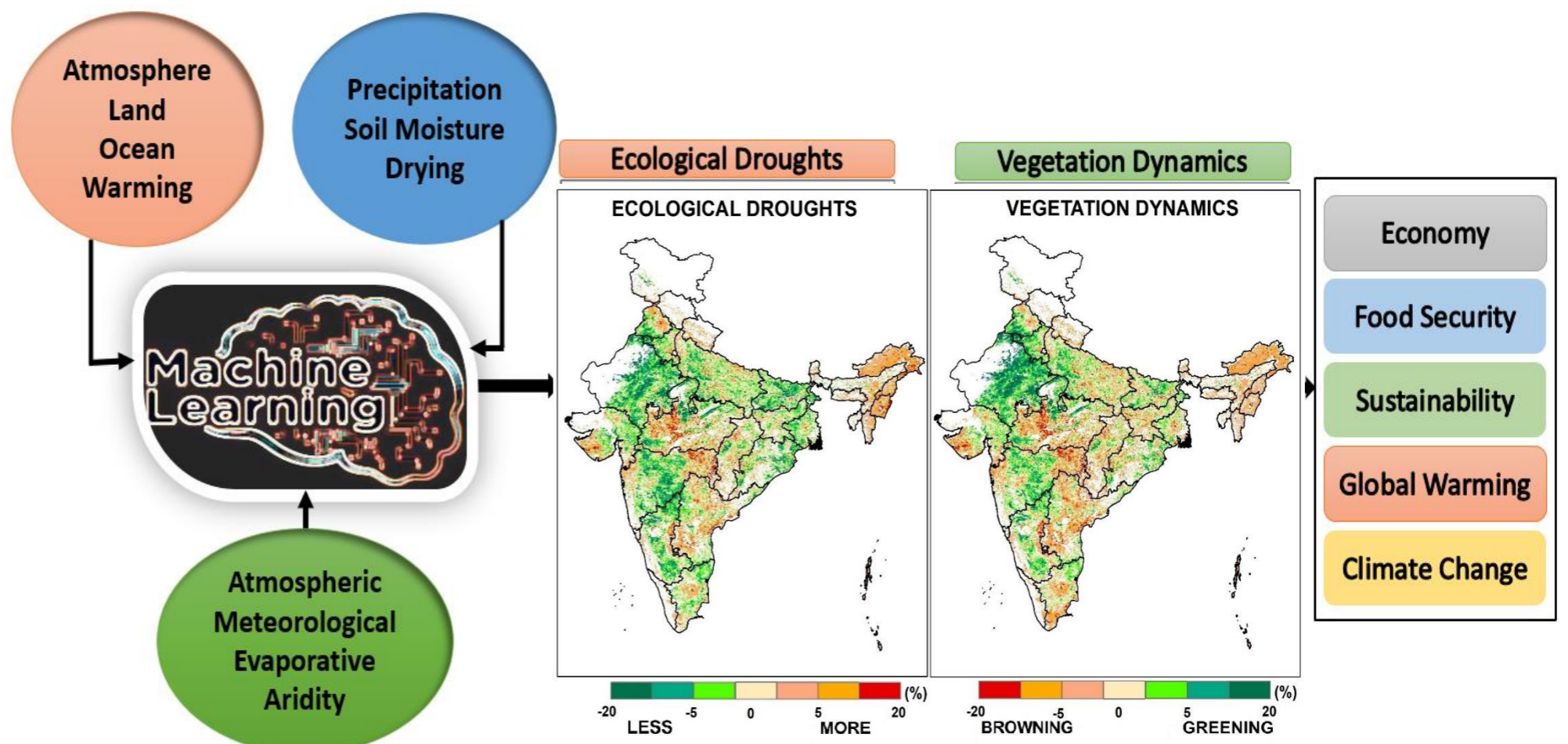


## OVERVIEW

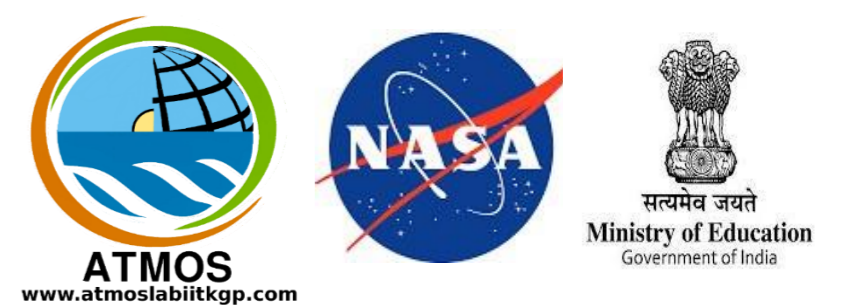
- Current definitions of drought have a limited perspective as it overlooks its ecological impacts. Ecological drought refers to the hindered growth and development of vegetation, which has negative effects on the ecosystem such as altered carbon, nutrient and water cycling. India exhibits strong carbon-water cycle connection and is an agrarian economy.
- We find that the ecological droughts are rising in most parts (except western) of India due to enhanced land evaporative, meteorological and atmospheric aridity for the past two decades (2000-2019).
- The Machine Learning based Random Forest algorithm suggest meteorological aridity (23.9%) and ocean warming (18.2%) largely drives the ecological droughts in India during ISM. Causal analysis reveals ocean warming indirectly triggers ecological droughts in India, as it affects its other drivers.
- The rising ecological droughts leads to browning during ISM, which is a concern for sustainability, food security and climate change mitigation.

## RESULTS AND POLICY RECOMMENDATIONS

- There is a need to consider the ecological implications of droughts in policies and combat its threats such as the prevention of crop failures, famines, degeneration and fragmentation of forests, and socio-economic issues.
- It may be feasible to alleviate ecological droughts by modified policies and efficient water management.
- Employing conventional solutions are inadequate as these approaches are largely inadequate in planning, effectiveness and cost.
- Need to incorporate ecosystem services and vulnerability assessment into the planning process to effectively tackle ecological droughts.
- Proactive resource management strategy such as forest thinning and nature-based solutions that align with natural processes can effectively mitigate ecological drought vulnerability.



## ACKNOWLEDGEMENTS



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## CONCLUSIONS

- There is an enhanced land (evaporative, ETR), meteorological (PDSI), atmospheric (VPD) aridity and ocean warming that drive increase in ecological droughts that leads to browning there.
- This study unveils the complex non-linear links between the atmosphere-ocean and biosphere.
- The findings of the study will help in effective planning for mitigation and adaption of the adverse impacts of droughts on ecosystems in India and is applicable to similar bioclimatic regions of the world.
- There is a need for efficient monitoring of the carbon-water cycle interaction, improved climate risk management, land management practices, and policies in the context of anthropogenic climate change in India to achieve sustainability and food security.