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Dam Break Analysis of Annamayya Dam across Cheyyeru River, Andhra Pradesh

by

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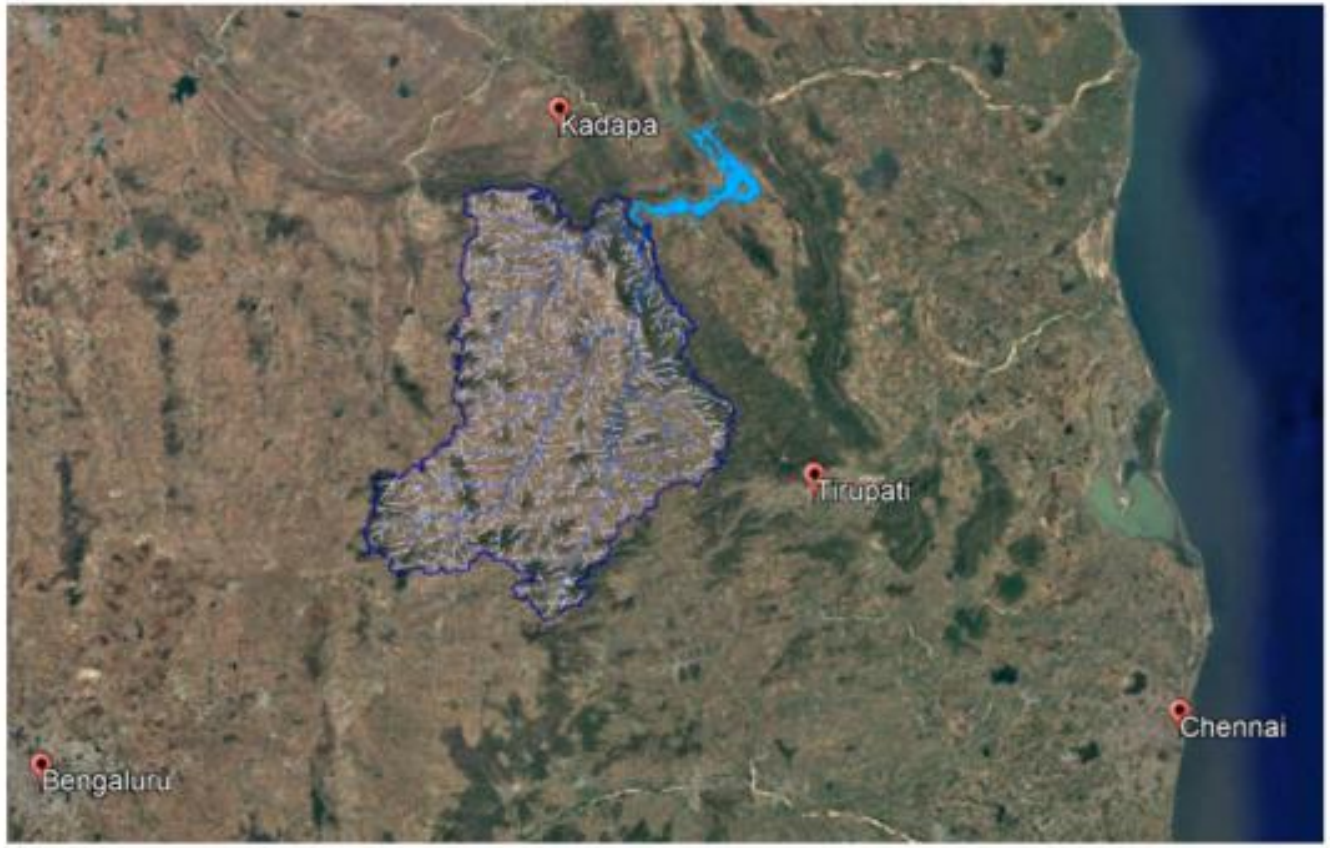
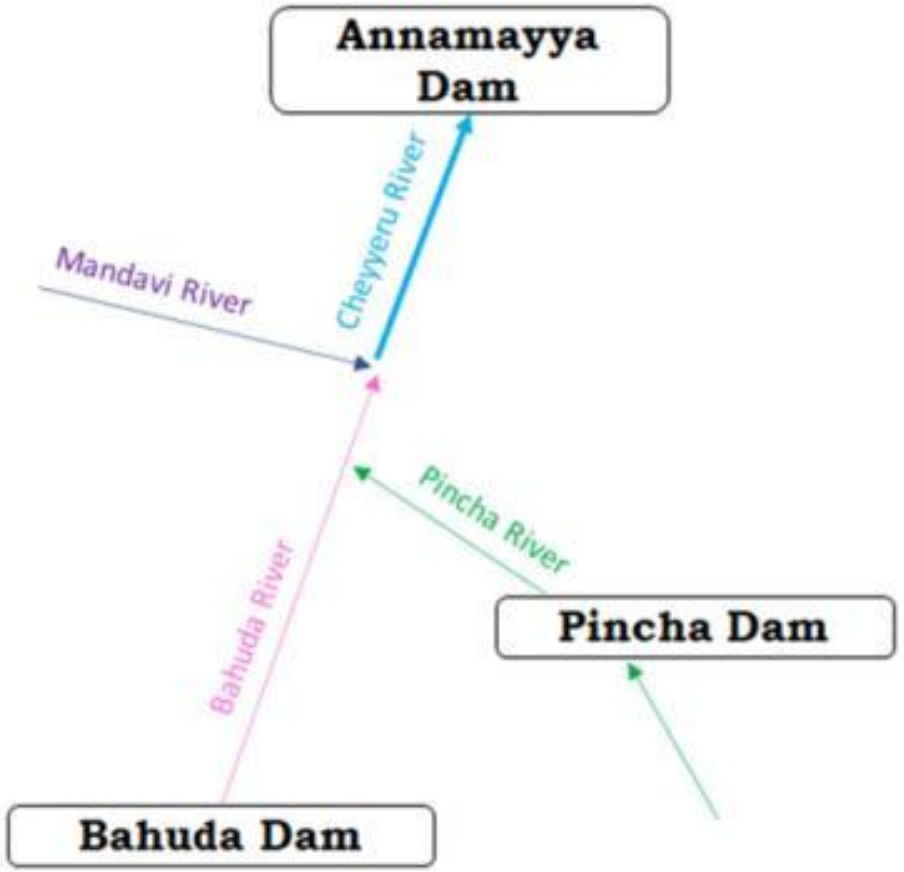
Study Area

Study lies in Andhra Pradesh



Dams, Rivers in the area



Annamayya Dam is constructed across Cheyyeru River, which results from the confluence of Mandavi, Bahuda, and Pincha rivers.

Annamayya Dam Details

Dam	Annamayya Dam (Medium Height Large Dam)
Gross Storage	63.16 Mcum / 2.23 TMC
Height	25m
Length	409m
Gates	5 no's (13.75m x 14m)

Pincha Dam (Upstream Dam)

MH Large Dam

Gross Storage =9.28 Mcum/0.33 TMC

Height=21m

Length=486.0 m

Cascading Dam failures
Flash Floods of 19-November-2021

Pincha Dam Fails

Annamayya Dam Fails

After Flood Photos

Pincha Dam

Annamayya Dam

After Flood Photos

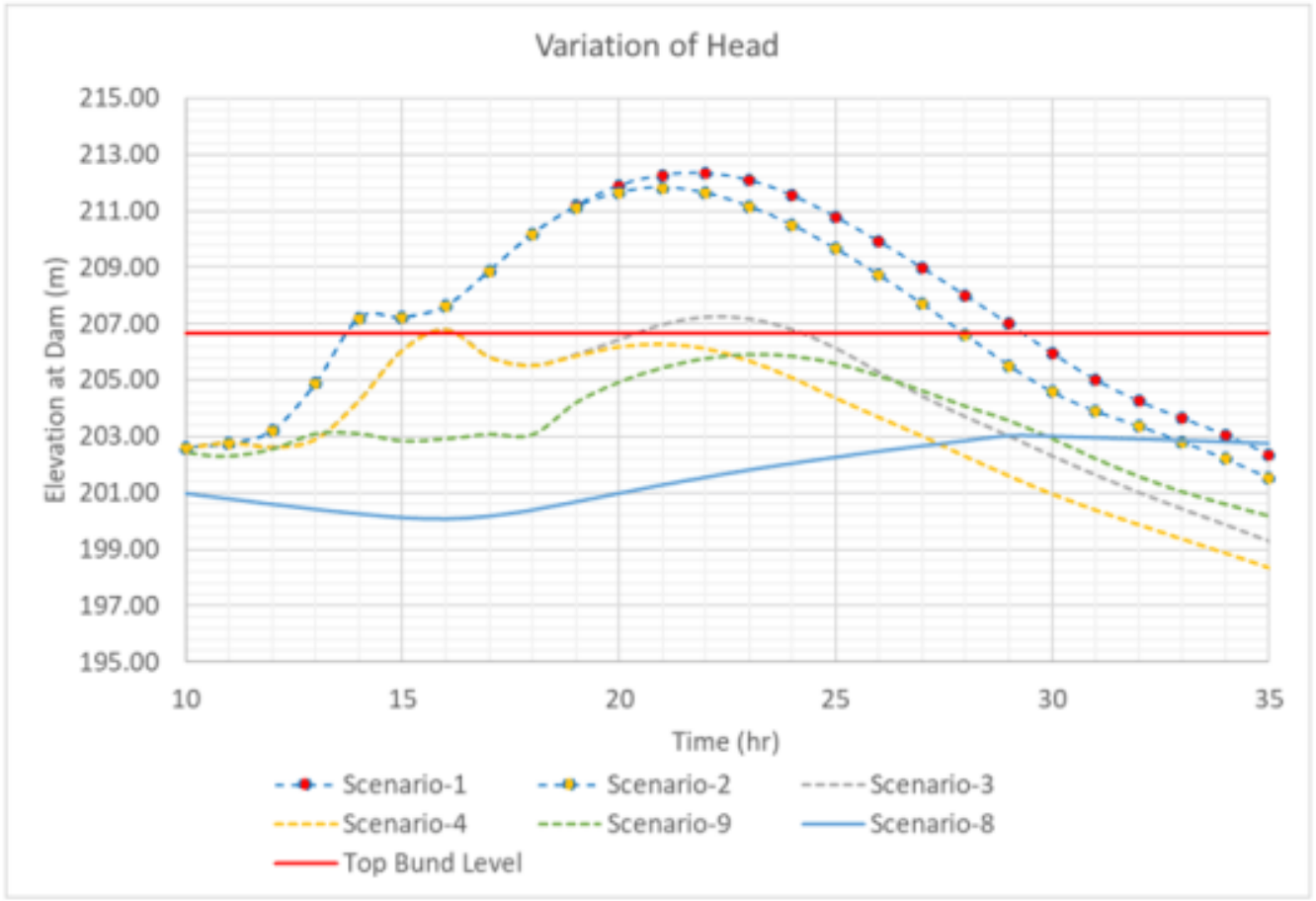
Objectives

- To review the design flood (PMF).
- To investigate the cascading effects of upstream dam breaches on Annamayya dam.
- To perform dam breach analysis and study the downstream effects.

Methodology followed

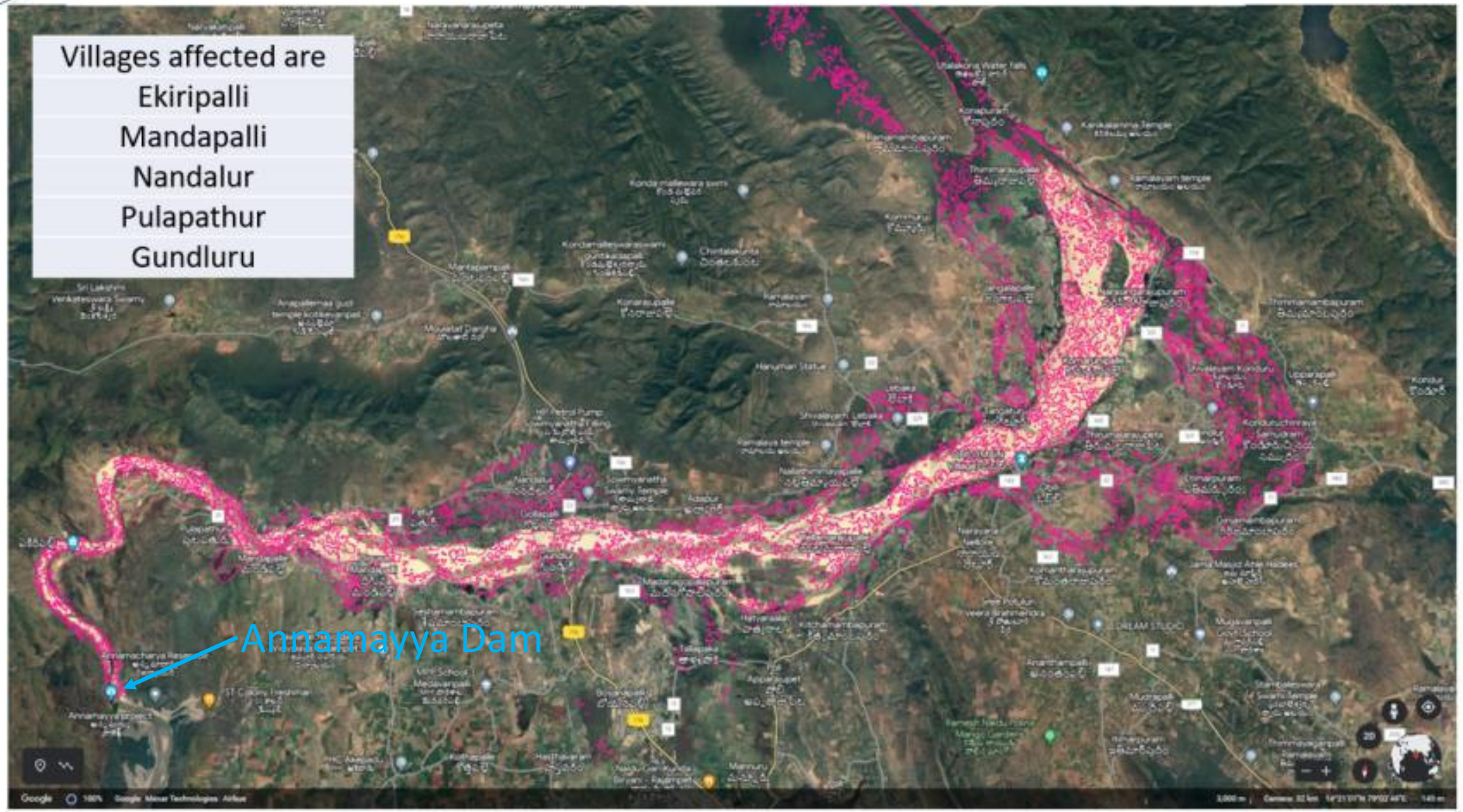
- ✓The Total Annamayya catchment is partitioned to five sub catchments.
- ✓Distributed model is considered. The hydrograph of each sub-catchment is subjected to channel/reservoir routing.
- ✓Various scenarios are considered considering two upstream dams for Annamayya dam breach analysis.

Variation of Head for various scenarios



Severe weather condition	Scenario-1	Pincha and Bahuda dam fails
	Scenario-2	Only Pincha fails
	Scenario-3	Only Bahuda fails
	Scenario-4	Both dams are safe
	Scenario-9	Bahuda, Pincha and Mandavi catchments do not contribute flow
Fair weather condition	Scenario-8	Pincha and Bahuda dam fails

Map showing villages affected by flood waters



Summary

- Annamayya dam failure can be a catastrophic event.
- The upstream Pincha dam is found to have significant effect in inducing failure of the Annamayya dam under extreme weather condition.
- The inundation on either side of the Cheyyeru river is expected to be significant and lives of nearly 71,000 people could get affected by flood waters.
- The Nov-2021 floods took almost 33 lives, caused huge economic loss.

Lessons drawn

- How much cushion is sufficient to absorb the flood waters ?

i. The dam failures happened in November, which was towards the end of the monsoon, so there may be a certain precaution if too much water is released, acute water shortage might result, in case it doesn't rain against the rainfall predictions.

ii. Heavy rains can happen anytime, so calculations to depict the "Flood Cushion" required for each rainfall alerts such as (yellow, orange and red alerts) from IMD need to made.

Lessons drawn

- ✓ Climate change a concern: Most of the dams in India (including the Annamayya dam) are constructed long back. Hence design checks with evolving methods considering climate change, rapid urbanisation and other factors is to be done.

- ✓ Cascading dam failure effects are severe. More studies in this regard needs to be done.

- ✓ Public awareness, warning time and rapid response is critical in saving lives during a dam failure emergency.

Thank You