A source tracking model to identify water quality consequences of multi-reservoir projects

HS2.2.2 Multi-dataset, multi-variable and multi-objective techniques to improve prediction of hydrological, ecological, and water quality models

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Water transfer pose a threat to recipient basin fish ecosystems

THE TIMES OF INDIA

Nagarjuna Sagar dam sees an influx of the famous `Devil fish'

TNN | Dec 23, 2016, 03.13 PM IST

HYDERABAD: Looks like the negative impact of the AP government's ambitious river-linking project is fast showing up. The `devil fish',which made its way into the Prakasam barrage across river Krishna in Vijayawada from Godavari through the much-talked about Pattiseema lift scheme, has now `invaded' the Nagarjunasagar (NS) reservoir.

A devil fish was caught by a farmer from an agricultural well at Pedakurapadu village in Guntur district on Sunday . Since Pedakurapadu is not served by the Prakasam barrage, it is unlikely that the exotic fish may have entered the village from Vijayawada. The area is served by Nagarjunasagar right bank canal and the fish may have made its way into Pedakurapadu from the NS dam, it is suspected.

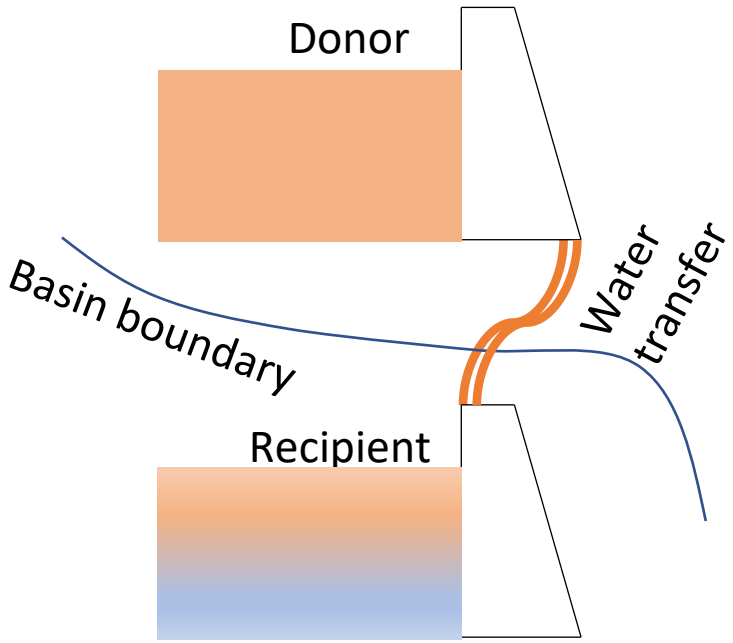
Source: https://timesofindia.indiatimes.com/city/hyderabad/nagarjuna-sagar-dam-sees-an-influx-of-the-famous-devil-fish/articleshow/56137740.cms

Armoured catfish and Piranha species present in Godavari waters led to economic and environmental damage in the Krishna river

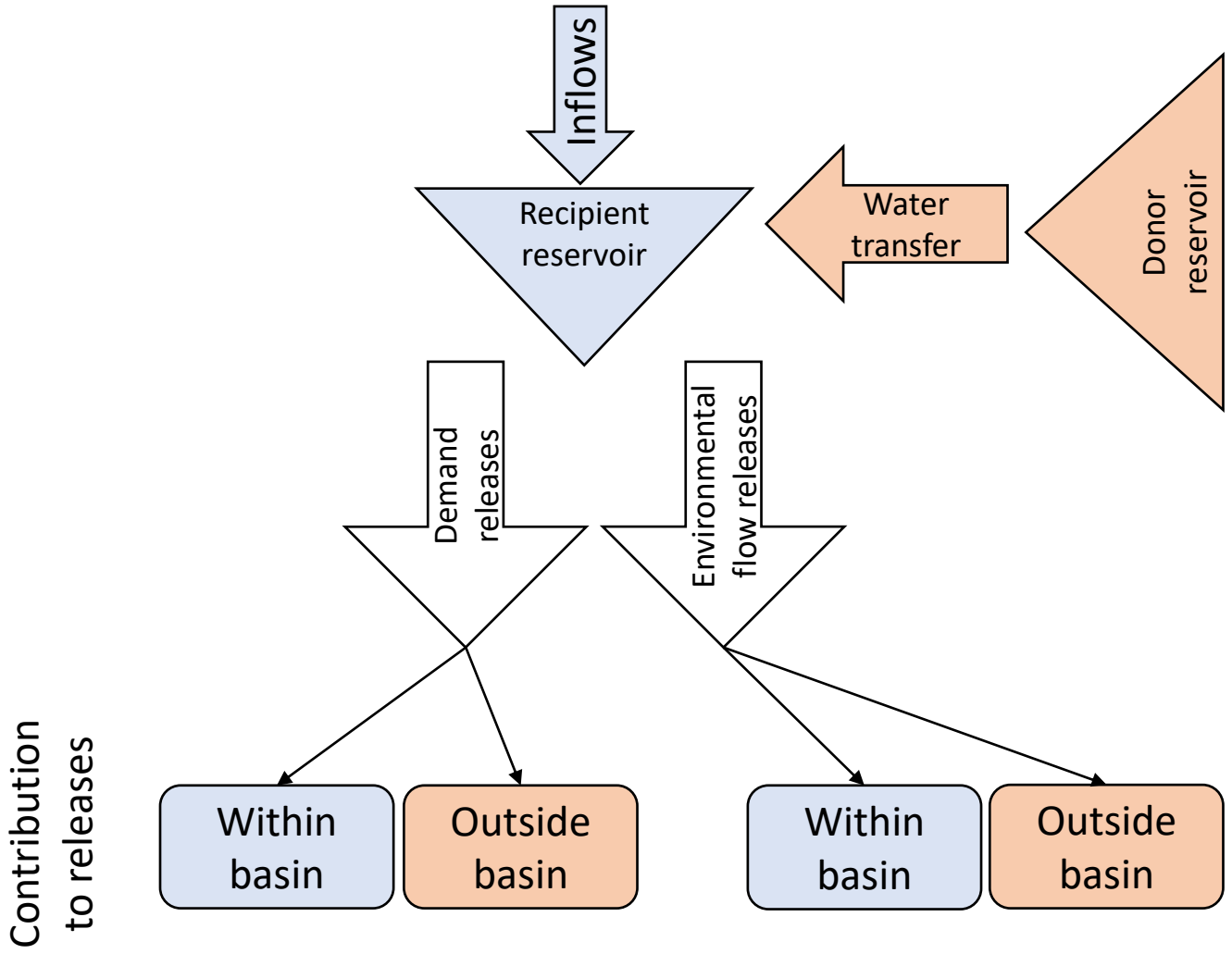
Babu et al., 2016; Seshagiri et al., 2021

>Water quality and ecological evaluations critical at planning stage of large scale water projects
>Limited data records and/or expertise inhibit application of such models often

Need for tracking the water source in multi reservoir systems

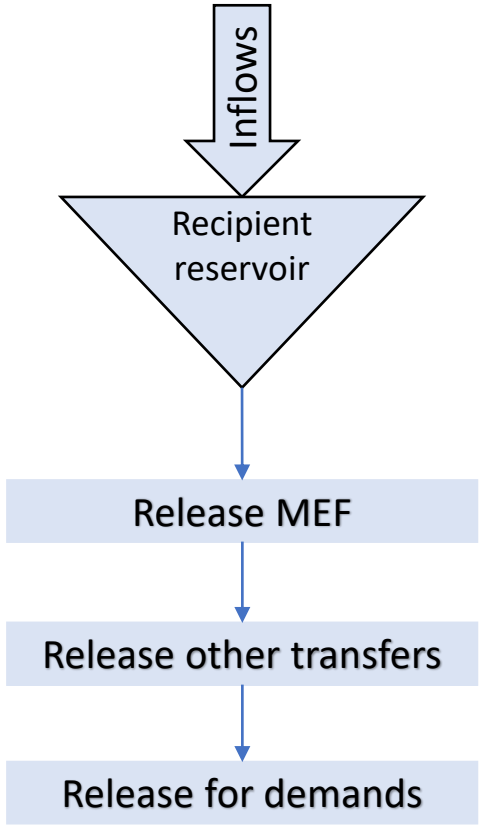


Releases
Environmental flows (MEF)
Demands
Other transfers
Excess releases

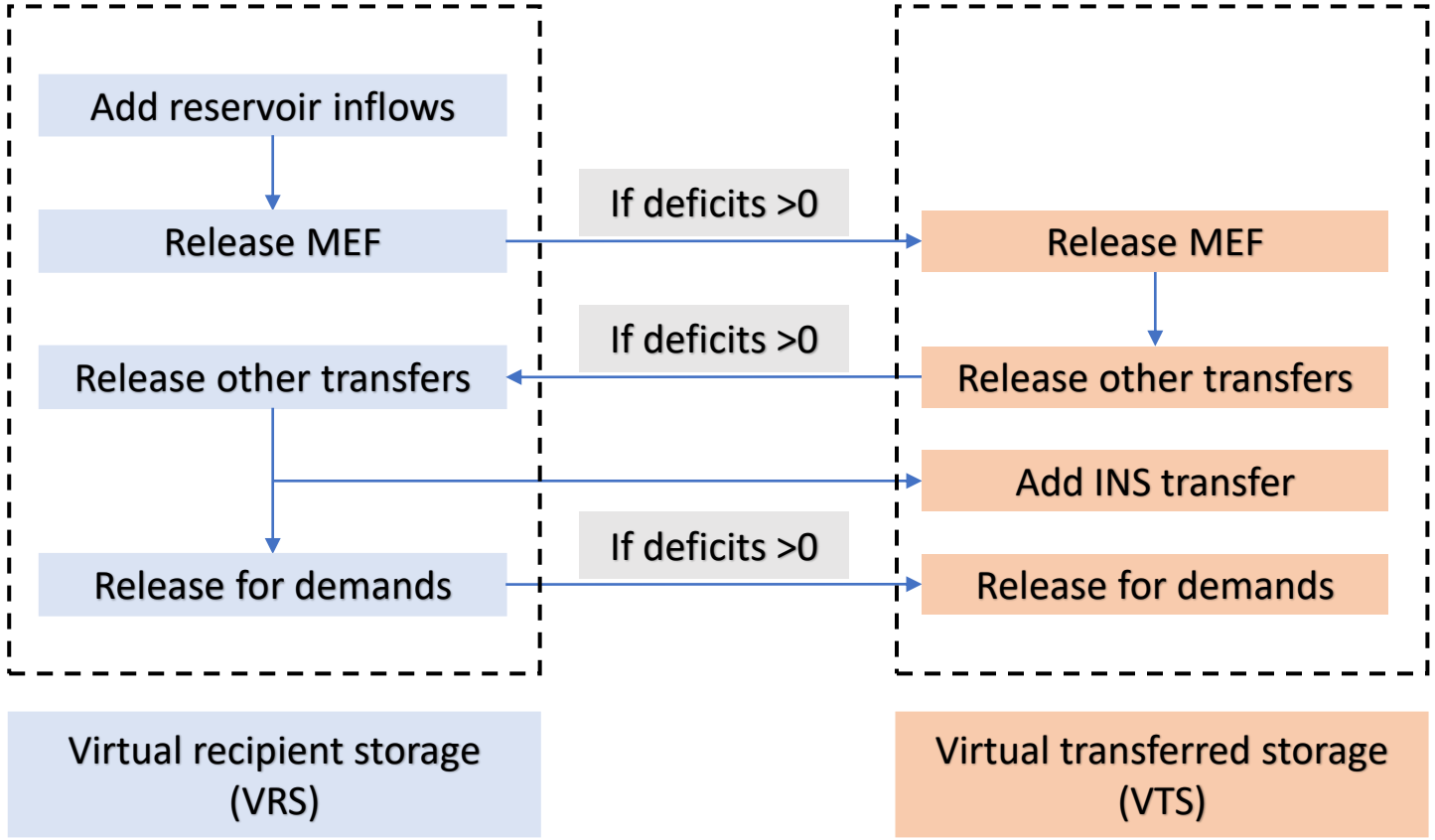


The *source tracking* modeling framework

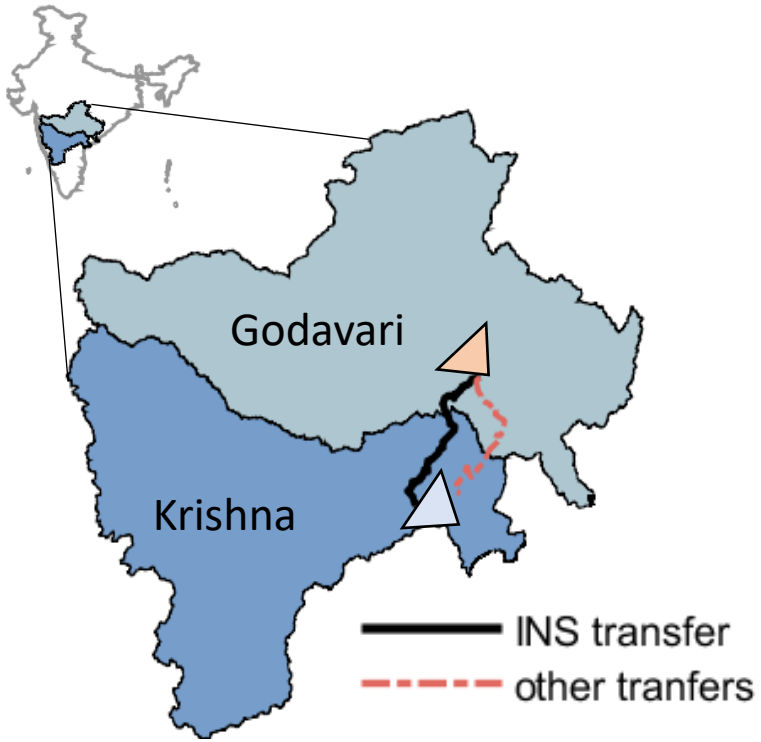
Water balance model



Modified source tracking water balance model



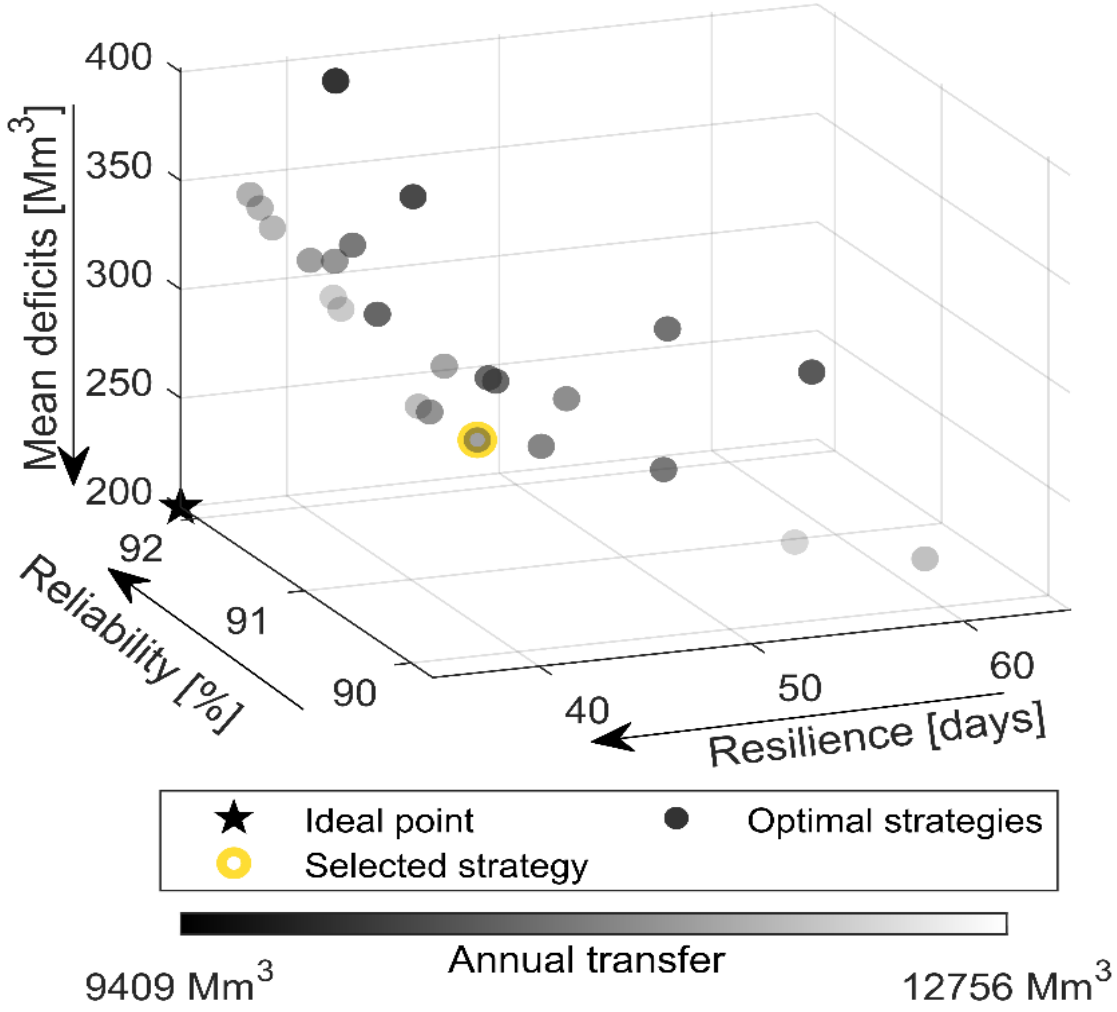
Application of framework to the INS inter-basin transfer in Southern India



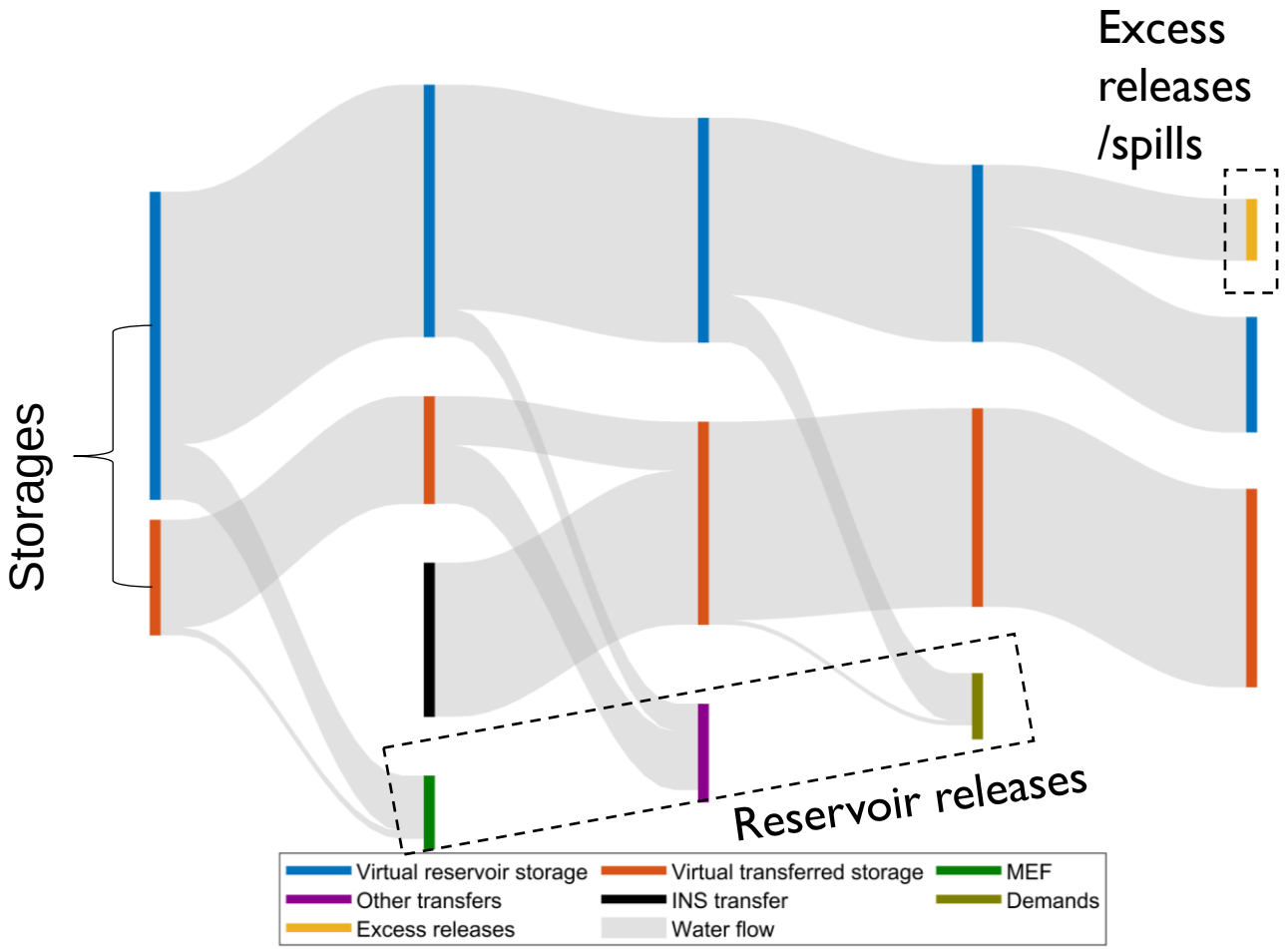
Objectives:

MEF, irrigation, water supply

Multi-objective optimization considering stochastic uncertainties identifies water transfer alternatives



The contribution of donor's water to recipient's environmental flows increases during low flow periods



Releases	Percentage contribution of transferred water		
	Annual (all / low)	**Monsoon (all / low)**	**Non monsoon (all / low)**
Environmental flows	1% / 14%	1% / 14%	0% / 4%
Demands	8% / 54%	4% / 54%	14% /41%
External demands	65% / 29%	63% / 29%	77% /0.2%

The water intended to meet the recipient's demands are being used to transferred to other basins.

Policy recommendations

Recommendations based on our results	Ecology	Water stress	Water quality
Providing separate reservoir storage for the transferred water in the recipient site.	●	●	●
Connecting the canals instead of reservoirs avoids mixing water in reservoirs	●	●	◑
Shift command areas from the water-scarce regions to water-abundant regions	●	●	●
Change in cropping pattern by adapting to less water-intensive crops.	◑	●	◑
Arrangements to avoid fish transfer from the donor by providing infrastructure arrangements	●	○	○
Decentralization of the water storage and distribution by providing small scale infrastructures	◑	●	◑

Alleviates negative consequences? ● Yes ◑ May be ○ No