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Fiscal instruments for water resources management in Mahanadi river basin under climate extremes

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The Basin's Settings

Surface water is the major source of water for all needs--irrigation, manufacturing & thermal power, and municipal water supply

Well irrigation in the basin is growing, even in canal command areas, especially in the lower basin areas in Odisha

Rural water supply is heavily dependent on groundwater--bore wells and tube wells

Seasonal depletion of groundwater in the hard rocks is a major problem

The flows in the basin are highly variable, with very high flows during wet years and very low flow during dry years

Competition for water and conflicts occur **between sectors during dry years**, and **between the two riparian states, during the lean season**

Water demand management is the key to resolving conflicts



Rationale for using Fiscal Instruments

Currently **pricing of surface water** (on a volumetric basis) is done only for the manufacturing sector; for the rest, there is no volumetric pricing and hence **no incentive to use water efficiently**

Rights to use groundwater are attached to land ownership rights; and there is no resource fee or tax for groundwater

Electricity used for groundwater pumping in agriculture is not charged on the basis of consumption and **no metering of agro wells in any of the two states**

There is **no marginal cost of using canal water for irrigation**; and **no marginal cost of agricultural groundwater pumping**--low physical & economic efficiency

Industrial water use is very high in the basin (second largest); and is highly efficient from an economic point of view (more cash per drop of water)



Modes of Pricing Surface Water

Differential pricing of water (with high unit prices for industries and subsidized prices for agriculture and domestic sectors) is necessary, but can ensure only economic efficiency.

But it is not sufficient to ensure **equity in water allocation across sectors** and **sustainability** (water resource management) goals

Volumetric allocation of the basin's water across sectors, based on considerations of basic survival, and food security & livelihoods, is a pre- condition before introducing pricing for water in different sectors

The 'total allocation' should be the basin yield minus 'water for environment'

It can keep changing from year to year depending on the 'flows



Groundwater allocation and pricing

Since wells are under the control of individual farmers, groundwater allocation can be affected only through **inducing limits to withdrawal by farmers**

This can be done through rationing of energy supplied for pumping groundwater, fixed on the basis of the **sustainable yield of the aquifer** and the amount of electricity required to pump a unit volume of groundwater.

Energy quota for individual farmers can be fixed on the basis of land holding, family size; **rationing of draft at the individual farmer level** will have to be done through **pre paid energy meters with pro rata pricing**

This way, not only the total withdrawal of groundwater is limited, but the farmers are confronted with **marginal cost of pumping**.

This will ensure efficiency as farmers allocate the pumped water for **economically-efficient crops**



Criteria for Fixing Water & Energy Prices

The average price for water should consider the long-term marginal cost that includes the **depletion cost**, the **resource degradation cost** (due to pollution, if any, caused) and the **cost of production and supply of water**

The pricing of water for economic production functions can be guided by the **average values in its various uses**, while at the aggregate level, it should help recover the full cost

Hence, there will be a need for cross subsidization, with higher unit charges for industries

The price for groundwater therefore has to be less than that of surface water, for the same end use, as cost of production and supply is borne by the farmers for the former

Electricity pricing (unit charges) should consider the pumping depths

Affordability will be an addition concern for water used for domestic & municipal supply; hence targeted subsidies and **use of IBT** will be essential

The price of water will then be higher during dry years and lower during wet years, as the resource cost and degradation cost are going to be higher in dry years and vice versa



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