NEW PARADIGMS OF WATER SUSTAINABILITY THROUGH MARKET-BASED INSTRUMENTS

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Water sustainability challenges are widely acknowledged, yet effective strategies to address them are urgently needed. While local approaches play a crucial role, it is essential not to overlook broader macro-level policies. Regulatory, fiscal, and market-based instruments drive these policies, each offering unique advantages and disadvantages.

Active participation from society is vital in developing solutions to water security. Policymakers are increasingly favouring market-based instruments, which encourage individuals and businesses to consider the impacts of their choices thoroughly. Government support facilitates these collaborations.

The Government of India has introduced several aspirational policy documents to align with the above spirit. In July 2023, NITI Aayog published guidelines on water neutrality for Indian industries and proposed a water trading mechanism to encourage the reuse of treated wastewater. In October 2023, the Ministry of Environment, Forest and Climate Change (MoEFCC) announced the Green Credit Rules, followed by the Ecomark Rules in September 2024. While the first three documents explicitly address water efficiency and productivity, the Ecomark Rules implicitly promote water conservation and pollution reduction by production units.

However, the experience of industrialised countries in using market-based incentive mechanisms has shown that successful implementation depends upon several conditions. First, the agency responsible for environmental policy must have sufficient technical knowledge to formulate and implement market instruments, and polluters must know how to respond appropriately. Second, the legal structure must adequately define property rights and establish the authority to implement and enforce incentive systems. Third, a country must have a competitive market relatively free of market distortions. Finally, the responsible government agencies must have financial and administrative capacity to initiate, monitor and enforce programs.

NITI Aayog's concept of water neutrality encourages industries to obtain certification by minimizing physical water inflows and outflows and maximizing internal reuse. Additionally, it considers the water used as embodied water in the mate-

rial used for product making. This approach allows industries to implement on-site and off-site measures to conserve water. The concept is like scope 1, 2, and 3 carbon emission estimation, but it underrecognizes the impact of the activity on the local watershed. In the case of water, local conditions matter!

The initiative to trade treated wastewater, introduced by NITI Aayog, aims to recognize water's economic value while ensuring universal access to safe water. Establishing a fair water market poses challenges. Industries that generate large volumes of wastewater, like textiles, can earn water reuse credits (WRCs), while those that use more water but produce less wastewater, like beverages, may need to buy them. This raises concerns about the impact of energy-intensive treatment processes, potentially shifting burdens to other sectors and locations.

The Green Credits Rules focus on enhancing water resources through water harvesting structures that meet set thresholds. They will establish performance standards to encourage water conservation in industries. While this strategy may boost local water stock, it may affect runoff, leading to upstream-downstream conflicts. Additionally, the implementing agency will take time to collect data from industries.
Water is a complex resource with multiple dimensions, making its management challenging. In the context of this discussion, scientific literature categorizes water resources into three types: Green (rainwater), Blue (surface and groundwater), and Grey (polluted water). The three policy documents described above focus primarily on one of these components: the policy on water trading addresses Grey water, the Green credits rules pertain to Green water, and the policy on Water neutrality relates to Bluewater. Can there be a unified approach to the above?

Our work on estimating the Impact-Adjusted Water Footprint addresses many issues identified above. It is a weighted measure of the impact of a production unit (or a product) on water sustainability at the catchment/district level. It thus uses three inputs: a) the actual water footprint of a product or a production unit, b) the water scarcity of the region, and c) water credits earned. It informs the effects of the production unit on the background hydrology of the watershed where it is located.

This method simultaneously accounts for Green, Blue, Grey, and Total water consumption throughout the production and material supply chain and provides valuable information that addresses gaps in current policy discourse. Some pertinent value additions that our research has brought out are:

- It considers how production affects the background hydrology. The effects of a water-intensive activity vary significantly between water-stressed and water-abundant areas. Our methodology considers local hydrology, ensuring it aligns with watershed-based water resource planning, as emphasized in national water policies.
- It provides a graded approach in place of a binary approach. Ecomark and water neutrality certificates are binary, meaning an entity either has them or does not. In contrast, a footprint serves as a rating that an entity can use to compare itself with peers and improve over time.
- It quantifies the impact of pollution on

the watershed. Current approaches focus on meeting environmental standards as qualifying criteria. Still, they lack methods to quantify efforts to go beyond these standards and how they improve the quality of ambient water. To address this, we developed a mathematical model to measure the impact of Greywater and its contribution to a product's overall water footprint.

- Co-benefits and trade-offs of sectoral policies are internalized. Our methodology addresses the “problem of shift” across space, time, and sector, maximizing the co-benefits of various sectoral goals. Strategies to reduce water footprints may face trade-offs with other objectives, such as energy and carbon emissions reduction. Our methodology incorporates energy use and material supply chains into water footprint estimations. This approach allows for comparisons of water footprints alongside strategies involving inter-fuel and material substitutions. For example, we discovered that substituting solar energy for grid electricity can reduce the water footprint by more than 10% in beverage industries.
- Product footprint labelling provides more information to consumers. While Ecomark identifies a product as a sustainable choice, what happens when two or more competing products display the Ecomark? The footprint labels on these products will help consumers compare them and provide data to monitor their progress toward a sustainable lifestyle.