

Analyzing the relationship between water pollution and economic activity for a more effective pollution control policy in Bali Province, Indonesia

ABSTRACT

An adequate water supply is essential for the continued and sustainable growth of the Balinese economy. In addition to mounting water demand, Bali's water supply has been constrained by high levels of water pollution. Despite being paid great attention, Bali's earlier efforts to control water pollution yet to prove effective, mainly owing to their reliance on traditional methods and regulations that focus on water pollution being linked to discrete sets of economic activity (e.g., processing industries, livestock farming, and hotels). However, an economy of a region/country comprises a set of sectoral activities, which are interconnected through supply chains; thus, water pollution could be well explained by examining the entire sectoral economic activities and their environmental performance. Therefore, determining the structural relationships between water pollution and economic activity serves as an important basis for more effective forms of pollution control for the Balinese economy. In this study, accordingly, we employed an environmentally extended input-output model to establish the links between water pollution and the production processes of the entire economy. Using biochemical oxygen demand (BOD) as a proxy for water quality in our analysis, we estimated that 246.9 kt of BOD were produced from Bali's economic activity in 2007. Further, we identified the chief BOD-emitting sectors and found that intermediate demand and household demand were the major causes of BOD discharge in the economy. We also accounted for the indirect role of each sector in total BOD emissions. Moreover, we categorized the sectors into four groups based on their direct and indirect BOD emission characteristics and offered appropriate policy measures for each group. Managing demand (i.e., lowering household consumption and exports) and shifting input suppliers (i.e., from polluters to non-polluters) are effective measures to control pollution for Categories I and II, respectively; clean production and abatement is advised for Category III; and a hybrid approach (i.e., demand management and abatement technology) is recommended for Category IV.