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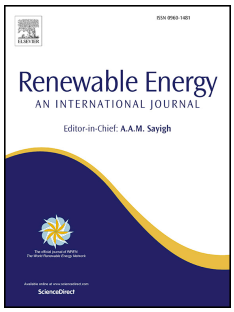

Economic trade-offs between hydroelectricity production and environmental externalities: A case for local externality mitigation fund

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Title:
Economic trade-offs between hydroelectricity production and environmental externalities: A case for local externality mitigation fund.

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Abstract:

Many proposed solutions for mitigating environmental externalities from hydroelectricity generation raise equity concerns and do not adequately address uncertainties and fluctuations in energy production. To balance the disparity caused by locally concentrated negative externalities and nationally or globally dispersed benefits, this study makes a case for the adoption of a locally negotiated endogenous externality mitigation fund (EMF) – one that directly compensates individuals for the specific environmental externality – as a policy alternative to lump-sum taxation and/or indirect measures such as integrating externality costs into energy prices. Using downstream crop damage due to the restricted flow of water as a representative externality, we employ optimal control framework to conduct comparative analyses of exogenous and endogenous EMFs relative to the base case with no EMF. Our findings show that endogenous EMF, when compared to the base case, reduces crop loss by 87.5% with a corresponding energy production trade-off of 11.8%. On the other hand, exogenous EMF, contrary to its purported intent, exacerbates externality by incentivizing the firm to increase production to self-compensate for the payment towards the fund. Results indicate that the endogenizing EMF is preferable because the consequential reduction in energy production is economically outweighed by the externality damages avoided.

Keywords: hydropower economics, environmental damages, externalities, mitigation fund, benefit sharing, crop loss