**Session: The impact of Climate change on ecosytem services in coastal marine environments**

**Title: Analysis of the long-term effects of PES programs on avoided deforestation and ecosystem services provisioning: The case of Southern Oaxaca, Mexico.**

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**Abstract**

Payments for ecosystem services (PES) are key strategies for mitigating deforestation and improving ecosystem services (SE). However, PES’ long-term effects and their impact on ES provision have seldom been evaluated. Therefore, this paper evaluated the additionality and permanence of induced effects by three PES programs on avoided forest loss and the provision of two ES (i.e. water yield and sediment retention), in Southern Oaxaca (Mexico) from 2003-19. By developing quasi-experimental methods, the approach compared ES and deforestation changes between enrolled areas and credible counterfactuals based on rejected land, during pre- and post-PES intervention. Landsat satellite data was analyzed to estimate annual forest loss, while ES were spatially quantified using InVEST. Covariate-matching and difference-in-difference estimators were used to measure the average treatment effects within areas participating: (*i*) in only one PES contract and (*ii*) in the long-term with two or the three contracts, both during and after payment gaps. Results showed a positive but small impact on avoided forest loss and additional sediment retention. Yet, deforestation resumed after payments ceased, such that forest gains were only maintained in enrolled areas when continuous payments were being received, whilst erosion control was permanent after PES were discontinued. Despite these gains, PES enrollment led to significant decreases in the annual water yield, suggesting trade-offs between avoided forest loss and water availability. The findings contribute to the understanding of long-term PES outcomes and the expanding realm of spatially explicit quantification of ES, for improving impact evaluations of conservation policies and designs for future PES programs.

***Keywords*:** *biophysical spatial patterns; conservation incentives; environmental policy; impact evaluations; permanence; trade-offs.*