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Present and future tradeoffs between biodiversity, ecosystem services and human well-being in tropical Latin America

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Tropical forests are critical for the maintenance of biodiversity, the mitigation of climate change, this assets has to be in line with the upkeep of the livelihood of rural populations that live with them. Yet, tropical areas have been and still are transformed under the pressure imposed by the production of commodities for global markets. In order to assess the challenges in balancing these multiple needs of tropical areas, we modeled biodiversity change, ecosystem services and human well-being under current conditions and into three contrasting future scenarios (low and high climate forcing, conventional and sustainable development) for Mexico, Brazil and Bolivia. We aimed to answer the following questions: 1- What is the relationship between ecosystem integrity, as an indicator of biodiversity, and ecosystem services? 2- What is the nature of tradeoffs between biodiversity, ecosystem services and human well-being? 3- What policies can contribute to better navigate these tradeoffs. We modeled biodiversity indicators from remote sensed data; we modeled ecosystem services from vegetation models (LPJmL) and using ARIES modeling platform, and assessed human well-being indicators as reported in governmental sources. Our basic spatial unit were square pixels one km on side as well as the municipality (or equivalent) political divisions. We also derived information from stakeholder workshops. We assessed tradeoffs at national, sub-national and local scales. We used bivariate and multivariate statistics to identify relationships among variables and bundles of ecosystem services, underlined by an interdisciplinary sustainability framework. We found that at national scales, ecosystem integrity was negatively correlated with cattle production but positively correlated with carbon storage, largely due to changes in land use. Also, areas within these countries with recovering vegetation showed increased carbon sequestration, higher regulation of

disease (Leishmaniasis) and increased evapotranspiration but decreased carbon stocks, water flow, and agricultural production. Some of these tradeoffs increased under high climate forcing. Relationships between biodiversity, ecosystem services, and human well-being indicators differed across countries and scales. Option frontier functions among pairs of services differed across countries and scales and among scenarios with high and low climate forcing. Policies aimed at agricultural intensification for commodity production face steep tradeoffs against climate change mitigation and biodiversity conservation. Integration of policies among environmental, agricultural, economic, development, and development sectors is essential to navigate the identified tradeoffs.