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# Getting to know Mexico's biodiversity through a modelling perspective: modelling initiatives and the development of indicators for decision making

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## Abstract

In order to make informed decisions about biodiversity, its use and conservation, it is necessary to count with a solid knowledge base about the distribution and abundance of species and ecosystems. Mexico is one of the five most biodiverse countries, forms part of the Mesoamerican hotspot with high levels of diversity, endemics and threats and many important knowledge gaps persist for Mexican biodiversity. Even though information on land use and cover is readily available, data on species distributions, conservation status and functional processes associated with ecosystem services are scarce. Nevertheless, conceptual developments and progress in informatics have led to a series of initiatives in Mexico to model different aspects of biodiversity on a national scale and to analyze changes over time as part of a communication strategy to feed the science-policy interface. In the context of systematic conservation planning, a set of 2950 potential species distribution models (PSDM) based on climate data was generated for all vertebrate groups, covering 80-95% of all species per group. Then human impacts on biodiversity were modelled, so as to include hotspots of endemic and threatened species in the selection of priority sites for terrestrial, marine and fresh water conservation. Given the usefulness and data availability for indicators of human impact on biodiversity, MEXBIO, a model based on the GLOBIO methodology was developed and a time series ranging from 1995 to 2010 was produced. This way an analysis of change was possible, including the impacts of land use, degradation of natural vegetation and LUC, road infrastructure and resulting fragmentation. The average impact of human activities increased from 42 in 1995 to 46 in 2010 on a 0-100 scale, where 100 means complete transformation. This indicator is also being used in regional prospective models that use scenarios of LUC to explore possible political options for conservation and development. In the last few years, the challenge of obtaining recent and robust data on biodiversity has entered a new phase, centered on the development of an ecological integrity indicator that integrates data on the composition, structure and function of ecosystems, as well as on degradation caused by human impacts in close collaboration with several government and academic institutions. In this context, a National Biodiversity Monitoring System is being established to fill in situ data gaps, as well as a remotely sensed data base on detailed land

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cover and changes in extension and productivity. Another focus has been the development of data bases on functional traits of fauna, so that PSDM can be modified using explicit effects established for each species and the degradation factors encountered inside their range. The priority sites were used for Mexico's gap analysis requested by the protected area agency and used to fulfill commitments to the CBD. MEXBIO has been part of the country reports to CBD to inform about the status of biodiversity. Besides the PSDM and MEXBIO have been used for a wide range of other policy informing activities of CONABIO (national and regional).

**Keywords:** Biodiversity modelling, Mexico, MEXBIO, systematic conservation planning, priority sites, ecological integrity, scenarios, species distribution models