

Forest Cover loss in Paraguay: Earth Observation Analysis for Deforestation Policies

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Deforestation in the tropics today continues inexorably with severe implications for biodiversity conservation, climate regulation and ecosystem services such as carbon storage. The rapid expansion of the agricultural frontier, cattle ranching and illegal logging has converted the world's last remnants of tropical forest into isolated patches endangering their continuity. Between 1999 and 2005, 69 million ha of forest have been lost in Latin America accounting for almost 7% of the forest cover of the continent. Latest studies conducted on a global scale identified Paraguay as one of the countries in Latin America with the highest deforestation rates. Prior to 1940, the Atlantic Forest in Paraguay (BAAPA) covered over 55% of the eastern region of the country (accounting for almost 9,000,000 ha). Nevertheless, uninterrupted deforestation practices resulted in the loss of 91% of its original cover. By 2003 Paraguay had become the country with the second highest deforestation rate in the world. In response, the Paraguayan government approved in 2004 the "Zero Deforestation Law (2524/04)" which prohibited the conversion of any parts of the Atlantic forest in eastern Paraguay. According to reports from environmental agencies deforestation rates decreased drastically as a result, slowing by over 90% from 2002 (110,000 ha of forest loss per year) to 2009 (8000 ha of forest loss per year). Within this context the present research provides a multi-temporal analysis of changes occurred in the forest between the years 1999 – 2016. The results were obtained from a dense stack of Landsat images applying a series of metrics and vegetation indices to characterize the forest cover in the BAAPA. This research not only focuses on the quantification of the forest loss, but also how environmental policies addressed to halt deforestation activities has an effect on the dynamics of the forest itself. Overall change detection results demonstrated a total forest cover loss of 7500 km² (almost 28% of its original cover) between 1999 and 2016, at an annual deforestation rate of 1.5% (442 km²) over the entire Paraguayan Atlantic Forest area. Furthermore, a detailed analysis of the time series indicates that deforestation rates seem to increase abruptly between the years 2002–2004 (almost four times higher than previous years (9% of the forest cover)) and gradually decrease again until the years 2015–2016, where slight increase is once again observed. This trend can be attributed to the Zero Deforestation Law (N°2524/04) established in the year 2004, which banned the conversion of forest lands for other purposes. Apparently, rural communities and large landowners increased considerably their deforestation activities before the deforestation law took effect. The use of multi-temporal information is a key component to designing and supporting conservation strategies and policies. It is crucial to consider not only the outlook of laws and policies addressed to halt deforestation activities but their actual influence on the behavior of natural resources over time.

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