Population Dynamics, Forest Cover, and Biodiversity Conservation

Panel Contribution to the Population-Environment Research Network Cyberseminar on Population Dynamics and Millennium Development Goal 7
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PERN Coordinator's Note: Dr. Bonilla shares some recent research findings related to population dynamics and indicators 25 and 26 of the MDGs (forest cover and biodiversity). Firstly, his research finds that population variables are highly correlated with forest fragmentation, which may be a precursor to total deforestation. Even where it isn't, it can still significantly alter the functioning of forest ecosystems. Secondly, he finds that six percent of Costa Rican protected areas have large populations surrounding them, which represents a potentially important stressor on biodiversity through a number of mechanisms: constraints on animal migrations owing to habitat loss, water diversions, zoonotic diseases, and demands for resources within the parks.

As Bremner & Bilsborrow state in the background paper, most population-environment research is based on empirical evidence. It has not led to a new comprehensive and accepted theory, nor is it likely to lead to significant theoretical advances in the near future.

The loss of tropical forests worldwide has severe consequences for biodiversity. I would like to comment not only on the proportion of land area which is covered by forest, but also the "structure" of the forest. This approach gives to the indicator a space-time dimension. A study of Rosero, Maldonado & Bonilla (Bosque y Población en la Península de Osa, Rev. Biol. Trop. 50(2): 585-598, 2002) concludes demographic factors are significantly associated with probabilities of deforestation but also with the fragmentation of the forest. Fragmentation is the first stage of the deforestation process. Fragmented forests are more likely to be deforested than non-fragmented forest. An unanswered question is how population dynamics might be connected with the process of fragmentation of the forest.

Indicator 26 (ratio of land area proteced to maintain biological diversity) is in some ways derived from indicator 25 (proportion of land area covered by forest). It's very important to consider the level of stress of the land area protected to maintain biological diversity. A measurement of stress is to consider people living around protected areas, or within a certain radius of them. This indicator needs a demographic dynamic dimension. A study carried out in Costa Rica by Bonilla & Rosero concludes that 6% of the protected areas are highly stressed (i.e., have more than 5000 person living around them). The most stressed areas are located in areas of high urbanization. (Bonilla, R. & L. Rosero. 2004. Presión demográfica sobre bosques y áreas protegidas al Inicio del Nuevo Milenio. In. Rosero-Bixby, Luis. Costa Rica a la luz del censo del 2000.- San José, C. R).