Geography and Indonesian oil-palm expansion

Koh and Ghazoul (1) model oil-palm expansion in Indonesia under multiple scenarios in which the probability of land cover conversion to oil palm is weighted by land cover qualities such as agricultural productivity and carbon content. Their goal was not a predictive model but rather a “broad model” that would make explicit to decision makers the tradeoffs between oil palm, forests cover, biodiversity, and food production. This model has considerable merit but would be improved if geographic factors such as proximity, scale, and location were considered.

Proximity. In Indonesia, as elsewhere, plantations concentrate in select regions. Such concentration reflects favorable political and economic conditions that will likely attract plantation expansion to the same regions (2). To illustrate, of ~170 km² of forest plantation established in Panama over 2000–2008, 20% are within 500 m of plantations established over 1990–2000, and 60% are within 5 km (3). The distribution of plantations established over 1990–2008 is markedly clustered (nearest neighbor Z score = -18.3, $P < 0.001$) (3).

Scale. Economies of scale in plantation production entail large, contiguous oil-palm estates. Even where production involves smallholder participation, the majority of plantation area usually still falls within larger commercial estates (4).

Location. Plantation establishment and related forest-cover change often gravitate to road networks (5) to lessen transportation costs. Insofar as plantations concentrate along roadways, they replace mostly anthropogenic and productive land covers (4). (One must also acknowledge that some large Indonesian oil-palm interests construct their own access roads).

The omission of these factors to attain a simplified model adds uncertainty to the output, because many of the land covers patches (polygons) reclassified as oil palm may, in fact, be un-

likely oil-palm candidates. Consider the food production scenario by Koh and Ghazoul (1), whereby “oil-palm expansion [i.e., patch reclassification] proceeded from the least productive to the most productive [patches] for rice” (1:11,140) (1). Because unproductive patches are probably relatively small, dispersed, widespread, and peripheral to major roads, they might not constitute integral, viable plantations when reclassified. Without the gravity of proximity, scale, and location to shape the geography of plantation expansion, one may envisage buckshot expansion, whereby thousands of small rice patches are reclassified across Indonesia, each in isolation to the next, effectively sprinkling new plantation area among vast marginal regions. The environmental implications of such land cover change are likely different from those of estimates sensitive to proximity, scale, and location. Without alternative estimates, we cannot say how important this difference is. In the realm of policy, to which Koh and Ghazoul (1) hope to contribute, uncertainty is as undesirable as error. The inclusion of geographic determinants of land cover change should, therefore, feature in replications of their research to provide more confident policy recommendations.

Sean Sloan¹ and Nigel Stork

Department of Resource Management and Geography, University of Melbourne, Parkville, Victoria 3010, Australia

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¹To whom correspondence should be addressed. E-mail: seanpatrickslloan@mac.com.