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Special section

Introduction: Restoring lowland rain forests in Indonesia

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Degraded and secondary tropical forests supply a diversity of ecosystem services and their value for biodiversity conservation is increasingly recognised. Moreover, restoration of such forests can enhance ecosystem service provisioning and their value to conservation [1]. However, degraded forests are vulnerable to deforestation through conversion to plantations or small holder encroachment because, as a consequence their depleted resources, their capacity to generate income is limited. Nowhere is this problem more evident than in Indonesia, which has approximately 25 million hectares of exhausted former logging concessions without current management [2] and some of the highest deforestation rates globally [3].

The Bonn Challenge, from the Partnership on Forest & Landscape Restoration, set a target of restoring 150 million hectares of degraded land globally by 2020, a target that was recently extended to 350 million hectares by 2030. Moreover, under the Convention for Biological Diversity (CBD)'s Aichi Target 15, nations have committed to restoring at least 15% of degraded ecosystems, or approximately 300 million hectares, by 2020 [4]. While highly laudable, these international commitments are unlikely to make significant headway unless much more is done by the international community to address the ultimate drivers of ecosystem degradation, namely human population growth and unsustainable agricultural intensification.

In addition, reducing or halting deforestation and reversing forest degradation throughout the tropics will require the development of appropriate business models for forest restoration. Attracting investment will depend on accurate prediction of rates of resource recovery and yields, including timber, non-timber forest products, and ecosystem service provisioning, such as carbon sequestration or water supply. However, despite over a century of tropical silviculture, we understand relatively little about the rates of natural regeneration in tropical forests or the cost effectiveness of possible interventions. Income generation is also central to a more equitable sharing of the benefits, which is essential to justify restoration socially. To be sustainable, restoration must consider the interests of local people, including traditional forest communities and more recent migrants, and ensure these are aligned with restoration goals.

The international demands for large-scale restoration efforts and the evident knowledge gaps to achieving these in an cost-efficient and socially acceptable manner points to a need for scientists to adopt a greater role in designing and monitoring restoration efforts. With relatively little additional effort, restoration interventions may be implemented within the context of an experimental design thereby enabling the efficacy of alternative interventions to be explicitly evaluated. Within the context of a particular project, such an approach provides opportunities for scientists to contribute to the selection and design of interventions,

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which should help to shorten the time-lag in the adoption of better practices. For investors, supporting the development of a solid knowledge-base will enhance returns on investments in the long-term. Lastly, prudent use of public funds from the donor community requires that restoration efforts are properly monitored and evaluated, which is best done within the context of an experimental design. The papers in this special section illustrate how the inclusion of a scientific program can contribute to large scale restoration efforts.

These papers were originally presented at a symposium during the Association for Tropical Biology & Conservation (ATBC) Asia-Pacific chapter meeting in Banda Aceh in March 2013. All five papers present experiences based on restoration research in lowland rain forests in Indonesia. The first four papers are based on work conducted at Harapan Rainforest, an Ecosystem Restoration Concession (98,000 ha) in Sumatra. Ecosystem Restoration Concessions are a relatively new development in Indonesia and indeed in 2008 Harapan Rainforest was the first license to be awarded. They offer an important opportunity for retaining and restoring natural forest in Indonesia and a potential model for the expansion of tropical forest restoration elsewhere. However, much work remains to be done in the development of viable business models for Ecosystem Restoration Concessions and in improving the policy and regulatory environment. The first paper in the series outlines current and proposed restoration research at Harapan Rainforest, focusing on three planned large-scale silvicutural experiments. The second paper addresses the critical question of whether the seed disperser community is sufficiently intact to contribute to natural regeneration. The third paper outlines an approach of botanists to identify targets for restoration, with a focus on the conservation of plant diversity. Meanwhile, the last paper on Harapan Rainforest addresses the specific problem of restoring areas flooded by the construction of logging roads. The fifth paper in the series is from a restoration project in West Kalimantan, which was set up under the auspices of a programme specifically designed to address the conflict between local needs and conservation goals in a protected area. The paper examines the impact of peoples' involvement in the restoration project on their attitudes to illegal logging.

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