Relevance of science to conservation planning in developing countries

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An estimated 10% of the world's tree species are threatened.

Relevance of science to conservation planning in developing countries

If conservation is to become a societal priority, conservation science has to become more engaged in the real world and reach scientific conclusions when knowledge is incomplete or not fully available, incorporating analyses from the social sciences and humanities, and address conservation in a human-dominated landscape (Robinson 2006). Powerful computational methods have been developed to identify sets of nature reserves that maximise the representation of biodiversity. However, lack of communication between scientists and managers has been identified as a reason for the minimal application of site-selection tools in practical conservation planning.

To address this shortcoming, a number of Cambodian forest managers, decision-makers and NGOs met with researchers from Danish Centre for Forest, Landscape and Planning (FLD) at a workshop in Phnom Penh to work on a tree conservation programme in Cambodia. The

Policy Recommendations

- Integration of biological information, political constraints and costs in reserve selection models can provide evidence-based estimates of conservation outputs and costs to donors and decision-makers.
- Policy-makers, planners and managers should be involved in the identification and generation of data, as well as setting up and running models, in order to make application of scientific planning tools accessible and acceptable.
- Accurate information on the conservation value of an area and the costs of management allows scientists, managers and politicians to evaluate trade-offs between maximising biodiversity benefits and minimising costs in the design of a reserve system.

purpose was two-fold. Firstly, to assist with developing a national tree conservation programme for Cambodia. Secondly, to evaluate the usefulness and relevance of systematic conservation methods in practical conservation planning in developing countries, using Cambodia as a case country. The stakeholders interactively used expert-driven reserve selection methods, considering incomplete knowledge about species occurrence and future threats. This development policy brief presents the steps and the expected gains using systematic reserve selection tools. Furthermore, the brief discusses stakeholders' concerns about using systematic conservation methods in designing future reserve networks in developing countries.

How to select an optimal reserve network to conserve endangered tree species?

Cambodia is rich in biodiversity and has relatively large forest areas that are still intact (Mittermeier *et al.* 1998; Myers *et al.* 2000). Most people in Cambodia are dependent on the forests in ways ranging from meeting household requirements to earning an income from enterprises associated with the forests. However, numerous precious Cambodian tree species are endangered. The Forestry Administration of Cambodia identified 19 indigenous trees of particular importance to the forestry sector and the livelihood of local people and developed a national forest gene conservation strategy (CTSP and FA 2003). For implementation, the question is how to select an optimal reserve network to conserve the target species.

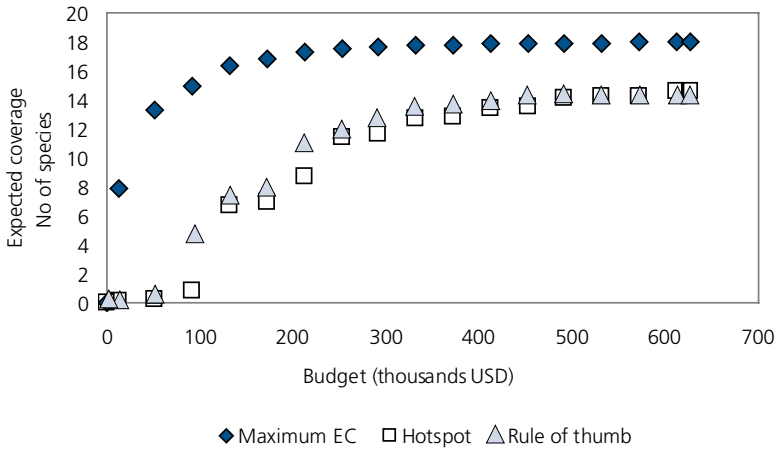


Figure 1. Efficiency measured as the expected number of species covered by selected areas using the Maximum expected coverage, Hotspot and Rule of thumb strategies. Note that costs and budgets are estimated as net present values of 20 years conservation effort using a 5 per cent discount rate.

The challenge of working with incomplete knowledge and uncertainties

To address this problem, the Forestry Administration together with FLD hosted a workshop in Phnom Penh in May 2006, inviting key conservationists, conservation planners and managers. The participants were selected based on experience with forest inventories, policy and planning processes within the forestry sector, and current conflicts relating to forest conservation. They were faced with several challenges: Distribution data for most Cambodian tree species is incomplete or non-existent. Choosing sites where target species are present today does not necessarily mean that the species will persist over time. Local differences in social and political constraints as well as future development will affect both the survival of reserves and budgets required to establish and maintain them.

Methods to bridge the gap between theory and practice

In order to deal with multiple conservation criteria, researchers from FLD collaborated with their Cambodian colleagues in describing and demonstrating a reserve site selection model that integrates probabilities of species distribution, survival and costs. The methods of Rapid Stakeholder and Conflict Assessment (RSCA) and drawing of cognitive maps showing threats to forest conservation were applied to identify and structure the problems faced by conservation planners. In order to place decision-makers in a position where power relations and conflicts were addressed openly and constructively, the analysis focused on stakeholders and conflicts. Thus the RSCA provided a common basis on which to assess geographical differences in threats, including social and political constraints to conservation. The cognitive maps

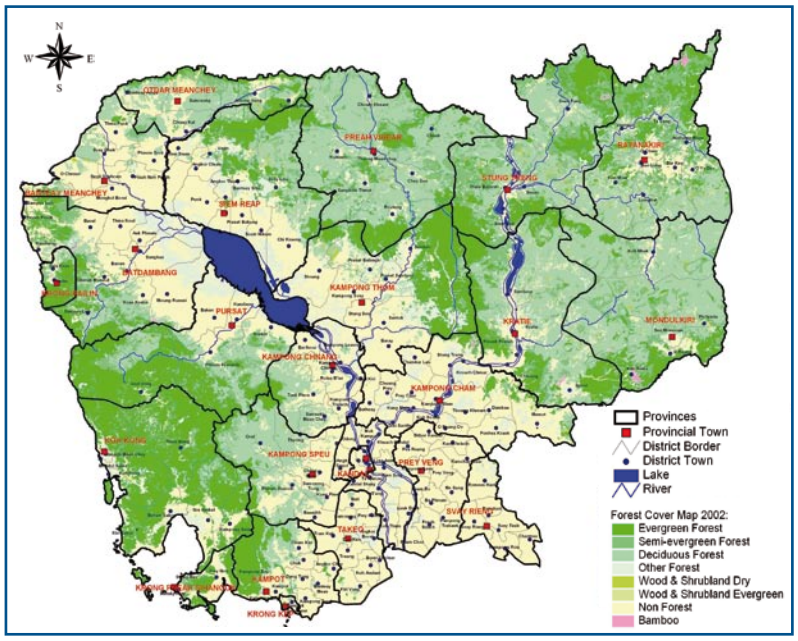
drawn by the expert group included conflicts and threats of political and social character (corruption, lack of justice, lack of funds, etc.), issues directly causing deforestation (logging, encroachment, land concessions, etc.) as well as links between them. This was followed by presentation of a probalistic model and description of various other conservation strategies that can be used for reserve selection. The workshop participants went on to generate data on distribution of the 19 target species and threats for the probalistic model based on their local knowledge of species distribution and the RSCA and cognitive maps (Strange *et al.* 2007).

Performance of computational and traditional reserve selection models

The performance of the probalistic model called the »Maximum expected coverage« was compared with more traditional reserve selection methods used for choosing a reserve network. This included a »Hotspot« strategy where the most species rich areas are selected until the budget limit has been exceeded, and the »Rule of thumb« strategy currently used by the Forestry Administration based on access, threats and species richness in selection of reserve areas. The expected coverage of the 19 tree provided by the Maximum expected coverage strategy (Maximum EC) and the two non-probabilistic conservation strategies (Hotspot and Rule of thumb) are presented for different budget levels in Figure 1.

The Hotspot and Rule of thumb strategies perform quite similarly. On the other hand, the Maximum expected coverage is capable of covering almost three species more than the two other strategies at a budget maximum of approximately USD 630 000. Of course the established network is not going to be changed; it is considered to be sunk cost. But it is relevant to evaluate future strategies as an increased budget has been allocated to expand the present network. Again, the Hotspot and Rule of thumb strategies are performing equally inferior to the Maximum expected coverage strategy (Fig. 2). Interestingly, spending an extra USD 12 000 per year, the Maximum expected coverage approach is capable of increasing the expected number of species by approximately 4.7 species, where the Hotspot and Rule of thumb strategies only increase expected coverage by 0.05 species. An increase in the annual budget by USD 190 000 may conserve almost all species using the Maximum expected coverage approach.

The resulting distribution of additional selected areas following the Maximum expected coverage and Rule of thumb strategies were compared and discussed at the workshop as well as ways of improving the model to gain broader acceptance by planners. The expert workshop was found to be an effective way of involving key stakeholders interactively in the planning process, as well as strengthening their capacity in the identification of priority areas. By relying on stakeholders to identify conflicts and generate data and involving them in the running of models and setting up premises, they acknowledged that it was possible to contribute to a more systematic conservation planning. The learning situation provided by the workshop made the computational site-selection method accessible to conservation planners and managers.



Forest cover of Cambodia, 2002.

Relevance of science to the policy and planning process in developing countries

The final session of the workshop was used to identify and discuss ways in which scientific, expert-driven and systematic approaches can be better integrated to improve transparency, acceptance and impact of conservation planning. In Cambodia, as elsewhere, science is unlikely to carry the day in policy debates. In Cambodia, the forestry sector is characterised by: i) Few opportunities for policy debate and interaction at strategic policy level, debates between Ministries and Departments are often resource rather than policy competitive, and much of the policy debate in Cambodia has been issue based (e.g. illegal logging) or has taken place around contested situations, not on overall strategic goals. ii) Ministries have no tradition for evidence-based analysis. iii) Conservation initiatives are likely to be donor- and project driven with distinct objectives. Furthermore, the cognitive mapping

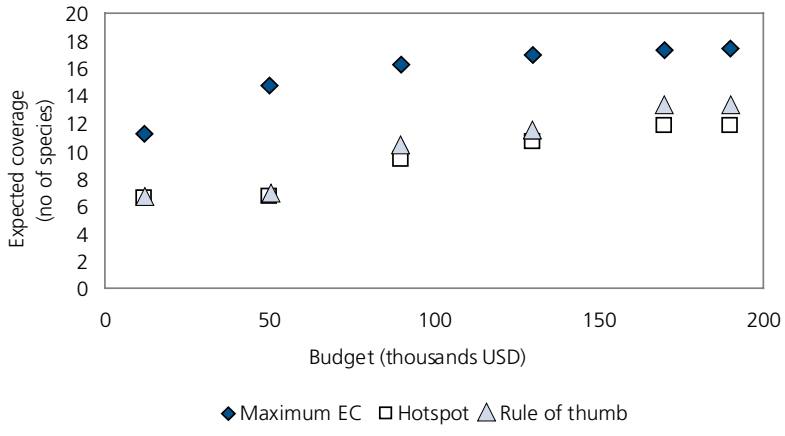


Figure 2. Efficiency measured as the expected number of species covered by selected areas when expanding the existing reserve network using the Maximum expected coverage, Hotspot and Rule of thumb strategies. Note that costs and budgets are estimated as net present values of 20 years conservation effort using a 5 per cent discount rate.

Cognitive maps were used to structure threats to conservation including political and social constraints.

pointed to overriding problems such as lack of independent courts, extra-legal payments and land grapping. One could question the relevance of a systematic decision support tool, such as the reserve selection model, in a political environment which lacks debate and interaction at strategic policy level. The advantage of the suggested approach is that the Rapid Stakeholder and Conflict Assessment to some extent integrates the political constraints mentioned above. Furthermore, growing donor alignment increasingly favours assistance to strategic planning based on transparent analysis.

The integration of biological information and costs was the most attractive attribute of the model to managers as it provided evidence-based estimates for project proposals to donors and decision-makers. In this respect the research was seen as of direct benefit to the policy- and planning process. This is in line with other studies showing that accurate information on the conservation value of an area (i.e. its contribution to target achievement) and the costs of effectively managing it can help to facilitate the often difficult transition from planning to implementation by allowing scientists, managers and politicians to evaluate trade-offs between maximising biodiversity benefits and minimising costs in the design of a reserve system. The inclusion of annual management expenditure avoids the danger of establishing »paper parks« (parks that do not have the financial means to achieve their management objectives). At the end of the day, such systematic inclusion of costs, conservation benefits and uncertainty may provide a more qualified discussion of means and ends of future Cambodian conservation policy. The results generated during the workshop can be used by the Forestry Administration in the selection of additional conservation areas over the next years.

To learn more about the study and its results please refer to Strange *et al.* (2007).

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