WWF

REPORT

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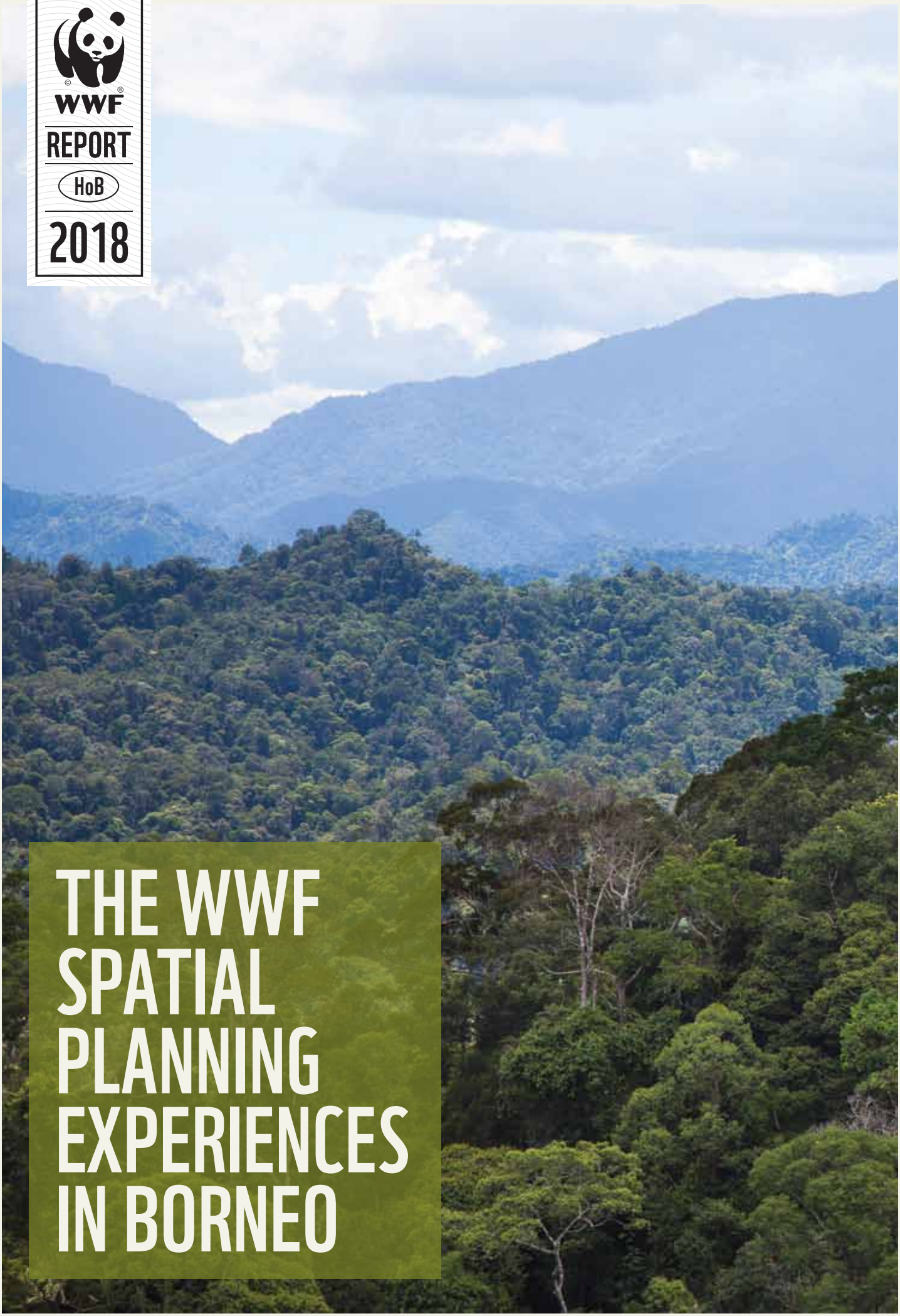

THE WWF SPATIAL PLANNING EXPERIENCES IN BORNEO

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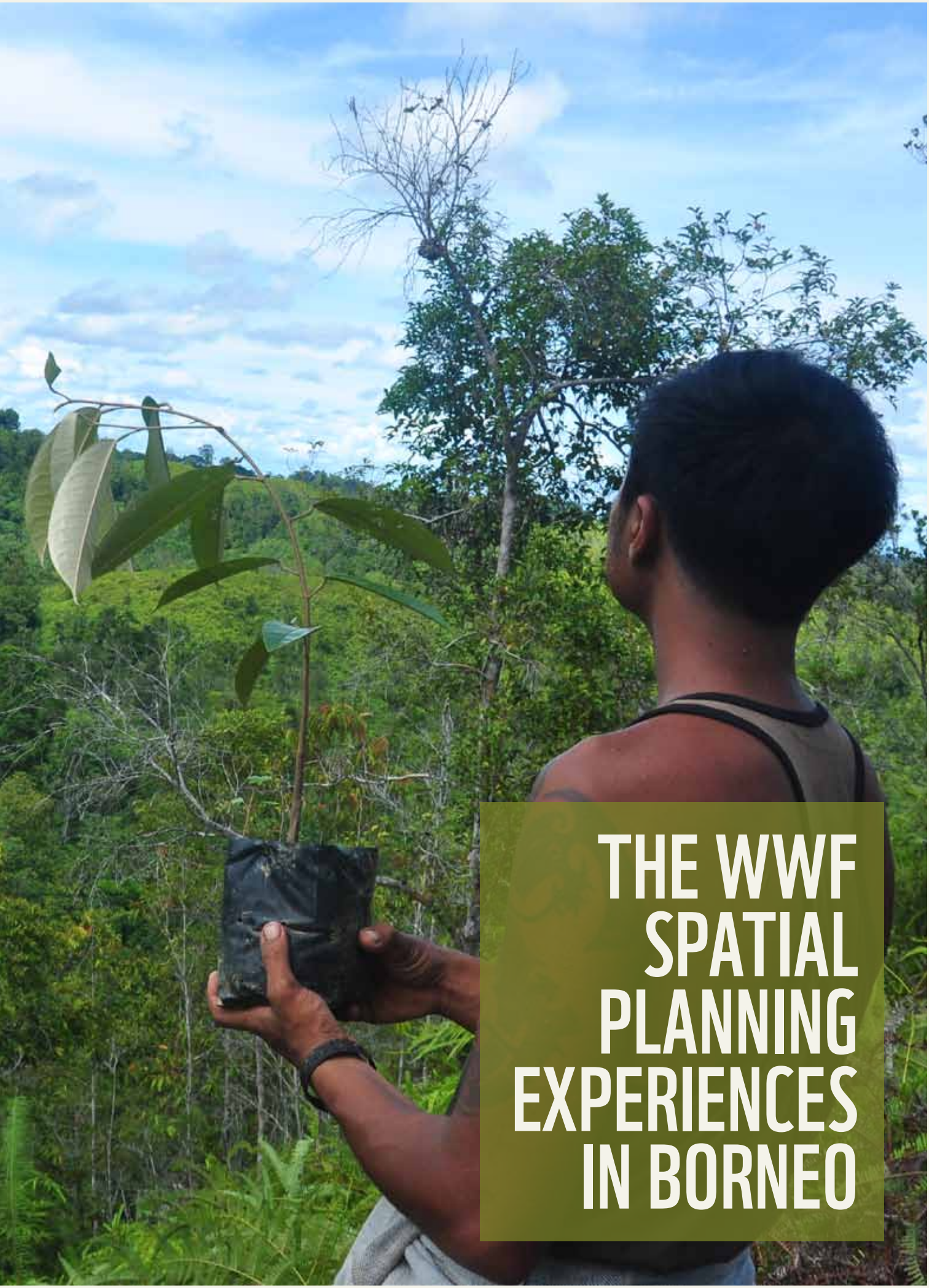
WWF is one of the world's largest and most experienced independent conservation organisations, with more than five million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by: conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.



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EXECUTIVE SUMMARY

WWF has embarked on conservation spatial planning initiatives in Kalimantan, Sabah and Sarawak within their respective economic, social, environmental, administrative and political contexts. These initiatives have started and evolved somewhat independently of each other, and have reached different stages of outcomes.

This report examines the systematic conservation planning methods used by WWF and assesses its roles, results (outputs, outcomes) and contributions to the conservation effort in Kalimantan, Sabah and Sarawak. It also captures the challenges and lessons learned and presents it from a consolidated Borneo perspective for sharing with relevant stakeholders within and beyond Borneo.

In moving forward the systematic conservation planning initiative, WWF faced technical (e.g., data limitations), capacity (lacking of understanding and expertise on planning methods and tools, both internally and among WWF's partners), and institutional challenges (government policy and regulations were still evolving to adopt conservation spatial planning outputs).

Notwithstanding, over time, WWF's systematic conservation planning has evolved both in scope (e.g. more detail and features), analysis method (becoming more participative) and in terms of its focus (a trend to plans with very clear policy objectives or implementation outcomes). There was also a clear progression both in terms of depth and scope of WWF's involvement in developing SCP capacity. This iterative building of capacity took place internally within WWF and across the range of institutions involved.

WWF is now entering into a more challenging stage of the systematic conservation planning process, that is to get the governments' adoption of the SCP outputs including to incorporate the identified PCAs as part of the official spatial and development plans as well as to translate the outputs into conservation actions on the ground. This report outlines the lessons learned and makes recommendations on the way forward, as follows:

- Data and maps of environmental/conservation features are essential;
- The need to mainstream climate change in SCP;
- Proactive engagement is crucial;
- Invest in educational materials on how to apply PCA maps;
- Follow-up advocacy is key;
- Useful to develop an implementation style follow-up project;
- Ensure there is enough fund to turn SCP output into actual outcome; and
- Put in place a robust monitoring and evaluation system.

ABBREVIATIONS

CIESIN	Center for International Earth Science Information Network
ERA	Ecoregional Assessment
ESA	Environmental Sensitive Areas
GIS	Geographic Information System
HCS	High Carbon Stock
HCV	High Conservation Value
HOB	Heart of Borneo
IBEC	Institute of Biodiversity and Environmental Conservation
IDRISI	Integrated GIS and Remote Sensing Software
InVEST	Integrated Valuation of Ecosystem Services and Tradeoffs
MODIS	Moderate Resolution Imaging Spectroradiometer
PA	Protected Area
PCA	Priority Conservation Area
REDD	Reducing Emissions from Deforestation and Forest Degradation
Marxan	MARine and SPatially EXplicit ANnealing
Maxent	Maximum-entropy
MoU	Memorandum of Understanding
NGO	Non-governmental organization
PFE	Permanent Forest Estates
PFR	Permanent Forest Reserves
RAPPAM	Rapid Assessment and Prioritization of Protected Area Management
SCP	Systematic Conservation Planning
SSP	Sabah Structure Plan
TNC	The Nature Conservancy
TPA	Totally Protected Area
TRPD	Town and Regional Planning Department
UNIMAS	Unversiti Malaysia Sarawak
WWF	World Wide Fund for Nature

We would like to thank:

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CHAPTER 1:
INTRODUCTION

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Borneo is known as one of the mega biodiversity areas in the world. It is shared by the Indonesian Kalimantan provinces, the Malaysian states of Sabah and Sarawak, and the nation of Brunei.

Conservation spatial planning is crucial for the conservation of biological diversity and ecological integrity in Borneo in the face of growing competition for land for urban development, agricultural expansion, resource extraction and infrastructure development.

WWF has embarked on conservation spatial planning initiatives in Kalimantan, Sabah and Sarawak (the three landscapes) within their respective economic, social, environmental, administrative and political contexts. These initiatives have started and evolved somewhat independently of each other, and have reached different stages of outcomes. There are valuable experiences and lessons that can be learned from the initiatives.

1.0 OBJECTIVE

This study aims to document and analyse the conservation spatial planning exercises conducted by WWF-Indonesia and WWF-Malaysia in Borneo. It examines the methods used by WWF and assesses its roles, results (outputs, outcomes) and contributions to the conservation effort in Kalimantan, Sabah and Sarawak. It also captures the challenges and lessons learned from the endeavour and presents it from a consolidated Borneo perspective for sharing with relevant stakeholders within and beyond Borneo.

1.1 RESEARCH METHOD

This research is performed using a desk study method. It critically reviews the published and unpublished reports on conservation spatial planning shared by WWF-Indonesia and WWF-Malaysia. It also reviews extensively relevant research articles and academic journals. To supplement the secondary research, primary information was collected through email interviews with the relevant conservation spatial planning experts and practitioners in WWF-Indonesia and WWF-Malaysia during the period May-August 2017.

1.2 RESEARCH FOCUS

This study focuses on documenting and analysing WWF's systematic conservation planning (SCP) effort in Borneo. This is in view of the fact that SCP has played a central role in shaping WWF's conservation strategies in Borneo in recent years. This role is going to increase in the future (WWF, 2016c) as SCP is now commonly practiced around the world from local to provincial, national and regional levels, and is mandated by several international or national agreements (Groves 2003, WWF 2016).

Compared to most single-site-focused conservation plans, systematic conservation plans developed by WWF are characterised by a vigorous planning process and their results are systematically documented. This has presented a good source of information for an in-depth analysis of the subject matter.

1.3 STRUCTURE OF THE REPORT

Following this introductory chapter, Chapter 2 provides an introduction on the basic concept, principles, key steps and main stages of SCP. It also describes how SCP fits within WWF's larger conservation strategy in Borneo. Chapter 3 outlines the relationship between WWF Global 200 and SCP and discusses why SCP is relevant to Borneo. It also gives a brief historical account of the implementation of SCP in Borneo. Chapters 4, 5, 6 and 7 start with examining the background and objectives of SCP in Borneo as well as the Heart of Borneo, Kalimantan, Sabah and Sarawak, respectively. This follows by a review of the methodology, processes, results (outputs, outcomes) and limitations and challenges of the SCP exercises. Chapter 8 concludes the report with lessons learned and recommendations to move forward the SCP initiatives.

CHAPTER 2:
SYSTEMATIC CONSERVATION PLANNING

2.0 SYSTEMATIC CONSERVATION PLANNING

Systematic Conservation Planning (SCP) is an objective and inclusive way of identifying a set of areas that most efficiently represent conservation features (e.g., species, forest types, and other aspects of biological diversity) and meet goals set by policies or by stakeholder participation. SCP has become a very relevant approach in identifying and securing priority areas for conservation in the face of increasing demand for land and use of marine environment for economic development activities.

Margules and Pressey (2000) aptly summarised the rationale for SCP by noting that existing protected area (PA) systems throughout the world contain a biased sample of biodiversity, usually that of remote places and other areas that are unsuitable for commercial activities. A more systematic approach to locating and designing PAs will need to be implemented if a large proportion of current biodiversity is to exist in a future of increasing numbers of people and their demands on natural resources.

"SCP HAS BECOME A VERY RELEVANT APPROACH IN IDENTIFYING AND SECURING PRIORITY AREAS FOR CONSERVATION"

SCP is underpinned by the following five principles:

- **Representativeness** – the need to conserve a representative sample of biodiversity, taking into account composition (e.g. species and genetic diversity), structure (e.g. habitat types) and function (e.g. dispersal processes) for its persistence;
- **Complementarity** – new areas identified complement species and ecosystems already protected in existing protected areas by contributing features that are still unrepresented so that redundancies are reduced and more biodiversity is captured in the network of reserves;
- **Efficiency** – an area which is relatively easier for conservation, meets as many conservation features as possible and is less threatened is sought. It attempts to maximize the conservation benefits from an area while considering effectiveness for maintaining conservation efforts in that area amidst competing interests in the long term;
- **Irreplaceability** – priority is given to species and features which are highly endemic, unique or highly threatened; and
- **Flexibility** – the approach is flexible in producing alternative outputs to meet the conservation features and goals. It also enables alternative methods of conservation that supports persistence of the species and ecosystem functions as opposed to the single option of full protection with no activities allowed (WWF-Malaysia, 2016).

There are four broadly defined steps of the SCP process, as follows:

1. **Identify conservation features** and the **basic design criteria** that determine what an ideal portfolio of managed areas would look like. Conservation features comprise of ecosystems and species, which can be further subcategorised as under step 2 below. The criteria for how these features can be efficiently captured and how they can either complement or contrast with the

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existing network of managed areas should be defined. The conservation design criteria consist of:

- Representation (percentage goals)
- Replication (number of occurrences)
- Separation (posing the question - are the represented feature occurrences far enough to survive large events that are either natural or manmade?)
- Connectivity (are the necessary conditions available for features to interact as necessary?)

In addition, there is also the need to cover socio-economic and industrial use needs for the design criteria:

- Growth rate of an industry (e.g., tourism, oil palm, logging, etc)
- Conceptual practices government might want to develop in relationship to other practices (e.g., tourism and conservation areas)

2. **Data collection** to gather information on:
   - Conservation features
     - Forest types
     - Species
     - Endangered species, hotspots and endemics
     - Existing management area boundaries
     - Protected areas
     - Managed use areas
     - Industrial use areas
   - Current status of biodiversity condition
     - Habitat health/viability (fragmentation, species composition)
     - Endemics and uniqueness in planning area
   - Areas with existing opportunities to work and/or threats to success
     - Previously proposed protected areas
     - Proposed development of industry
     - Existing support from stakeholders for new or other management practices
     - Existing development plans
   - Existing issues with current management system

3. **Gap analysis:** Assess existing portfolio of managed areas in order to identify spatial gaps in management. This includes measures to:
   - Construct database capable of measuring status (or inclusion) of key design criteria in existing management system
   - Identify spatial gaps in reaching the defined design criteria. For example, only 10 percent is protected but planners want 20 percent (Marxan will help identify those areas (see Stage 4)

4. **Marxan Analysis** to deliver decision support for reserve system design. Marxan, a software, was initially designed to solve a particular class of reserve design problems known as the minimum set problem where the goal is to achieve some minimum representation of biodiversity features for the smallest possible cost. Marxan helps users to determine the possible contribution of individual areas and whole networks towards meeting their objectives. Users may use Marxan to explore and propose possible network configurations, to facilitate collaborative network design, or to guide their own land acquisition or marine zoning.

Marxan is not designed to act as a stand-alone reserve design solution. Its effectiveness is dependent upon the involvement of people, the adoption of sound ecological principles, the establishment of scientifically defensible conservation goals and targets and the construction of spatial datasets. Marxan should be used as part of a SCP process and in collaboration with other forms of knowledge. These other forms of knowledge are essential to the refinement of Marxan inputs, the interpretation of Marxan outcomes and the precise placement of final reserve boundaries. Marxan is meant to be a decision support tool. The solution that it produces is not absolute and should therefore not be considered as the only implementable option.

The process outlined above will present several different scenarios using various input data. These scenarios can be compared on how they capture the design criteria and how they are grouped based on what inputs might be influencing them.

Running a Marxan analysis is an iterative process involving many steps. Following Ardron (et al., 2013), the steps typically include:

a. Dividing the study area into planning units
b. Creating a GIS database of conservation features
c. Preparing the Marxan input files
d. Running Marxan simulations and scenarios
e. Reviewing and analysing the results
f. Consulting with stakeholders
g. Adding new information
h. Refining input parameters
i. Re-running Marxan
j. Printing maps
k. Communication of the results

The output of the Marzan analysis is a map showing Priority Conservation Areas.

2.1 PRIORITY CONSERVATION AREAS

Essentially, the SCP approach and its principles are applied to identify the locations of Priority Conservation Areas (PCA) that meet the targeted conservation features and goals. SCP provides a spatial representation or maps of where these areas are that best capture the conservation targets aspired. SCP considers the competition between the need to conserve biodiversity and to meet human interests and activities (Margules, et al., 2002). It is socio-economically not feasible to protect all areas that contribute to the conservation of biodiversity, hence, a prioritization of areas in terms of their importance or contribution to biodiversity is the reasonable solution (Knight, et al., 2006).

2.2 APPLICATION OF SCP

SCP has been widely applied. It was applied in South Africa to identify National Freshwater Ecosystem Priority Areas (Dirk, et al., 2013), and in the Democratic Republic of Congo to reinforce their protected area network (Linke, et al., 2012). In the Peruvian and Bolivian Amazon's Madre de dios River, it supported the development of transboundary freshwater ecosystems conservation initiatives (WWF, 2015). In the Brazilian Tapajos basin within the Amazon, SCP is used to identify sites with the least impact for hydropower development (WWF, 2015), while in the US, to develop an analytical framework to integrate biodiversity and ecosystem services into conservation planning (Chan, et al., 2006).

APPLICATION OF SCP

1. United States
2. Peru
3. Bolivia
4. Democratic Republic of Congo
5. South Africa
6. Borneo (Kalimantan, Sabah, Sarawak)

In Borneo, SCP has been applied island wide to assess the value of integrating economic and conservation targets across borders and to find the best scenario with optimum returns (Runting, et al., 2015). WWF in the three different landscapes of the island of Borneo (i.e., Kalimantan, Sabah and Sarawak) and within their respective political and legal environments have applied SCP in a participatory and consultative manner, involving government and other stakeholders.

2.3 SYSTEMATIC CONSERVATION PLANNING AND STRATEGIC PLANNING

SCP approach is best undertaken as an imbedded component in a larger conservation effort. Ideally, both SCP and strategic planning should integrate seamlessly. In WWF, strategic planning refers to conservation strategies that include responsible forestry, freshwater conservation, sustainable land use, REDD+, sustainable palm oil, species conservation, reforestation and community-based conservation. Within WWF-Indonesia and WWF-Malaysia, conscious effort had been made to ensure SCP is a critical complement to strategic planning.

CHAPTER 3:
WWF GLOBAL 200 AND SYSTEMATIC CONSERVATION PLANNING IN BORNEO

3.0 INTRODUCTION

WWF has a global, decentralized organizational structure and there are no mandated approaches to conservation planning at landscape scale (Morrison, et al., 2009). Nevertheless, at the strategic and technical levels, WWF-Indonesia and WWF-Malaysia's conservation planning approaches in Borneo are significantly influenced by those adopted at the WWF Network-level.

Such influence is likely to persist as WWF's current global strategy is to harness the strengths of the WWF network in a shared vision, focusing on six major goals - water, wildlife, the ocean, climate and energy, forests, and food – and three key drivers of environmental problems – markets, finance and governance. As a Network, WWF organizes itself around communities of practice with one for each goal and driver. It is becoming more focused and more targeted in its efforts. WWF aims to bring the weight of its unique local-to-global Network to bear and drive these issues forward cohesively (wwf.panda.org).

In this light, it is necessary to examine the evolution of conservation planning at the WWF Network-level over the past two decades in order to fully appreciate the decision made by WWF-Indonesia and WWF-Malaysia to implement systematic conservation planning for the Kalimantan landscape and Sabah and Sarawak landscapes, respectively.

In many ways, the evolution was in tandem with the effort taken by global conservation community towards making conservation planning more realistic and effective.

3.1 GLOBAL 200

In the late 1990s, WWF introduced a large-scale conservation planning approach called Global 200. Global 200 is a biodiversity priority setting exercise that used a representative approach to select 238 of the earth's most outstanding terrestrial, freshwater and marine systems. WWF defined the 238 systems as Global Ecoregions **(Figure 1)** (Olson, et al., 1998).

3.1.1 Key characteristics of Global Ecoregions

Global Ecoregions were not defined by political boundaries but were demarcated, mapped, and assessed for different biodiversity criteria (e.g. species richness, endemism, higher taxonomic uniqueness, unusual ecological or evolutionary phenomena, global rarity of habitat type) (Olson, et al., 1998).

Global Ecoregions are regional or continental in scale stemming from the understanding that only at relatively large scales could conservation planning and implementation become effective and adequate in preserving habitats and ecological processes.

The identification of the Global Ecoregions was typically an expert-driven process. Partly due to data limitation, the ecoregions were defined and prioritised a priori by specialist perception of the distribution of biodiversity.

Global 200: Ecoregions in Borneo

For Borneo, the world's third largest island, WWF has identified the following four ecoregions under the Global 200 framework:

1. Borneo Lowland and Montane Forests (under the category Tropical and Subtropical Moist Broadleaf Forests)
2. Kinabalu Montane Shrublands (Montane Grasslands and Shrublands)
3. Sundaland Rivers and Swamps (Small Rivers)
4. Greater Sundas Mangroves (Mangroves) (Source: Olson & Dinerstein, 1998)

Borneo was identified for further planning by WWF in part because it was included as a Global 200 Ecoregion.

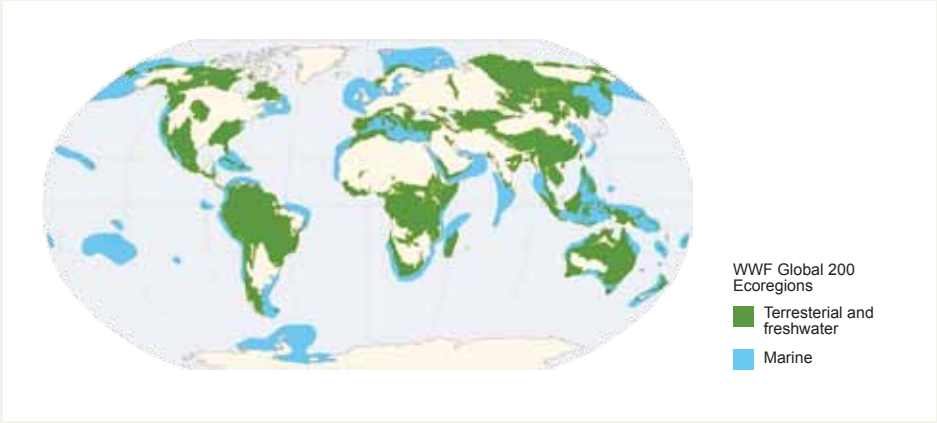

Figure 1: WWF Global 200
Source: Olson, et al., 1998

Demographic and socio-economic factors were not the primary considerations in the designing of Global Ecoregions. No spatial data on humans and their activities were featured in the Ecoregions.

3.1.2 Priority conservation areas at landscape level

The establishment of Global Ecoregions has been influential in directing resources toward broad regions. However, WWF is mindful that the top-down approach adopted under the Global 200 framework had to be complemented by landscape level processes of identification of priorities. This is to ensure the implementation of area-based conservation and to gain institutional support and stakeholder buy-in at the local level. This has led to the effort to identify priority conservation areas (PCA) within the Global Ecoregions, including the ecoregions in Borneo. This involves complementing the coarse-scale global ecoregion approach with a much finer scale conservation planning.

WWF Global 200

The Global Ecoregions reflects 3 major innovations:

1. It is **comprehensive** in its scope - it encompasses all major habitat types including freshwater and marine systems as well as land-based habitats.
2. It is **representative** in its final selection. The most outstanding examples of each major habitat type are included from every continent and ocean basin.
3. It uses **ecoregions as the unit of scale** for comparison and analysis. Ecoregions are large areas of relatively uniform climate that harbour a characteristic set of species and ecological communities. By focusing on large, biologically distinct areas of land and water, the Global Ecoregions set the stage for conserving biodiversity.

Source: http://wwf.panda.org/about_our_earth/ecoregions/about/

The adoption of the PCA approach was a result of growing realisation that:

- Representation of biodiversity, as advocated under Global 200, is just one aspect of conservation planning. Considerable attention should therefore be targeted at the scale of landscapes and seascapes to ensure not just the representation of biodiversity but also of connectivity, spatial structure, and processes that allow its persistence, thereby effectively conserving species habitat;
- Biodiversity and threats are not evenly distributed within an ecoregion, so prioritization is essential to minimize biodiversity loss;
- It is through the conservation of actual sites that biodiversity will most effectively be preserved;
- Socio-economic factors, institutional capacity and governance affect biodiversity indirectly, but they are not been effectively incorporated in the conservation planning process; and
- Costs of conservation generally increase as the threat increases. However, most of the global and ecoregion-scale conservation proposals have yet to incorporate costs directly (Brooks, et al., 2006).

Increasingly systematic thinking is being applied to choosing PCAs and designing protected area systems through the use of the SCP methodology pioneered by Australian scientists (Margules, et al., 2000).

3.2 THE IMPORTANCE OF SCP TO WWF-INDONESIA AND WWF-MALAYSIA

SCP is vital for strategic planning in conservation for it helps to address existing gaps in the protected area system and socio-economic pressure over natural resources.

3.2.1 Gaps in the existing protected area systems

Borneo is estimated to be home to around 222 mammals (including 44 endemic), 420 birds (37 endemic), 100 amphibians and 394 fish (19 endemic) (wwf.panda.org). Borneo's major forest types include peat swamp forest, mangrove forest, heath forest, limestone forest, lowland rainforest, montane forest, upland rainforest and upper montane cloud forest. These complex forest types are important repositories of terrestrial biological diversity. The ecology of Borneo's rivers varies enormously during their course, from the fast and clear headwaters to the wide-bodied and slow-flowing rivers of the lowlands, shaping and nurturing a wide array of freshwater wildlife (wwf.panda.org).

There were concerns that the existing system of protected areas in Borneo might be inadequate to conserve the island's unique and rich biodiversity[1]. SCP was seen as an effective approach to address the potential conservation gaps and propose new areas to be part of the existing network of protected areas.

3.2.2 Socio-economic pressure

Kalimantan, Sabah and Sarawak have been in a transition phase to becoming middle to high income economies in the next 10 to 20 years. While rapid economic and social transformation may bring many benefits to the people in the three landscapes, the conviction was that their natural resources must be carefully managed and accounted for so that development would not impinge on the viability of the ecosystems and the services they provide.

WWF-Indonesia and WWF-Malaysia were aware of the urgency of adopting the SCP approach to safeguard the natural resources and biodiversity of Borneo amidst the fast-changing socio-economic conditions.

Despite the numerous conservation success stories, conservation within the three landscapes has too often taken a piecemeal approach. There was a desperate need for a holistic and integrated landscape approach that would look at the respective landscapes as a whole system. There was also a growing realisation of the importance of integrating conservation planning with development/land use planning to facilitate actual sustainable development on the ground as well as to avoid potential land use conflicts and competition for land between agencies.

3.2.3 Practical benefits

SCP was introduced to WWF-Indonesia and WWF-Malaysia in the late 1990s by WWF Network. Both two national offices were receptive to the SCP approach given its many potential advantages over non-systematic preferences and decision-making procedures. Overall, WWF-Indonesia and WWF-Malaysia recognised that SCP would bring about the following practical benefits:

- While the SCP process is not entirely expert-driven, it includes consultation procedures with stakeholders ensuring issues on the ground are taken care of as well as gaining greater stakeholder buy-in. This approach flows well with the prevailing corporate objective and outreach policy of WWF-Indonesia and WWF-Malaysia;
- SCP, through its mapping exercise, is a powerful tool to help stakeholders to visualize the gaps in the existing protected area systems. It shows them where they should prioritise their conservation efforts and demonstrates the potential benefits;
- SCP is an evidence-based approach that enables decision makers to allocate limited resources strategically and efficiently. It is able to show the differences

1). For example, WWF in its 2016 Report on The Environmental Status of Borneo stated that a majority of orangutans live outside the Heart of Borneo, an area covering 23 million hectares (234,000 km^2) in the centre of the island (source: Wullfraat et al (2016b). The Environmental Status of Borneo)

in costs between planning systematically and planning in an ad-hoc manner. The cost-efficient aspect of SCP resonates well with bureaucrats and donors whose interest is in optimizing economic benefits within a given budget-constrained environment;

- SCP makes societal trade-off explicit and optimises trade-off between conservation and socio-economic objectives. As opposed to the single solution of full protection with no socio-economic activities permitted, SCP allows joint optimisation of productive land use and management and conservation, thereby taking into account the joint needs of all stakeholders; and
- SCP is flexible in producing alternative outputs to meet the conservation features and goals. It also integrates and complements well with other strategies employed by WWF-Indonesia and WWF-Malaysia in their respective landscapes in Borneo such as the strategies on responsible forestry, sustainable palm oil, and reducing emissions from deforestation and forest degradation (REDD).

Other conservation organisations such as The Nature Conservation (TNC), Borneo Futures and HUTAN were in the initial stage of employing SCP for their works in Borneo. From WWF-Indonesia and WWF-Malaysia's perspective, the SCP approach represents a strategic platform for collaboration with like-minded conservation organisations and for cross-fertilisation of scientific and technical know-how. Capitalising on each other's strengths, WWF Network, WWF-Indonesia and TNC jointly undertook the first Borneo-wide SCP in 2006. More recently, in 2013, WWF-Malaysia collaborated with HUTAN to promote SCP in Sabah. In the same year, WWF-Malaysia hired a former SCP expert of TNC to implement the Marxan component of the SCP in Sabah and Sarawak.

3.2.4 Stages of SCP

The WWF's systematic conservation planning process usually goes through the following stages of evolution:

1. Initiation of SCP process by WWF (with or without a formal invitation/mandate from government[2]);
2. Development of PCA maps by WWF (with expert opinion and in consultation with key stakeholders);
3. WWF to advocate the PCA maps (and its associated recommendations) to government;
4. Adoption of the PCA maps by government for implementation; and
5. WWF and/or designated government agency to monitor the progress of the PCA implementation and evaluate the results. Adaptive management is carried out where necessary.

3.2.5 implementation timelines of WWF Global 200 and SCP in Borneo

Figure 2 gives a snapshot of the implementation timelines of WWF Global 200 and SCP in Borneo. Chapters 4 to 7 provide detailed explanations on the timelines.

Figure 2: Implementation timelines of WWF Global 200 and SCP in Borneo

Source: WWF, various years

2). For example, the SCP exercise in Sabah was purely an initiative originated from within WWF under the Sabah Terrestrial Conservation Programme. The same goes for the SCP exercise in Sarawak. WWF-Malaysia initiated the SCP process under its Sarawak Conservation Programme in 2013. The official mandate/invitation came more than one year later through the signing of a MoU between the Forest Department of Sarawak and WWF-Malaysia in November 2015.

CHAPTER 4:
A BORNEO-WIDE IMPLEMENTATION OF SYSTEMATIC CONSERVATION PLANNING

4.0 BACKGROUND

WWF began to embark on Borneo-wide systematic conservation planning (SCP) in 2006 under a project titled Ecoregional Assessment (ERA) of Borneo. Following the Heart of Borneo (HoB) Declaration in 2007, the focus of the SCP shifted to the development of a monitoring framework to characterize both the ecological health and conservation status of the HoB. In 2016, the scope of the SCP exercise was expanded to cover the whole of Borneo with increasing attention given to promoting transboundary integration of protected areas, wildlife corridors and sustainable land-use areas.

4.1 ECOREGIONAL ASSESSMENT OF BORNEO, 2006-2008

The implementation of the Ecoregional Assessment (ERA) of Borneo during the period October 2006 to July 2008 marked the beginning of SCP in Borneo. It was a collaboration between WWF-Network, WWF-Indonesia and TNC. ERA, in turn, was built on the Ecoregional Assessment of Biological Diversity Conservation in East Kalimantan conducted by TNC in 2002-2003.

4.1.1 Objective

It was observed that spatial planning was already underway across multiple levels of government in Indonesia and Malaysia and land use decisions were being made in absence of larger scale vision. There was also growing global interest in Borneo for carbon credits through REDD and reforestation efforts. The ERA was therefore aimed at:

- Establishing a baseline of current conservation status of Borneo;
- Creating a decision platform in the form of a data management framework;
- Generating maps of conservation options for Borneo; and
- Identifying potential options for carbon sequestration (e.g., REDD) and restoration opportunities.

4.1.2 Methodology and process

The ERA exercise employed Marxan as a planning tool. The ERA process included target selection, goal setting, development of cost layer, development of alternative portfolios of managed areas, spatial analysis, and fine tuning and final portfolio development. The whole process was an expert-driven process.

The selected conservation targets were freshwater swamp, heath forest, karst formation, limestone forest, lowland rainforest, mangrove forest, montane forest, peat swamp forest, upland rainforest, upper montane cloud forest, freshwater classes (in terms of geology, slope, stream gradient and hydrosheds), Bornean Elephant, Sumatra Rhino, orangutan, gibbons, Irrawaddy dolphin, proboscis monkey, protected areas, major river systems (two per stratification unit).

Borneo was stratified into the following regions for the Marxan analysis. Following **Figure 3**, the stratification was done broadly based on the main watersheds of Borneo[3]:

I. Northern Borneo;
II. Eastern Borneo

3). Stratification units were created by using the major watersheds in Borneo. In the lower flat lands multiple major watersheds were combined to give a somewhat uniform size stratification units

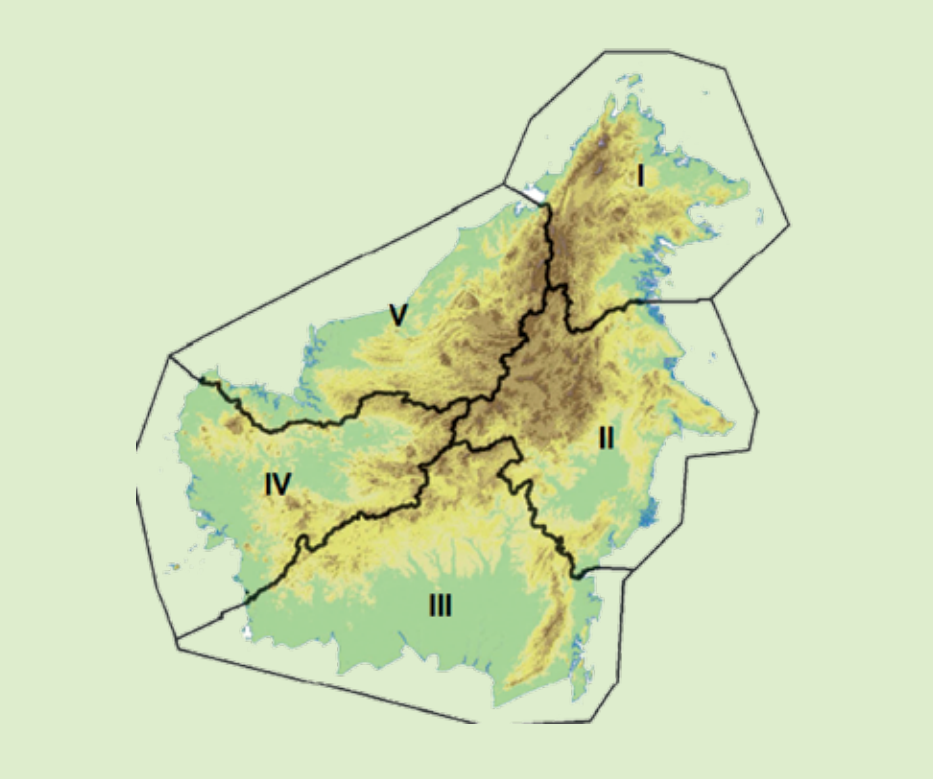

Figure 3:
Stratification according to the ERA of Borneo 2008
Source: WWF-TNC, 2008

III. South-central Borneo
IV. Kapuas Basin
V. Sarawak/West Borneo

The process was guided by the following considerations. Table 1 shows the selected conservation targets (coarse scale) and their respective goals.

- Conservation by design parameters set by patch size and distribution of targets
- Minimal 30 percent goal scenario based on the Indonesian Law No. 26/2007 (Spatial Planning Act).
- Variable goals scenario based upon historical extent.
- Fine filter targets (where data permits) locked into analysis – otherwise used as site decision tool during portfolio assembly.
- Freshwater classes checked for ex post facto for full representation, but not for regional redundancy nor were goals set specifically for them.

No.	Conservation Target	Goal (% of historical extent)
1	Upper montane and cloud forest	90
2	Montane forest	80
3	Upland forest	50
4	Lowland forest	35
5	Karst	100
6	Limestone forest	75
7	Freshwater swamp	30
8	Peat swamp	55
9	Heath forest	30
10	Mangrove forest	50

Table 1:
Conservation targets and goals
Source: WWF-TNC, 2008

The cost layer was derived from the Global Human Footprint v2 data. A low footprint figure represents a relatively low impact from human activity and hence less costly to conserve.

Projections were made for forest cover for the whole of Borneo for the year 2010 and 2020. Based on the results of the projections, WWF made recommendations on possible policy, administrative and technical interventions to overcome deforestation.

4.1.3 Results

Output

The ERA had produced important baselines on conservation features, identified the current status of biodiversity conditions in Borneo, and established basic design criteria for what an ideal portfolio of managed areas would look like. With that, it recommended a conservation vision for Borneo as shown in the following map **(Figure 4)**. The map may be interpreted as among the earliest PCA maps of Borneo.

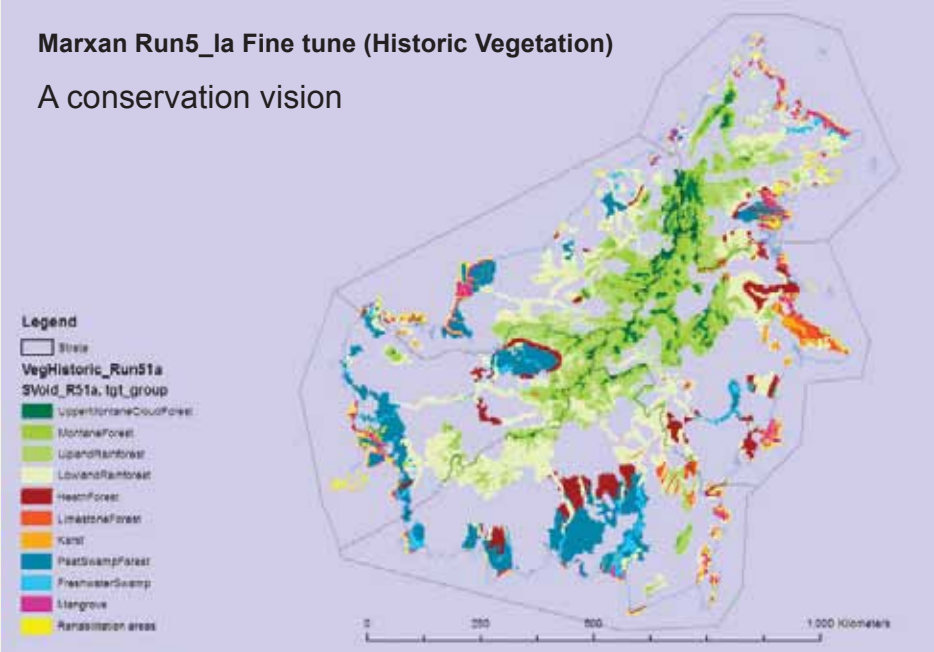

Figure 4:
PCA map of Borneo

The Ecoregional Assessment of Borneo (WWF-TNC 2008) identified a portfolio of sites that together met the quantitative goals set for each of Borneo's habitat types. The map shows the portfolio of Priority Conservation Areas.

Source: WWF-TNC, 2008

Outcome

There is no strong evidence to suggest that the ERA had directly contributed to creation of new protected areas in Borneo. Neither have the three member countries of HoB adopted the above PCA Map as HoB map. In any case, the demarcation of the HoB boundary was never a pure systematic conservation planning exercise. Reflecting this fact is the lack of inclusion of the biodiversity-rich lowland rainforest in the HoB. In addition to environmental consideration, the HoB boundary was decided based on political and economic considerations.

Notwithstanding, given WWF's intimate involvement in promoting the creation of the HoB from the very outset and the catalytic role that it played in the process, there is reason to believe that the results of the ERA did in a way guided WWF in its HoB-related advocacy works.

Moreover, the ERA has become one of the important references for the SCP exercises in Kalimantan, Sabah and Sarawak. The subsequent spatial planning exercises for the Heart of Borneo were also built upon the results of the ERA.

4.1.4 Limitations and challenges

The ERA Report acknowledged that the assessment process was a rapid internal expert-driven process with no stakeholder input. Additionally, the ERA team encountered the following challenges in completing the ERA report:

- Lack of island-wide high-resolution species data; and
- Sarawak data was hard to come by.

4.2 REPORTS OF THE ENVIRONMENTAL STATUS OF THE HEART OF BORNEO AND BORNEO

WWF started monitoring the environmental status of the Heart of Borneo (HoB) on a systematic and regular basis in the second half of 2008. In recent years, the monitoring scope has expanded to cover the whole of Borneo.

The initiative is characterised by WWF's continuous effort to improve the robustness of the monitoring framework developed under the ERA period (2006-2008), including the inclusion of more biological indicators for better representation of the flora and fauna in the HoB/Borneo.

4.2.1 Background

This phase of the SCP exercise is closely related to the HoB Initiative, a three countries collaboration mooted by WWF formalized through the signing of the Heart of Borneo Declaration by the governments of Brunei Darussalam, Indonesia and Malaysia in February 2007.

4.2.2 Objective

In the early years of the HoB Initiative implementation, there was no comprehensive and reliable data showing the current environmental status of the HoB. As a result, no one could tell for sure the extent and condition of forest cover in the HoB, the spatial distribution of its ecosystems and species, the types of threats facing the ecosystems and species, etc. This phase of the SCP attempts to provide this data and analysis.

Overall, the exercise aims to contribute to the effective management of forest resources, conservation of a network of protected areas, and other sustainable land uses in the HoB. More specifically, it aims to provide for objective and scientifically based long-term monitoring of the environmental status of the HoB, evaluate the effectiveness of the current conservation efforts and make recommendations for the sustainable management of the area.

4.2.2 Methodology and process

This phase of the SCP exercise represents an extension of the ERA of Borneo conducted during the period 2006-2008. Overall, it follows the same methodology used in the ERA. However, there has been continuous effort by WWF to improve the monitoring framework and datasets. The indicators have been enhanced and refined so that they may be representative of the ecological status of the HoB and could be monitored at appropriate time intervals. Three types of indicators have been developed: biological indicators (the major ecosystems and selected keystone species); threat indicators and conservation management indicators.

Some of the original goals have been revised based on newly available information and latest research findings. **Table 2** shows some of the goals set in 2012 and are still being actively monitored these days. A rating system has been put in place in 2008 so that each of the indicators could be rated Very Good, Good, Fair or Poor.

The whole SCP process is still pretty much driven by the WWF's team of international and Bornean experts, with occasional contribution from consultants. WWF-Indonesia is more experienced in SCP than WWF-Malaysia[4]. It is therefore no surprise that the Borneo-wide and HoB-wide SCP exercises is largely driven by WWF-Indonesia, with WWF-Malaysia providing the necessary input and in-

4). WWF-Indonesia started embracing and implementing SCP since 2006. WWF-Malaysia began to do the same for the Sabah and Sarawak landscapes about seven year later in 2013

country coordination. WWF-US, WWF-Germany and WWF-Netherlands have provided significant guidance and technical assistance to the endeavour.

Since 2016, the scope of the exercise has been expanded from the HoB to the whole of Borneo, a reflection of the cross-boundary landscape approach needed to adequately address the loss of natural capital in this globally significant environmental hotspot.

No.	Conservation Target	Goal (set in 2012)
1	Upper montane and cloud forest	90%
2	Montane forest	90%
3	Upland forest	80%
4	Lowland forest	45%
5	Limestone forest	60%
6	Freshwater swamp	40%
7	Peat swamp	60%
8	Heath forest	50%
9	Mangrove forest	60%

Table 2:
Conservation goals
Source: WWF, 2017b

4.2.4 Results

Output

Monitoring reports

Three flagship reports on the environmental status of the HoB have been produced by WWF since 2012, namely:

- The Environmental Status of the Heart of Borneo 2012. This report was based on an analysis undertaken in 2008 using historical spatial data and field data from 2007;
- The Environmental Status of the Heart of Borneo 2014, using data from 2012 and 2010; and
- The Environmental Status of Borneo 2016 (published in 2017 and covers the whole of Borneo), which used the latest 2015 data.

The Environmental Status of the Heart of Borneo 2012 indicates that most forest types in the HoB were rated as good or very good. It underlined the severe threat to lowland rainforest across the rest of the island of Borneo.

The Environmental Status of the Heart of Borneo 2014 highlights that conversion of natural forest into industrial plantations posed the biggest threat to the ecosystems of both Borneo and the HoB. Lowland rainforest was one of the ecosystems affected most by forest conversion while the other two were heath forest and peat swamp forest.

The Environmental Status of the Heart of Borneo 2016 shows that Borneo's forests were in decline, a trend observed since the 2012 Environmental Status of the Heart of Borneo report. From the historical forest cover at 96 percent, by 2005 this had dwindled to 71 percent and the 2016 report indicates by 2015, this had fallen to 55 percent **(Table 3)**. The report identifies at least three major threats currently facing Borneo's ecosystems: fire; land conversion for oil palm and pulpwood plantations, and mining concessions; and inadequate spatial planning. The report made the following key recommendations:

- Ensure ecological connectivity of the landscapes of Borneo through island wide spatial planning for effective conservation of biodiversity and ecosystem services;
- Evaluate spatial planning per location and per landscape, to ensure as much natural forest and species habitats as possible, be retained;
- Identify and establish a new baseline for all idle non-forest land, and consider it as the only alternative for new plantations;
- Develop monitoring systems and prescriptive action to ensure that all production forest remain under natural forest cover; and
- Expand protected areas to include entire landscapes and achieve better representation of all ecosystems and species habitats.

Ecosystem	Historical Extent (ha)	Forest cover in 2005 & % of historical extent		Forest cover in 2010 & % of historical extent		Forest cover in 2015 & % of historical extent	
		Ha	%	Ha	%	Ha	%
Lowland rainforest	31,180,420	19,338,952	62.0	15,740,581	50.5	13,198,688	42.3
Upland rainforest	13,820,382	13,118,466	94.9	12,664,227	91.6	12,347,960	89.3
Montane forest	6,727,267	6,655,131	98.9	6,553,412	97.4	6,461,895	96.1
Limestone	1,279,195	902,331	70.5	775,266	60.6	675,147	52.8
Heath forest	7,004,188	2,930,249	41.8	2,196,159	31.4	1,624,719	23.2
Freshwater swamp	2,373,142	1,068,219	45.0	746,059	31.4	534,564	22.5
Peat swamp forest	9,417,938	6,490,437	68.9	4,961,696	52.7	3,951,151	42.0
Mangroves	2,580,630	1,653,256	64.1	1,462,689	56.7	1,279,414	49.6
Total	**74,383,159**	**52,093,104**	**70.0**	**45,100,089**	**60.6**	**40,073,538**	**53.9**

Table 3:
Forest cover and percentage of historical extent according to ecosystem, 2005, 2010 and 2015
Source: WWF, 2017b

The Heart of Borneo Corridor and the WWF Priority Landscapes in Borneo

One of the important offshoots of the SCP in recent years and the outcome of the status of the environment reports is the project proposal on Heart of Borneo Corridor. Initiated by the WWF HoB Programme, the HoB Corridor project attempts to secure and restore landscape connectivity in the Heart of Borneo by linking protected areas through sustainable and traditional land use, and sustainable forest management across Borneo. The goal is to create an interconnected forest landscape totalling 10 million hectares through linking the mountain ranges and sources of major river system in the HoB to six priority conservation landscapes **(Figure 5)**. The six priority conservation landscapes are:

1. The Crocker Range - Central Forest Landscape;
2. The Transboundary Elephant Landscape (southern part of Sabah-North Kalimantan);
3. The Brunei-Sabah-Sarawak-North Kalimantan Transboundary Landscape;
4. The Sarawak-West Kalimantan Transboundary Landscape (the protected areas of Batang Ai-Lanjak Entimau-Betung Kerihun-Danau Sentarum);
5. The Muller-Schwaner-Arabela Landscape; and
6. The Katingan Landscape (Sebangau National Park-Schwaner Mountains).

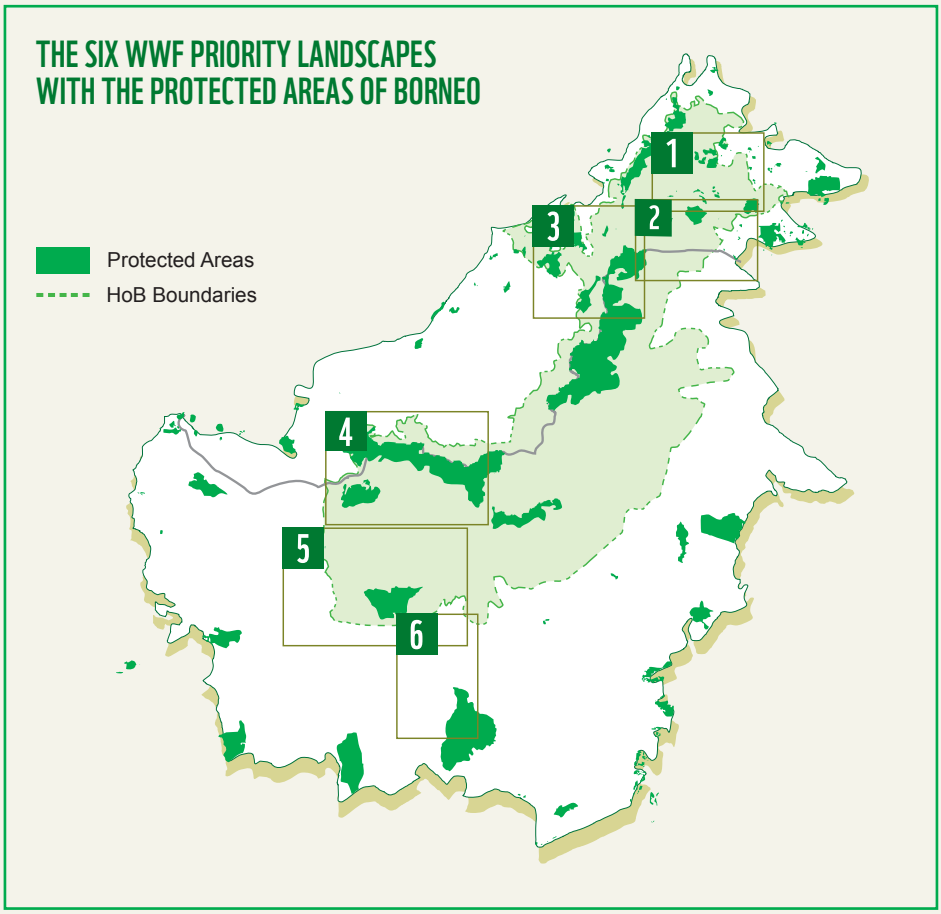

Figure 5:
The six Priority Conservation Landscapes of the HoB Corridor

Source: WWF, 2017d

It must be emphasised here that Figure 5 is not a PCA map of the HoB because it was generated without fully adhering to the SCP principles and steps (see Chapter 2 for the SCP principles and steps)[5]. Notwithstanding, within the context of enhancing cross-boundary connectivity, the map underscores the six landscapes with the highest urgencies for intervention.

Outcome

The Borneo-wide SCP exercise has resulted in the following positive outcomes:

- Member Countries of the HoB now know the state of the environmental of the HoB. They can access to the relevant historical and current information made available by WWF on a regular basis;
- Guided by the PCA maps, stakeholders know the key locations where they should concentrate their conservation efforts; and
- There has been transferring of technology and knowhow on SCP from WWF Network to WWF-Indonesia[6].

5). The six priority conservation areas were selected out of 10 priority terrestrial landscapes in Borneo. Marine, coastal and riparian landscapes were not included in the selection process. It started with a process of inventorying and preliminary identification and mapping of potential landscapes by WWF experts. This was followed by compilation and documentation of facts on each of the 10 landscapes, covering key information on location, ecosystems, forest cover, watersheds vulnerability, habitats, government spatial planning, protected areas, land use, local communities, infrastructure, fire hotspots, climate change impacts and food security. A regional workshop was held to determine a set of criteria for the selection and prioritisation of the landscapes, including criteria on geo-political, ecological, social, threats and possible interventions to address the threats. Through a scoring system, the six landscapes with the highest urgencies for intervention were identified.

6). For one, the monitoring of the environmental status of the HoB in 2008 was basically driven by WWF-US under its WWF Conservation Measures program. Five years later, in 2013, the responsibility was taken over by WWF-Indonesia. The technical capability of the geographic information system (GIS) staff of WWF-Indonesia has also been enhanced. A few years ago, WWF-Indonesia had to acquire certain satellite images (e.g., MODIS images) from external sources but now the GIS staff members have the in-house expertise to generate such images

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4.2.5 Limitations and challenges

- There is still inadequate data input from Malaysia, particularly the data on extents of logging concessions and plantations in Sarawak;
- Useful information on management effectiveness of protected areas may be derived from the Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) assessments. However not all the protected areas in Borneo have undergone such an assessment;
- Some of the biological indicators (e.g., proboscis monkey, hornbills, Arowana, endangered plant species) are incomplete due to lack of comprehensive data sets from the field;
- Threat indicators are crucial, but threat data on over-hunting and illegal logging, is still hard to come by; and
- The SCP regularly takes a 10-year projection on major threats. Because of the relatively short projection into the future, climate change is not prioritised as one of the major threats.

CHAPTER 5:
IMPLEMENTING SYSTEMATIC CONSERVATION PLANNING IN KALIMANTAN

5.0 INTRODUCTION

The origin of the SCP in Kalimantan can be traced back to the Ecoregional Assessment (ERA) of Borneo conducted by WWF in collaboration with TNC during the period 2006-2008. The ERA itself was an extension of an East Kalimantan ecoregion study conducted by TNC in 2002-2003 (TNC, 2003).

Because the ERA gave a reasonably comprehensive picture for Kalimantan, there was little pressure to develop a Kalimantan-specific SCP exercise until recently. WWF-Indonesia started its current phase of the SCP exercise in Kalimantan in 2013, about the same time WWF-Malaysia began its SCP in Sabah and Sarawak[7].

Given its strong Kalimantan focus, the various SCP exercises conducted by WWF under the HoB Initiative have generated many outputs that were highly relevant to the WWF-Indonesia's conservation programmes in Kalimantan. WWF-Indonesia began to incorporate its Borneo-level SCP results into its conservation programmes in Kalimantan in 2009. This included programmes that aimed to influence the formulation/revision of the various provincial and district-level spatial plans in Kalimantan; programmes on establishing ecological corridors; forest restoration; REDD+, etc.

5.1 OBJECTIVE

The current phase of the SCP in Kalimantan aims to capitalise on the Presidential Regulation No.3/2012 on Spatial Planning for Kalimantan. The Presidential Regulation was issued on 5 January 2012, stipulating an allocation of at least 45 percent of Kalimantan to remain as conservation and forested areas which would serve as "the lungs of the world".

The Government of Indonesia has no plan to add new protected areas in Kalimantan in the foreseeable future. Its current focus is on evaluating the effectiveness of the existing protected area management practices. Given the scenario, the overall focus of the WWF-Indonesia's strategy is on maintaining the existing forest in conservation areas, enhancing forest protection and promoting forest restoration.

In the context of SCP, the main attention is on identifying potential areas for promotion of sustainable land management, particularly areas that may serve as ecosystem corridors between protected areas. This includes areas that have already been converted or earmarked for plantation, logging or other forms of commercial land uses. According to Article 1 of the Presidential Regulation No.3/2012 on Spatial Planning for Kalimantan the main function of the ecosystem corridors is to facilitate the movement of species between conservation areas.

7). Based in Indonesia, the international team members of the ERA collaborated closely with the staff members of WWF-Indonesia on data collection and analysis. By default (due to the unavailability of data on Sabah and Sarawak), not design, the making of the ERA was somewhat Kalimantan-centric. For example, the goal setting process of the ERA was guided by the Indonesian Law No. 26/2007 (Spatial Planning Act). There is no evidence suggesting that the ERA had consulted the similar spatial planning laws of Sabah and Sarawak during its goal setting process. The inclusion of mining as one of the top threats is another example. Unlike Kalimantan, Sabah and Sarawak faced no serious threat from mining. Also, two WWF-Indonesia's project sites in Kayan Mentarang and Betung Kerihun National Parks were used as sites for the field trials of the application of the full social aspects of the Conservation Measures framework, which was an integral part of the WWF-US led assessment on the environmental status of the HoB in 2008.

Article 6, Paragraph 3 of the Presidential Regulation No.3/2012 stipulates strategies for the development of ecosystem corridors between conservation areas, as follows:

- Establish ecosystem corridors between natural asylum conservation and nature conservation;
- Controlling the utilization of space in the cultivation area that functions as an ecosystem corridor;
- Limiting the development of residential areas in areas that serve as ecosystem corridors; and
- Develop environmentally friendly infrastructure to support eco-system corridors.

The official spatial maps of Kalimantan have not yet identified such corridors. This represents an opportunity for WWF-Indonesia to provide the relevant input to the government and to influence its spatial planning in Kalimantan both at the provincial and district levels.

5.2 METHODOLOGY AND PROCESS

To develop and promote its SCP results, and in line with the three-tier spatial planning system of the Indonesian Government, WWF-Indonesia interacts with three levels of government - national, province and district **(Table 4)**. Operating at national level, WWF-Indonesia's national office focuses on providing input to the spatial planning process of the National Strategic Area for HoB and the whole of Kalimantan Island. In the West, Central, East and North Kalimantan provinces, WWF-Indonesia's offices focus on giving input to the various provincial and district-level spatial plans.

Level of authority (scale)	General planning	Detailed planning
National (1:1000.000 – 1:500.000)	National Spatial Planning	• The spatial planning of the national strategic area of HoB • Kalimantan island spatial planning
Province (1:250.000 – 1:100.000)	Province Spatial Planning	Province strategic area
District/ Municipality (1:50.000 – 1:1000)	District/ Municipality Spatial Planning	• District/ Municipality strategic areas • Zoning regulation

Table 4: Indonesia spatial planning, the three-tier system
Source: WWF-Indonesia, 2017

Since early 2014, WWF-Indonesia has been actively engaging the Kalimantan Ecoregion Management Centre (Pusat Pengelolaan Ekoregion) of the Ministry of Environment and Forestry (formerly Ministry of Environment) for the implementation of SCP. The process began with a discussion between WWF-Indonesia and the Kalimantan Ecoregion Management Centre to determine the criteria and strategy for the SCP. This was followed by a focus group discussion with the provincial governments of Central Kalimantan, East Kalimantan, North Kalimantan, South Kalimantan and West Kalimantan on 20 May 2014. Subsequently, a focus group discussion with stakeholders comprising of representatives from the ministries, agencies, universities and NGOs was held on 27 October 2014 to identify strategic issues facing spatial planning in Kalimantan.

As of June 2017, the data processing and analysis process is currently still ongoing. The process faces delay due to changes in stakeholder composition and dynamics following the presidential election in 2014 and merger between the Ministry of Environment and the Ministry of Forestry in late 2014.

A consultant has been hired to support the data analysis and report writing, with WWF-Indonesia providing the overall technical and strategic supervision. Besides spatial analysis, WWF-Indonesia also reviews the development plans, land use

policies and regulations affecting spatial planning and conservation in Kalimantan.

The SCP in Kalimantan uses the following data inputs/attributes:

1. Orangutan distribution (source: Forum Orangutan Indonesia, Population and Habitat Viability Assessment 2013 report)
2. Rhinocerous distribution, primary data from field survey, modeled using Maxent, a machine-learning algorithm based on the principle of maximum entropy
3. Elephant distribution (WWF 2008)
4. Proboscis monkey (Maxent modelling)
5. Irrawaddy dolphin (WWF and Conservation Foundation for Rare Aquatic Species of Indonesia)
6. Ecoregion/ecosystem types (Ministry of Environment and Forestry)
7. Erosion hazard level derived from InVEST Sediment Delivery Ratio module
8. Water yield

Attributes 1 to 5 have been selected as representation of biodiversity for protection. Attribute 6 was selected to be consistent with the requirement under Law 32/2009, in which the Environmental Protection and Management Plan of the Ministry of Environment and Forestry embraces an ecoregion-based approach. Eleven types of ecosystems were identified and incorporated in the planning framework. Attributes 7 and 8 were selected as conservation areas that provide environmental services critical to the well-being of the people in Kalimantan.

In addition to Marxan, WWF-Indonesia uses the following software/software models:

- ArcGIS: for data preparation and simple analysis such as overlay and buffer
- InVEST: Sediment Delivery Ratio and Water Yield Module - for modelling environmental services data related to erosion and water yield data
- IDRISI: Land Change Modeller Module - for modelling land cover prediction from 2015 – 2045. The predicted model was used as loss trend for each conservation layers and as baseline to monitor the degree of deforestation
- Maxent: for species distribution modelling

Since early 2017, WWF-Indonesia has begun using Zonation 4.1 software as conservation planning tool for Kalimantan, in consideration of the software's ability to overcome large numbers of planning units at once. Cost layer is not considered as a primary consideration because spatially Kalimantan is more or less saturated with actual or planned investments in place, which in turn may be considered as cost.

Moreover, WWF-Indonesia's main intention is to identify priority areas for promotion of sustainable practices and not to design any new protected area. Those areas may be located in a developed landscape; or a landscape that is earmarked for development; or inside a concession area with plantation or logging activities.

Conservation features and goals

Through expert opinion and stakeholder input, WWF-Indonesia identified 20 conservation features and determined a numeric goal for each of the features **(Table 5)**. The ecoregion goals (Items 1 to 11, and 20) were determined based on the remaining forested areas and loss trend in land cover generated using IDRISI Land Change Modeller. The species goals (Items 12 to 17) were generated using Maxent. The erosion risk and water yield goals were derived using InVEST. The goal of the

SCP is to conserve as much as possible those conservation features based on the minimum goals set while maintaining the ecological connectivity.

No.	Conservation features	Goals
1	Ecoregion 1: Lowland dipterocarp	50%
2	Ecoregion 2: Lowland mixed dipterocarp	50%
3	Ecoregion 3: Mountainous mixed dipterocarp	60%
4	Ecoregion 4: Riparian forest	90%
5	Ecoregion 5: Freshwater swamp forest	50%
6	Ecoregion 6: Peat swamp forest	90%
7	Ecoregion 7: Heath forest	50%
8	Ecoregion 8: Karst limestone forest	90%
9	Ecoregion 9: Beach forest	90%
10	Ecoregion 10: Mangrove	90%
11	Ecoregion 11: Open swamp	90%
12	Elephant distribution	90%
13	Clouded leopard viable population	60%
14	Orangutan distribution	60%
15	Irrawaddy dolphin	90%
16	Proboscis monkey	60%
17	Rhinocerous	90%
18	Erosion risk	50%
19	Water yield	50%
20	Existing protected areas	100%

Table 5:
Conservation features and goals, Kalimantan
Source: WWF-Indonesia, 2017

5.3 RESULTS

Output

The results of the SCP exercise are summarised in the following map **(Figure 6)**.

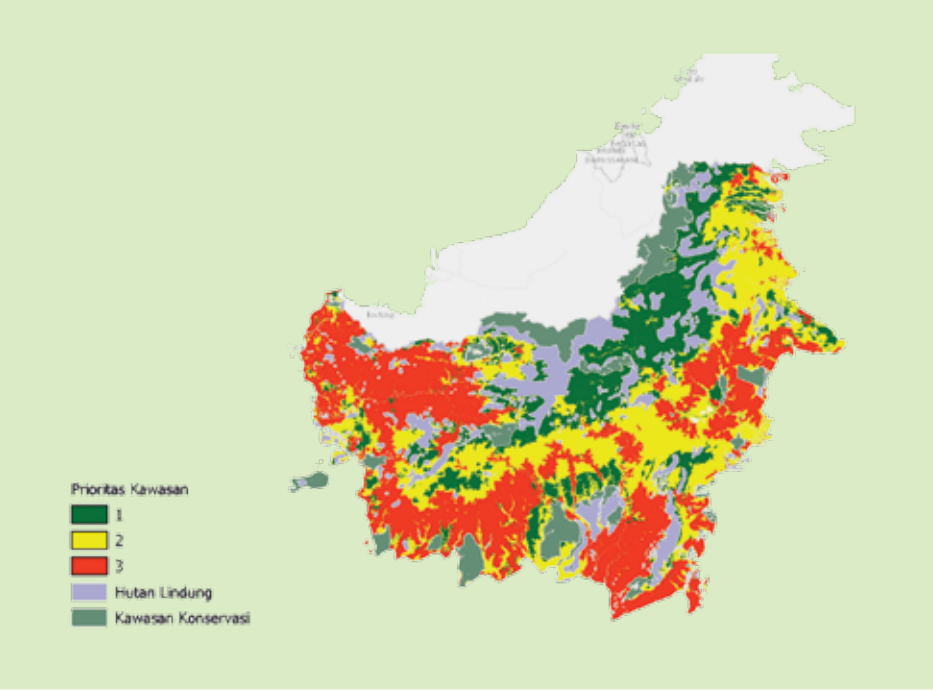

Figure 6:
PCA map of Kalimantan
Source: WWF-Indonesia, 2017

Note: *Hutan Lindung*: Protection Forest; *Kawasan Konservasi*: Conservation/Protected Areas; *Prioritas Kawasan*/Priority Area
1: Highest priority to be conserved or promoted for sustainable practices
2: High priority to be conserved or promoted for sustainable practices
3: Not a priority

The next step is to seek the stakeholders' input and comments on the PCA map. WWF-Indonesia is currently working on this. The end goal is to get the National Government (Ministry of National Development Planning; Ministry of Environment and Forestry) and Provincial Governments in Kalimantan to adopt and implement the PCA map.

Outcome

It is still too early to assess the outcome of the current phase of the SCP in Kalimantan given that the process of getting the buy-in and official adoption of the PCA map is still ongoing.

There are also instances where the district regulations *(peraturan daerah)* governing the adoption and implementation of district-level spatial plans are still undergoing public consultation or awaiting the endorsement of provincial governments. The situation has delayed the adoption of the Kapuas Hulu District Spatial Plan (including the district-level plan on the Labian-Leboyan corridor) and Sintang District Spatial Plan, both of which have significant WWF's spatial planning input.

Nevertheless, through sharing of strategic and technical spatial information with related WWF-Indonesia programmes in Kalimantan (e.g., Forest Restoration and Rehabilitation; Sustainable Land Use Management programmes) the SCP exercise has directly or indirectly guided the outreach efforts of these programmes.

There have been positive discussions with governments, private companies and community groups on the prioritisation of habitats of wildlife importance for conservation and undertaking sustainable management practices with the view of increasing ecological connectivity and enhancing coverage and functions of protected area networks in Kalimantan.

More specifically, through provisioning of spatial planning input, the past and ongoing SCP initiatives of WWF have directly or indirectly contributed to the development and implementation of a number of conservation plans and programmes in Kalimantan. This has led to the improvement of the spatial planning contents of the following initiatives, among others:

- The drafting the Presidential Decree on National Strategic Area of the HoB, a process led by the East Kalimantan Regional Planning Authority that involved overlaying the National Strategic Area into provincial spatial planning as well as incorporating data related to High Conservation Values on key species habitat/areas, watershed and peatland areas;
- The implementation of the integrated conservation work in West and Central Kalimantan which aims at delivering landscape level sustainable development and on-site conservation in a pristine tropical forest that is inhabited by orangutan, Kalimantan hornbill, Malayan sun bear, Muller's gibbon, among others. The scope of conservation covers 10 districts and the 28,548 ha Gunung Lumut conservation area;
- The identification of six Indigenous Community Conservation Areas in West Kalimantan and capacity building effort for local organization to enhance various aspects of managements;
- The development of the Elephant Conservation plan for the North Kalimantan province, including input to the drafting of a Decree of Human-Elephant Conflict Coordination Team for submission to the Governor of North Kalimantan;

- The public consultations of the Kayan-Mentarang National Park zoning system in the two districts of Malinau and Nunukan to strengthen park management and zonation through collaborative management; and
- The preparation of the institution and the management mechanism of the Labian-Leboyan Corridor, an essential component of the Conservation District Declaration of Kapuas Hulu, for ecological integrity and conservation of orang-utan (WWF, 2017d and WWF-Indonesia, 2012).

5.4 LIMITATIONS AND CHALLENGES

At a more macro level, a WWF-Indonesia's internal impact monitoring effort concludes that the impact of WWF lobby on the development of provincial spatial planning of Kalimantan has been strong as WWF is one of the major advisory stakeholders in the process. Generally, there was relatively more sustainable land-use pattern (e.g., relatively low loss of protected areas) in the provinces where WWF's spatial planning effort was most active (e.g., Central Kalimantan) and vice versa (e.g., South Kalimantan). However, it was a mixed result for West Kalimantan where WWF has a long-term presence with several field offices there. The finding suggests that conservation message for protection of natural forests might not have reached all levels of spatial planning (WWF, 2017a).

WWF-Indonesia has encountered the following challenges in the course of its SCP exercise in Kalimantan:

- Absence of a comprehensive species database for meaningful species distribution modeling;
- Changes in stakeholder composition and dynamics following the presidential election and merger between the Ministry of Environment and the Ministry of Forestry in 2014 has interrupted the progress of the exercise;
- While waiting for the One Map Initiative[8] to be fully implemented nation-wide, WWF-Indonesia is still confronted with a situation where different land-cover maps are being used by different ministries and at different levels of government; and
- Some of the data on forests and land-cover maps are still varied amongst ministries. Complexity and ambiguity in the governance of forest land and natural resources are made worse by the use of outdated or inaccurate maps, resulting in overlapping forest-land concessions and conflicting customary and statutory land tenure. The situation may potentially delay the buy-in process of the WWF-Indonesia's PCA map.

8). This is a government initiative. The stated objective of the One Map Initiative is to create an integrated map that will provide a single reference map of Indonesia for any decision-making related to land-based management (source: Mulyani, et al., 2017).

CHAPTER 6:
IMPLEMENTING SYSTEMATIC CONSERVATION PLANNING IN SABAH

6.0 BACKGROUND

Sabah is a global hotspot of tropical forest biodiversity (Myers, 1988). It has been heavily impacted by conversion of forests to other landuses since 1970s (Gaveau, et. al., 2016) and is under threat of further deforestation. The conventional approach is to deal with the issues through reviewing the relevant EIAs and intervene at monitoring level. But that would be mostly reactive in nature. SCP was seen as an effective approach to address the issues and WWF-Malaysia would like to use it to influence the state's spatial planning process top-down. WWF-Malaysia started SCP in Sabah in 2013 under its Sabah Terrestrial Conservation Programme.

6.1 OBJECTIVE

The objective of the SCP exercise in Sabah was to include priority conservation areas into the Sabah Structure Plan (SSP) 2013-2033. This was done through influencing the Sabah Structure Plan planning process and to produce quick policy outcomes through it. The SSP 2013-2033 was commissioned by the Sabah Town and Regional Planning Department in 2012. It is a statutory planning document prepared under the provision of the Town and Country Planning Ordinance (Sabah Cap141), Section 4C Enactment (Amendment) 2002. This overarching spatial policy document aimed to be gazetted and subsequently served as a guiding document for the formulation of the various district and local plans. Implementation of the SSP 2013-2033 was therefore expected to have a far-reaching impact on land-use in Sabah.[9]

6.2 METHODOLOGY AND PROCESS

The SCP exercise in Sabah involved identifying terrestrial conservation features, collecting data, developing conservation goals and finding areas that meet those goals in the most efficient and objective way.

The goals and design criteria for the SCP in Sabah were discussed and determined through three formal stakeholder workshops held between May and July 2013. There were many other informal consultations held with experts and stakeholders in 2013 and 2014. Among the key stakeholders engaged were Hutan (and Borneo Futures), an NGO, Forest Research Centre of the Sabah Forestry Department, the forestry school of University of Malaysia Sabah, state government departments and agencies such as the Town and Regional Planning Department (TRPD), Environmental Protection Department, Sabah Forestry Department, Sabah Economic Planning Unit and the consultants appointed by the TRPD to develop the SSP.

Conservation features

Species and functional diversity of forests are the main features that need to be planned for conservation. SCP for Sabah thus focused on forests and the threatened plant and animal species that inhabit the forests. Data on locations of conservation features and distribution of indicators of opportunity costs were gathered from various sources. WWF-Malaysia proactively forged collaboration with Hutan (which also represented Borneo Futures) with information useful for such planning efforts. WWF also sought inputs for this planning from various conservation experts, NGOs and academic researchers in Sabah.

9). The SSP 2013-2033 was gazetted by the Sabah Government in November 2016

Spatial data gathered for this planning included:

- Extent of forest cover in Sabah;
- Locations of recent deforestation and forest degradation;
- Extent of intact (unlogged) natural forest;
- Historical and current extent of forest types;
- Predicted distribution of orangutan, elephant, and proboscis monkey (post processed to reflect known distribution of these species);
- Potential distribution of four other threatened or endemic species of mammals (Malayan sun bear, Bornean gibbon, banteng, and clouded leopard);
- Hotspots of endemic species in plant families, Dipterocarpaceae, Fagaceae, and Nepenthaceae, as mapped by WWF HoB programme;
- Predicted extent of critically endangered endemic trees;
- Topography and watersheds;
- Distribution of human footprint (impact on the environment) as predicted by the Wildlife Conservation Society and the Columbia University Center for International Earth Science Information Network (CIESIN);
- Aboveground carbon storage as of 2009 as mapped by Woods Hole Research Centre (Baccini et al 2012); and
- Boundaries of protected areas in Sabah and adjoining parts of Sarawak and Kalimantan.

Conservation goals

For each conservation feature, the numerical goal of how much should be identified for protection within Sabah was set based on existing policy commitments of the government (state, national and international) and through stakeholder inputs. The conservation goals were expressed in two ways: for the forest types, goals were expressed as percentage of their historical extent. For plant and animal species they were expressed as a percentage of their predicted extent based on forest cover in 2007. In both cases the percentage captured in the analysis only considered what could be viable habitats (after excluding the severely degraded forests).

For forest types, a goal of 30 percent (of historical extent) was proposed by WWF-Malaysia, which was agreed at the various stakeholder consultation workshops attended by government agencies, business community, NGOs, research organisations and universities. The figure was in line with the state government's policy of keeping under protection 30 percent of land area of Sabah. Mangroves was an exception, for which 75 percent of historic extent was set as the goal, considering the importance of mangroves for protection of shorelines and for being coastal fish and shrimp breeding and nursing grounds. For threatened mammals, a goal of 60 percent of the potential distribution was set as agreed upon in consultation workshops. For the critically endangered plant endemics a goal of 100 percent was set because those species were extremely vulnerable to extinction **(Table 6)**.

To encourage all stakeholders to aim high, the goals set for the conservation features were larger than the actual remaining extent. This indicated an inadequacy in the Protected Area (PA) network of Sabah, in relation to the policy requirements and the stakeholder expectations, and suggested an urgent need for bringing in all remaining extent for the rare and threatened forest types under PA coverage.

Conservation feature	Goals set	Goals met	
		% of historic extent captured	% of remaining extent captured
Bornean orangutan	60%	65%	87%
Asian elephant	60%	69%	93%
Proboscis monkey	60%	73%	99%
Other endangered or endemic animal species	60%	63%	85%
HoB endemic plants	60%	90%	95%
Critically Endangered Endemic Trees	100%	45%	100%
Beach Forest	30%	34%	96%
Mangrove Forest	75%	66%	98%
Lowland Peat Swamp Forest	30%	35%	97%
Lowland Freshwater Swamp Forest	30%	33%	100%
Lowland Seasonal Freshwater Swamp Forest	30%	17%	100%
Lowland Kerangas Forest	30%	7%	100%
Lowland Mixed Dipterocarp & Kerangas Forest	30%	20%	100%
Lowland Mixed Dipterocarp Forest & Limestone vegetation	30%	49%	100%
Lowland Mixed Dipterocarp Forest	30%	23%	100%
Lowland Ultramafic Forest	30%	55%	100%
Upland Peat Swamp Forest	30%	38%	100%
Upland Freshwater Swamp Forest	30%	15%	100%
Upland Kerangas Forest	30%	53%	100%
Upland Mixed Dipterocarp & Kerangas Forest	30%	48%	70%
Upland Mixed Dipterocarp Forest & Limestone vegetation	30%	89%	100%
Upland Mixed Dipterocarp Forest	30%	46%	77%
Upland Ultramafic Forest	30%	88%	100%
Lower Montane Peat Swamp Forest	30%	100%	100%
Lower Montane Kerangas Forest	30%	63%	70%
Lower Montane Ultramafic Forest	30%	98%	100%
Lower Montane Forest	30%	80%	90%
Upper Montane Ultramafic Forest	30%	98%	100%
Upper Montane Forest	30%	93%	100%
Sub Alpine Vegetation	30%	90%	100%

Table 6:
Conservation features and goals, Sabah*

Source: WWF-Malaysia, 2017

Note: *Goal set for the final scenario for each conservation feature and the goals met, in terms of their historic and remaining extent captured by the final Marxan solution. In some cases, the goals met, in terms of historic extent captured, were higher than the goals set. This was caused by three factors: 1. Those habitats that either had less than 30 percent of historical extent remaining or were less than 100,000 hectares in remaining extent were 'locked-in' to the assessment; 2. The existing PAs were 'locked-in' and therefore the existing bias in protected area coverage towards certain forest types was carried forward to the final solution; 3. The process of stratification using river basins to ensure a more widespread coverage of conservation features in each river basin resulted in overall higher representation at the level of Sabah.

Marxan analysis: Marxan analysis for Sabah was run with multiple iterations to get a summed solution of planning units (that meet the optimum goals for Sabah, factoring in cost elements and connectivity characteristics. Sabah was stratified by river basins for the Marxan analysis, to enable a more widespread coverage of conservation features and within which some level of data consistency could be obtained.

Marxan's "lock in" function[10] was used to ensure specific areas were included within Marxan's final output and to ensure that the resulting selection complemented the existing conditions. This included the existing PAs; a buffer strip of 5-km width along the border of Kalimantan's protected areas (as buffers of PAs, as envisioned in the HoB Initiative); and a north-south strip of land in Forest Management Unit 25 as "elephant corridor" under the HoB framework. For the forest types that either had less than 30 percent of historical extent remaining as of 2013, or were less than 100,000 hectares in remaining extent were also "locked in", meaning that the entire extent of such forest types was selected to be part of the output. Lastly, all forest within the Kinabatangan was locked in (this was done as a post-Marxan step).

Three potential scenarios of conservation coverage were analysed **(Table 7)**[11]. The 'minimum' scenario was aligned with the Malaysian government's commitment to United Nations Convention on Biological Diversity (UNCBD) with respect to the Aichi target on PAs; the 'optimum' scenario was aligned with the Sabah government policy of keeping under protection 30 percent of land area of Sabah; and the 'best' scenario aligned with the Malaysian federal government commitment to keep 50 percent of land under forest cover and the Sabah government commitment to keep at least 49 percent of land under permanent forest reserve. Variants of these scenarios, e.g., with or without lock-ins and with or without mammal species layers were analysed additionally.

Characteristics	Minimum (17%) scenario	Optimum (30%) scenario	Best (50%) scenario
Goal for forest types (% of historical extent)	17%	30%	50%
Goal for mangroves	75%	75%	75%
Goal for critically endangered endemic plants	100%	100%	100%
Goal for endangered mammal species	60%	60%	60%
Policy backing	UNCBD Aichi target	Sabah state policy of PA coverage of 30% of land area of Sabah	Malaysian federal government policy of 50% forest cover[12]; Sabah forestry department policy of no nett loss of land under PFR[13] (which in 2013 covered 49% of Sabah).
Policy references	UNCBD website	Sabah Chief Minister's speeches; Sabah Forestry Department press releases	Malaysian Prime Minister's speech at Rio+20 Conference; Sabah Forestry Department annual reports.

Table 7: Characteristics of potential scenarios of conservation coverage analysed in the SCP exercise for Sabah

Source: WWF-Malaysia, 2017

10). Special interest areas can be locked into the portfolio before the algorithm of Marxan is run. In other words, planning units or special interest areas coinciding with current protected areas will be forced to be selected in the Marxan solutions.

11). See Chapter 2 for the need to build different scenarios for Marxan analysis

12). The Malaysian federal government policy applies the UN-FAO definition of "forest" which includes tree plantations. However, for the Sabah SCP exercise the policy was interpreted to mean natural forest cover.

13). Sabah Forestry Department policy of no net loss applies simply to the extent of land administered by the department on Permanent Forest Reserves (PFR). The actual land cover in PFR includes tree and oil palm plantations.

6.3 RESULTS

Output

The main outputs of the SCP exercise for Sabah are:

- A map and associated spatial data of the priority conservation areas;
- An estimate of the goals to be achieved for the various conservation features when the PCAs are protected;
- Location and extent of areas to be advocated for protection; and
- An assessment of rarity and threatened status of the various forest types **(Table 8)**.

Feature Desc	Remaining Extent (Ha)	Historical Extent (Ha)	Percent Remaining	Note
Orangutan	2,340,234	3,148,102	74%	Of known (modeled) habitat, including degraded areas
Elephant	1,050,740	1,420,841	74%	
Proboscis monkey	283,424	386,859	73%	
Other animal species	3,029,187	4,073,991	74%	
HoB endemic plants	287,593	301,811	95%	
Critically Endangered Endemic Trees	71,710	157,700	45%	
Beach Forest	19,451	54,441	36%	Of Historical (modeled) Extent
Mangrove Forest	263,867	390,500	68%	
Lowland Peat Swamp Forest	42,231	118,382	36%	
Lowland Freshwater Swamp Forest	23,625	71,607	33%	
Lowland Seasonal Freshwater Swamp Forest	42,966	256,102	17%	
Lowland Kerangas Forest	1,335	18,227	7%	
Lowland Mixed Dipterocarp & Kerangas Forest	94,365	475,919	20%	
Lowland Mixed Dipterocarp Forest & Limestone vegetation	1,328	2,685	49%	
Lowland Mixed Dipterocarp Forest	613,672	2,708,721	23%	
Lowland Ultramafic Forest	44,665	81,531	55%	
Upland Peat Swamp Forest	145	377	38%	
Upland Freshwater Swamp Forest	787	5,330	15%	
Upland Kerangas Forest	10,023	18,917	53%	
Upland Mixed Dipterocarp & Kerangas Forest	308,890	447,651	69%	
Upland Mixed Dipterocarp Forest & Limestone vegetation	1,329	1,499	89%	
Upland Mixed Dipterocarp Forest	1,268,330	2,128,260	60%	
Upland Ultramafic Forest	83,982	95,175	88%	
Lower Montane Peat Swamp Forest	1,360	1,360	100%	
Lower Montane Kerangas Forest	238,683	263,789	90%	
Lower Montane Ultramafic Forest	16,083	16,466	98%	
Lower Montane Forest	170,000	190,637	89%	
Upper Montane Ultramafic Forest	4,527	4,617	98%	
Upper Montane Forest	3,781	4,081	93%	
Sub Alpine Vegetation	966	1,069	90%	

Table 8: Historical and current extent of conservation features in Sabah

Source: WWF-Malaysia, 2013

The final solution produced by Marxan containing hexagon-shaped planning units[14] was further clipped to the remaining forest extent (as of 2013). To this, the severely degraded forest areas in the lower Kinabatangan were added, to take advantage of the capacity of these areas for supporting long-term conservation after forest restoration and establishment of corridors. This post-processing produced the final PCA map for Sabah (under the 'optimum' scenario; **Figure 7)**.

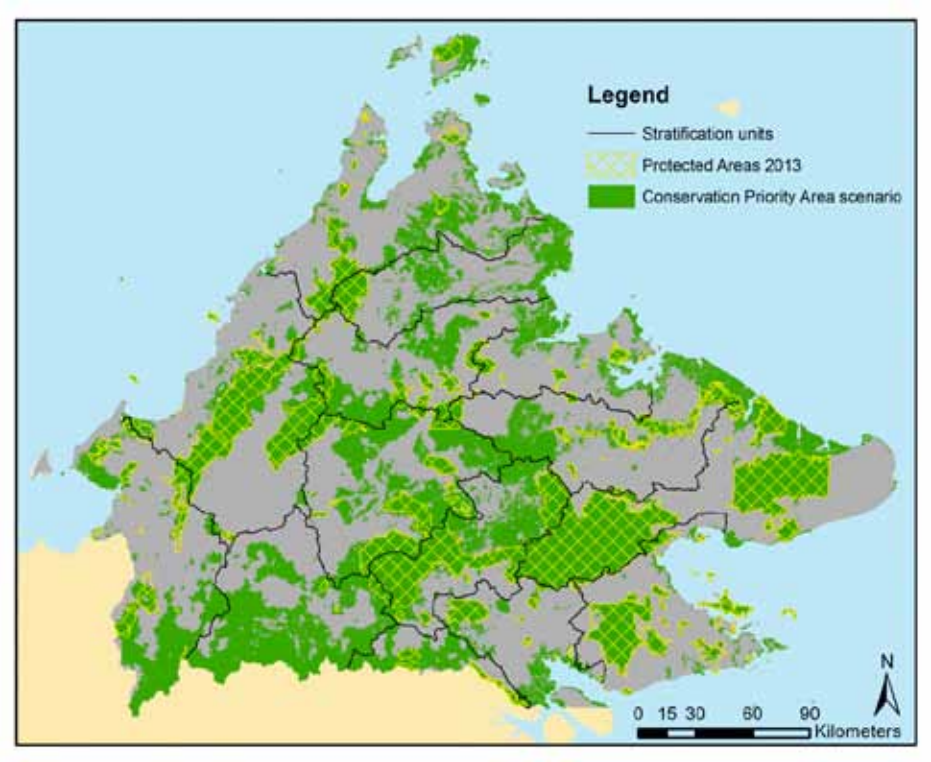

Figure 7:
Final PCA map under the 'optimum' scenario

Source: WWF-Malaysia, 2017

Note: The PCAs are shown in green, the existing protected areas are cross-hatched in yellow and the black lines demarcate the river basins used for stratification in the SCP planning process.

Outcome

The original aim of the SCP exercise in Sabah was that the technical outputs would help achieve certain positive outcomes for conservation. In fact, the SCP was planned and executed fairly rapidly to capitalize on the opportunity to intervene in the Sabah Structure Plan (SSP) 2013-2033 planning process and to produce quick policy outcomes through it. Hence, some of the policy outcomes were achieved immediately following the SCP exercise. These included:

- Incorporation of the PCAs into the Environmental Sensitive Areas (ESA) map of the SSP;
- Proposals for new PAs included in the SSP based on the PCA map (Ulu Padas, Deramakot, etc);
- Policy statements and proposals on conservation included in the environment chapter of the SSP; and
- Influence on WWF's Sabah terrestrial programme planning in 2013, in terms of strategies, etc.

Incorporation of PCAs into the Environmental Sensitive Areas (ESA) map of the SSP: The PCA map generated under the 'optimum' scenario of conservation goals and which is backed by current policy of Sabah Government, has

14). Multi-facetted (edged) planning units (e.g., hexagons) are often more efficient than a square grid in creating reserves with low edge to area ratios (Source: Ardron, et al., 2010)).

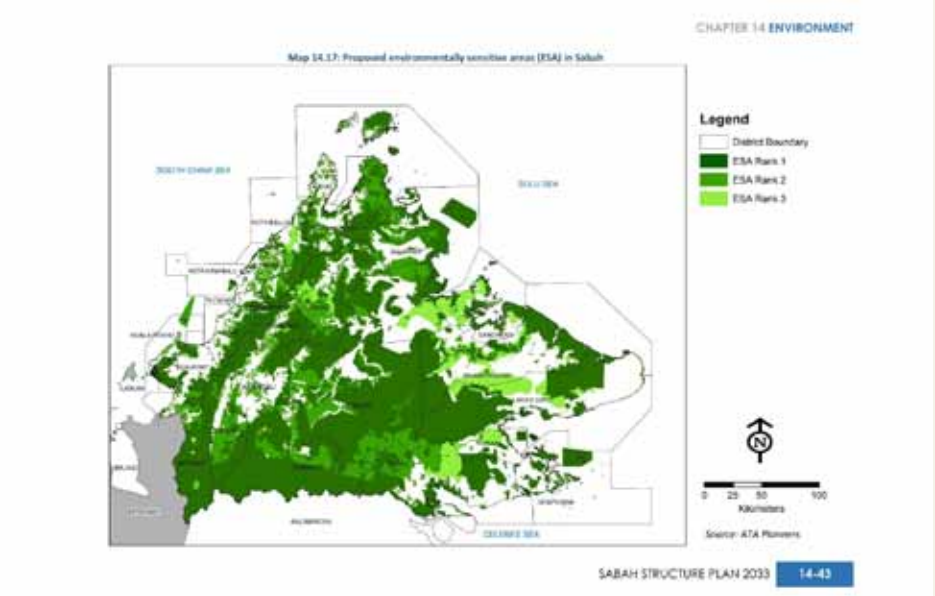

Figure 8:
The map of environmental sensitive areas (ESA)

Source: Sabah Government, 2016

been incorporated into the ESA map of the SSP **(Figure 8)**. The PCAs have been included under Rank 1 areas of ESA and this would mean restrictions on conversion of natural forest within the areas identified as PCAs. This is a very significant policy outcome of the SCP exercise.

Proposals for new PAs made in the SSP based on the PCA map: The SSP proposed some forest areas to be made into new PAs. These proposed PAs were identified based on the PCA map **(Figure 9)**. The areas included are Ulu Padas–Sapulut forest areas; Deramakot forest area; Ulu Telupid-Trusmadi forest area and Ulu Kota Marudu forest area. These areas were proposed as a priority for their relative intactness, large patch sizes, threatened status of the forest types contained therein, and to achieve geographical representation and PA connectivity. This is again a significant policy outcome but substantial advocacy effort is needed before this policy can be turned into conservation actions.

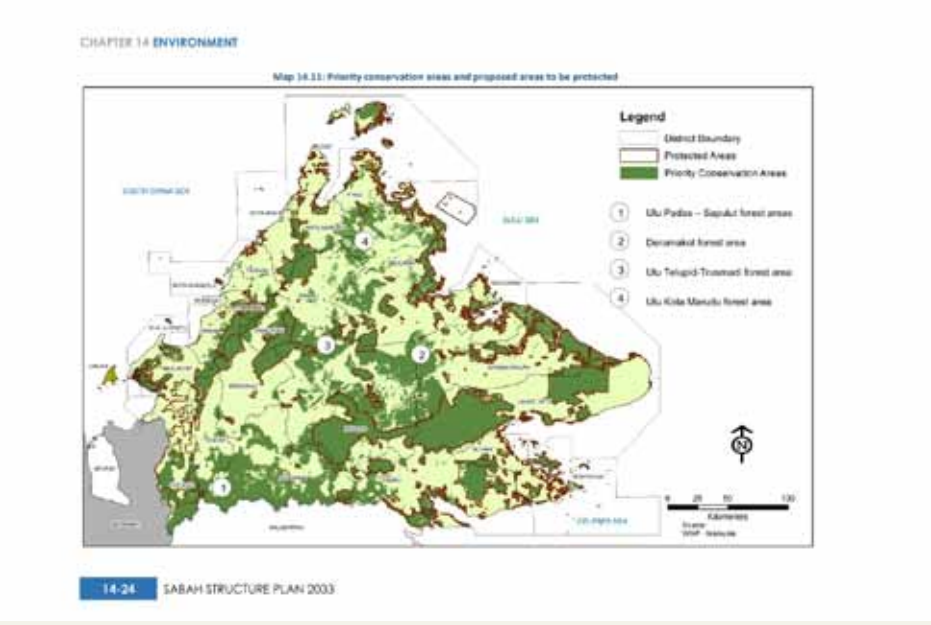

Figure 9:
The map of PCAs and areas proposed as PAs

Source: Sabah Government, 2016

Note: The numbers placed on the map to identify locations of the proposed PAs and the names given to the proposed areas are incorrect in this map, probably due to map publication error.

Policy statements and proposals on conservation included in the environment chapter of the SSP: Several policy statements and proposals on conservation have been included in the environment chapter of the SSP. This section was strengthened by WWF Malaysia by way of specific inputs on suitable policies, provided based on latest knowledge and experience in the practice of conservation. This intervention was possible as a result of the SCP exercise and the consequent partnership established with the Town and Regional Planning Department and its consultants who prepared the SSP. The policy statements and proposals thus strengthened in the SSP included:

a. Management prescriptions for the areas designated as ESA ranks 1 to 3 **(Table 9)**;
b. Retention and strengthening of the PA network;
c. Restrictions on plantations in protection forest reserves;
d. Keeping the High Conservation Value (HCV) and High Carbon Stock (HCS) areas in production forest reserves under protection;
e. Maintaining wide buffer zones around PAs;
f. Maintaining natural forest cover;
g. Protecting remaining large blocks of forests;
h. Establishing connectivity among protected areas and small fragments of forests;
i. Limiting extent of plantations in permanent forest reserve; and
j. Applying the proposed policy of no net loss of biodiversity during conversion of natural forest to plantations.

Rank	ESA	Management Criteria
ESA Rank 1	• Existing and future Protected Areas (PA) • Priority Conservation Area (PCA) • Catchment area of existing and proposed dams • Water protection areas • Development Prohibited Zone under SMP • Gazette Cultural, Historical and Archaeological Sites • Geological Features and Sensitive Areas	• No development, agriculture, tree plantations or logging shall be permitted except for eco-tourism, research and education • For areas within Class II Forest Reserve, no conversion of natural forest shall be permitted • Restoration of natural forest however is permitted
ESA Rank 2	• All other forests and wetlands outside of PA and PCA • Marine Conservation Areas • Development Restricted Zone under SMP	• No development • Sustainable logging, credibility certified plantation adhering to sustainability standards, agriculture within Malaysian Agriculture Practices (MyGAP) and low impact nature tourism may be permitted subject to local constraints. • No nett loss of biodiversity in forest conversion landscapes.
ESA Rank 3	• Problematic Rock Formation • Water Conservation Areas • Catchment area of new water intake • Areas above 1,000 meters AMSL • K-Col area	• Resticted Development. • Sustainable logging, credibility certified plantation adhering to sustainability standards, agriculture within Malaysian Agriculture Practices (MyGAP) • Controlled industrial development whereby the type and intensity of the development shall be strictly controlled depending on the nature of the constraints.

Table 9: The land types included in the three different ranks of ESA and the management prescriptions for each ESA rank

Source: Sabah Government, 2016

Influence of SCP on WWF's Sabah terrestrial programme planning in 2013: A non-public policy outcome, nevertheless of significance to WWF is the influence the SCP exercise and its outputs like the PCA map had on WWF's Sabah terrestrial programme planning in 2013. The influence was in the form of new conservation targets, goals, strategies, priority actions and geographical focus areas that were included during the programme planning. For example, one of the goals was on achieving total protection from conversion for the threatened forest type identified in the SCP, the lowland *Dipterocarp* forest. A new strategy was included to focus on identifying and establishing new PAs[15]. Yet another strategy focused on identifying PCAs and other areas to conserve at a fine scale and incorporating them in district and local plans following from the SSP. Monitoring potential/planned loss of PCAs through analysing EIA reports and making interventions to prevent the loss became a priority action. Lastly, Forest Management Unit 5, located on eastern part of the Trusmadi mountain range and the Sugut river basin in northern Sabah were included among geographical areas of focus for the programme.

Avoided loss of PCA in a planned oil palm plantation in Kalabakan Forest Reserve: Probably the only example where an area identified as PCA in the SCP exercise then turned into a conservation action by WWF was the case of avoided deforestation of PCA in the Benta Wawasan area. About 5,000 ha of PCA was advocated by WWF to be set aside in the area licensed for oil palm plantation development to Benta Wawasan (Ratus Awansari) in Kalabakan Forest Reserve. Seeing the ecological importance of the area and realizing that there were options to grow oil palm elsewhere (as presented in the PCA map), the Sabah Forestry Department consequently agreed to set aside the area as HCV and disallow planting of oil palm in that PCA.

There were other areas where PCAs were threatened with loss due to plantation development and on which engagement was initiated by WWF (e.g. the Asian Forestry Corporation area in Kota Marudu), but these have not resulted in a positive outcome so far.

6.4 LIMITATIONS AND CHALLENGES

A lot of the spatial data needed for the SCP exercise, including basic data such as extent of forest cover, locations of recent forest loss, were not readily available within WWF and needed to be built newly or sourced from others. Such data are essential to be gathered or kept updated by WWF as a repository of knowledge on conservation and to enable informed decision making.

15). The eventual delay in approval and gazettement of the SSP (which happened only in November 2016) impeded the possibility of taking full advantage of the PCA and PA proposals in the SSP, for advocating for new PAs during the first two years of WWF's Sabah terrestrial programme implementation. There were substantial areas advocated by WWF and became established as PAs between 2013 and 2015, but they were due to justification provided by data on orangutan occurrences and elephant movements, or because the areas served as buffer for PAs

CHAPTER 7:
IMPLEMENTING SYSTEMATIC CONSERVATION PLANNING IN SARAWAK

7.0 BACKGROUND

In Sarawak, biodiversity and environment conservation initiatives are implemented under different policy and legislative frameworks. Under the Wild Life Protection Ordinance (1998), National Parks and Nature Reserves Ordinance (1998), and Forest Ordinance (1958), Forest Department Sarawak undertakes to create and manage wildlife sanctuaries, protected areas and permanent forest estates. Under the Sarawak Water Ordinance 1994, the Water Resources Council of Sarawak identifies, gazettes and protects important water catchments, while the Sarawak Integrated Water Resources Management initiative of the State Planning Unit undertakes integration and sustainable management of water resources. Such initiatives have direct and indirect impact on land use and use of natural resources.

The existence of such comprehensive legislative frameworks, however, does not ensure adequate protection and conservation of biodiversity. Biodiversity loss is uneven across the state with certain vegetation types receiving less protection than others. Also, the current extent of protected areas is relatively small in size, most of them existing in isolation and surrounded by other land uses. The consequence is limitation of the movements and habitat range of wildlife.

WWF-Malaysia sees the need to support the implementation of a holistic and integrated approach towards conservation and sustainable development amidst a fast-changing socio-economic landscape. It would also like to support the State Government in minimizing potential conflicts in land use strategies with the view of optimizing conservation needs and efforts.

In this light, WWF-Malaysia adopted the SCP approach under its Sarawak Conservation Programme in 2013.

7.1 OBJECTIVE

The objective of the SCP exercise is to support the Sarawak State Government's conservation agenda and its goal to achieve one million hectares of Totally Protected Areas (TPAs) and six million hectares of perpetual forest cover under Permanent Forest Estates (PFEs)[16].

The SCP exercise attempts to establish sufficient baseline data to support gazettement of TPAs. It also endeavours to come out with scientifically sound recommendations for creating a network of protected areas and sustainably managed landscapes across Sarawak. As much as possible, these areas should also link up with adjacent priority conservation areas within the Heart of Borneo landscape to form part of a vibrant ecological landscape across Borneo.

To this end, the SCP exercise places strong emphasis on:

- Demonstrating the benefits of applying systematic conservation planning to produce information to guide more informed decision making for conservation, natural resources management and development planning; and

16). Forest land is Sarawak is classified as the Permanent Forest Estate (Forest Reserves, Protected Forests and Communal Forests), Totally Protected Areas (National Parks, Wildlife Sanctuaries and Nature Reserves) and Stateland Forest (source: http://www.forestry.sarawak.gov.my/).

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- Transferring of knowledge and skills on the application of systematic conservation planning to government agencies.

7.2 METHODOLOGY AND PROCESS

WWF-Malaysia adopted a participatory approach towards developing and executing the SCP, involving the relevant public agencies, private enterprises, academia and NGOs. Overall, the activities conducted under the SCP exercise represent a combination of awareness and capacity building activities on SCP, and multi-stakeholder consultations to develop conservation features and criteria to identify PCAs, sharing of baseline data, etc. Marxan was used as a decision support tool. ArcGIS and Excel software were used to complement Marxan. A consultant was hired to support the Marxan analysis in 2015.

To begin the SCP exercise, an introductory workshop on the SCP concept by WWF-Brazil was held in September 2013. This was followed a year later by the development of Ecological Risk Index with technical experts from WWF-Malaysia, WWF-Brazil and the Institute of Biodiversity and Environmental Conservation (IBEC) of Universiti Malaysia Sarawak (UNIMAS) A month later, in October 2014, the Technical Configurations Expertise Workshop which served as a technical review session of the SCP in Sarawak was held. After that, in January 2015, the Capacity Building Workshop for Assessment of Terrestrial and Freshwater PCAs was held with participation from government agencies, universities, NGOs and industry.

Over two years from September 2013 to June 2015 period, the technical experts identified and agreed on a total of 52 terrestrial and freshwater conservation features to identify the PCAs. **Table 10** shows 30 features in addition to baseline data; cost layers in the form of ecological risk index; opportunity layers; and other key criteria.

The initial planning units were based on watersheds, deriving the boundaries of smaller sub-watershed units from HydroSHEDs. However, having discovered the disparity between the size of the planning units and conservation feature areas, modifications were done in 2015 to apply uniform sized hexagon planning units instead.

Terrestrial conservation features	Freshwater conservation features
1. Lowland, hill and submontane mixed dipterocarp 2. Montane forest 3. Kerangas (Tropical heath) 4. Mangrove 5. Peatswamp 6. Riverine forest 7. Bay cat *(Catopuma badia)* 8. Flying fox *(Pteropus vampyrus)* 9. Hose civet *(Diplogale hosei)* 10. Orangutan *(Pongo pygmaeus)* 11. Proboscis monkey *(Nasalis larvatus)* 12. Red banded langur *(Presbytis melalophos cruciger)* 13. Rafflesia *(R. hasseltii, R. tuan-mudae, R. pricei)* 14. Ramin *(Gonystylus spp.)* 15. Keruing paya *(Dipterocarpus coriaceaus)* 16. Legumes & Liana 17. Engkabang bindang *(Shorea praestans)* 18. Geoheritage sites 19. Mud volcano 20. Limestone 21. Salt springs 22. Bornean Endemics	1. Lowland rivers 2. Upland rivers 3. Highland rivers 4. Montane rivers 5. Forest crabs *(Ibanum pilimanus)* 6. Forest crab *(Thelphusa cristicervix)* 7. Forest crab *(Isalopatamon baunse)* 8. Forest crab *(Lepidothelphusa cogneti)* 9. Forest crab *(Stygothelphusa bidiensis)* 10. Forest crab *(Terrathelphusa kuchingensis)* 11. Forest crab *(Stygothelphusa antu)* 12. Irrawaddy dolphin *(Orcaella brevirostris)* 13. Asian Arowana *(Scleropages formosus)* 14. False gharial *(Tomistoma schlegelii)* 15. Sarawak native catfish *(Claarias spp.)* 16. Freshwater prawn *(Macrobrachium osenbergii)* 17. Labang *(Pangasius nasutus)* 18. Mahseers - Empurau *(Tor tambroides)* & Semah *(Tor duoronensis)* 19. Giant freshwater catfish *(Wallago leerii)* 20. Gastromyzon spp. 21. Terubok *(Tenualosa toli)* 22. Seluang *(Rasbora spp.)* 23. Bubuk *(Acetes spp.)* 24. Mangrove crab *(Scylla spp.)* 25. Baram oxbow lakes 26. Gazetted water catchments 27. Water intake points 28. Gravity feed dam areas 29. Microhydro dam areas 30. Tagang system areas

Table 10:
Conservation features
Source: WWF-Malaysia, 2016

In addition to the extensive list of conservation features, the following criteria were used to identify PCAs:

- State land use policy - the government's policy to have one million hectares of TPAs and six million hectares of permanent forested area, also termed as Permanent Forest Estates (PFE)[17]. High conservation value (HCV) areas within the PFEs were treated as conservation opportunities. These areas were expected to be set aside for conservation under Sustainable Forest Management for forest management certification and implementation of the Wildlife Master Plan for Sarawak;
- Species and ecosystems conservation priorities and representativeness - the aim was to efficiently conserve as many conservation features where possible to maximise the conservation values and to capture as much as possible the representation of Sarawak's biodiversity within the selected areas for conservation. A 100 percent goal was set for conservation features which are very limited in distribution, endemic to Sarawak, highly threatened and at high risk of being lost, and therefore needing special attention for protection;

17). The Forests Ordinance cap 126 of Sarawak provides for the establishment of three categories of permanent forests: (a) Forest Reserves, which will normally be a productive forest destined to be the principal permanent source of the state's supply of timber; (b) Protected Forests, which permits the people of Sarawak to take forest produce for their own domestic use, to hunt and to fish, and to pasture cattle; and (c) Communal Forests, which constitute only where it is clearly the desire of a settled community to set aside a convenient area of woodland to provide the domestic needs of forest produce (source: http://www.forestry.sarawak.gov.my)

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- Important ecosystem services, which includes the State's emphasis to protect and manage important water resource areas as stated in the Sarawak Integrated Water Resources Management Master Plan Study Report (2009);
- Existing and proposed Totally Protected Areas – new PCAs must meet the conservation features set under the SCP and complement the features already conserved within the existing totally protected areas (national parks, nature reserves and wildlife sanctuaries);
- Conservation goal for each of the conservation feature which is expressed in the form of a target percentage; and
- Opportunities within non-productive land area or with legal limitations to land use – this may include areas where there are legal limitations to productive activities, e.g. buffer of 1-km from international boundaries, Class IV terrain (comprising steep mountainous country, and an area in which more than half of it contains continuous slopes with gradients in excess of 35 degrees) and 8-km radius of water intake points.

Several scenarios of PCAs were examined using various goal configurations, clustering tolerances and other settings in Marxan. Additionally, existing and proposed conservation management status was considered and assessed as part of the process. These scenarios were: a) baseline; b) TPAs locked-in, high vegetation goals; c) TPAs and gazetted water catchments locked-in, high vegetation goals; d) TPAs locked-in, low vegetation goals; e) TPAs and gazetted water catchments locked-in, low vegetation goals.

Subsequently, with input from experts and stakeholders and based on the latest available data, the main design aspects and parameters of the SCP were updated and further refined. To provide a more feasible and practical output that would align with the government's land use policies, PCAs were first identified within opportunity areas and then outside of the opportunity areas to make up the desired conservation goals during the MARXAN runs.

The first draft map of Priority Conservation Areas for Sarawak was ready in July 2015. The results were presented first to the Ministry of Urban Development and Natural Resources (MUDNR, formerly known as Ministry of Resource Planning and Environment (MRPE)[18] on 29 September 2015 and then to various heads of departments on 6 October 2015. On the same date, a stakeholder consultation workshop on the Case Study on Batang Lupar which was jointly organised by IBEC, UNIMAS, Forest Department Sarawak and WWF-Malaysia.

A Technical Working Committee on Systematic Conservation Planning for Sarawak was formed under the purview of the MUDNR and chaired by the Forest Department Sarawak in November 2015. It consists of representatives from the following agencies/organisations.

1. Ministry of Urban Development and Natural Resource
2. Ministry of Modernisation of Agriculture and Rural Economy
3. State Planning Unit
4. Forest Department Sarawak
5. Sarawak Forestry Corporation
6. Department of Agriculture
7. Sarawak Biodiversity Centre
8. Mineral and Geoscience Department Sarawak
9. Natural Resources and Environment Board Sarawak
10. Public Works Department
11. Universiti of Malaysia Sarawak (UNIMAS)
12. Wildlife Conservation Society
13. WWF–Malaysia

The terms of reference of the Committee are, as below:

- Prepare a strategy document for conservation planning in Sarawak using the SCP approach;
- Develop and refine the PCA map for Sarawak to make it comprehensive, practical and relevant for its application and use in decision making;
- Provide technical inputs towards the preparation and finalization of the PCA map;
- Liaise among members to update the PCA map, through feedbacks and data sharing;
- Identify applications of PCA map in land use planning and management; and
- Provide timely advice for the Government of Sarawak, through the Ministry of Urban Development and Natural Resource, on SCP matters.

During the period June-July 2016, the PCA Map Version 1 was developed and shared with stakeholders, and post-Marxan analyses were carried out.

To facilitate practical steps to implement the PCA, during the period July-October 2016, the Technical Working Committee developed an Implementation Guide for Systematic Conservation Planning in Sarawak.

18). The ministry has been renamed Ministry of Urban Development and Natural Resource in the reshuffling exercise in March 2017

7.3 RESULTS

Output

The SCP exercise has identified a total of 3.86 million hectares as PCA, constituting 31 percent of Sarawak's total land area **(Figure 10)**. This is in addition to the existing 0.76 million hectares of terrestrial TPAs. The combined area of the PCA and TPAs is therefore 4.62 million hectares, representing 37 percent of Sarawak's total land area. The PCAs were configured in such a way that they complement with and improve connectivity between the existing TPAs. Accordingly, WWF-Malaysia recommended the State Government to give priority to the PCAs in its effort to identify future areas as totally protected area.

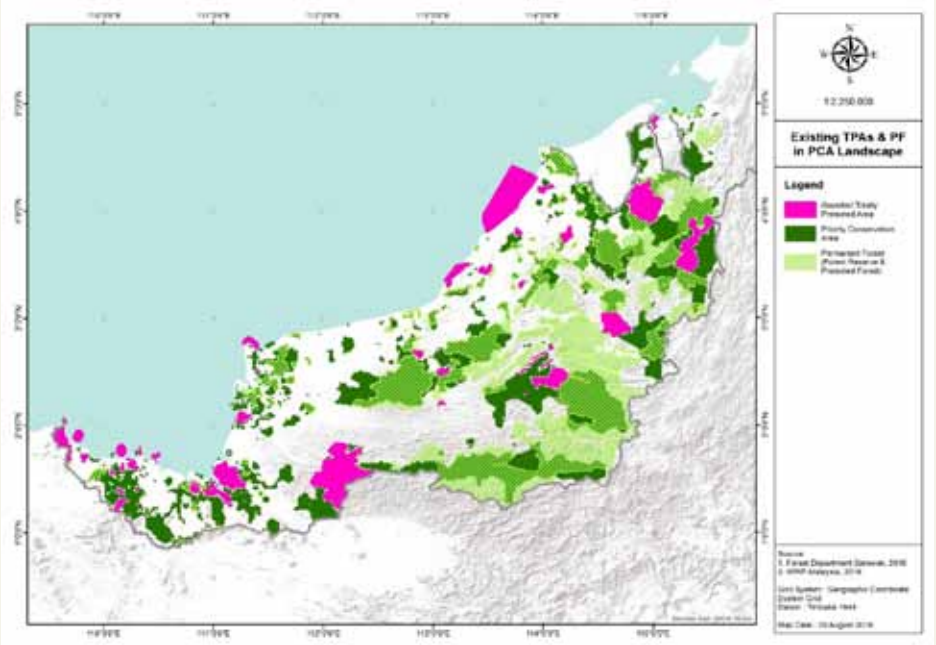

Figure 10:
PCA map of Sarawak
Source: WWF-Malaysia, 2017

Outcome

As the process of getting the government to formally adopt the PCA map is still ongoing, it may be too early to evaluate the policy outcome of the SCP exercise.

Nevertheless, since the SCP exercise started in September 2013, there has been significant progress made in terms of getting the state government's interest and commitment in the exercise. One of the key milestones was the formalization of the state government's commitment in the SCP exercise through the signing of a Memorandum of Understanding (MoU) between the Forest Department and WWF-Malaysia in November 2015. The MoU covered documentation work for the gazettement of new areas as TPA and specifically called for developing a PCA map for Sarawak where future TPAs and conservation areas may be identified though SCP approach. The MoU underscored the state's conservation goals and objectives, i.e., to strengthen environmental protection and management in PCAs, promote protection of ecosystems, and facilitate greater integration of biodiversity and ecosystem services conservation into development planning for sustainable development.

The formation of the Technical Working Committee on Systematic Conservation Planning for Sarawak consisting of various agencies under the then MRPE and chaired by the Director of Forest Department is also a milestone. The setting up of this formal committee underscores the State's ownership of the SCP exercise and

its willingness to participate in the process of the PCA mapping for Sarawak. It enables the SCP process to be officially a part of Sarawak State's process rather than a standalone process by WWF. This arrangement helps to facilitate the adoption process of the PCA map by the State Government.

Through the SCP exercise, the stakeholders have become more knowledgeable about the current state of the environment in Sarawak. Guided by the PCA map, they now know the areas where conservation should be prioritized. This includes potential areas to be gazetted as totally protected areas in line with the state's target of one million hectares of TPAs and six million hectares of perpetual forest cover under Permanent Forest Estates.

Through the SCP process, public agencies in Sarawak have become more open to sharing spatial data with WWF-Malaysia. WWF-Malaysia has also forged healthy working relationships with logging companies (e.g., Ta Ann Group) through the process.

Having collaborated with the SCP experts of WWF-Brazil and UNIMAS, and interacted with their counterparts in Kalimantan and Sabah, WWF-Malaysia's staff members in Sarawak have become more confident and stronger technically in moving forward the SCP agenda.

7.4 LIMITATIONS AND CHALLENGES

Due to the lack of biodiversity data and land status information, the PCAs identified are by no means exhaustive or definitive.

- Some totally protected species under the Wild Life Protection Ordinance of Sarawak 1998 and species that are listed as Endangered/Critically Endangered in the IUCN Red List are excluded, as spatial distribution data is limited due to lack of systematic collection. The species excluded are Sunda clouded leopard, various species of hornbills and many riverine fish species of important value in Sarawak;
- Native Customary Rights lands and Community land use are not included. This is because land status information is not widely available. The delineation exercise to map out all Native Customary Rights lands in Sarawak is still ongoing. This implies that the PCAs identified could be located within alienated, State or community lands;
- The running of the SCP exercise is hampered and the quality of its output is affected due to the lack of willingness by some government agencies to share classified information.

CHAPTER 8:
CONCLUSION - LESSONS LEARNED AND RECOMMENDATIONS

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With the exception of Sabah, systematic conservation planning was first undertaken by WWF without any official request or mandate from the governments. It is with conviction and perseverance that WWF took a proactive approach to introduce SCP to the governments, with the result that as in Sarawak, the state government has taken active role in facilitating the process of SCP.

"...THE CHALLENGE NOW IS TO CONVINCE THE RESPECTIVE GOVERNMENTS TO ADOPT THE MAPS AND THE IDENTIFIED PCAS AS PART OF OFFICIAL SPATIAL AND DEVELOPMENT PLANS"

With different level of engagement and active participation of the governments, WWF went through an important iterative learning process in moving forward its SCP initiative. Over time, the initiative has evolved: in scope by including more detail and features; in method by promoting more participatory decision-making; and being more focused towards clear policy objectives or implementation outcomes.

There was a clear progression both in terms of depth and scope of WWF's involvement in developing SCP capacity. This iterative building of capacity took place internally within WWF and across the range of institutions involved.

As the process of SCP enters into the conclusion phases in several Kalimantan provinces and in Sabah and Sarawak, the challenge now is to convince the respective governments to adopt the maps and the identified PCAs as part of official spatial and development plans. With that, there is also a need to translate the SCP outputs into conservation actions on the ground.

There are many valuable lessons that WWF could learn from its SCP experience in Borneo. It is time to take stock and to learn how to become more effective in advocating for the acceptance of the PCA maps. While WWF's inputs in the SCP process are well-defined, there is a lack of clarity as to what the overall actual results would be. In Sarawak and Sabah the results can be seen in the draft spatial plans. In the Kalimantan provinces, it remains largely unclear if WWF inputs are or will be reflected in the spatial plans. The following section outlines the lessons learned and makes recommendations on the way forward.

LESSONS LEARNED AND RECOMMENDATIONS

Data and maps of environmental/conservation features are essential to produce maps of higher level accuracy:

Much spatial data needed for the SCP exercise such as extent of forest cover and locations of recent forest loss were not readily available within WWF and had to be built newly or sourced from others. Such data is essential to be gathered or kept updated by WWF as a repository of knowledge for conservation and to enable informed decision making.

The need to mainstream climate change in SCP:

the SCP exercises conducted by WWF in Borneo have not explicitly dealt with the effects of climate change. There is a need to incorporate climate change into conservation plans to improve the chances that these plans and priorities will remain effective as climate changes. To this end, the SCP process must mainstream approaches to: (a) conserve the geophysical stage; (b) protect climatic refugia; (c) enhance regional connectivity; (d) sustain ecosystem process and function; and (e) capitalize on conservation opportunities emerging in response to climate change (e.g., REDD) (Craig, et al., 2012). Monitoring and analysis of data and changes to confirm or modify existing climate models are needed.

Proactive engagement with the state authority is crucial:

Proactive engagement with agencies responsible for landuse policy is crucial, as demonstrated in both the Sabah and Sarawak cases. Once the agencies understand the process and appreciate the amount of effort and categories of data needed for effective conservation and land use planning, they would endorse the role of WWF in facilitating SCP to ensure the delivery of the common objectives. This proactive engagement underlined by a scientifically sound approach helps gain acceptance in an otherwise planning process that is largely political and socio-economically driven. For that reason, SCP outputs have been included in the Sabah Structure Plan (SSP) 2013-2033 that was driven by the Town and Country Planning Department and which therefore enabled conservation to be mainstreamed into state landuse policy. Conversely, involvement after the fact, i.e., reactive engagement, would unlikely to have produced a similar result at the policy level.

Invest in educational materials on how to apply PCA maps:

Not all public agencies and private sector players are familiar with SCP and know how to use its outputs. It helps to have a user-friendly implementation guide that introduces SCP and how to apply PCA maps within a prevailing policy, regulatory and institutional environment. The Implementation Guide for Systematic Conservation Planning in Sarawak (2016) developed by the Technical Working Committee of the SCP in Sarawak is a best practice that is worth emulating. Trainings should be provided by WWF and its partners on how to use such guide. Such guide can also serve as a useful in-house reference document or educational material to enhance intra- and inter-programmatic collaboration, thereby integrating SCP approach into other WWF conservation strategies. Consider the units/departments and their role in spatial planning so they have materials they can use matching their roles etc.

Follow-up advocacy is key:

Adoption of a policy does not necessarily mean its implementation. This is particularly the case for the non-conventional environmental policies. Inclusion of SCP outputs in a provincial or district spatial plan, such as a PCA map or management prescriptions of environmental sensitive areas may remain ignored by the various departments responsible for development plans. Therefore, knowing who in the governments are agents of change coupled with a persistent follow-up advocacy is crucial for producing real conservation impacts. There are many examples where such policies have remained simply 'on paper'. The outcomes and success of the SCP exercise can become meaningless if environmental NGOs such as WWF do not follow up and turn the policies into specific conservation actions or get them incorporated into development plans by the respective government agencies and private sector.

Useful to develop an implementation style follow-up project:

One of the ways of turning policies resulting from a SCP exercise into conservation actions is to develop a follow-up implementation style project. For instance, the PCA component can be turned into a PA network project to be implemented by WWF in partnership with relevant departments managing land and with funding support from Global Environment Facility and United Nations Development Programme. The HoB Corridor Project Implementation that emphasizes landscape level conservation could provide the specific localities to undertake on-the-ground SCP project.

Ensure there is enough technical and financial resources to turn SCP output into actual outcome:

The experiences of the SCP exercise in Kalimantan and Sarawak have shown that it is not uncommon to take up to two to three years to produce a final PCA map. And the map may not be exhaustive or definitive and are subjected to rounds of revision based on latest available data. It is therefore important for WWF to take a longer term (e.g., five to six years) perspective when comes to funding a SCP programme to ensure there is secured financial resources to sustain a full cycle of SCP. This includes allocation of fund for the development and implementation of follow-up projects and activities that aim to translate SCP output into actual outcome. In Malaysia, WWF should work with the Forest Departments in Sabah and Sarawak and the Ministry of Natural Resources and the Environment to develop a medium length SCP programme under the Five Year Malaysia Plan. WWF must continue to enhance its capacity to incorporate climate change in SCP including capacity to apply the relevant tools and latest models on climate change.

Put in place a robust monitoring and evaluation system:

It is difficult to measure how much of the positive changes at the policy and ground levels is due to the SCP exercises, as this study has experienced. WWF must put in place a robust monitoring and evaluation system of its SCP interventions with clearly defined result chains linking SCP outputs to outcomes and goals. Due consideration must also be given to developing database useful for checking or reviewing climate models. This is crucial for WWF to consolidate source of information to showcase its SCP progress, build on its SCP expertise and knowledge, and generate data that form a sound basis for it to influence policy.

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Website:
http://wwf.panda.org/
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BORNEO FOREST FACTS

PAPER FROM RESPONSIBLE SOURCES

3rd LARGEST

Borneo is the third largest island on the planet.

FORESTS LOSS

About half of Borneo's natural forests have been lost and losses continue at a rapid pace.

850,000

Between 1985 and 2005 Borneo lost an average of 850,000 hectares of forest every year. If this trend continues, forest cover will drop to less than a third by 2020.

75.5 MILLION

East Kalimantan alone is believed to lose over €75.5 million a year in business tax revenue due to illegal logging and illegal timber processing.

WWF

Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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WWF · THE SPATIAL PLANNING EXPERIENCES IN BORNEO

HoB

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