Forest landscape restoration for Asia-Pacific forests
Experiences, lessons and future directions for forest landscape restoration in Indonesia

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1. Introduction

Indonesia has had considerable experience in implementing more than 150 projects, in more than 400 locations, on forest rehabilitation and mining reclamation in the past four decades (Nawir et al. 2007a). However, forest landscape restoration (FLR), implemented over the past four or five years, is considered a recent initiative. The IUCN, ITTO and Tropenbos International Indonesia Programme (TBI Indonesia) led the initiative in voluntarily developing Principles and Guidelines on Landscape Restoration for Indonesia by involving different stakeholder groups, such as the government, private companies and international organizations as part of the Working Group on FLR (National GPFLR 2009).

In facilitating Indonesia as it moves forward in the direction of FLR, this paper summarizes the main issues that are useful as a basis for designing future scenarios from past and current experiences gained from implementing various forest rehabilitation projects.

The paper takes into account extensive studies and experiences of the Center for International Forestry Research (CIFOR), TBI Indonesia, WWF Indonesia and the local government of Sumbawa District. It relies strongly on the CIFOR study in Indonesia on ‘Review of Forest Rehabilitation – Lessons from the Past’ implemented in collaboration with the Forestry Research and Development Agency, Ministry of Forestry (Nawir et al. 2007a). TBI Indonesia has experience in facilitating the Working Group on FLR, as well as the promotion and establishment of nine learning sites uploaded to the Global Partnership on Forest Landscape Restoration website as part of FLR implementation projects. Lastly, WWF Indonesia and the local government of Sumbawa District have been involved in implementing FLR through the forest management unit (FMU) or Kesatuan Pengelolaan Hutan (KPH) and this is presented in this paper as one of the case studies.
2. Historical overview of forest and land degradation and current status

Indonesia’s total terrestrial area covers 193 million ha including 130.7 million ha of state forest land and 5.5 million ha of marine national parks under management of the Ministry of Forestry; the remaining terrestrial areas are not forested (MoF 2012). The state forest area is administered and managed by the Ministry of Forestry, while the area classified as non-state forest area is administered and managed by the National Land Agency. The state forest area is estimated to be almost 68 percent of the terrestrial land mass; land allocated for non-forest purposes constitutes 32 percent.

As an archipelagic country with more than 13,466 islands (Susanto 2013), population and forest cover are unevenly distributed. Two-thirds of the estimated 240 million people (2013) live on the fertile island of Java with only 2.3 percent of primary forest land cover remaining; the rest of the population is distributed among many other islands across the archipelago that have higher forest cover (BPS 2013).

Assuming that 46.3 percent of the population lives in rural areas and directly engages with forests, the average ratio of forest area per capita is only 1.2 ha (Table 1). The assumption is that all 130 million ha of forest are distributed among the rural population.

Table 1. Population and population density in Indonesia in 2010

<table>
<thead>
<tr>
<th>Island</th>
<th>Total area (km²)</th>
<th>Population</th>
<th>Density (people/km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumatra</td>
<td>482 393</td>
<td>46 136 521</td>
<td>96</td>
</tr>
<tr>
<td>Java</td>
<td>127 499</td>
<td>136 610 590</td>
<td>1 071</td>
</tr>
<tr>
<td>Kalimantan</td>
<td>547 891</td>
<td>9 391 848</td>
<td>17</td>
</tr>
<tr>
<td>Sulawesi</td>
<td>191 800</td>
<td>17 371 782</td>
<td>91</td>
</tr>
<tr>
<td>Papua</td>
<td>421 981</td>
<td>3 593 803</td>
<td>9</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1 937 179</td>
<td>237 641 326</td>
<td>123</td>
</tr>
</tbody>
</table>


The 130.7 million ha of state forest is classified based on its functions as conservation forest (20.52 percent), protection forest (24 percent), production forest and limited production forest (18.72 percent), permanent production forest (24.95 percent) and convertible production forest (13.73 percent) (Table 2). As open access areas increased, they were subject to encroachment and subsequently degraded. Highly degraded forests are caused by uncertainty of tenure, lack of ownership and/or management. The decline in forest concessions has resulted in the absence of forest management at the site level. Consequently, with no protection and site management, the forests are encroached and illegal activities have further degraded the forests left by the concessionaires.

Table 2. Forest distribution by function

<table>
<thead>
<tr>
<th>Forest function</th>
<th>Area (000 ha)</th>
<th>Percentage of the total forest area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation forest</td>
<td>26 820</td>
<td>20.52</td>
</tr>
<tr>
<td>Protection forest</td>
<td>28 860</td>
<td>22.08</td>
</tr>
<tr>
<td>Limited production forest</td>
<td>24 460</td>
<td>18.72</td>
</tr>
<tr>
<td>Production forest</td>
<td>32 600</td>
<td>24.95</td>
</tr>
<tr>
<td>Convertible production forest</td>
<td>17 940</td>
<td>13.73</td>
</tr>
<tr>
<td>Total forest area</td>
<td>130 680</td>
<td>100.00</td>
</tr>
</tbody>
</table>


State forest management rights are unevenly distributed between corporate and community allocations. In the early 1980s some 98 percent of production forest was granted to more than 580 logging concessionaires, while less than 2 percent was allocated to local communities under various schemes, such as community forestry (Hutan Kemasyarakatan – HKm) (Safitri 2006).

A study conducted by Gunarso (2013) found that Java had only 0.29 million ha (2.3 percent) of undisturbed forest cover in 2010 (Table 3) compared to 2.6 million ha of privately-owned forest (Hutan Rakyat – HR) at around 20 percent of the island (BPKH and MFP 2009; Wonodipuro 2013). Most timber for local wood industries used in Java comes from farm forestry. Gunarso (2013) also concluded that the remaining primary forest cover on the outer islands varied from the least on Sumatra with only 11 percent of the island to the highest in West Papua with 69 percent.
The rate of degradation of primary upland forest (Table 3) is alarming, particularly for Sumatra and Kalimantan. In Sumatra, the upland primary forest was 14 percent of the total land area in 2000 and declined to only 11 percent in 2010, equal to loss of 1.4 million ha or 140 000 ha per annum. In Kalimantan the upland primary forest in 2000 amounted to 16.9 million ha, while in 2010 it had been reduced by 5 percent (from 31 percent to 26 percent), equal to loss of 2.7 million ha or 270 000 ha per annum. This degradation was particularly rampant after the Reformation Era started in the late 1990s. The national annual rate of deforestation reached 2.83 million ha per year during the 1990s. This was more than triple the rate during the period 1982-1990, which was 900 000 ha per year (MoE 2007).

Illegal logging, forest encroachment and forest conversion have been identified as the three main causes of deforestation in the Reformation Era (Wibowo 2013). Forest conversion, however, was not directly from primary forest, but mostly a succession from primary to degraded areas, and then converted into agricultural and estate crops (FWI 2011). Degraded areas identified as critical lands inside forest accounted for 54.6 million ha for the whole of Indonesia (Baplan 2002). Industrial forest plantations have grown much more slowly than oil-palm plantations, although they were planted much earlier in the mid-1980s. Of the 10 million ha the Ministry of Forestry (MoF) allocated for industrial forest plantation, less than 5 million ha are currently planted (FWI 2011). There are more complex dynamics underlying the causes of deforestation.

Up to 2011, recent statistics showed that the deforestation rate had declined to 1.08 million ha per year (MoE 2007). While this appears to be good news, there has been no detailed study to assess the causes of this decline or to confirm that the deforestation rate is slowing down and forest areas and conditions are being restored.

Table 3. Percentage of undisturbed primary forest cover in upland state forests

<table>
<thead>
<tr>
<th>Island</th>
<th>2000 (Million ha)</th>
<th>2005 (Million ha)</th>
<th>2010 (Million ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(% of the total area on each island)</td>
<td>(% of the total area on each island)</td>
<td>(% of the total area of each island)</td>
</tr>
<tr>
<td>Sumatra</td>
<td>6.50 (14)</td>
<td>6.03 (13)</td>
<td>5.49 (11)</td>
</tr>
<tr>
<td>Kalimantan</td>
<td>16.92 (31)</td>
<td>15.57 (29)</td>
<td>14.07 (26)</td>
</tr>
<tr>
<td>Sulawesi</td>
<td>5.85 (31)</td>
<td>3.96 (21)</td>
<td>3.90 (21)</td>
</tr>
<tr>
<td>Java</td>
<td>0.37 (2.8)</td>
<td>0.29 (2.3)</td>
<td>0.29 (2.3)</td>
</tr>
<tr>
<td>Papua</td>
<td>31.56 (76)</td>
<td>29.87 (72)</td>
<td>28.64 (69)</td>
</tr>
</tbody>
</table>

Source: Gunarso (2013).
3. Current status of forest degradation

The vast area of Indonesian forests is now of very low quality or its status is highly degraded. Deforestation and degradation have left only small areas of undisturbed primary forests. Only about 30 percent of the primary forests remains and the proportion continues to decrease due to continuing deforestation and forest degradation. Based on the latest figures, the total critical areas inside and outside forest land accounted for 77.8 million ha in 2007 or about 60 percent of the total estimated forest area of Indonesia (MoF 2007). Most is located inside forest (38 percent), which includes critical peat swamp forest covering 4.5 million ha (MoF 2007). The quality of related water supply has also been affected – around 17 000 watersheds are in a critical condition inside these forests, and another 3 000 watersheds have been destroyed (MoF 2007). This situation has affected an estimated 10-20 million people who depend on forests for their daily livelihoods (Sunderlin et al. 2000; FWI/GFW 2002).

Furthermore, large areas of forest cover remain in areas designated for non-forestry use. Due to spatial planning where terrestrial land is divided into conservation, protection and utilization zones, many areas designated for non-forestry use remain covered with forests. In contrast, many areas designated as state forests have no forest cover due to the unsustainable practices of forest concessionaires. A land swap between forested non-forestry use areas with designated deforested or degraded forest has been proposed in recent years. The proposal is mainly linked to the potential of the carbon sequestration role of these forests and at the same time to encourage forest rehabilitation on designated deforested or degraded areas through FLR. Recent policy to allow mining of coal in production forest has increased the areas of highly degraded forests. In East Kalimantan alone, the total land allocated for coal mines has amounted to 5 million ha released under 1 488 permits (Hidayat 2013). The potential for forest destruction from coal mining, with no proper reclamation, is huge. While companies are required to deposit funds for post-mining reclamation in the beginning, in practice only a small number of mining companies undertake reclamation activities after their permits have terminated.

With such a large area of degraded forest and associated diminishing ecological services, massive forest rehabilitation and restoration of forest landscape are needed. Despite more than three decades of implementation of forest rehabilitation and other associated programmes, this work has not been able to catch up with the rate of deforestation and forest degradation (Nawir et al. 2007c). This is due, in part, to the MoF not having adjusted the annual target area since the 1980s; it is not keeping pace with the increasing rates of deforestation and degradation (Nawir et al. 2007c). The government has provided only limited funds for the rehabilitation or restoration of degraded forests. In a more recent programme, ‘Planting One Billion Trees’ launched in 2011, less than 300 000 ha of degraded forest were targeted annually for inclusion in the programme. This was in addition to another annual development programme for 200 000 ha of forestry plantations (Sarinah 2013). This programme was initiated in response to Indonesia’s international commitment to reducing its greenhouse gas (GHG) emissions by 26 percent for ‘business as usual’ and 41 percent with international support by 2020 (Bappenas 2010). With funding from the Norwegian Government, Indonesia signed a Letter of Intent (LoI) to implement a low carbon economy and Reducing Emissions from Deforestation and Forest Degradation (REDD+) as part of the country’s efforts to reducing its GHG emissions. The recent Presidential Decree No. 6, 2013 aimed at improving the forest governance of primary forests and peatlands (CIFOR 2013; INPRES 2013).

While the government has limited funding available for forest landscape restoration and rehabilitation, local communities are a potential source of labour and investment for the rehabilitation of degraded forests and land. When access to forest areas is given to local communities, such as in Java, they have implemented reforestation and forest rehabilitation with a small amount of funding assistance or no support at all from the government. The demand for local timber in Java has increased the interest of small investors, mainly temporary out-migrants working in the city who invest in trees in their home villages. In 2009, community forestry from this kind of investment covered approximately 2.8 million ha, 78 percent of all private forest in Indonesia, which is an estimated 3.6 million ha (Wonodipuro 2013).

There are more dynamic and complex driving factors related to deforestation and land degradation to be resolved in order to improve forest management in Indonesia. Any forest rehabilitation, mining reclamation and restoration efforts at project sites and the landscape level should include plans and actions to address them.

3.1 Causes of forest degradation

It is important to understand the range of drivers behind deforestation, so that the interventions undertaken by programmes (rehabilitation, reclamation and restoration) can address the underlying causes of deforestation and land degradation. These may be identified by understanding the direct and underlying causes, and the agents responsible for a certain act (Contreras-Hermosilla 2000).

3.1.1 Direct causes

There are two types of direct causes: natural conditions and those resulting from human activities. As direct causes, human activities usually have more permanent and prominent roles compared to natural conditions.

Natural conditions: Indonesian geomorphology and high rainfall (1 500-4 000 mm per annum) have affected the soil so that it is vulnerable to natural catastrophes such as landslides and erosion, which lead directly to deforestation (Santoso 2005). Long drought seasons (such as those caused by El Niño) are another natural condition that can render forests
vulnerable to fire, which is often unmanageable (FWI/GFW 2002). However, there are limited statistics that can actually estimate the total area affected and deforested in Indonesia due to natural causes. This is mainly because of the difficulty in differentiating between natural causes and those resulting from human activities, such as forest fires. The greatest natural disaster was the tsunami on 26 December 2004 that hit Aceh and Nias in North Sumatra. It was initially estimated that 48,926 ha of coastal forests (other than mangroves) were severely impacted (UNEP 2005). The tsunami’s impact was greater because most of the mangrove forests in Aceh had been converted to fish and shrimp ponds (EIU 2006).

**Human activities and agents of deforestation:** There are at least two direct causes of deforestation: (1) logging and illegal logging and (2) forest fires caused by human activities.

**Logging and illegal logging:** Human activities in relation to forest extraction have been the main causes of deforestation, mainly through logging operations, illegal logging and unmanageable fires (Sunderlin and Resosudarmo 1996; FWI/GFW 2002; Tacconi et al. 2004). Logging contributes between 77,000 - 120,000 ha to deforestation annually; this is about 10 - 20 percent of the total deforested area and 10 - 15 percent of the 800,000 ha logged each year (Sunderlin and Resosudarmo 1996). Since 2001, the number of logging companies or HPH has been in decline (Tacconi et al. 2004). Subsequently, the rates of deforestation and volumes of wood logged illegally have been increasing (Tacconi et al. 2004). There are three reasons for the fall in HPH numbers: permits have expired and have not been extended (186 units, 15.69 million ha), permits have been withdrawn and the area returned to the state (10 units, 1.15 million ha) and permits have been withdrawn as a punishment for violations (67 units, 4.32 million ha) (Ministry of Forestry and Estate Crops 1998 in Kartodihardjo and Supriono 2000). To date, however, these concessions have declined to less than 150 with a total area of around 24 million ha (Suparna 2013 in Rasyida 2013). As a result of the unclear status of the forest on revoked concession areas, there are more than 43 million ha of open access production forests (Forum Reklamasi Hutan Pada Lahan Bekas Tambang 2003; Nawir et al. 2007c). Although the number of HPH companies has declined, the area deforested has continued to increase because of other problems, such as illegal logging (Nawir et al. 2007c). Tacconi et al. (2004) estimated illegally-logged areas to be about 2.5 million ha in 2001, with a total volume of 50 million m³ based on the assumed harvesting rate of 20 m³ per hectare. In 2006 there were 345 cases of illegal logging, conducted by 319 people in 20 provinces (MoE 2007).

**Forest fires in relation to human activities:** Indonesia has experienced two major outbreaks of fire in the last 30 years: in 1982/1983 fire damaged 2.7 million ha of forest, and in 1997/1998 5.4 million ha of forest were destroyed, mostly in Kalimantan and Sumatra (FWI/GFW 2002). However, it is not clear whether the areas burned in 1982/1983 had recovered before the 1997/1998 fires occurred. The total area damaged by the later fires and forests not exclusively affected was 11.7 million ha across Sumatra, Java, Kalimantan, Sulawesi and West Papua (Tacconi 2003). The causes of the fires varied, but the main source was intentional burning during land clearance prior to the development of estate crops that spread out of control, as well as smallholder activities in clearing the land for cultivation (FWI/GFW 2002). Increasingly, forest fires have become an endemic problem every year with the magnitude tending to increase from year to year. The recent peak season for forest fire was in June 2013 (Sizer et al. 2013).

**3.1.2 Underlying causes and agents of deforestation**

The underlying and direct causes cannot be separated, because there is often a long chain of events that leads to deforestation (Contreras-Hermosilla 2000). However, the underlying causes of deforestation are complex and cover various aspects: (1) market failures, (2) policy failures and (3) broader socio-economic and political causes.

**Market failures:** Market failures have been identified as one of the disincentives to managing forests sustainably. With distorted or malfunctioning markets, prices do not necessarily reflect the actual social and environmental values of the resources (Pearce et al. 1990; Perman et al. 1996; Richards and Costa 1999). In Indonesia, even the most commercialized forest products, such as timber, have been undervalued as the domestic market for roundwood has been protected; this is reflected in the stumpage fees and obligatory reforestation fund payments set by the government (Scotland 2000). With an abundant supply of illegal logs the value of timber is even further reduced; this provides no incentive to conserve forest resources and leads to deforestation.

**Policy failures:** Policy failures occur when the policies implemented create disincentives to sustainably manage the resource and further distort market prices (Richards and Costa 1999). There are at least five policy-related issues that can be identified as major causes of deforestation in Indonesia:

(i) **Logging policies:** Logging companies’ irregular management of their concessions and the short-term investment period are due to the 20-year logging permit granted to concessionaires (Sunderlin and Resosudarmo 1996). This is a disincentive for companies to implement enrichment planting.

(ii) **Failures in rehabilitation by HTI:** (see iv) companies resulting in more abandoned land: Many companies were more interested in clear-felling of the remaining standing stock, instead of developing timber plantations under the HTI programme. This was mainly due to disenchantment, resentment and conflict with local communities over forest resources as well as competition for land during the development of oil-palm plantations. Furthermore, local governments at the district level are more supportive of private investments in oil-palm plantations because they perceive them as local government revenue sources.
(iii) Premature decentralization and inadequate capacity of local government and District Forestry Services: This has contributed indirectly to forests being managed unsustainably for the last ten to 15 years, resulting in an increase in degraded forest (Casson 2001; Obidzinski and Barr 2003). Continued illegal logging and forest encroachment have been a serious problem since the implementation of regional autonomy under the district governments, particularly in provinces with a high proportion of natural forest.

(iv) Transmigration policies: The transmigration policy, implemented intensively during the 1970s, reallocates people from high-density areas, such as Java, to other low-density islands. Transmigration has had three effects on forest cover on the outer islands: forest is converted for cultivation, new forest areas are opened up when cultivation on initially designated land is unsuccessful and transmigrants put pressure on the land and forests managed by local people (Sunderlin and Resosudarmo 1996). In 1985, the government also started the HTI Trans (Hutan Tanaman Industri Transmigrasi) programme to develop forestry plantations under partnerships between companies and transmigrants (Nawir et al. 2003). However, there is no clear indication that this programme has been successful (Potter and Lee 1998; Barr 2001).

(v) Policies result in higher risks as logged-over areas become ‘open access’: Two main policies contributed to more open access. First, the unclear status of revoked concession areas frequently left the question hanging as to who was responsible for rehabilitating these logged-over areas after the concession rights had been revoked. As often occurs in the field, this ambiguity rendered these areas common property and anyone could go in and convert them to non-forestry purposes, such as agriculture. However, as commonly perceived, the rights attached to the IUPHHK (Ijin Usaha Pemungutan Hasil Hutan Kayu) or licence to collect timber refer more to utilization (or exploitation) than to the broader area of management, which includes the responsibility to rehabilitate the former logging areas.

The second is the discontinuity of rehabilitation policies, in particular the rehabilitation programme assigned to state-owned companies. An example was the case of 5.5 million ha of degraded forest land being assigned to state-owned companies, Inhutani I to V (Nawir et al. 2007c), to be rehabilitated. This resulted in waste of government reforestation funds as no end outputs were ever produced. Further, the areas that had been allocated under the programme were abandoned and became open access lands.

3.1.3 Broader socio-economic and political causes

One example of broader socio-economic causes is economic crisis. The economic crisis that hit Indonesia in mid-1997 resulted in the loss of natural forest cover (Sunderlin et al. 2000). This finding was based on the responses of 68 percent of those interviewed, who had cleared new land during the crisis period. The category of ‘land cleared’ included primary forest, which ranged from 2.8 to 46.2 percent of the total areas in the provinces of Riau, Jambi, Lampung, West and East Kalimantan and Central Sulawesi. Consequently, forest encroachment has also become a serious problem, particularly in areas where the competition for land use is high. One farmer may only clear a small area of land to practise shifting agriculture, however, the net impact of many farmers can be very damaging to the natural forests (Scotland 2000). The encroachment problem is also a sensitive issue, as it often involves people who are poor and rarely have other income options. Forest encroachment is still the biggest problem in forest management, as well as forest rehabilitation and landscape restoration (Nawir et al. 2007a; Wibowo 2013). However, lack of records makes it difficult to estimate the magnitude of the areas being encroached.
4. Impacts of forest degradation

The increasing rates of deforested and degraded land have major consequences for the national economy, community livelihoods, as well as global forest biodiversity and GHG emissions. The most significant impact on the national economy has stemmed from diminishing timber production from natural forests. For example, timber production in 2012 was only 15 percent of that in 1992 and was produced by fewer concessionaires (294) on 23.90 million ha (Soeprihanto 2013). This was also reflected in productivity that declined to 0.23 m³/ha/year in the same year from 0.61 m³/ha/year in 1992 (Soeprihanto 2013). In addition, there have been losses due to illegal logging that accounted for about IDR30 trillion per annum as estimated in 2004 (Minister of Forestry, Kaban in Tempo newspaper, 14 November 2004 in Nawir et al. 2007b). This has affected government revenues as well as Reforestation Funds (Dana Reboisasi – DR) paid by concessionaires for each cubic metre logged. Reforestation Funds are used mostly to fund forest rehabilitation programmes. The total government budget spent on rehabilitation projects may account for as much as 85 percent of the total government forestry budget since the start of the early programme in 1976/1977 (H. Pasaribu, personal communication, 2004 in Nawir et al. 2007b). This has significantly reduced the forestry budget for other uses. For example in 2003, the total target area was 3 000 000 ha with a total allocated budget of IDR5.9 trillion (± US$670.6 million) (Ditjen RLPS 2003, 2004). In the same year, the programme focused on rehabilitating 17 catchment areas over the following five years and had an estimated total budget of US$1.6 billion (Baplan 2003).

Forests in Indonesia are home to 16 percent of the world’s bird species, 11 percent of the plant species and 10 percent of mammal species (FWI/GFW 2001). It is estimated that 20-30 percent of Indonesia’s biodiversity is lost every year, which also includes mammals, such as orangutan, elephant and tiger (Ministry of Environment 2008). Other ecological impacts include soil erosion, degraded watersheds, vulnerability to fires during the drought season and high probability of severe floods during the wet season. It was estimated that the economic costs of forest fires in 1997/1998 ranged from US$2.3-3.2 billion, and US$5.1-6 billion if carbon emissions are taken into account (FWI/GFW 2002; Tacconi 2003). All of these factors have caused a significant direct and indirect economic cost to society, not only in Indonesia, but also in neighbouring countries and at the global level. At the local level, forest and land degradation has directly or indirectly disrupted the livelihoods of 10-20 million forest-dependent people in Indonesia. (FWI/GFW 2002). Other estimates suggest between 6-30 million people have been affected (Sunderlin et al. 2000). Important forest products and services used by local people have been impacted due to biodiversity losses and the destruction of ecological systems including most non-wood forest products (NWFPs) important for local livelihoods.

Deforestation and land degradation in Indonesia have contributed to global GHG emissions and the country is one of the world’s ten largest emitters. In 2005, Indonesia’s annual GHG emissions were 2.2 giga tons (Gt), expected to rise to 3.2 Gt by 2030 under the ‘do nothing’ scenario (Dewan Nasional Perubahan Iklim Indonesia 2010). FWI/GFW (2002) indicated that total intact forest vegetation in Indonesia produced more than 14 billion tonnes of carbon and was estimated to store about 3.5 billion tonnes of carbon. Forest restoration in Indonesia is not important just for the country’s economy and local people’s livelihoods, but also for the global climate.
5. Implementation of forest restoration and rehabilitation initiatives

5.1 History of initiatives, strategies and techniques

As mentioned in the introduction, during the last 50 years there have been 150 official rehabilitation projects in 400 locations nationwide. However, the number of projects only started to increase significantly during the 1990s and by 2004 they had doubled from that of the 1980s. This is almost certainly in response to the escalating rate of deforestation since the late 1990s, and with few, if any, earlier rehabilitation projects showing positive results. The history of project initiatives can be understood by assessing the major policies driving the initiatives.

5.2 Major policies influencing rehabilitation initiatives in the New Order Era

Since the beginning of the New Order Era in 1966, 12 major forestry policies have directly and indirectly influenced different rehabilitation initiatives in Indonesia (Figure 1). The two most important policies are:

(1) The forest land classification system of the Forest Land Use by Consensus (Tata Guna Hutan Kesepakatan-TGHK) that aimed to better target rehabilitation in state forests, 1984

The Provincial Regional Spatial Management Plan (Rencana Tata Ruang Wilayah Propinsi – RTRWP), produced in 1992, complemented this policy.

(2) Reforestation Funds (RF) for implementing state forest rehabilitation programmes

The Reforestation Guarantee Deposit Fund (Dana Jaminan Reboisasi – DJR) was introduced in 1980 and renewed in 2002 under Dana Reboisasi or Reforestation Fund (RF) Management regulation PP No. 35/2002. In relation to the RF, two important initiatives funded by this fund as discussed here are: (a) Industrial Plantation Forest (Hutan Tanaman Industri – HTI) that was initiated in 1984, and then formalized in PP No. 7 published in 1990; and (b) state forest rehabilitation programmes implemented by state-owned companies. These two policies are discussed further below and the major policies in the Reformation Era and under regional autonomy are given in Section 5.4.1.

Figure 1. Timeline of major policies influencing rehabilitation initiatives during the New Order Era

Source: Adopted from Nawir et al. (2007c).

TGHK policy: The 1980s was a very important period in the development of rehabilitation programmes. Once the MoF became an independent ministry in 1983 (separated from the Ministry of Agriculture), it began to manage rehabilitation intensively. Rehabilitation programmes were mainly developed based on the forest land classification of ‘state forest’ for reforestation and ‘outside state forest’ for afforestation. It is perceived that the differences between reforestation and afforestation relate only to the status of forest, i.e. state forest as opposed to outside state forest, thereby defining the jurisdiction of the government agencies responsible. Afforestation is defined as any effort to rehabilitate critical areas on community land outside state forests through vegetative and ‘civil structure’ techniques, which aim to restore the functions of the land. Reforestation focuses on priority watersheds in protection forests and production forests where no concession rights have been granted.
Sources: Mursidin et al. (1997); Baplan (2003); Ditjen RLPS (2003); Santoso (2005); Wibowo (2006).

The MoF further classifies initiatives in state forests based on production forest, protection forest and conservation forest as included in the forest classification of TGHK in 1984. A fifth category inside state forest, ‘conversion production forest’, was adopted in the late 1980s to cover degraded forest land designated for permanent conversion to other uses (Barber 1997).

In 1990 the TGHK was overlaid with the RTRWP – the spatial management plan related to provincial land areas – to further elaborate the Spatial Management Act of 1992 (Kartodihardjo and Supriono 2000). According to the RTRWP, the spatial classifications were protection forest and forest land cultivation area. Since 1993, the two functional land classification systems have been integrated. The forest classification is useful when initiatives are being planned because it helps planners to clearly define the different objectives (single or multiple objectives) of the rehabilitation initiatives to be implemented in the different forest areas. For example, in production forests, the rehabilitation initiatives permit the felling of trees as harvestable products (but there is no access yet for communities), while in protection forest or conservation areas, it is not permitted to fell trees and harvestable products are limited to NWFPs (see Table 4).

Table 4. Government forest classification and its rehabilitation approaches

<table>
<thead>
<tr>
<th>Classification of forest area</th>
<th>Causes of deforestation</th>
<th>Rehabilitation approaches and technical methods</th>
<th>Objectives</th>
<th>Institutional arrangement</th>
<th>Land tenure</th>
<th>Actors involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production forest (limited and permanent production forests)</td>
<td>Overlogging &amp; illegal logging, land claims, forest fires</td>
<td>Establishment of HTI, enrichment planting, replanting of logged-over areas in the Selective Felling and Planting System (TPTI) mechanism, small-scale plantations, and assisted natural regeneration (ANR)</td>
<td>Commercial, increase forested areas &amp; fire prevention</td>
<td>Concessionaires’ rights, management rights given to tree grower cooperatives, companies and communities</td>
<td>State land</td>
<td>Private and state companies, forestry services, communities</td>
</tr>
<tr>
<td>Protection forest</td>
<td>Encroachment, forest fires, illegal logging, population pressures and mining</td>
<td>Community forestry programme and watershed management by developing agroforestry and payments for ecosystem services (water)</td>
<td>Improve and maintain the hydrological functions of watersheds and ecosystems</td>
<td>Communities given management rights and access to NWFPs, with NGO facilitation</td>
<td>State land</td>
<td>Forestry services, communities, NGOs</td>
</tr>
<tr>
<td>Conservation forest</td>
<td>Encroachment, illegal logging, forest fires, population pressures</td>
<td>Creating buffer zones and watershed management by developing agroforestry with no timber harvesting, conducting enrichment planting, preferably with endemic trees and/or fodder trees</td>
<td>Conserve biodiversity, flora, fauna and ecosystems and ecotourism</td>
<td>Communities given management rights and access to NWFPs, with NGO facilitation</td>
<td>State land</td>
<td>Forestry agencies, communities, NGOs</td>
</tr>
<tr>
<td>Special purpose forest</td>
<td>Encroachment, illegal logging, population pressures</td>
<td>Enrichment planting, community forestry</td>
<td>Improve ecological functions, conserve biodiversity, increase forest cover for R&amp;D, education and training, as well as religion and culture</td>
<td>Management rights provided for public interest i.e. universities, R&amp;D institutes and local communities</td>
<td>State land</td>
<td>Universities, research centres and local communities</td>
</tr>
<tr>
<td>Community land</td>
<td>Demand for increased productivity, inappropriate land use, population and market pressures</td>
<td>Private forest, partnerships, traditional forestry management by developing small-scale plantations and agroforestry</td>
<td>Income generation, improve land productivity, conserve water resources, hydrological functions of watersheds and ecosystems</td>
<td>Community manages the areas individually or in a group, with or without partnerships</td>
<td>Private and communal</td>
<td>Forestry services, communities, private and state companies</td>
</tr>
</tbody>
</table>

Sources: Mursidin et al. (1997); Baplan (2003); Ditjen RLPS (2003); Santoso (2005); Wibowo (2006).
Reforestation Fund (RF) policy: The policy of collecting RFs from concessionaires was established in 1980 under the Reforestation Guarantee Deposit Fund (Dana Jaminan Reboisasi – DJR), with the aim of promoting better management of production forests (Otsamo 2001; Oka and William 2004). The concessionaires are required to pay certain refundable ‘deposits’ defined for each cubic metre logged based on timber species and the location of the logging area. Currently DJR is non-refundable and has become the highest tax in the timber industry (Barr 2001). The DJR has been used for implementing several government programmes (Iskandar et al. 2003):

1. From 1989 to 2000, the funds were used mainly for plantation development.
2. In 1995/1996, most private and state companies (Inhutani I to V), which participated in plantation development and received their funds from the government through a soft loan mechanism, were not focused on degraded forests.
3. In 1995/1996, the funds were also used to support the Farm Forestry Credit Schemes.
4. Since 2001, these funds have also been used to finance the Specific Allocated Funds, Reforestation Funds (DAK-DR) programme, and since 2003, five-year programmes such as GN-RHL/Gerhan.

The establishment of HTI areas is an activity that will continue to be supported through the RF. According to this government regulation, RFs are to be deposited into the Central Government Account (Kas Negara) under the control of the Minister of Finance. HTI developed by private companies and the State Forests Rehabilitation Programme implemented by the state-owned companies are two important programmes funded by the RF.

5.3 Industrial timber plantations (HTI)

The development of fast-growing plantations has become the main approach of rehabilitation programmes for Imperata grasslands since 1988 (Potter and Lee 1998; Otsamo 2000). The underlying concept was to replace forest vegetation, remaining standing stock of less than 16 m³ per ha, scrub or Imperata cylindrica with forest plantations (Haeruman 1993). However, it is important to note that not all forestry plantation development programmes in production forest are aimed at rehabilitating degraded forest. A package of incentives was provided by the government to develop large-scale HTI, including interest-free loans, start-up capital for joint ventures with state forest companies, low property tax, the right to remain remaining trees in concession areas etc. (Haeruman 1993; Sudradjat and Subagyo 1993; Hasanuddin 1996; Potter 1996; Potter and Lee 1998; Otsamo 2000).

In 2000, the Directorate General of Forestry Production Management (Bina Produksi Kehutanan – BPK) produced a regulation, based on Ministerial Decree No. 10.1/Kpts-II/2000 dated 6 November 2000, to give HTI rights only on non-forested areas of production forest (Ditjen BPK 2000). Following this regulation, BPK produced the ‘HTI Development as Part of the Reforestation Programme’ Action Plan. Since 2002, HTI development has been prioritized on 2.6 million ha of barren, degraded production forest in ex-HPH areas, in which natural succession is not possible. The second priority is to implement reforestation inside active HPH areas covering 11.6 million ha (Departemen Kehutanan 2002). It has been pointed out that the funding for new HTI companies should come from private investment and not from the RFs. By developing plantations, the objective of rehabilitation has not focused on restoring the forest, but more on improving the productivity of the degraded forest areas, since HTI development makes intensive use of fast-growing exotic species, such as Acacia mangium.

5.4 State forest rehabilitation programmes implemented by state-owned companies

In 1995/1996 the MoF assigned the state companies Inhutani I, II and III and formed Inhutani IV and V to rehabilitate logged-over areas in Sumatra, Kalimantan and Sulawesi. As state-owned companies, they are intended to be profitable, and they act as government partners to support national development and forestry management, with the core business of logging and timber plantation development. However, in 1998 the MoF did not release a budget for this programme; an official decision was then made in 1999 to revoke the rehabilitation assignment by the end of 2002/2003 (date of closure varied from company to company) (Directors and staff of Inhutani, pers. comm. 2004). From 1995/1996 to 1998 there was little progress in the state companies’ rehabilitation activities and social problems occurred in some of the rehabilitated areas. The transition from a centralized to a decentralized forestry management policy in 1999 created a conflict of interest and uncertainty regarding law enforcement. The assigned areas were returned to the MoF, who handed the areas over to the provincial government to manage. With no budget allocated to the provincial government in conjunction with the responsibilities, due to lack of funding and human resources to at least supervise the areas, these areas then became open access and have been subject to illegal logging. This has led to further increase in degraded forest areas.

5.4.1 Rehabilitation programmes during the Reformation Era and regional autonomy

The master plan for forest and land rehabilitation: The MP-RHL was developed in 2000 with the objective of providing the basis for planning rehabilitation programmes and activities that could be integrated, transparent, participatory and based on local regions’ aspirations and uniqueness (Baplan 2003). By 2004, 28 provinces had finished their Regional Master Plans, and 16 of these had been approved by the provincial head and were referred to in the implementation of the rehabilitation programme (Baplan 2004). Consistent with the national forest rehabilitation programme, the Master Plans use watersheds as the unit of coverage.
The national movement for forest and land rehabilitation (GN RHL/Gerhan): Under direction from the three Coordinating Ministers of People’s Welfare, Economics, and Politics and Security, the MoF initiated the GN RHL/Gerhan programme in 2003/2004 to 2007/2008 in response to the need to rehabilitate the increasing number of degraded areas. GN RHL/Gerhan focuses on generating people’s involvement in forest and land rehabilitation by involving them in planting and maintenance. The programme is considered to be a strategic national initiative to restore and improve the function of forests and land, with the aim that eventually the carrying capacity of the forest, its productivity and roles can be maintained to provide services for people (Wibowo 2006).

The GN RHL/Gerhan programme was claimed to be a moral movement to invite people’s participation in forest and land rehabilitation activities (Santoso 2005). The total target area was 3 million ha with a total planned budget of IDR5.9 trillion (± US$670.6 million) (Ditjen RLPS 2003, 2004). The target areas were located in 236 districts, in 68 priority watersheds in 27 provinces. The priority areas are critical watersheds with critical levels of degraded forest and land, vulnerable to natural disasters and with a low area of forest cover.

In December 2006, the President of Indonesia launched the Indonesian Movement for Forest and Land Rehabilitation. This national strategy includes a policy and programmes designed by the MoF to involve local communities in commercial forestry. Its aim was to enhance community involvement in commercial forestry across 1.2 million ha by 2009 and 5.4 million ha by 2016. As a result of the President’s declaration, the MoF has prioritized Community Based Forest Management (CBFM) in the ministry’s strategic policy for forestry development, noting that CBFM could significantly assist national efforts to reduce poverty amongst rural communities in the surrounding forest areas.
6. Recent initiatives

Taking into account past experiences (failures) a more landscape-based and integrated approach has been introduced through FLR and FMU that involves communities actively. This has been highlighted in various programmes such as HTR and HKm.

**FLR:** This is implemented in many different forms that encompass the tree planting movement, industrial forest plantation, conversion to agricultural crops and ecosystem restoration and reclamation of post-mining activities. Consequently, coordination and data collection regarding implementation of FLR are scattered. While actors for FLR come from various sectors and across levels of government, coordination at the central office remains a challenge because of bureaucratic governance.

Tropenbos Indonesia (TBI), a Dutch-funded NGO, has established a network for landscape restoration called MASBENI (Landscape Community of Indonesia). This network has recently developed principles and guidelines supported by the International Tropical Timber Organization (ITTO) and the World Conservation Union (IUCN). The guidelines will be widely disseminated and led by TBI to promote productive landscapes for food and water availability to primary stakeholders – those who live and depend on the land. This activity is currently globalized in a global FLR network called GPFLR - Global Partnership on Forest and Landscape Restoration (www.ideastransformlandscapes.org). Forest landscape restoration is also organized by local communities and other pilot projects on a smaller scale. NGOs and universities in Indonesia, with support from state and foreign funding, have implemented pilot projects for forest rehabilitation and post-mining reclamation.

**The FMU:** This is a regional-management unit of forest areas that ensures that economic, environmental and social functions are sustainably managed. Management covers four main activities: forest utilization, forest rehabilitation and reclamation, as well as community empowerment. The plan is to establish 120 FMUs by 2014 that will lead integrated management on the ground.

**Community-based forestry plantations (Hutan Tanaman Rakyat – HTR):** This programme and the Village Forest Scheme (Hutan Desa) were formalized in 2009 (MoF 2009). The HTR's aims are for communities to develop commercial timber plantations similar to the Industrial Timber Plantation Scheme developed by private companies under HTI. The MoF sees the potential of small-scale plantations under HTR as a means to alleviate poverty ('pro-poor'), create new employment opportunities ('pro-job') and improve the distribution of economic growth among different stakeholder groups ('pro-growth').

**Community forestry (Hutan Kemasyarakatan – HKm):** HKm is one of several government-initiated programmes implemented since the early 1980s to involve communities in state forest management for a certain purpose, such as forest conservation or rehabilitation (MoF 2002; Hindra 2005). Since inception, the approaches, types and levels of community participation have been evolving under the influence of the government's policy orientation, such as the decentralization policy implemented since 1999 (Colchester 2002; White and Martin 2002; Safitri 2006). Under this scheme, rights are granted to cooperatives in the form of a Community Forest Concession Permit (Ijin Usaha Pengusahaan Hutan Kemasyarakatan – IUPHKm). Any tree planting as part of forest rehabilitation is usually developed as part of intercropping practices.

**Village forests (Hutan Desa – HD):** As with HKm, the government also gave village forest management rights (HPHD) in protection and production forests to rural institutions (LKMD, LMD etc.), and this is stipulated in MoF Decree No. P.49/ Menhut-II/2008. HD aims to allow local communities, through village institutions, to utilize forest resources sustainably as a means to improve their welfare. Permit holders in protection forests may manage the area’s ecosystem services and collect NWFPs. Production forests can also be managed in the same way as protection forests, but this can be coupled with harvesting of timber and NWFPs.

**Ecosystem Restoration (Restorasi Ekosistem – RE):** As regulated in MoF Regulation, Permenhut No. 6/Menhut-II/2007 with regards to Regulation No. 3/Menhut-II/2008, Ecosystem Restoration is an attempt to develop and improve the quality of natural forest inside production forest while maintaining important ecosystem functions (Arlan 2013). Efforts could also include planting, enrichment planting, thinning, animal breeding, re-introduction of flora and fauna to restore biological elements and addressing non-biological elements (soil, climate and topography) so as to restore biodiversity and ecosystems to their initial condition. Rights to implement RE can be granted to cooperatives, individuals and private- and state-owned companies. Up to 2013, the MoF has allocated up to 2.70 million ha via MoF Decree No. SK.5040/Menhut-VI/BRPUK/2013 in Sumatra, Nusa Tenggara, Kalimantan, Sulawesi, Maluku and Papua (Arlan 2013).
7. Technical approaches

In understanding the historical context it is important to review soil and water conservation; tree planting, enrichment planting and ANR; and watersheds as the unit of management and focus of the rehabilitation initiatives.

Soil and water conservation: Soil and water conservation has been defined as efforts to maintain, rehabilitate and increase land-use capacity according to the land-use classification (Mursidin et al. 1997). The main objectives were to maintain the forest hydrology through soil and water conservation and forest regeneration, based on the taungya system.

Tree planting, enrichment planting and ANR: Reforestation programmes defined the forest rehabilitation approaches and technical intervention methods as: tree planting (monoculture, mixed tree planting and intercropping), enrichment planting and ANR. Afforestation (penghijauan) or land rehabilitation was carried out via a range of technical approaches such as tree planting on degraded community land, developing demonstration plots, implementing conservation farming, enhancing private forest development and expanding the roles of forest extension workers by establishing Forestry Extension Field Officers (Penyuluh Kehutanan Lapangan – PKL). Technical intervention in afforestation/land rehabilitation focuses on the application of soil and water conservation methods by combining vegetative and physical-mechanical or civil structure techniques (Table 5).

Watersheds as the unit of management and the focus in rehabilitation initiatives: Throughout the history of rehabilitation, watersheds have often been the unit of management. The use of the watershed as the unit of planning for natural resource management was formalized in 1988 as part of the national development strategy; this has increased and clarified the role of the watershed (Baplan 2003).

Table 5. Technologies and species used in different rehabilitation approaches

<table>
<thead>
<tr>
<th>Rehabilitation approach</th>
<th>Technical method</th>
<th>Species used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Plantation Forest (HTI)</td>
<td>Planting; ANR</td>
<td><em>Acacia mangium</em>, <em>Acacia auriculiformis</em>, teak (<em>Tectona grandis</em>), mahogany (<em>Swietenia macrophylla</em>, <em>Swietenia mahagoni</em>), peronema (<em>Peronema canescens</em>), eucalyptus (<em>Eucalyptus</em> spp.), <em>Gmelina arborea</em>, damar (<em>Agathis borneensis</em>), pine (<em>Pinus merkusii</em>), meranti (<em>Shorea</em> spp.), perupok (<em>Lapopetalum</em> spp.) and merbau (<em>Intsia bijuga</em>)</td>
</tr>
<tr>
<td>Community forestry, reforestation programme via agroforestry</td>
<td>Planting; enrichment planting; terracing on sloping areas</td>
<td>Mahogany, teak, rubber (<em>Hevea brasiliensis</em>), candle nut (<em>Aleurites moluccana</em>), cashew nut (<em>Anacardium occidentale</em>), falcata (<em>Paraserianthes falcataria</em>), petai (<em>Parkia speciosa</em>), breadfruit (<em>Artocarpus brasiliensis</em>), jackfruit (<em>Artocarpus heterophylla</em>), tengkawang (<em>Shorea</em> spp.), jengkol (<em>Pithecellobium jirina</em>), pinang (<em>Areca catechu</em>) and gamal (<em>Gliricidia sepium</em>)</td>
</tr>
<tr>
<td>Farm forestry (small-scale plantation)</td>
<td>Planting; enrichment planting; simple terracing (guludan)</td>
<td>Falcata, teak, mahogany, tamarind (<em>Tamarindus indica</em>), damar (<em>Shorea javanica</em>), durian (<em>Durio zibethinus</em>), gambir (<em>Uncaria gambir</em>), cashew nut, jengkol, petai, melinjo (<em>Gnetum gnemon</em>), jackfruit, morinda (<em>Morinda citifolia</em>), breadfruit, candle nut, mango (<em>Mangifera indica</em>) and cassiavera (<em>Cinnamomum burmani</em>)</td>
</tr>
<tr>
<td>Watershed protection</td>
<td>Planting; terracing; planting along contours; grassing slopes; building waterfall channels, checking dams, gully head structures and gully plugs; stream-bank protection</td>
<td>Teak, mahogany, durian, falcata, cashew nut, mango, rambutan (<em>Nephelium lappaceum</em>), annual crops: maize (<em>Zea mays</em>), rice (<em>Oryza sativa</em>), beans (<em>Glycine max</em>) and grasses for livestock fodder</td>
</tr>
</tbody>
</table>

Source: Murniati et al. (2007).
8. Economic assessment of different possible forest rehabilitation strategies

A significant amount of government budget has been used for forest rehabilitation in various locations and conditions. While there has been no actual assessment of the cost effectiveness of various programmes, comparison of several government-based strategies can assess standard financial costs set by the government and paid by a private company (Table 6). The highest cost per hectare is for mining reclamation ranging from US$1 500 to US$2 000 (Sunandar 2013), and the lowest is for a community forestry scheme (HKm) at US$60 per hectare, based on implementation in Jambi, West Kalimantan, West Nusa Tenggara and Southeast Sulawesi (Arlan 2013).

Table 6. Standard costs per hectare for forest rehabilitation and restoration strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Standard costs (US$/ha)</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Industrial Timber Plantation (HTI) and Community-based Timber Plantation (HTR)</td>
<td>666-12 111</td>
<td>MOF (2009)</td>
</tr>
<tr>
<td>2. Community Forestry Scheme (HKm)</td>
<td>60</td>
<td>Arlan (2013)</td>
</tr>
<tr>
<td>3. Deposit for mining reclamation</td>
<td>1 500-2 000</td>
<td>Sunandar (2013)</td>
</tr>
<tr>
<td>4. Restoration Ecosystem</td>
<td>1 400</td>
<td>Arlan (2013)</td>
</tr>
</tbody>
</table>

Based on the study conducted by CIFOR and the Forest Research and Development Agency (FORDA) that analysed rehabilitation costs based on sources of funding (Nawir et al. 2007c), the cost per hectare ranged from US$43 - 15 221, which was higher than the HTI plantations’ standard cost of US$550 per hectare at the time of the analysis (2007). The HTI standard costs are commonly used in calculating the costs for implementing forest rehabilitation (Prasetyo et al. 2005).

Together, the significant amount of forestry budget allocated to rehabilitation initiatives, the small number of rehabilitated areas in major government programmes and high cost per hectare are a strong indication of the high cost of ineffective implementation of rehabilitation activities and therefore wasted budget. This is reflected in the amount spent on rehabilitation compared to the actual results. For example, the total allocated budget of IDR600 billion (US$68.3 million) resulted in only 19 percent of actual planted areas in the rehabilitation programmes implemented by state-owned companies on outer islands that initially aimed to rehabilitate 5.5 million ha (Nawir et al. 2007c). There has also been an indication of the misuse of IDR1 trillion (US$109.3 million) for non-rehabilitation purposes by district governments (Anonymous 2006).
9. Case studies

The two case studies illustrate the FLR approach and forest rehabilitation projects being implemented in the field. Despite many failures, the case studies positively indicate that restoring forest condition is possible with the collaboration of different stakeholder groups.

9.1 The FMU as an FLR approach: Sumbawa, Eastern Indonesia

The FMU concept fits well with the FLR approach. The FMU is loosely interpreted as a landscape platform with a certain ecological function in which:

- Conservation, rehabilitation and economic and sociocultural activities can be complementary in addressing ecological problems, as well as socio-economic and tenurial conflicts under integrated management; and
- Interaction among key stakeholders, including local communities, can bring about the required collaboration and resolve conflicts in a participatory manner for resource management.

The landscape platform as the basis for managing watersheds has been very effective in facilitating different projects (including forest rehabilitation and projects with focus on enhancing local community livelihoods) and implementation can be complementary. Since 2000, the MoF has piloted the FMU approach in 36 sites all over Indonesia, including Sumbawa District in West Nusa Tenggara Province (Kartodihardjo et al. 2011). Problems and threats to the implementation of FMU in Sumbawa District include: (1) how to manage protected forest while enhancing livelihoods; (2) ongoing forest encroachment; (3) illegal logging in state-owned companies; and (4) implementing forest rehabilitation in degraded areas while enhancing livelihoods.

As a landscape platform, complementary project activities can be implemented concurrently. Specific project activities include:

1) Timber and Non-Timber Products in an Integrated Production and Marketing System. This is an Australian Centre for International Agricultural Research (ACIAR)-funded project and coordinated and implemented jointly by CIFOR and the World Agroforestry Centre (ICRAF). The main activities include: integration of timber and NWFP production systems to enhance local livelihoods, enhancing marketing strategies and value chains to improve timber and NWFP market links for smallholders, improving policy frameworks to facilitate smallholder production and integrated marketing of timber and NWFPs, enhancing expansion of smallholder-managed integrated timber and NWFP production systems through extension programmes.

2) Permanent sampling plots for carbon, implemented in protected forest (the secondary forest ecosystem) with tengkawang (Dipterocarpus retusus) as the dominant species. This is part of an integrated watershed management approach and implemented in collaboration with FMU staff and the local community.

3) Other projects include protected forest rehabilitation and improving NWFP management.

The development of a detailed plan for the FMU consists of different stages: preparing the management plan (including site preparation, planting, maintenance, harvesting and marketing); setting up baseline data and monitoring mechanisms and procedures; setting up an agreed revenue sharing system, in particular between community groups and the government if the project site is located in state forest; and ensuring enabling conditions required for the sustainability of the project are identified and prepared, such as appropriate institutions and regulations and ensuring continuous community support for conservation efforts.

The FMU approach has been implemented since 2008 in Sumbawa and some noted potential impacts include:

1) Better integration of (external) intervention based on local priorities following strategic management plans developed by the FMU coordinator in consultation with wider key stakeholders, including local communities.

2) Management of different ecosystems in different types of forest/lands (production forest and protected forest) aims to enhance/improve the carrying capacity of the watersheds (there are three rivers: the Brang Kerekeh, Ai Ngelar and Brang Pelat).

3) Greater multiplier impacts by integrating different complementary activities from production systems to value chains to processing (e.g. forest honey is marketed through the Sumbawa Honey Forest Network or JMHS – Jaringan Madu Hutan Sumbawa in nationwide outlets such as Carrefour in Jakarta).

4) Better understanding of different possibilities in optimizing complementary management between timber and NWFPs, as well as optimizing incomes in the household portfolio.

5) Providing a place for other community groups to learn through cross-visits, including from other districts and provinces.

However some challenges need to be scaled up. At the local level they are: the need for delineation of production forest and community farming areas in resolving tenure conflicts; addressing the rapid increase of critical lands that affect the carrying capacity of the watershed; and the search for voluntary carbon markets and income from PES. Challenges at the national level include: (1) although supported by ministerial-level policy wider adoption of legislation is still uncertain, for example for commercial production forest, community forestry programmes and forest rehabilitation; (2) continuity of the pilot project beyond 2014 – the time frame decided by the MoF has not been discussed; and (3) implications for budget sharing between national and local government need to be discussed further.
9.2 Gunungkidul District in Yogyakarta

There are two interlinked subcases discussed here, which are complementary as they are implemented in the same district: (1) farm forestry (Hutan Rakyat) as part of the Forest Rehabilitation Project; and (2) the Learning Site at Wanagama, which is an FLR model.

**Forest Rehabilitation Project – private forest (Hutan Rakyat):** The most sustained rehabilitation projects are those activities that address the ecological problems that are relevant to the local people, in which significant economic impacts are subsequently generated as a result of the improved ecological conditions. One example is farm forestry in Gunungkidul, Yogyakarta, which has the highest area of forest cover and forest productivity (annual increment in tree growth). Successful farm forestry development in Gunungkidul has not only increased forest and land productivity, but also provided a supply of timber, fodder and fuelwood. Concomitantly, the increase in forest cover also has ecological benefits. This has increased water resources and likewise enhanced microclimates in the surrounding areas. As a result of improved household incomes, the community has better access to education, health facilities and even funding for social functions. On average, around 40 percent of the community’s total household income comes from farm forestry. Continuous income has provided the incentives for the sustainability of local community rehabilitation initiatives. The flow of ecological and economic multiplier benefits is presented in Figure 2.

![Figure 2. The flow of ecological and economic multiplier benefits](image)

- Resolving land and soil fertility problems that are important to local communities has resulted in the flow of ecological and economic multiplier benefits.
- Understanding the flow of goods, services and the multiplier effects from the ground up has provided valuable lessons for improving the design of rehabilitation activities. Considering the overall integrated economic, ecological and social aspects, scenarios for multiplier effects can be embedded in the project design as target impacts to be achieved by the projects within a reasonable and clear time frame. These will underlie the process of defining the project strategy and approach. Applying the most suitable technical intervention that fits with the underlying problems of degraded areas is important for significant ecological impacts to be achieved. More sustainable economic and livelihood benefits can be generated from ecological improvements in the long term, beyond the project period. However, most projects tended to generate short-term cash incomes for the communities involved, mainly from project-based employment opportunities such as manual labour in the transplanting of seedlings.

An FLR model – Learning Site at Wanagama: Wanagama in Gunungkidul, Yogyakarta represents an FLR model, literally from bare land to forest. This model was established in 1964 with an initial stage of only one compartment of highly degraded forest covering an area of 10 ha. In 1983 the area was expanded under a trust given by the national government to the Faculty of Forestry, Gadjah Mada to rehabilitate a further 80 ha of highly degraded forest. To date this educational forest has grown to its current stage covering more than 535 ha.

The objectives of this forest are to provide educational forest for students from the Faculty of Forestry, Gadjah Mada University, to study and address the issue of highly degraded and critical land that exists in the southern part of Yogyakarta, and the application of research into practice. The small laboratory has grown very slowly into its current state, but the lessons learned from it have inspired the local community to follow them. Gunungkidul District in the 1970s to 1980s was known for being barren land. Now the community can enjoy the green landscape with not only the timber produced from it, but also most importantly more food and water.

The success of the establishment of Wanagama is attributable to the application of technical/biophysical and social approaches. Given the harsh conditions of the area during the initial stage of the rehabilitation process, legume species were used to improve the soil as part of the biophysical approach. As part of the social approach the community planted...
medicinal plants and fodder for livestock and practised animal husbandry – sericulture, poultry raising and aquaculture. The social approach proved to be more important in determining success than technical and biophysical aspects.

Wanagama is now green and its success has inspired neighbouring villages, subdistricts and districts to follow suit. Investments are characterized by labour and informal workers such as food stall owners and side street vendors working in Jakarta and investing in trees in their hometowns. Java is now a source of domestic timber with higher production than the state-owned timber company, Perhutani.
10. Looking forward

Forest rehabilitation activities in Indonesia have a history of more than three decades. The development has been dynamic and complex due to complicated and interrelated aspects that may well influence the effectiveness and the sustainability of rehabilitation initiatives now and in the future. Conditions for success and the proposed national strategy for landscape restoration are discussed here.

10.1 Conditions for success

Reforming the funding mechanism policy to avoid project-oriented funding mechanisms: In view of the classic problems of project-oriented funding, the policy governing funding mechanisms urgently needs to be reformed. The funding for forest and land rehabilitation activities needs to be a multiyear system, less bureaucratic and adjusted to the planting seasons and local conditions. Budget approval should be given for at least five to ten years and integrated into rehabilitation planning.

A clear mechanism for the utilization of products obtained from rehabilitation programmes is also urgently needed for both the government and communities. This should provide long-term sustainable funding of the initiative's post-project activity. Equally, new funding mechanisms for forest and land rehabilitation initiatives should be explored – whether policy could be oriented to provide incentives for private sector involvement or an alternative approach such as the Collaborative Forest Management Project. Lastly, rehabilitation efforts should be viewed not so much as ‘cost centres’, but as ‘revenue centres’. Forest and land rehabilitation activities would then involve multistakeholders based on a cost-sharing and risk analysis.

Addressing the causes of deforestation and degradation inclusive in the design of the rehabilitation initiatives: Identifying the direct and indirect underlying causes of land and forest degradation should be conducted during the preliminary planning stage. This would of course include detailed planning of how these would be addressed in the initiated projects. By understanding the flow of goods, services and the multiplier effects from the ground up, the design of rehabilitation activities could be greatly improved. In addition, applying the most suitable technical intervention that fits the underlying problems of degraded areas is important, so significant ecological impacts can be achieved.

Ensuring the economic feasibility of the rehabilitation initiatives: Short-term cash incomes for the communities involved are generated from project-based employment opportunities, mainly via manual labour for planting seedlings. To ensure long-term economic benefits, a number of economic aspects should ideally be integrated into project designs. These could include: incentive mechanisms designed to encourage community participation; the definition of a marketing strategy in the planning process; a financial analysis conducted prior to project implementation as well as designing mechanisms for re-investment; cost and benefit sharing for stakeholders; and reaching out to ensure economic impact for marginalized groups. The importance of the government's role in creating the right incentives for community initiatives cannot be emphasized enough. However, the role of the government should be that of facilitator only, e.g. it is crucial that the government (local government, and local government with support from central government) should respond to the local initiatives by providing the right policy framework. For optimal livelihood impacts, attaching rehabilitation initiatives to other ongoing project developments, as part of integrated strategic planning directed by the local government, may well be the key to this situation.

Actively involving local communities is perceived, without doubt, to be key to the most promising approach in implementing rehabilitation initiatives and can effectively build the social capital that will ultimately address the underlying causes of deforestation and degradation, e.g. preventing illegal logging and forest encroachment. In order to increase community participation in the implementation of rehabilitation initiatives inside state forest, there should be a clear mechanism, and an agreement, for the government and communities to utilize products resulting from rehabilitation activities. This would create incentives for greater community participation and provide sustainable funding after the project term. Further, a mechanism for sharing the costs and benefits among stakeholders should be formed, particularly in securing community commitment. Specific types of incentives and conditions to be considered are: subsidies and direct assistance (non-monetary), subsidies (as revolving funds), credit schemes through cooperatives, markets for NWFPs, extension programmes, revenue sharing agreements etc.

Institutional arrangements and clearer ownership are needed for greater community participation: Equally, for greater community participation it is important to have: a local (or other) organization involved in the implementation of the rehabilitation activities, or alternatively, a newly formed community organization; programme(s) aimed at empowering the community's institutional and technical capacities to support the rehabilitation programme; and multistakeholder facilitation processes at various stages of the rehabilitation programme(s). Projects implemented on community land tend to have a higher success rate than those in state forest. Clearer ownership of the land and freedom from overlapping government policies are almost certainly playing a major role in this success. Clear land status means less conflict over land, a high level of community commitment to maintain the trees planted and a guarantee to community members that they will be able to harvest anything they have planted.

Ensuring adoption – addressing the gap in knowledge by understanding the determining factors influencing a community's adoption behaviour: Although extensive technical rehabilitation projects have been implemented, at the community level, there are still gaps in technical knowledge and very few of the different technical approaches, implemented on the ground, have been adopted. A preliminary assessment must be conducted to find the best technical interventions to suit the local ecological and social conditions as well as to meet the capacity and budget of the communities involved.
Long-term management planning of the rehabilitation project is needed to ensure sustainability: The process of defining the management framework should be a participatory process and involve all stakeholders. The most important conditions to ensure the sustainability of rehabilitation activities are: the activities must be long term and self-sustaining; the activities must be implemented in accordance with the terms of the project (no premature termination); the rehabilitation programme corresponds with and is integrated into regional spatial planning (rencana tata ruang wilayah); plans are made for long-term monitoring and evaluation; a feedback mechanism exists; efforts are made to protect the rehabilitated areas from continuing local disturbances such as fires and grazing; infrastructure development is part of the rehabilitation programme; and informal land rights are recognized and formal landownership or occupation is revised.

Towards different scenarios for rehabilitating logged-over areas: It is best not to generalize rehabilitation efforts, even though they may be implemented within the same production forest or logged-over area. It must be realized that different baseline conditions would develop different rehabilitation scenarios. Baseline and external conditions may include population density, location of the area in terms of markets or economic activities and ecological or other disturbances affecting the rehabilitated area. Using baseline information, natural regeneration is an option for rehabilitating an area, which is isolated and both the population density and ecological disturbance are low. Under this scenario, no advanced technical intervention is required. However, it is essential to have good supervision and law enforcement to make sure the area is undisturbed for natural succession to occur. In the case of high continuing disturbances, ANR or enrichment planting could be undertaken if a good strategy is in place to manage the disturbances, which are often fires. Where population densities are high and a market is accessible, an integrated strategy to generate livelihood options and link up to the market should be considered. Alternatively, a small-scale plantation scheme, in collaboration with a private company, is the most promising approach to rehabilitate production forest (limited and permanent production forests).

Optimizing the decentralization policy: The decentralization policy, which also influences forestry management regimes, has been implemented since 1998. Despite the many drawbacks, the decentralization policy actually provides an opportunity for a new direction in designing a strategy for forest and land rehabilitation. Because local governments have better knowledge of their areas and their forestry management priorities, it is best if the local governments themselves (i.e. the forestry services at the provincial/district level) lead the process of designing the most appropriate local rehabilitation programmes. The central government, i.e. the MoF, would ideally act as a facilitator providing the necessary policy framework.

As an alternative to dominant government-based initiatives, it is often suggested that the government should focus on rehabilitation activities with no commercial objectives, such as inside protection forest. A community forestry reforestation programme that develops agroforestry with no timber harvesting and pays compensation for ecosystem services (e.g. water, ecotourism, reducing carbon footprints) resulting, from the community’s efforts in maintaining the resources, is a possible option for protection forest. In conservation forest, efforts could be focused on creating buffer zones and watershed management by developing agroforestry with no timber harvesting, and conducting enrichment planting using endemic trees and/or animal feed plants.

Equally, state-owned and private companies need to be provided with incentives and clear supervision while implementing productive rehabilitation of logged-over areas. However, the redirection of the previous state-owned company’s rehabilitation approach should be seriously and carefully considered. Of particular importance is the allocation of time for setting up institutional arrangements and conflict resolution with and among all stakeholders involved and interested in investing in areas for non-forestry purposes. Tax or DR exemption is a possible incentive that may well entice the private sector to implement direct rehabilitation activities in its concessions.

10.2 National strategy for forest and landscape restoration

The implementation of FMU, primarily using a landscape-based management approach and the inception of an FLR initiative provides a good starting point in promoting the implementation of FLR in Indonesia. Moreover, lessons learned from the Global Partnership on Forest Landscape Restoration increase the technical discussion on the importance, interests and global nature of landscape restoration.

The success of FLR requires a reform with more flexible forest regulations and governance compared to the highly regulated regime implemented over the past four decades, particularly during the authoritarian Suharto era. The reform government post-Suharto has yet to fully accept the concept of a productive landscape due to jurisdictional ownership among sectors. Implementation of agroforestry for example has been challenged by such jurisdiction rivalry, rather than synergy for improved landscape productivity.

Another condition for success is the availability of investment funds for restoration and removing negative perceptions of the forestry sector. If we use the term ‘forest’ in landscape restoration, participation of other sectors is limited due to the past negative perception of the forestry sector. The general perception is that the forestry sector has failed to protect the forest and to fairly distribute the benefits, yet the attitude towards maintaining forest jurisdiction above functionality remains. It is for this reason that MASBENI intentionally removed ‘forest’ from the title of Forest Landscape Restoration to attract more collaboration and to create a more inclusive institution.

Investment for landscape restoration is expected from the new and innovative REDD+, but the lengthy discussion of this concept has reduced the potential of addressing global climate change because of the ‘low hanging fruit’ expected from it.
With no global investment, the Wanagama case study suggests that local action and collaboration with local communities can successfully overcome the problem of investment. Other promising opportunities include the revitalization of the community-company partnership scheme, which the state-owned company, Perhutani, implemented in Java and private HTI companies in Sumatra and Kalimantan. Adoption of a community-company partnership scheme by other non-forestry companies offers a wider application of conservation efforts.

Synergy among sectors with strong leadership is vital for success in addressing massive forest degradation in Indonesia. Public awareness is now easily organized with numerous examples of forest-related disasters such as floods, landslides, drought and a lack of fresh water. The challenge is to organize public awareness across the country with differing degrees of deforestation and forest degradation and differing land suitability and imbalanced population distribution among the island-based community.

Global initiatives such as the Bonn Challenge will attract global investment for landscape restoration. If Indonesia participates in this global effort, not only could the image of Indonesia be improved, but also more economic activities could be generated. In the long term such initiatives could increase the services derived from forestry for the benefit of the wider community, beyond the forestry sector.
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