



Republic of Indonesia

# Indonesia Climate Change Sectoral Roadmap ICCSR



Summary Report  
Forestry Sector

March 2010



# AUTHORS

## **Indonesia Climate Change Sectoral Roadmap – ICCSR**

### **Summary Report: Forestry Sector**

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# ACKNOWLEDGMENTS

The Indonesia Climate Change Sectoral Roadmap (ICCSR) is meant to provide inputs for the next five year Medium-term Development Plan (RPJM) 2010-2014, and also for the subsequent RPJMN until 2030, laying particular emphasis on the challenges emerging in the forestry, energy, industry, agriculture, transportation, coastal area, water, waste and health sectors. It is Bappenas' policy to address these challenges and opportunities through effective development planning and coordination of the work of all line ministries, departments and agencies of the Government of Indonesia (GoI). It is a dynamic document and it will be improved based on the needs and challenges to cope with climate change in the future. Changes and adjustments to this document would be carried out through participative consultation among stakeholders.

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Deputy of International Cooperation, Coordinating Ministry for Economy; Secretary of Minister, Coordinating Ministry for Public Welfare; Secretary General, Ministry of Transportation, Deputy of Economy, Deputy of Infrastructures, Deputy of Development Funding, Deputy of Human Resources and Culture, Deputy of Regional Development and Local Autonomy, National Development Planning Agency; and Chief of Secretariat of the National Council for Climate Change.

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# Remarks from Minister of National Development Planning/Head of Bappenas



We have seen that with its far reaching impact on the world's ecosystems as well as human security and development, climate change has emerged as one of the most intensely critical issues that deserve the attention of the world's policy makers. The main theme is to avoid an increase in global average temperature that exceeds 2°C, i.e. to reduce annual worldwide emissions more than half from the present level in 2050. We believe that this effort of course requires concerted international response – collective actions to address potential conflicting national and international policy initiatives. As the world economy is now facing a recovery and developing countries are struggling to fulfill basic needs for their population, climate change exposes the world population to exacerbated life. It is necessary, therefore, to incorporate measures to

address climate change as a core concern and mainstream in sustainable development policy agenda.

We are aware that climate change has been researched and discussed the world over. Solutions have been proffered, programs funded and partnerships embraced. Despite this, carbon emissions continue to increase in both developed and developing countries. Due to its geographical location, Indonesia's vulnerability to climate change cannot be underplayed. We stand to experience significant losses. We will face – indeed we are seeing the impact of some these issues right now- prolonged droughts, flooding and increased frequency of extreme weather events. Our rich biodiversity is at risk as well.

Those who would seek to silence debate on this issue or delay in engagement to solve it are now marginalized to the edges of what science would tell us. Decades of research, analysis and emerging environmental evidence tell us that far from being merely just an environmental issue, climate change will touch every aspect of our life as a nation and as individuals.

Regrettably, we cannot prevent or escape some negative impacts of climate change. We and in particular the developed world, have been warming the world for too long. We have to prepare therefore to adapt to the changes we will face and also ready, with our full energy, to mitigate against further change. We have ratified the Kyoto Protocol early and guided and contributed to world debate, through hosting the 13<sup>th</sup> Convention of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), which generated the Bali Action Plan in 2007. Most recently, we have turned our attention to our biggest challenge yet, that of delivering on our President's promise to reduce carbon emissions by 26% by 2020. Real action is urgent. But before action, we need to come up with careful analysis, strategic

planning and priority setting.

I am delighted therefore to deliver *Indonesia Climate Change Sectoral Roadmap*, or I call it ICCSR, with the aim at mainstreaming climate change into our national medium-term development plan.

The ICCSR outlines our strategic vision that places particular emphasis on the challenges emerging in the forestry, energy, industry, transport, agriculture, coastal areas, water, waste and health sectors. The content of the roadmap has been formulated through a rigorous analysis. We have undertaken vulnerability assessments, prioritized actions including capacity-building and response strategies, completed by associated financial assessments and sought to develop a coherent plan that could be supported by line Ministries and relevant strategic partners and donors.

I launched ICCSR to you and I invite for your commitment support and partnership in joining us in realising priorities for climate-resilient sustainable development while protecting our population from further vulnerability.

Minister for National Development Planning/  
Head of National Development Planning Agency



**Prof. Armida S. Alisjahbana**

## Remarks from Deputy Minister for Natural Resources and Environment, Bappenas



To be a part of the solution to global climate change, the government of Indonesia has endorsed a commitment to reduce the country's GHG emission by 26%, within ten years and with national resources, benchmarked to the emission level from a business as usual and, up to 41% emission reductions can be achieved with international support to our mitigation efforts. The top two sectors that contribute to the country's emissions are forestry and energy sector, mainly emissions from deforestation and by power plants, which is in part due to the fuel used, i.e., oil and coal, and part of our high energy intensity.

With a unique set of geographical location, among countries on the Earth we are at most vulnerable to the negative impacts of climate change. Measures are needed to protect our people from the adverse effect of sea level rise, flood, greater variability of rainfall, and other predicted impacts. Unless adaptive measures are taken, prediction tells us that a large fraction of Indonesia could experience freshwater scarcity, declining crop yields, and vanishing habitats for coastal communities and ecosystem.

National actions are needed both to mitigate the global climate change and to identify climate change adaptation measures. This is the ultimate objective of the *Indonesia Climate Change Sectoral Roadmap*, ICCSR. A set of highest priorities of the actions are to be integrated into our system of national development planning. We have therefore been working to build national consensus and understanding of climate change response options. The *Indonesia Climate Change Sectoral Roadmap* (ICCSR) represents our long-term commitment to emission reduction and adaptation measures and it shows our ongoing, inovative climate mitigation and adaptation programs for the decades to come.

Deputy Minister for Natural Resources and Environment  
National Development Planning Agency

U. Hayati Triastuti

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# **Summary Report Forest Sector Climate Change Roadmap**

This peat land and forestry sector climate change roadmap is a temporary document, which should be further developed and revised in 2010 through a process of coordination involving Ministry of Forestry, Bappenas, and other ministries of concern such as Agriculture, Environment, Public Works, Marine and Fisheries as well as the research community. Indeed, consensus on priorities, activities and decisions related to this important sector are still need to be reached in order to meet climate change government objectives.

## 1 Sector status: GHG emission sources and removals, vulnerability and adaptation

### Indonesian forests and climate change

In Indonesia, the role of forest in the context of climate change is crucial for its adaptation and mitigation functions. Indonesian adaptation and mitigation policies for the forestry sector will impact both national and global levels because of the sector significant levels of GHG emissions as well the need to enhance the resilience of forest ecosystems.

### Vulnerability and Adaptation of the Forest sector

Depending directly on the main climatic parameters rainfall and temperature, Indonesia's forests are highly vulnerable to the negative impacts of climate change. As the assessment of the ICCSR showed, climate change parameters which are expected to directly influencing the forest sector in Indonesia are temperature increase and precipitation changes, ENSO frequency and magnitude as well as sea level rise. However, climatic effects interact with non-climatic factors, such as land-use practices and related socio-economic factors through destabilizing feedback systems, such as forest degradation processes in combination with increased fire risk, which are aggravated by higher temperatures and drier conditions. This has important implications for the adaptation of forest management, for forest dependant people and for the preservation of the important environmental functions of forests in climate change mitigation.

### Mitigation in the forest sector

Indonesia has lost approximately 1.7 million ha of its forest per year during the period of 1985-1997. The highest forest loss occurred during 1997-2000, reaching 2.8 million ha per year. The latest published data (MoF, 2009) showed that net forest lost has decreased during 2000-2005, reaching about 1.09 million ha annually. Based on the statistic from the Ministry of Forestry in 2008, there is 77 million ha of critical land<sup>1</sup> all over Indonesia, 59 million ha are located in forest area and needs to be rehabilitated (MOF, 2009b).

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<sup>1</sup> Critical land refers to a piece of land severely damaged due to loss of vegetation cover or loss of functions as water retention, erosion control, nutrient cycling, micro climate regulation and carbon retention. Based on its vegetation condition, the land could be classified as : very critical, critical, slight critical, potential critical and normal condition (MOF, 2009 b)

**Table 1:** Indonesia's forest lands and non-forest lands (MOF, 2009b)

Indonesia lands in million ha									
	Forest lands							APL	Total
	Conservation	Protection	Limited Production	Production	Total Permanent Forest	Conversion Forest	Total forest land	Non Forest land	Total
Forest cover	15,2	23,0	18,8	22,1	79,1	11,0	90,1	8,3	98,5
Non-Forest cover	3,8	5,9	5,5	13,1	28,3	11,0	39,3	46,5	85,8
Data deficiency	0,7	0,9	0,5	0,5	2,6	0,3	3,0	0,6	3,6
<b>Total</b>	<b>19,7</b>	<b>29,9</b>	<b>24,8</b>	<b>35,7</b>	<b>110,0</b>	<b>22,4</b>	<b>132,4</b>	<b>55,4</b>	<b>187,8</b>
%	18	27	23	32	100				

**Source:** *Extent of Land Cover Inside and Outside Forest Area Based on the Interpretation of Satellite Image Landsat 7 ETM+*

### Deforestation and degradation drivers: status and emissions

Developing policies and actions for reducing forestry sector CO<sub>2</sub> emissions will not be effective without addressing the drivers of deforestation and forest degradation (DD). At national scale, drivers of DD have been identified. Deforestation causes are conversion of forests to perennial plants (oil palm, shrubs, short-rotation pulpwood plantations), conversion of forests to annual cropland, energy and mining exploration in forest lands, conversion to exploit mineral resources, conversion to slash-and-burn (shifting cultivation) lands, and conversion to urban lands or other human infrastructure. Drivers are for instance the price of commodities, labor market, lands' rights insecurity, demographic growth and development policies. The drivers of deforestation and degradation may change over time.

Forests have two major mitigation functions: to act as carbon sink and source of GHG emissions. High rates of deforestation, degradation of peat lands and forests degradation constitute the key sources of emissions. Most of emissions come from a limited number of Provinces (10 Provinces, 78 % of emissions on dry land and 96 % of swamp forests). Riau, Central Kalimantan and South Sumatra account currently for over half of emissions and deforestation (MoFor, IFCA, 2008). The SNC<sup>2</sup> indicates that average net annual emissions from land use, land use change and forests (LUCF<sup>3</sup>) are 638 MtCO<sub>2</sub>/year between 2000 and 2004. One should add another 690 MtCO<sub>2</sub>/year consisting of 220 MtCO<sub>2</sub>/year from peat oxidation<sup>4</sup> and 470 MtCO<sub>2</sub>/year from peat fire<sup>5</sup>. These estimations result into a business as usual scenario (BAU) for peat and forest land use change of 1, 33 GtCO<sub>2</sub>/year. This amount was used for the BAU in the scenarios below.

<sup>2</sup> Second National Communication

<sup>3</sup> LUCF is LULUCF without peat fire and peat oxidation

<sup>4</sup> Estimation from Bappenas peat report (2009),

<sup>5</sup> From Bappenas peat report (2009),

A recent Ministry of Forestry proposal for the Reference Emission Level (REL) is approximately of the same magnitude than the LUCF from SNC above. It indicates that gross emissions are 1,24 GtCO<sub>2</sub>/year and absorption 660 MtCO<sub>2</sub>/year, which results into a net annual emissions of 580 MtCO<sub>2</sub>/year without peat lands. But these figures are not yet validated, discussions are still ongoing (per March 2010).

### **Peat lands**

In Indonesia there are about 21 million ha of peat lands (Bappenas, 2009), of which half is still forested. About 11 millions are protected by law either as their thickness is more than three meters or they are on conservation or protection forest lands. About 3 million ha of peat lands are classified as conversion forest, 7 million ha as production forest, and 6 million ha are outside forest lands. As laws are not yet enforced peat lands are currently, and could remain in the future, a main source of emissions.

General peat degradation and related emission processes start from drainage, generally made for agriculture or plantation development. Drainage is followed by: 1) peat oxidation, which produces emissions, 2) land fire, 3) loss of above ground biomass due to legal or illegal logging and associated degradation. According to the latest survey on peat lands (Bappenas, 2009) peat land related emissions was 900 MtCO<sub>2</sub>/year between 2000 and 2006. This is disaggregated into (1) emissions from oxidation (estimation: 220 MtCO<sub>2</sub>/year), (2) emissions from above ground biomass removal (calculated: 210 MtCO<sub>2</sub>/year) and fire emissions (470 MtCO<sub>2</sub>/year from van der Werf *et al*, 2008). But uncertainties on peat emissions are very high due to uncertainties on the emission processes themselves and uncertainties on the quantities of carbon stored as the thickness of the peat and the carbon contents per cubic meters are both very irregular from place to place. Furthermore emissions from fire are very variable from year to year: 194 MtCO<sub>2</sub> in 2001, 678 MtCO<sub>2</sub> in 2002 (SNC, 2009).

## **2 Ongoing forest policies related to Climate Change**

### **Indonesian ongoing strategies for adaptation**

Adaptation of the forest sector is a new topic for Indonesia, hence only a few initiatives address explicitly the issue of increasing resilience to the negative impacts of climate change. A number of existing strategies address the issue indirectly (such as fire management, forest and biodiversity conservation, mangrove management), which are anchored in the long term plan of the Ministry of Forestry (2006 – 2025) but a comprehensive vulnerability analysis still needs to be conducted in order to derive specific activities.

In the RPJM 2010 – 2014, adaptation activities are accommodated in two programs namely, i) the Biodiversity Conservation and Forest Protection Program and ii) the Improvement Program for watershed

functions and Empowerment of watershed based communities. Supporting programs are the Forestry Research and Development Program, Forestry sector Macro Planning, Stabilization of Forestry Area, and Management Support and Technical Task Program.

### **Indonesian ongoing strategies for mitigation**

In general terms, Indonesia pursues a twofold strategy for mitigation, which reflects the two major functions of forests in the context of climate change, i.e., as a carbon source and a carbon sink. Protecting the existing forest will maintain the stock of carbon and its absorption capacity, reforestation and forest rehabilitation will increase the forests' capacity as carbon sink, while deforestation and forest degradation will increase emission of GHGs. Key strategies can be summarized as follows:

1. SFM – Forest Mitigation Strategy 1: Enhancement of forest carbon stock and avoiding emissions linked to unwanted degradation and unplanned deforestation; the goal is to move to sustainable forest management (SFM) through consistent policies, law enforcement supported at local level by a fast development of KPHs<sup>6</sup>,
2. RED- Forest Mitigation Strategy 2. Avoiding emissions linked to planned deforestation, through management of conversion forest land: using REDD for financing incentives, associated to the development of KPHs to ensure permanence at local level,
3. Plantations- Forest Mitigation Strategy 3- Increasing carbons sink capacity by promoting plantations on non forest cover lands. These plantations can be disaggregated into wood plantations and rehabilitation plantations. Wood plantations have also an indirect mitigation effect as an alternative to wood from natural forest for supplying industries.

In current policies a lot of means have been devoted to plantations for increasing carbon sink capacity. But little is planned, outside the development of KPHs, to ensure that the trees are well maintained and are actually growing, or to monitor accurately the plantation growth and carbon absorption. KPH development and establishment is an important means to safeguard permanence of carbon sequestration in forests and should therefore be viewed as a crucial precondition for all mitigation activities.

### **Cross Cutting Issues with other sectors**

The roadmap identified three sectors with major influences on mitigation efforts in the forestry sector, i.e., agriculture, energy and mining and several sectors having interactions with the forest sector, such as ocean and fishery, transportation, industry, and health. Without addressing these cross sectoral issues properly, mitigation efforts as described in the scenarios above are at risk.

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<sup>6</sup> KPH (Kesatuan Pengelolaan Hutan) is a Forest Management Unit

In the light of climate change mitigation efforts and to deal successfully with these cross sectoral issues, the existing regulations<sup>7</sup> can indeed serve to synchronize these different activities, so more efficient and effective program implementation can be achieved, provided that law enforcement is strengthened. The integrated land use planning should be enforced. For development purposes of strategic importance, some forest lands need to be used and this should be compensated by allocating other lands to forest land. In case of non compliance this can cause a further significant increase of emissions from the forestry sector. Since the current set of regulations both in and outside forestry sector have been made without sufficient consideration of climate change issues, more analysis of regulations and policies should be done.

**Table 2:** Cross sectoral issues between forestry sector and other sectors

Sectors other than forestry:	Forestry Sector:
Agriculture	Policy synchronization needed with a view to expansion of agricultural land and palm oil plantation as well as other sources of bio fuel for enhancement of sinks and reducing emissions from deforestation
Mining	Open pit mining in the forest area, mining exploration in forests
Energy	Forest conversion to increase energy alternative supply, geothermal in forest area and exploration in forests
Public Works, Water Resources	Priority for river catchment area rehabilitation and irrigation infrastructure development in forest area
Ocean and Fishery	Coordination of National park management and mangrove forest management
Transportation	Transportation infrastructure development in forest area
Industry	Wood supply industry (pulp & paper, timber)
Health	Disease spread indication as the impact of forest and mangrove forest conversion

### 3 Vulnerability and adaptation options 2010 - 2029

Climate change related hazards can be estimated in three major areas : forest resources, forest dependent people and forest industries. Some identified vulnerabilities and hazards are summarized in the table 3 and described in the subsequent parts, but further analysis is needed in order to derive specific and conducive adaptation strategies.

<sup>7</sup> Law No. 5 year 1967 (basic forestry regulation), Law No. 5 Year 1990 (natural resources and ecosystem conservation),

**Table 3 :** Identified climate hazards, vulnerabilities and possible further assessment tools

System perturbation and hazards	Current vulnerabilities		Indicative adaptation actions
<b>1. Forest resources</b>	Climatic	Anthropogenic, land use and other stressors	
Forest biodiversity	Changing site conditions by temperature and precipitation patterns	Forest exploitation, alteration of species composition, forest fires	Review impacts and vulnerability analysis (e.g., on distribution, migration, inter-species interaction), Biodiversity conservation and forest protection, with a target of reducing conflict and tension in National parks + other conservation areas, and encroachment of forest areas in 12 priority provinces, increasing buffer zones
Forest fire	ENSO occurrence, droughts, temperature increase	Land clearing, lacking means to control fires	Increasing staff and developing human resources for forest fire management and control (e.g., “Forest Fire Supervision Brigade” (BPKH)) – community empowerment, land tenure clarification Identification of hotspot by satellite, develop fire break, establishment of community fire fighter, revitalization of fire prevention tools, demonstration of land clearing without burning
Forest productivity and changed site conditions		Forest degradation	Reviewing match species – site conditions, vulnerability analysis, adaptive management, including mixed native species to enhance resilience of silvicultural systems
Mangrove / coastal forests recession	Extreme events (waves , storms)	Coastal erosion, intensive mangrove use	Research (adaptive capacity of mangroves, coastal forests) and mangrove reforestation
<b>Suggested assessment tool for further assessment:</b> Mapping of interactions atmosphere, plants, soil <sup>1</sup>			

System perturbation and hazards	Current vulnerabilities		Indicative adaptation actions
<b>2. On forest dependent people / livelihoods</b>	Climatic	Anthropogenic, land use and other stressors	
Income/livelihoods	Extreme events (landslides, erosion, droughts, fires)	Dwindling with degrading forest resources	Enhancing communities' capacity to manage forests by making rights to forest management certain, institutional strengthening, participation and active role of the stakeholders)
Cultural/traditional value systems		Dwindling with degrading forest resources	
<b>Possible assessment tool:</b> Sustainable Livelihoods Framework and Community-based Risk assessment Tools <sup>2</sup>			

System perturbation and hazards	Current vulnerabilities		Indicative adaptation actions
<b>3. Forest industries</b>	Climatic	Anthropogenic, land use and other stressors	
Forest plantations – productivity decline	Extreme events (wind, drought)	Monocultures, low level genetic variation	Adaptive forest management including mixed native species to enhance resilience of silvicultural systems <sup>3</sup>
Negative impact on wood based industries		Gap between wood supply and demand by industry	Research & development, Forest product diversification to increase economical resilience of the sector
<b>Suggested assessment method:</b> combination of plant-soil maps and economic model (e.g., CGE model)			

## 4 Mitigation Scenarios for 2010 - 2029

The following section contains a set of preliminary scenarios for mitigation over the period 2010 – 2029 for peat lands and forest on dry lands (peat, SFM, RED, plantations)<sup>8</sup>.

### Peat scenario and results

Bappenas peat survey proposes for the period 2010-2025 three main following scenarios (Bappenas, 2009):

1. Law enforcement and best management practices in existing land under production use including forests and agriculture crops.
2. Peat land rehabilitation and prevention of uncontrolled fire.
3. Revision of land allocation, forest conversion and land swaps, possibly using REDD as an incentive, that direct future development away from peat lands.

These results were summarized under a “peat scenario”, developed for the period 2010-2029, and taking into account the existing rehabilitation work plan from the Ministry of Forestry (RAN-GRK). The effectiveness of peat management will depend also on the development of forest management units, which are assumed to be progressive<sup>9</sup>. In these conditions the peat scenario could produce 93 MtCO<sub>2</sub>/year of average emission reductions during the period 2010-2019, which is increasing to 544 MtCO<sub>2</sub>/year during the period 2020-2029.

### Forest scenarios and results

The forest scenarios cover periods 2010-2019 and 2010-2029; they have been aggregated into three key scenarios (Bappenas, 2009):

1. SFM – Law enforcement and sustainable forest management will depend on the consistency of national policies to protect forests and the development of forest management units at local level. These combined efforts will enhance forest carbon stock in protected and production forests with forest cover. They will also curb encroachment, illegal logging and fire on forests, which will reduce emissions from unwanted degradation and unplanned deforestation. SFM could produce 160 MtCO<sub>2</sub>/year of average emission reductions during the period 2010-2019, this increasing to 370 MtCO<sub>2</sub>/year during the period 2020-2029.

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<sup>8</sup> These scenarios need to be further discussed, integrated and peer-reviewed in 2010.

<sup>9</sup> It was assumed that forest management unit will allow controlling 100 million ha of permanent forest lands by 2029

2. RED - Avoiding emissions linked to planned deforestation. In this scenario it was assumed that, at least, during the next 20 years period, a third of planned deforestation of forest land with high carbon value on dry land would be avoided by revising land allocation. This could be facilitated using land swap agreements and REDD as financing incentives, associated to the development of KPHs to ensure permanence at local level. This would add an emission reduction of 138 MtCO<sub>2</sub>/year at average.
3. Plantations - Increasing carbon sink capacity thanks to plantations on non forest cover lands would add another 37 MtCO<sub>2</sub>/year from 2010 to 2019 and 90 MtCO<sub>2</sub>/year during the following period until 2029. A constant effort of 1,4 million ha per year of new plantations was assumed consisting of i) rehabilitation of protected watershed (0,22 million ha per year)<sup>10</sup>, ii) social forestry (0,61 million ha per year) and iii) industrial and wood plantations (HTI,HTR: 0,58 million ha per year). As most successful plantations are planted for timber and plantations need time to grow and store carbon, a relatively small mitigation can be achieved in relation to the financial resources needed<sup>11</sup>. It was assumed that plantations are harvested after 8 to 15 years according to their type and are systematically replanted after harvesting. Actually plantations have an indirect mitigation effect by reducing pressure on natural forests; they contribute to the mitigation strategies above: Peat, SFM and RED. Efforts allocated to plantations should not be assessed only from a mitigation perspective but be adjusted with the needs of wood industries, the demands of local communities and the protection of watershed.

## Mitigation scenarios results

In table 4, the key activities for mitigation in the forest and peatland sector are displayed and the most important results are given in table 5.

**Table 4: Scenarios description according to activities**

		Scenarios				
		BAU	Peat	SFM	RED	Plantations
Emissions reduction from	Peat		4	4	4	4
	SFM			4	4	4
	RED				4	4
	Plantations					4

<sup>10</sup> It is very difficult to estimate the mitigation impact of rehabilitation and social forestry plantations efforts as no monitoring of plantation growth is made after 3 years, so no fair estimation of mitigation is possible. MoF announces results in ha which are a mix of full plantations, enrichment and agroforestry plantations. 0.83 million ha a year is an effort, which should be re-assessed considering the society needs and the cost associated. Past experiences show that a total of 0,3 million ha a year for these two categories of plantations is already a challenging target.

<sup>11</sup> About 4 trillion IDR per year from the central government plus another 8 trillion a year from private investors and local government budgets.

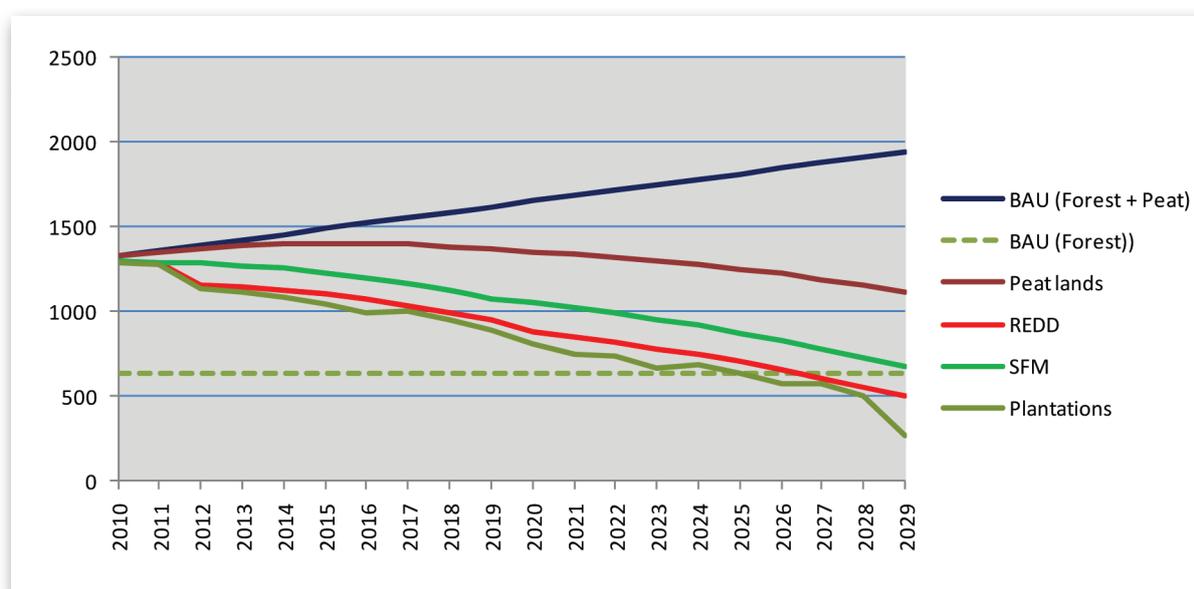
**Table 5: Mitigation scenario key results**

Sector / scenario	Cumulative	Cumulative Emission Reduction (MtCO <sub>2</sub> )	Total Mitigation Cost	Abatement Cost [USD/tCO <sub>2</sub> ]
	BAU		[billion IDR]	
	(MtCO <sub>2</sub> )			
Peat		6379	266	4,2
SFM		5300	53	1,0
RED dry land		2760	55*	2,0
Plantations		1270	241	19,0
<b>Total</b>	<b>32722</b>	<b>15708</b>	<b>615</b>	<b>3,9</b>

\*Cost estimated

### Scenario discussion

By 2019 an emission reduction of 727 MtCO<sub>2</sub> per year can be produced with the assumed scenarios, which would allow meeting the RAN-GRK objective (figure 1).



*Note on figure 1: the cumulative emission reduction is the area between lines BAU (Forest + peat) and plantations.*

Figure1: Annual GHG emissions reduction (Mio TCO<sub>2</sub>) for the forest and peat sector scenarios

However this achievement will depend on consistent national policies to protect forests and the development of forest management units at local level that. Following this assumption, 65 million ha of permanent forest land will be attained by 2019 and 100 million ha by 2029. The results could decline for instance to 352 MtCO<sub>2</sub> per year by 2019 if the development of forest management units would be limited to 20 million ha of permanent forest land in that year. This would be far below the RAN-GRK objective for forest sector and peat<sup>12</sup>.

By 2020, with these scenarios and preconditions in place, the forest and peat sector will emit only one fifth of its emissions compared to 2010 (figures 1 and 2).

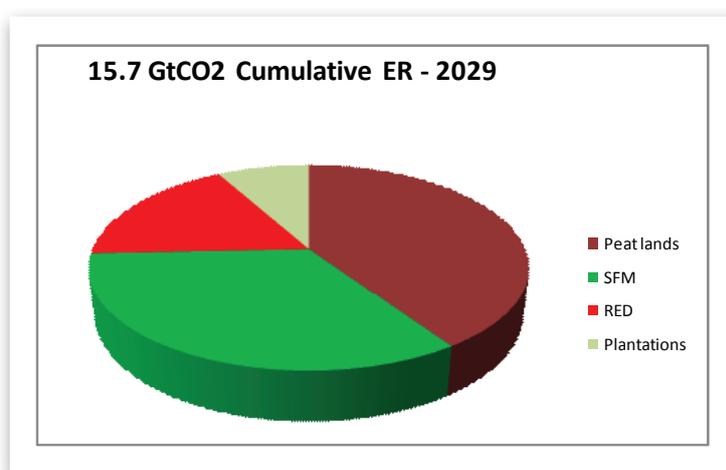


Figure 2: Cumulative emissions reduction

These scenarios show some preliminary priorities: peat lands over dry lands, within dry lands to focus first on sustainable forest management and law enforcement, then land allocation and plantations for wood production and last plantations for rehabilitation. But these priorities should be adjusted to local contexts.

Mitigation strategies should be elaborated in synergy to development and adaptation goals. For instance if a mitigation strategy denies access to resources to local communities, it would create conflicts.

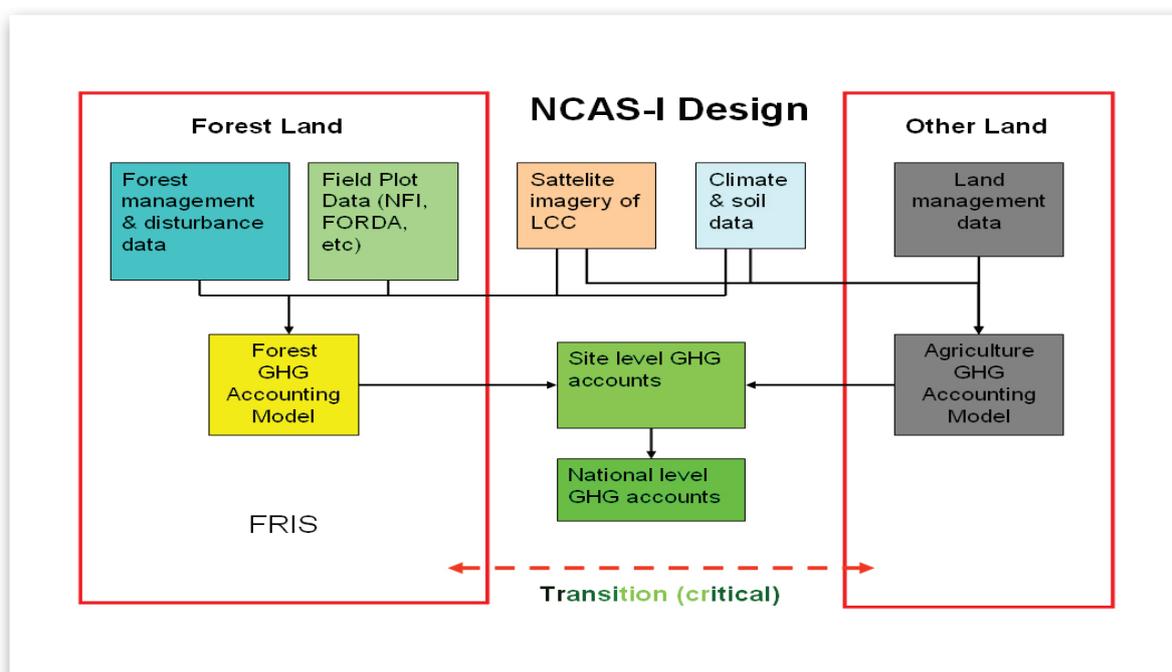
<sup>12</sup> RAN-GRK objective for forest sector and peat lands is an emission reduction of 672 MtCO<sub>2</sub> per year to contribute to the 26 % Indonesian GHG emissions reduction by 2019.

In this regards, the clarification of land rights, which precede forest management units (KPH) establishment and the possibility to provide clear rights to local communities and local entrepreneurs to access forest land are very important steps to find synergies between development needs, adaptation and mitigation efforts. Forest management units' development will enable to take more decisions locally which will facilitate finding synergies between adaptation and mitigation strategies and between sustainable forest management and local communities' development needs. Such approach requires platforms for negotiation at local level to further discuss and define rights roles and responsibilities and make some parts of mitigation decisions locally.

### **Monitoring, Reporting, and Evaluation**

All the mitigation activities need to be supported by a monitoring system for forest carbon stock changes and associated emissions and removals.

The reporting system used by Indonesia is the Revised 1996 IPCC Guidelines for LULUCF (Land Use, Land Use Change and Forestry) and the more recent 2006 IPCC Guideline for AFOLU (Agriculture, Forestry, and other Land Use). The Ministry of Forestry has designed a monitoring system for practical/supportive use on decision-making. The system is called the Forest Resource Information System (FRIS). The National Carbon Accounting System (NCAS) is also designed in accordance with the guidelines provided by UNFCCC (See Figure 3). In the light of the forthcoming requirements for Measurable, reportable, and verifiable (MRV) emissions reduction, Indonesia should prepare itself for a more frequent measurement and associated reporting system for carbon stock changes and GHG emissions and removals from LULUCF. Such a system might be designed to measure the effect of mitigation activities in relation to the national reference emissions level and possibly detect leakage and non-permanence. Furthermore, streams of payments, credits, supportive and enabling activities (e.g., capacity building, technologies introduced) might be subject to MRV, if internationally supported. Generally, methods will have to be developed that allow the measurement and reporting of mitigation actions in the forest sector. These methods will have to be synchronized with the national system of MRV.



**Figure 3:** National Carbon Accounting System

Forest management data are required to produce emissions reduction accurate enough to allow emissions reduction credited at local level. This will be supported by the development of KPHs on the field, where trained foresters will monitor the forest and gather data from management, which in turn might feed into an MRV system.

## 5 Recommendations for Roadmap 2010-2029

### Recommendations for adaptation priority programs (2010 – 2029)

Considering the estimated vulnerabilities of the Indonesian forest sector, the potential adaptation programs in the forest sector should be targeted to increase the resilience of forest ecosystems and local communities to extreme natural events as well as the sector's adaptability to the negative impacts of climate change. Accordingly, forestry programs are linked to forest resource preservation, forest dependent communities and actors, and sustainability of forest businesses. The implementation of these activities also supports the success of mitigation programs (i.e., addressing permanence). Adaptation priority programs are directed at accomplishing: forest resource conservation and preserving the potentials of biodiversity, research on e.g. germ plasma, enhancing the potentials and value of natural biotic resources to maintain the role of forestry in national development and the revitalization of river catchment areas.

The detailed activity recommendations are as follow:

**Strengthening vulnerability analysis.** The roadmap contains the first attempt to assess the vulnerability of the Indonesian forest sector at national level. In order to design specific activities for the adaptation of the forest sector over the following two decades, it becomes apparent that more data and information are required to be able to undertake the following suggested steps towards a more detailed vulnerability analysis:

- Downscaling from the macro level (large scale climate models) to local level by applying appropriate models and assessment tools,
- Mapping expected climate change impacts: GIS mapping of expected hotspots of vulnerability and climate change risks and overlay with forests in current critical conditions,
- Building an adaptation strategy for the three areas identified: forest resources, forest dependent people and forest industries.

**Forest resources – Biodiversity.** The vulnerability assessment could result into the following measures: adjustment and expansion of National parks and wildlife reservoirs, revitalization of riverbanks, expanding maritime preservation area. Lessons learnt can be drawn from screening and assessing existing programs for biodiversity conservation and community empowerment according to their ability to address vulnerabilities and hazards.

**Coastal zones.** It should be planed research on impacts of seawater frequency, on adaptive strains of mangroves, and on ways to enhance mangrove-ecosystem conservation and restoration efforts.

**Impacts on forest industries.** Research and strategy building are needed on forest product diversification to increase economical resilience of the sector.

**Development of neighboring communities capacities:** is needed to enhance communities' capacities to take collective decisions about renewable resources, to organize and manage conflicts, to clarify role and responsibilities at their level, to make certain forest management rights for managing forest. This can be summarized by institutional strengthening and developing platforms for negotiation to let some strategic decisions made at local level with local communities. Interactions between these platforms with KPHs should be designed.

**Adaptive forest management at local level.** Strengthen applied research on KPH level, and introduction of adaptive forest management at KPH level.

**Forest health.** Development of forest health monitoring (forest including plantations and growth monitoring is a cross cutting issue as needed for mitigation) means equip KPHs with a monitoring team and MoF structure with a monitoring system.

## **Recommendations for mitigation priority programs (2010 – 2029)**

**MRV and forest growth monitoring.** Managing forest wood stocks and forest assets is relatively new in Indonesia, monitoring wood stocks and plantations growth is not yet a routine, so managing carbon is challenging and requires efforts and new approaches regarding forest management. In consequence, to allow measuring the results of the mitigation activities described above, the existing monitoring systems should be adjusted for the issues of climate change under the UNFCCC (Monitoring, reporting and verification, MRV). To contribute to this future system of “Measurement, reporting and verification regime”, the Ministry of Forestry should further develop a monitoring system gathering forest management data.

**Peat.** In order to mitigate peat land emissions, a policy focused on peat carbon needs to be developed that addresses: (a) institutional issues, (b) policy instruments within and outside of the forest estate, (c) methodologies and systems for MRV emission reductions, (d) national peat land carbon accounting, (e) policies and mechanisms for fiscal incentives and equitable sharing of carbon-related revenues.

A critical point to highlight in terms of national policy is that Indonesia’s peat and lowlands are home to millions of people, many of whose families have used and depended on the forests and natural resources of these areas for centuries. Past studies have highlighted that these communities often have relatively high levels of poverty and can be caught in a spiral of poverty and environmental degradation. Policies to address peat emissions in Indonesia will ultimately need to be “people- focused” and in particular address issues such as community land rights, local livelihoods and the broader economic development of Indonesia’s 40 million hectare lowland area, within which the majority of its peat lands are found.

**Sustainable forest management and forest management units (KPHs).** In the forestry sector, at constant budget, development of KPHs should be prioritized. Weak governance system, as well as lack of forest rangers, facilitates cases of illegal logging and fires, which lead to further source of forest degradation and unplanned deforestation. KPHs will give to Indonesia the capacity to control and manage its extensive 110 million ha of forest land. Land tenure and demarcation should be clarified and human capacities be developed in order to facilitate controlled access on forest lands to neighbouring communities, allow local development and prevent conflict. Budgets and human capacity development shall be provided at national and sub-national levels in a constant way as to allow for rapid and continuous development of KPH. This activity conciliates climate change objectives with development objectives. If developed fast enough during the period 2010-2019, it will boost efficiency of other forest mitigation activities during 2020-2029 period. It will help to collect taxes revenues from forests. In this sector, it is the most cost efficient state budget allocation on medium and long term.

**REDD.** Activities for reducing emissions from deforestation and degradation (REDD), including peat land degradation, are promising mitigation measures. It is far more effective to avoid deforestation than to rehabilitate forestland, as the scenarios have shown.

Leakage<sup>13</sup> and non permanence<sup>14</sup> are major threats to REDD implementation. The system of carbon national accounting and MRV associated to law enforcement could detect and prevent leakages at National level. KPHs should address the risk of non-permanence as the KPHs are conceived to manage the forest sustainably and so the carbon stock. There is a risk that illegal activities moved from places where KPHs has been developed to other places where they have not yet been (i.e., leakage); this should be tightly monitored. Development of KPHs is key regarding REDD and should be done as fast as possible to avoid both leakage and non-permanence.

The successful implementation of REDD requires establishing a number of activities at national/subnational levels, based on the national REDD strategy. REDD implementation requires institutional and human capacities and effective control over forest land, which means efforts in KPHs development and local community capacity building. A national and subnational REDD architecture includes:

- National reference emissions level
- Establishment of MRV system at national level
- Institutional building and development (national registry, national – local level roles and responsibilities, incentive systems, payment mechanisms)
- Communication (information, data, awareness etc) and capacity development (for monitoring and reporting, negotiation and testing of REDD mechanisms)
- Demonstration activities (local level).

Amongst the activities, which can be carried out under the REDD strategy are:

- Land swaps from carbon rich peat lands and/or natural forest to forest with no forest cover on dry land,
- Options to supply the requirements of the pulp and paper industry. As to shift from harvesting native mixed tropical hardwoods to wood from communities and small holders' owned pulpwood plantations grown on degraded forest and agricultural lands ( e.g. along along grasslands).
- Production Forests, protected areas, oilpalm, Peatland REDD strategy development

**Forest plantations.** Rehabilitation activities should be focused in order to increase the efficiency of this activity and to use state budgets wisely. During the period of the first RPJM (2010-2014) it should be targeted to forestland in place where KPHs have already been established and outside forestland with communities and private entrepreneurs, where market forces support plantations activities. Rehabilitation activities could come in force in following periods on forestland along with the development of KPHs.

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<sup>13</sup> The risk that REDD activities merely displace deforestation

<sup>14</sup> Lower emissions at current time, followed by higher emissions later

HTI-HTR plantations should be prioritized during the first period as they are more efficient in terms of mitigation than rehabilitation activities. HTI can be developed at a moderate cost for the state, as most of this cost is borne by the private companies. HTI could be facilitated by the development of KPHs as land security is a key incentive to attract investors in plantation business.

According to criteria of effectiveness and efficiency, mitigation priorities at national level for the LULUCF sector are in the following order: Peat, SFM, REDD, plantations. Wood plantation to supply wood industries should be prioritized upon plantations for rehabilitation purposes as the first is pro-job and pro-growth and offers a substitute to wood from natural forest for supplying industries. The development of KPHs should be at the top of the mitigation priority list as it contributes to law enforcement, enhanced forest governance, increase efficiency of all mitigation activities and will ease communication and partnerships with local communities.

Any mitigation strategies should be preceded by the clarification on land rights, roles and responsibilities on land and resources as this would later facilitate mitigating conflict at local level and finding synergies with development and adaptation strategies. Furthermore at local level, some platforms of negotiation should allow local stakeholders to readjust National strategies according to local priorities.

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