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Policy forum: Institutional architecture and activities to reduce emissions from forests in Indonesia☆

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ABSTRACT

The Government of Indonesia has developed the institutional architecture to deliver the emission reductions commitments stated in its Nationally Determined Contribution (NDC) submitted to the UNFCCC. It has also indicated a range of policies and activities that will be implemented to deliver those commitments. This paper outlines the architecture and provides an initial analysis of proposed activities to reduce emissions. It is found that proposed activities fall significantly short of the emissions reduction committed in the NDC. Policies and activities with the potential to further reduce emissions are highlighted drawing on the findings of the papers published in the Special Issue on Landuse Change in Indonesia.

1. Introduction

In its Nationally Determined Contribution (NDC), Indonesia has committed to reduce emissions of greenhouse gases (GHG) against a business as usual scenario by 2030 unconditionally by 29% and conditionally (i.e. with external financial support such as for REDD+) by up to 12% Tacconi (2018). The forestry sector is expected to contribute about 59.6% of the unconditional reduction in emissions and about 60.5% of the conditional reductions (Government of Indonesia, 2016). The Government of Indonesia (GoI) has established the institutional architecture to support the implementation of policies and activities aimed at delivering these commitments. It has also identified the key activities to achieve the reductions. In this paper, we describe the architecture and provide an initial analysis of the main emission reduction activities planned for the forestry sector. We comment on options and opportunities to boost emissions reduction measures particularly in light of the findings of the papers included in this Special Issue on Land Use Change in Indonesia.

We focus on Indonesia and its NDC for three main reasons. First, the goals of the Paris Agreement on Climate Change cannot be achieved without a significant contribution from forests (Griscom et al., 2017; Rockström et al., 2017), and reductions of emissions from land use, particularly forests, account for a quarter of the reductions pledged by Parties to the Paris Agreement in their NDCs (Grassi et al., 2017). Second, Indonesia's emissions from forests are globally significant as the country is thought to be the second largest emitter of GHG from forest after Brazil (Zarin et al., 2016). In years coinciding with the El Nino Southern Oscillation weather patter, Indonesia has experienced increased emissions from fires (Tacconi, 2016; Zarin et al., 2016), which contribute to making the country the fourth for total emissions after China, USA and India (BAPPENAS, 2019). And, third, analyses of the NDCs are needed to support the countries that implement them as well as to ensure transparency in the delivery of the commitments made in accordance with the Paris Agreement (Winkler et al., 2017).

The paper proceeds by outlining the institutional architecture developed to reduce emissions. It then analyses the activities that have been proposed by the GoI to reduce emissions in the forestry sector during the commitment period to year 2030. It finds that the planned activities fall significantly short of the pledged reduction of emissions from forests. The discussion section draws out the key issues arising from the papers in the Special Issue on Land Use Change in Indonesia that should be taken into account for the planning and implementation of activities aimed at achieving the intended reductions in emissions.

2. The architecture to reduce emissions

The architecture to reduce emissions refers to the institutional 'structure that supports comprehensive actions and delivers carbon

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mitigations outcomes that are effective, efficient and equitable' (Vatn and Angelsen, 2009; p. 57). They also note that the main functions of the architecture relate to responsibility and coordination, channelling international funding, monitoring and reporting, and verification and safeguards. This description of the architecture was developed in the context of REDD+, but it can also be adopted for the overall implementation of NDCs (apart from their international funding aspect).

The Directorate General for Climate Change in the Ministry of Environment and Forestry is the focal point for the United Nations Framework Convention on Climate Change (UNFCCC) and has oversight of policy issues relating to climate change. Indonesia has developed an institutional architecture for REDD+ which is essentially the framework mandated by the Cancun Agreement of the UNFCCC of 2010. The framework includes the following features, as summarised by the Ministry of Environment and Forestry (2018).[1]

In 2012, Indonesia developed a National REDD+ Strategy (Indonesia REDD+ Task Force, 2012) and eleven provinces prepared provincial strategies and action plans. A Forest Reference Emission Level was submitted to the UNFCCC that was assessed in 2016 and a National Forest Monitoring System is now operational. It includes a National Inventory System for Greenhouse Gas Emissions and a National Registry System to account for all actions taken to reduce emissions by all stakeholders. A Safeguards Information System has also been developed and is operational in the provinces of Jambi, East Kalimantan and West Kalimantan. A funding mechanism for REDD+ is included in a regulation issued by the Ministry of Forestry and Environment on *Economic Instruments for the Environment*. This regulation mandates the establishment of a fund which was established with a subsequent presidential regulation on the *Management of the Environmental Fund*. The fund will have several windows to address nature conservation, climate change (including REDD+), and environmental degradation and will be managed by the Environmental Fund Management Agency, which is being established by expanding the mandate of the Forest Development Fund Agency within the Ministry of Environment and Forestry (the latter agency that has been managing the deforestation fund to support the establishment of plantation forests). The Environmental Fund Management Agency will develop criteria and indicators for the distribution of funds. On the basis of the work carried out on emissions reduction architecture, the GoI considers that it has now reached the implementation phase of REDD+, although result-based payments have yet to be received and, in-turn, granted to sub-national entities (Ministry of Environment and Forestry, 2018). In relation to result based payments it is worth noting that Indonesia has submitted a report on achieved emission reductions to the Government of Norway (Ministry of Environment and Forestry, 2019) in the context of their Letter of Intent of 2010 which established a program to reduce emissions from forests. Norway will pay for a portion of the reduced emissions following an independent third-party verification of the report.

Criteria and indicators for result-based payments have been developed in relation to the agreement with Norway,[2] but not for the Environment Fund. Therefore, it is not clear as to how the GoI will use the Environment Fund. Also, the activities that will be supported to reduce deforestation and forest degradation and which will be eligible for REDD+ funding still need to be identified. This is one of the most significant challenges to be addressed. It is clear, however, that the architecture to reduce emissions is in place.

3. Activities planned to reduce emissions from forests

The conditional reduction in emissions pledged by Indonesia in its NDC is uncertain and ranges from 9 to 12% Tacconi (2018). Therefore, the target for conditional emissions reduction from the forestry sector considered in this section is 9%, as implied by Table 1 of the NDC (Government of Indonesia, 2016). The unconditional target for emissions reduction by 2030 against the business–as-usual scenario assigned to the forestry sector amounts to 497 $MtCO_2e$, with a further reduction of 153 $MtCO_2e$ as a contribution to reaching the conditional emissions reduction target.

The approach to reducing emissions from forests is summarised by the NDC as follows:

> 'Indonesia has taken significant steps to reduce emissions in land use sector by instituting a moratorium on the clearing of primary forests and by prohibiting conversion of its remaining forests by reducing deforestation and forest degradation, restoring ecosystem functions, as well as sustainable forest management which include social forestry through active participation of the private sector, small and medium enterprises, civil society organizations, local communities and the most vulnerable groups, especially adat communities (Indonesia: *Masyarakat Hukum Adat*, internationally known as Indigenous People), and women – in both the planning and implementation stages. A landscape-scale and ecosystem management approach, emphasizing the role of sub national jurisdictions, is seen as critical to ensure greater and more enduring benefits from these initiatives.' (Government of Indonesia, 2016, pp. 3–4).

The main activities identified by the GoI to reduce emissions are a reduction in deforestation, reforestation of degraded land, and rehabilitation of peatland (Government of Indonesia, 2016). The assumptions used for the planning of these activities are not sufficiently clear in the NDC (Wijaya et al., 2017a). However, they have been further detailed by the GoI (Kementerian Lingkungan Hidup dan Kehutanan, 2017) and we rely on that source to analyse the activities.

Deforestation has been projected at 0.82 million ha per year between 2021 and 2030. The GoI intends to reduce deforestation to 0.325 million ha per year, which implies a reduction of 0.495 million ha per year (Government of Indonesia, 2016). This reduction in deforestation would deliver a yearly reduction in emissions of about 157.9 $MtCO_2e$. This calculation is based on the assumption that emissions from deforestation are about 319 tCO_2e/ha (Kementerian Lingkungan Hidup dan Kehutanan, 2017).

The NDC's plan to reforest 12 million ha of degraded land is one of its key activities and has assumed a seedling survival rate of 90%. This is extremely high, particularly when compared to the current survival rate (Table 1).[3] Therefore, the simulation assumes that the survival rate will be progressively improved to reach 90% by year 2030 (a rather optimistic assumption that will need to be assessed in detail as the reforestation program progresses). A significant issue to be noted is that the simulation assumes that reforestation delivers an enhanced carbon stock in the year when it takes place. In practice, the increase in the carbon stock takes place over several years as vegetation mass develops. Therefore, the total increase in the carbon stock calculated in the simulation in Table 1 will take place over a much longer period of time and well beyond 2030, the final year of the commitment period.

The NDC indicates that two million hectares of peatland will be restored by 2030. Peatland restoration is assumed to take place at a rate of about 150,000 ha per year starting in 2018 (Table 2), and have a success rate of 90% as stated in the NDC (Government of Indonesia, 2016) It is not specified how *success* will be measured. For our purpose, we can assume this means that the peatland in question will be restored in a way that avoids further emissions and even enhances carbon stocks

[1] See Ekawati et al. (2019) for more details about policies and regulations concerning REDD+.

[2] https://www.norway.no/contentassets/8b319959d6e5489483f0d924281fdf55/mrv_protocol_final.pdf

[3] It needs to be noted that survival rates can be as low as 20% (Boer, 2001).

Table 1
Simulation of carbon stock enhancement from reforestation of degraded land.

Year	NDC target			Business as usual			Net increase	
	Area (M ha)	Survival rate (%)	Effective area (M ha)	Area	Survival rate (%)	Effective area (M ha)	Area (M ha)	Carbon stock ($MtCO_2e$)
2016	0.8	30	0.24	0.49	30	0.15	0.09	10.64
2017	0.8	30	0.24	0.49	30	0.15	0.09	10.64
2018	0.8	30	0.24	0.49	30	0.15	0.09	10.64
2019	0.8	35	0.28	0.49	30	0.15	0.13	15.21
2020	0.8	40	0.32	0.49	30	0.15	0.17	19.79
2021	0.8	45	0.36	0.49	30	0.15	0.21	24.37
2022	0.8	50	0.40	0.49	30	0.15	0.25	28.94
2023	0.8	55	0.44	0.49	30	0.15	0.29	33.52
2024	0.8	60	0.48	0.49	30	0.15	0.33	38.09
2025	0.8	65	0.52	0.49	30	0.15	0.37	42.67
2026	0.8	70	0.56	0.49	30	0.15	0.41	47.25
2027	0.8	75	0.60	0.49	30	0.15	0.45	51.82
2028	0.8	80	0.64	0.49	30	0.15	0.49	56.40
2029	0.8	85	0.68	0.49	30	0.15	0.53	60.97
2030	0.8	90	0.72	0.49	30	0.15	0.57	65.55
Total	12.0		6.72	7.35			4.51	516.51

Source: Derived from (Kementerian Lingkungan Hidup dan Kehutanan, 2017).

Table 2
Simulation of reduced emissions/carbon enhancement from peatland restoration.

Year	NDC target			
	Restored area (M ha)	Success rate (%)	Effective area (M ha)	Reduced emissions ($MtCO_2e$)[a]
2016	0.025	90	0.0225	13.21
2017	0.025	90	0. 0225	13.21
2018	0.150	90	0.1350	79.25
2019	0.150	90	0.1350	79.25
2020	0.150	90	0.1350	79.25
2021	0.150	90	0.1350	79.25
2022	0.150	90	0.1350	79.25
2023	0.150	90	0.1350	79.25
2024	0.150	90	0.1350	79.25
2025	0.150	90	0.1350	79.25
2026	0.150	90	0.1350	79.25
2027	0.150	90	0.1350	79.25
2028	0.150	90	0.1350	79.25
2029	0.150	90	0.1350	79.25
2030	0.150	90	0.1350	79.25
Total	**2.000**		**1.7775**	**1056.67**

Source: Derived from (Kementerian Lingkungan Hidup dan Kehutanan, 2017).
[a] The amount of reduced emissions is calculated in the original source by using data from Agus and Subiksa (2008).

to achieve the assumed reduced emissions/carbon enhancement.

Large scale peatland rehabilitation has yet to be carried out in Indonesia, and, therefore, significant research and actual implementation work will need to be undertaken to establish the extent to which the target for restoration set-out in the NDC, as well as success rate and actual emissions reduction, can be practically achieved. It is important to note two issues. First, the GoI has already mandated the Peat Restoration Agency to restore two million hectares of peatland by 2020. A senior official of the Ministry of Environment and Forestry was questioned about whether the peatland to be restored according to the NDC was additional to that of the Peat Restoration Agency.[4] The answer was that the GoI has committed to restoring two million hectares as part of its NDC. Therefore, it would seem that the area to be restored that was included in the NDC is the same that was already announced as part of the establishment of the Peat Restoration Agency. In turn, this implies that the mandate of the Peat Restoration Agency would not be realised by 2020. In relation to the amount and timing of the reduction in emissions, it should be noted that an area of peat restored in a given year could not be expected to deliver all the carbon benefits in the same year if it involved the replanting of swamp forest. Therefore, not all the reduced emissions/enhanced stocks reported in the simulation (Table 2) would eventuate during the period considered.

Second, before summarising the results of this section it is worth noting that Indonesia's Third National Communication to the UNFCCC (Republic of Indonesia, 2017, p 142a) states that peat fires in unmanaged lands will be removed from the GHG inventory. Peat only burns when it has been degraded (that is, managed at some stage even if not appropriately) by some actors. Therefore, the definition of "unmanaged" when peatlands have been abandoned without being restored is arbitrary. Moreover, removing this source of emissions from the inventory would reduce apparent emissions from the accounts but would do nothing to address one of the major sources of anthropogenic emissions in Indonesia.

We now consider how the planned reduction in emissions and enhancements of carbon stocks compares to the emissions reduction for the forestry sector set out by the GoI for the year 2030. For the sake of simplicity, we assume that the emissions reduction and carbon enhancement activities summarised in Tables 1 and 2 for year 2030 will all accrue to that year. As discussed earlier, it is unlikely that this will be the case. However, it is also possible that some carbon stock enhancements from activities implemented in earlier years could accrue to year 2030.

The emissions reduction and carbon enhancement activities presented in the NDC and further detailed in Kementerian Lingkungan Hidup dan Kehutanan (2017), fall short of the 2030 unconditional emissions reduction target for the forestry sector (Table 3). Given this shortfall, we assigned all planned emissions reduction activities to the unconditional target. Therefore, the conditional target would not yet have any clearly planned activities. If some of the reduced emissions from deforestation were to be delivered through REDD+ programs, the shortfall in the planned unconditional emissions reduction would increase.

It should be noted that since 2011 the GoI has been implementing a policy on the *Suspension of Granting of New Licenses and Improvement of Governance of Natural Primary Forest and Peatland,* and in September 2018 introduced a moratorium on the expansion of oil palm plantations

[4] The question was raised by the first author at a seminar on peatland in Indonesia held at the Center for International Forestry Research (CIFOR) in Bogor (Indonesia) on 8th August 2018.

Table 3
Emissions reduction targets and planned reductions in year 2030.

	$MtCO_2e$	Percentage of target
Emissions reduction from reduced deforestation	157.9	
Carbon stock enhancement from reforestation	65.55	
Emissions reduction/carbon stock enhancement from peatland rehabilitation	79.25	
Total planned reductions and enhancement	302.7	
Unconditional emissions reduction target	497	60.9
Conditional emissions reduction target	153	0

for a period of three years. It is also expected that the regulation on Suspension of Granting of New Licenses and Improvement of Governance of Natural Primary Forest and Peatland will be made permanent. These policies might support the achievement of the planned reduction in deforestation.[5] However, based on the description of the emission reduction activities prepared by the Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan, 2017), which have been reported above, there is still a gap between them and the targets for the forestry sector presented in the NDC (Table 3).[6]

4. Discussion

Indonesia has made significant unconditional and conditional commitments to reduce emissions of greenhouse gases (Government of Indonesia, 2016; Tacconi and Muttaqin, 2019). The forestry sector is expected to be the largest contributor to these reductions. The institutional architecture required to carry out the reductions (including the institutional elements required to implement REDD+) has been established. While there remains some policy and regulatory changes that would improve the architecture (Ekawati et al., 2019), Indonesia is ready to implement emissions reduction activities including through REDD+.[7] But although Indonesia has made significant commitments to reduce emissions, the activities proposed in the NDC will be sufficient to deliver only about 60.9% of the unconditional emissions reduction target assigned to the forestry sector. By assigning all emissions reduction to the unconditional component, our analysis implies that the activities to achieve conditional emission reductions remain to be identified.

Significant design and implementation problems were experienced by an earlier plan, the National Action Plan for Greenhouse Gas Emissions Reductions, which was implemented between 2010 and 2014. There is little evidence that any of the forestry related activities of this Plan reduced emissions (Meehan et al., 2019). Since then, and as noted above, Indonesia has certainly increased its capacity to monitor and report on its emissions. However, our finding concerning the significant shortfall in the planned reduction of emissions in year 2030 demonstrates the need to consider the lessons arising from the analysis of the implementation of previous plans and programs. The analysis carried out by Meehan et al. (2019) shows that the GoI needs to learn from its past activities and carefully redesign and monitor emissions reduction activities planned for its NDC.

The need for the active participation of the private sector in emissions reduction programs is noted in the NDC, but only in the context of social forestry programs. Consideration should therefore be given to the contribution by the private sector in other types of activities to reduce emissions. Since the private sector is responsible for a significant share of the emissions from the forestry sector, Cadman et al. (2019) provide fine-grained recommendations on how to possibly stimulate the participation of the private sector in REDD+ activities. These recommendations could also be considered in relation to the unconditional reduction of emissions, that is, not supported with international funding for REDD+. Given the significant shortfall between targets and currently planned emissions reduction activities, there is certainly a need to engage the private sector in a dialogue to assess the extent to which it could contribute to reductions in forestry emissions.

The role of sub-national jurisdictions is noted in the NDC. Irawan et al. (2019) stress that all sub-national jurisdictions -from provincial to village-level governance -have a role to play in reducing emissions. Indeed, the GoI is commencing the implementation of jurisdictional REDD+ programs in East Kalimantan and Jambi provinces (Tacconi and Muttaqin, 2019). A question to be considered is the extent to which sub-national governments can be involved in activities aimed at delivering unconditional emissions reduction activities in forestry as well as conditional reductions such as those arising from REDD+ programs similar to those mentioned above. The role of rural communities below the village level in emissions reduction activities should also be considered. Muttaqin et al. (2019) highlight that some communities would be interested in participating in emissions reduction activities that provide incentives (see also Watts et al., 2019a, 2019b) with the potential to improve their livelihoods. Consideration should therefore be given to the extent to which community-based programs can contribute to the unconditional and conditional emissions reduction targets.

As a final comment in regard to deforestation, we note that illegal logging and illegal land clearing are significant sources of emissions in Indonesia (Tacconi et al., 2019). The NDC makes the distinction between planned and unplanned deforestation, the latter presumably referring to illegal land clearing. In calculating the potential reduction of emissions, the NDC also assumes that illegal logging will no longer take place in 2050. Tacconi et al. (2019) suggest that Indonesia consider the lessons arising from Brazil's successful efforts to reduce illegal logging. The establishment by the GoI of the intelligence centre for environmental and forestry law enforcement is in line with the recommendations provided by Tacconi et al. (2019). This centre could support a forestry law enforcement program that should attempt to achieve a significant reduction in illegal logging and illegal land clearing preferably by 2030 rather than 2050 in order to offset some of the shortfall in the planned reduction in emissions identified in the previous section.

The NDC also mentions the significance of social forestry, which would not only be important for the planned reforestation of degraded land but it could also be expected to play a role in the restoration of peatland. Thus, social forestry is important from a climate change perspective as well as for the enhancement rural livelihoods. The GoI is carrying out a significant land reform program which includes 16.8 million hectares of forested land, of which 12.7 million hectares would be allocated to social forestry (Resosudarmo et al., 2019). Some potential implications of the social forestry program for livelihoods, including negative ones, are considered by these authors. Here we highlight potential emissions reduction implications of the land reform program. The analysis by Resosudarmo et al. (2019) reveals that a significant percentage of forest identified for allocation to social forestry in the case study of Central Kalimantan province is situated in peatland areas. Therefore, there is a need to assess the risk that the allocation of peatland to social forestry could increase emissions. This is particularly important in light of the fact that planned emissions reduction activities already fall short of the targets.

If the planned restoration of peatland was successful, it would certainly contribute to a reduction in emissions given that degraded peat

[5] Research on the moratorium introduced in 2011 shows that some deforestation still occurred within forest areas covered by it (Wijaya et al., 2017b), but it had significantly reduced emissions (Busch et al., 2015).

[6] For simplicity, we have assigned all planned and documented emission reduction to the unconditional target. If some of those reduced emissions were achieved through REDD+ and were therefore assigned to the conditional target, the unfulfilled amount of unconditional emission reduction would increase.

[7] See Tacconi and Muttaqin (2019) for examples of projects funded by the Forest Carbon Partnership Fund and the BioCarbon Fund that demonstrate that Indonesia's has reached the implementation stage for REDD+.

and peat fires are significant sources of emissions (Republic of Indonesia, 2017). A concern about the implementation of peatland restoration activity is that it currently appears to be underfunded (Hansson and Dargusch, 2017). It should also be noted that restoration of peatland will only partly reduce the recurrence of land and forest fires and non-restored peatland will continue to pose a significant risk of emissions from fires.[8] Forests on mineral soil would also contribute emissions if they experience fires. Therefore, reducing the occurrence of fires is essential for a significant reduction in emissions. It is encouraging that the GoI has developed an overall plan to address fires. The implementation of the plan should consider the role of the private sector, incentives to communities to reduce fires, and the impacts that a total ban on fires for smallholder agricultural activities will have on livelihoods (Watts et al., 2019a, 2019b).

5. Conclusion

Indonesia has made significant commitments to reduce emissions from forests. However, the activities currently planned to achieve these commitments fall significantly short of targets. The research presented in this Special Issue highlights some issues that should be taken into account in the design and implementation of emissions reduction activities. It also highlights some emission sources that need to be targeted such as illegal logging, illegal land clearing, and fires. The shortfall in planned emissions reduction activities requires that significant research and planning efforts will be required to identify all activities that could achieve the intended reductions committed to in the NDC. Their design and implementation will certainly be influenced by political economy factors which have not been addressed in this Special Issue. These will need to be the subject of future research.

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[8] Fires have social and economic impacts beyond emissions that are very significant (Tacconi, 2016), but are not considered here.