Study on cooperative MRV as a foundation for a potential regional carbon market within ASEAN

Indonesia Country Report

IGES

Regional Collaboration Centre – Bangkok
Promoting Action Against Climate Change

National Environment Agency
Safeguard · Nurture · Cherish

Table of Contents

Abbreviations

AFOLU	Agriculture, Forestry and Other Land Use
ASEAN	Association of Southeast Asian Nations
BUR	Biennial Update Report
CDM	Clean Development Mechanism
CEMS	Continuous Emission Monitoring System
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
DGCC	Directorate General on Climate Change
DJK-KESDM	Directorate General of Electricity, Ministry of Energy and Mineral Resources
ETS	Emissions trading scheme
FOLU	Forestry and Other Land Us
FREL	Forest Reference Emission Level
GHG	Greenhouse gases
GWP	Global warming potential
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
IPSDH	Directorate of Forest Resources Inventory and Monitoring
JCM	Joint Crediting Mechanism
LULUCF	Land Use, Land-Use Change and Forestry
MBI	Market-based instrument
MOEF	Ministry of Environment and Forestry
MOI	Ministry of Industry
MRV	Monitoring, Reporting and Verification
NC	National Communication
NCV	Net calorific value
NDC	Nationally Determined Contribution
NFI	National Forest Inventory
NFMS	National Forest Monitoring System
NRS	National Registry System
PMR	Partnership for Market Readiness
QA	Quality assurance
QC	Quality control
RBP	Results-based payment
SUTRI	Sustainable urban transport
TNC	Third National Communication
UNFCCC	United Nations Framework Convention on Climate Change

Executive Summary

In year 2014, Indonesia's greenhouse gas (GHG) emissions totaled 1,844.3 MtCO2e, as reported in the country's Third National Communication. LULUCF accounted for the largest share of emissions on that year, 53 percent of the total, followed by the energy (33 percent), agriculture (6 percent), waste (5.5 percent) and IPPU (2.5 percent) sectors. Indonesia has ratified the Paris Agreement and submitted its Nationally Determined Contribution, where it made the commitment of reducing GHG emissions by 29 percent in 2030 from the projected business-as-usual (BAU) scenario, having 2010 as the reference year. Emission reductions could go up to 41 percent, subject to the provision of international support in terms of finance, technology transfer and capacity building.

Indonesia has been considering the introduction of carbon pricing instruments, and four design options have been assessed in the context of the World Bank's Partnership for Market Readiness (PMR) programme: i) a cap-and-trade mechanism for the power generation and industrial sectors; ii) an energy efficiency certificate system for industries; iii) a cap-and-tax system for the industrial sector; and iv) a domestic carbon offset mechanism. This assessment was conducted by an international consultancy company, and initial findings were presented in November 2018 to a Working Group (WG) on Market-Based Instruments established under the PMR. This WG is composed of representatives of several line ministries, including the Ministry of Energy and Mineral Resources and the Ministry of Environment and Forestry (MOEF).

The WG considered the first option, the establishment of a domestic cap-and-trade system, as the most fitting to the Indonesian context. This option is also in line with Government Regulation No. 46 of 2017, on environment economic instruments, which sets a mandate for setting up a national ETS by 2024. The option is currently being assessed in detail by the aforementioned consultancy company, with the outcomes of the analysis expected to be finalized in the third quarter of 2019. A piloting stage is one of the planned next steps.

Carbon pricing instruments have been considered in Indonesia alongside the development of a Monitoring, Reporting and Verification (MRV) framework at the facility level for certain sectors. This work has also been carried out in the scope of the PMR programme. In this respect, MRV guidelines and a platform for reporting GHG emissions have been developed for the power generation sector. The guidelines lay out a set of calculation methodologies for estimating GHG emissions at the installation level, including a tiered system to take account of different levels of accuracy in calculations as well as guidance for conducting uncertainty analyses. The reporting platform, named APPLE-GATRIK, was launched in October 2018 and had 168 registered companies, corresponding to 295 power generation facilities and a combined installed capacity of 52,888 MW. The platform was being piloted for the JAMALI (Java-Madura-Bali) interconnected grid, the largest in Indonesia.

An MRV framework was also being developed for the industrial sector. Any industrial facility in Indonesia can report emissions through the so-called SIINAS platform, which was established by Indonesia's Ministry of Industry to collect a pool of information from registered industries in Indonesia. The reporting of GHG emissions has been made possible by the addition of a module to SIINAS, through which industries can submit their emissions data. With respect to the development of MRV guidelines, three industrial sectors are currently being prioritized: cement production, paper & pulp, and fertilizer production. For the latter, guidelines were under preparation in the scope of the PMR programme.

MRV systems are also under development at the sectoral level, in particular on transport and forestry. With regards to the first, Indonesia is currently piloting a Nationally Appropriate Mitigation Action (NAMA) programme on Sustainable Urban Transport. The NAMA aims to promote a wider adoption of sustainable transportation modalities in Indonesian cities, and an MRV framework has been laid out for tracking progress on GHG emission reductions. This framework will be further developed during the piloting phase which is currently under implementation. Indonesia has also taken concrete steps to establish an MRV framework for REDD+. Several key elements have already been developed, namely the establishment of a

Forest Reference Emission Level (FREL) and National Forest Monitoring System (NFMS). More recently, the national government issued two regulations on MRV with relevance to REDD+, in particular Regulation 70/2017 of MOEF, which defines institutional arrangements at the sub-national level for results-based payments on REDD+.

At the national GHG inventory level, MRV procedures are routinely adopted and the inventory is prepared on a regular basis, with roles and responsibilities across ministries and agencies well-defined. The estimation of emissions is based on both tier 1 and 2 approaches of the IPCC, with the ambition of gradually adopting higher tiers. An online platform named SIGN-SMART facilitates the processes of gathering activity level data and the computing of emissions, whereas a QA/QC framework has also been implemented. More recently, Indonesia has developed a National Registry System (NRS). This consists of a web-based platform through which MOEF intends to collect data on mitigation and adaptation from all over Indonesia. The relevance of the NRS is that it is an effort to consolidate all initiatives on climate change in Indonesia as a means of preventing the duplication and overlap of climate-related actions in the future.

All in all, Indonesia has been taking steps to establish a robust national MRV framework, with significant progress on several fronts, either in MRV at the facility-level, in sectoral programmes or in the preparation of national GHG inventories. Nevertheless, there is scope for further work and improvements. A case in point is emission verification standards at the facility level, for instance on the role of independent third-party verification, where a lack of detail vis-à-vis monitoring and reporting guidelines can be observed. Another example pertains to the existence of several platforms for reporting information related to climate change and GHG emissions. While these reporting systems serve different functions and purposes, their convergence and full alignment should be ensured in the future.

1. National Climate Change Context

Indonesia is the largest ASEAN Member states, both in terms of population and land area. It is an archipelagic country consisting of approx. 13,500 islands, out of which only 6,000 are inhabited. The five main islands are Java, Sumatra, Sulawesi, Kalimantan and Papua. Administratively, the country is divided into 34 provinces. As of 2016, Indonesia's population stood at approximately 260 million[1]. Although the population has more than doubled since 1971, its annual growth rate exhibits a decreasing trend (from 1.98 percent in 1980-1990 to 1.38 percent in 2010-2015)[2].

In 2016, Indonesia's GDP at current prices stood at 12,407 trillion Indonesian Rupiah (approximately USD 942 billion)[3], making it the largest economy in all of ASEAN. In the 7-year period of 2010 to 2016, Indonesia's GDP exhibited an average growth rate of 5.5 percent, above the ASEAN average of 5.1 percent for the same period. The services and industrial sectors make the biggest contribution to the national economy of Indonesia, accounting for 46.6 percent and 40.6 percent of the GDP in 2016, respectively.

The latest official figures for Indonesia's GHG emissions are from year 2014 and are presented in the Third National Communication (TNC), which was submitted to the UNFCCC in February 2018. In 2014, the country's emissions totaled 1,844.3 MtCO2e, which includes emissions from LULUCF and peat fire. This represents an increase in emissions of 83 percent in relation to year 2000, when these stood at 1,007.5 MtCO2e. Table 1 displays the national GHG inventory for 2014.

One aspect which stands out from the inventory is the weight of the LULUCF sector in Indonesia's emissions, which accounted for 53.1 percent of the total, at 979.4 MtCO2e, in 2014. Figure 1 displays the breakdown of GHG emissions excluding LULUCF, it may be observed that the share of the energy sector in relation to the three other sectors considered: agriculture, IPPU, and waste, is by far the largest. A breakdown of energy-related emissions is provided in Figure 2, the important contribution of energy industries, manufacturing and transport can be noted in this figure.

Table 1: GHG emissions by source in Indonesia, 2014, in MtCO2e. NE: Not Estimated.

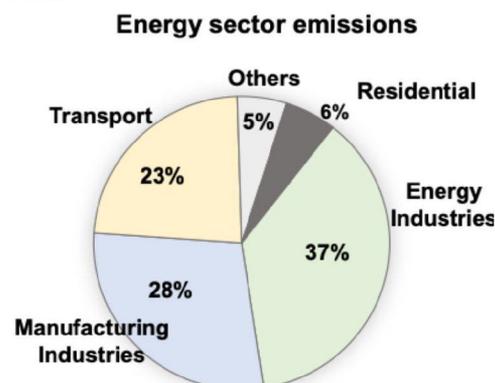| Greenhouse Gas Emission Source	CO_2	CH_4	N_2O	Total (MtCO2e)
Energy	569.1	27.5	5.9	602.5
IPPU	47.0	0.1	0.4	47.5
AFOLU				
Agriculture	6.8	56.0	50.7	113.5
FOLU (incl. peat fire)	979.4	NE	NE	979.4
Waste	2.7	95.9	3.0	101.6
Total	1,605.0	179.3	60.0	1,844.3

Source: Third National Communication (2018)

Figure 1 – Breakdown of GHG emissions in Indonesia excluding LULUCF, 2014.

Breakdown of GHG emissions excluding LULUCF

Agriculture 13%
Waste 12%
IPPU 5%
Energy 70%
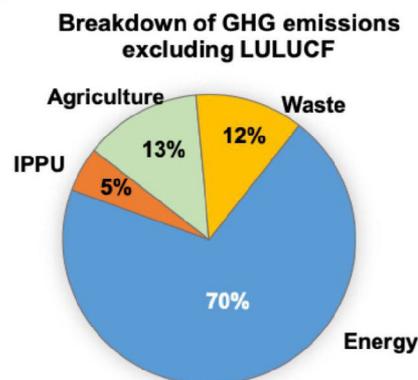
Source: Third National Communication (2018)

Figure 2 -Breakdown of GHG emissions in Indonesia from the energy sector, 2014.

Energy sector emissions

Transport 23%
Others 5%
Residential 6%
Energy Industries 37%
Manufacturing Industries 28%

Source: Third National Communication (2018)

1   ASEAN Statistical Yearbook 2016/2017.
2   Indonesia's Third National Communication, 2018.
3   ASEAN Statistical Yearbook, 2016/2017. Exchange rate used as of 30 June 2016.

Indonesia submitted its Intended Nationally Determined Contribution (INDC) on September 24, 2015. The INDC was then reformulated into Indonesia's First Nationally Determined Contribution (NDC) on October 2, 2016, following the ratification of the Paris Agreement[4]. In its pledge, Indonesia committed to reduce GHG emissions by 29 percent in 2030 from the projected business-as-usual (BAU) scenario, which takes the year 2010 as the reference. The level of contribution could increase to 41 percent, subject to the availability of support provided by the international community in terms of finance, technology transfer and capacity building.

In its NDC, Indonesia identified three priority sectors for the reduction of GHG emissions: forestry, energy and agriculture. With regard to forestry, REDD+ is highlighted as an important component of its mitigation pledge, while for energy one of the major priorities is the development of clean energy sources. Mitigation measures considered in agriculture include the adoption of: i) low-emission crops, ii) more water-efficient concepts in water management, iii) improved manure management practices for biogas production, and iv) new dietary regimes to reduce emissions from enteric fermentation from cattle production. The NDC also identifies specific measure for reducing emissions in the waste sector, which are to be guided by the adoption of policies aligned with the principles of reducing, reusing and recycling (3R)[5]. In addition to this, sectoral plans and targets have been developed to support the achievement of the NDC pledge.

Indonesia's mitigation target for 2030 builds on an earlier pledge, of reducing emissions by 26 percent on a voluntary basis by 2020 in relation to a business-as-usual (BAU) scenario (or 41 percent with international assistance). This served as basis for the issuance of two key policy and legal instruments on climate change in Indonesia: Presidential Decrees No. 61/2011 and 71/2011. The first is the National Action Plan for GHG Emission Reduction, or "RAN-GRK", and is a decree which provides guidance to both national ministries (on planning, implementation and monitoring of GHG emissions) and provincial governments (in the formulation of regional action plans for climate change mitigation). Presidential Decree No. 71/2011 pertains to the implementation of the national GHG inventory, and mandates different bodies of the government to produce national and sub-national GHG inventories on an annual basis. In addition, the most recent Medium-Term Development Plan (RPJMN) of Indonesia, for the 2015-2019 period, specifies that the foundation for the country's prosperity and development is green growth, and sets specific targets in support of those previously laid out in the RAN-GRK.

The Ministry of Environment and Forestry (MOEF) is Indonesia's focal point for all issues related to climate change, including mitigation. Among its roles and responsibilities, MOEF takes the lead in the formulation of national policies, strategies and programmes on climate change, is vested with the task of preparing National Communications and Biennial Update Reports, and acts as the national focal point to the UNFCCC. The Directorate General of Climate Change (DGCC) is the organizational unit within MOEF with the purview of climate change issues.

---

4   First Nationally Determined Contribution, Republic of Indonesia, 2016.
5   Ibid.

2. Analysis of national MRV system

2.1 Carbon pricing status and outlook

Indonesia has not yet adopted any carbon pricing instrument , but the national government recognizes the potential role these instruments can play in support of national mitigation targets. In this regard, the issuance of Government Regulation No. 46 of 2017, on Environment Economic Instruments[6] needs to be underscored . This regulation lays out the basic framework for exacting penalties to any party that causes pollution or damage to the environment. The regulation does not specify the type of incentive/penalty for the preservation/damage inflicted to the environment, as this will be regulated under more specific provisions to be issued by each technical Ministry. Nonetheless, government regulation 46/2017 is the policy basis for the introduction of carbon pricing instruments in Indonesia. More specifically, it sets the mandates for establishing an ETS by 2024[7].

Indonesia is considering the establishment of a domestic carbon market, and different options and design architectures are currently under assessment. Among activities being carried out in this field, the work conducted in the scope of the World Bank's Partnership for Market Readiness (PMR) programme should be noted. The PMR is supporting the government of Indonesia in three main areas: i) exploring the viability of market-based instruments (MBIs) in the Indonesian context; ii) establishing the necessary "infrastructure" for domestic carbon markets; and iii) piloting an MRV framework for the power generation sector and industry[8]. Indonesia's focal agency for the PMR is the Coordinating Ministry for Economic Affairs (CMEA).

The implementation of the programme started in early 2017 and is slated for completion in June 2019. It consists of four key components: i) the preparation of GHG emissions profiles for the power generation and industry sectors; ii) the setting-up of MRV systems for both sectors; iii) initiating preparations to pilot these MRV systems; and iv) development of a market-based instrument framework with an assessment of options for implementation[9]. In addition, the Indonesian PMR has established three technical working groups (WGs) on Power, Industry and MBIs. The activities of these WGs are relevant to the topics considered on this study, as they are supporting Indonesia in the establishment of MRV systems at the facility-level and in the design of carbon pricing instruments.

As part of the work under the PMR, four MBIs have been assessed: i) an ETS for the power generation and industrial sector; ii) an energy efficiency certificate system for the industrial sector; iii) a cap-and-tax system for the industrial sector; and iv) a carbon offset mechanism. These MBIs were identified based on the recommendations of an initial scoping study, which found that these would be the most adequately aligned with the specific circumstances of Indonesia and its policy framework, namely existing policies on energy efficiency, renewable energy deployment and targets for the reduction of GHG emissions. This initial assessment led, for example, to the exclusion of an economy-wide carbon tax, which was considered particularly challenging to implement in Indonesia, as it would require strong political backing and a lengthy approval process through Parliament. This could take years to finalize.

With funding from the PMR programme, Deloitte Tohmatsu (Japan) was commissioned to conduct an assessment of the four abovementioned MBIs. For each of them, the study elaborates on the basis of considering their introduction (e.g. as instruments to support certain policies or regulations), the recommended institutional architecture (e.g. which line ministry should take the coordinating role), as well as potential benefits and drawbacks deriving from implementation. As part of the assessment, a computable general equilibrium (CGE) modelling study was carried out to estimate the macro-economic impacts of each of the four instruments to the national economy.

The first option considered was a cap and trade mechanism for power generation and three industrial sectors: cement, fertilizer and pulp & paper. Under

6   New Regulation On Economic Instruments In Environmental Matters, 2017.
7   Indonesia PMR: Country Program Update, 2018.
8   PMR Programme Indonesia.
9   PMR Indonesia Project Implementation Status Report, October 2018.

this architecture, the study's recommendations is for MOEF to fulfil the role of regulator, with the establishment of an MRV framework highlighted as a key success factor for implementation. With regard to option ii), the energy efficiency certificate system, the study established its full alignment with existing policies in Indonesia on industrial energy efficiency and conservation. The main drawback identified is that "rewarding" the most energy efficient facilities would not necessarily have a correspondence with the least carbon intensive ones, as fuel types consumed could be markedly different even within the same industry (e.g. coal, natural gas, co-combustion with biomass, etc.).

With regard to the third option, the impact of a cap on the emissions on three industrial sectors – cement, fertilizer and pulp & paper – was studied, with a tax being levied on facilities emitting above that cap. In this configuration, the study's recommendation is for the Ministry of Finance to be the operator of such system, given the inherent taxation component. The fourth option is the development of a domestic offsetting mechanism, whereby the government of Indonesia would issue emission reduction units or credits for every emission reduction delivered by a qualified or eligible reduction project. The issued emission reduction units or credits could then be used by those in need of offsetting emissions. The potential buyers would be the national government, businesses and/or individuals, depending on how the mechanism would be set-up. The study acknowledged that such a scheme could be implemented on a standalone basis, for instance along the lines of Australia's Emissions Reduction Fund mechanism, or in co-existence with other MBIs, such as a cap and trade or cap and tax system. This option also resonates with earlier plans of the government of Indonesia to develop the so-called "Nusantara Carbon Scheme", which was conceived as an alternative mechanism to providing financial support to project based activities along the lines of the CDM following the first commitment period of the Kyoto Protocol (2008-2012)[10].

The analysis of the four MBIs was completed by Deloitte Tohmatsu in November 2018, and a presentation on the findings was made at a meeting of the Working Group on MBIs held on November 13, 2018[11]. Among the results of the assessment, the domestic carbon offset system emerged as exhibiting the lowest impact (negative) to the economy. Nonetheless, members of the WG selected option i), a domestic cap-and-trade, as it was considered to hold the highest potential and fit the best to the Indonesian context. As next steps, Deloitte Tohmatsu would carry out a detailed assessment of this option, which would be the final step preceding the conduct of a piloting stage. This assessment is slated for conclusion in the first quarter of 2019; technical and financial support for piloting activities had not yet been secured[12].

Indonesia's considerable experiences on market based mechanisms and project-level emission reductions initiatives must be noted. At the end of 2018, Indonesia had approximately 160 projects registered by the CDM Executive Board, ten of which consisting of Programmes of Activities. Indonesia has also been a host to projects in the scope of Japan's Joint Crediting Mechanism (JCM), with approximately 50 projects at different stages of development, from feasibility assessment to credit issuance[13].

2.2 MRV at facility level

Indonesia has been developing an MRV system for the power generation and industrial sectors under the scope of the PMR programme. The set-up of these systems was preceded by profiling GHG emissions for both sectors, as one of the four key components of the programme.

With respect to power generation, MRV guidelines were prepared and finalized in May 2018, with the Ministry of Energy and Mineral Resources being the focal point for this work stream. The development of the guidelines was based on international and national good practices for quantifying GHG emissions in power generation[14], and they draw on the principles of transparency, accuracy, completeness, comparability and consistency. The guidelines document provides detailed guidance on GHG emission calculation and reporting

10   See, for example, <https://www.iges.or.jp/en/archive/cdm/pdf/regional/20130306/4_Indonesia_Mr.Dicky.pdf>
11   The authors of the study attended this meeting. The main report is available here.
12   Information based on consultations held in Indonesia on 12 and 13 November, 2018.
13   Status of JCM project development can be accessed from <http://gec.jp/jcm/projects>.
14   These guidelines are publicly available: <www.pmr-indonesia.org/download/134/technical-notes-and-guidance-documents/ 4881/pedoman-igrk-pembangkit-2018.pdf>. International references include Monitoring and Reporting Requirements of the EU ETS, the GHG Protocol, guidelines issued by the United States Environment Protection Agency, etc.

particularly on the following elements: identification of sources and main categories of GHG emissions; emissions scope; methodologies for data collection and GHG emission calculation; reporting of GHG emissions data; preparation of a quality control and quality assurance system (QC/QA) at the facility level; and procedures for calculating the level of uncertainty from the estimation of GHG emissions.

In addition to the guidelines, a reporting system named APPLE-GATRIK (which stands for Aplikasi Penghitungan dan Pelaporan Emisi Ketenaga-listrikan) has been set up and was made operational in August 2018. APPLE-GATRIK is an online platform through which power generation facilities report their emissions. Among its features, the platform enables registered facilities to calculate emissions in a standardized manner through the insertion of activity data and emission factors. As of mid-November 2018, 168 companies were registered in APPLE-GATRIK, corresponding to 295 power generation facilities and a combined installed capacity of 52,888 MW. This equates to more than 95 percent of the total grid-connected power generation capacity of Indonesia. The platform was also being piloted for the JAMALI (Java-Madura-Bali) interconnected grid, the largest in Indonesia.

The reporting of GHG emissions in the power generation sector is still voluntary. Even though power generation companies have been described to be fairly receptive to the reporting of GHG emissions, the MRV system will only be "complete" with the issuance of regulations that make reporting mandatory. In this regard, two regulations which will establish the legal basis for MRV in power generation are currently in the works. These will consist of a Ministerial Regulation on GHG inventory and mitigation in the energy sector, and an Electricity Decree on guidelines on MRV and mandatory reporting system[15].

Table 2 below (continued on the following page) captures the main features of the MRV guidelines prepared for the power generation sector.

Table 2: MRV guidelines at the facility level for power generation facilities in Indonesia[16]

Measurement and monitoring of emissions	
Scope	• Emissions of CO2, CH4, and N2O from fuel combustion; • Only direct emissions (scope 1) are to be reported (e.g. burning fuel in boilers, diesel, generator sets, gas engines, etc.); • Control approach whereby GHG emissions are reported by the company(ies) that has(have) operational control over the power generation unit.

GHG emissions quantification methods/ approaches	• Four methods can be applied for estimating GHG emissions:
	
	  o **Method 1**: in the absence of data on the NCV of the fuel that is combusted, national default factors can be used in the calculation of CO2 emissions for coal, natural gas and fuel oil (tier 2 under IPCC guidelines). In the case of emissions of CH4 and N2O, IPCC default values can be used (tier 1 of the IPCC).
	
	  o **Method 2**: used in case there is data available at the facility level to calculate the emission factor of the fuel. If data on NCV is available but not of the oxidation factor, this data can be obtained either from national default factors (for CO2 emissions) or IPCC guidelines (for CH4 and N2O).
	
	  o **Method 3**: can be used in case information is available on the oxidation factor, fly ash and bottom ash of the combustion process. Emission factors from biomass-based fuels, as well as CH4 and N2O emissions need to use default values of the IPCC.
	
	  o **Method 4**: pertains to the use of Continuous Emission Monitoring Systems (CEMS) to measure CO2 emissions. It can only be approved if the measurement takes place at least during 97.5% of the time the power plant is operating. In the case of emissions of CH4 and N2O, IPCC default values should be used (tier 1 of the IPCC).

15 Indonesia PMR: Country Program Update, 2018.
16 Available in Bahasa Indonesia from <www.pmr-indonesia.org/download/134/technical-notes-and-guidance-documents/ 4881/pedoman-igrk-pembangkit-2018.pdf>. Summary of guidelines made with the assistance of Google Translate.

Table 2: MRV guidelines at the facility level for power generation facilities in Indonesia (contd.)

Data requirements	• GWP based on the Second Assessment Report of the IPCC (1995), with GWP (CO2) = 1, GWP (CH4) = 21 and GWP (N2O) =310.
	
	• A tier system is defined in the guidelines, with each tier level representing differences in quality, accuracy and data uncertainty. The higher the tier used, the more accurate the results of the calculation. Tier 3, the highest available, is in principle required for carbon trading purposes, in case such system is implemented in the future.
	
	  o **Tier 1**: corresponds to the application of calculation method 1 for quantifying emissions, where default factors used are taken from the IPCC, both with regards to the NCV and the emissions factor;
	
	  o **Tier 2**: corresponds to either a) application of calculation method 1 using national emission factors; or option b) application of calculation method 2 whereby specific emissions factors are used (but assuming default oxidation factors are used);
	
	  o **Tier 3**: corresponds to either option a) application of calculation method 2 with specific emission factors available, including carbon content of the fuel, oxidation factor and NCV of the fuel at the level of the generation unit; option b) application of calculation method 3; or option c) application of calculation method 4 (i.e. CEMS).

Monitoring plan	• No monitoring plan is required for covered facilities
Support tools	• The reporting platform APPLE-GATRIK provides a web-based tool that assists facilities in the calculation of emissions based on activity data supplied and emission factors.
Reporting of emissions	
Reporting system and format	• Reporting made online through the APPLE-GATRIK platform; • A set of data needs to be inserted in the online platform according to a certain format, including activity data, emission factors, uncertainty analysis and supporting documents.
Reporting procedures	• Reporting of GHG emissions for each calendar year. For example, data pertaining to year 2017 can only be reported in 2018 or after.
Reporting period	• Data on GHG emissions should be reported since year 2010; • Emissions reporting starts in 2018, and entities are requested to report on emissions on all years from 2010 to 2017.
Reporting timing	• Not specified
Verification of emissions	
Responsible institutions	• Power generation facility; • Parent/head company of the power generation facility; • Directorate General of Electricity, Ministry of Energy and Mineral Resources (DJK-KESDM).
QA/QC and uncertainty assessment	**Quality control (QC):** • QC activities include checking data accuracy and calculations, use of approved standard procedures for calculating emissions, uncertainty estimation, data documentation and reporting; • QC is the responsibility of the power generation company, which needs to appoint an individual to be in charge of QC; **Quality assurance (QA):** • The Quality Assurance (QA) system is a system developed to conduct a review / validation of the GHG emissions data produced at the facility level; • QA of data is carried out by the parent/head company of the power generation facility and DJK-KESDM; • If budget is available, DJK-KESDM may conduct more intensive validation of the data submitted by contracting an accredited auditing body or by inviting experts with credentials in the field. **Uncertainty analysis:** • Needs to be carried out with a confidence interval of 95%; • Uncertainty analysis needs to be conducted on activity data and on emission factors; • A sensitivity analysis and error propagation analysis also needs to be carried out.
Enforcement and penalties for non-compliance	• Not yet available as regulation to make MRV guidelines mandatory is still in the drafting stage.
Verification requirement procedures	• Third-party verification of data submitted by power generation facilities is at the discretion of DJK-KESDM; • The guidelines do not specify verification requirements for third-party verification.

The MRV system in development for the industry sector is being led by the Ministry of Industry of Indonesia (MOI). While the reporting system for the power generation sector was built from scratch, the one for industry is being established based on a platform that has been in operation for several years. This platform was developed "in-house" by MOI and is named SIINAS (Information System for National Industry). The initial motivation for establishing SIINAS was to collect a pool of information from registered industries in Indonesia. The reporting of GHG emissions was introduced through the addition of a sub-module to SIINAS, based on which industries can submit their emissions data. While SIINAS has more than 8,000 industrial facilities registered, so far only some 80 units have reported their GHG emissions. In addition to this, as of November 2018 there were no guidelines available for the reporting of these emissions, leaving to the discretion of the facilities the selection of the calculation methodology. Additionally, GHG data submitted through SIINAS was not subject to any type of verification, either by MOI or an independent third-party.

With respect to the development of MRV guidelines, three industrial sectors were considered: cement production, paper & pulp, and fertilizer production. The first one was not deemed an immediate priority, as specific standards for quantifying GHG emissions are already being followed by the cement production industry in Indonesia. These standards are those developed in the scope of the Cement Sustainability Initiative[17], and UNFCCC approved methodologies for CDM projects in the cement sector. GHG emissions estimated through these standards area already reported as tier 2 data in Indonesia's national GHG inventory.

With regards to the paper & pulp industry, MOI has the intention of developing MRV guidelines due to the fact that they are significant emitters and also in light of their willingness to report on emissions. However, their small number (approx. 25 paper & pulp facilities) and the different production processes employed by these make the development of such guidelines technically challenging and with high transaction costs involved. With the fertilizer industry, the process of developing guidelines was found to be more feasible, as the production processes of facilities in operation in Indonesia are similar and there are just a few major emitters (only 5 units). In view of this, this was the industrial sector shortlisted for the development of MRV guidelines in the scope of the PMR programme. As of December 2018, these guidelines were in drafting stage and under review by MOI[18].

Last but not least, two regulations were under preparation to serve as the legal basis for the implementation of an MRV system in the industry sector. As of December 2018, draft versions were under review by the legal unit of MOI.

2.3 Sectoral and policy-level MRV

The preceding section focused on MRV at the facility level in power generation and industry. This section sheds light on MRV frameworks being established at the sectorial level for transport and forestry

Emissions from transport account for a significant share of energy-related emissions, as shown in the graph of Figure 2. In order to support emission reductions in this sector, Indonesia is currently implementing a Nationally Appropriate Mitigation Action (NAMA) programme on Sustainable Urban Transport (also known as SUTRI NAMA). The aim of this NAMA is to promote the adoption of sustainable transportation modalities in Indonesian cities. The NAMA is currently in the piloting stage, which is funded by both domestic and international sources. In fact, this NAMA was selected for support by the UK/German NAMA Facility, with a total funding volume of 14 million Euro (approx. 15.5 million USD). Funding from national sources, which is provided by the National Planning Agency BAPPENAS and the Ministry of Transport as well as the local government authorities hosting the piloting activities, amounts to 17 million Euro (approx. 18.8 million USD).

SUTRI NAMA will be piloted in 7 cities of Indonesia, where a number of demonstration activities will be implemented. Five cities are already part of the project: Bogor, Medan, Palembang, Solo and Yogyakarta.

---

17 World Business Council on Sustainable Development, Cement Sustainability Initiative.
18 These guidelines are not publicly available yet.

Activities implemented include, for example, the improvement of public transport corridors, the upgrade of bus fleets, and the introduction of demand-side management measures for transport services[19]. One of the main components of this NAMA is the development of an MRV system for tracking progress on mitigation actions implemented. The MRV will not simply track emission reductions, but also co-benefits achieved by the programme and the level of support provided, both domestically and internationally[20].

A blueprint for the MRV of GHG emission reductions is described in the detailed NAMA concept[21]. This MRV concept was prepared during the design stage of the NAMA and is expected to be further detailed and refined over the course of the piloting phase. Despite this lack of detail, emission reductions will be assessed at two levels: i) "direct" mitigation captured at the urban level for the cities that have implemented demonstration projects under the scope of the NAMA; and ii) "indirect" mitigation, which intends to capture the impacts of the programme being replicated to other cities, as a means of taking account of its "transformational" impact.

The MRV system is loosely based on the Global Protocol for Community-Scale GHG Emissions[22]. Only CO_2 emissions from fuel burning are covered (i.e. tank-to-wheel), with emissions from fuel supply (i.e. well-to-tank) excluded. In the concept document, the impact of the NAMAs was made based on a comparison of CO_2 emissions in a business-as-usual (BAU) scenario vis-à-vis different GHG emission reduction trajectories in relation to "Shift" and "Improve" scenarios[23]. Data required for quantifying GHG emission reductions will be collected at the city level to validate and update assumptions made on these scenarios. Data will be obtained through different sources, such as national statistics, traffic surveys, statistical data of the police, etc.. Reporting and verification procedures were still under development. Table 3 summarizes the main MRV features of this NAMA.

Table 3: MRV concept for NAMA on Sustainable Urban Transport in Indonesia

Measurement/ monitoring	• Scope of GHG emission measurement/monitoring:
	  o CO_2 is the only GHG covered;
	  o Diesel and gasoline as the fuels covered;
	  o Motorized passenger road transport (i.e. passenger cars, motorcycles, bus and minibus);
	  o CO_2 emissions from fuel burning (tank to wheel);
	  o Direct emissions from cities piloted and indirect emissions from cities voluntarily replicating the approaches piloted.
	
	• Parameters monitored in the NAMA implementation:
	  o Activity data: i) transport performance of different vehicle categories differentiated by vehicle size, age and fuel type (vehicle numbers, average annual mileage, vehicle load rates, etc.); ii) passenger numbers of public transport. Data to be collected through national vehicle statistics, trip surveys and the Police Department of each city.
	  o Emission factors by vehicle type and for different traffic situations. Data to be obtained by the Ministry of Energy and Mineral Resources.
	  o Other parameters: vehicle mileage, fleet composition, energy efficiency of vehicle fleet, modal share and motorization rate (e.g. cars or motorcycles) to be obtained at the city level through traffic surveys, household surveys, statistical data of the police, etc.
	
	• Monitoring period: from the start of implementation (2015, according to the NAMA concept) until 2030.

Reporting	• Reporting procedures to be defined based on requirements of the NAMA Facility.
Verification	• Verification procedures to be defined in the future by the National Planning Agency BAPPENAs.

---

19 Sustainable Urban Transport Programme Indonesia (NAMA SUTRI), Overview document.
20 Sustainable Urban Transport Programme Indonesia (NAMA SUTRI), Full-concept document.
21 Ibid.
22 GHG Protocol for Cities, 2014.
23 This was to estimate the ex-ante impact of the NAMA. For example, the "Shift" Scenario assumes that increasing demand for transport services is met by shifting from personal to public buses or non-motorized transport. The "Improve" Scenario: assumes improvement measures such as an increase in fuel efficiency, bus size and seat utilization.

With regard to the forestry sector, which accounts for the largest share of GHG emissions in Indonesia, the REDD+ programme is the centerpiece of mitigation actions in the sector. Indeed, Indonesia's Third National Communication acknowledges that the programme holds the potential of reducing up to 70 percent of national emissions in land-based sectors. In this connection, as a REDD+ participant Indonesia has taken steps to develop the essential components for REDD+ implementation, in particular: i) a REDD+ National Strategy; ii) a Forest Reference Emission Level (FREL); iii) a National Forest Monitoring System (NFMS); and iv) a Safeguards Information System.

With regard to the NFMS, its establishment dates back to 1986, when the initial National Forest Inventory (NFI) was prepared. This NFI was the foundation for establishing a system to monitor Indonesia's forest resources, which consisted of four components; i) forest resources (status) assessment; ii) forest resources (changes) monitoring; iii) geographic information system; and iv) users' involvement. The NFMS is a continuation and improvement of the initial NFI[24], and is managed by the Directorate of Forest Resources Inventory and Monitoring (IPSDH) under MOEF. The current NFMS provides detailed data on forest resources which consists of satellite-based forest mapping, the national forest inventory, and data on the spatial distribution of deforestation and forest degradation from 1990 until present. The NFMS is also the source of activity data and emission factors required to determine GHG emissions from the forestry sector.

While the NFMS is one of the pillars of forestry MRV processes at the national level, in 2017 the government of Indonesia established specific MRV modalities for REDD+. Among these is Ministerial Regulation No. 72/2017 on the national MRV scheme (which provides MRV guidelines for all sectors) and, more specifically, Ministerial Regulation No. 70/2017 on the implementation of REDD+, which lays out detailed guidelines on MRV. The underlying concept of MRV for REDD+ is that of a "national approach with sub-national implementation". Based on this concept, Indonesia has introduced the use of FREL at sub-national level. The sub-national FREL is derived from the national FREL and only applies to individual sub-national authorities at the provincial level.

Regulation No. 70/2017 lays out two MRV schemes for REDD+ implementation. The first scheme is designed for provinces that do not have the capacity to act as coordinating institutions/agencies at provincial level. This means that provincial level authorities act as "regular" REDD+ actors, just like NGOs or community based organizations. Under this modality, these REDD+ actors "measure" progress and submit their reports directly to Indonesia's National Registry System (NRS)[25], therefore bypassing provincial authorities. If submitted reports are not under a results-based payment (RBP) scheme, the verification is conducted by a team of the Directorate General on Climate Change (DGCC), MOEF. In case the report is part of a RBP scheme, third-party verification will have to be carried out, and the DGCC will assign an independent body for this purpose.

The second scheme introduces the role of a sub-national coordinating institution/agency at the province level. Under this scheme, REDD+ actors submit their implementation reports to this institution/agency. Upon approval by the institution/agency, the REDD+ actors can register the report in the NRS. This scheme gives provincial authorities the ability to better manage emission reductions on REDD+ within their jurisdictions, including a better harmonization with FREL processes at the sub-national level and REDD+ provincial strategies. After the verification process is finalized, the REDD+ actors and/or coordinating institution/agency should be entitled to result-based financing, in case eligible. The distribution of funds can be either through direct access or intermediary agencies. At present, no market-based mechanisms are being considered for the payments of emission reductions under the Indonesia REDD+ programme[26].

24 Indonesia Report on REDD+ Performance, Directorate General of Climate Change, Ministry of Environment and Forestry, 2018.
25 Further details of Indonesia's NRS are provided in Section 2.4
26 Information provided during consultations in Indonesia on 12 and 13 November 2018.

2.4 National GHG inventory and MRV processes

The preparation of national GHG inventories is a process coordinated by the MOEF with the support of line ministries and agencies. According to Presidential Regulation No. 71/2011 on the implementation of the national GHG inventory, different bodies of the government are mandated to produce national and local GHG inventories. In this connection, each ministry/agency has assigned a specific unit within their institution to contribute to the preparation of the national inventory.

Depending on the sector, the estimation of GHG emissions is based on tier 1 and 2 approaches of the IPCC (2006 Guidelines). In general, the tier 1 approach was the most widely adopted, whereas tier 2 was used to estimate emissions in the IPPU sector for some industries, namely cement, ammonia, nitric acid, and aluminum. For these industries, GHG emissions data was obtained from CDM projects implemented in Indonesia. In addition to this, global warming potentials (GWP) were based on the Second Assessment Report of the IPCC (1996).

To support the preparation of the national inventory, a reporting platform named SIGN-SMART has been developed. This is a web-based system that enables the submission of activity data gathered by relevant agencies. Sub-national authorities can also submit relevant data through SIGN-SMART. The system standardizes and automates calculation methodologies, thereby reducing errors in GHG emission computations. At present, relevant ministries are only responsible for the collection of activity level data, which is subsequently compiled by the MOEF for calculation of emissions. In the future, each ministry will be responsible for conducting the computation of emissions on its own, with the MOEF validating results[27].

As mandated by Presidential Regulation No. 71/2011, the inventory preparation needs to be supported by a QA/QC system. QA/QC procedures are applied to both activity data and emission factors used in the calculation of GHG emissions. QC on activity data is conducted by the ministry/agency providing the data. QC is also carried out at the end of the GHG Inventory preparation as part of technical working group meetings at sectoral level. QA/QC is also supported by SIGN-SMART, as the system enables the cross-checking of inserted data. QA is conducted after the GHG inventory is compiled via the review of experts who have not been directly involved in its preparation. As part of the QA procedures, experts verify whether the implementation of the GHG inventory process has followed prevailing standards and procedures, applied the best methods in accordance with the latest available knowledge and data, and the support of an effective QC program[28].

With regard to reporting processes and procedures at the national level on climate change, MOEF developed another system named "National Registry System on Climate Change" (NRS), which was also mentioned in a previous section as part of REDD+. The NRS is a web-based platform through which MOEF intends to collect data on mitigation, adaptation and any other aspect considered relevant (e.g. finance, means of implementation, etc.). This data is expected to be voluntarily reported by a wide range of stakeholders, but namely by sub-national authorities, the private sector, and community-based organizations. Through this, MOEF aims to obtain a comprehensive picture of what is happening on the ground on both mitigation and adaptation. This encompasses a wide range of initiatives, from sub-national policies to project-based activities such as CDM projects. The NRS is being developed on a "learning by doing" basis, and one of the activities being carried out as this report was being prepared was integration among different reporting systems, for instance the Safeguards Information System developed as part of the REDD+ programme. The importance of NRS is that, being part of the national MRV system of Indonesia, it signals an effort to prevent the overlap of information and double reporting of activities, therefore it supports a higher level of transparency and enhanced synchronization among different actors.

---

27 Indonesia's Third National Communication, 2018.
28 Ibid.

3. Concluding remarks and future outlook

Indonesia has been taking steps to establish a robust national MRV framework, with significant developments in recent years across multiple fronts, either at the level of the national GHG inventory preparation, sectoral programmes, or facility-level emissions. To an extent, these developments are grounded on the establishment of a sound regulatory framework on MRV, in particular Presidential Decree No. 71/2011, on the preparation of national GHG inventories as a regular national process, or for instance Regulation No. 70/2017 of MOEF, which lays out specific guidelines for MRV in REDD+. While an MRV framework at the facility-level is being set up for some sub-sectors, namely power generation and industry, these processes will only be "complete" with the issuance of regulation that mandates covered entities to report on their emissions.

One aspect which stands out in Indonesia's existing MRV set up is the existence of several platforms for reporting information related to climate change and GHG emissions. These include SIGN-SMART (for the submission of activity data collected by line ministries for the computation of national GHG emissions), the National Registry System (as a nation-wide database to keep track on activities related to mitigation and adaptation, as well as the submission of reports on REDD+ at the sub-national level), APPLE GATRIK (a recently established platform for the reporting of emissions for power plants), and SIINAS (the system for reporting information on industries, which includes a sub-module on GHG emissions). While these reporting systems serve different functions and purposes, in the future their convergence and full alignment should be ensured.

While Indonesia has made significant advances in the establishment of frameworks for the measurement, monitoring and reporting of emissions – either at the GHG inventory, sectoral or facility levels – on verification there seems to exist scope for further progress and improvement. As in the case of emission verification standards at the facility level, in particular the role of independent third-party verification, where a lack of detail vis-à-vis monitoring and reporting guidelines can be observed. In this regard, it should be noted that the development of a verification and accreditation framework would be an important component in case Indonesia decides to establish carbon markets in the future.

Indonesia has also been exploring different carbon pricing options. Among the four options assessed in the context of Indonesia's participation in the PMR programme, a domestic cap and trade system for power generation and industry is set to be the instrument of choice for future implementation. This option is also supported by Government Regulation No. 46 of 2017, on environment economic instruments, which sets a mandate for the introduction of a domestic ETS in Indonesia by 2024. While several stages still lie ahead with respect to the establishment of such a system, this could be a stepping stone for considering international linkages with jurisdictions that have developed carbon markets as well as for other cooperative opportunities under the scope of Article 6 of the Paris Agreement.

Acknowledgements

N.B.: This report is still pending formal clearance by Indonesia's focal points.