Mitigation Momentum

NAMA for small and medium scale renewable energy generation in Indonesia

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Foreword

This Nationally Appropriate Mitigation Action (NAMA) concept has been developed under the MitigationMomentum project together with the Ministry of Energy and Mineral Resource (ESDM) and Ministry of National Development Planning (Bappenas) of Indonesia. The contents of this concept note are the result of a multi-stakeholder consultation process that began in March 2013 and continued for almost a year.

This concept note outlines the NAMA to both domestic stakeholders and potential international supporters, as well as describes next steps in developing a full proposal and seeking to start implementation.

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All views expressed in this article are those of the authors and do not necessarily represent the views of those acknowledged here for their review and input.

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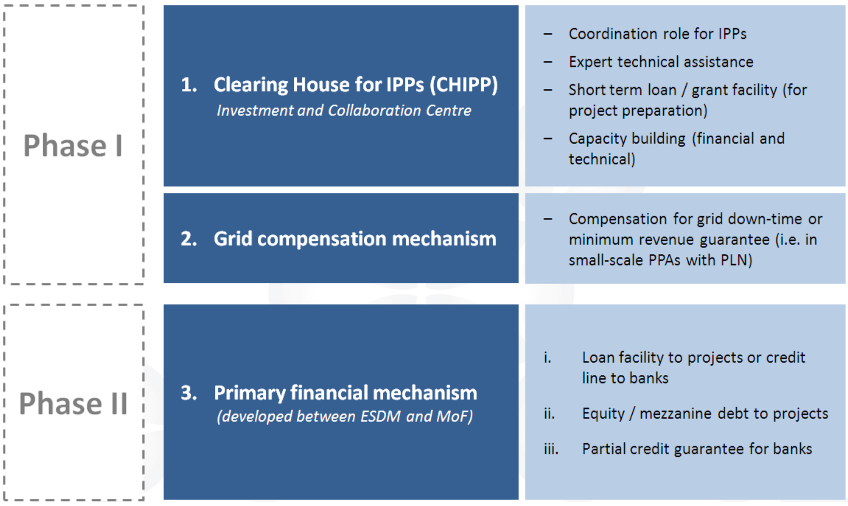
RINGKASAN EKSEKUTIF

Indonesia sedang menghadapi tantangan jangka panjang pada sistem energinya. Pertumbuhan kebutuhan energi listrik yang diharapkan pada tahun-tahun yang akan datang adalah sebesar 8%, sementara kondisi bauran energi saat ini membuat Indonesia rawan terhadap harga minyak yang diimport karena besarnya subsidi. Pada sisi lainnya, Indonesia mempunyai komitmen mengurangi emisi Gas-gas Rumah Kaca (GRK) dari level business as usual. Hal-hal tersebut menjadi latar belakang yang harus disikapi, oleh karena itu Indonesia mempunyai ambisi untuk meningkatkan penggunaan energi terbarukan (RE) pada masa datang, dari komposisi 6% di tahun 2012 menjadi 17-23% pada tahun 2025, bauran ini sudah termasuk dari panas bumi dan hidro skala besar dan juga dari sumber-sumber RE skala kecil dan menengah. Berdasarkan rencana pengembangan kelistrikan nasional yang telah dirilis, bahwa sampai tahun 2021 tambahan kapasitas pembangkit baru yang bersumber dari RE adalah 12 GW, ini berarti membutuhkan nilai investasi sebesar 25 – 30 Miyar Dolar Amerika (USD).

Kerangka kebijakan untuk RE saat ini didasarkan pada kebutuhan yang besar akan investasi pihak swasta untuk mencapai target-target tersebut. Kebijakan feed-in tariff (FIT) dan disertai beberapa tindakan fiskal yang telah digulirkan ditujukan untuk menarik pasar. Tetapi, sektor RE skala kecil dan menengah belum menunjukkan respon positip terhadap semua kebijakan ini. Hal ini terlihat dari perkembangannya yang masih sangat lambat, meskipun Indonesia mempunyai potensi yang sangat besar. Hasil studi yang telah dilakukan, termasuk interview pada beberapa pengembang RE dan pihak perbankan, menunjukkan terdapat sejumlah rintangan yang membuat FIT dan semua kebijakan pendukung tadi tidak optimal menggerakkan semua potensi RE. Para pengembang ini membutuhkan peningkatan pada sisi mendapatkan akses perbankan, kapasitas teknik, prosedur perijinan, dan stabilitas pendapatan. Oleh karena itu, dukungan terpadu pemerintah diharapkan dapat menanggulangi semua rintangan ini dan menciptakan dorongan yang dibutuhkan oleh sektor energi ini.

Pemerintah Indonesia sedang mengembangkan dukungan terpadu ini dan akan diformulasikan dalam bentuk sebuah aksi yang bernama Nationally Appropriate Mitigation Action (NAMA), yang bertujuan mempromosikan investasi oleh IPP RE skala kecil dan menengah (< 10 MWe) yang menghasilkan listrik terkoneksi grid. Implementasi NAMA ini direncanakan akan didanai sebagian dari dana nasional dan sebagian lagi dari dukungan internasional. Besarnya skala NAMA ini akan didasarkan pada ambisi dan kebutuhan, sebagai sebuah dokumen resmi, proposal ini tidak memberikan sebuah target yang spesifik, tetapi dapat berubah sesuai ambisi dan kebutuhan. Berdasarkan analysis dan dialog bersama beberapa pemangku kepentingan, secara konservatif NAMA ini dapat menghasilkan penambahan kapasitas RE skala kecil dan menengah sebesar 1,8 GW di seluruh wilayah Indonesia. Nilai ini membutuhkan investasi sekitar 2,7 Milyar USD. Sebagai implementasi pada provinsi terpilih (pilot), Sumut dan NTB, target kapasitas sebesar 180 MW adalah sangat realistis. Target ini setara dengan sekitar 10% investasi tersebut.

Sebagai bentuk respon terhadap rintangan yang telah diidentifikasi, NAMA ini dirancang terdiri dari tiga komponen utama seperti yang ditunjukkan pada Gambar X1. Komponen pertama disebut Clearing House for IPPs (CHIPP) yang dapat dipandang sebagai bantuan melalui kordinasi dari pengetahuan dan informasi, ahli tehnik, dan pinjaman untuk peningkatan studi kelayakan (FS). Komponen kedua adalah mekanisme kompensasi grid, yang bertujuan menjamin stabilitas pendapatan pengembang meskipun jaringan (grid) tidak dapat menerima produksi listrik akibat masalah stabilitas. Komponen ketiga adalah instrumen finansial yang bertujuan untuk meningkatkan akses ke lembaga keuangan yang sesuai, termasuk pinjaman publik, lini kredit dan penjaminan resiko parsial kepada bank, serta equity dan mezzanine debt bagi pengembang. Ketiga komponen ini akan dilaksanakan selama dua fase, dimana Fase I akan fokus pada komponen pertama dan kedua (Pengembangan CHIPP dan Kompensasi grid) dan Fase II akan fokus pada komponen ketiga saluran aliran keuangan dan pelayanan.



Gambar X1: Komponen-komponen NAMA

Kebutuhan dukungan pada NAMA ini dan impaknya bergantung pada skala dan variasi konfigurasi adalah dimungkinkan. Pada kedua provinsi pilot dimana targetnya 180 MW, produksi listrik dari RE akan menjadi 880 GWh pada tahun 2020 dan ini berarti pengurangan emisi 0,7 MtCO2 eq/tahun mulai tahun 2020. Fase pertama untuk provinsi pilot ini akan membutuhkan hibah sebesar 9 juta USD. Fasa kedua akan membutuhkan dukungan tambahan hibah mulai 20 juta USD sampai diantara 90 juta USD dan 200 juta USD berupa pinjaman lunak. Sementara untuk implementasi nasional, dukungan pada 1,8 GW tambahan kapasitas dari RE akan menghasilkan 7150 GWh tambahan produksi listrik yang berarti pengurangan emisi 6,5 MtCO2 eq/tahun sejak tahun 2020. Fase I akan membutuhkan dana sekitar 65 juta USD dan Fasa II sampai 2 Milyar USD tergantung pada skema yang akan diadopsi. Sebagai bentuk kontribusi pada RAN-GRK, maka NAMA ini mempunyai potensi mengcover setengah dari target sektor energi untuk mencapai tambahan 15% (dari target 26% ke 41%).

Keuntungan yang diharapkan adalah cukup besar, baik dari sisi ekonomi, sosial dan juga lingkungan. Keuntungan ekonomi termasuk meningkatkan ketahanan energi dan mengurangi pengaruh fluktuasi harga minyak dunia, tambahan kapasitas energi untuk mendukung pertumbuhan ekonomi, menyediakan lapangan kerja, mengurangi subsidi, dan mempercepat perkembangan sektor swasta. Keuntungan sosial dapat berupa peningkatan akses terhadap sumber energi modern bagi daerah pedesaan dan keuntungan kesehatan juga ada karena meningkatkan kualitas udara.

Sistem Pengukuran, Pelaporan, dan Verifikasi (MRV) telah ditetapkan pada negosiasi iklim internasional sebagai sebuah komponen kunci dari NAMA. Sistem-sistem ini ditujukan untuk mengukur kemajuan pada pengurangan emisi, keuntungan pembangunan berkelanjutan, dan aliran dana iklim. Sistem MRV yang diajukan menggunakan pendekatan yang praktis namun akan sesuai dengan sistem Pemantauan, Evaluasi, dan Pelaporan (PEP) di Indonesia yang saat ini sedang dijalankan.

Proposal NAMA yang disajikan pada dokumen ini adalah pekerjaan yang sedang berjalan. Ini mempunyai potensi untuk mendukung transformasi sektor energi menjadi lebih rendah karbon dan energi yang lebih terjamin. Ini juga bertujuan memobilisasi investasi sektor swasta dalam skala besar, mendayagunakan instrumen kebijakan yang sudah ada dan menyelaraskan dengan strategi iklim yang lebih besar dan mengembangkan kerangka kerja. Seperti yang sudah dirancang, NAMA ini bersifat dapat diskalakan dan dapat ditiru dan cocok untuk berpadu dengan berbagai instrumen sumber dukungan dan peluang lainnya.

Langkah berikutnya termasuk membuat rencana yang lebih detail untuk implementasi dan penyesuaian dengan usaha-usaha pendukung lainnya, menyusun dengan rinci instrumen finansial, mencari dukungan dari sponsor yang potensial dan organisasi yang mengimplementasikan, dan menjamin keuangan untuk implementasi Fase I.

EXECUTIVE SUMMARY

Indonesia is facing long-term challenges to its energy system. The expected growth in electricity demand in the coming years is 8% annually, the current energy mix leaves Indonesia vulnerable to the price of imported oil due to subsidises, and the country has committed to substantially reducing its greenhouse gas emissions relative to business as usual. Against this background, Indonesia has the ambition to increase its share of renewable energy in the energy system from 6% in 2012 to 17-23% in 2025, including large scale geothermal and hydro, as well as small and medium scale renewable energy. The announced capacity plans until 2021 already amount to almost 12 GW of new renewable energy generation, requiring in the order of US $25 to 30 billion of investment.

The current policy framework for renewable energy is premised on the need for substantial private sector investments to achieve these targets. An existing feed-in tariff and complementary set of fiscal measures provide a strong pull for the market. However, the small and medium scale renewable energy sector has shown limited growth in response to these policies, even though the potential for renewable energy in Indonesia is large. Interviews with project developers and financial institutions reveal a number of barriers that prohibit the existing policies to reach their full potential. In short project developers need improvements in access to appropriate finance, technical capacity, permitting procedures, and revenue stability. Tailored government support can address these barriers and provide a much needed boost for the sector.

Indonesia is developing this tailored support as a Nationally Appropriate Mitigation Action (NAMA), which aims to promote investments by independent power producers in small and medium size (< 10 MWe) grid-connected electricity production. The implementation of this NAMA is foreseen to be partly covered by domestic resources and partly by international support. The scale of the NAMA is based on a sense of ambition and need, as official documents do not provide unambiguous guidance on targets. In dialogue with stakeholders, a target of 1.8 GW additional capacity across Indonesia was considered conservative for the NAMA (which corresponds to roughly US $2.7 billion of investment). Considering a pilot implementation, if the initial scale is limited to two provinces of North Sumatra and West Nusa Tenggara, a figure of 180 MW is considered more realistic (with approximately 10% of the investment requirements).

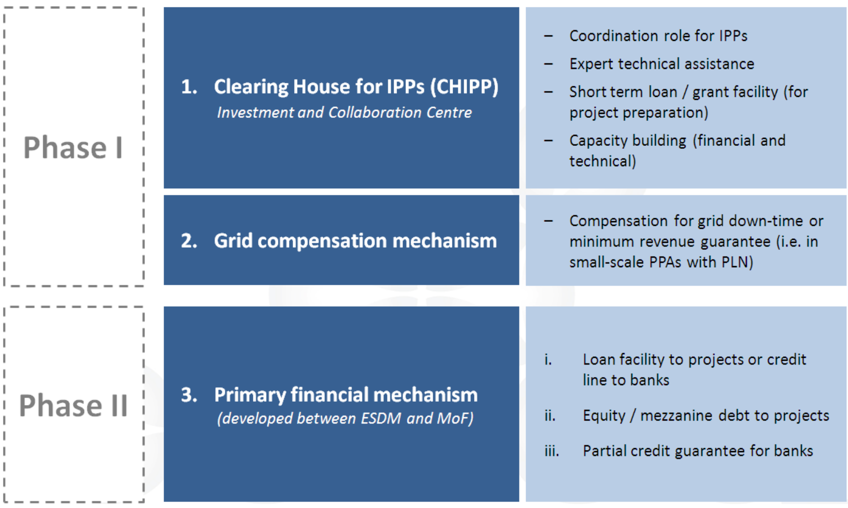


Figure X1: NAMA components

In response to the identified barriers, the NAMA is designed around three main components (Figure X1). The first component is a so-called Clearing House for IPPs, which can be of assistance to the sector through coordination of knowledge and information, technical expertise, and lending for improved feasibility studies. The second component is a grid compensation mechanism, that assures producers income stability even when the grid cannot 'off-take' their production due to stability issues. The third component will be a choice of financial instruments that aim to improve access to appropriate finance, including direct public loans; credit lines and partial risk guarantees for banks; and equity and mezzanine debt for developers. An initial phase will focus on establishing the first two components (the clearing house and the grid compensation), and the second phase will channel financial flows and services.

The support requirements for this NAMA and impacts depend on the scale and various configurations are possible. Based on a two-province pilot of 180 MW, the additional production will be 880 GWh in 2020 and an emission reduction 0.7 $MtCO_2$/yr from 2020. The first phase of such a pilot would require in the order of US $9 million of grant/non-coverable financing. The second phase would require additional support, ranging from US $20 million of non-coverable financing to between US $90 and 200 million of concessional lending. A national implementation, supporting 1.8 GW of additional capacity will result in 7,150 GWh additional production and an emission reduction of 6.5 $MtCO_2$/yr from 2020. The first phase would require roughly US $65 million and the second phase up to US $2.0 billion depending on the scheme adopted. With regards to a contribution to the climate change action plan of Indonesia, the RAN-GRK, the NAMA has the potential to cover half the emissions reduction expected from the energy sector to achieve the additional 15% target (from 26 to 41%).

The expected benefits are considerable. Economic benefits include improved energy security and reduced exposure to fluctuating fuel prices, additional energy capacity to support economic growth, positive employment impacts, reduced fossil fuel subsidy costs, and accelerated private sector development. The social benefits can include improved access to modern energy sources in rural areas and health benefits through improvements in air quality.

Measurement, reporting, and verification (MRV) systems have been specified in the international climate negotiations as a key component of NAMAs. These system are intended to measure progress on emission reduction, sustainable development benefits, and climate finance flows. The proposed MRV system takes a practical yet appropriate approach that will be compatible with the Indonesia monitoring, evaluation and reporting (MER) system that is currently being established.

The NAMA proposal presented in this document is a work in progress. It has the potential to support the transformation of the energy sector to a lower carbon, more energy secure pathway. It aims at mobilising large scale private sector investments, leveraging existing policy instruments and aligning closely with the larger strategic climate and development frameworks. By design, the NAMA is scalable and replicable, and suitable to tailor to the requirements of sources of support and other opportunities.

The next steps include making a more detailed plan for implementation and alignment with other support efforts, detailing the financial instruments, exploring alliances with potential sponsors and implementing organisations, and securing implementation finance for the first phase.

Abbreviations

BOE	Barrels of oil equivalent
CDM	Clean Development Mechanism
CHIPP	Clearing House for Independent Power Producers
EPC	Engineering, Procurement and Construction [contract]
ESDM	Ministry of Energy and Mineral Resources; Energi dan Sumber Daya Mineral
FiT	Feed-in Tariff
GHG	Greenhouse Gas
GoI	Government of Indonesia
IPP	Independent Power Producer
MRV	Measurement, Reporting, and Verification
Mt	Megatonne (= 10^6 kg)
MW/GW	Megawatt/Gigawatt
MWh/GWh	Megawatt-hour/Gigawatt-hour
NAMA	Nationally Appropriate Mitigation Action
NTB	Nusa Tenggara Barat (West Nusa Tenggara)
PIP	Pusat Investasi Pemerintah; Indonesia Investment Agency
PLN	Perusahaan Listrik Negara; state electricity company
PPA	Power Purchase Agreement
PT IIF	PT Indonesia Infrastructure Finance (PT IIF)
PT SMI	PT Sarana Multi Infrastruktur
PV	Photovoltaic [power generation]
RAD-GRK	Provincial Action Plan for Reducing Greenhouse Gas Emissions
RAN-GRK	National Action Plan for Reducing Greenhouse Gas Emissions; Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca
RE	Renewable Energy
RPJM	Regional Long Term Development; Rencana Pembangunan Jangka Menengah
RUPTL	Power Supply Business Plan (Rencana Usaha. Penyediaan Tenaga Listrik)
TA	Technical Assistance
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction

Small and medium scale renewable electricity generation provides a great opportunity for Indonesia to improve access to energy, to improve energy security, and to provide power for growth in a low-carbon way. This concept note shows how a Nationally Appropriate Mitigation Action (NAMA) can support the government in expanding renewable energy capacity. A team of national and international experts[1] supports the government to develop a detailed proposal for a NAMA.

This NAMA concept note[2] provides a concrete basis for an informed discussion and decisions on finalising a full proposal in 2014. It should be noted that certain elements are still to be defined, and the purpose of the concept note is to indicate the current direction and identify open questions. As such, the description of the NAMA concept is followed by a discussion of the steps to be taken to move from the current concept to a full proposal, eventual UNFCCC registry submission and securing support for implementation.

The following chapter describes the driving forces behind Indonesia's need to transform its energy sector, summarises the scale of the challenge and introduces the policy context. Chapter 3 presents the scope and objectives of the NAMA; describes a national and pilot implementation; outlines two phases of implementation and the elements that have been chosen to address the barriers in the sector; before presenting support requirements and impacts with an MRV system to monitor these aspects. The note finishes with the steps that will be taken to move forward on the NAMA to finalise the design and secure support.

[1] The team includes experts from ECN, the University of North Sumatra, the University of Mataram and several individuals, and is led by ECN. All technical assistance is part of the MitigationMomentum project which is financed through the German International Climate Initiative (ICI) with support from CDKN for the programme of work in West Nusa Tenggara; www.mitigationmomentum.org

[2] This note assumes a basic understanding of the NAMA concept. For a good introduction to NAMAs, see Sharma and Desgain (2013).

2. Transforming the power system: rationale, ambition and context

Indonesia's energy system will undergo enormous expansion and change in the coming years, driven by economic growth; a response to issues of energy security and fossil fuel subsidies; and a recognised role for Indonesia in an international climate solution. This chapter describes these driving forces as part of the rationale for prioritising this sector, presents the scale of the challenge and policy context, as well as introduces the barriers that are currently holding back the growth of renewable energy projects that this NAMA focuses on.

2.1 The challenge of transforming the electricity sector

Indonesia faces multiple large challenges in its electricity system that can be distilled to three main issues:

1. keeping up with the rapid growth in demand,
2. exposure to international fuel prices, and
3. encouraging low-carbon growth of the sector.

These three challenges will require a transformation and up-scaling of the electricity sector in order to provide cost-effective energy for economic growth in a climate-compatible way. Renewable energy, in particular small and medium scale generation, can have an important role in this transformation if the correct enabling environment for its expansion is created.

Growth in demand

Economic growth and increasing energy access is projected to increase power demand by more than 8% annually until 2020, and significant capacity additions will be needed for production to keep up with demand (PLN, 2012). Underpinning the growth in the electricity sector, the Indonesian economy, population and broader energy system is growing rapidly. Indonesia's total final energy consumption (excluding biomass) grew at an average annual rate of 5% over the last decade, mostly due to increased coal use (Figure 1). Electricity demand has outpaced this level of growth and the share of total primary energy supply used for electricity generation has increased from 20% a decade ago to close to 28% in 2011 (IEA 2013).

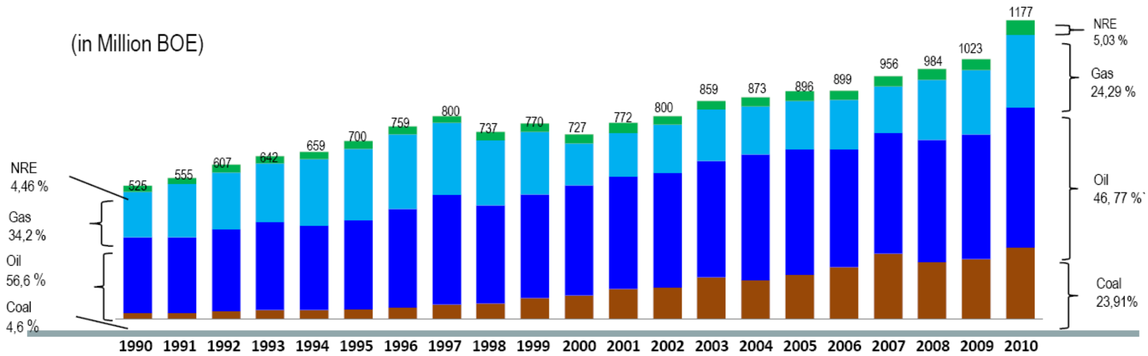


Figure 1: National energy supply 1990 – 2010; excluding biomass used by the residential sector (source: ESDM, 2012)

Electricity generation is led by the state owned utility PLN, which generated almost three quarters (131 TWh) of Indonesia's electricity in 2012[3]. The increasing demand for power, growing at more than 6% per year (Figure 2), and the geography of Indonesia, with smaller grids spread across numerous islands, represents a large challenge for reliable and cost-effective supply.

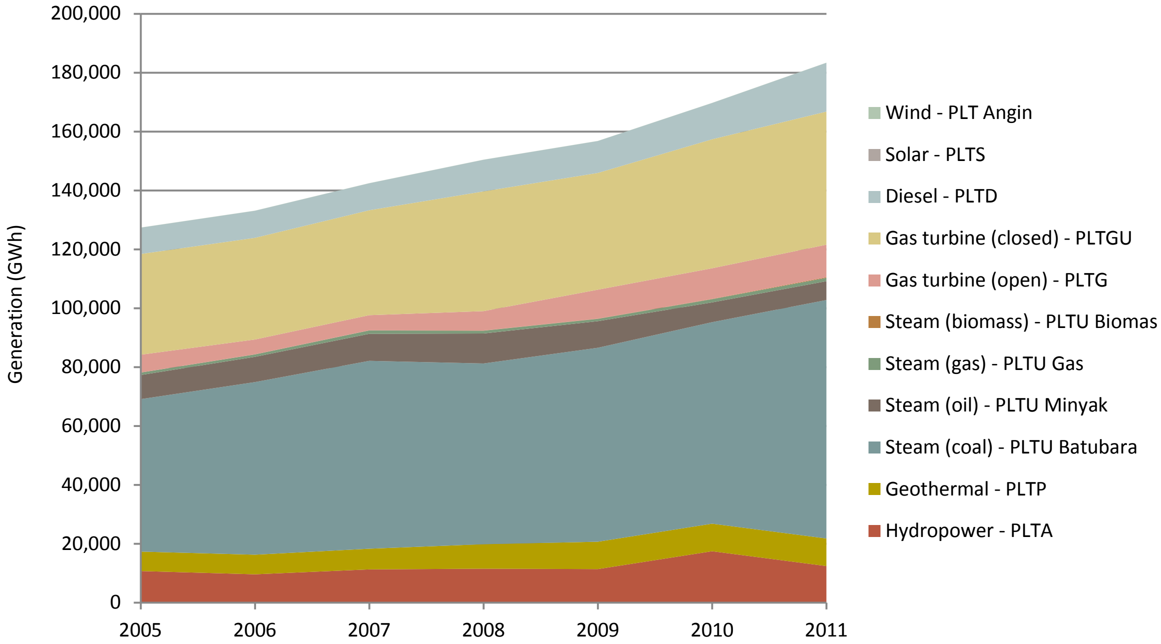


Figure 2: Electricity generation by source 2005 – 2011 (source: ESDM 2013)

Partly as a result of this challenge, growth in generation capacity in recent years has been split roughly equally between PLN and independent power producers (IPPs), with IPPs now providing roughly 25% of electricity production (PLN, 2013; ESDM, 2013)[4]. Much of this increase in IPP generation has come from coal-based generation and this is set to continue with the completion in the coming years of the GoI's first fast-track, or 'crash', programme that prioritised 10 GW of mostly coal based power generation in response to an urgent need to grow electricity provision (PLN 2013b).

The Indonesian electricity sector will continue to expand, driven by strong growth of the Indonesian economy and population. Estimates from the second National Communication suggest that installed capacities in Indonesia could grow 5 times by 2030 (GoI, 2010). There is need to support renewable energy deployment in order to maximise the contribution that it can make to this future expansion.

Energy diversification

Indonesia needs new domestic energy sources to reduce the role of oil-based (diesel) power generation, because of rising fuel and subsidy costs. In many smaller grids or remote areas, there is a large presence of oil-based generation, providing roughly 12% of total electricity in 2011 (ESDM 2013). The regulated tariffs that PLN can charge to customers means that these types of plants effectively run at a loss. On average, sales of electricity by PLN recouped only around one half to a third of the cost of electricity supply[5], in part

[3] PLN also acts as transmissions and distribution system operator across Indonesia, so purchases power from non-PLN sources (PLN, 2013)

[4] These types of large-scale, fossil-fuelled IPPs are not the focus of this NAMA, which centres on small and medium scale renewable energy IPPs.

[5] sale = Rp730/kWh and supply = Rp1,200/kWh in 2012 (PLN, 2013)

due to such oil-based generation costs. Moreover, the exposure to international oil prices means that these subsidies can unexpectedly increase.

A key objective of the GoI is to reduce dependence on oil by expanding the use of coal, gas and renewable energy sources. The basis for working towards this goal is the Presidential Regulation no. 5/2006 on National Energy Policy (GoI 2006). It sets a national target for the optimal energy mix in 2025 to be: (i) less than 20% from oil; (ii) more than 30% from gas; (iii) more than 33% from coal; (iv) more than 5% from biofuel; (v) more than 5% from geothermal; (vi) more than 5% from other renewable especially biomass, nuclear, micro-hydro, solar and wind; and (vi) more than 2% from liquefied coal.

This broad objective and targets have, in turn, been: incorporated into a subsequent National Blueprint for the energy sector; the formation in 2007 of a National Energy Council chaired by the President with the authority to design and formulate energy policy[6]; and ongoing updates of national energy policy. Looking beyond the 2025 timeframe, the National Energy Council has argued for a 30% share of renewable energy 2050, which corresponds to a 23% share in 2025, a figure that was recently approved in draft legislation (ESDM 2014a) (Figure 3).

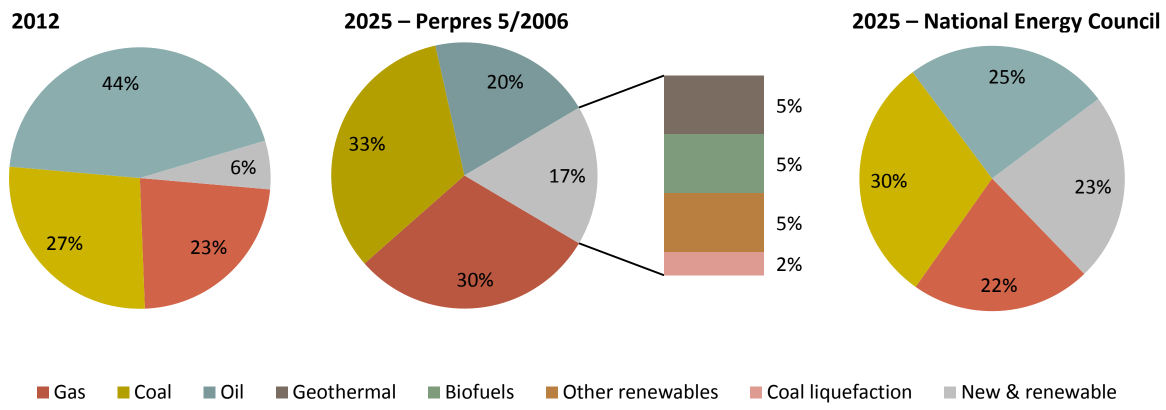


Figure 3: Primary energy mix, excluding biomass, in 2012 and 2025 under two scenarios (source: GoI 2006; Lubis 2013; ESDM 2014a)

It is self-evident, that the capacity of renewable energy in Indonesia will need to expand enormously over the coming decade for these targets to be reached. Not only does the share of renewable energy need to almost triple, but the entire sector is growing quickly as well. Government estimates suggest that in the order of 5 GW of small and medium scale renewable energy[7] will need to be developed over the coming decade to meet these ambitions (ESDM 2008). This issue is further addressed in Section 3.2, that considers the scale of the NAMA.

Climate commitments

The final major factor driving renewable energy is Indonesia's communicated ambitions with regard to reducing greenhouse gas emissions. In 2009, President Susilo Bambang Yudhoyono pledged that Indonesia will reduce its greenhouse gas emissions (GHG) by 26% in 2020 relative to business-as-usual levels, and that with international support a further 15% reduction could be achieved. These commitments were submitted as Indonesia's nationally appropriate mitigation actions to the UNFCCC in January 2010.

[6] Formed as part of Law No. 30 Year 2007 on Energy

[7] Incremental to large scale hydro and geothermal

In 2011 this ambition was elaborated in a national climate change action plan[8] (*Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca*, henceforth RAN-GRK) and at the provincial level through local action plans (RAD-GRK). These RAN-GRK and RAD-GRKs are regarded as the starting point for the development and implementation of NAMAs (GoI, 2013).

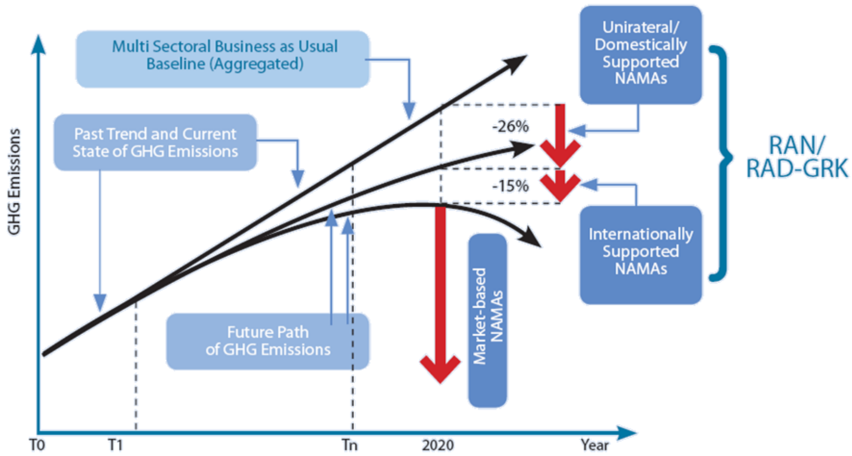


Figure 4: NAMA concept and national GHG emissions targets; showing role of unilateral and supported NAMAs (source: GoI, 2013)

At the same time, the power generation sector is expected to become one of the largest contributors of Indonesia's GHG emissions in the next 15-20 years and contributes the bulk of Indonesia's expected increase in GHG emissions, increasing more than 7 times under some scenarios (Figure 5). This underlines the need to support renewable energy expansion, to minimise the impact of the sector on Indonesian GHG emissions, in parallel to the fossil fuel generation that will be necessary for Indonesia's growth.

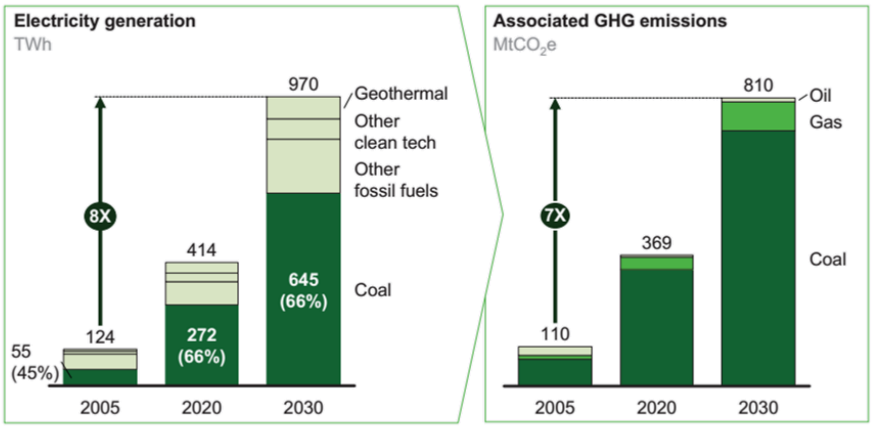


Figure 5: Estimated Indonesian GHG emissions in the power sector 2005 - 2030 (source: DNPI 2010)

Drivers for transformation

These three key drivers of energy system transformation – growth, diversification and mitigation – will require large investments in new renewable energy generation capacity in the coming years, with negative consequences for the state budget without substantial private sector contributions. Fortunately Indonesia is well endowed with resources, both renewable and entrepreneurial, and has already started on the path to developing renewable energy at scale.

[8] Note that the mitigation ambition is clear in its formulation, but two aspects have not yet been made explicit. First, a formally agreed baseline is yet to be announced. Second, which actions count towards the first 26% and which against the second 15% is in the process of being finalised.

Box 1: Indonesia as a leader on NAMAs

- In 2010, Indonesia submitted a list of 7 priority areas for NAMAs to the UNFCCC; including development of alternative and renewable energy
- In 2012, establishment of the National Center for NAMA Development (NC4ND), a developing think tank that complements the work of the RAN-GRK secretariat
- In 2013, one of the first countries to submit a NAMA – Sustainable Urban Transport Initiative – to the UNFCCC registry
- In 2013, one of five successful NAMAs in the first round of funding from the NAMA Facility for the Sustainable Urban Transport Initiative (BMU/DECC, 2013)
- In 2013, launch of Indonesia's framework on NAMAs that introduces the idea of a national registry for NAMA coordination along with a standardised submission process (GoI, 2013)
- Since 2011, ongoing development of 12 NAMA concepts across the energy, transport, industry, waste and land-based sectors (GoI, 2013)

2.2 Ambitions for renewable energy

This section summarises Indonesia's stated renewable energy targets and plans, as well as illustrating the investment requirements and describing renewable resources available to get to reach these ambitions.

Stated ambitions

The need to diversify the energy mix away from oil and provide new sources of electricity has been the driving force in defining Indonesia's renewable energy ambition. The government policy defining this diversification, Presidential Regulation 5/2006, provides targets for renewables – 15% of generation in 2025 – at an aggregate level. Estimates of the expected contributions of various technologies, particularly for mini-hydro, solar PV, biomass and wind, to this target suggest that small and medium scale renewable energy will have a major role to play over the coming decade, providing in the order of 5 GW of capacity (ESDM, 2008). In the medium term, the RAN-GRK prioritises part of this capacity to be developed through domestic efforts and the RUPTL planning of PLN tracks projects that targeted for implementation out to 2021. These three documents sketch the envelope of Indonesian renewable energy ambition over the coming six to ten years and show the immense challenge to expand small and medium scale renewables from current capacities (Figure 6).

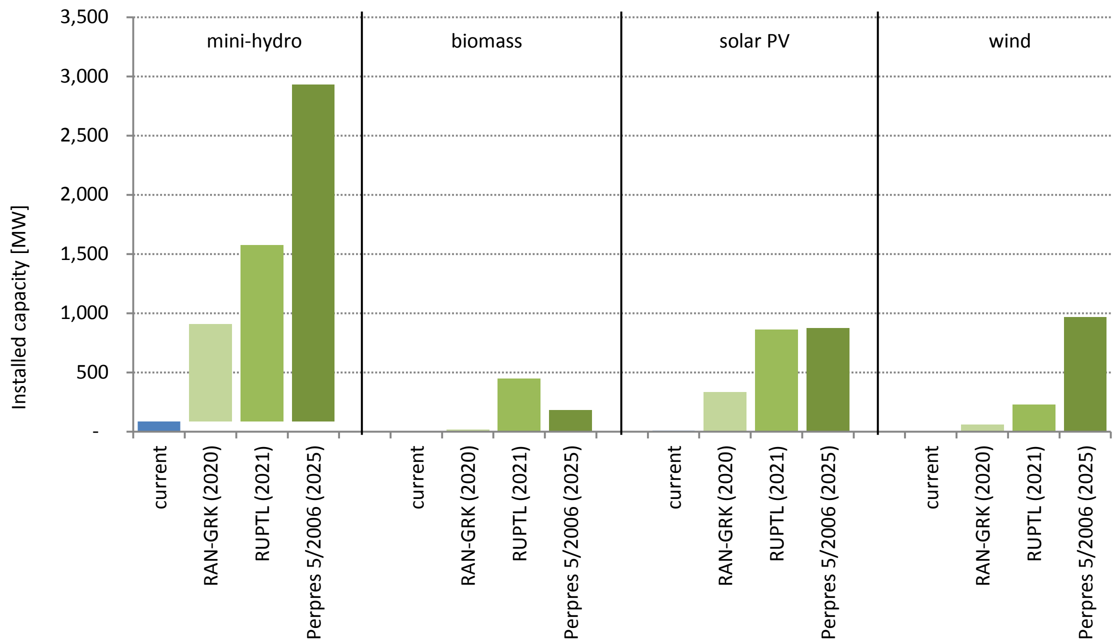


Figure 6: Small-scale renewable energy capacity and range of ambition (source: own derivation from sources in Table 5)

Renewable energy investment requirements

It is not possible to know the capacities of the various technologies that will be installed in the future with certainty. The values shown in Figure 6 represent possible futures, but even planning documents will change over time due to viability of individual projects or changes to the policy environment. However, what can be said with certainty is that the required expansion of renewable energy will be, for almost all conceivable futures, very large and that this will have large corresponding investment needs.

A rough calculation of the renewable energy capacity forecast in PLN's Power Supply Business Plan (PLN, 2012), suggests that between US $25 to 30 billion of investment will be required in geothermal, hydropower, solar and other forms of renewables. The 2025 targets of the Presidential Regulation 5/2006, and their subsequent translation to technology capacities, would require in the order of US $9 billion of investment in small and medium scale facilities alone, noting that the National Energy Council has called for even more ambitious renewable energy targets that this. The argument for increased private sector investment is therefore a strong one, and one that the GoI has clearly recognised in its approach to developing energy sector over the last decade.

Renewable energy potential

This growth in capacity will require large numbers of new projects spread across Indonesia, which has one of the world's largest potentials of renewable energy resources. For many regions and technologies only a small fraction of this resource has been exploited (Table 1). On this basis, the opportunities for small and medium scale facilities up to 10 MW are immense, particularly in regards to hydropower, biomass and solar.

In making this statement, it should be noted that data availability on resources and potentials is a challenge, with very limited quality data available in a consistent format across provinces. An increased availability and transparency of resource data would give additional confidence to planning and investment activities. This is something that would be addressed through this NAMA, amongst other challenges for developers and government.

Table 1: Indonesian renewable energy potentials and installed capacities; electricity production only[9] (source: Hasan et al. 2012; PLN, 2012; 2013)

	Potential (MW)	Installed capacity (MW)
Hydropower (large scale) [10]	34,000 – 75,000	3,481
Hydropower (micro-mini scale)	7,5000 – 8,000	86
Geothermal	28,000	6,184
Biomass (agricultural & forestry residues) [11]	6,500 – 8,500	small
Solar [12]	4 – 5.1 kWh/m^2/day	6

The key message here is that Indonesia has a large potential for small and medium scale RE facilities that is waiting to be tapped. The government's existing policies have started to create interest in this, but as described later in this chapter, there are still significant challenges for project developers.

2.3 Renewable energy policy framework

This section describes the starting point for renewable energy support in Indonesia and in particular for the small and medium scale renewables sector. This includes key stakeholders, existing incentive policies, the role for IPPs and current barriers that inform the NAMA design.

Key stakeholders

A NAMA, as a government led action, must deal with a number of key stakeholders in a sector in order to determine preferred design, sources of support, the correct points for intervention and roles and responsibilities amongst actors. A wide range of stakeholders were consulted during the development of this NAMA. Table 2 summarises key organisations and groups that were involved in the process as well as their role in the broader energy system.

[9] While Table 1 does not show wind power resources due to a lack of wind speed data reconciled as an economically feasible potential, there are modest opportunities for wind power production at certain coastal locations; though it should be noted that average wind speeds are, by and large, low in Indonesia (Jacobs 2010)

[10] While the upper figure is often quoted as the potential, the economic potential is estimated to be closer to the lower figure

[11] Calculated from Prastowo (2011) based on an assumed conversion efficiency of 35% from biomass to electricity

[12] 167 - 212 W/m^2 with an average mid-day irradiation approximately 1,000 W/m^2

Table 2: Institutional and stakeholder arrangements in the Indonesian energy sector (adapted from Damuri and Atje 2012)

Stakeholder	Description
Ministry of Energy and Mineral Resources (ESDM)	This national government agency is the main institution responsible for day-to-day supervisory activity related to the energy sector including policy design. It is also in charge of providing data and analysis related to energy sector development and conducting surveying and research into energy and mineral resources. In 2010, the ministry established a Directorate General in order to administer the development of renewable energy, which has strengthened regulatory supervision over the sector.
Ministry of National Development Planning (Bappenas)	While this agency is not directly involved in the implementation of energy regulation, it is key stakeholder in determining the direction of energy policy, as well as aligning it with broader economic plans and regulations. Bappenas sets out the plan for energy development to be carried out by ESDM. Its recent roadmap for the acceleration of development identifies the promotion of renewable energy as a key issue in the provision of infrastructure.
Ministry of Finance (MoF)	The Ministry of Finance has authority over approving the use of government expenditure, including investment incentives. It sets out these decisions when considering the annual government budget that it formulates. It also overseas three agencies which are of interest to this NAMA: *Indonesian Investment Agency (PIP)*; a public service agency, primarily funded by the GoI, established with the mission to stimulate national economic growth through investment in strategic sectors that provide optimum return and measurable risk. It has almost US $2 billion of assets under management and recently started to offer loans for min-hydro projects[13]. PT Sarana Multi Infrastruktur (*PT SMI)*; is a public company, primarily funded by the GoI, established as a catalyst in the acceleration of the infrastructure development. PT SMI has some flexibility in its offerings, including market rate loans, mezzanine finance and equity and has provided support to a limited number of mini-hydro projects. *Indonesia Infrastructure Guarantee Fund (PT IIGF)*; is a public company, established as the response of the GoI to the need for adequate assurance against the political risks inherent in infrastructure investments. The focus is on large scale Public-Private Partnership (PPP) investment projects, but its operation establishes the idea of risk mitigation mechanisms in Indonesia (in this case political risk, not technical/operational).
Local and regional governments	These play an important role in the implementation of energy policy by developing relevant regulations and issuing permits. They may also introduce their own, sub-national promotional strategies. Some local governments also provide schemes to simplify administrative procedures related to project development
Independent power producers (IPPs)	An IPP is a non-government producer of electricity. IPPs can be private enterprises (businesses) that produce power as a commercial activity, or collective organizations (e.g. communities) that may engage in energy production for other reasons, such as improved energy access. This NAMA focuses on grid connected IPPs, who produce electricity and supply (part of) this to the PLN operated electricity grid. Nonetheless, in rural and more remote parts of Indonesia, off-grid IPPs can also offer significant opportunities. See the section below that discusses IPPs in more detail.
Financial sector	The Indonesian banking sector is a two-tier banking system with a broad range of commercial banks and rural credit banks. More than one hundred each of commercial and private nation banks as well as four state-owned banks are registered in the country. Profitability among the banking sector is high as are average net interest margins, however banks can be considered as risk averse and extend no long-term credit to clients. Although lending to renewable energy projects has been very limited so far, the current situation theoretically provides good preconditions for safe credit-taking in order to meet the country's investment needs for the sector (DIE 2013).
Development partners	Development agencies and NGOs are involved in the Indonesian energy sector in a number of ways that are of relevance for this NAMA. Primarily, they represent an opportunity for NAMA support should interests and support modalities sufficiently align. Major development partners and selected activities include: USAID and the Millennium Challenge Corporation through the ICED programme and US $600 million 'Indonesia compact' that includes renewables; GIZ working on energy access, energy NAMAs and NAMA coordination; AFD who have provided credit lines for low-carbon technologies; JICA who have provided concessional support for geothermal power; DANIDA's Environmental Support Programme that includes establishing clearing houses for energy efficiency and renewable energy.

[13] Under this programme, PIP would act as a source of debt for projects which are economically feasible but commercially not attractive for banks, by applying competitive interest rate and a longer repayment period. However, to date, the risk profile of projects that have applied have not been acceptable to receive funding. Furthermore, PIP's collateral requirements are at least as high as the domestic banking sector.

Feed-in-tariff and supporting fiscal policies

As noted in Section 2, Indonesia's targets for installed generation capacity are laid out in the Presidential Regulation 6/2006. By 2025, 15% of Indonesia's total energy mix should be based on low-carbon energy sources; 5% geothermal, 5% biofuels and 5% from other new and renewable sources. This provides the overall framework for the sector and for this NAMA, but of most immediate relevance are those policies that directly impact on the small and medium scale renewable energy sector.

The catalyst for the emergence of this sector is the series of feed-in-tariffs that have been announced by ESDM for various technologies since 2009. These provide IPPs of 10 MW or less capacity with a guaranteed purchasing price for renewable electricity for period of 10 to 15 years (Table 3).

The allocation of the current tariffs for the various technology categories (with the exception of solar), are adjusted dependent on location, assuming greater costs, and increased value to society, of providing electricity to less economically developed regions in Indonesia. For example, a hydropower project in Java or Bali, the most developed islands in terms of energy infrastructure would receive a tariff of Rp 656/kWh, whereas an identical project in the more remote Maluku or Papua region would receive 1.5 times the base rate, to reflect the higher marginal production costs faced by PLN in producing electricity in these regions (Azahari 2012).

Box 2: Feed-in-tariff development

Since the early 2000's, regulatory steps have been taken to reform the energy sector, placing emphasis on partial liberalization of the energy market, decentralized energy planning and increased transparency. As part of this process, in 2002 a Ministerial Decree on small-scale power purchase agreements was introduced, which obligated PLN to purchase electricity generated from renewable energy sources by non-PLN operators, or IPPs. The ruling was originally limited to installations up to 1 MWe capacity, but additional regulation in 2006 adjusted this to 10 MWe, and introduced a minimum power purchasing contract period between the producer and PLN of 10 years.

Table 3: Feed-in-tariffs by technology

Source	Tariff	Conditions	Regulation
Geothermal	US$ 0.01 - 0.19/kWh	Depends on location, and whether the power plant is connected to a high- or medium voltage network	ESDM Regulation No. 22 of 2012
Mini/micro hydro	Rp 656 - 1,506/kWh	<10 MW, dependent on location and whether connected to low or medium voltage network	ESDM Regulation No. 4 of 2012
Biomass	Rp 975 - 1,722.5/kWh		
Municipal solid waste (non-biogas)	Rp 1,050 - 1,398/kWh		
Municipal solid waste (landfill gas)	Rp 850 - 1,198/kWh		
Solar PV	Price ceiling US$ 0.25 - 0.30/kWh	Purchase agreements through tenders. Price ceiling dependent on use of 40% local content	ESDM Regulation No. 17 of 2013

A number of additional policies have been put in place by the GoI to support renewable energy projects, which can have benefits for small and medium scale renewable energy IPPs. These include import-duty/VAT exceptions on equipment, reduced income tax and accelerated asset depreciation Table 4). While these improve the financial viability of projects, they are, in some sense complementary to the core incentive provided by the feed-in-tariff.

Table 4: Additional incentive policies for renewable energy (source: Damuri and Atje 2012)

Aspect	Description	Regulation
Import duty and VAT exemption	Import duty exemption on machinery and capital for development of power plants. Exemption from VAT on importation of taxable goods.	Ministry of Finance Regulation No. 21 of 2010
Income tax reduction	Reduction and various facilities for income tax on energy development projects, including net income reduction, accelerated depreciation, dividends reduced for foreign investors and compensation for losses.	Ministry of Finance Regulation No. 21 of 2010
Accelerated depreciation and amortization	This allows investments to be depreciated within 2–10 years, depending on type of asset. This incentive would reduce the income tax paid by the investors and is expected to encourage expansion of investment	Government Regulation No. 1 of 2007
An income tax reduction for foreign investors	allows foreign investors to pay a rate of only 10 per cent on dividends they receive	

Taken together, the feed-in-tariff and fiscal policies provide a set of incentives that attempts to create a strong business case for private sector (IPP) participation in small and medium scale renewable energy generation. It will be shown, that although these policies provide excellent basis for growing this sector, there are still challenges for IPPs that prevent many projects from being realised. This is a key issue, as IPPs are expected to play a major role in developing Indonesia renewable energy infrastructure.

Independent Power Producers (IPPs)

A focus of the government's efforts to expand renewable energy power generation has been through IPPs. IPPs producing power from renewable sources can make important contributions to resolving key government challenges:

1. IPPs can alleviate the pressure on the state budget. Historically, most investments in the power system have been made by the Indonesian government, through the state-owned utility PLN and its subsidiaries. IPPs, however, use private sector money for their investments and carrying the risks.
2. IPPs build and operate generation capacity, which helps to meet increasing demand.
3. Technologies for renewable electricity production such as solar PV, mini hydro, and biomass conversion can also provide energy access in remote or rural areas.
4. Using domestic renewable energy resources can improve energy independence.
5. Renewable energy technologies help to reduce greenhouse gas emissions in line with the GoI's policy objectives.

It is expected that IPPs have an important role at all scales of project, but experience has shown that the small scale 'sector' has particular challenges in expanding as described in the following section. PLN anticipates additions of small scale renewable capacity adding up to over 3,000 MW by 2020 (PLN, 2012), which is more than 25% of the 11.7 GW total renewable capacity anticipated in PLN capacity planning. However, this will require a significant expansion of projects, private sector investment and skills.

Box 3: The business case for IPPs

The engineering, procurement and construction (EPC) of the generation plant and connection to the grid requires initial financing. This generally comes from a mixture of investors (equity) and banks (debt). IPPs sell the electricity they produce to the state utility (PLN) through power purchase agreements (PPAs) that describe delivery and payment conditions. For electricity from small-scale renewable sources the feed-in-tariff set by the ESDM pays a premium rate for electricity and makes the project feasible; i.e. creates the business case.

However, the FiT is only part of the picture. Investors and banks will only risk their money if they are confident that their investment will actually pay off. For example, they require confidence in the design and EPC contracting; experience in assessing projects; and suitable returns on equity and debt.

Barriers

Successfully operating a small scale renewable energy installation requires the IPP to overcome a variety of technical, financial and administrative challenges. As private sector ventures, the main requirement for successful operation of IPPs is a solid business case (Box 3). The feed-in-tariff scheme makes profitable operation for IPPs possible, but only a limited number of IPPs have been able to be successful to date. This hints at the barriers project developers still face and that this NAMA seeks to address.

Interviews have been conducted with over 20 project developers and local banks, as well as development partners and government officials. These show that that the government's feed-in tariff provides a strong 'pull' mechanism, but that IPPs still face a number of barriers that prevent or delay many projects. The interviews identified challenges in three main areas:

Finance; the majority of IPPs have difficulties getting the necessary loans from banks. This is due to a number of reasons: i) banks report that project proposals often have inadequate feasibility studies, ii) there is a lack of good practice cases for business models, which makes banks reluctant to loan, and iii) banks ask for prohibitively high collateral from IPPs due to the perceived risks, or reject the proposal altogether. IPPs and banks would both profit from the availability of professional technical support that could improve feasibility studies and reduce risks. Additionally, a financial mechanism to encourage banks to give loans, or provide support directly to IPPs, could help to bring down risk premiums and therefore project costs.

Permitting; renewable energy projects often cross multiple government authorities, both in level (national, provincial and district) and area (e.g. energy, water and forestry). A lack of coordination between government officials and having so many authorities involved sometimes leads to delays. Insufficient technical understanding of issues related to RE projects at the permitting authority is also reported to lead to barriers in permitting. At the same time, the IPP is not always aware of the procedures and technical guidelines to follow. A combination of technical and legal support could improve this situation, though it should be noted that many project developers did not report significant.

Revenues; once operational, there can be a limited availability of the PLN grid to receive the power generated by the IPP. The nature of many RE schemes means that they are often located in remote locations. Exactly this type of location is normally where the PLN grid tends to experience problems and the frequency of grid down time is at its highest (Hayton and Nugraha, 2013). To address this with a technical solution is costly and time consuming, since it involves major refurbishing of the power grid. As a short term alternative, some form of compensation payment could be used to reduce the financial impact of the off-take risk help affected IPPs maintain profitability.

The picture that emerges is that finance institutions are able (and often willing) to finance renewable energy projects, but **financing terms are restrictive** and not tailored to the sector. As a result, the only IPPs that can get finance are those who have enough assets to provide the entire capital sum in collateral. This is a large restriction to enter the market.

IPPs typically struggle to get the right expertise and resources in the preparation phase, and there is a serious **lack of technical capacity**. It is fair to say that most parts of the supply chain (those who provide services to developers) need improvement. Part of this is the **need for IPPs to be connected with quality service providers**. Largely as a result of a lack of technical capacity, IPPs frequently encounter time and cost overruns, and there are indications that projects in progress contain technical errors in the design. Projects and developers are only successful if they have access to appropriate expertise. If access to finance is improved to allow 'smaller' players to enter the market, there is a serious capacity building task.

For Indonesia to reach its renewable energy and climate targets there is a clear need for interventions that help the sector grow. An examination of the barriers for IPPs shows that existing policies need to be complemented to be effective, but that there is no single solution. The focus of this NAMA is on barriers where there is a case for government intervention, and on three specific areas that were found to be most compatible with domestic and international support:

1. access to **appropriate finance**,
2. improved **technical capacity**, and
3. improved assurance of **project revenues**.

This focus means that some barriers, such as difficulties with land acquisition or permitting, will not be addressed under this NAMA, but are to be considered in parallel by ESDM and provincial authorities.

3. NAMA objective, components and implementation

Based on the results of the detailed barrier analysis and consideration of existing policy incentives in Indonesia, a number of interventions are proposed for implementation through this NAMA.

This chapter presents the objective, scope and ambition (scale) of the NAMA, as well as the main elements to be implemented, the anticipated impacts, support requirements and approach to measurement, reporting and verification. As noted in the previous section, IPPs face a variety of challenges, which requires a solution with multiple components, that each target specific issues.

THE DRIVER FOR PURSUING THIS NAMA:

To improve the viability for the private sector to invest in small and medium scale renewable energy generation facilities

3.1 Objective and scope

This NAMA seeks to promote small and medium scale renewable energy electricity generation. In particular it focuses on privately owned facilities that are grid-connected and sell electricity back to PLN, so called independent power producers (IPPs). Specifically the NAMA aims to:

- Substantially increase the rate of growth of the small and medium scale renewable energy sector through incentivising IPPs and the financial sector;
- Contribute to the achievement of Indonesia's national targets to reduce GHG emissions by 26% below BAU by 2020 through national means and by 41% with international support; and
- Drive economic development, power generation diversification and reduced oil subsidy costs.

The scope of the NAMA has been defined as:

- Small and medium size (≤10 MWe) grid-connected renewable electricity installations
- Private sector projects, developed as IPPs supplying electricity to PLN
- Technologies that are currently eligible for a feed-in-tariff; i.e. geothermal, mini/micro-hydro, bioenergy, municipal solid waste and solar PV.
- Timeframe for starting implementation and provision of initial support for the NAMA is 2015 – 2020.

Two pilot provinces for the NAMA were selected by Bappenas and ESDM on the basis of suitability for a pilot, availability of data, and their progress with the provincial climate change plan (RAD-GRK). The pilot provinces allowed detailed data and stakeholder feedback to be feasibly gathered, they also provide an opportunity to implement the NAMA at a smaller scale during a pilot phase. These provinces are:

- North Sumatera; with comparatively more experience with IPPs and a more substantial electricity infrastructure; and
- West Nusa Tenggara (NTB); with emerging IPP interest, more modest renewable energy resources and lower levels of infrastructure and grid-connection.

The NAMA is designed to assist grid-connected facilities. However, certain elements are proposed that could also provide a benefit for off-grid generation facilities, such as community or private sector driven projects in remote areas (Box 4).

3.2 Scale and ambition

Two broad options for the scale are discussed here. The first, considers a NAMA that covers the whole of Indonesia. The second, considers a pilot implementation of the NAMA that targets two provinces, North Sumatra and NTB, where stakeholder consultation and data gathering has already taken place. The challenge is to estimate two counterfactual scenarios for both a national and provincial pilot implementation; i.e. what would be the growth in the small and medium scale renewable energy sector in the absence of NAMA intervention versus the growth that could be achieved with the NAMA?

Although the rate of growth of the sector has been relatively slow since the implementation of the feed-in-tariff – with small numbers of mini-hydro projects and little-to-no biomass or other projects – the medium term planning documents of PLN show enormous interest in the sector, with many MW of projects registered and seeking to be implemented. It is extremely difficult to estimate how many of these projects will ever come to fruition without assistance.

Additionally, anecdotal evidence from banking and renewable energy sectors suggests that confidence in lending to small-scale renewable energy projects is currently low for many banks. Interviews suggest that this is due to the fact that the initial generation of mini-hydro projects have often failed to perform as per design, with cost and time overruns common and achieved capacity factors often below those declared in feasibility studies. This is largely due to a lack of technical capacity in the preparation of project documentation and during construction; intentional optimism in possible installed capacities at a certain site; inaccurate resource data and occasionally lack of suitable terms from banks (e.g. short grace periods leading to compressed construction schedules and overruns).

For these reasons a straightforward approach is taken to estimating potential NAMA scale. First an estimate is made the total capacity of small-scale renewable energy generation that could or should reach financial close by 2020 according to planning reports and national/provincial targets. Five main sources were examined (Table 5).

Table 5: Reference documents for determining scale of the national and pilot NAMA

Document	Comments	Source
RUPTL 2012-2021	latest Power Supply Business Plan (*Rencana Usaha. Penyediaan Tenaga Listrik*). Shows firm projects, hence differs significantly (lower) versus the known pipeline below	PLN 2012
RAN-GRK	makes reference to firm targets for small and medium scale capacity by technology in 2020 (but represents only those projects that would be installed unilaterally; i.e. contribute to the 26% GHG reduction target)	Government of Indonesia 2011
Presidential decree (Perpres) 5/2006	Requiring a 5% contribution to the national energy mix from non-geothermal, non-large-scale hydro by 2020 along with specific technology targets provided by ESDM	Government of Indonesia 2006; ESDM 2008
known IPP pipeline for North Sumatra and NTB	as submitted by developers to PLN; only available in detail for North Sumatra and NTB based on data provided by PLN in both these provinces	unpublished
Resource data	Collected in detail in North Sumatra and NTB based on the work of the CASINDO programme[14] and updated during the course of NAMA development. Whole Indonesia data is aggregate level only based on limited data.	Ambarita 2013; Muchtar et al. 2013a

The significant differences observed across these documents and the approach taken in determining appropriate scale is discussed for both the national and provincial pilot cases.

[14] www.casindo.info

Indonesia

As seen in Figure 6, there are a range of plans and targets that can be considered for small and medium scale renewables, all of which are far in excess of current installed capacities. The PLN RUPTL planning provides a sound basis for estimating the potential installed capacity in 2020 (Figure 7). More optimistic estimates can be obtained by considering the resource potential, the pipelines of projects recorded in provinces or interpolating the government Perpres 5/2006 targets from 2025; however, these provide less rigour than looking at planned projects. From this starting point of the RUPTL plans, Figure 7 shows two approaches to determining scale. In the first, the full planned capacity out until 2020 is supported by the NAMA and in the second, the domestic efforts of the RAN-GRK are taken into account. In the latter formulation, the NAMA, as a supported mitigation action, is considered to support required capacity beyond announced domestic efforts.

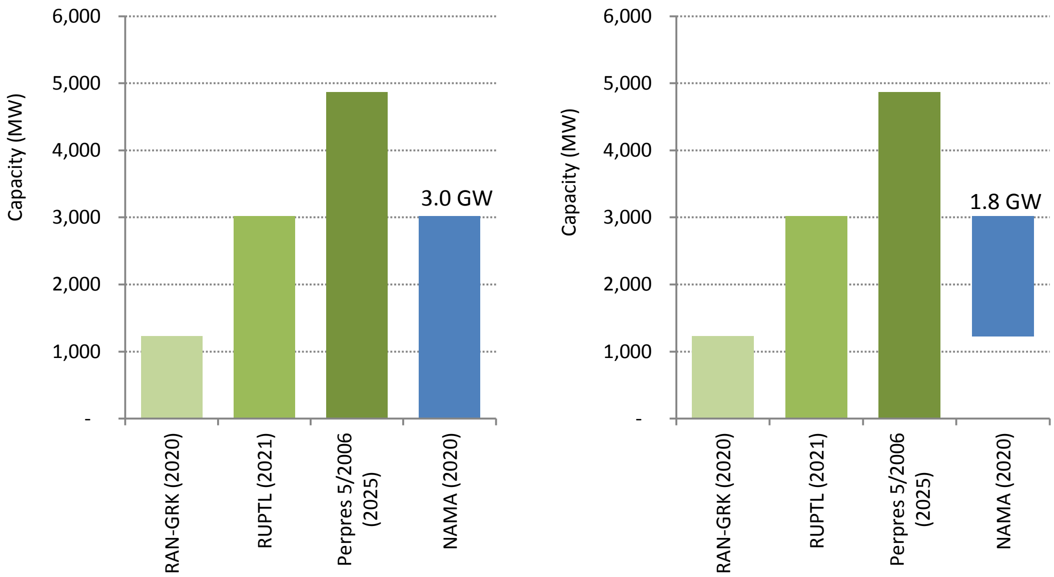


Figure 7: Two methodologies for determining national NAMA ambition; full planned capacity [left] and incremental planned capacity beyond RAN-GRK ambition [right] (source: own derivation from sources in Table 5)

The second approach is adopted, such that the national NAMA would support 1.8 GW of additional small and medium scale renewable energy; i.e. beyond those initiatives laid out in the RAN-GRK. There are a number of justifications for this more conservative target:

Not all 2020 capacity will be IPPs; the RUPTL planning document includes both PLN and non-PLN projects. Targeting the entire anticipated installed capacity would exceed the total capacity of IPP projects.

Not all IPPs will need NAMA support; a small number of project developers have shown themselves to have adequate technical and financial resources to successfully develop projects, typically those larger concerns that have existing business interests in other sectors.

This NAMA seeks international support; the NAMA seeks to raise ambition of RAN-GRK (domestic NAMAs) by seeking international support, so should focus on this additional capacity.

Some components will benefit the entire sector; certain proposed solutions, for example in relation to capacity building and technical assistance are relatively independent of the scale of national ambition for the NAMA.

It should be noted that a figure of 1.8 GW represents a sub-set of known projects, that have already been submitted to PLN for consideration or proposed by PLN for development themselves. It is not a figure based on resource assessments or speculation based on potentials, but rather an achievable target that gives a sense of scale of what could achieved in Indonesia with support. The uncertainty behind the figure comes from knowing what fraction of projects may realistically come to fruition without further support. That is very hard to judge, but has generally been low in recent years. That being said, 1.8 GW remains a very large scale of renewable energy deployment to consider; even based on modest technology costs, the total investment to be mobilised is in the order of US $2.7 billion. For this reason a pilot of the NAMA is also considered in the two provinces where there has been initial engagement with the concept; North Sumatra and West Nusa Tenggara.

Provincial pilot

At the provincial level, more detailed information on project pipelines are available, including those projects that have been announced to PLN, but are not included in the RUPTL planning. Theoretically this allows more certainty in determining scale, but in fact, the additional registered (but not formally planned) projects are often unclear in terms of viability.

Figure 8 shows the large additional capacity of mini-hydro IPPs that has been announced to PLN in North Sumatra, roughly three times that shown in the RUPTL at almost 700 MW. Yet the estimated potential for mini-hydro in North Sumatra is 735 MW (Ambarita 2013), which suggests that basically all sites in the province would have to be developed for the registered pipeline to be accurate. This mismatch occurs because projects often overstate their capacity or calculate incorrectly.

Therefore, as a conservative approach to determining scale, a portion of the RUPTL planned capacity is considered to be supported by the NAMA, using similar logic to the national case. In this instance it is assumed that

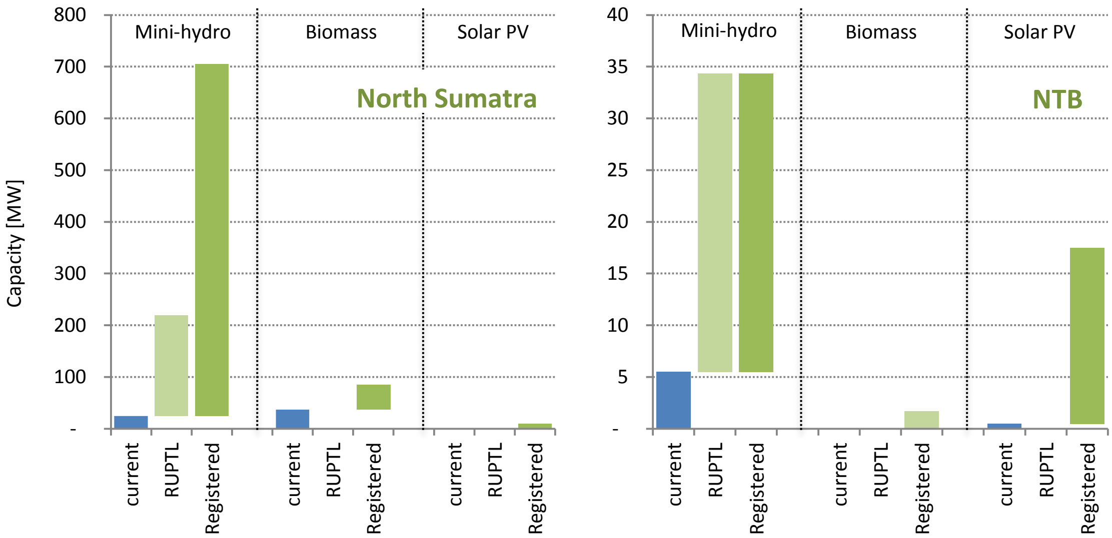


Figure 8: Current, PLN planned and registered capacities for mini-hydro, biomass and solar PV in two pilot provinces; North Sumatra [left] and NTB [right] (source: own derivation from sources in Table 5)

3.3 Programme design

The government of Indonesia and development partners already undertake various initiatives to support renewable energy investments. To avoid duplication and overlap, this NAMA therefore focuses on three areas that face ongoing challenges: *1) access to appropriate finance,* 2) *technical capacity* and 3) *assurance of project revenues.* This focus emerged during NAMA development in consultation with GoI, private sector and development partner stakeholders. Chapter 2 and Annex B provide more detail on the analysis of the barriers that led to these three elements. To be explicit, the NAMA does not propose changes to the feed-in-tariff regulations, as these were deemed to be adequate during the development of this concept[15].

The NAMA proposed is a package of three components that together act to improve the investment environment for independent power producers (IPPs) to invest in grid connected small and medium scale renewable electricity production (Figure 9). The components are expected to combine domestically sourced actions and internationally supported actions.

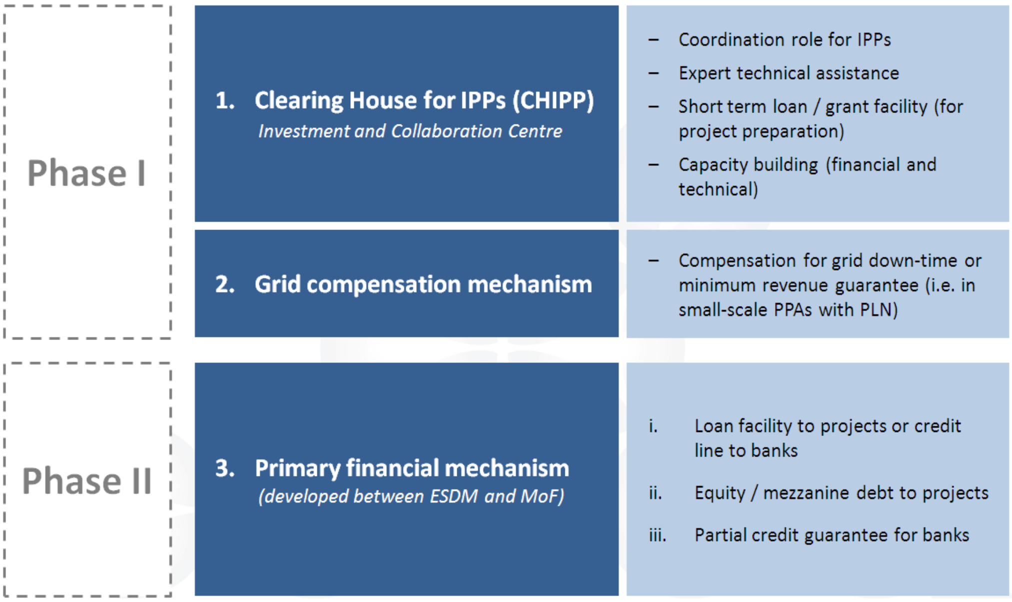


Figure 9: NAMA components

3.3.1 Phase I: Technical assistance and revenue compensation

Phase I addresses barriers to project development that relate to technical capacity and project revenues in order to improve the operating environment for project developers and project viability. It establishes a technical support centre, or so-called ‘clearing house for IPPs’ (CHIPP), in order to improve capacity amongst stakeholders. Phase I also provides compensation for revenue losses for projects that cannot export power due to infrastructure issues outside of their control.

Phase I outcomes

In order to quantify the potential impacts of these components, a financial analysis[16] was undertaken for a nominal mini-hydropower project that considered IPPs financial internal rate of return (FIRR[17]), a key

[15] However, recent changes to macroeconomic conditions in Indonesia, particularly the recent rise in interest rates and devaluation of the Rupiah, may cause this assumption to come into question. These issues are touched on in Chapter 4: Next Steps

[16] This allowed an observation of the results of changes in various parameters on the Financial Internal Rate of Return (FIRR) for potential investors. The @Risk software programme was used to generate simulations of the FIRR based on identifying probability distributions for key parameters in the FIRR calculation.

[17] the FIRR of an investment is the discount rate at which the net present value of costs (negative cash flows) of the investment equals the net present value of the benefits (positive cash flows) of the investment. IRR calculations are commonly used to evaluate the desirability of investments or projects. The higher a project's IRR, the more desirable it is to undertake the project. More specifically,

metric for assessing project viability (Figure 10). The analysis quantifies the impact of applying real-world uncertainty to different project parameters and how this impacts the FIRR. The first of these parameters is project investment costs and the uncertainty surrounding estimates of these costs. The analysis assumes a nominal investment cost in line with the average of existing mini-hydropower developments in Indonesia and analyses the impact of applying a potential 10% and 20% cost overrun[18]. The second key parameter is the capacity factor achieved by the project. The analysis assumes that this lies between 60 - 70%, but that a developer has imperfect knowledge of their final achievable capacity factor due to inadequate resource data and technical skills[19]. The third parameter is grid availability and this is assumed to lie within a range of 80 – 100%[20].

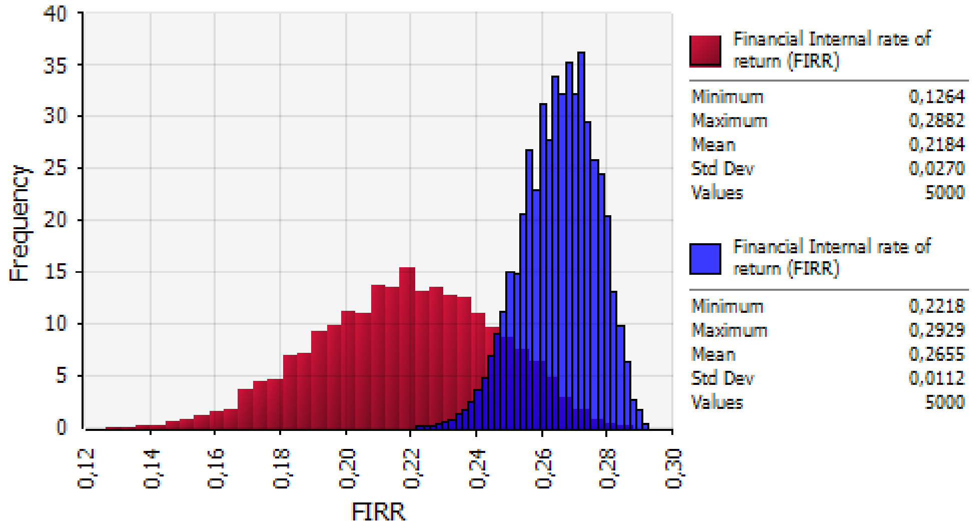


Figure 10: Example of potential FIRR improvements due to Phase I components; without NAMA intervention is shown in red and with Phase I assistance is in blue (source: own derivation)

The difference between the two FIRR probability distributions shows the impact of making improvements to the project conditions as a result of the assistance proposed in Phase I of the NAMA. The FIRR distribution in blue shows an improved scenario, with a higher mean return of 26.5% and lower standard deviation (i.e. a lower risk of variation in returns).

In order to illustrate outcomes, the improved scenario assumes that technical assistance[21] allows an investor to more accurately identify the capacity factor of potential projects (i.e. less risk of under-performing). Second, it is common for project developers to experience cost overruns in hydropower projects in Indonesia. Improving the accuracy of investment cost estimates reduces the probability of cost overruns. Finally, enabling project developers to obtain full access to the grid and deliver 100% of the power they produce will improve the IRR of the project and reduce risk to the investor. It is assumed that

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only projects or investments with IRRs that exceed the cost of capital should be undertaken. This rate is high in Indonesia (in the order of 15%), due to the prevailing high interest rates and strong market for investment opportunities, meaning that developers typically look for IRRs in excess of 20%

[18] which is indicative of the observed overruns from interviews, with almost all developers facing an overrun of at least 10%

[19] Similarly, it was observed across the vast majority of projects that achieved capacity factors were substantially lower than those forecast

[20] When developing a financial model for a project, the developer expects to be able to export 100% of the electricity produced. However, based on observations, grid tripping and outages in many more remote locations can reduce this by up to 20% in some instances. See section on barriers earlier.

[21] In the form of resource data, matchmaking with technical consultants, guidelines and expert review

this is achieved through the compensation mechanism proposed in Phase I for situations where grid availability is less than 100%.

Although this is an illustrative example, it shows the significant effect that improved project design (i.e. technical capacity) and assurances of project revenues – the interventions proposed for Phase I of the NAMA – can have on the financial viability of IPP projects.

Clearinghouse for IPPs (CHIPP)

The starting point for transformation of the sector is to improve the level of technical, financial and institutional capacity within IPPs, associated service providers (such as engineering firms), government agencies and the financial sector. The key mechanism for building capacity and providing technical assistance will be through the formation of a technical support centre for IPPs; a so-called clearinghouse for IPPs, 'CHIPP' henceforth.

The CHIPP will have benefits for financial institutions as well as IPPs. Technical support and matchmaking will lead to more robust feasibility studies and more realistic business plans, which will reduce risks for banks and therewith help to increase access to finance for IPPs. At the same time, better technical capacity is likely to improve project performance throughout its lifetime, which will lead to better project return overall. Specific tasks proposed for the CHIPP are presented in Table 6, covering the following roles identified from consultations:

Coordination role; IPPs often have little information about who to ask for technical assistance, even this expertise may be available they are not aware of it.

Knowledge and information management; reliable resource data, tailored project guidance and sector information is difficult to obtain.

Technical assistance; many IPPs have basic needs for early stage expertise to make pre-feasibility assessments. In addition, off-grid, community based projects have difficulties to remain operational.

Short term loan / contingent grant[22] facility; upfront costs of FS are significant and interviews have shown that cost and lack of experience often leads to low quality FS and low confidence from the financial sector. This activity requires relatively modest investment that should be able to be repaid for successful projects.

Training and capacity building; there is a widespread need to provide training targeted at different stakeholders including project developers, banks and government officials (e.g. regulators). Key areas include feasibility study preparation, financial assessment/due diligence, EPC contracting and technology characteristics.

[22] Contingent grants of this type are targeted at preparatory activities and then repaid in part or in full when the project has reached the operation and revenue-generating stages (Maclean et al. 2008)

Table 6: Specific tasks proposed for the CHIPP

	Tasks
Coordination role	– Champion for IPPs; dedicated 'voice' within ESDM that can reflect challenges from the sector – Provide a database of relevant actors to provide a reference for consultants, technical experts, project developers, and financing institutions. – Coordinate within ESDM; e.g. strategy input and review activities
Knowledge and information management	– Coordinate, track and publish renewable energy resource data – Provide a central accessible project database; e.g. developers, capacities, project performance and technologies. – Process advice, guidelines and user/technology manuals – Regular report on the sector; e.g. newsletters and updates – Review of licensing processes in the interest of increased standardisation
Technical assistance	– Serve as centre of technical and financial advice for hydro, biomass, solar PV and MSW projects – High-level review of early stage project documentation and provision of templates – Guidance to Koperasi on O&M procedures for off-grid projects
Short term loan / contingent grant facility	– Provide partial grants / loans for feasibility studies (FS) to increase the quality and volume of early stage projects – Manage the loans/grant programme; eligibility assessments, awarding, monitoring and potential cost recovery – Gather data from the funded studies to inform policy
Training and capacity building	– Provide capacity building activities/training (financial and technical) – Coordinate outreach events in provinces and with private sector

Review of the CHIPP with stakeholders led to a number of design considerations that should be taken into account in the final implementation of the body. These focus around:

Process Start from design of legal framework and organizational structure; Roles, responsibilities, reporting and legal status should be clearly established in advance of operation

Benchmarks Use MDG Secretariat and Energy Efficiency and Conservation Clearing House Indonesia (EECCHI) as benchmarks and learning experiences for establishment; Secretariat is semi-independent agency and EECCHI already operates as clearing house using state budget contributions

Support Utilise both national budget and donor support; This demonstrates domestic buy-in and ownership, but also satisfies the ambition of the NAMA to use international support to supplement RAN-GRK domestic efforts.

Targets Set clear targets; for example, how many forums, IPPs assisted, FS funded per year? This will also be important in terms of measuring performance (see later section on 'MRV').

Expertise Provide professional and expert assistance; IPPs were clear in their responses on the potential added value of such a body. For greatest impact it should provide expert assistance, or link to people that do. This may require external consultancy support during establishment and operation.

Concretely, the proposed activities of CHIPP are expected to improve the accuracy of IPPs studies/designs, reducing the risk of cost overruns and increasing the trust of banks in these projects. Based on a study of off-grid renewable energy in West Nusa Tenggara (Hekkenberg and Cameron 2014), it is found that there is also the opportunity for CHIPP to offer similar guidance and assistance to off-grid projects, a key challenge for the viability and sustainability of these projects (Box 4).

Box 4: Off-grid renewable energy and CHIPP

Approximately 20% of the Indonesian population lives without access to electricity (ESDM 2014b), and many connected households and businesses may be considered to have access to minimal infrastructure and power availability. Off-grid systems have a long history for providing power to these customers. Indonesia's archipelagic geography, combined with low energy demand in rural areas, make off-grid power solutions a logical choice in these communities as an initial solution for access. Renewable energy options such as small hydro and solar PV systems are prime candidates for this, with good resources available locally throughout much of Indonesia and low operational costs compared to diesel generators. Additionally, these options fit well in the context of Indonesia´s targets for renewable energy and greenhouse gas mitigation.

There are and have been, many initiatives from the Indonesian government, NGO's and international organizations, to build off grid renewable energy systems in Indonesia. Many of them have successfully provided electricity to communities and improved local livelihoods. However, there are still many stories of such initiatives failing after a limited time, for a variety of reasons. A lack of technical and project management capacity is identified as the leading challenge for off-grid RE based on a study of micro-hydro systems (MHP) in the province West Nusa Tenggara. This deficit of experience and skills impacts on the performance of projects through design inaccuracies, ongoing operation through poor maintenance and the eventual viability of projects in terms of increased costs.

There is a need to provide improved technical assistance to these projects and to government agencies (current off-grid programmes are spread across three line ministries). There is the possibility that this support could be included in the mandate of CHIPPs activities, given the strong overlap in needs between on- and off-grid projects in this regard. These tasks could include: tracking off-grid initiatives in Indonesia in order to improve coordination by the government, providing guidance and resources to support different stages of off-grid development, monitoring system performance for comparison with benchmarks to identify areas for improvement and liaising rural operations with experts or between communities for learning and improving performance. For some technologies existing organizations could play a role, rather than building all expertise within CHIPP. For example, there is already a micro-hydro centre in Bandung, the ASEAN Hydropower Competence Centre (HYCOM; www.hycom.info). Extending the role of this organization and linking it to the target audience through CHIPP is a possibility.

Grid compensation mechanism

As noted earlier, the nature of many RE schemes means that they are often located in remote locations. Exactly this type of location is normally where the PLN grid tends to experience problems and the frequency of grid down time is at its highest. Interviews with IPPs show that some projects in areas of poor grid stability are not able to export power for up to 20% of their generated power (Hayton and Nugraha, 2013). Such a loss in revenues can have with severe implications for their ongoing viability.

Large IPPs are often able to negotiate 'take-or-pay' provisions in their power purchase agreements (PPAs), effectively a type of minimum revenue guarantee. In this instance, if an IPP is generating electricity, PLN must be able to receive this or pay some form of compensation that is agreed (for example lost revenues). However, small and medium scale installations are not currently able to achieve this. In practice, the mechanics of agreeing a take-or-pay provision payment for small and medium scale generation may be too complicated and would require quite sophisticated logging monitoring of actual power generation for many smaller facilities. Such detailed logging would be needed as it is possible, for example, that low output of a project is due to inefficiency of IPP operation.

What is more feasible, and proposed here, is a compensation (or part compensation) mechanism for grid down time where this can be formally recorded, monitored and is therefore accountable. In this formulation an agreed payment would be made to affected IPPs based on a more pragmatic measure of the availability of the facility to provide power, e.g. production over an agreed preceding period. Monitoring central grid interruptions – as opposed to connections to the grid provided by IPPs themselves – would still require strict controls on aspects such as data logging and calibration of logging equipment, but the equipment available to do this is readily available and affordable.

The mechanism requires non-recoverable support for those affected IPPs. Using external (non-PLN) funds is one option, however, this creates a risk of a perverse incentive for PLN for the provision of reliable grid access. A mixture of PLN and non-PLN compensation programs may be possible, for example topping up payments made to generators. Given the existing challenges of infrastructure development in remote regions and current substantial subsidies to PLN to sustain operation, such a formulation may be necessary. Similarly, it is proposed that the grid compensation mechanism is run as a pilot with non-PLN funds during a test phase.

3.3.2 Phase II: Financial mechanism

Phase II will address the barriers for IPPs to secure appropriate financing for project development. As noted earlier, there is limited experience and trust for renewable energy projects within the Indonesian financial sector which could be characterised as generally liquid but risk averse. Linked to this, there is little to no availability of project financing[23] and loans that are made available may not be favourable (e.g. in terms of loans tenor, variable rates or other characteristics of the traditional mode of lending).

Phase II outcomes

The primary objective of the proposed financial mechanism is to increase access to finance for IPPs by encouraging project financing and mitigating risk perception for renewable energy projects in the financial sector. The goal is to increase the ability of IPPs, who may have otherwise had difficulty in obtaining financing, to enter and participate in the renewable energy market. This will act to increase the number of active IPPs and therefore projects, scaling up the sector faster than a scenario in which only large incumbent players, who have established business interests in other fields, participate.

That being said, the implementation of a financial mechanism can also have important benefits for the financial viability of projects as it can affect factors such as perceived risk (reducing lending rates), the period of time for debt repayments (improving project cash flows) and rates of return from lenders.

The range of design options available for Phase II mean that firm outcomes cannot be determined; however, the three proposed financial mechanisms have some similar characteristics and potential outcomes. As one example, all three could be used to extend the loan period (or 'tenor') for debt provided to IPPs, which improves project cash flows during initial years when IPPs most value their return. This type of intervention can yield marked improvements for the viability of projects for IPPs (Figure 11), increasing not only the interest of IPPs to develop projects, but also making projects feasible that would have otherwise been marginal.

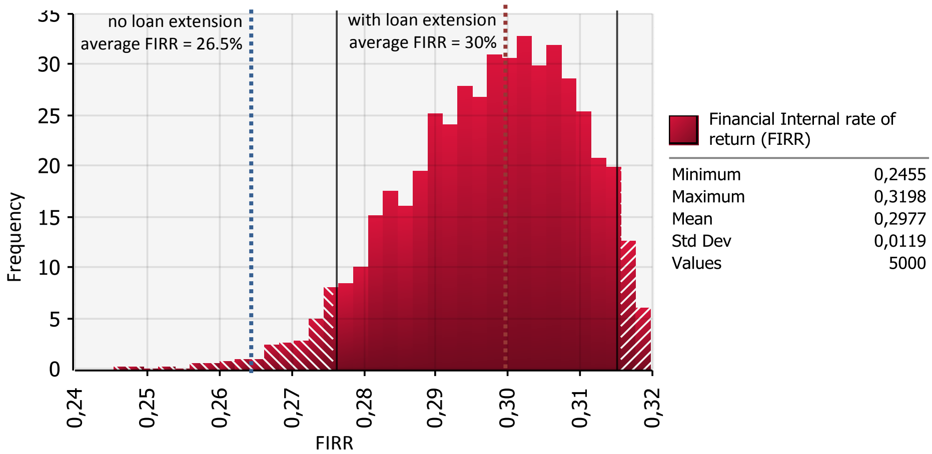


Figure 11: Example of FIRR improvements for Phase II components due to increased tenor (length) of lending from 7 years to 10 years; with NAMA intervention is shown in red while the average FIRR without support is shown in blue (source: own derivation)

[23] Lending to projects against expected project revenues rather than the current practice of lending to small and medium scale renewables against collateral (which many IPPs will have difficulty to provide).

Increasing FIRR through such a mechanism can be substantially more cost-effective, in terms of use of public funds, versus a simple increase in feed-in-tariffs.

Design options

The starting points for the selection of options for a finance mechanism are an observation of the current banking sector – generally liquid, quite risk averse and limited to relatively short term loans – and existing efforts to transform this sector and increase private sector involvement in infrastructure investment in Indonesia. At this time a choice of financial assistance has not been made, but will be coordinated during 2014.

Presented here are three interventions that have the common features of: being favoured by stakeholders during consultations; having been considered by government financing agencies or public banks to lesser or greater degrees in recent years; currently offered in some form in Indonesia, perhaps at a different scale or sector; and have an identified implementing agency that has expressed interest in administering Phase II of the NAMA.

Loan facility / credit line

Loan facilities and credit lines are a way to provide debt financing for projects, either directly from a facility or via the banking sector (Box 5). They are a relatively direct way to stimulate lending, substituting public funds for debt that would otherwise come from the market. With debt generally providing 70% of investment costs in the sector, they require significant funds to operate.

Box 5: Loan facility / credit line

The main purpose of credit lines is to address the lack of liquidity to meet medium to long-term financing requirements of clean energy or other climate projects. In markets where high interest rates are seen as a barrier, credit lines can be offered at concessional rates to induce borrowing and direct credit to target sectors and projects. And when the credit risk of such projects is high, credit lines can also be structured on a limited or non-recourse basis so that the development financial institution shares in the risk of the loans on-lent by other financial institutions. These provide debt finance but by-pass commercial financial lending institutions. Can stimulate investment from CFIs, as overall risk profile is reduced, but I have limited the examples as they are not specifically directed at engaging CFIs (Maclean et al. 2008).

Experiences from existing schemes (Box 6) and interviews with the Indonesian banking sector show that the additional administrative burden of on-lending can make credit lines less attractive. A recent study of the Indonesian banking sector noted that "*The currently favourable refinancing conditions of Indonesian banks reduce the attractiveness of such schemes if those eat into their usual profit margins or require a high administrative burden. Experience with soft loan schemes from international donors have shown that banks are hesitant to cooperate if this comes with smaller profit margins than their conventional business... Feedback from banks suggests that they are reluctant to accept soft loan facilities that provide individual loans which are tied on project loans, since these are associated with high transaction costs for rather low loan amounts. In addition, donor credit lines were rejected for requiring a too long planning horizon*" (DIE, 2013). The study reaches the same conclusion as the interviews during NAMA development, that a portfolio approach to credit lines is therefore more appropriate than individual project loans should such a scheme be pursued.

In the longer term this type of scheme expects that banks gain familiarity with renewable energy projects through utilisation of the credit line (for which there is evidence for from other countries), or observe of the success of a public loan facility (though this is harder to argue) and would begin to make loans independently. Thereby allowing the scheme to be removed or phased out over time.

Box 6: Indonesian experiences with loan facilities and credit lines

PIP has experience with offering both a renewable energy loan facility and energy efficiency credit line in Indonesia. The first is a revolving debt fund of roughly US $25 – 30 million for mini-hydro projects. However, as noted earlier, the risk profile of projects have so far not been acceptable to receive funding and collateral requirements remain high under this scheme (in excess of 100% of loan value) limiting eligible IPPs. The second is the Energy Efficiency Revolving Fund is a USD 45 million concessional credit line for local banks lending to energy conservation projects. This is in the process of being implemented.

The French Development Agency (AFD) has provided USD full-recourse credit lines to banks in Indonesia, starting with a US $100 million credit line to Bank Mandiri for low-carbon investments. Three additional credit lines are planned. Anecdotal evidence suggests that lending to renewable energy projects through such a credit line remains challenging due to perceived risks and due diligence challenges of these projects.

Equity / subordinated debt

Taking an equity stake in projects or providing subordinated debt (either from a direct facility or a credit line through a financial institution) can improve the ability of IPPs to obtain bank financing as well as favourably impact their lending terms (for example longer loan periods) (Box 7). The involvement of an equity/debt sponsor can also signal to financial institutions that a recognised organisation considers the project viable and has conducted its own due diligence.

Box 7: Equity / subordinated debt

"Subordination" refers to the order of or priority for repayment. Subordinated debt is structured so that it is repaid from project revenues after all project operating costs and senior debt service has been paid. The senior lender gets paid first, and then the subordinated lender. Subordinated debt can substitute for and reduce the amount of senior debt in a project's financial structure thus addressing a possible debt-equity gap and reducing risk from the senior lender's point of view. Subordinated debt can also substitute for and reduce project sponsor equity requirements set by senior lenders. It is typically in the range of 10-25 percent of a project's sources of funds, and mostly intended to support smaller scale (<15 MW) RE projects (Maclean et al. 2008). In some sense, equity is the 'most subordinated' form of financing, as these investors are the last to be paid, though a key difference is that they retain a stake in the project.

This approach has seen limited testing in Indonesia, for example through the Indonesian investment companies PT SMI and PT IIF (Box 8). Both have a mandate that can include subordinated debt, equity or convertible debt positions in projects. PT IFF is targeted towards filling a gap in the institutional landscape for infrastructure development and finance in Indonesia - a commercially oriented entity providing fund based products such as long term financing. PT SMI already plays a role in providing equity (as well conventional project financing) to renewable energy projects, typically mini-hydro, but lacks the resources to do this at sufficient scale across Indonesia.

As with credit lines, the expectation in providing such a mechanism to renewable energy projects is, that over a relatively short time financial institutions gain familiarity and trust in these projects by directly administering loans, allowing the support to be reduced or removed.

Box 8: Indonesian experiences with equity and subordinated debt

PT Indonesia Infrastructure Finance (PT IIF) is a private non-bank financial institution under the Ministry of Finance, Regulation (PMK) No. 100/2009, with a focus on investing in commercially feasible infrastructure projects. IIF's nature is to provide project financing scheme to infrastructure projects, whereby IIF can offer term loan financing up to 15 years. This is an area that banks in Indonesia have not yet been able to comfortably to offer to their clients. In addition, IIF is able to provide mezzanine financing and equity investments to certain clients. PT IIF has been operating for 4 years and delivered its first financing agreement in September 2012, with long term finance for a toll road project in West Java. It now has investments in two gas fired power stations and one large hydro project, though the financing conditions for these involvements are not clear from publically available information (IIF, 2014).

An initial concept for a biomass NAMA in Indonesia – to act as a catalyst for early demonstration projects that incorporate methane capture from biomass waste streams – also considers a form of equity provision, proposing a 10% grant in place of equity to projects (GoI 2013).

Credit guarantee

Credit guarantees provide compensation to lenders for the non-payment of a loan by a borrower. They can therefore encourage lending in instances where a financial institution felt the risk of non-payment was too high or had set prohibitive collateral requirements; e.g. in newer areas of lending such as renewables (Box 9).

Box 9: Credit guarantees

The use of guarantees is appropriate when financial institutions have adequate medium to long-term liquidity, yet are unwilling to provide financing to clean energy or other climate projects because of high perceived credit risk (i.e. repayment risk). The role of a guarantee is therefore to mobilise domestic lending for such projects by sharing in the credit risk of project loans the financial institutions make with their own resources. Guarantees are generally only appropriate in financial markets where borrowing costs are at reasonable levels and where a good number of banks are interested in the targeted market segment. Typically guarantees are partial, that is they cover a portion of the outstanding loan principal with 50-80 percent being common. This ensures that the financial institutions remain at risk for a certain portion of their portfolio to ensure prudent lending (Maclean et al. 2008). They have been used successfully in many countries and sectors, see for example Beck et al. (2008) who summarise 76 such schemes.

A recent banking survey in Indonesia confirmed the findings of this NAMA's barrier analysis, that a major bottleneck to renewable energy financing in Indonesia is the perception that green investments are more risky than conventional ones (DIE, 2013). This is due to two main factors: first, banks having little experience with these projects and therefore insufficient capacity to adequately assess the risk, and second, the poor quality of feasibility studies and technical/financial documentation that banks often receive. Alongside the technical capacity building efforts described in Phase I, a risk mitigating instrument such as a (partial) credit guarantee could help to incentivise the financial sector.

Key issues to consider in the design or agreement of such a scheme are the fact that these types of guarantees are rarely self-sustaining[24] and may add significant burdens for due diligence and administration if applied at the project level. Proposed here is a publicly operated direct portfolio guarantee to Indonesian banks, in which the governance and funding of the scheme is public (domestic and

[24] i.e. they will require non-recoverable or grant financing that is exhausted as claims on the guarantee are made. This results from the need to keep administration fees paid by IPPs relatively low in order to avoid negatively impacting project feasibility (Beck et al. 2008).

international). Management of the scheme is also proposed to be performed by a public implementing agency, but credit risk assessment (with technical assistance provided for novel project types) and loan recovery may more practically be done by the private sector.

Initial consultations with stakeholders shows interest in such a scheme, with PIP suggested as a potential implementing agency. There is also anecdotal evidence to suggest that a guarantee scheme may be adopted in place of PIP's planned Energy Efficiency Revolving Fund, should sufficient support to capitalise the fund not eventuate.

As with the other mechanisms described above, the expectation is that banks gain familiarity and experience with guaranteed projects/portfolios and that over time this translates to independent lending and the guarantee can be reduced or removed.

Box 10: Indonesian experiences with credit guarantees

Kredit Usaha Rakyat (KUR) is a micro credit guarantee programme in Indonesia. KUR is part of the Jaminan Kredit Indonesia (JAMKRINDO) credit guarantee scheme and is 100% government-owned. KUR offers guarantees for loans given to micro-SMEs and therefore decreases the normally high interest rates for these loans. A key difference would be that the size of these KUR guarantees is modest compared to those required for the renewable energy sector, while the number of guarantees is immense. For example, a total of RP 29.2 trillion (approx US $2.6 billion) was guaranteed in 2011 across more than 6,000,000 customers (JAMKRINDO 2012).

The Indonesian Infrastructure Guarantee Fund (IIGF), which offers government guarantees to large PPP infrastructure projects against political risks, is often referred to in this context, but should be noted as being distinct from a credit guarantee. This type of political guarantee provides coverage against specifically defined political (or sovereign) risks; i.e. risks related primarily to government, as opposed to risks related to IPPs or relatively new fields of lending.

Selection and design

The design options described above are loosely defined at this stage by intention, as the broader strategy for encouraging smaller scale private sector involvement in green investments in Indonesia is still evolving under the guidance of the Fiscal Policy Agency (BKF) of the MoF, as well as initiatives from other bodies such as the outgoing financial regulator, Bank of Indonesia[25]. Development of a suitable concept and scheme for the financial mechanism will be done in collaboration with ESDM, MoF, the identified potential implementing agencies and selected sources of support over the course of 2014. More on this in the final chapter on 'next steps'.

3.4 Support requirements

Although the mechanisms outlined for Phase II are not yet final and require further detailing, an indicative estimate required for the implementation of the NAMA for each of the different options is valuable. The possible sources for support and types[26] of support are also discussed.

[25] Bank Indonesia have been promoting various levels of regulation; for example to require banks to take into account environmental issues when providing loan portfolios, or possibly requiring a certain portion of loans to be provided to certain types of projects

[26] e.g. loan or grant/non-recoverable finance. This question is equally relevant whether funds are provided domestically or internationally

Sources

Domestic

Substantial domestic public support for a financial mechanism to assist the small and medium scale renewables sector would be in keeping with the GoI's recent approach to initiatives and policies that can reduce fossil fuel subsidies and diversify energy supply; for example PT SMI's contribution to the IIF, the anticipated support to the PIP energy efficiency revolving fund, the establishment of the Geothermal Fund and others.

Furthermore, there is the expectation within government that public financial contributions towards the achievement of the RAN-GRK will need to increase. In the 2012 budget, central government expenditure on RAN-GRK actions amounted to IDR 7.7 trillion, which is four times the level in 2009, but still accounts for less than 1% of total public expenditure. Internal estimates of costs required to meet the national target of a 26% reduction in GHG emissions by 2020 versus BAU (equivalent to approximately 767 $MtCO_2$-eq) suggest that the current level of RAN-GRK support will only achieve 15% of the GHG target (i.e. 116 $MtCO_2$-eq) (Ministry of Finance, 2012). Additional expenditure on RAN-GRK actions, improved effectiveness of expenditure and additional actions on renewable energy generation in the electricity sector are all proposed in order to meet the target (Table 7).

Table 7: Anticipated contributions to 26% emissions reductions and indicative costs (source: Ministry of Finance, 2012)

Sources of Emission Reduction	Emission reduction (m tCO2e in 2020)	Indicative costs (IDR tr/year[1])		
		Public	Private	Total
Maintaining RAN GRK expenditure at 2012 levels	116	16	0	16
Additional RAN GRK expenditure in line with GDP	31	4	0	4
Improving cost effectiveness of existing expenditure	78	1-2	0	1-2
Power generation emissions 26% lower, incl. geothermal	104	15-45	15-45	40-70
Policies to limit deforestation to 450,000ha/year	260	1-2	20-30	21-32
Reductions required from new initiatives	121	6	11	17
RAN GRK target for forest, peatland, energy & transport	710	45-75	45-85	100-140
Reductions from agriculture, industry & waste water	57	Not covered in this first MFF		
Total RAN GRK target	767			

1) Indicative costs expressed in 2012 prices.

The support needs for this NAMA and an expectation of GoI support for implementation are, therefore, broadly in line with current approaches to public support and the anticipated additional expenditures and actions in required in the power sector. In addition, the Ministry of Finance (2012) Mitigation Finance Framework study notes that it would be prohibitive to fund mitigation efforts from public budgets alone and that, "*government is therefore committed to finding ways of engaging the private sector and other non-state actors to share the cost of the gap in mitigation funding*". The focus of this NAMA on leveraging private sector investments in the form of IPPs is in keeping with this need to minimise public contributions.

International

The volume and form of international support for the NAMA will depend on the scale chosen for implementation – national or provincial pilot – and the design of Phase II. This includes the possible role of the GoI in funding the financial mechanism, potentially in cooperation with a development partner or other source of international support. In the short term international support is sought for Phase I components, including establishment costs and initial operational costs for the CHIPP, as well as funding for a pilot of the grid compensation mechanism in the recognised absence of sufficient revenues at PLN.

To date Indonesia has been successful in securing support from the limited earmarked funds available to NAMA implementation; namely the NAMA Facility, jointly established by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Department of Energy and Climate Change (DECC) of the United Kingdom which launched with an initial €70 million of funding. The NAMA Facility awarded the Indonesian Sustainable Urban Transport Initiative (SUTRI) NAMA 15 million of grant support in November 2013 for the initial phases of implementation (GoI, 2013b). In addition to dedicated sources of support such as the NAMA Facility, this NAMA is considering additional sources and has been in discussions with a number of development partners over the last 12 months. It is anticipated that these discussions will continue in more depth in 2014 as more detail is known on Phase II and a firmer proposal is available for discussion.

Indicative support needs

Support requirements are calculated at both national and provincial pilot scales indicating type of support needed, be that concessional lending of some form, or grant/non-recoverable support for certain elements. The first phase of a pilot implementation would require in the order of US $9 million of grant/non-coverable financing. The second phase would require additional support, ranging from US $20 million of non-coverable financing to between US $90 and 200 million of concessional lending. A national implementation, supporting 1.8 GW would require roughly US $65 million in Phase I and up to US $2.0 billion in Phase II depending on the scheme adopted (Table 8).

In the absence of detailed designs and operational plans for each element, these estimates are indicative only, but provide a useful starting point for discussions on anticipated support requirements. They are based on a number of assumptions in regards to uptake of support and costs as indicated in Table 8.

Table 8: Indicative NAMA support requirements (source: own derivation)

		National implementation	Pilot implementation (North Sumatra and NTB)	Type of support
Phase I	CHIPP: establishment[27]	US $1 – 1.5 mil.	Similar to national	Non-recoverable/grant
	CHIPP: core tasks[28]	US $0.5 – 1 mil./yr		Non-recoverable/grant
	CHIPP: FS grant/loan scheme[29]	US $2.5 mil./yr	US $0.25 mil./yr	Majority concessional
	Grid compensation mechanism[30]	US $3 mil./yr in 2020	US $0.3 mil./yr in 2020	Non-recoverable/grant
Phase II	Option 1: Loan facility or credit line[31]	Approx. US $1,500 to 2,000 mil.	Approx. US $140 to 190 mil.	Concessional lending
	Option 2: Equity / subordinated debt[32]	Approx. US $850 mil.	Approx. US $80 mil.	Concessional lending
	Option 3: Partial credit guarantee[33]	Approx. US $175 mil.	Approx. US $20 mil.	Non-recoverable/grant

3.5 Implementing partners

Different implementing partners are proposed for the two phases, with Phase I being substantially focused on technical assistance with a small aspect of financial assistance through the grid compensation mechanism. Phase II is entirely focused on financial assistance.

Phase I

CHIPP – Ministry of Energy and Mineral Resources (ESDM)

Feedback from IPPs consistently requested that whatever structure is chosen, CHIPP should be a professional organisation, able to answer technical and financial queries or provide guidance in these regards. Moreover it should act as a champion for the sector, as well as be proactive and result oriented in its support to IPPs and government. A comparison of different structures (e.g. fully independent, public service agency or secretariat amongst others) concluded that the most practical approach was to found CHIPP as a secretariat under ESDM[34] (Figure 12). CHIPP would be a national entity, operating from Jakarta, but would run programmes throughout the country to do outreach, awareness raising and training across provinces.

[27] Scaled from known establishment costs of the Energy Efficiency and Conservation Clearing House Indonesia (EECCHI), including a significant component of outreach and awareness

[28] Based on known, ongoing operational costs for the EECCHI, that are currently funded by ESDM, and scaled to recognise the broader scope of the CHIPP as proposed. Estimated lifetime of 5 years.

[29] Allows for up to 50% of projects to seek financial support for feasibility studies; or roughly 25 projects per year in a national implementation. Estimated lifetime of 5 years.

[30] Estimate of compensation costs based on assumed percentage of affected IPPs (5%) and 5% annual losses fully compensated at current feed-in-tariff rates. Estimated lifetime of 15 years as per FiT regulation.

[31] Assumes 50% contribution to debt from a credit line with the balance of funding coming from the financial institution (20%) and investor (30%). Upper estimate assumes full debt provision is made by a loan facility for 70% of financing costs.

[32] Assumes 30% of project funds is provided as subordinated debt to extend loan tenors from 7 to 10 years

[33] Assumes a conservative 10% default rate with 80% debt coverage

[34] Although the ability of a ministerial secretariat to oversee a small loan or grant programme still needs to be confirmed, other design options such as establishment as a Public Service Agency (BLU) are considered less feasible due to the desire of the GoI to reduce the numbers of BLUs operating. Establishment as a secretariat also allows a more rapid implementation.

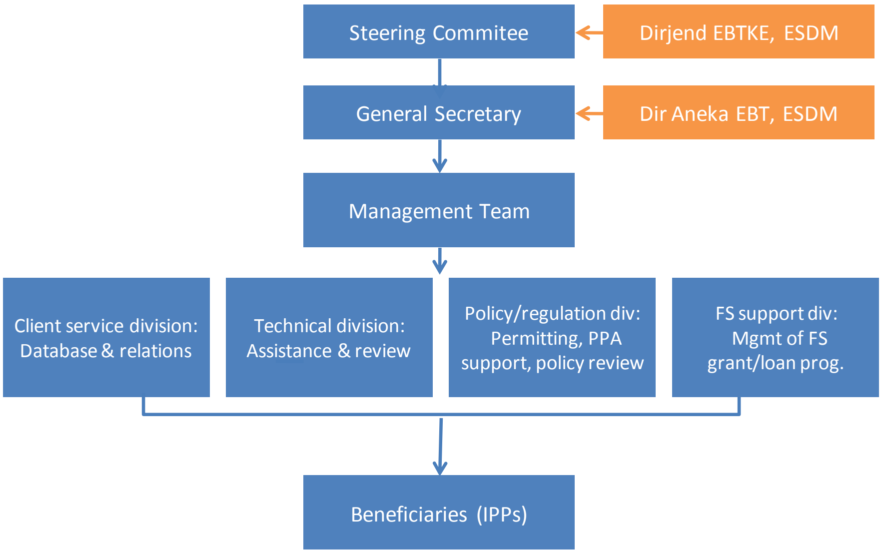


Figure 12: Possible CHIPP structure as a secretariat within ESDM

This approach has been approved by ESDM during consultation at stakeholder workshops and is in line with existing initiatives such as the Energy Efficiency and Conservation Clearing House Indonesia (EECCHI), which is a similar service facility under ESDM[35].

Grid compensation mechanism – PLN

The nature of the proposed compensation mechanisms requires relatively detailed monitoring of grid status for connected IPPs, a task that PLN as the existing TSO/DSO is uniquely suited to. Very limited consultations have taken place at the provincial level in regards to PLN playing a role in implementation and further consultation is planned in 2014 (see the following chapter). Oversight and monitoring of this aspect of the programme would be coordinated by ESDM (for example through CHIPP) as the responsible line ministry for NAMA implementation and the primary line ministry to which PLN reports.

Phase II

The implementing entity for the financial mechanism will be dependent on the selected intervention. The two candidate organisations are PIP and PT SMI which have similar yet distinct mandates in promoting infrastructure investment in Indonesia.

The Indonesian Investment Agency (PIP) is a public service agency, primarily funded by the GoI, established with the mission to stimulate national economic growth through investment in strategic sectors that provide optimum return and measurable risk. It has almost US $2 billion of assets under management. It is a strong candidate to implement a loan facility, credit line or guarantee fund and has already made initial investigations into these areas. Its credentials are evident in its recent establishment of the Energy Efficiency Revolving Fund (USD 45 million concessional credit line for local banks lending to energy conservation projects) and operation of the Geothermal Fund Facility (USD 220 million revolving fund for geothermal exploration). The nature of PIP and the regulations that establish it[36] limit the risk that

[35] www.energyefficiencyindonesia.info

[36] Government Regulation No. 1/2008 provides a legal basis for PIP as the government investment operator for infrastructure and other sectors that are stated by the Minister of Finance, while Ministry of Finance Regulation No. 52/PMK.01/2007 and 91/KMK.05/2009 establish PIP as a public service agency.

it can take in the public interest, making equity offerings or more innovative financing mechanisms more difficult to implement.

PT Sarana Multi Infrastruktur (PT SMI) is a public company, primarily funded by the GoI, established as a catalyst in the acceleration of the infrastructure development. PT SMI has comparatively more flexibility in its offerings, including market rate loans, mezzanine finance and equity and has already provided support to a small number of mini-hydro projects. In addition to this core business, it is the largest funder of the PT Indonesia Infrastructure Finance (PT IIF), a non-bank financial institution that focuses on providing long term funding for infrastructure projects in Indonesia[37]. As an infrastructure financing company, PT IIF is expected to increase the availability of equity and long term debt, particularly Rupiah, debt, available for private infrastructure investment and was established with approximately US $190 million starting capital including contributions from both international development partners and private banks. PT IIF does not currently fund small or medium scale renewables projects, but this could represent one avenue for expanding lending to that sector if support were available for this.

Both PIP and PT SMI have been consulted during the development of this NAMA concept and both are interested to play a role in implementation should support for an appropriate financial mechanism be available.

3.6 Expected impacts

Given the clear role of renewable energy in Indonesia to contribute to much needed energy system growth, energy diversification and climate mitigation – this proposed programme is clearly both a nationally appropriate action and a mitigation action, with impacts expected both in terms of development and GHG emissions. The former may drive an action domestically and politically, but understanding the latter is instrumental in recognising Indonesia's climate commitments and international interest in achieving mitigation.

GHG emissions reduction

An estimate of the direct emission reduction potential of the NAMA is relatively straightforward. Mitigation results from the production of power with lower emissions than it would otherwise have happened. In a general sense, the way to estimate this is to compare the emissions intensity of the new production technologies versus a baseline. In the case of renewables, with zero or negligible emissions operational emissions, it is the baseline that will determine the mitigation potential. This baseline emission factor can be based on a specific technology that is considered 'replaced', or by the standard emission factor of the energy mix.

In making a calculation of mitigation potential, a number of factors need to be accounted for and assumptions made:

- Grid emission factors[38] in the different island subsystems vary significantly. For calculations of emissions reductions for a national implementation of the NAMA, an average national grid emission factor is used; i.e. assumes that the additional capacity incentivised by the NAMA is spread across Indonesia roughly in proportion with current generation patterns. For the calculations relating to the two provincial pilots, the local provincial grid emission factors are used.

[37] www.iif.co.id

[38] The average number of tonnes of CO_2 emitted per MWh of electricity for a certain grid system, based on the generation sources contributing to it.

- The electricity mix is changing as diesel/oil generation is reduced and coal and gas is introduced; to estimate impacts in 2020, an assumed future generation mix needs to be used.
- The additional capacity implemented through the NAMA can be considered to replace existing fossil fuel generation capacity (e.g. diesel) or offset increases in new fossil fuel capacity. Assumptions need to be made as to mix of old versus new fossil fuelled capacity.
- Lastly, attribution of the GHG emissions reductions to the NAMA, which projects count towards direct GHG emissions reductions. Pragmatically, it is assumed that all projects that benefit from the financial mechanism of Phase II contribute to direct emissions reductions. Projects benefitting from other components of the NAMA only are not considered as counting toward the estimate of mitigation potential. This is discussed further in Section 3.7 on MRV.

A national scale NAMA supporting 1.8 GW would reduce GHG emissions up to 6.5 Mt CO_2-eq. per year by 2020. The pilot in two provinces would support 180 MW with a reduction of 0.65 Mt CO_2-eq (Box 11). Annex A provides further details on the methodology for calculating the necessary grid emissions factors to determine these figures.

Box 11: Estimated mitigation impacts

National implementation

- Estimated yearly production of **7,150 GWh** from 2020 based on assumed mix of technologies
- Total potential reduction of **6.5 $MtCO_2$/yr** from 2020

Provincial pilot

- Estimated yearly production of **880 GWh** from 2020 based on likely mix of technologies
- Total potential reduction of **0.7 $MtCO_2$/yr** from 2020

Comparison with RAN-GRK

- Energy sector target is 30 $MtCO_2$/yr to reach 26% (from RE 4.5 $MtCO_2$/yr)
- Energy sector target is approx. 44 $MtCO_2$/yr to reach 41%
- NAMA could deliver approximately half of this additional 14 $MtCO_2$/yr

Sustainable development impacts

Indonesia's National Development Policy on Natural Resources and Environment (RPJMN 2010-2014) identifies an overarching aim to support National Economic Development. Furthermore, energy security, or "*risk management through [an] energy mix [moving] towards sustainable economic development*" has been mentioned as a key prerequisite for successful economic development. Specifically, the GoI has been looking towards the diversification of the Indonesian energy mix as a means to ensure the sustainability and quantity of energy supply, particularly the increased utilization of RE resources and energy efficiency as mechanisms for supporting low-carbon economic and social development.

Both Indonesia's national and provincial level GHG mitigation plans have been developed in line with existing development policies and priority goals include; improving information related to climate change, improving natural resource management and environmental protection, and achieving sustainable development (Bappenas, 2010). The provincial plan also considers other initiatives such as the Master Plan for Economic Acceleration and Expansion (MP3EI) and the Millennium Development Goal's (MDGs).

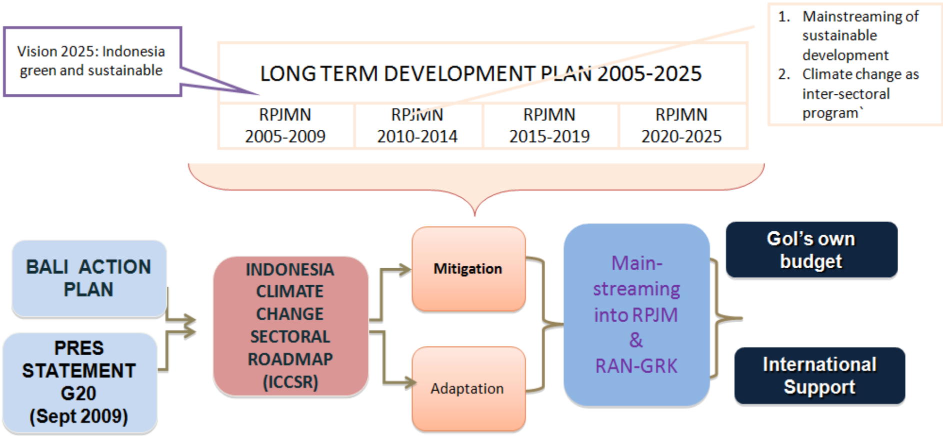


Figure 13: Policy framework of RAN-GRK and the linkages to Development Plans (Source: Bappenas 2013)

In order to assess the true impact of the NAMA, its contribution to this wide range of broader development issues must be considered, evaluated and reported on. Several studies have suggested indicators which can be used to monitor progress towards sustainable development objectives, and some of these will be integrated into the NAMA's MRV framework based on local stakeholder discussions and specific donor requirements in the detailing and implementation phases. An outline of expected impacts and possible sustainable development indicators is given in Table 9.

Table 9: Sustainable development impacts and indicators

Impact category	Anticipated impact	Potential indicators
Economic	**Improved energy security**; Renewable energy is a domestic resource that is not exposed to market fluctuations. It can replace fuels like diesel that are risky to import.	– Installed RE capacity
	Energy for economic growth; Many locations, e.g. North Sumatra, have too little regular supply to meet demand. Additional RE capacity provides energy for customers and their activities	– Average electricity prices* – Quality of supply and blackouts*
	Employment; even without local manufacturing, installation and O&M job numbers can be significant (Cameron and van der Zwaan, 2014). Certain technologies and components may also lead to manufacturing jobs, such as mini-hydro.	– Size of the small and medium scale RE industry in terms of direct and indirect job estimates (firm surveys)
	Reduced subsidy costs; sales of electricity by PLN were only around half to a third the cost of supply (sale = Rp730/kWh and supply = Rp1,200/kWh in 2012) in part due to diesel generation costs that could be offset by RE IPPs.	– Costs of supply in various provinces*
	Increased participation of private sector; the huge scale of investment needed in new generation capacity in Indonesia in the coming decade will necessitate increased private sector participation.	– Number of project developers – Total private sector investment and leverage factors
	Accelerated sector development	– Development process duration - amount of time to achieve key stages (i.e. reduction in lead time for small-scale RE projects) – Number/percentage of IPPs that used NAMA instruments – Monitoring of the pipeline of projects and applications to banks
Environmental	Changes in habitats, diversity and natural resources; the important of 'do-no-harm' for sustainable development must be borne in mind. Potential negative impacts around, e.g. hydro development or biomass residue processing, should also be considered.	– Environmental standards that relate to the various potential technology impacts
Social	**Access to energy**; electrification ration is 76% nationally (PLN 2013b), but substantially lower in many locations. Non-grid connected projects can also benefit from improved coordination and technical assistance to IPPs.	– Average electricity prices* – Number of new electricity connections* – Electrification ratio*
	Public health; burning fossil fuels is a significant source of air pollution as illustrated by the air quality concerns seen in China. RE energy sources generally don't have these issues.	– Urban air quality measures*

*indicates those indicators that would be difficult to disaggregate from other broader influences on the electricity sector

3.7 Monitoring, Reporting and Verification (MRV)

Measurement, Reporting and Verification (MRV) systems have been specified in the international climate negotiations as a key component of NAMAs (UNEP, 2012). The MRV system will have the goal of keeping track of the overall performance of the NAMA, provide assurance to stakeholders that the NAMA is achieving what was intended to do and that measurable GHG reductions and other benefits and objectives have been achieved, reported on, and verified (UNEP, 2012).

The objectives of the MRV system are expected to focus on measurement of progress with respect to GHG emission reductions, sustainable development outcomes and support flows for the implementation of the NAMA. UNEP (2012) sets out several key steps that will be required in the detailing phase of the project in order to fully define the MRV system. This includes (but is not limited to):

- Clear definition of the scope or boundary of the MRV system
- Selection of appropriate indicators to assess NAMA impacts
- In order to understand whether the NAMA is having an impact on selected indicators, an appropriate baseline will need to be defined for each indicator.
- Definition of the metrics to be utilised (quantitative vs qualitative, input vs. output).
- Appropriate data collection and measurement system definition, including responsibility and frequency.
- Definition of reporting channels (and interface with any local MRV system).
- Verification system (first, second, third party, or government).
- Interaction with Biennial Update Reports.
- Definition of roles and responsibilities of different stakeholders in the MRV process.

MRV in Indonesia

In 2013, the Government of Indonesia introduced a Guide for implementation of Monitoring, Evaluation and Reporting (MER) (Figure 14). Training on the guideline is being provided across 33 provinces to support Indonesia's provincial action plan on GHG emission reduction. The guideline could eventually also form the basis of a domestic MRV or MER system at a national level, as well as possibly being applied to specific NAMAs.

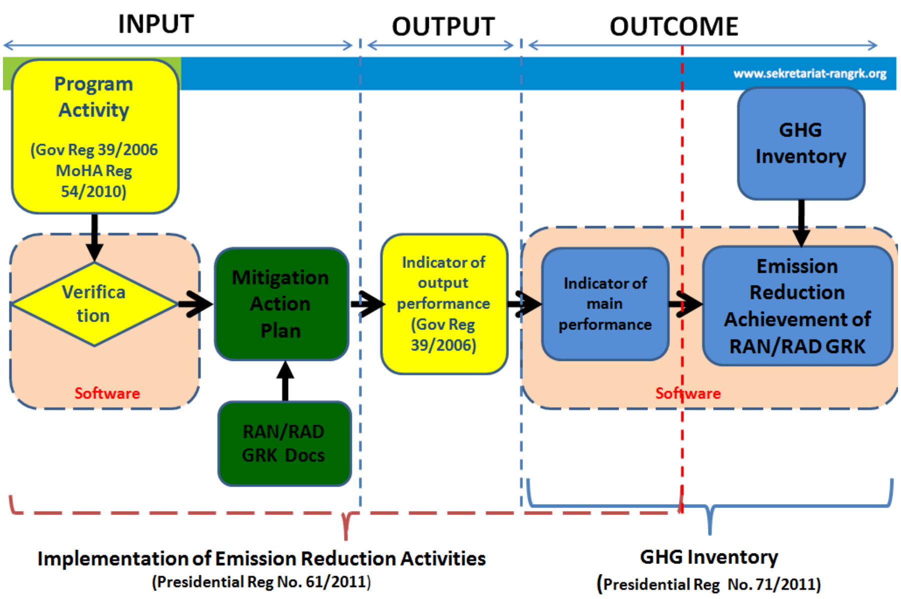


Figure 14: Summary or the MER framework for reporting (BAPPENAS, 2013)

The MRV system proposed in the MER guideline works on a bottom up basis, with sectoral local government representatives reporting to provincial representatives, who in turn report at a national level. This process has been introduced to support the national and provincial GHG mitigation plans (RAN/RAD-GRKs), so the guidance is focused solely on GHG reductions. This will feed into national communications and Biennial Update Reports to the UNFCCC. This MER framework provides the basis for understanding a possible MRV system for this small and medium scale renewable energy NAMA. Where possible, it should build on this structure, for example through the addition of indicators that may be specific to the NAMA.

Outline of MRV system

The challenges of developing an MRV system for this NAMA can be summarised as:

i. MRV of impacts from Phase I activities; i.e. the work of CHIPP and a change in PPAs to include minimum revenue provisions
ii. MRV of impacts from Phase II activities; i.e. for those facilities that were implemented through the finance mechanism proposed based on the amount of generated electricity.
iii. Interactions between these two Phases; e.g. projects that received assistance from both CHIPP and subsequently utilised the Phase II financial mechanism.
iv. MRV of support to the NAMA; i.e. inputs from development partners and GoI.

A straightforward concept is proposed that keeps the indicators for the two NAMA phases distinct from one another and assumes that GHG impacts are only explicitly attributable to Phase II (Table 10).

Table 10: MRV concept outline

	Description	Proposed MRV approach	GHG impacts
Phase I	The work of CHIPP and the provision of a grid compensation mechanism	Focus on **activity level indicators**; e.g. – number of trainings carried out; – number of short-term loans/grants provided, – number of FS reviewed, guidance/guidelines produced, – number of projects with compensation payments and sum of payments	Indirect – not calculated
Phase II	Facilities that were implemented through the finance mechanism	Focus on **output level indicators**; e.g. – number of MW commissioned, – number of MWh produced per year, – private sector investment leveraged – leverage ratios Calculation of **outcome level indicators**; e.g. – GHG emission reductions per year	Direct - calculated
Interactions between Phases	e.g. projects that received assistance from both CHIPP and subsequently utilised the Phase II financial mechanism	With no common indicators (i.e. GHG emission reductions are only explicitly estimated for projects that receive Phase II support) the issue of interactions or double counting is avoided.	n/a
Support	Inputs from development partners and GoI	Focus on **input level indicators**; e.g. – GoI budgetary support – Grants and/or concessional loans to each NAMA Phase – TA provided (value, scope, man-months) – Facilities and on-loan staff	n/a

The approach proposed in Table 10 is compatible with the framework for MER that is being developed in Indonesia. It is also compatible with the need for provincial level reporting of outcomes in regards to satisfying the objectives of each province's RAD-GRK. As per normal practices, provincial arms of PLN would report on local outputs, allowing provincial level emission reductions to be calculated.

A critical element of the MRV system will be the quantitative estimates of the GHG mitigation impact of the NAMA over the duration of the NAMA. It is proposed that GHG emission reductions would only be estimated for direct impacts, i.e. those associated with Phase II: projects supported by the financial mechanism. These success of these projects can be much more clearly attributed to the intervention of the NAMA, whereas Phase I impacts will be MRV'ed at the activity level only.

A methodology to measure and report on the emission reductions in $MtCO_2e$, generated by the NAMA, is proposed that is somewhat analogous to CDM methodology at its simplest. Calculation of emissions impacts for stationary power sources is then relatively straightforward. Annual achieved emission reductions would be estimated based on yearly MWh production and average annual local grid emission factors. Any facility that had received support through the Phase II financial mechanism would be within the scope of the GHG estimation[39]. Data on installed capacity and electricity exported to grid, as well as local electricity generation mix and emissions intensity, is kept by PLN in their role as TSO/DSO and due to feed-in-tariff payment requirements[40].

[39] This approach precludes the need for detailed baselines or additionality criteria. Very simply, if a project is eligible for the financial mechanism (eligibility criteria to be determined in the detailing phase) and chooses to use it, then that project is assumed to be enabled by the NAMA and is counted towards NAMA impacts (including GHG emission reductions).

[40] Data on on-site consumption, e.g. self-use by generators, is also kept by PLN but with a lower level of statistical rigour. The need to improve this reporting of self-use is likely to increase with increased biomass utilisation (the renewable energy source most likely to be used on-site by facilities like palm oil mills). Similarly for

4. Discussion and next steps

The ongoing design of Phase II and detailing of Phase I make a concrete implementation plan and firm definition of support premature. Work will continue in 2014 to finalise these aspects; build support within GoI, with development partners and with the private sector and raise awareness outside of Indonesia.

This concept note represents the first major milestone in NAMA development. By end 2014 a NAMA proposal can be delivered of sufficient detail to start (bilateral) talks with sources of support, noting that fine tuning of design details is expected in reaching agreement between GoI and support providers.

The current NAMA design and progress was confirmed at a validation workshop hosted by ESDM in October 2013 with the involvement of key stakeholders. A work plan for 2014 was also agreed (see below) that plans ongoing work to detail the specific components and present these to sources of support in parallel. The development of the NAMA has demonstrated the value of cross-ministerial coordination, as well as the importance of grounding policy interventions in objective research and analysis.

It must also be noted, that over the course of the development of the NAMA concept, there have been important developments in the small and medium scale renewables sector due to changes in macro-economic conditions. These changes further highlight the need to provide support to the sector and will add an additional challenge in designing an appropriate package of supporting policies.

Changing conditions

The depreciation of the Indonesia Rupiah, along with the rise in inflation and interest rates in the last six months, has severe consequences for IPPs. With a majority of capital expenditure used for generation equipment from outside Indonesia and the variable rate loans provided by banks, Indonesia IPPs are particularly vulnerable to such changes, a typical project could see their expected return on investment almost halve over the last year, making many projects unexpectedly non-profitable (Figure 15).

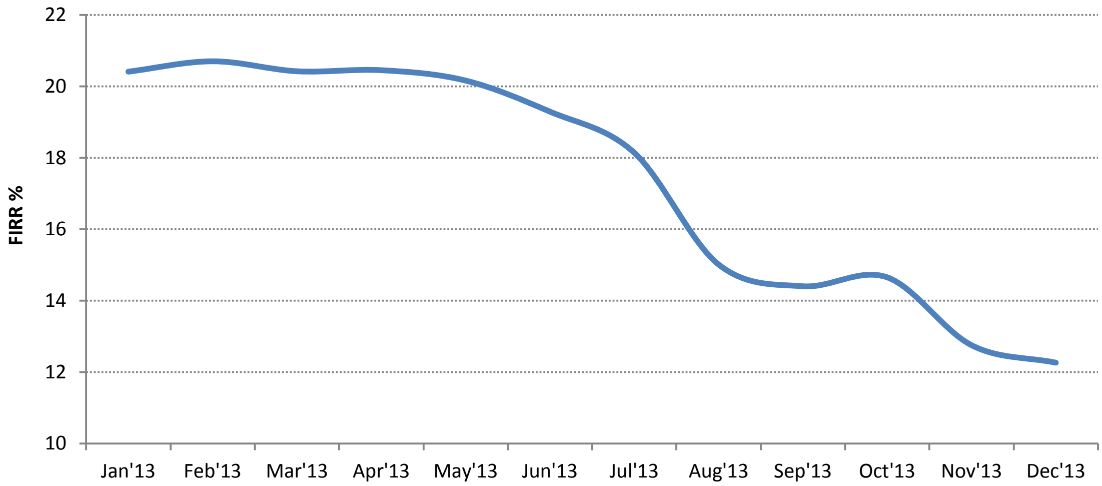


Figure 15: Impact of Rupiah depreciation and rising interest rates on the FIRR of new nominal hydropower projects in Java over 2013 (source: own derivation)

A further potential change in the investment environment for small and medium scale renewables is the possibility of a revised draft of the DNI or negative investment list for approval. The DNI is a list of sectors that are either wholly or partially closed to private foreign and/or domestic investment. It has been reported that the revised DNI may reduce the allowable investment by a foreign entity in a renewable energy project between 1 - 10 MW to a maximum of 49%. This had previously been 95% with a stipulation for some manner of "kemitraan" or partnership with an SME on operational contracts.

If implemented, this would reduce international interest and investment in the renewable energy sector at the same time that financial conditions have become significantly more challenging for IPPs. These recent developments only increase the need for support to small and medium scale renewable energy projects, particularly domestic financing, and make the argument for this NAMA more compelling. It also strongly suggests that the existing feed-in-tariff scheme needs to be reviewed in parallel in order to determine its ongoing adequacy to stimulate investment.

4.1 Next steps

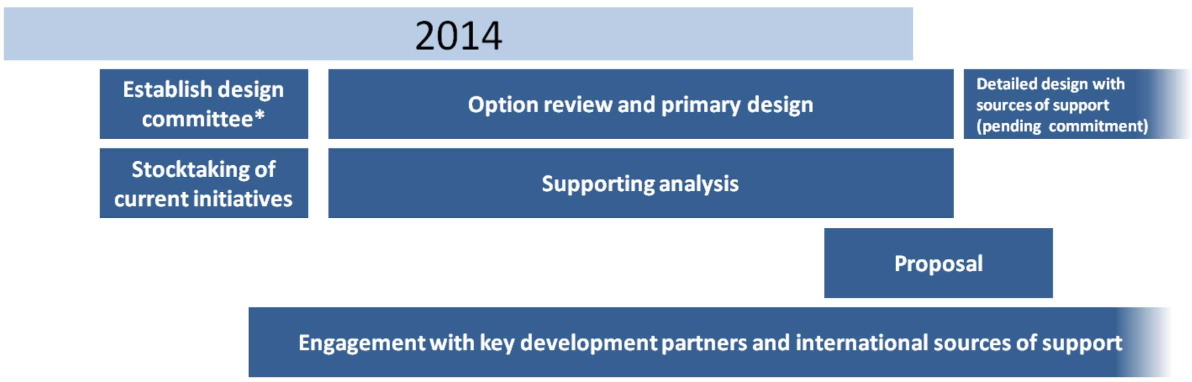
This NAMA concept note lays the groundwork for a comprehensive support scheme for small and medium scale renewables. The consultations with, and inputs received from, stakeholders have raised awareness of the concept both domestically and outside Indonesia. In the short term, the detailed design of the NAMA will be completed, in particular Phase II which is currently loosely defined. The work plan for 2014 includes consultations on each of the three NAMA elements:

Phase I

Definition of and securing of support for CHIPP will continue to be led by ESDM and ECN. Design and funding approach for grid compensation to continue to be led by ESDM, PLN and ECN, with support from Bappenas to coordinate as required.

Phase II

As noted earlier, the preferred approach to stimulating private sector participation in green investments is still be developed in Indonesia, driven in a large part by the MoF; however, with regards to renewable energy ESDM is the key partner in those efforts. To bring these parties and other key stakeholders – such as the banking regulator, the Financial Services Authority (OJK) – together, a series of focused workshops will be used under the lead of a design committee, complemented by analysis and outreach with development partners. Care will be taken to coordinate closely with ongoing efforts in the MoF to develop a coherent approach to green investment promotion.



* including ESDM, MoF (BKF), PIP, PT SMI, OJK

In addition to these processes and outcomes, the concept note will be further developed into a full NAMA proposal. The proposal must have the full support of relevant stakeholders, as well as be of a sufficient quality and detail that allows for steps to be taken to commence implementation and receive support. Beyond the need to agree details for Phase I and select instruments for Phase II, the proposal will also include:

- Further analysis and quantification of the impacts of the selected instruments;
- An initial implementation plan, showing timing, actors, roles and responsibilities; and
- An estimate of final support requirements (financial volumes by year and source).

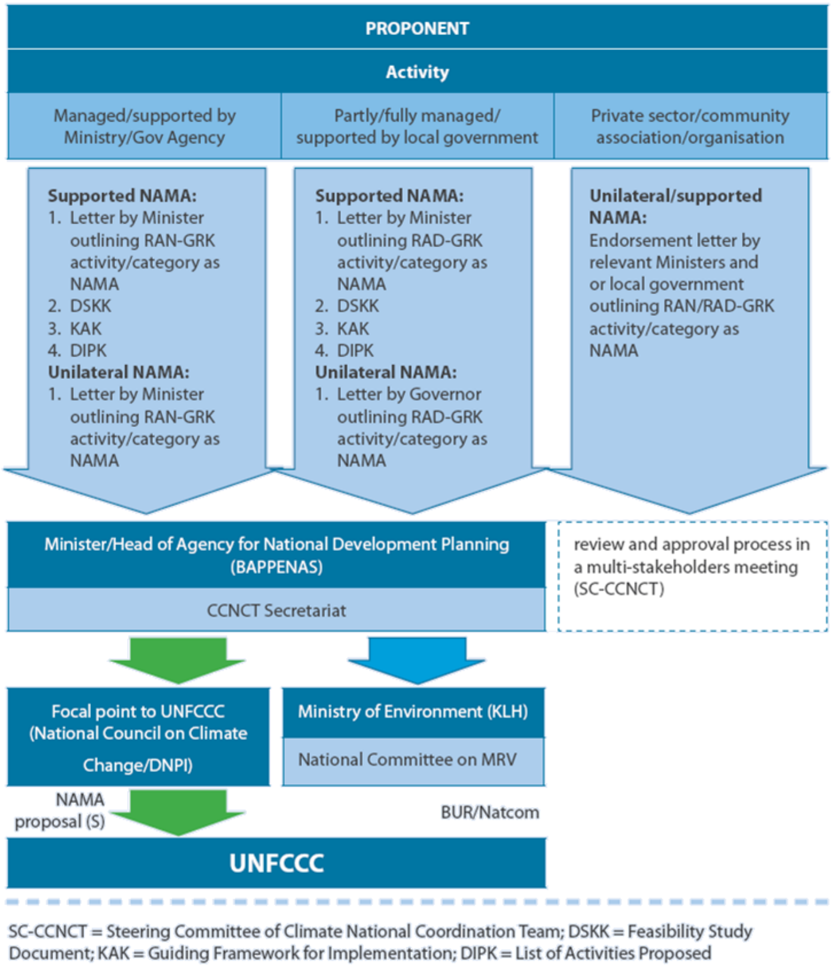


Figure 16: Indonesian submission procedure for NAMAs (unilateral and supported) (source: GoI 2013)

The next steps include approving the NAMA internally in Indonesia, through Bappenas, for registration with DNPI, endorsement of the MRV system, and subsequent submission to the UNFCCC (Figure 16).

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ANNEX A: GHG impact calculation methodology

The Indonesian power system consists of a multitude of unconnected sub-systems. The power production mix, and the resulting grid emission factor in these different subsystems varies significantly. Combined margin emission factors were calculated to range from 0.121 tCO_2/MWh in North and Central Sulawesi to 1.280 tCO_2/MWh in Central and South Kalimantan in 2008 (Kencana, 2010).

Moreover, the rapidly increasing electricity demand, grid extension plans and the aim to bring down generation cost by reducing the share of diesel generation, expectedly lead to big changes in the power production mix in the coming decade. PLN (2012) anticipates additional capacity until 2021 to exceed currently existing capacity. The capacity that will be decommissioned in this period is unknown. The current and future emission factors for subsystems are therefore expected to differ significantly.

In such volatile conditions, the exact emission impact of developing a small scale renewable energy project is difficult to assess, as it is impossible to determine exactly which type of production the project replaces[41]. It could be said that additional renewable capacity helps to phase out diesel generation, but equally it could be said that the additional renewable capacity replaces (part of) the planned coal capacity.

CDM approved methodology ACM0002 provides a useful concept to assess the emission impact of the small scale renewable energy project supported by the proposed NAMA. This methodology suggests to approximate the expected emission reduction by applying a weighted average of operating margin (OM) and build margin (BM)[42]. The methodology implies that new projects in the short term mainly replace electricity that would otherwise be produced by existing installations (OM), while in the longer term, new projects replace planned capacity additions (BM). For this NAMA proposal, as the small RE projects are intended to contribute to Indonesia's 17% NRE goal and Indonesia's goal to reduce GHG emissions, it seems logical to surmise that projects replace only fossil fuel based capacity rather than the total system average.

Moreover, the level of detail used for CDM calculations seems excessive for the purpose of estimating the avoided emissions of the proposed NAMA. Rather than using individual plants' actual production data as suggested by ACM0002, it seems sufficient here to use an emission factor based on production as derived from the existing capacity (comparable to OM) and future additions (comparable to BM) as stated in PLN's capacity plan (PLN 2012).

In this calculation we use Indonesian averages for efficiency and capacity factors. The average efficiencies of the current coal, gas and diesel capacity are calculated from PLN production statistics in the year 2012 (PLN 2013). Load factors are approximated based on the production data from 2010-2012 (PLN 2013). Future capacity additions are assumed to operate at higher efficiencies and slightly improved load factors. Table 11 presents the assumed load hours and efficiencies.

The projects within the scope of the NAMA proposal may be said to help phase out existing capacity[43] as well as replace planned capacity[44]. It seems reasonable to apply a 50/50 weighting factor between existing and planned capacity, as is the default suggested by ACM0002.

[41] Lazarus (2005) names this an "unknowable counterfactual baseline"

[42] To calculate the emission reduction of CDM projects, approved methodology ACM0002 suggest to apply a weighted average of operating margin (OM) and build margin (BM). UNFCCC (2012) provides guidance to calculate the OM and BM based on detailed data on production from the existing and recently built capacity. The CDM Methodology Panel (2005) gives guidance on the OM/BM weighing factor.

[43] E.g. help to phase out diesel generation

Table 11: Assumed average full load hours (FLH) and efficiencies of Indonesian power production capacity.

		existing capacity (OM)		Capacity addition (BM)	
		FLH	efficiency	FLH	efficiency
Coal	PLTU	5500	29%	6000	36%
Diesel	PLTD	1800	33%	3500	38%
Gas	PLTG	4000	33%	4500	50%
Large Hydro	PLTA	3500		4000	
Mini/micro hydro	PLTM/PLTMH	3500		4000	
Geothermal	PLTP	7500		7500	
Biomass		5800		5800	
Solar	PLTS	1700		1700	
Wind		2500		2500	

The resulting avoided emission factor used to calculate the impact of the supported NAMA are shown in Table 12.

Table 12: Combined margin emission factors (ton CO2/MWh)

	Combined Margin emission factors (ton CO2 / MWh)		
	Indonesia total	North Sumatra	NTB
complete capacity	0.70	0.63	0.72
fossil capacity only	0.89	0.83	0.83

These combined marginal emission factors are directly applied to the capacities targeted for the NAMA in both a national and provincial pilot scenario in order to determine final mitigation potentials.

[44] E.g. reduce the need for additional coal capacity

ANNEX B: Barrier analysis results

Interviews were conducted with over 20 project developers and local banks, as well as development partners and government officials. The full findings of these have been presented across three reports:

- Hayton and Nugraha (2013); focused on mini-hydro IPPs as the most well established technology in Indonesia – province neutral
- Ambarita (2013); focused on project developers in North Sumatra and includes developers of mini-hydro, biomass and solar projects
- Muchtar et al. (2013); focused on project developers in West Nusa Tenggara and includes developers of mini-hydro, biomass and solar projects

Presented here is a summary of the first of these, both as the most extensive analysis and as having reached similar conclusions for the mini-hydro sector as seen for other technologies in the other two province specific reports

Summary Matrix (source: Hayton and Nugraha 2013)

Stakeholder:	Actions:	Characteristics:	Legislative	Technical Aspects	Finance
1. Government policy makers (Indonesian Ministry of Energy – ESDM):	Introduction of favourable renewable energy policy encompassing feed in tariffs and power purchase agreements.	Limited experience in dealing with private sector projects. Often unwilling to fully enforce conformance with government policy by PLN. Legislation introduced by the government is not always in line with the aspirations of the state utility PLN potentially leading to misinterpretations.	Conclusion: The prevalent legislative environment has improved significantly following the introduction of the most recent law defining tariffs in 2009. In general the private sector developers are familiar with its content and requirements, nevertheless particularly for less aware regions further socialization efforts would be valid. Recommendation: Media (website, printed, etc.) providing clear guidelines of procedures to be followed by IPPs and PLN would provide IPPs, district governments, PLN and other involved institutions with a clear and transparent reference to follow, particularly in regions where less experience exists with this type of project.	Conclusion: ESDM are sufficiently familiar with the type of technology involved for MHP projects in the 1 – 10MW range although they don't have any direct involvement in technical issues of IPP projects Technical due diligence / value engineering is currently a very weak part of the implementation process whereby there is limited control over the IPPs technical design. In some cases this leads to sub optimal harnessing of resources. Recommendation: Ultimately it is in the interests of the government to ensure that IPPs develop natural resources optimally therefore a strategy on how to enforce proper technical standards are achieved is required. Given that the technical capacity of local government to enforce this is very limited, ESDM needs to explore how proper technical standards via a due diligence process be can be more effectively enforced in the future.	Conclusion: ESDM are not involved in aspects of project finance for IPPs beyond hosting various renewable energy support programs financed from foreign development organizations or financial institutions. ESDM does not have close connections with financial institutions and its capacity to influence and participate in project finance related issues is currently very limited. It is not particularly well informed on financial support programs for RE projects and is not able to advise potential IPPs on any finance related aspects. Recommendation: ESDM should be adequately informed on financing programs offered by local and international banks and other financial institutions in the country allowing them to facilitate the dissemination of this information. They should be furnished with relevant material allowing them to disseminate this as appropriate.

Stakeholder:	Actions:	Characteristics:	Legislative	Technical Aspects	Finance
2. Local Government Authorities (Provincial and District – Pemprov & Pemda):	They have the authority for issuing the numerous permits including ijin prinsip (principle agreement) required by IPPs at local level. They are responsible for facilitating land acquisition from private and state owned entities and mediating during this process.	In general they are not very familiar with commercial MHP projects and the specific characteristics of these projects and have limited specific knowhow and human resources to handle and deal with them. Nevertheless they are usually keen to encourage investors to invest in their districts as they view such projects as a potential source of revenue / PAD (Pendapatan Asli Daerah).	Conclusion: Local governments in general could be better informed about the most recent legislative developments and the importance of renewable energy projects as part of the countries national energy policy. There still remain numerous grey areas regarding responsibilities for the various approvals and standard procedures (example standardized process of calculating water rights payment / retribusi air) etc. This sometimes leads to misunderstandings between developers and local authorities Recommendation: Media (website, printed, etc.) providing clear guidelines of procedures to be followed by IPPs and at district level district governments, PLN and other involved institutions with a clear and transparent reference to follow.	Conclusion: Local governments are not very familiar with MHP technology and do not always appreciate that these projects are developed based on a long-term perspective of >25 years. This leads to unrealistic expectations from local governments when negotiating issues such as land acquisition, concession etc. with IPPs. Recommendation: Awareness building initiatives targeting local governments should be conducted aimed at familiarizing them with the specific nature of MHP projects. In particular their dependency on a sustainable and well functioning natural environment and the relatively long lifespan of a MHP project and the implications this has on aspects such as investment payback, preservation of catchment area etc.	Conclusion: Local government has very little knowledge of finance related aspects of MHP projects. The majority of existing projects have or are being developed by Jakarta based IPPs whereby financing is arranged almost exclusively at Jakarta level. There is only one example of where local government has actively taken a stake (effectively as a shareholder) in a project rather than playing the role of administrator. Given that the nature of MHP projects lends itself very favourably to involving municipalities as shareholders, this is still an unexplored opportunity. Recommendation: To provide examples and references for district governments to apply in the development of future projects, media (printed, video, etc.) presenting examples of progressive and innovative ownership models should be prepared and disseminated as a means of generating ideas from local authorities.

Stakeholder:	Actions:	Characteristics:	Legislative	Technical Aspects	Finance
3. National Electricity Utility (PLN):	They are a very large national utility of extremely high strategic importance. They have a monopoly in the supply of electricity in the country.	They still adopt very traditional management principles and structure. Due to their position as a state owned utility and their size it is extremely difficult for small-scale energy producers to negotiate favourable conditions unilaterally (David and Goliath scenario)..	Conclusion: It is extremely difficult for IPPs to negotiate any issues related to their contracts on a bilateral basis with PLN at central level and regional representatives are reluctant to negotiate sensitive issues such as tariffs without the support of headquarters. This often results in a stalemate situation therefore following standard policy avoiding negotiation with PLN is by far the best option. PLN authorities are familiar with current legislation and appear to be applying it for new projects without negotiation. Unfortunately for projects preceding the 2009 legislation, the stalemate situation prevails. PLN is still undecided on how to effectively deal with these projects with the result that no progress has been made. There have already been initiatives, however, so far these have not produced any concrete results much to the frustration of the respective projects and their developers. Recommendation: Agreement needs to be made and formalized between PLN and the “terkendala” IPPs on the revision of their PPAs including tariffs. Given the slow progress made so far this process needs to facilitated and moderated by ESDM or another appropriate third party body.	Conclusion: PLN are fully familiar with MHP technology in the 1 – 10MW range and are able to scrutinize the proposed plans of IPPs to ensure compatibility of their systems with the PLN grid network, however, it is apparent strict technical due diligence / value engineering is not always carried out by project developers. Recommendation: PLN should be more involved at the stage of technical due diligence / value engineering to ensure projects are implemented in accordance with the specific requirements of PLN therefore optimizing resources. Ways should be explored on involving PLN more intensively in a technical capacity regarding the design and construction of schemes particularly where the developers are relatively inexperienced.	

Stakeholder:	Actions:	Characteristics:	Legislative	Technical Aspects	Finance
4. Small Scale MHP Independent Power Producers (IPP)	Following the improved attractiveness of energy generation private sector are interested to develop MHP sites as they see this as being potentially lucrative business.	There are 2 main category of IPP operating in the <10 MW range. There are those having good access to capital and finance and also access to useful site data / existing feasibility studies etc. These IPPs are also able to draw on relatively extensive technical expertise and knowhow either in-house or through their established networks. These tend to be companies being supported by larger sponsors / conglomerates. There are also smaller scale IPPs, with limited experience in the sector and limited access to the required technical expertise to plan, design and develop projects effectively.	Conclusion: The private IPPs entering the sector are fully aware of and up to date with current legislation governing the sector. They are also comfortable with dealing with authorities at central, provincial and district levels.	Conclusion: They frequently over estimate the capacity of projects resulting in lower financial rates of return than anticipated. They tend to underestimate the technical complexity of building a MHP scheme and there is a tendency to "cut corners" which leads to problems and undermines performance. In many cases these mistakes are quite elementary and could be easily eliminated. To compound this situation there is a clear lack of awareness of the importance of putting in place proper technical due diligence measures (external consultant) to assess and scrutinize designs at planning stage. The reason for neglecting the step of technical due diligence is more due to lack of awareness rather than economic considerations (the cost of a consultant to carry out this work is largely irrelevant in the context of the overall project cost). Recommendation: The provision of an informal / semi-formal support facility comprising the necessary technical knowhow to which IPPs could draw on. This would facilitate a relatively easy due diligence process for IPPs. This could comprise a network / pool of experts who could be commissioned for specific value engineering tasks upon request paid for by the individual IPPs. Their presence could also be complimented with the preparation of media that could be disseminated amongst the IPP community highlighting the most common mistakes etc.	Conclusion: Singularly the biggest complaint from IPPs interviewed was the issue of difficulty in securing finance. Although Indonesian banks are willing to finance MHP projects, they currently apply the same procedures and requirements as for conventional projects. In particular the collateral requirements often disqualify small-scale developers from participating in the sector. Recommendation: See financing institutions

Stakeholder:	Actions:	Characteristics:	Legislative	Technical Aspects	Finance
5. Financing Institutions: (Banks)	Providing loan finance for renewable energy projects either from their own funds or as an agent for third parties such as foreign banks, renewable energy financial support programs etc.	They have limited experience in financing RE projects or projects with similar characteristics. They have very limited capacity in being able to assess accurately RE business proposals and financial viability of proposed schemes.	Conclusion: Banks having experience with financing MHP projects (Bukopin, Mandiri for example) are sufficiently familiar with current legislation, however, other smaller banks are less familiar. Recommendation: Introductory activities and information dissemination need to be carried out in particular for smaller regional banks that could be suitable for smaller scale projects. Although the larger banks referred to are more familiar with legislation this is limited to the main branches in Jakarta therefore socialization for regional offices would also be relevant for these banks.	Conclusion: The banks do not possess “in house” in depth technical knowledge of the MHP sector. They hire independent technical consultants to carry out technical assessment of project proposals from prospective borrowers. Similarly they hire consultants to carry out verification of construction progress as a basis for fund disbursement once a loan has been agreed. However, they reported that it was sometimes difficult to procure the necessary expertise. Recommendation: A more comprehensive pool of suitable experts and consultants able to conduct the specialist tasks on behalf of banks should be established and made available to banks. Media prepared targeting other areas of the IPP sector could also incorporate elements specifically aimed at improving the banking sectors awareness to the technical characteristics of MHP.	Conclusion: Banks have in the last 5 years acquired quite some experience in financing such projects. With the emergence of private sector participation in the renewable energy sector banks are now becoming more familiar with financing this type of project. The banks that are currently financing mini hydro projects handle the project similarly as with other conventional commercial projects. They require similar types of collateral, generally apply similar interest rates and provide on average 2 year grace periods for loans. They currently do not have special programs geared specifically for RE projects. The relatively stringent lending conditions in particularly the collateral requirements mean that it is difficult for small developers without the support of larger sponsor companies to secure loans. The increased collateral requirements imposed as a result of costs and time overruns experienced on on-going projects has further compounded this situation. Recommendation: The establishment of a guarantee fund deposited with selected banks in the country to alleviate the risk level for the banks in lending to RE projects. Through this facility, technical and financial assessment of proposals and assessment of the IPP would be the main lending criteria meaning that committed genuine companies having good project proposals, however, with limited collateral would still be able to qualify for lending.

Stakeholder:	Actions:	Characteristics:	Legislative	Technical Aspects	Finance
6. NGOs, Bilateral RE support programs, etc.:	Provide support and technical assistance to the development of sustainable private sector initiated renewable energy projects in Indonesia.	Their impact is often limited often due to a lack of traction and capacity to be able to provide tangible usable products. Program time frames are often incompatible with the relatively long gestation periods inherent to RE projects and in particular MHP projects. Their actions are often compromised due to their obligations to work through Government counterpart organizations.	Conclusion: Sufficiently well informed about legislation covering the sector and able to facilitate further dissemination of information to other relevant parties. Recommendation: Where willing, RE development programs should be mobilized to assist in dissemination of information related to the IPP RE program as a means of awareness building.	Conclusion: These organizations do possess know how and have access to technical resources which could be of use for IPPs particularly those with having limited experience in the sector. IPPs, however, are sceptical about the capacity of such programs to be able to deliver tangible benefits for their projects. Due to their obligation to work through government counterparts, private sector are often reluctant to cooperate with them unless they are convinced of the benefits. Recommendation: Programs implemented by these organizations need to focus their resources in addressing the actual technical needs of IPPs for example facilitating better technical due diligence practices at critical stages of project development. To be able to do this, clear areas of intervention need to be agreed between the programs and their government counterparts enabling activities to be focussed and target orientated thus gaining the confidence of the target groups.	Conclusion: So far the main involvement of third parties has been regarding CDM. Due to the current low value of CERs this is not anymore attractive for developers. For IPPs without the backing of large established companies access to appropriate financing facilities is still a serious shortfall. So far nobody has been able to effectively address this problem. Recommendation: For organizations active in financing aspects of RE, collaboration with local banks should be sought with the view to establish guarantee facilities, enabling the banks to become more progressive in their approach to RE financing. Depending on the size and scale and the specific objectives of the programs, guarantee fund facilities could be orientated towards guaranteeing loans for actual project capital or limited to project preparation components (FS, DED etc.).

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