

# DIGITALES ARCHIV

ZBW – Leibniz-Informationszentrum Wirtschaft  
ZBW – Leibniz Information Centre for Economics

Setiawan, Sigit; Ismalina, Poppy; Nurhidajat, R et al.

## Article

# Green finance in Indonesia's low carbon sustainable development

## Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEPP)

*Reference:* Setiawan, Sigit/Ismalina, Poppy et. al. (2021). Green finance in Indonesia's low carbon sustainable development. In: International Journal of Energy Economics and Policy 11 (5), S. 191 - 203.

<https://www.econjournals.com/index.php/ijeep/article/download/11447/6073>.

doi:10.32479/ijeep.11447.

This Version is available at:

<http://hdl.handle.net/11159/7833>

## Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics

Düsternbrooker Weg 120

24105 Kiel (Germany)

E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)

<https://www.zbw.eu/econis-archiv/>

## Standard-Nutzungsbedingungen:

Dieses Dokument darf zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen dieses Dokument nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen. Sofern für das Dokument eine Open-Content-Lizenz verwendet wurde, so gelten abweichend von diesen Nutzungsbedingungen die in der Lizenz gewährten Nutzungsrechte.

<https://zbw.eu/econis-archiv/termsfuse>

## Terms of use:

*This document may be saved and copied for your personal and scholarly purposes. You are not to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public. If the document is made available under a Creative Commons Licence you may exercise further usage rights as specified in the licence.*



## Green Finance in Indonesia's Low Carbon Sustainable Development

Sigit Setiawan<sup>1\*</sup>, Poppy Ismalina<sup>2</sup>, R Nurhidajat<sup>1</sup>, Cornelius Tjahjaprijadi<sup>1</sup>, Yusuf Munandar<sup>1</sup>

<sup>1</sup>Fiscal Policy Agency, MoF Republic of Indonesia. <sup>2</sup>Department of Economics, Gadjah Mada University, Indonesia.

\*Email: [sigit\\_setiawan@kemenkeu.go.id](mailto:sigit_setiawan@kemenkeu.go.id)

Received: 28 March 2021

Accepted: 19 June 2021

DOI: <https://doi.org/10.32479/ijeep.11447>

### ABSTRACT

This paper primarily discusses how Indonesia - as a developing country and one of the world's top 10 greenhouse gas (GHG) contributors - has committed and struggled to attain low carbon development goals, which are crucial for its national development sustainability and the world campaign on climate change impact mitigation and adaptation. Indonesia's awareness of the impact of disasters due to climate change on the sustainability of its national development brings forth commitments at the international level and robust programs at the national level in reducing GHG emissions. These programs have delivered historical achievements, especially in the forestry sector and the energy sector, the two most critical sectors of national GHG emission. Discussions continue on the conceivable green finance support options varying from the banking sector until the facilitation of ASEAN regional cooperation on low carbon sustainable development. The awareness of stakeholders to prevent potentially excessive burdens on Indonesian public green finance has delivered continuing responses to stimulate private green finance to contribute more for low carbon sustainable development. The study concludes with the exploration of current challenges to address in order to boost the Indonesian dominant banking sector contribution up to the next level.

**Keywords:** Climate Change, Forestry, Energy, Public Finance, Private Finance, Asean Regional Cooperation

**JEL Classifications:** O13, O19, O23, O38, G21

### 1. INTRODUCTION

Climate change has been one of the biggest issues in the current sustainable development agenda. The shifting to a low carbon economy is deemed crucial to achieve sustainability. The changing paradigm will gradually enforce the more sustainable land use which produces low carbon emission and also the use of more renewable energy resources instead of carbon polluted energy resources in the main economic activities.

Low carbon economy development that has been firstly initiated in developed countries has been mainstreaming a development strategy of almost countries in the world. As a part of a country's strategy, a contribution of financial institutions has been existing in the form of various kinds of public investment and financing models - some are part of the instruments in capital markets and

carbon emissions trading. It is supported by the existence of a relatively comprehensive and protecting regulatory framework, which facilitate fiscal inputs and taxation incentives in the budget arrangement of low carbon investment and financing in the country.

The top three greenhouse gas emitters (China, the US and EU28) are accountable for above 50 percent of overall global emissions, then the top ten (China, the US, EU28, India, Russia, Japan, Brazil, Indonesia, Canada, Mexico) emit 67% of total emission in the world, while the 100 countries in the bottom rankings are responsible for only 3,5%. The largest contributor to emission comes from the energy sector, especially from the use of fossil fuels. As the world GHG emissions keep rising and the risk of climate change increases, more and more nations are taking actions against the climate change. The world's climate change mitigation

goals are to stabilize global GHG emission to 450 ppm CO<sub>2</sub>e and to maintain the increase in temperature (global warming) within 2°Celsius (World Resources Institute, 2017).

In recent years, the Government of Indonesia (GoI) has struggled to adopt strategies to address climate change issues. As a matter of fact, Indonesia is currently facing some challenges in balancing between accelerating economic growth and green transformation. If Indonesia opts to take a sustainable growth path, a window of opportunity is open for Indonesia to minimize environmental damage and make benefits of its natural resources efficiently. With the sustainable path, long term advantages of green transformation innovation will bring together increasing employment, energy security along with industrial efficiency, and less risk of exposure for poor people to the harmful impacts of climate change. According to the Asian Development Bank (2009), the climate change impact will cost between 2.5% and 7% of Indonesia's GDP by the end of this century. Moreover, the poorest and most marginalized groups will face the worst of the impact.

In seeking to follow the sustainable growth path, then Indonesia will need to "green" its financial system as well. Government of Indonesia needs to guide the finance sector to flow in favour of sustainable finance - channeling the fund to major sectors of the economy which have environmentally responsible production. With relevant robust regulatory framework and supervision, in the near future Indonesia will be able to prevent exacerbated environmental damage and stop the increased flow of funds which sustain unsustainable economic sectors and polluted industries. A large large mobilization of investment is needed to take sustainable growth as stipulated in the National Long Term Development Plan (Volz, 2015). The source of investment may come from either public or private sectors.

It is well understood that low carbon development in Indonesia is still at an early stage. So far, most of funding for low carbon development still depends on domestic public sector (66%) and international fund (34%) (Ampri et al., 2014; Ministry of Finance, 2019). Meanwhile, private sector funding is still at minimum.

A current and comprehensive study to map the most updated achievement, to compile the conceivable green finance options and to explore major challenges on promoting more private sector financing in Indonesian low carbon sustainable development is needed. It would also enrich comparative references to developing countries on how a national low carbon sustainable development and the equilibrium of green finance support has progressed in a particular ecosystem.

Thus, this study first seeks to explore a current and comprehensive picture of Indonesian low carbon development progress and initiatives, including more detailed and specific contribution of the energy sector and the forestry sector. The two sectors have so far served as the top two green house gas national contributors to Indonesian low carbon development. Furthermore, it identifies green finance options for low carbon development in Indonesia. The study concludes with identification on major challenges to address in order to spur more domestic green banking contribution

in Indonesian low carbon development. The study adopts a descriptive method, either with qualitative or quantitative analysis. It makes use of the latest data and information during the study process. The data is sourced from relevant ministries (Ministry of Finance; Ministry of Environment and Forestry, 2020; Ministry of Energy and Mineral Sources), Central Agency of Statistics, and previous literatures (journals, reports, books, and articles). The challenges of green banking contribution are based on the most current business practitioners perspectives taken from published interviews.

## 2. LOW CARBON DEVELOPMENT

According to United Nations concepts and definitions, low-carbon development (LCD) is part of sustainable development (see <https://sustainabledevelopment.un.org>). Climate change due carbon dioxide emissions has accorded the world economy some significant adverse impacts, thus it has crystallized LCD as an international main concern. LCD is a development track where 'higher productivity of resources shares better standards of living and quality of life' (Department of Trade and Industry UK, 2003). Higher resource productivity is characterized with more production, but with fewer natural resources and less pollution. Coverage of actions in LCD include taking compatible actions with sustainable development principles, which assure that all groups within society are able to fulfill their development needs. Then, having an equitable share towards the global climate change campaign by implementing a profound committed reduction of global emissions to achieve a stable and safe atmospheric concentration of CO<sub>2</sub> and other GHGs. Next, undertaking the optimum energy efficiency simultaneously with the use of low-carbon sources of energy and production technologies. The other is applying consumption and behaviour patterns which maintain low GHG emissions (Skea and Nishioka, 2008).

The low carbon economy focuses on GHG emissions, with the concept of resource-efficient low carbon economy (EFFECT, 2013). The low-carbon energy production across the globe is driven by technological advances and falling prices (McKinsey and Company, 2017). New and innovative low carbon technologies are projected to reduce GHG emissions and create employment and growth. Changing into a low carbon economy due to climate change issues implies trade offs as several GHG intensive activities would decrease, fossil fuels for energy would need to be replaced, and some initial investment would be required to finance low-carbon assets (OECD, 2015). There is a three-pillar approach recommended by OECD (2015) to be most effectively reducing GHG emissions. First, a clear and robust signal on GHG emissions or other market-based instruments; second, smart regulations to remove market barriers to low GHG choices; and third, forward-looking support to low-carbon technologies.

## 3. THE PROGRESS OF INDONESIAN LOW CARBON DEVELOPMENT

GoI considers low carbon development as a key economic development and planning issue (World Bank, 2008). Indonesia

has determined an explicit and comprehensive growth and development agenda in its Medium-term National Development Planning (RPJMN) 2020-2024. During the period, it seeks to reform its economy to provide solid fundamentals to become a developed country, enhance standards of living, spread electricity access to 100%, decouple growth from dependence on fossil fuels as a prime source of energy, and keep reducing carbon emissions on track targeted to 29% in 2030 – which 11% of these emissions reduction relies on the energy sector.

According to the Ministry of Finance (2015), Indonesian economy will be inflicted to the adverse impacts from climate change and deteriorated environment, pushing the growth down to an estimate 3%-5% lower than the targeted growth 7% by 2050. According to World Resource Institute (2017), Indonesia is one of the top ten countries with the highest share of GHG emission in the world. Indonesia has GHG emission per capita of 10.5 tCO<sub>2</sub>e/cap, higher than G20 countries average (8.3 tCO<sub>2</sub>e/cap), contributing 5.3% share of global GHG emissions (Climate Transparency, 2017).

In addressing the above issues, Indonesia has been actively supporting and contributing to the mitigation and adaptation of GHG emissions. Indonesia's commitment is reinforced through its firstly introduced the Nationally Determined Contribution (NDC) document in November 2016 with a determined unconditional target of 29% (around 834 Mtonnes CO<sub>2</sub>e) and a conditional target of up to 41% (or around 1.081 Mtonnes) in comparison with the business as usual (BAU) scenario in 2030. NDC is a concrete form of the heart of the Paris Agreement in 2015, a strong country's political will to reduce emissions and adapt to the impacts of climate change. Particular relevant ministries or national institutions in each sector have been appointed to be accounted for national various mitigation actions. By joining the bold climate action scenario, Indonesia and other countries could deliver US\$ 26 trillion in economic benefits from new job employment and better health outcomes (New Climate Economy, 2018).

According to World Bank (2008), the major GHG emission contributors in Indonesia are forestry, peatland management and agriculture expansion; the energy sector where its emission grows faster than economic growth; and the transportation sector due to urbanization and rapid decentralized growth. Most of Indonesia's GHG – slightly below 90% - comes from land use and energy. The composition structure has no change, two leading contributors are still forestry sector and energy sector. More recent data from the World Resources Institute (2017) shows more details that the contribution of GHG by sectors in Indonesia are: (1) 65.5% emission from conversion of land-use change and forestry (LUCF), (2) 22.6% emission from energy, (3) 7.4% emission from agriculture, (4) 3% emission from waste, and (5) 1.4% emission from industrial process. The main discussion on achievement updates will surely be around the two leading emission contributors: forestry (LUCF) sector and energy sector.

Some progress that Indonesia has achieved in combatting carbon emission up to date is shown historically - from 2010 up to the most recent data compilation in 2018 (Table 1). GoI has followed

the right path during those years in its LCD campaign to achieve its NDC targets, which resulted in a series of significant achievement in emission reduction. Although the NDC campaign still has a relaxed deadline up to 2030, Indonesia has been able to reach more than one-fourth of its target.

The challenge still remains, however, especially in the forestry sector. According to Ministry of Environment and Forestry (2018), in 2015 a big peat fire covering 0.82 million hectare took place, which ruined the past campaign result. The fire together with other factors produced 1,565 Mton CO<sub>2</sub>e. It was a very substantial amount since it contributed 66% of the GHG emission in 2015.

Based on Figure 1, Tables 1 and 2 above, energy sector has contributed the biggest accumulation in the emission reduction campaign. The energy sector contributes 207.69 Mton CO<sub>2</sub>e in total; so far it has reached 66% of the NDC-based sectoral target in 2030. While forestry sector as the top GHG contributor contributes inconsistently, only 37.25 Mton CO<sub>2</sub>e in total during the measurement period – which has only reached 7.5% of its 2030 NDC-based sectoral target. Such inconsistency in the forestry sector indicates that the emission reduction campaign in the sector has many unpredictable factors which are difficult to handle. Thus, there is still much to be done in association with the campaign in the forestry sector to keep reaching 2030 NDC on target.

With reference to Ministry of Environment and Forestry (2018), the initiatives in the forestry sector are classified into six group of actions: reduced deforestation, decreasing forest degradation, sustainable forest management, increasing carbon stocks, increasing role of conservation, and peatland management.

Deforestation and forest degradation are a major concern for Government of Indonesia. According to Contreras-Hermosilla (2000), deforestation and forest degradation can be perceived positive and negative, depending on the side of assessments - whether it is for economy, environment and other dimensions of life – and the various groups which are related to those impacts.

Deforestation is the change of forested land to become non-forested (Central Agency of Statistics, 2019). Since its independence day up to 1980s, the paradigm among Indonesian policymakers was deforestation gave positive impact because it provided a stream of foreign exchange and revenue to the country. Indonesia was once a log exporter and also the largest plywood producer in the world. Logs were even once the second largest contributor to foreign exchange for Indonesia. However, after the 1980s, the paradigm has gradually changed. It has been considered that deforestation gives negative implications for forest resources and human well-being.

The causes of current deforestation are varying. They are not only restricted to intensive forest management in the area of Timber Forest Product Utilization Permits (IUPHHK) to satisfy log domestic demand and export, but also some conversion of forest areas for use by other sectors. A lot of conversion takes place due to agricultural expansion, mining, plantations and transmigration,

**Table 1: Progress of Sectoral Achievement towards 2030 NDC Targets in Carbon Emission Reduction and or Carbon Sequestration (2010-2018)**

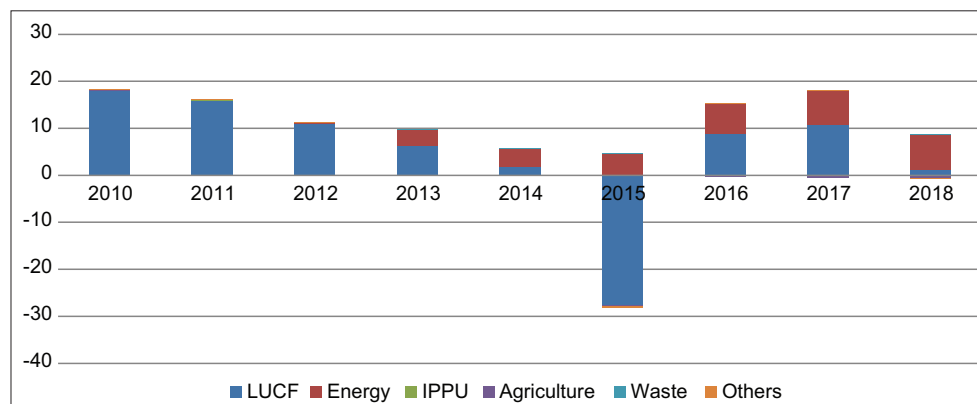
Target and Achievement	Reduction from BAU (Mton CO <sub>2</sub> e)						Total	
	LUCF	Energy	IPPU	Agriculture	Waste	Others		
2030 NDC Target	497	314	2,75	9	11	11	834	100%
Emission Reduction and or Carbon Sequestration Achieved*	37,25	207,69	-2,84	-16,61	0,31	0,2	226	27%

\*Accumulated emission from period 2010-2018

**Table 2: Progress of Sectoral Achievement towards 2030 NDC Targets in Carbon Emission Reduction and or Carbon Sequestration (2010-2018)**

Target and Achievement	Progress Achieved towards 2030 NDC Target (%), accumulated							Total	
	LUCF	Energy	IPPU	Agriculture	Waste	Others			
2030 NDC Target	17,2	11	0,1	0,32	0,38	0,38	29	100%	
Total Emission Reduction and or Carbon Sequestration Achieved	1,29	7,28	-0,1	-0,59	0,01	-0,04	7,85	27%	

\*Accumulated emission from period 2010-2018

**Figure 1: Progress of Sectoral Achievement towards 2030 NDC Targets in Carbon Emission Reduction and or Carbon Sequestration (2010-2018)**

Source: Ministry of Environment and Forestry (2020)

infrastructure development, population growth and density, urbanization and expansion of urban areas, unsustainable forest management, timber theft or illegal logging, encroachment and land occupation in forest areas as well as forest fires.

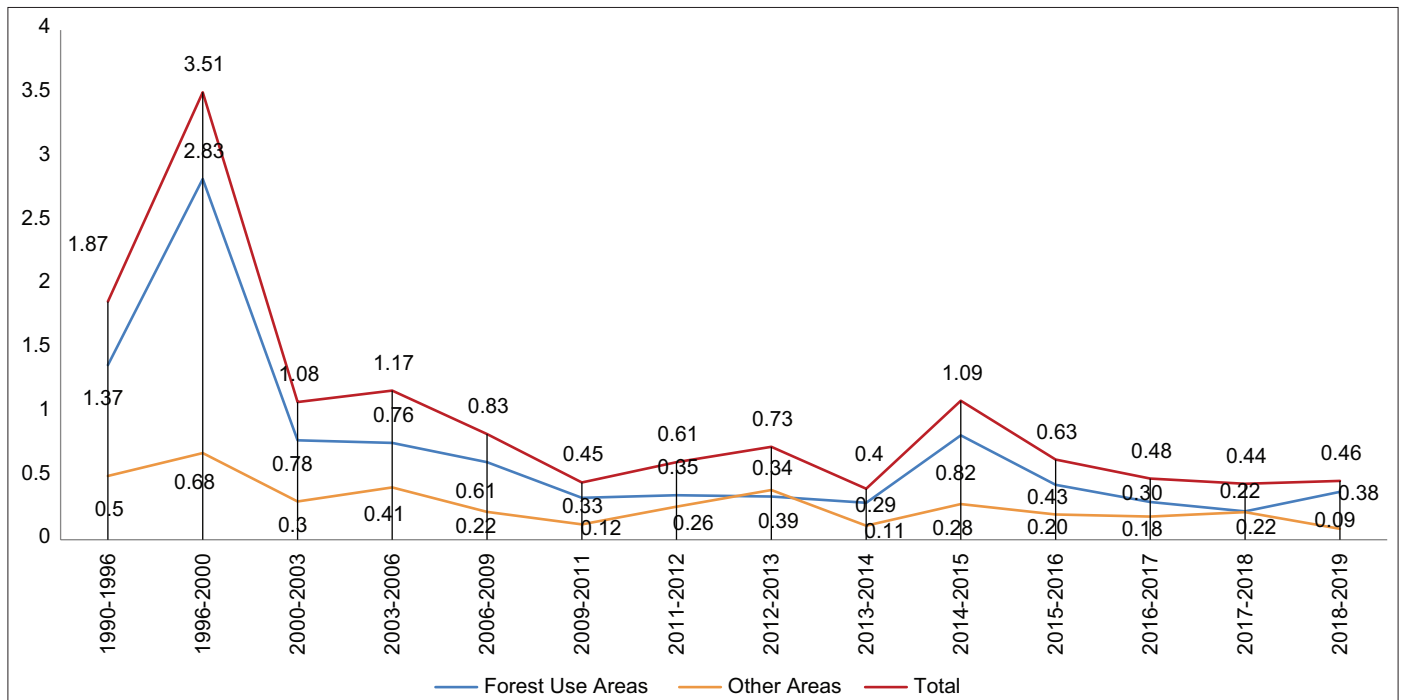
The government has undertaken some measures to reduce deforestation and it has effectively marked down the deforestation rate to <500,000 hectares per year during 2016-2019, when compared with 3.5 million hectares per year during 1996-2000 (Figure 2). To reduce the rate of deforestation, the Indonesian government has issued several policies, including a moratorium on the issuance of new permits on primary natural forests and peatlands since 2011, land provision for communities, resolving land use conflicts, monitoring environmental permits and law enforcement.

Different with forest deforestation which is more related to area reduction, forest degradation issue is more on forest quality, on the temporary or permanent lowering of the productive capacity of land. The degradation of forest means the ecological, economic and social functions of the forest are reduced. The degraded land is commonly left abandoned untilled and generally overgrown with shrubs (Food and Agriculture Organization, 1994). It is also

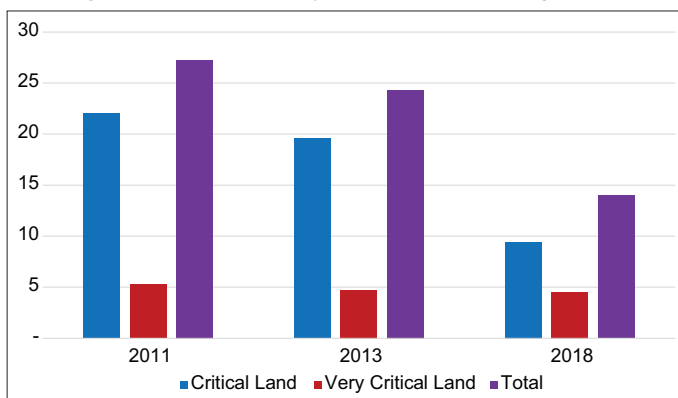
characterized by reduced land cover and the presence of erosion symptoms (Sitorus and Pravitasari, 2017). It may potentially cause disasters such as drought, floods, landslides, and fires that in turn can contribute to global warming or GHG emissions.

Government has successfully restored the quality of land by executing the Forest and Land Rehabilitation in priority watersheds, production forest areas, conservation forests and outside forest areas (Figure 3). Referring to the Central Agency of Statistics (2019) data, one can see the downward trend of degraded land areas based on the data 2011-2018. The total of critical land areas in Indonesia in 2013 was 24.3 million ha, consisting of 15.5 million hectares inside forest areas and 8.7 million hectares outside forest areas. That is a decrease of around 3.0 million hectares if one compares with the critical land area in 2011 totalled 27.3 million ha. Meanwhile, based on the latest data in 2018 the critical land area kept decreasing to an area of 14 million hectares.

After the forestry sector, the next priority sector of the carbon emission reduction is the energy sector. Mitigation actions and emission reductions in the energy sector are grouped into 5 (five) action groups, namely: (1) Energy Efficiency, (2) New and Renewable Energy, (3) Low Carbon Fuels, (4) Use of Clean

**Figure 2:** Deforestation rate (net) Indonesia, Inside and Outside Forest (mill. ha/year), 1990-2018

Source: Ministry of environment and Forestry (2018)

**Figure 3:** Critical and very critical land due to degradation

Source: Central agency of statistics (2019)

Generation Technologies, and (5) Other Activities (Post Mining Reclamation).

According to Ministry of Energy and Mineral Sources (2020), the total Indonesian sectoral energy demand in 2019 which includes biomass - was 1,007.26 million BOE. The transportation sector consumed the most energy, which was followed by industry, household, commercial, non energy, and other sectors (Figure 4). As fossil energy potentials are declining, the government has encouraged to put new and renewable energy – low carbon energy – as the main priority to develop for future energy security and independence.

However, Indonesia is still heavily dominated by fossil fuel energy (Figure 5), despite the potentials given for new and renewable low carbon energy. One can see that the decreasing trend of carbon fuel use has been offset by the increasing tendency of coal use as

a consequence of the national energy policy adopted. The factor behind the downward trend of fuel use is the successful energy policy in the transportation sector, i.e. introducing biofuel to replace carbon diesel fuel. There is also subsidy removal for high octane carbon fuel, which then it goes partly as direct financial assistance to the poor and more productive budget allocation, including research on biofuel.

The government effort in fulfilling the electricity demand is basically the accountable factor behind the increasing tendency of coal use. The government needs more electricity to have a big push in transforming its economy into a developed country. To address the issue, it embraced the option of simple and low cost technology and investment of a coal-based power plant instead of sophisticated and high cost ones of a renewable energy-based power plant. Thus, there is still much work to be done as well in the future in terms of low carbon development in this area.

Indonesia has stepped further in a more sustainable energy supply provision, significant reduction in fossil fuel subsidies and has set ambitious energy efficiency and renewable energy targets, particularly for geothermal energy (Marquardt, 2016). On the other side, Indonesia's new and renewable energy – particularly low carbon energy – has not been utilized maximally. There is significant energy potential in Indonesia, varying from hydropower (76 GW), solar (4.8 kWh/m<sup>2</sup>/day), biomass (33 GW), wind (3–6 m/s) and geothermal reserves (28 GW) which accounts for 40 percent of the world's reserves (Tharakan, 2015 and Marquardt, 2016).

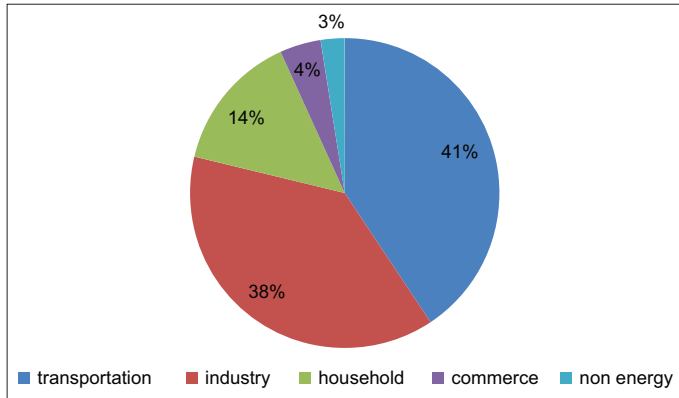
The struggle for building more new and renewable low carbon energy based power plant for electricity is still ongoing. One can

see a gradual incremental use on new renewable energy in the Indonesian share of primary energy supply mix from 4.35% (2009) to 9.18% (2019). The additional capacity of new renewable energy is mostly for electricity needs. The administration of President Joko Widodo has set indicated the target of additional capacity 7,600 MW by generating new renewable energy power plants over five years through 2024 (see Figure 6). The budget allocation for realizing the power plants target is Rp 166 trillion, which consist

of Rp 75 trillion for hydropower, Rp 42.3 trillion for geothermal, Rp 24.7 trillion for bioenergy, Rp 17.9 trillion for solar energy, and Rp 5.8 trillion for wind energy (Republic of Indonesia, 2020).

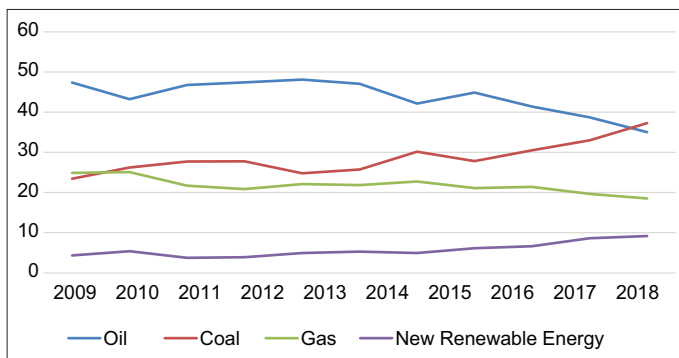
#### 4. FINANCING INDONESIA'S LOW CARBON DEVELOPMENT AGENDA

Figure 4: Indonesian Sectoral Energy Consumption 2019 (Mill. BOE)



Source: Ministry of Energy and Mineral Resources – Indonesia (2020)

Figure 5: Indonesian Primary Energy Supply 2009-2019



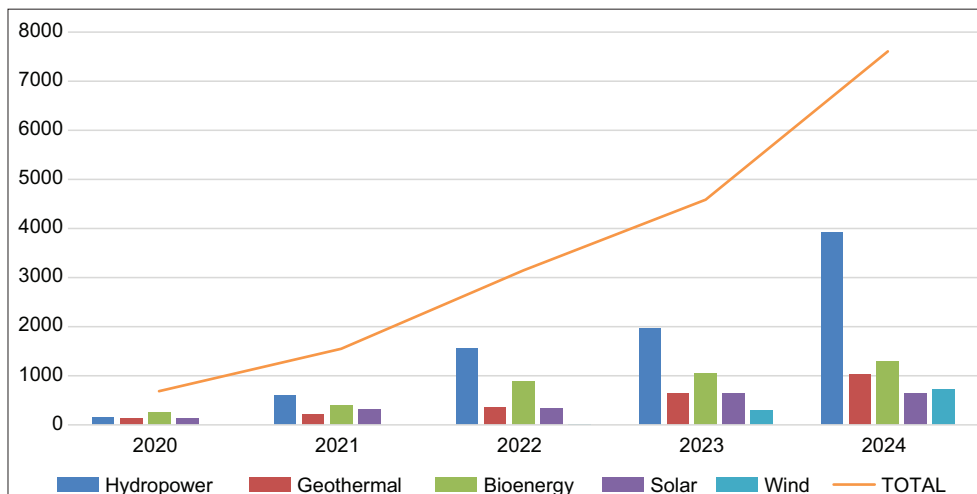
Source: Ministry of Energy and Mineral Resources (2020)

There are several funding options for low carbon finance in Indonesia, which vary from government funding, financial institutions, private investment/non-state investment, public-private partnership, corporate social responsibility, foreign direct investment, international development partners, and regional cooperation (Figure 7). Government funding is currently the main source of funding in low carbon development. With this funding, state budget expenditures are aligned with national planning priorities and local implementation, and comprehensive incorporation of climate actions in the annual, medium and long-term development planning process, to ensure budgets are allocated to support climate action (Ampri et al., 2014). In government funding option, low carbon projects can be funded through central government or local government, or implemented via investment by state-owned enterprises.

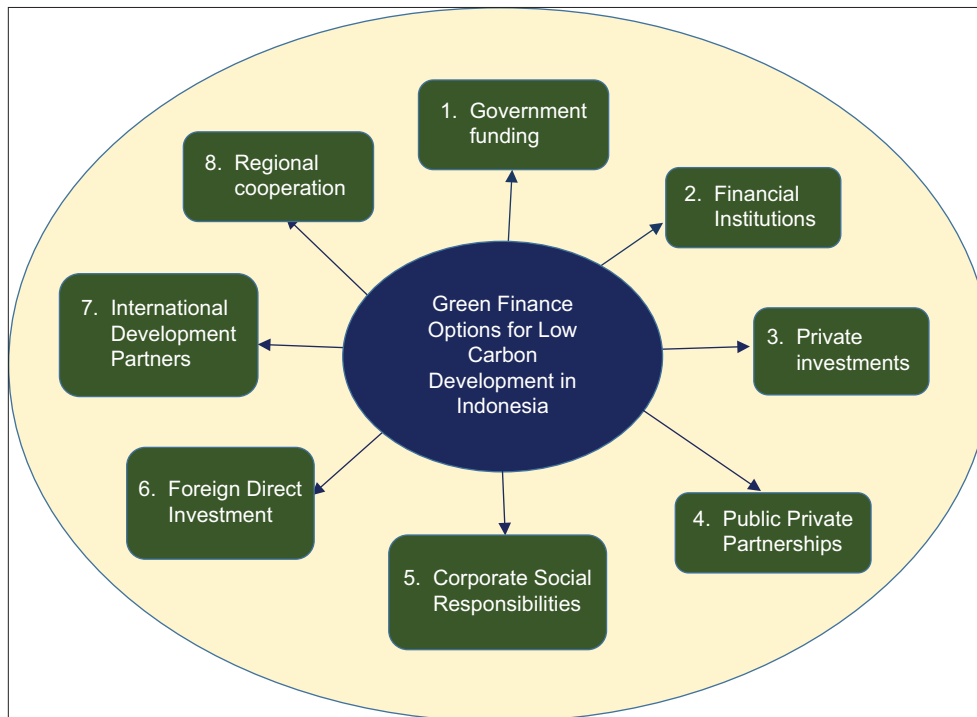
Two schemes are available to finance through the central government funding scheme, i.e. public investment and budget tagging. Public investment is conducted in the form of *revolving fund* and *equity participation*. In public investment, GoI provides support for projects and activities which can generate revenues. The other one, budget tagging involves the relevant ministries' budget which is intended specifically for climate change mitigation and adjustment.

Aligned with the central government, local governments of Indonesia also provide funding to support climate change mitigation and adjustment projects. Local government may finance low carbon projects through local budget revenues, general allocation of grants, special allocation fund, revenue sharing

Figure 6: Accumulated indicated target of new renewable energy plant capacity 2020-2024 (MW)



Source: Republic of Indonesia (2020), author's analysis

**Figure 7:** Green Finance Options for Low Carbon Development in Indonesia

Source: Authors' compilation

grants, and local grants. According to Ampri et al. (2014), the highest support for the climate change mitigation and adjustment project by the local government can be realized through funding from the special allocation fund and local grants.

The other kind of government funding is investments by state-owned enterprises (SOEs). GoI may have a full or majority of ownership in the SOEs. Ministry of Finance represents the government in SOEs ownership, while Ministry of State-Owned Enterprises supervises the SOEs operation. Although the SOEs assets are legally the lawful state assets, yet they are operationally considered separated assets; they are neither part of a budget cycle nor included in a government institutional structure.

Most funding from climate mitigation and adjustment programs was delivered through domestic budget expenditure, particularly the state budget (Ampri et al., 2014). More recently in 2018, the picture remains unchanged. The largest source for the funding was generated from state budget counterpart funds while the smallest sum was generated from overseas grants. There was total budgeted allocation of IDR72.2 trillion to M/Is engaged in mitigation activities and IDR37.5 trillion to M/Is engaged in adaptation activities (Ministry of Finance, 2019). The potential problem associated with excessive dependence on the government funding is it can create a higher risk of increasing budget deficit, and the disbursements is commonly lower than commitments.

Financial institutions are the next conceivable option for low carbon finance in Indonesia. The government through Indonesia's Financial Service Authority (OJK) has made efforts to encourage the transition process for financial institutions to support sustainable financing. OJK has published the Sustainable Finance Roadmap Phase I (2015-2019) which focuses on increasing the

understanding, implementing the capacity building and laying the basis for regulations for the financial services industry.

OJK has completed further the Sustainable Finance Roadmap Phase II for the next five years (2021-2025) to accelerate the application of environmental, social and governance principles in Indonesia. Roadmap Phase II focuses on creating a comprehensive sustainable finance ecosystem.

The financial institution funding for low carbon projects in Indonesia can be divided into two financial sectors, i.e. banks and non-banks. Funding for low carbon projects in Indonesia may be done through "green lending" scheme by banks. As defined by Bank Indonesia, green lending is a type of lending which covers these categories, i.e. renewables, sustainable agriculture, ecotourism and green industry. Low carbon projects may be included in the "green industry" category. The other kind of financial institutions is non-banks, which role in the Indonesian financial industry is smaller than banks. Low carbon projects may be funded by non-banks financial institutions, such as insurance company, mutual fund and other financial services institutions.

Capital markets have an important role to play as a source of long-term funding for green investment (Volz, 2015). Low carbon project developer may get fundings through equity and/or bond markets. Indonesia has a capital market following the standard and regulation of Sustainable and Responsible Investment (SRI), named KEHATI SRI Index. KEHATI SRI Index consists of 25 companies listed in the IDX that regarded as beneficial and constantly managing sustainable development.

Next option for low carbon finance is private investment. Private sectors have a key role to fund the low-carbon and another climate



change mitigation and adjustment projects, as the public fund is not enough to finance the projects alone. Private/non-state investment may fund low carbon projects via particular financing sources, i.e. venture capital firms, angel investors, impact investors, peer to peer lending and crowdfunding platforms.

Venture Capital firms (VCs) target companies within sectors with a capacity to reach economies of scale and to grow fast. VCs search for long-term investment opportunity with healthy returns. Meanwhile, angel investors are wealthy individuals or high net-worth individuals who are interested in potentially high return investments like early-stage startups. Angel investors usually invest in companies with high growth potential. Both VCs and angel investors may offer expertise and technical assistance to particular projects in exchange for shares of company or venture ownership (AlliedCrowds, 2017).

Another feasible possibility of low carbon financing through private sector is impact investors, which invest capital to create social impacts and environmental return beside financial returns. The impact investment industry in Indonesia is fairly new, for example the Impact Network Indonesia (AlliedCrowds, 2017).

Peer to peer lending (P2P) is also known as "social lending". It removes official financial institution mechanism and acts as alternative financial intermediaries to bridge people who intend to borrow and lend money. However, P2P involves more time, effort and risk than general lending via financial institutions. The interest rate of P2P is usually higher because of the high risk.

One form of P2P lending is crowdfunding. Crowdfunding is the practice of collecting fund from individuals, typically with an online portal. Crowdfunding is based on the innate human desire to help others. Nowadays, this method of financing is evolving rapidly in the era of high technology, particularly the advancement of social media. Indonesia has some crowdfunding platforms like *Kitabisa.com* and *Wujudkan.com* and many more. According to AlliedCrowds (2017), there are four models of the crowdfunding basis: donation, reward, lending and equity. Other private sector investors may come from individual investors and private equity, which include pension fund and sovereign wealth fund.

The Public-Private Partnership (PPP) is needed to fill the cost gap between the needed and available public financing of low carbon projects. The government works on the PPP to pool funds, with the support of multilateral agencies, donors and private sources, to climate change mitigation and adjustment programs. In the PPP scheme, the government has a major role of attracting private sector investments by using public funds and policies, to leverage low carbon projects.

Corporate Social Responsibility (CSR) provides a window of opportunity for funding sources in the future (GIZ-PAKLIM CDIA, 2011). CSR allows a range of activities covering social and environmental aspects. Low carbon projects have a high impact on environment, which can be very attractive to companies into investing the project as the CSR. However, the barrier associated with CSR funding for low carbon projects is the unclear

guidance of a proper monitoring of CSR activities and the lack of recommendation of the CSR types that companies should conduct.

Foreign Direct Investment (FDI) is one important source of funding. FDI in Indonesia would place emphasis on investment that mitigates the climate change effects: investment that brings clean technology to resource extraction or uses sustainable design in the building of infrastructure. Low carbon projects pass the requirement above. However, there are no formal sustainability standards to FDI imposed by BKPM (Volz, 2015).

International development partners added domestic public resources significantly. The international development partners funding to the low carbon project in Indonesia can be divided into three types: loans, grants, and joint crediting mechanism.

Loans are intended to support infrastructure projects serving direct climate change mitigation and adaptation purposes, such as geothermal power plant and drainage rehabilitation project (Ampri et al., 2014). Mostly the beneficiaries are state-owned enterprises which treat the loans as low-cost project debt.

Another financing strategy to leverage investments in low carbon projects is climate finance facilities (World Bank, 2008). There is the Indonesia Climate Change Trust Fund (ICCTF), which is managed by the government but it is not present in the national budget. The other climate finance facilities are Indonesia Green Investment Fund (IGIF) under Ministry of Finance, Carbon Markets, Clean Development Mechanism (CDM), Reducing Emission from Deforestation and Forest Degradation (REDD+), Clean Technology Fund (CTF) for geothermal investment promotion, and many more. Those climate finance facilities may be used to capture grants, loans or even carbon payments.

In addition, grants are directed to build enabling environments and other forms of readiness (Ampri et al., 2014). Grants were delivered to international organizations, non-governmental organizations, and other organizations dealing with capacity building. Joint crediting mechanism (JCM) projects are particularly in cooperation with developed nations. As illustration, the ongoing Indonesia-Japan JCM in climate mitigating projects serves to promote green investments and technology transfer between the two countries.

Regional cooperation forums may also serve to facilitate green finance options. Based on ASEAN WC-CMD Report (2020), the countries in Asia and the Pacific have developed a regional roadmap, i.e. The Regional Road Map for Implementing the 2030 Agenda in Asia and the Pacific, to facilitate cooperation at the regional level. To facilitate avenues for regional green finance, ASEAN have developed ASEAN Green Bond Standards (ASEAN GBS), the ASEAN Social Bond Standards (ASEAN SBS) and the ASEAN Sustainability Bond Standards (ASEAN SUS). These standards are used as a guidance when financial industries in ASEAN countries plan to issue sustainable issuances in bonds or sukuk. There are currently three options of bonds available with these standards, i.e. ASEAN Green Bond, ASEAN Social Bond and ASEAN Sustainability Bond.

ASEAN countries have all agreed to the regional roadmap above and moved forward at a different pace. Indonesia is one of ASEAN countries which has developed SDG Indonesia One. It is a platform for infrastructure financing which mixes finance schemes to be channelled into infrastructure projects in relation to sustainable development.

## 5. CHALLENGES IN PROMOTING GREEN BANKING CONTRIBUTION FOR LOW CARBON DEVELOPMENT

As stated earlier, sources of funding still depends on public sector (66%) and international fund (34%) (Ampri et al., 2014; Ministry of Finance, 2019). Private sector source of funding for low carbon development remains insignificant.

The total central government spending for climate change mitigation from 2016 to 2020 reached IDR256.7 trillion, while that for climate adaptation reached IDR75.9 trillion (Ministry of Finance, 2020). International partner institutions shared in estimation around USD 324 million to public green finance flows (Ampri et al., 2014). More recently, GIZ also supported the Indonesia Climate Change Trust Fund (ICCTF) in enhancing governance of climate finance in Indonesia by providing grant worth 3.500.000,00 € during 2013 until 2018 (see <https://www.international-climate-initiative.com>). In August 2020, GCF approved that Indonesia obtained funding worth USD103.8 million. The Environmental Fund Management Agency (Badan Pengelola Dana Lingkungan Hidup/BPDLH) will manage the funding for GCF REDD+ Results-Based Payment program until 2022 (see <https://gggi.org>).

In public finance, the government has a major important role regarding the funding of climate change mitigation and adaptation. Overall in the first phase, the majority of low carbon development is funded by the state budget which is managed by Ministry of Finance.

Financing which relies on government side only is projected to only increase GoI's budget deficit, and financing from private sector and non-state parties are expected to fill the gap in the budgeting plan (Ministry of Finance, 2012). Public finance relies on the government role in raising the funding, while private finance depends on the financial industries and markets activities to close the funding gap. To attract private sector, Ceres (2014) in Campiglio (2015) noted that green investment performances are dependable to the specific type of resources which meet the investors' targets and provide adequate amount of fund.

Other than public finance, it is important for designing private finance for low carbon development as the reliable funding scheme for the second phase. The most conventional way of financing seems to be the next reliable source of capital to support for low carbon ventures, i.e. the banking sector. The sector is still dominating Indonesian financial system by injecting 59% of national financing needs (Bank Indonesia, 2019). If regulated properly, the banking sector has an extraordinary potential to

mobilize and reallocate capital to fund sustainable sectors of the economy.

A stimulus in legislation protection, fiscal investment, and taxation support can generate government-backed investments in low carbon economy, low carbon enterprises, and low carbon projects. State-owned banks, regional development bank (BPD) and generally commercial banks in Indonesia have a great potential to support those government-backed investments. Thus, the government has a vital part to empower banks, particularly state-owned banks to offer financing for low carbon projects, leverage private bank capital and provide credit guarantees.

Some nations have utilized state-owned or government-supported banks to facilitate financing for renewable and clean energy venture (Alexander, 2016). In China and India, state-owned banks provide long-term financing for sustainable energy and infrastructure projects, and even for smaller businesses dealing with sustainable economic activities. In several developed nations like UK and US, green investment banks are established to support financing for renewable energy projects.

GoI has been attempting to adopt policy incentives, like providing financial discount to support banks and other credit organizations to take part in low-carbon economy. The next one is guiding banks and relevant financial institutions to establish green credits to endeavors and tasks concentrating on growing new energies, reducing carbon emission, and developing low-carbon technologies. The other is urging banks and relevant financial institutions to give low-premium loans or unsecured loans to key projects that benefit energy conservation and pollution reduction.

State owned banks in Indonesia, particularly the biggest three (BRI, Bank Mandiri and BNI) are now actively developing new funds and programs to support government infrastructure projects and green lending. Some state-owned banks like Bank Mandiri and Bank BNI are collaborating with international institutions and multilateral development banks to provide funding for infrastructure or green projects. The Bank Pembangunan Daerah (BPDs) also have an important role in the development of regions in Indonesia by supporting local government projects. Indonesia has 26 BPDs across the nation. BPD may be potential to finance low carbon projects. Beside state-owned banks, private banks can bolster the portion of the government's projects and sustainable development programs (e.g. BCA, CIMB Niaga), and can possibly back low-carbon ventures.

Green banking which facilitate green credit leads to "green lending" concept, as defined by Bank Indonesia, lending in renewables, sustainable agriculture, green industry and ecotourism. Green credit itself actually provides benefits for banks. Funding from international institutions for green credit is quite large and at low interest rates. It certainly provides the benefit of low interest when distributed to debtors. However, not many banks are familiar with environmentally friendly financing (see <https://finansial.bisnis.com>).

Bank Negara Indonesia (Bank BNI) is a state-owned bank with progressive vision in sustainable financing. This bank has been

implementing green banking concept since 2009 and has had a sustainability report. Bank BNI has distributed green financing, especially in the gas and hydro power plant sector, renewable energy, green building, and Indonesian Sustainable Palm Oil (ISPO) and Roundtable Sustainable Palm Oil (RSPO) certified oil palm plantations. BNI financial report data in 2018 shows that the corporate green financing reached IDR 134.7 trillion or grew 133.6% from previous year. The composition of green financing for productive credit also increased from 18.3% in 2017 to 33.4% in 2018.

In following to Bank BNI success, the Financial Services Authority (OJK) has currently appointed seven other banks to commence credit distribution which adopts sustainable finance principles. These banks are Bank Mandiri, Bank BRI, Bank BCA, Bank Artha Graha International, Bank Muamalat Indonesia, Bank BRI Syariah (merged into Bank Syariah Indonesia), and BPD of West Java and Banten (see <https://finansial.bisnis.com>). These banks have begun participating in a number of sustainable finance projects related with renewable energy, energy efficiency, sustainable agriculture, green building and infrastructure, recycling industry, and ecotourism.

In 2019 BRI became the first bank in Southeast Asia and in Indonesia which successfully issued sustainability bonds. BRI issued the USD 500 million Sustainability Bond with a 3.95% coupon and 5 year maturity to finance green and social bond projects in Indonesia (see <https://www.ca-cib.com>). The amount of US\$ 78 million or 15.6 percent of the funding was used for environmental-oriented activities such as Green Transportation and Green Building. The construction of LRT (light rapid transit) projects are included in the above activities (see <https://www.thejakartapost.com>). In April 2021, Bank Mandiri is then following afterwards by successfully issuing US\$ 300 million of sustainability bonds with a 2% coupon and 5 year maturity (see <https://www.thejakartapost.com>). The two issuances were in compliance with ASEAN standards (the ASEAN SUS, ASEAN GBS, and ASEAN SBS), and also the international standard (International Capital Market Association/ICMA).

To scale up Indonesian banking industries share in national green finance in the near future, it would be very useful to take business practitioners perspectives into consideration, given that contribution of the private sector (particularly the dominating banking sector) on low carbon development is still relatively low in comparison with that of the public sector. Based on their observation, there are currently several challenges need to be addressed by the government and regulators.

The first challenge is the high-perceived risk in low carbon ventures and green project financing due to uncertainty of returns. Banks are likely to set a high interest fee for green investment because of the high perceived risk. It regularly happens that banks ask for a guarantee on the loan and ask for additional collateral to protect themselves against risks (AlliedCrowds, 2017). In this manner, green investment is less alluring to investors. Such risk perception is caused by at least three factors.

The first factor is the lack of awareness from banks to undertake green financing. Given that Indonesia is in the very early stages of implementing sustainable finance, the industry level of sustainable finance understanding is still low (see <https://finansial.bisnis.com>). It requires optimal education and campaign efforts for many parties, including for banks.

The lack of understanding among banks was indicated on the OJK survey result in 2019. From the survey on green credit for eight major Indonesian banks, it was found that green credit disbursement only reached 2%. To notice the green credit progress, OJK itself has required Indonesian banks to prepare annually a green report in accordance with POJK 51/2017 concerning the Implementation of Sustainable Finance for Financial Service Institutions, Issuers and Public Companies. The implementation has commenced gradually from 2019 to 2025 towards particular financial industries scheduled in the regulation.

The second factor is the high initial costs of establishing low carbon projects. The high upfront costs are associated with the costs of exploration; feasibility and environmental study; and the expenses of technology utilized as a part of the venture. Local capacities for project operation and maintenance are also taken into consideration. This is because green investments are mostly infant industries, resulting other barriers of limitations in knowledge and expertise.

The third factor is the long span horizon of the green investment period. Often, investors are more interested in short-term investments. Assuming that it will be in the long-term time span, after a short period of time investing in green projects, investors could not get returns or even go out of business before the projects are well-established. The three perspectives mentioned above caused the high-perceived risk in low carbon ventures and green project financing.

A rational option for banks to reduce the above risk of financing low carbon projects is green bonds or sustainability bond issuance. Bank BRI and Bank Mandiri have pioneered such issuance of green bonds among Indonesian banks, the kind of bonds which are compliant with ASEAN standards and the international standard. Green bonds offer a lower interest rate, which may benefit both the banks and also the green projects (Alonso-Conde and Rojo-Suárez, 2020).

The second challenge to low green banking share on low carbon development is related to the limited demand for credit. The customers limited demand for green credit has also contributed to the limited green financing of the Indonesian banking sector. Meanwhile, banks themselves are required to comply with many rules to encourage green credit. Thus, there is no disincentive for the bank to reject requests for financing from companies which have not implemented sustainable principles yet.

The third challenge the low green banking contribution on low carbon development is that the green credit selection process costs relatively higher, because the calculated valuation includes not only general banking risks, but also environmental and social

impacts. It is this additional valuation that may increase the costs of banking, while the benefits obtained are only marginal.

The fourth challenge is that there is no agreement on standardization for the green category at the national level ([www.ojk.go.id](http://www.ojk.go.id)). Besides, to facilitate the application and supervision of the application of principles referred to in the green industry, it is also necessary to refer to a globally recognized standard. With the existence of standards, one can set the size, unit, and criteria for the green industry (Ministry of Industry, 2012).

Developing a national classification standard or taxonomy for sustainable economic activities is necessary to enhance the market clarity of which investments are “green” and “sustainable”. It would also enable the government to trace sustainable finance flows for measurement and to set correct policy incentives (OECD, 2020). A national taxonomy is thus developed based on environmental objectives related to national sustainable development priorities and agenda (World Bank, 2020). Several countries have developed a national sustainable finance taxonomy and definitions, i.e. EU, China, Japan, the Netherlands, and France (EC, 2020). In ASEAN regional cooperation, it would be advantageous if Indonesia could move forward a strategic initiative which facilitates a national sustainable taxonomy development for ASEAN Members.

Those problems should be addressed immediately so that the banking industry can maximize existing opportunities. The opportunities are present in line with the increasing demands from the market and society for sustainable financial products and services.

In taking advantage of these opportunities, risk management aspects should be put in place to prevent unwanted or negative impacts. Climate change risks include the risk of climate change phenomena which may cause damages in property and direct impacts on business processes (physical risk), risks arising from policy and technology changes in consequence of transition to low-carbon economy (transition risk), and risks of legal loss or claims due to some business activities which do not calculate the impact of climate change (liability risk).

## 6. CONCLUSIONS

Low carbon development is an Indonesia key economic development and planning issue, since the negligence will push the growth down to an estimate 3%-5% lower than the targeted national growth 7% by 2050. On the other hand, by participating in the collaborative climate action scenario, Indonesia and other countries could deliver US\$ 26 trillion in economic benefits from new job employment and better health outcomes.

As one of the top ten countries with the highest share of GHG emission in the world, Indonesia has been actively supporting and contributing to the mitigation and adaptation initiatives of GHG emissions. The commitment was reinforced through its the Nationally Determined Contribution (NDC) document in November 2016 with a determined unconditional target of 29% and a conditional target of up to 41% in comparison with the ‘business

as usual’ scenario in 2030. Bappenas has also mainstreamed the low carbon development framework into Indonesian National Medium-Term Development Plan 2020-2024.

Most of Indonesia’s GHG emissions - slightly below 90% - comes from the forestry sector and the energy sector. Based on the data period 2010-2018, Indonesia has been able to reach more than one-fourth of its NDC 2030 target. The energy sector contributes 207.69 Mton CO<sub>2</sub>e in total; so far it has shown consistency and has reached 66% of the NDC-based sectoral target in 2030, the biggest accumulated contribution among all sectors. While the forestry sector as the top GHG contributor contributes inconsistently, only 37.25 Mton CO<sub>2</sub>e in total during the data period – which has only reached 7.5% of its 2030 NDC-based sectoral target.

In the forestry sector, GoI has effectively marked down the deforestation rate, from 3.5 million hectares per year during 1996-2000 to below 500,000 hectares per year during recent years (2016-2019). GoI has successfully reduced the degraded land area to 14 million hectares (2018) from 27.3 million hectares (2011) as well.

In the energy sector, Indonesia is still heavily dominated by fossil fuel energy. However, GoI has encouraged to put new and renewable energy as low carbon energy as the main priority to develop for future energy security and independence. One can see a gradual incremental use on new renewable energy in the Indonesian share of primary energy supply mix from 4.35% (2009) to 9.18% (2019). For over 5 years 2020-2024 period, GoI has allocated specific budget and set an indicated target of additional capacity 7600 MW by generating new renewable energy power plants.

There are several funding options for low carbon finance in Indonesia, which vary from government funding, financial institutions, private investment or non-state investment, public-private partnership, climate finance facilities, corporate social responsibility, capital markets, foreign direct investment, and international development partners. Government funding - through central government or local government, or implemented via investment by state-owned enterprises - is currently the main source of funding in low carbon development.

Like other developing countries, low carbon development in Indonesia is still at an early stage. Therefore, sources of green finance for low carbon development in Indonesia still currently rely very much on the public sector if compared with the private sector.

The total domestic public sector contribution for Indonesian low carbon development in the last 5 years – either for climate change mitigation or climate adaptation – has reached at least IDR332.6 trillion in total, while domestic private sector contribution still lags much behind. In the near future, high dependence on public sector to promote low carbon development is projected to merely add more budget deficit.

Domestic public finance relies on the government role in raising the funding, while domestic private finance depends on the sound ecosystem developed by the government and regulating agency

to stimulate financial industries and market activities – especially the dominating banking sector - to get involved.

Apart from the ongoing government and the regulating agency efforts to encourage green banking industry explained in general in the previous section, the green banking ecosystem in Indonesia still encounters a few challenges. This study recommends GoI and the financial services regulator to set focus on addressing those challenges to successfully promote private sector, in order to equally contribute with public sector to achieve the national low carbon development agenda.

The first challenge is the high-perceived risk in low carbon ventures and general green project financing. With this regard, an available rational option is green bond issuance which complies with ASEAN standards (ASEAN GBS, ASEAN SBS, ASEAN SUS) and the international standard (ICMA). The second challenge is the limited demand for credit which satisfies sustainable finance criteria for low carbon development, and it provides no disincentive for the bank to reject financing for companies which have not complied with sustainable principles yet. The third is that the green credit selection process costs involves additional valuation which may add up the banking cost, while the profits obtained are only marginal. The last one is that there is no national standardization for the green category to enable industry compliance. In that regard, in taking advantage of ASEAN regional cooperation, Indonesia could push forward a strategic initiative which facilitates ASEAN members to develop a respective national sustainable taxonomy.

## REFERENCES

- Alexander, K. (2016), Greening Banking Policy. UNEP Inquiry. Available from: [http://www.unepinquiry.org/wp-content/uploads/2016/09/10\\_greening\\_banking\\_policy.pdf](http://www.unepinquiry.org/wp-content/uploads/2016/09/10_greening_banking_policy.pdf).
- AlliedCrowds. (2017), Social Finance Landscaping Report. In: Collaboration with UNDP Indonesia.
- Alonso-Conde, A., Rojo-Suárez, J. (2020), On the effect of green bonds on the profitability and credit quality of project financing. *Sustainability*, 12, 6695.
- Ampri, I., Falconer, A., Wahyudi, N.L., Rosenberg, A., Bara, M.A., Tuwo, A., Glenday, S., Wilkinson, J. (2014), The Landscape of Public Climate Finance in Indonesia. An Indonesian Ministry of Finance and CPI Report.
- ASEAN WC-CMD. (2020), Report on Promoting Sustainable Finance in ASEAN. ASEAN WC-CMD.
- Asian Development Bank. (2009), The Economics of Climate Change in Southeast Asia: A Regional Review. Available from: <http://www.adb.org/sites/default/files/publication/29657/economics-climatechange-se-asia.pdf>.
- Bank Indonesia. (2019), Bank Indonesia Press Conference on 23 July 2019.
- Campiglio, E. (2015), Beyond carbon pricing: The role of banking and monetary policy in financing the transition to a low-carbon economy. *Ecological Economics*, (121), 220-230.
- Central Agency of Statistics. (2019), Environment Statistics of Indonesia 2019. Central Agency of Statistics.
- Climate Transparency. (2017), Brown to Green: The G20 Transition to a Low-carbon Economy. Available from: <http://www.climate-transparency.org/wp-content/uploads/2017/07/B2G2017-Indonesia.pdf>.
- Contreras-Hermosilla, A. (2000), The Underlying Causes of Forest Decline. Occasional Paper No. 30, June 2000. CIFOR.
- Department of Trade and Industry UK. (2003), Energy White Paper: Our Energy Future Creating a Low Carbon Economy. The Collaboration of Department of Trade and Industry, Department of Transport, and Department of Environment, Food, and Rural Affairs, UK.
- EC. (2020), EU Taxonomy for Sustainable Activities.
- EFFECT. (2013), Low Carbon Economy Policy and Project Review: Background Paper.
- Food and Agriculture Organization. (1994), World Soil Resources Reports. Rome, Italy: Food and Agriculture Organization.
- GIZ-PAKLIM CDIA. (2011), Existing Local and National Available Financing Instruments for Mitigation Measures in Indonesia. Final Report.
- Marquardt, J. (2016), A long way to low-carbon development. In: Roehrkasten, S., Thielges, S., Quitzow, R., editors. *Sustainable Energy in the G20: Prospects for a Global Energy Transition*. Institute for Advanced Sustainability Studies. p64-69.
- McKinsey and Company. (2017), Pathways and Obstacles to a Low-Carbon Economy. Chicago: McKinsey and Company.
- Ministry of Energy and Mineral Sources. (2020), 2019 Handbook of Energy and Economic Statistics of Indonesia. Indonesia: Ministry of Energy and Mineral Sources.
- Ministry of Environment and Forestry. (2018), Status Hutan dan Kehutanan Indonesia 2018. Jakarta: Ministry of Environment and Forestry.
- Ministry of Environment and Forestry. (2020), Laporan Inventarisasi Gas Rumah Kaca (GRK) dan Monitoring, Pelaporan, Verifikasi (MPV). Jakarta: Ministry of Environment and Forestry.
- Ministry of Finance. (2012), Indonesia's First Mitigation Fiscal Framework. Jakarta: Ministry of Finance.
- Ministry of Finance. (2015), Study Report on Green Planning and Budgeting Strategy for Indonesia's Sustainable Development 2015-2020. Jakarta: Ministry of Finance.
- Ministry of Finance. (2019), Public Finance for Climate Change in Indonesia 2016-2018. Jakarta: Ministry of Finance.
- Ministry of Finance. (2020), Laporan Anggaran Mitigasi dan Adaptasi Perubahan Iklim Tahun 2018-2020. Jakarta: Ministry of Finance.
- Ministry of Industry. (2012), Laporan Kajian 2012 Pendalaman Struktur Industri Efisiensi dan Efektivitas dalam Implementasi Industri Hijau. Jakarta: Ministry of Finance.
- New Climate Economy. (2018), Unlocking the Inclusive Growth Story of the 21<sup>st</sup> Century: Accelerating Climate Action in Urgent Times. The Global Commission on the Economy and Climate.
- OECD. (2015), Aligning Policies for a Low-Carbon Economy. Aligning Policies for a Low-Carbon Economy. Paris, France: Organisation for Economic Co-operation and Development.
- OECD. (2020), Developing Sustainable Finance Definitions and Taxonomies: A Brief for Policy Makers. Paris, France: Organisation for Economic Co-operation and Development.
- Republic of Indonesia. Indonesia: Republic of Indonesia.
- Republic of Indonesia. (2020), Presidential Regulation of the Republic of Indonesia Number 18 Year 2020 regarding Middle Term National Development Plan 2020-2024. Indonesia: Republic of Indonesia.
- Sitorus, S.R.P., Pravitasari, A.E. (2017), Land degradation and landslide in Indonesia. *Sumatra Journal of Disaster Geography and Geography Education*, 1(2), 61-71.
- Skea, J., Nishioka, S. (2008), Policies and practices for a low-carbon society. *Climate Policy*, 8, S5-S16.
- Tharakan, P. (2015), Summary of Indonesia's Energy Sector Assessment. ADB Papers on Indonesia No. 9: 40.
- Volz, U. (2015), Towards a Sustainable Financial System in Indonesia.

The UNEP Inquiry into the Design of a Sustainable Financial System in partnership with the Association for Sustainable and Responsible Investment in Asia (ASrIA) and the International Finance Corporation.

World Bank. (2008), Low Carbon Development Options for Indonesia. Phase 1: Status Report and Findings. Washington, DC: World Bank.

World Bank. (2020), Developing a National Green Taxonomy: A World Bank Guide. Washington, DC: World Bank.

World Resources Institute. (2017), Interactive Chart Explains World's Top 10 Emitters, and How They've Changed. Available from: <http://www.wri.org/blog/2017/04/interactive-chart-explains-worlds-top-10-emitters-and-how-theyve-changed>.