



**HOW CAN INDONESIA ACHIEVE  
WATER, ENERGY AND FOOD  
SECURITY WITHOUT ERODING  
ITS NATURAL CAPITAL?**



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The Global Canopy Programme is a tropical forest think tank working to demonstrate the scientific, political and business case for safeguarding forests as natural capital that underpins water, food, energy, health and climate security for all. GCP works through its international networks – of forest communities, science experts, policymakers, and finance and corporate leaders – to gather evidence, spark insight, and catalyse action to halt forest loss and improve human livelihoods dependent on forests. Visit [www.globalcanopy.org](http://www.globalcanopy.org) for more information.

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# EXECUTIVE SUMMARY

Indonesia is one of the world's fastest growing economies and has set a goal to become one of the world's top ten largest economies by 2025<sup>1</sup>. Economic independence and greater self-sufficiency, founded on its abundant natural resources, are key themes of the country's development agenda. From the perspective of economic growth, this strategy is proving very successful, ensuring that Indonesia remains the largest economy in South East Asia, maintaining an average annual GDP growth of over 5% since 2010<sup>2</sup>.

Yet economic growth has gone hand in hand with widespread environmental degradation, and this now risks destabilising these economic gains. The recent devastating forest and peatland fires are a case in point, costing an estimated 2% of GDP – more than twice what the country spent on reconstruction after the Aceh tsunami in 2004<sup>3</sup>. The current Government of Indonesia recognises the intense pressure this is putting on its natural ecosystems, and the resulting threat to water, energy and food security that could undermine the country's ability to achieve sustainable economic prosperity. Its success at moving away from this 'business-as-usual' development model will depend on coordinated development strategies that both recognise and account for the true value of natural resources, their ecosystem services and the inherent resource trade-offs between sectors.

This briefing note outlines the challenges and opportunities for Indonesia to achieve water, energy and food security targets in ways that align with its long term development strategy<sup>4</sup>. A water-energy-food (WEF) nexus approach is used to identify and evaluate synergies and trade-offs across different sector targets. This recognises the interdependency between water, energy and food systems and their reliance on natural resources, in particular forests and peatlands. Finally, it focusses on how Indonesia's existing legislative and institutional frameworks can facilitate or hinder cross-sectoral coordination and the coherent implementation of national development targets. Although primarily focussed at the national level, it draws on in-depth case studies from Aceh province to help in understanding practical realities at the scale of implementation.

Key findings:

## How coherent are Indonesia's water, energy and food security targets?

- **Water security is prioritised across sectors. However, energy and agriculture sector strategic plans do not prioritise forest conservation in improving water supply despite significant co-benefits for emissions reductions.** All sectors recognise the need for investment in water infrastructure to achieve water, energy and food security targets. However, whilst water security objectives clearly recognise the role of forest management and conservation in improving water supply, the agricultural and energy sectors' strategic plans are focused on built infrastructure, including the irrigation network and dams. With forests critical to Indonesia's emissions reduction targets, forest conservation and restoration in watersheds can support positive outcomes across the WEF nexus.
- **Investments in increased productivity are essential to meet ambitious agricultural targets sustainably.** Ambitious targets for food self-sufficiency, agricultural commodities, and biofuels are likely to require the expansion of agricultural land, threatening forest conservation and land-use emissions reductions targets. However, results from a study of Aceh's agricultural development targets indicate that investments in increasing productivity could dramatically decrease the amount of land required for rice and oil palm, enabling targets to be reached without further deforestation. Conversely, under business-as-usual-production (with no increase in yields) there is not sufficient agricultural land, putting forests in the Leuser Ecosystem at risk of conversion.

- **The energy and agriculture sectors do not prioritise development on degraded land.** Utilising degraded land for the expansion of food, commodity and biofuel production is another strategy that could reduce pressure on forests. This is identified as a key objective within the forest/environment sector but is not prioritised within the energy and agricultural sectors' plans. However, in both sectors there are signs of interest in this approach. For example, the agricultural sector's strategic plan recognises the potential to use degraded land, particularly former mining areas; and in 2015 the Ministry of Energy and Mineral Resources signed a Memorandum Of Understanding with the local Governments of Katingan and Pulang Pisau districts of Central Kalimantan for the implementation of a sustainable bioenergy programme on degraded land on former mining areas.
- **Competing land uses may undermine different sector targets unless potential trade-offs are recognised and carefully managed at the local scale.** Achieving economic, energy and food security targets, which all require land and water resources, will depend on implementation, and thus priorities, at the local scale. The continued conversion of rice production area to other land uses in Java despite ambitious rice production targets is a clear example of this issue.

### **How do existing governance structures facilitate coordination?**

- **The complexity of Indonesia's existing governance structure is a challenge for coordination, yet it provides the overarching structure for connecting different sectors.** This coordination relies on lower level regulations, and a lack of clarity on the hierarchy of different sector regulations can lead to confusion and conflict in their implementation. This is exacerbated by the overall complexity of the legal and institutional framework.
- **There is a disconnect between the national legal framework and implementation at the provincial and district scales, with local Governments having the authority to define their**

**development priorities.** Local Governments have significant authority in natural resource management and land use planning and decisions at this scale will play a large role in determining if and how Indonesia achieves its water, energy and food security goals. Yet sub-national development plans reflect local priorities and interests, with the national mid-term development plan being seen more as a 'menu' to choose from rather than a holistic set of guidelines. In this context, better governance at the sub-national scale has been identified as a key priority for improving spatial planning, ecosystem planning and land based management issues.

- **Good models for cross-sectoral coordination exist and can be drawn upon to improve the coherence of development plans across sectors and scales.** In order to achieve its WEF sector objectives, the country can draw on lessons from its mosaic of existing coordination mechanisms, which range from highly centralised and formalised approaches to ad-hoc communication and autonomous decision-making. For example, lessons on the effectiveness of the BP REDD+ taskforce will be important for the success of the new Peatland Restoration Agency.

This analysis has identified critical priorities that need to be addressed coherently across different sectors for the Government of Indonesia to achieve its ambitious development goals. Whilst the complexity of Indonesia's existing governance structure is a challenge for coordination, it provides the overarching structure for connecting different sectors. In the absence of clarity in the hierarchy of lower level regulations across sectors and scales, there is a wide range of existing models for overcoming coordination challenges. Whilst these existing governance structures, such as cross-sector water councils, provide a platform for improving policy coherence, ultimately, the outcomes of WEF trade-offs are inevitably mediated by power dynamics between different actors. Future research should focus on the entry points this report identifies for improving coordination within Indonesia's existing policies, plans and governance structures, and on understanding the interests, actions and relationships of the actors who influence and govern WEF trade-offs.

# BACKGROUND

## **Indonesia's abundant natural resources have fuelled economic development**

On current trends, Indonesia is on course to become the seventh-largest economy in the world by 2030 - overtaking Germany and the United Kingdom<sup>5</sup>. However, in order to meet its goal of becoming a high-income country on this timeframe Indonesia must sustain a rapid rate of economic growth of approximately 6-8% percent per year<sup>6,7</sup>.

To date, the steady pace of economic growth has been sustained through a strategy that relies on exploiting Indonesia's abundant natural resources. Commodities comprise more than half of exports and over 25% of Indonesia's GDP is directly based on natural resources, through mining (12%) and agriculture (15%), with the majority of Indonesia's manufacturing industry (24%) indirectly reliant on the country's natural resources<sup>8</sup>. Indonesia's abundant natural resources include vast coal, oil, natural gas and geothermal reserves; 57 million hectares of agricultural land<sup>9</sup>; 98 million hectares of tropical forests, the third largest area globally; significant mineral deposits, including copper, tin and bauxite; and substantial renewable water resources<sup>10</sup>.

In addition to their direct economic benefits Indonesia's natural resources underpin water, energy and food security for millions of rural and urban citizens, and are key pillars of Indonesia's national mid-term development plan (RPJMN) and strategy for inclusive growth.

## **Growing pressure on resources**

A rapidly growing population, predicted to reach 280 million by 2030, will place increasing pressure on Indonesia's natural resource base. Rapid urbanisation, with more than 70% of the population expected to live in urban areas in 2030 (up from 53% today), brings new challenges for sustainable production and consumption<sup>11</sup>. In particular, a reduction in labour availability in rural areas will require a change in agricultural production systems. Poverty reduction remains a major challenge. Whilst poverty levels in Indonesia have been halved since 1999, from 24% to 12%, around 28 million people are still living below the Government's poverty line and income inequality has grown<sup>12</sup>.

This is in the context of significant differences in resource availability and resource need across Indonesia's archipelago. For example, Java has more than 50% of the population and grows more than 50% of Indonesia's rice, but has less than 5% of the available water resources.

Climate change is expected to further increase pressure on resource production and distribution with Indonesia already highly vulnerable to natural disasters. All these factors present significant challenges to Indonesia's development objectives.

## Environmental degradation is undermining the economy

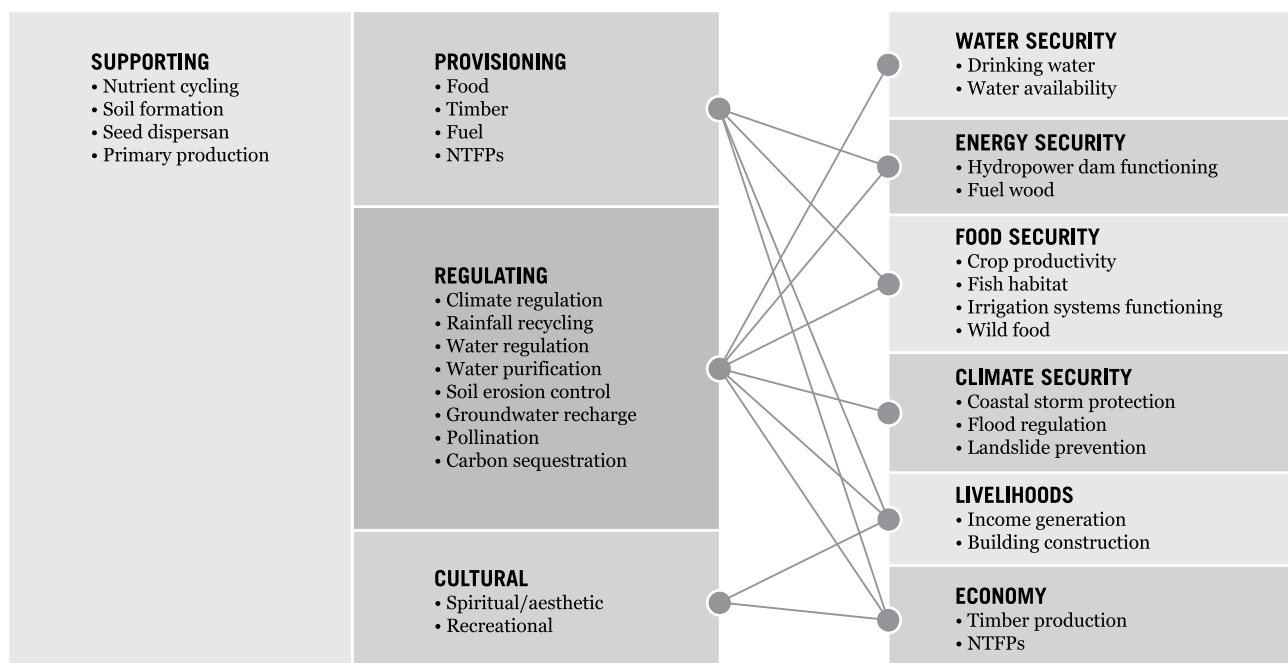
The development of Indonesia's natural resources has gone hand in hand with environmental degradation. Indonesia lost an average of 918,678 hectares of forest each year from 1990 to 2012. This included an average annual loss of 195,050 hectares on peatlands<sup>13</sup>. Over the same period an annual average of 507,486 hectares of forest was degraded, including 17,157 hectares on peat<sup>14</sup>.

Key drivers of deforestation include oil palm and industrial timber plantations, mining and illegal logging, but the expansion of subsistence farming and the development of new settlements, driven in part by the official Government policy of transmigrasi, have also been significant.

Indonesia has the highest rates of deforestation in the world<sup>15</sup>, which have contributed to widespread watershed degradation; high rates of river sedimentation; and it becoming the world's fifth largest emitter of greenhouse gas emissions. Seasonal forest fires, caused by burning

to clear agricultural land, have resulted in significant national and regional pollution and devastating health impacts. Forest fires in 2015, exacerbated by dry conditions caused by El Nino, led to an estimated 0.5 million people suffering respiratory illness, exposed 43 million people to toxic smoke and gases, and caused a regional haze crisis<sup>16</sup>.

Deforestation and degradation are also eroding forest ecosystem services, undermining economic growth and wellbeing (Figure 1). A recent study on the value of Indonesia's forest ecosystem services reports that economic losses and health costs from peatland fires in 1997 were greater than the economic revenue generated by oil palm plantations and forestry on peatlands. Furthermore, in Central Kalimantan more than three quarters of rural households' incomes depend on forests and their ecosystem services<sup>17</sup>. 'Business-as-usual' economic growth will continue this trend and will increase the likelihood of Indonesia reaching an economic tipping point, where environmental degradation undermines the country's capacity to maintain the current pace of economic progress.



**Figure 1.** Forest ecosystem services underpin water, energy and food security. Adapted from the Millenium Ecosystem Assessment, 2005<sup>18 19 20</sup>



## **A new paradigm: transitioning to green growth**

*“Indonesia’s natural capital base is being eroded, with corresponding impacts on the country’s food, water and energy security, and, ultimately, on the prosperity of all Indonesians.”*

Bappenas Green Growth Program<sup>21</sup>

In a positive step, and recognising the need for sustainable development, the Government of Indonesia’s current national mid-term development plan (RPJMN 2015-2019) seeks to improve human and community development; narrow the income gap through increased productivity and poverty reduction measures; and increase development without environmental degradation. The value of ecosystem services in particular has been recognised by the Ministry of Finance’s Green Planning and Budgeting Strategy, which estimates that threats from natural resource degradation and climate change are likely to reduce GDP growth from 7% to 3.5% by 2050<sup>22</sup>.

The Government has also made significant commitments to forest and peatland conservation, including a moratorium on new licences in peatlands and primary forests and the establishment of a Peatland Restoration Agency in response to severe forest fires in 2015. The Intended Nationally Determined Contribution (INDC) submitted ahead of COP 21 includes a commitment to unilaterally reduce emissions by 29% by 2030.

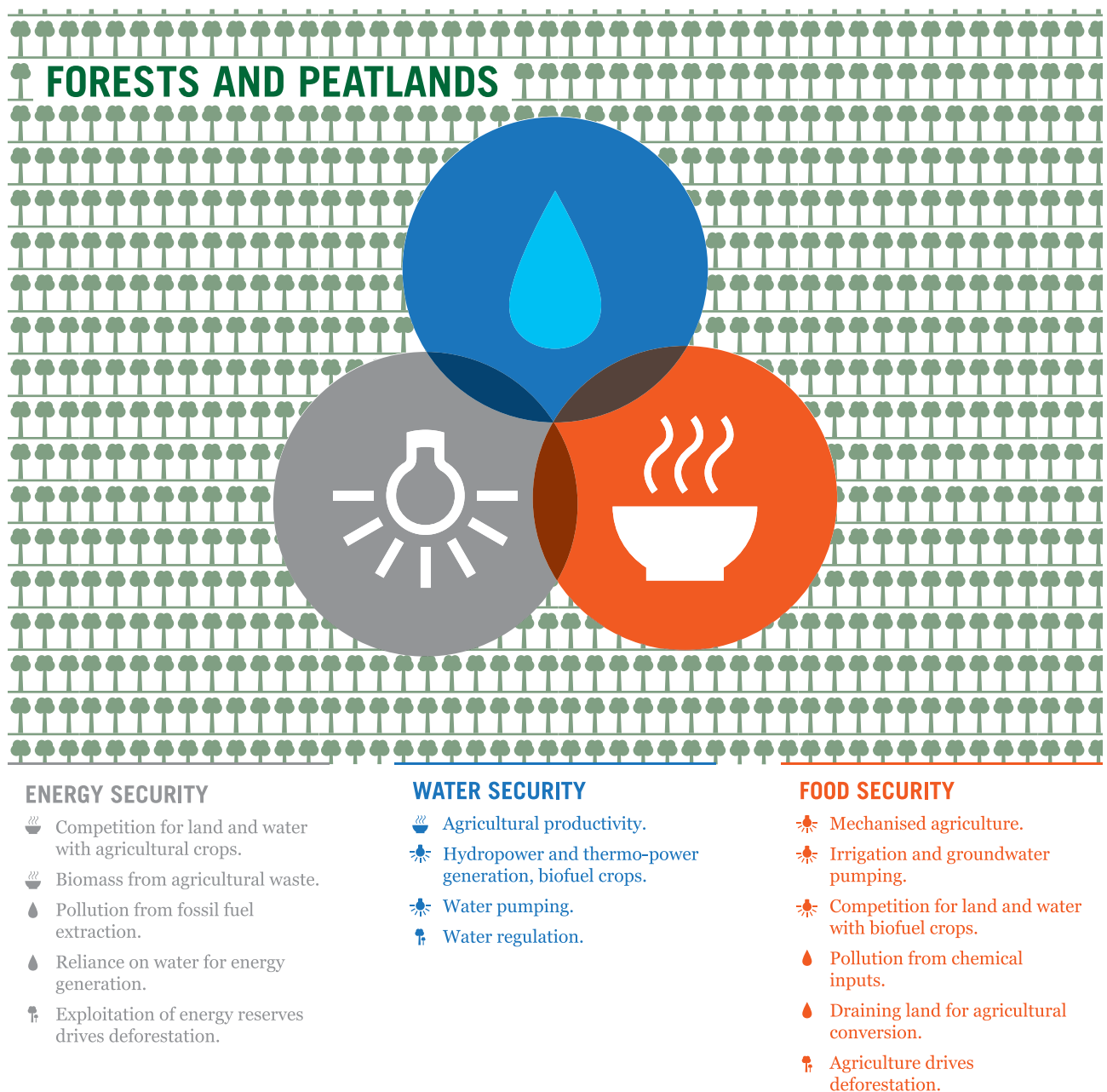
Ensuring that these commitments are coordinated and integrated with national development plans will depend on a paradigm shift in existing planning processes to:

- a. take into account the true value of natural resources and their ecosystem services; and
- b. recognise and evaluate inherent resource trade-offs between sector targets (i.e. with finite agricultural land area, improvements in productivity may not be sufficient to achieve self-sufficiency in multiple food crops and oil palm production targets).

## The water-energy-food nexus

The water-energy-food nexus is a useful approach for identifying and evaluating resource trade-offs across different sectors. This approach recognises the interdependency between water, energy and food systems and their reliance on natural resources.

In Indonesia water is at the heart of this nexus, critical to both food security (agricultural productivity and fisheries) and energy security (hydropower generation, biofuel crop productivity, and cooling in thermo-power stations). Both water quality and supply are particularly dependent on forest ecosystem services (Figure 1).



**Figure 2.** What is the Water-Energy-Food nexus? Global trends such as population growth and rising economic prosperity are expected to increase demand for water, energy and food which will compromise the sustainable use of natural resources. This pressure on resources could lead to shortages which may put water, energy and food security at risk, hamper economic development, lead to social and geopolitical tensions and cause irreparable environmental damage (Bonn 2011).



Indonesia's Intended Nationally Determined Contribution (INDC) explicitly recognises the value of WEF nexus thinking and close cross-sectoral coordination to mitigate the likely socio-economic impacts of climate change.

*“Climate change presents significant risks for Indonesia’s natural resources that will in turn impact the production and distribution of food, water and energy. As the population grows, there will be increasing pressures on Indonesia’s already limited resources. As a response, Indonesia plans to build resilience into its food, water and energy systems through the following enhanced actions: sustainable agriculture and plantations; integrated watershed management; reduction of deforestation and forest degradation; land conservation; utilization of degraded land for renewable energy; improved energy efficiency and consumption patterns”.*

Indonesia’s INDC, 2015<sup>23</sup>

The INDC also recognises that the enabling conditions for addressing climate change adaptation and mitigation include “certainty in spatial planning and land use; tenurial security; food security; water security; (and) renewable energy”. Establishing these enabling conditions constitutes an integrated and cross-cutting priority of the national mid-term development plan (RPJMN).

## Case Study: Understanding the links between deforestation and flooding in Aceh

In Aceh Province, the conversion of forested upland into agricultural land, predominantly for palm oil and rice production, has been blamed for increases in flooding frequency and intensity. Deforestation may have multiple impacts on water flows, including increased sedimentation of rivers, the loss of vegetation cover that acts as a 'sponge' for heavy rainfall; and increased rapidity of runoff into hydrological systems. All of these factors may contribute to more severe flooding events, although this remains highly contested.

Under Aceh's current but controversial spatial plan deforestation is expected to increase dramatically, largely driven by a reclassification of forest areas to enable conversion for agriculture and the development of an expansive road network that would open remote areas to encroachment. Increased deforestation presents a serious direct threat to the biodiversity of Aceh's forests, but also represents a critical economic risk to Aceh's future sustainable development, and the water, energy and food security of its population. The economic risks in particular are often poorly communicated to decision makers in district and provincial Government, and are therefore often misunderstood and not accounted for within development planning. For example, the economic costs of flooding disasters in Aceh during 2006, which damaged over 25,000 hectares of agricultural land, are estimated at US\$210 million (over 20% of Aceh's current centrally allocated budget).

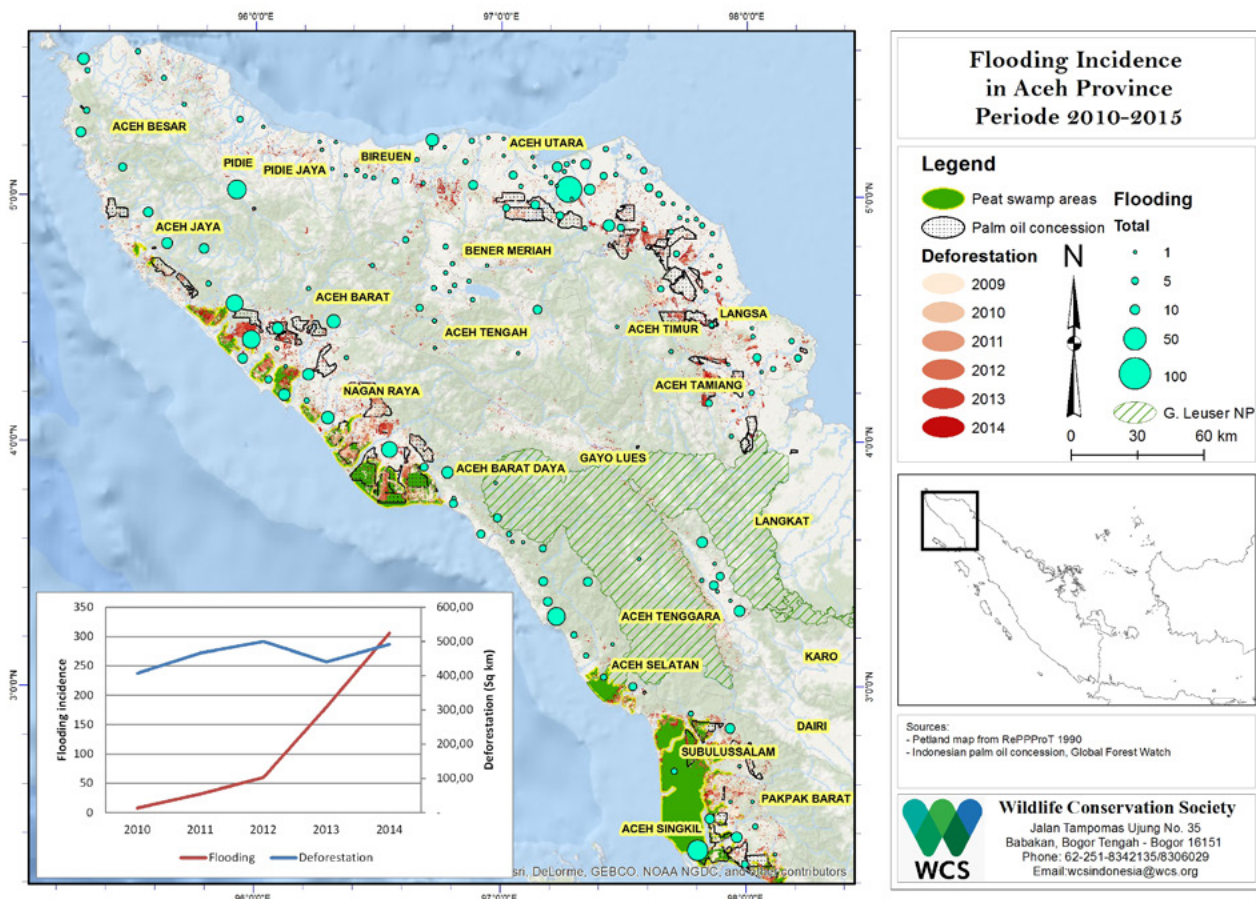


Figure 3. Flooding and major palm oil concessions in Aceh.

In this study we aim to demonstrate a statistically significant correlation between forest loss and flooding incidence in key districts and watersheds. Data on flooding events was drawn from official Basarnas and BNPB data and media sources and a series of statistical tests were used to determine the correlation between flooding incidence and deforestation at the district and watershed scale in Aceh. Existing metrics were also used to estimate the potential economic cost of flooding loss and damage in Aceh between 2010 and 2015.

**Its key findings were as follows:**

1. The frequency of recorded flooding events in Aceh is increasing steadily.
2. Districts where there are large oil palm plantations experience more frequent floods, possibly due to increased rapidity of run-off into river systems, and/or land subsidence from peatland forest clearance and drainage.
3. The current annual direct costs of flooding are conservatively estimated at US \$27m per year.
4. Increased flooding frequency and inundation from land subsidence may render many of Aceh's oil palm plantations on peatland forest environmentally 'stranded assets', with a direct cost likely to be in the billions of US dollars.

# ASSESSING THE COHERENCE OF INDONESIA'S WATER, ENERGY AND FOOD SECURITY TARGETS

This briefing note uses a WEF nexus approach to analyse the coherence of key objectives across the water, energy and food sectors. Objectives and related targets were identified from Indonesia's national mid-term development plan and related sector development plans. Objectives in each sector were then screened against each of the other WEF nexus sectors (water, energy, food and forests/climate) to identify areas of interaction. Potential synergies and trade-offs were then analysed through interviews and desk-based research.

## 💧 Water Security

Water resources are abundant though unevenly distributed across the archipelago, and the monsoon climate leads to floods in the wet season and water shortages in the dry season<sup>24</sup>. Agriculture uses 90% of water, although economic development, population growth and urbanisation are increasing the demand from industry and urban centres<sup>25</sup>. Low water storage capacity, the depletion of ground water, degradation of watersheds and poor condition of irrigation infrastructure are important challenges in improving water supply. Water quality is a further problem due to untreated domestic sewage, solid waste disposal, and industrial effluents. Flooding is a growing occurrence throughout most of the country, imposing heavy annual economic losses of up to US\$430 million<sup>26</sup>. Climate change is likely to increase pressure on water resources through changing rainfall patterns and extreme weather events.

Indonesia's key water security objectives are to improve water supply for people, industry and agriculture and to reduce risks from flooding. In improving water supply, there are targets for improving both natural (forest ecosystems) and built (reservoirs and irrigation network) infrastructure. Targets for improved watershed management include the rehabilitation of 5.5 million hectares of critical land in forest management units and the development of 12.7 million hectares of community forests. In terms of improving built infrastructure, targets include the rehabilitation of 3 million of hectares of damaged irrigation network and the establishment of another 1 million hectares of irrigation (see the Annex for specific Government targets).

## **Energy Security**

Indonesia has significant reserves of oil, coal and natural gas. It also has substantial renewable energy potential, including hydropower, solar, biomass, wind and geothermal<sup>27</sup>. Although little renewable energy potential has been developed so far, Indonesia's national energy policy aims to increase its share of the energy mix from less than 6% to 23% by 2025.

Despite these significant energy resources, Indonesia's domestic energy production cannot satisfy domestic demand. If the Indonesian economy continues to grow at its current rate, the Ministry of Energy and Mineral Resources estimates that domestic energy demand will continue to rise by around 7% per year, with electricity demand alone projected to nearly triple between 2010 and 2030<sup>28</sup>.

The main targets for energy security in the RPJMN are to maintain energy supply and achieve an electrification ratio of 100%. The Government aims to increase the energy mix from new and renewable energy by 10 – 16% by 2019, whilst also increasing the production of coal and natural gas. The Government has defined several strategies to achieve these targets including improving the utilisation of biofuel for transportation and water resources for hydropower (see the Annex for specific Government targets).

## **Food Security**

The Global Food Security Index ranked Indonesia as 74 out of 109 countries for food security in 2015. More than a third of under-fives show stunted growth<sup>29</sup>. Rice is the main staple food in Indonesia and accounts for 45% of total food intake or 80% of main carbohydrate sources in the diet of Indonesians<sup>30</sup>. Indonesia is a net importer of grains, livestock and horticulture<sup>31</sup>. Natural disasters are a major threat to food security in Indonesia, particularly droughts and floods. During 2000-2013, floods impacted more than 1 million ha of rice country wide<sup>32</sup>.

Key objectives for improving food security status include achieving self-sufficiency in staple foods through increased domestic production. Indonesia has self-sufficiency targets for rice, soy, corn and sugar. Key strategies to achieve self-sufficiency include increasing productivity, expanding crop area, and protecting cultivated land from conversion to other land uses. Food diversification is also seen as important in achieving food security (see the Annex for specific Government targets).



## Coherence of WEF objectives

Key findings from this coherence analysis in terms of strategic priorities for achieving water, energy and food objectives include:

### 1. Investing in water infrastructure

- Investing in water resource infrastructure is identified as a strategic priority for water, energy and food security in Indonesia's national mid-term development plan.
- Irrigation is vital for rice production and therefore to Indonesia's food security goals; around 85% of rice is produced on irrigated land although more than half of the irrigation network is estimated to be in either a poor or ruined condition<sup>33</sup>. Accordingly, the development and rehabilitation of Indonesia's irrigation network is a shared priority for the Ministry of Agriculture and Ministry of Public Works.
- Similarly, investing in water storage is a shared goal across sectors, including through the development of multi-purpose dams that can meet irrigation, water supply and hydro-electric power generation needs.

### 2. Conserving forests as 'natural' water infrastructure

- Beyond investment in built infrastructure, sustainable forest management, restoration and conservation in upstream areas are also identified as key objectives for improving downstream water supply for agriculture and hydroelectric power generation.
- These targets reinforce Indonesia's forest and peat land conservation goals under its REDD+, climate mitigation and climate adaptation strategies.
- However, forest conservation is not explicitly identified as an objective within energy and food sector targets and strategic plans which focus on investments in the irrigation network.

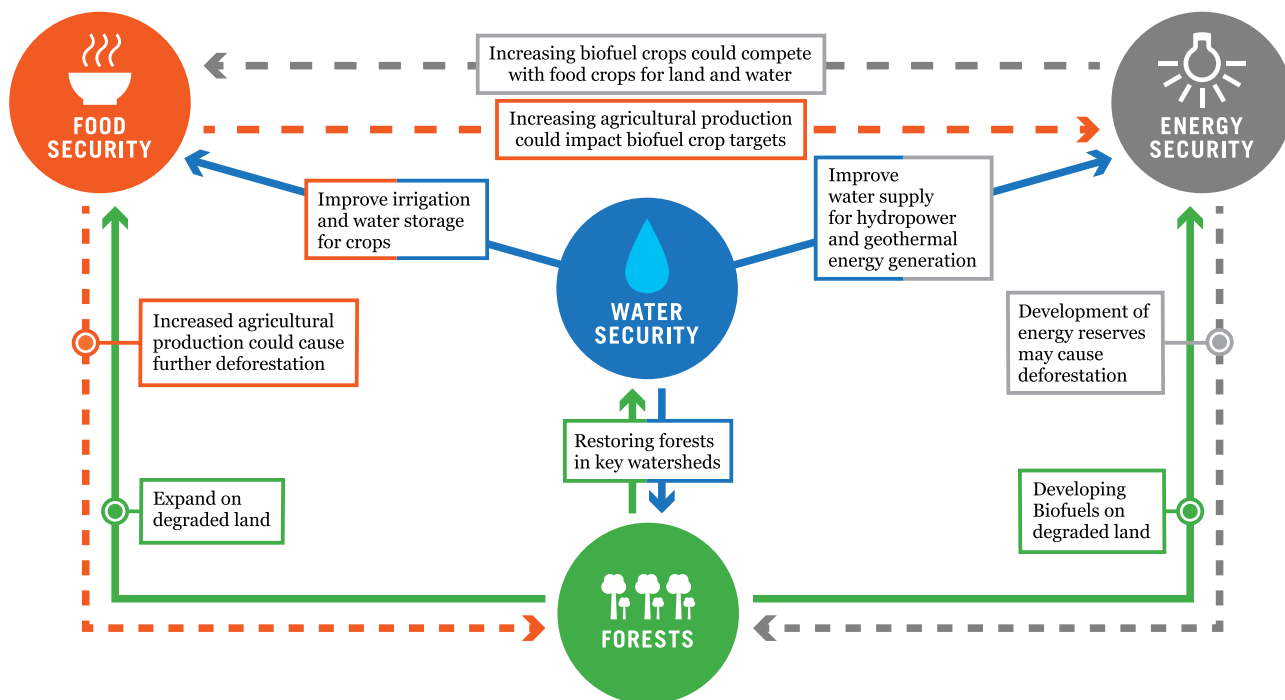
### 3. Utilising degraded lands to reduce pressure on forests

- Ambitious production targets for bioenergy, staple food crops and commodities (such as oil palm and rubber) will require more land, increasing pressure on forests. For example, there is insufficient suitable land area in Aceh to accommodate the Government targets for the expansion of oil palm (see case study on page 16).
- Prioritising production on degraded land would help reduce the risk of forest conversion. Although the data is not comprehensive, and further analysis is needed on the suitability of degraded land for agriculture, a number of studies have concluded that there is sufficient degraded land to meet production targets.
- Currently the utilisation of degraded land for plantation and agricultural crops is only prioritised in Indonesia's climate mitigation strategy and not within the agriculture or energy sector strategic plans. However, in 2015 the Ministry of Energy and Mineral Resources signed a Memorandum of Understanding with the local Governments of Katingan and Pungut districts of Central Kalimantan for the implementation of a sustainable bioenergy programme on degraded land in former mining areas.

### 4. Optimising land use across competing demands

- Competing land uses may undermine different sector targets unless potential trade-offs are carefully managed. For example, whilst the Government is actively seeking to expand the area of rice production from the current 8.1 million hectares to meet domestic needs, the total productive agriculture area for rice production has tended to decrease due to conversion to other land uses such as urban settlements (particularly in Java) and/or oil palm plantation (outside Java)<sup>34</sup>.
- The strategic plan of the Ministry of Energy and Mineral Resources has also identified





**Figure 4.** Key interactions between water, energy, and food security objectives in existing development planning.

overlapping land allocation as a barrier for the development of geothermal energy. Out of 312 potential sites of geothermal plants, 31% are located in conservation forest areas and a further 18% in protected forest areas. Similarly, hydropower potential is concentrated in forest areas.

- The Ministry of Environment and Forestry (MOEF)'s strategic plan recognises that forest area is needed to meet energy and agricultural production needs. The MOEF is collaborating with both the Ministries of Agriculture and Energy to identify suitable land within the state forest area, for example, the development of bioenergy crops in 100,000 ha of production forest area in Sumatra, Kalimantan and Papua.
- In managing trade-offs between forest conservation and land for energy and food production, the MOEF is currently undertaking land suitability analyses across the forest estate to identify areas suitable for agriculture. This will also identify forest conservation priorities, such as critical watersheds, and areas where the forest classification needs to change, for example swapping heavily degraded conservation forest for less degraded production forest.

## Translating national targets into implementation in provinces and districts

Local Governments have significant authority in natural resource management, land use planning and decisions at this scale, and will play a large role in determining if and how Indonesia achieves its water, energy and food security goals. Yet sub-national development plans reflect local priorities and interests, with the national mid-term development plan being seen as a 'menu' to choose from rather than a holistic set of guidelines<sup>35</sup>. Furthermore, the implementation of development plans is primarily at the province and district scale. For example, in terms of national targets to develop and rehabilitate Indonesia's irrigation network, 40% is under the authority of district governments<sup>36</sup>. In this context, better governance at the sub-national scale was identified as a key priority for improving spatial planning, ecosystem planning and land based management issues.

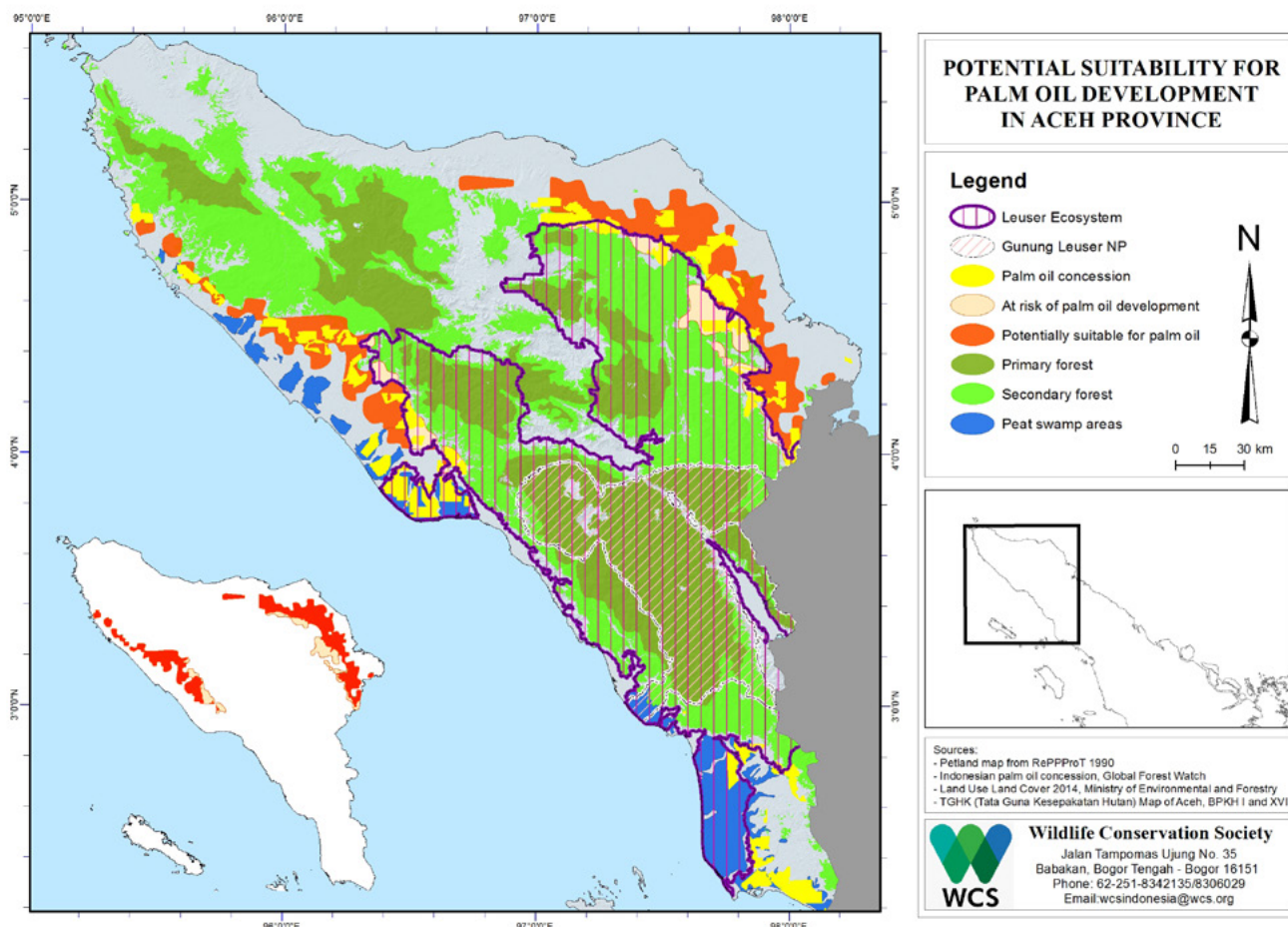
## Case study: Evaluating trade-offs in the agricultural sector in Aceh

In response to ambitious national sectoral targets mandated by the Indonesian mid-term development plan (RPJMN), the Government in Aceh has set similarly ambitious targets across the energy, water, and agricultural sectors<sup>37</sup>. While these developments are likely to make significant economic contributions, as well as support national and provincial targets for food security and food sovereignty, concern has been expressed by environmental groups that significant land conversion will be required to meet these targets, and that this will result in further forest loss.

This study seeks to first collate and analyse the existing Government targets for rice and oil palm expansion in Aceh; to model the available suitable land area for agricultural expansion for both commodities; and to

analyse the likely trade-offs and synergies that would result from the implementation of plans to achieve these targets, including the potential risk of further deforestation<sup>38</sup>.

Palm oil production targets in Aceh are set to rise by almost half a million tonnes between 2015 and 2019, which under the business-as-usual (BAU) development scenario will result in the conversion of approximately 220,000 hectares of land into new oil palm plantations. However, if yields were supported to reach the national industry average (3.67 t/ha) the land required for oil palm in Aceh would fall year on year to 41,000 hectares less than the current total plantation area, while still meeting Government production targets. Similarly, with a yield increase of 3% per year the required land for future rice production to meet Government targets by 2019 is also less than the current baseline area. When the legally available and suitable land area



**Figure 5.** Potential land suitability for oil palm development in Aceh.

for oil palm was modelled, based on existing production targets and BAU productivity (2.1 t/ha), and assuming a commitment to zero deforestation there is currently insufficient land in Aceh suitable for conversion to meet the palm oil productivity target by 2019. When the potential danger of oil palm plantation yields being negatively affected by inundation and regular flooding is also accounted for (see page 10) the palm oil production target may be at considerable risk. Pressure to find additional land for conversion may therefore endanger forests within the Leuser Ecosystem under the BAU development scenario.

According to the model designed in this study, enough suitable land exists for Aceh to meet its rice production targets without productivity increases. Trade-offs in investing in improving productivity on existing land (such as through fertiliser use and improved irrigation), versus the costs of land conversion and new irrigation schemes under rice area expansion plans should be considered. Additionally, if oil palm conversion is allowed to continue on forest areas it may have knock-on impacts on water flows for major rice producing areas, particularly in northern and western Aceh, and could also increase the risk of flooding in districts where oil palm and rice production exist alongside each other.

**Its key findings were as follows:**

1. Business-as-usual palm oil production targets will result in the conversion of a minimum of 220,000 hectares of land into plantations.
2. Increasing tonnes/hectare productivity of oil palm to meet Indonesian industrial averages will reduce the amount of land required by 2019 to 41,000 hectares less than the current plantation area.
3. At only a 1% increase in productivity per year between 2015-2019, the land required for rice production in Aceh to meet targets will more than halve.
4. There is insufficient suitable land in Aceh to meet current targets for oil palm production without yield increases or further deforestation.

# ENSURING COORDINATION TO FOSTER IMPROVED COHERENCE ACROSS WEF SECTORS

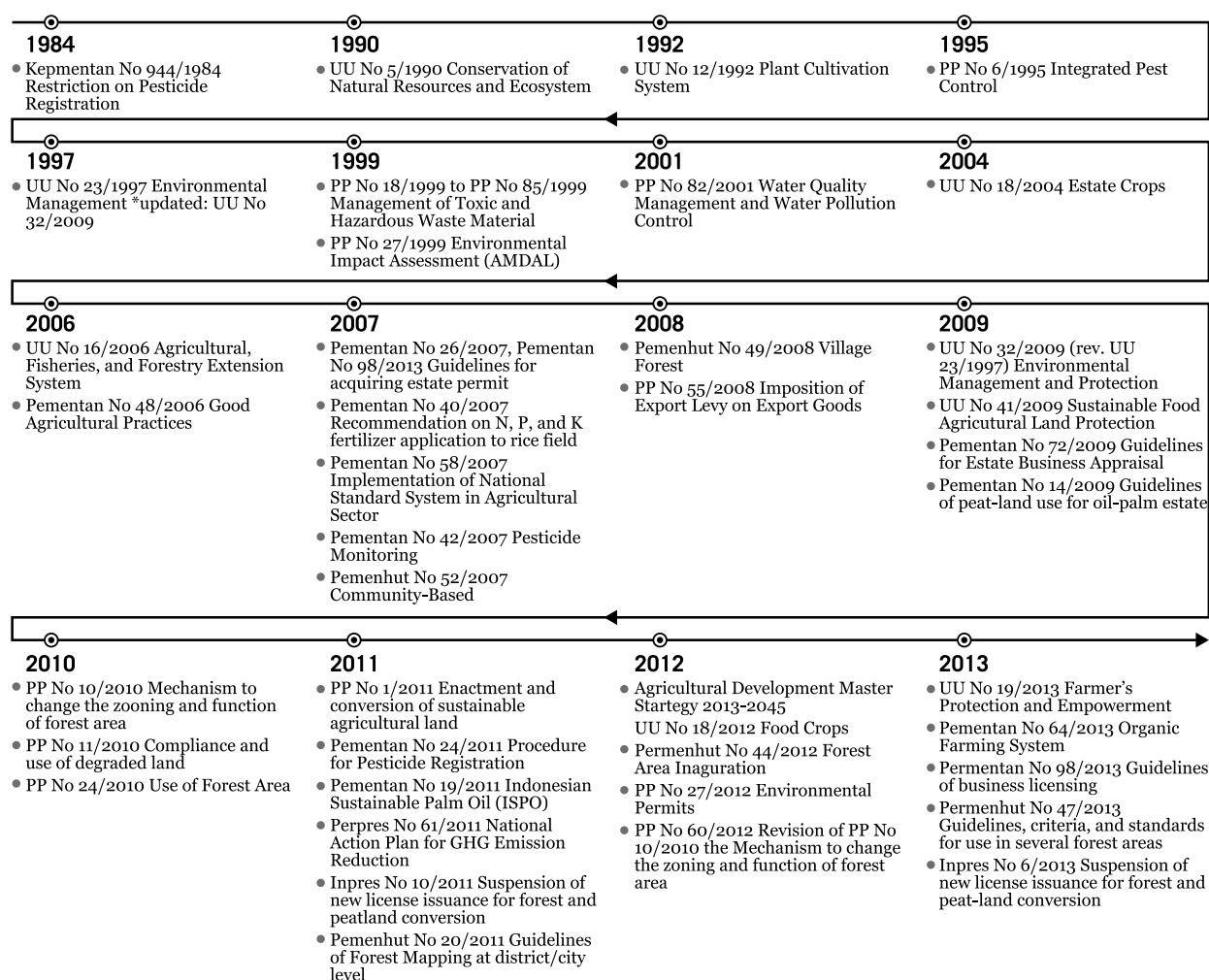
Ensuring improved coordination between and within different sectors is a critical first step towards ensuring that national development targets are both feasible and coherently planned. This section analyses how Indonesia's existing governance frameworks can facilitate or hinder cross-sector coordination.

## Legal framework coherence from a WEF nexus perspective

Indonesia's legislative framework establishes the policies and regulations which facilitate (or enforce) coordination between implementing ministries. An initial analysis was therefore undertaken of Indonesia's overarching legislative framework relating to water, energy, food and the environment to assess the extent to which

coordination across sectors has been formalised within Indonesia's laws, regulations, and decrees.

Where a clause, article or note in one or more areas of primary legislation (the laws, primary government and presidential regulations) explicitly mentions another overarching law in another WEF sector, connections were recorded and assessed. As lower regulations must neither conflict with nor supersede the higher rank of laws, an assessment of the primary legislation for connections to other sectors provides one way of assessing the foundational structure, or legislative 'blueprint', which can facilitate cross-sectoral coordination in the implementation of plans and policies.



**Figure 6.** The evolving complexity of the legal framework surrounding the agricultural/environmental nexus.

The diagram above shows 41 of the laws, policies and plans which connect the agricultural and environment/forestry sectors. The complexity of the legal framework is one of the factors which inhibits smoother coordination between ministries at the level of implementation. Redrawn from Saner et al. (2015)<sup>40</sup>.



## The Indonesian Legislative Framework

The Indonesian Constitution and its amendments provide the overarching legal framework and basis for all laws and norms in the country<sup>39</sup>. Laws and policies related to the balanced and sustainable management of natural resources largely stem from Article 33 of the Constitution: *“The land, waters and natural resources contained therein shall be controlled by the State and be utilized for the greatest benefit of people’s welfare...”*

The Indonesian hierarchy of laws is as follows:

- The 1945 Constitution.
- Decree of the People’s Consultative Assembly.
- Parliamentary Act (Undang-Undang - UU)/Government Regulation in Lieu of Law (Peraturan Pemerintah Pengganti Undang-Undang) – the highest law in the hierarchy of regulations.
- Government Regulation (Peraturan Pemerintah - PP) – used to implement Acts.
- President’s Regulation (Peraturan Presiden – Perpres) – used to implement Acts and/or Government Regulations. Ministers may also issue Ministerial regulations in order to assist the President in the implementation of a higher rank of laws.
- Regional Regulations (at Province/Regency/City level) (Peraturan Daerah).

Key findings from this legislative mapping exercise include:

- There is a strong existing legal architecture that connects WEF sectors.
- The environmental/forestry sector demonstrates the most connectivity in its relevant legislation to other sectors, with numerous references to the respective legal frameworks of the WEF sectors.
- The legal frameworks of the water and agricultural sectors are also well aligned, particularly with respect to the role of irrigation and clean water flows in contributing to crop production.
- Legislation within the energy sector demonstrates the least connection to the other sectors.
- For all sectors the focus of legislation remains on maximising production, but with relatively few (or in some cases a complete absence of) clauses or articles which recognise the role that the environment can play in ensuring the continued stability of water, energy and food security.
- The legislative framework relies heavily on subsidiary lower level regulations, e.g. Ministerial Regulations, to support the overarching legal framework and direct implementation. At this level the connections between sectors are often more explicitly expressed in the various relevant sectoral strategic plans, visions, mission statements and policies. For example, the potential conflict between biofuels development and food security is explicitly referenced in Ministerial Regulations rather than in the primary legislation.
- Partly as a result of the reliance on lower level regulations to establish coordination frameworks, there is a lack of clarity on the relative hierarchy of the various laws, policies and plans – e.g. should the stipulation under this water policy supersede that energy strategic plan? This is exacerbated by the complexity of the legal framework (see Figure 6 which shows an assessment of the connections between agricultural and environmental laws and subsidiary regulations).

## **Institutional coordination across the WEF nexus**

The organisation of Indonesia's Government is complex and consistently evolving. At time of writing there are approximately 34 ministries, four ministerial-level governmental agencies and 29 non-ministerial agencies, as well as more than 500 provincial, district and municipal Governments. Since the process of reformation, which began in the 1990s, governmental authority has been increasingly delegated to the provinces and districts and away from central Government in Jakarta. This has been recently strengthened with the issuance of the Law No. 23/2014 on Local Government. While this has undeniably reduced the enormous power of central Government to dictate provincial policy, it has arguably made coordination both horizontally (between different Ministries), and vertically (between central, provincial and district Government) considerably more complex.

Different levels of decentralisation across the WEF nexus bring further coordination challenges. In a study on land use planning in Moluccas, poor coordination between decentralised agencies, such as agriculture and spatial planning, and de-concentrated agencies which report to national agencies, such as Watershed Management Agencies, was identified as an important barrier<sup>41</sup>. Critics have also identified district Governments' lack of accountability to central Government and local people as a further barrier for effective local governance<sup>42</sup>.

While the legal frameworks that enable coordination are one factor, it is worth noting that in other countries, such as Switzerland<sup>43</sup>, responsibility for cross ministerial coordination is also not codified by law, but is built into the various job descriptions and responsibilities of different staff in Ministries. Formal coordination of this nature is less common in Indonesia, where hierarchical structures are firmly embedded within many Government agencies, and where the delegation of authority, particularly where it may involve external agencies, is tightly controlled. Decentralisation is an additional inhibiting factor to effective coordination, particularly between national and provincial/district scales.

## **Land use and spatial planning**

An effective and holistic land use planning framework is critical to achieving Indonesia's water, energy and food security objectives, which rely on the optimal use of its natural resources. Indonesia's Spatial Planning Law (Law No.26/2007) sets out the spatial demarcation of land use across national, provincial and district scales. Whilst this provides the overarching legislative framework for coordinated land use planning across the WEF nexus, inconsistencies in the legal framework across sectors and scales for designating land use, such as permitting, has led to a lack of clarity.

Agricultural, mining and environmental laws all give the ability to designate land use creating potential conflicts with the spatial planning law<sup>44</sup>. In terms of vertical coordination, a rapid and changing decentralisation process which has granted local Governments powers over natural resources management<sup>45</sup>, including issuing permits for plantations and mining, has resulted in confusion<sup>46</sup>.

Meanwhile, other sector laws require the integration of their land use management processes into spatial planning. This is the case for both watershed management plans (Law No. 7/2004) and environmental carrying capacity assessments (Law No. 32/2009). In these cases, implementation has been hampered by the lack of a clear mandate for their prioritisation in spatial planning<sup>47</sup>. This is reflected by the currently limited integration of watershed planning within provincial and district spatial plans. This is now a priority in the national mid-term development plan, which aims to develop 108 integrated watershed management plans and ensure their integration into province/district spatial plans. The coordination of land-use management plans is complicated by different scales of governance across sectors, for example forest management units, watersheds and political administration boundaries are not consistent.



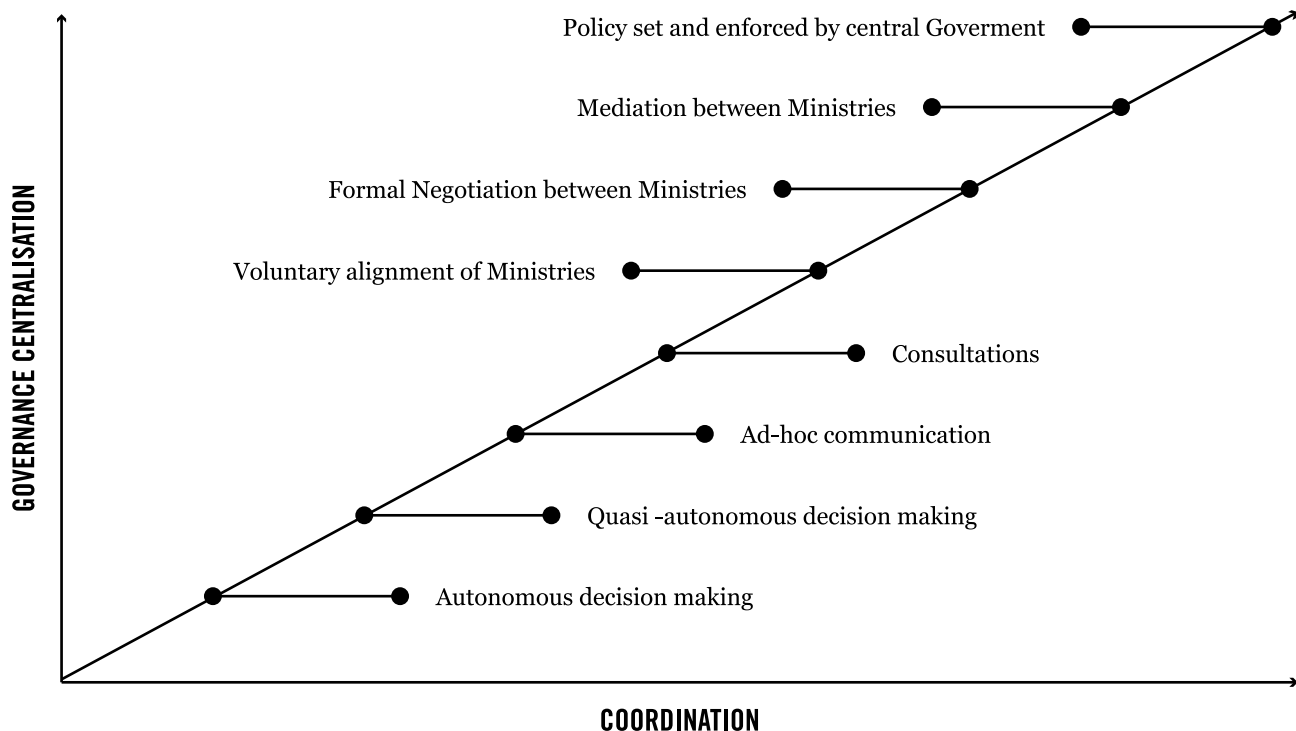


Figure 7. Coordination mechanisms in Indonesia.

In this context of multiple actors and overlapping roles and mandates, consistent and coherent data remains a significant challenge. Land use designations are not always consistent with the most appropriate land use. In addressing this challenge the Ministry of Environment and Forestry is currently reviewing land use suitability analyses in 5 main islands to support their assessments of requests for the conversion of forest estate to other land uses. Initial results have highlighted discrepancies across Ministries<sup>48</sup>.

## Coordination Mechanisms

The many different types of coordination mechanism employed by the Indonesian Government reflect the complexity of the legislative and institutional frameworks. These range in approach from simple autonomous or quasi-autonomous decision making or ad-hoc communication to highly centralised mediations between Ministries – for example on annual budget setting and the national development planning process. The diagram above shows how Indonesian coordination

strategies vary across a spectrum of devolved/centralised control against increased coordination.

The obvious trade-off is that the most coordinated policy approaches are those that require the highest degree of centralisation to achieve, and are therefore least favoured by the majority of stakeholders in each sector. In reality, a mosaic of different coordination mechanisms is in use constantly at all levels in each WEF sector.

In exploring the effectiveness of different strategies in supporting coordination across the WEF nexus, two specific mechanisms that have been used in this context have been reviewed.

### a. Enforcement by central government: Specialist taskforces

There have been several notable examples of the Indonesian Government utilising specialist taskforces to overcome specific institutional challenges and specifically to improve inter-ministerial coordination. These have included UKP4 – the Presidential Working Unit for Supervision and Management of Development; the REDD Agency, which again directly reported to

the President, was tasked with coordinating REDD+ in Indonesia<sup>49</sup>. More recently, two further taskforces have been established – the Renewable Energy Taskforce in 2015, tasked with transitioning Indonesia towards a higher renewable energy mix, and the Peatland Restoration Agency in 2016, tasked with halting the devastating annual burning and clearances of peatlands. The rationale behind these taskforces is essentially that a supra-Ministerial body, removed from the politicking and entrenched interests of existing Ministries and with the direct authority of the President, will be able to overcome barriers and fast-track critically important initiatives successfully. To some extent this has been the case, with UKP4 and BP REDD having made significant advances against their agendas. However, BP REDD in particular failed to institutionalise its gains as an independent agency, partly because it faced constant challenges in coordinating with established Ministries that, in effect, refused to recognise that it had authority to do so. As a result, the REDD+ agenda has stalled since being incorporated into the Ministry of Environment and Forestry. Similar challenges are likely to be faced by the Peat Restoration Agency as their mandate covers political territory which is entirely held by either the Ministry of Agriculture or Ministry of Environment and Forestry.

## **b. Consultations: National Water Resources Council**

Three ministries have the authority for watershed management; the Ministry of Environment and Forestry for water catchment areas, the Ministry of Public Works for surface water and the Ministry of Energy and Mineral Resources for ground water. In the water sector the architecture for the coordinated management of water resources exists at national level through the National Water Resources Council (DewanSumberDaya Air Nasional - DSDAN), established by Presidential Decree in 2009. This council comprises a broad membership of all of the relevant Government ministries (including environment and forestry, energy

etc) and a similarly broad group of NGOs – also including those who represent spatial planning, environmental, agricultural, energy and private sector interests. Provincial Water Councils (PWC) also exist in order to facilitate the implementation of water management plans, and these in turn should oversee a number of River Basin Water Councils (RBWC) which exist at the watershed scale (WS). According to the ministerial regulation No. 11a/PRT/M/2006 issued by Minister of Public Works, the country is divided into 133 WS<sup>50</sup>.

However, there are still multiple gaps in this structure. At least another 20 PWC have yet to be established, and 121 other WS have yet to be formalised, which leaves considerable opportunity for expansion of this otherwise promising structure for cross-sectoral coordination. Additionally, although Law No.7/2004 creates an enabling environment for landscape scale integrated water resources management, and allocates institutional roles, it does not clearly define the legal frameworks required for water management (i.e. which law has precedence in case of conflict over water resources), and considerable conflicts continue to emerge over the management of water resources, particularly between downstream users and upstream providers. Recommendations for overcoming this obstacle, other than through providing a legal mandate for integrated water resource management actions, include payments for water services models and other fiscal incentives, which are recognised as being powerful tools in balancing the needs and trade-offs of water user groups<sup>51</sup>.



# REFERENCES AND END NOTES

- <sup>1</sup> GoI/GGGI. (2012) Green Growth Program. Prioritizing Investments: Delivering Green Growth.
- <sup>2</sup> World Bank. (2016) Indonesia Economic Quarterly – December 2015. Accessed at: <http://www.worldbank.org/en/news/feature/2015/12/15/indonesia-economic-quarterly-december-2015>
- <sup>3</sup> World Bank. (2016) Indonesia Economic Quarterly – December 2015. Accessed at: <http://www.worldbank.org/en/news/feature/2015/12/15/indonesia-economic-quarterly-december-2015>
- <sup>4</sup> Government of Indonesia. RPJPN National long-term development plan, 2005 – 2025 based on Law No.17/2007.
- <sup>5</sup> McKinsey. (2012) The Archipelago Economy: Unleashing Indonesia's Potential. McKinsey Global Institute.
- <sup>6</sup> Government of Indonesia. RPJPN National long-term development plan, 2005 – 2025 based on Law No.17/2007.
- <sup>7</sup> Government of Indonesia. RPJMN National mid-term development plan, 2015 – 2019.
- <sup>8</sup> World Bank. (2016) Indonesia Economic Quarterly – December 2015. Accessed at: <http://www.worldbank.org/en/news/feature/2015/12/15/indonesia-economic-quarterly-december-2015>
- <sup>9</sup> FAOSTAT. (2016) Agricultural Area, Indonesia, 2013. Accessed at: <http://faostat3.fao.org> on 29 February 2016.
- <sup>10</sup> Dutu, R. (2015) "Making the Most of Natural Resources in Indonesia", OECD Economics Department Working Papers, No. 1236, OECD Publishing, Paris.
- <sup>11</sup> McKinsey. (2012) The Archipelago Economy: Unleashing Indonesia's Potential. McKinsey Global Institute.
- <sup>12</sup> World Food Programme. (2015) Indonesia - Food Security and Vulnerability Atlas.
- <sup>13</sup> Indonesia's National Forest Reference Emission Level (FREL) submission to the UNFCCC.
- <sup>14</sup> Other data sources give different estimates of deforestation, for example Abood et al. 2015 states that 14.7 million ha of tropical forest was lost in Sumatra, Kalimantan, Sulawesi, Moluccas and Papua between 2000 and 2010. Abood, S. A., Lee, J. S. H., Burivalova, Z., Garcia-Ulloa, J., & Koh, L. P. (2015) Relative contributions of the logging, fiber, oil palm, and mining industries to forest loss in Indonesia. *Conservation Letters*, 8(1), 58-67.
- <sup>15</sup> Margono, B. A., Potapov, P. V., Turubanova, S., Stolle, F., & Hansen, M. C. (2014) Primary forest cover loss in Indonesia over 2000-2012. *Nature Climate Change*, 4(8), 730-735.
- <sup>16</sup> The Jakarta Post. (2015) Haze kills 10 people, leaves 503,874 with respiratory ailments: Agency. The Jakarta Post. Published 24 October 2015, accessed 15 December 2015. Accessed at: <http://www.thejakartapost.com/news/2015/10/24/haze-kills-10-people-leaves-503874-with-respiratory-ailments-agency.html>
- <sup>17</sup> United Nations Office for REDD Coordination in Indonesia - UNORCID. (2015.) Forest Ecosystem Valuation Study: Indonesia.
- <sup>18</sup> Millennium Ecosystem Assessment. (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.
- <sup>19</sup> Katrina Mullan. (2014) "The Value of Forest Ecosystem Services to Developing Economies." CGD Working Paper. Washington, DC: Center for Global Development.
- <sup>20</sup> Katrina Brandon. (2014) "Ecosystem Services from Tropical Forests: Review of Current Science." CGD Working Paper 380. Washington, DC: Center for Global Development.

- <sup>21</sup> GGGI and Government of Indonesia. (2015) Delivering Green Growth for a Prosperous Indonesia: A Roadmap for Policy, Planning, and Investment.
- <sup>22</sup> Ministry of Finance, Government of Indonesia Green Planning and Budgeting Strategy for Indonesia's Sustainable Development, 2015-2020 Centre for Climate Change Financing and Multilateral Policy Fiscal Policy Agency, Ministry of Finance, Republic of Indonesia. Accessed at: <http://www.kemenkeu.go.id/sites/default/files/gpb-strategy.pdf>
- <sup>23</sup> Indonesia's Intended Nationally Determined Contribution. (2015)
- <sup>24</sup> Bruijnzeel, L, A. (2004) Hydrological functions of tropical forests: not seeing the soil for the trees? Agriculture, Ecosystems and Environment 104,185–228
- <sup>25</sup> Clements, G.R.; Lynam, A.J.; Gaveau, D.L.A.; Wei, L.Y.; Lhota, S.; Goosem, M.; Laurance, S.; Laurance, W.F. (2014) Where and how are roads endangering mammals in Southeast Asia's forests? PLoS ONE 9 (12):25.
- <sup>26</sup> Van Beukering, P.J.H., Cesar, H.S.J. & Janssen, M.A. (2003). Valuation of ecological services of the Leuser National Park in Sumatra, Indonesia. Ecological Economics 44(1): 43-62.
- <sup>27</sup> Van Beukering, P.J.H., Cesar, H.S.J. & Janssen, M.A. (2003) Valuation of ecological services of the Leuser National Park in Sumatra, Indonesia. Ecological Economics 44(1): 43-62.
- <sup>28</sup> The National Search and Rescue Agency (<http://www.aceh.basarnas.go.id>); the Badan Nasional Penanggulangan Bencana (<http://www.bnpb.go.id> - National Board for Disaster Management); Aceh Tribune News (<http://aceh.tribunnews.com>), Kompas (<http://regional.kompas.com>) and Antara News <http://aceh.antaranews.com>.
- <sup>29</sup> WIRA Study team. (2012) Indonesia Water Investment Roadmap 2011-2014, World Bank, Ministry of Public Works and Water Partnership Program, January.
- <sup>30</sup> Fulazzaky, M. A. (2014) Challenges of integrated water resources management in Indonesia. Water, 6(7), 2000-2020.
- <sup>31</sup> ADB. (2015) Summary of Indonesia's agriculture, natural resources, and environment sector assessment. Eric Quincieu. ADB papers on Indonesia. No 8 October 2015.
- <sup>32</sup> ADB. (2015) Summary of Indonesia's energy sector assessment. Pradeep Tharakan. ADB papers on Indonesia. No 9 December 2015.
- <sup>33</sup> ADB. (2015) Summary of Indonesia's energy sector assessment. Pradeep Tharakan. ADB papers on Indonesia. No 9 December 2015
- <sup>34</sup> World Food Programme. (2015) Indonesia - Food Security and Vulnerability Atlas.
- <sup>35</sup> Badan Intelijen Negara. (2014) Memperkuat Ketahanan Pangan Demi Masa Depan Indonesia. 2015 – 2025. Hikam, MAS. editor. Jakarta (ID) : CV. Rumah Buku.
- <sup>36</sup> ADB. (2015) Summary of Indonesia's agriculture, natural resources, and environment sector assessment. Eric Quincieu. ADB papers on Indonesia. No 8 October 2015.
- <sup>37</sup> World Food Programme. (2015) Indonesia - Food Security and Vulnerability Atlas.
- <sup>38</sup> Sigit Supadmo Arif and Murtiningrum. Challenges and future needs for irrigation management in Indonesia. Accessed at: <http://www.oecd.org/tad/sustainable-agriculture/49202003.pdf>
- <sup>39</sup> Interview with Director General of Food Crop, 29 January 2016.
- <sup>40</sup> Interview with the Deputy of Minister of National Development Planning, 4 December 2015.

- <sup>41</sup> Sigit Supadmo Arif and Murtiningrum. Challenges and future needs for irrigation management in Indonesia. Accessed at: <http://www.oecd.org/tad/sustainable-agriculture/49202003.pdf>
- <sup>42</sup> Interview with The Head of National Steering Committee on Climate Change, Ministry of Environment and Forestry, 23 September 2015.
- <sup>43</sup> Rencana Pembangunan Jangka Menengah Daerah Kota Banda Aceh Tahun 2012 – 2017 (2012). Accessed at: <http://bappeda.bandaacehkota.go.id/rpjm/>
- <sup>44</sup> Soeprapto, M.F.A. 1998. Ilmu Perundang-undangan: Dasar-dasar dan pembentukannya. Kanisius, Jakarta.
- <sup>45</sup> Saner, R. Winanti, P. (2015) Policy coordination and consultation in Indonesia. The Indonesian Journal of Leadership, Policy and World Affairs
- <sup>46</sup> Durey L and Mwangi E. (2014) Land-use planning in the Moluccas: What of customary tenure security? Working Paper 143. Bogor, Indonesia: CIFOR.
- <sup>47</sup> Djogo, T. Syaf, R. (2004) Decentralization without Accountability: Power and Authority over Local Forest Governance in Indonesia.
- <sup>48</sup> Saner, R. Winanti, P. (2015) Policy coordination and consultation in Indonesia. The Indonesian Journal of Leadership, Policy and World Affairs
- <sup>49</sup> Indrarto, G. B. et al. (2012) The context of REDD+ in Indonesia: drivers, agents and institutions (Vol. 92). Cifor.
- <sup>50</sup> Law No.22 1999, Law No. 32/2004, Law No.23/2014 on Regional Government
- <sup>51</sup> Indrarto, G. B. et al. (2012) The context of REDD+ in Indonesia: drivers, agents and institutions (Vol. 92). Cifor.
- <sup>52</sup> Indrarto, G. B. et al. (2012) The context of REDD+ in Indonesia: drivers, agents and institutions (Vol. 92). Cifor.
- <sup>53</sup> Interview with Director General of Forest Planology, 30 November 2015.
- <sup>54</sup> Natahadibrata N. (2013) REDD+ agency to begin work soon. The Jakarta Post. Published 20 December 2013, accessed 27 February 2014. Accessed at: <http://www.thejakartapost.com/news/2013/12/20/redd-agency-begin-work-soon.html>
- <sup>55</sup> Fulazzaky, M. A. (2014) Challenges of integrated water resources management in Indonesia. Water, 6(7), 2000-2020.
- <sup>56</sup> This target is 12.7 million ha in the Ministry of Environment and Forestry's Strategic Plan 2015-2019 and is 40 million ha in the national mid-term development plan, RPJMN 2015-2019.










# ANNEX

Objectives	Specific Targets
Improving water security for people	<ul style="list-style-type: none"> <li>• Improve access to drinking water and sanitation to 100% in 2019 (baseline for 2014 of 65.6% and 60.5% respectively).</li> </ul>
Maintain and recover watersheds and ecosystems	<ul style="list-style-type: none"> <li>• Rehabilitate 5.5 million ha of critical land in forest management units by 2019 (baseline 0.5 million ha in 2014).</li> <li>• Develop 40 million ha of community forests by 2019 (baseline 0.5 million ha in 2014).</li> <li>• Restore 30 priority watersheds</li> </ul>
Improve water supply for urban and productive sectors	<ul style="list-style-type: none"> <li>• Build 30 reservoirs</li> <li>• Enhance and develop irrigation network by 1.1 million ha.</li> <li>• Rehabilitate 3 million ha of damaged irrigation networks</li> </ul>
Reduce impacts from water risks	<ul style="list-style-type: none"> <li>• Reduce flood frequency to less than 286 events (from baseline of 302 in 2014)</li> <li>• Water and soil management of 33 urban water catchment areas by 2019 (baseline of 3 in 2014)</li> </ul>
Improve water resource management	<ul style="list-style-type: none"> <li>• Establish water resource information network</li> </ul>

**Table 1.** Key objectives and related targets for water security in the national medium term development plan and related sectoral plans.

Objectives	Specific Targets
Improve energy access	<ul style="list-style-type: none"> <li>• Electrification ratio increase to 100% in 2019 from 81.5% in 2014</li> </ul>
Maintain and recover watersheds and ecosystems	<ul style="list-style-type: none"> <li>• New and renewable energy to reach 10-16% of energy mix by 2019, and 23% by 2025 (from baseline of less than 6% in 2014),</li> <li>• Increase in new and renewable energy production by 2019 from 2014 as follows: <ul style="list-style-type: none"> <li>Geothermal <span style="color: green;">▲</span> 122%</li> <li>Biodiesel <span style="color: green;">▲</span> 80%</li> <li>Bioethanol <span style="color: green;">▲</span> 19%</li> <li>Hydropower <span style="color: green;">▲</span> 27%</li> <li>Solar <span style="color: green;">▲</span> 238%</li> <li>Biomass <span style="color: green;">▲</span> 45%</li> </ul> </li> </ul>
Continue production of coal, oil and natural gas	<ul style="list-style-type: none"> <li>• Continue exploitation of fossil fuel reserves as follows: <ul style="list-style-type: none"> <li>Crude oil <span style="color: red;">▼</span> 14%</li> <li>Natural gas <span style="color: green;">▲</span> 6%</li> <li>Coal <span style="color: green;">▲</span> 11%</li> </ul> </li> </ul>

**Table 2.** Key objectives and related targets for energy security in the national medium term development plan and related sectoral plans.

Objectives	Specific Targets
Improve food security status	<ul style="list-style-type: none"> <li>• Increase in calorie intake to 2150 kcal by 2019 (from baseline of 1970 kcal in 2014)</li> <li>• Increase in desirable dietary pattern indicator to 92.5 by 2019 (from baseline of 81.5 in 2014)</li> </ul>
Increase domestic agricultural production	<ul style="list-style-type: none"> <li>• Increase in food production by 2019 against 2014 baseline as follows: <ul style="list-style-type: none"> <li>Rice  26%</li> <li>Soy  109%</li> <li>Sugar  46%</li> <li>Beef  67%</li> <li>Fish  51%</li> </ul> </li> </ul>
Maintain and expand agricultural crop area	<ul style="list-style-type: none"> <li>• Expansion of agricultural land by 300,000 ha by 2019.</li> <li>• Protect existing sustainable agricultural land.</li> <li>• Conversion of degraded land to productive agricultural land.</li> </ul>
Zero burning during preparation of land for agriculture activities	

**Table 3.** Key objectives and related targets for food security in the national medium term development plan and related sectoral plans.

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