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Climate Change Profile: INDONESIA

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Climate Change Profile: Indonesia

The shocks of climate change are already being felt in Indonesia, with more frequent droughts, heat waves and floods, and will pose an increasing threat to the country's development. A World Bank analysis ranks Indonesia 12th among 35 countries that face high mortality risks due to multiple hazards, including tsunamis, floods, landslides, droughts, and earthquakes. About 40% of Indonesia's population is at risk of such hazards, and their number will increase under climate change which is likely to exacerbate droughts on southern islands, floods and cyclone intensity across the country, and sea level rise effects in coastal areas. Food security and water availability will be heavily affected by temperature increase, shorter growing seasons, unpredictable rainfall, and salt-water intrusion. By 2100, climate change impacts will cost 2.5–7% of GDP¹.

Overall ranking

Indonesia ranks 95 out of 180 countries in the ND-GAIN index² (2014), which is unchanged from its 2013 ranking (also rank 95). Indonesia is the 89th least vulnerable country and the 76th least ready country— meaning that adaptation challenges still exist, but that Indonesia is well positioned to adapt to climate change effects. *Vulnerability* measures the exposure, sensitivity, and ability to cope with climate related hazards as well as accounting for the overall status of food, water, environment, health and infrastructure within a country. *Readiness* targets those portions of the economy, governance and society that affect the speed and efficiency of adaptation.

Biophysical vulnerability

Current climate. Indonesia is the world's largest archipelagic state, encompassing more than 17,000 islands³. Indonesia is generally dominated by a tropical rainforest climate⁴. Due to the presence of warm waters around these islands, the country's **temperatures** are fairly constant over the year, around 28°C for the coastal plains, 26 °C for the mountain areas, and 23 °C for higher mountains. **Rainfall** varies between 1800 and 3200 mm for lowlands, increasing with elevation, up to 6,000 mm in some mountain areas. Most rainfall occurs during the wet **season** that lasts from November to April (with a rainfall peak in January and February). The dry season lasts from May to October (with July–September as driest months). Indonesia is affected by various types of **natural disasters**, including floods, droughts, earthquakes, tsunamis, and volcanic eruptions⁵.

¹ World Bank (2014): *Indonesia Risk Profile*. http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile&CCode=IDN

² GAIN index summarizes a country's vulnerability to climate change and other global challenges in combination with readiness to improve resilience. <http://index.gain.org/country/indonesia>

³ Wingqvist, G.Ö.; Dahlberg, E. (2008): *Indonesia Environmental and Climate Change Policy Brief*. SIDA. <http://sidaen-vironmenthelpdesk.se/wordpress3/wp-content/uploads/2013/04/Environmental-policy-brief-Indonesia-2008.pdf>

⁴ Climate Service Center (2015). Climate Fact Sheet – Indonesia, updated version 2015.

⁵ Karmalkar, A.; McSweeney, C.; New, M.; Lizcano, G. (2012): *UNDP Climate Change Country Profiles: Indonesia*. http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Indonesia/Indonesia.hires.report.pdf; World Bank (2014): *Indonesia Dashboard*. http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile&CCode=IDN

Current trends. Some climatic trends have been observed in Indonesia. Surface **temperatures** have increased at a rate of 0.04 °C per decade over the last 30 years⁶. Reported total temperature increases range from 0.64 °C for 1960–2006 to 0.76 °C for 1985–2005 (see [Map 1](#)). This increase is similar for all seasons, but there are some regional differences: more rapid increases are reported over the larger islands in the west of the country. The frequency of ‘hot days’ and ‘hot nights’⁷ has increased significantly between 1960 and 2006, especially during the driest months (July–September), by 24% and 26%. At the same time, the frequency of cold nights has decreased by 6.8%⁸.

Total annual **rainfall** has increased by 12% over the last 30 years⁹ (see [Map 2](#)). These trends are greatest for the driest season (July–September), where decreases of 4.8% have been reported. There are some regional differences: total rainfall has increased in northern regions but decreased in southern regions. In both cases, the proportion of rainfall occurring during the wet season has increased – suggesting increased intensity of dry and wet seasons. The frequency of intense 1-day and 5-day rains however has decreased, indicating a trend towards higher but more uniform rainfall during the rainy season. In addition, the wet season has tended to start later than normal in some regions; for parts of Sumatra and Java, delays of 20 days were reported for 1991–2003 compared to 1960–1990 while the dry season starts 10–60 days earlier. In general, rainfall predictability is decreasing.

There is a trend towards an increase in **extreme events**. While droughts occurred once every 4 years before 1960, they are now reported to occur every 3 years¹⁰.

Climate change. **Temperature** increase is likely to continue by 0.2–0.3 °C per decade, with a total increase estimated at 0.9–2.2 °C by the 2060s and 1.1–3.2 °C by 2100. Projected warming is more rapid for larger islands than for the sea and small islands. ‘Hot days’ and ‘hot nights’ are expected to occur on 48–95% of days and 63–99% of nights by the 2090s, while ‘cold nights’ are expected to occur no more by the 2060s (each compared to 10% of days/nights in the 1960s)¹¹.

An increase of annual **rainfall** is most likely for Indonesia on the national level (models project changes ranging from –1% to +5% by 2100), but large variations per season are expected¹²:

⁶ Climate Service Center (2015). Climate Fact Sheet – Indonesia, updated version 2015.

⁷ Defined as days with a temperature that is exceeded on 10% of days/nights in the reference period.

⁸ Karmalkar et al. (2012); World Bank (2014); Climate Change and Water Resources in Indonesia (2009): *Country Report*; Soesilo, I. (2014): Climate change: Indonesia's adaptation and mitigation efforts. *The Jakarta Post*. <http://www.thejakartapost.com/news/2014/04/26/climate-change-indonesia-s-adaptation-and-mitigation-efforts.html>

⁹ Climate Service Center (2015). Climate Fact Sheet – Indonesia, updated version 2015.

¹⁰ Wingqvist and Dahlberg (2008); World Bank (2014); Karmalkar et al. (2012); Syaikat, Y. (2011): The impact of climate change on food production and security and its adaptation programs in Indonesia. *Journal ISSAAS* 17(1): 40–51. <http://www.issaas.org/journal/v17/01/journal-issaas-v17n1-07-syaikat.pdf>

¹¹ World Bank (2014); Wingqvist and Dahlberg (2008); Karmalkar et al. (2012); Climate Change and Water Resources in Indonesia (2009)

¹² Climate Service Center (2015). Climate Fact Sheet – Indonesia, updated version 2015.

- the onset of the dry season (April–June) may experience a rainfall increase of 10% by 2050;
- rainfall during the peak of the dry season (July–September) is however expected to decrease by 10–25% by 2050 – with peak decreases up to 75%;
- moreover, the probability of a 30–day delay in the onset of the rainy season is expected to increase significantly by 2050 (30–40% probability, compared to 9–18% today)¹³.

Regional rainfall projections are appreciably different:

- the easternmost islands are expected to experience rainfall increases up to 15% by the 2090s;
- Borneo may receive 10–30% more rainfall during the rainy season by 2080;
- rainfall on southern islands (Java, Bali, Nusa Tenggara) will decrease by 5–15% (especially in the dry season) by 2100, while the delayed onset of the rainy season will be largest for these regions;
- for Sumatra, projections vary from large increases to major decreases – especially in the south of the island; a decrease in length of the rainy season is however generally expected¹⁴.

The proportion of annual rainfall that falls in heavy events is generally projected to increase by up to 15% by the 2090s. Maximum 1–day and 5–day rainfalls are also expected to increase by up to 86 mm for 1–day maxima and up to 123 mm for 5–day maxima by the 2090s. Especially for regions south of the equator (including Java and Bali), wetter wet seasons as well as dryer dry seasons are expected¹⁵.

Due to higher evapotranspiration, erosion and deforestation, the recharge of rainwater into the soil will decrease. This means that the replenishment of the groundwater resources will decrease considerable, leading to lowering groundwater tables and empty wells, lack of drinking water and lack of irrigation water for the gardens/fields.

Due to rainfall changes, extreme events including droughts and floods will increase in southern regions of Indonesia. For the future, **droughts** (especially during El Niño events) are expected to have more serious impacts on the south than temporary rainfall increases – although shorter and more intense rainy seasons will probably lead to more intense **floods**¹⁶ (see [Map 3](#) and [Map 4](#)). The frequency of tropical **cyclones** is projected to decrease with climate change, but their intensity could increase¹⁷.

An additional effect of climate change is **sea level rise**, which could have a major impact along Indonesia's 81,000 km of coastline. Sea level rise in the country is projected to occur at about 5 mm per year, although estimations that take into account melting ice dynamics are much higher (see [Map 5](#)). Conservative estimates project a total sea level rise of 40 cm by 2100 for

¹³ Naylor, R.L.; Battisti, D.S.; Vimont, D.J.; Falcon, W.P.; Burke, M.B. (2007): *Assessing risks of climate variability and climate change for Indonesian rice agriculture*. PNAS. <http://www.pnas.org/content/104/19/7752.full.pdf>

¹⁴ World Bank (2014); Karmalkar et al. (2012); Soesilo (2014); Syaukat (2011); Climate Change and Water Resources in Indonesia (2009); Oktaviani, R.; Amaliah, S.; Ringler, C.; Rosegrant, M.W.; Sulser, T.B. (2011): *The Impact of Global Climate Change on the Indonesian Economy*. IFPRI. <http://www.ifpri.org/sites/default/files/publications/ifpridp01148.pdf>

¹⁵ Case, M.; Ardiansyah, F.; Spector, E. (2007): *Climate Change in Indonesia: Implications for Humans and Nature*. WWF. http://awsassets.panda.org/downloads/inodesian_climate_change_impacts_report_14nov07.pdf

¹⁶ Climate Change and Water Resources in Indonesia (2009); Soesilo (2014); Syaukat (2011)

¹⁷ UK's Met Office Hadley Center (2013): *Climate change impacts around the world: Indonesia*. http://knowledge.alli-anz.com/environment/climate_change/?2088/Climate-change-impacts-around-the-world

Southeast Asia; less conservative estimates project a similar rise by 2050 and a total sea level rise of 1.75 m by 2100. A total sea level rise of 50 cm, combined with ongoing land subsidence in Jakarta Bay, could permanently inundate Jakarta's and Bekasi's densely populated areas (affecting 270,000 people). A 1-meter sea level rise could flood 405,000 hectares of coastal lands and indirectly affect an additional 1 million hectares, particularly in northern Java, eastern Sumatra, and southern Sulawesi. It would affect 17 million people in the country and affect 39% of the GDP in coastal regions¹⁸. [Map 6](#) indicates which (densely populated) regions may directly or indirectly be affected by sea level rise.

These changes will affect **food security** and **water availability**. Water deficits due to climate change have already been reported for Bali and East Nusa Tenggara, while food deficits resulting from climate change occur in various regions including South Sumatra and Lampung, East Kalimantan and Papua¹⁹. In the future, climate change will affect water availability and food security in Indonesia in a number of ways:

- saltwater intrusion due to rising sea levels will decrease freshwater availability in coastal zones²⁰;
- river flow reductions will decrease inland water availability²¹ and promotes saltwater intrusion in the rivers (see [Map 7](#));
- decreased rainfall in the dry season limits overall water availability, while a lack of water recharge and storage mechanisms in soil or surface water storage reservoirs limits opportunities for balancing this with increased rainfall in the rainy season²²;
- temperature increase will increasingly limit general crop productivity, leading to estimated food deficits of 90 million tons of husked rice by 2050²³;
- crop failure risks will increase due to reduced durations and unpredictable starts of the rainy season (while in some southern regions durations are already too short) and decreasing rainfall predictability²⁴;
- food production will occasionally suffer from increasingly severe floods across the country;
- food production in southern regions (including Java, Bali and Nusa Tenggara) will occasionally suffer from increasing frequency and intensity of droughts²⁵;
- production of specific crops, including rice, will suffer significantly from the projected decrease in number of cold nights during the planting season²⁶;
- more crop pests and diseases will occur as a result of increased temperatures²⁷;
- erratic and intense rainfall will make preservation of crops and seeds more difficult²⁸;

¹⁸ World Bank (2014); Wingqvist and Dahlberg (2008); Karmalkar et al. (2012); Case et al. (2007)

¹⁹ Syaukat (2011); Climate Change and Water Resources in Indonesia (2009)

²⁰ Case et al. (2007); Climate Change and Water Resources in Indonesia (2009)

²¹ World Bank (2014)

²² Naylor et al. (2007)

²³ Syaukat (2011)

²⁴ Lassa, J.A.; Mau, Y.S.; Li, D.E.; Frans, N. (2014) : *Impact of Climate Change on Agriculture and Food Crops : Options for Climate Smart Agriculture and Local Adaptation in East Nusa Tenggara, Indonesia*. IRGSC Working paper 8. <http://irgsc.org/pubs/wp/IRGSCWP008-climate-smart-agriculture.pdf>

²⁵ Oktaviani et al. (2011) ; World Bank (2014) ; Wingqvist and Dahlberg (2008)

²⁶ Caruso, R.; Petrarca, I.; Ricciuti, R. (2014): *Climate Change, Rice Crops and Violence. Evidence from Indonesia*. CESifo Working paper no. 4665. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2411403

²⁷ Wingqvist and Dahlberg (2008)

²⁸ Lassa et al. (2014)

- the availability of fish for consumption, a crucial source of nutrients and indispensable part of the diets of many Indonesians, will be negatively affected by rising sea water temperatures and levels²⁹.

Socio-economic vulnerability

Key facts:

GDP (PPP) per capita (2015) ³⁰ :	USD 11,035
Population (June 2016) ³¹ :	260,565,444
Projected population (2050) ³² :	322,237,410
Population density per km ² (2014) ³³ :	140
Human Development Index (201) ³⁴ :	110 out of 188 countries
Corruption Perception Index (2015) ³⁵ :	88 out of 168 countries
Gender Inequality Index (2014) ³⁶ :	110 out of 188 countries
Adult literacy (2015) ³⁷ :	93.9% (male 96.3%; female 91.5 %)

Indonesia is vulnerable to climate change due to its high population density – especially in coastal areas, and strong dependence on natural resources for economy and consumption. The island of Java is especially vulnerable because it is home to two-thirds of Indonesia’s population and over half of the country’s poor. Vulnerability for food security is high due to the country’s dependence on the production of rice, the primary staple food, which is projected to decrease as a result of climate change. Poverty of a large part of the population (110–140 million live on less than USD 2 per day) decreases their adaptive capacity to the effects of climate change³⁸. A study on vulnerability and adaptive capacity to climate change, including physical and socio-economic factors, has resulted in three comprehensive maps ([Map 8](#), [Map 9](#) and [Map 10](#)).

Among Indonesia’s most climate change-vulnerable populations are small-scale farmers, due to their strong dependence on natural resources including land and water, and their limited access to improved technologies and inputs and alternative livelihood options. In general, inhabitants of rural areas (58% of Indonesia’s total population) have limited access to appropriate climate-smart agricultural information, technologies and finance that could increase their adaptive capacity. Another vulnerable group is Indonesia’s (rural and urban) poor, who often spend more than 50% of their income on food and will be heavily affected by increasing food prices due to climate change³⁹.

²⁹ UK’s Met Office Hadley Center (2013); Case et al. (2007)

³⁰ World Bank Data – GDP per capita, PPP. <http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>

³¹ World Population Review – Indonesia. <http://worldpopulationreview.com/countries/indonesia-population/>

³² UNDESA (2015): *World Population Prospects: The 2015 Revision*. <http://esa.un.org/wpp>

³³ World Bank Data – Population density. <http://data.worldbank.org/indicator/EN.POP.DNST>

³⁴ UNDP (2015) <http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components>

³⁵ <http://www.transparency.org/cpi2015/results>

³⁶ <http://hdr.undp.org/en/content/table-4-gender-inequality-index>

³⁷ CIA (2015). The World Factbook, Indonesia. Available via <https://www.cia.gov/library/publications/the-world-factbook/geos/id.html>

³⁸ World Bank (2014); Wingqvist and Dahlberg (2008); Syaukat (2011); Oktaviani et al. (2011)

³⁹ Lassa et al. (2014) ; Oktaviani et al. (2011)

The agricultural sector is very important for Indonesia, as it accounts for 13.6% of GDP and employs around 39% of the population⁴⁰. It depends heavily on natural resources including land and water (the sector accounts for 80% of Indonesia's water consumption). Effects of climate change will negatively impact the agricultural sector in various ways (see above), leading to an estimated 17.9% decrease in total agricultural productivity per unit area by the 2080s.

Rice is by far the most important crop of Indonesian agriculture in terms of production as well as consumption. Other important production crops (in order of cultivated area) are oil palm, maize, coconut, rubber and cassava. Important consumption crops (in order of volume consumed) are cassava, vegetables, fruits, maize, and coconuts. Projections for climate change effects on some of Indonesia's crops (maize, wheat and soybeans) are all negative, with maize yields declining up to 50% and wheat yields decreasing 36.3% by 2080⁴¹.

For rice, Indonesia's primary crop, projections indicate major yield decreases ranging from 4% per year to a total of 16.5% between 2000 and 2080. Climate change affects rice production in various ways:

- each 1°C change in temperature causes lower rice quality and yield losses of 1.3 million metric tons or 10–25% of total production;
- a 60 cm sea level rise strongly reduces rice yields, e.g. by 300,000 tons in two west Java districts;
- a 30-day delay in wet season onset decreases rice yields by 6.5–11%, prolongs the 'hunger season', and may ultimately prevent farmers from planting two consequent rice crops.

Most of Indonesia's rice is produced in Java and Bali (together 55%). Food security of the country as a whole therefore depends heavily on climate effects and adaptation in these regions⁴².

The fishery sector is also expected to experience negative effects from climate change, leading to a decrease in food security. Sea level rise will disrupt coastal fish and prawn farming, and changing marine species distributions will make fish catches less reliable. Indonesia is expected to experience some of the largest decreases in marine fish stocks across the globe, with maximum catch potential decreasing by 23% between 2005 and 2055⁴³. Although the aquaculture sector in Indonesia is growing, it will not be able to compensate for the losses in the capture fisheries sector.

⁴⁰ CIA (2015). The World Factbook, Indonesia. Available via <https://www.cia.gov/library/publications/the-world-factbook/geos/id.html>

⁴¹ UK's Met Office Hadly Center (2013); Climate Change and Water Resources in Indonesia (2009); Measey (2010); Oktaviani et al. (2011); Rusono, N.; Setyawati (2011): Indonesian Food Security and Climate Change: *Looking into the Futures*. <http://www.slideshare.net/SBuzzelli/nono-rusono-indonesian-food-security-and-climate-change-looking-into-the-futures#>; Zhai, F.; Zhuang, J. (2009): *Agricultural Impact of Climate Change: A General Equilibrium Analysis with Special Reference to Southeast Asia*. ADB. <http://www.adbi.org/files/2009.02.23.wp131.agricultural.impact.climate.change.pdf>

⁴² Oktaviani et al. (2011); Zhai and Zhuang (2009); UK's Met Office Hadly Center (2013); Measey (2010); Wingqvist and Dahlberg (2008); Case et al. (2007); Lassa et al. (2014); Falcon, W.P.; Naylor, R.L.; Smith, W.T.; Burke, M.B.; McCullough, E.B. (2004): Using Climate Models to Improve Indonesian Food Security. *Bulletin of Indonesian Economic Studies* 40(3): 355–377. <http://www.wmo.int/pages/about/pdf/Agriculture%201.pdf>

⁴³ Wingqvist and Dahlberg (2008); UK's Met Office Hadly Center (2013)

National government strategies and policies

Indonesia has ratified the UN Convention on Biological Diversity (CBD), the Convention to Combat Desertification (CCD), the Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. Other milestones in Indonesia's strategies and policies concerning climate change were the first and second National Communications on climate change (1999 and 2011), the establishment of a National Commission on Clean Development Mechanisms (2005), the National Action Plan addressing climate change (2007), and the Indonesian Climate Change Sectoral Roadmap (ICCSR, 2009⁴⁴).

The ICCSR has long been the leading framework for Indonesia's climate change mitigation and adaptation efforts. It focuses on mitigation for five sectors and adaptation for four sectors (including agriculture, marine/fishery, and water resources), with among others the following key activities:

- water resources: vulnerability/risk assessment; indigenous knowledge and community mobilization; water conservation and improved supply technology and storage capacity;
- marine/fishery: marine science/technology; climate change adaptation for coastal/spatial planning; technical coastal adaptation; adjustment of cultured and captured fishery management;
- agriculture: climate change resilient crop varieties/technologies, post-harvest activities incl. cold chain system; rice integrated crop management; shifting to new lands; consumption diversity⁴⁵.

In recent years, there have been important developments in Indonesia with regard to climate change mitigation and adaptation. Acknowledging that it is one of highest global GHG emitters (currently 6th) mainly due to the conversion of its forests and carbon-rich peat lands⁴⁶, the country has focused on mitigation and specifically on reduction of GHG emissions. In 2009, Indonesia made a voluntary commitment to reduce its GHG emissions by 26% by 2020, or by 41% with international assistance, compared to its estimated emissions in a 'business as usual' scenario. Most of this goal (87%) is to be achieved by reducing emissions from deforestation and peat land conversion. To achieve this, the Indonesian President signed a decree in 2011, putting into effect a two-year moratorium on issuing new permits for the use of primary natural forest and peat land. The moratorium covers 43.3 million hectares of forest and peat land, and ca. 25.3 gigatons of carbon stocks⁴⁷. The moratorium was extended for another two years in

⁴⁴ Republic of Indonesia (2009). Indonesia climate change sectoral roadmap, ICCSR, synthesis report. Available via http://www.adaptation-undp.org/sites/default/files/downloads/indonesia_climate_change_sectoral_roadmap_iccsr.pdf

⁴⁵ Climate Change and Water Resources in Indonesia (2009); Rusono and Setyawati (2011); Grüning, C.; Menzel, C.; Shuford, L.S.; Sonntag-O'Brien, V. (2012): *Case Study: The Indonesian Climate change Trust Fund*. Frankfurt School – UNEP Collaborating Centre for Climate & Sustainable Energy Finance. <http://fs-unesp-centre.org/sites/default/files/publications/icctf.pdf>

⁴⁶ World Resources Institute. Top 10 emitters (2014) <http://www.wri.org/blog/2014/11/6-graphs-explain-world%E2%80%99s-top-10-emitters> Note: According to a 2015 estimate posted on the Statista Portal, Indonesia was ranked 11th. <http://www.statista.com/statistics/271748/the-largest-emitters-of-co2-in-the-world/>

⁴⁷ CDKN Global (2012): *A new direction in climate compatible development – Indonesia's forest moratorium*, http://cdkn.org/wp-content/uploads/2012/05/Indonesia-InsideStory_final_low-res.pdf

2013 and was extended again in April 2016⁴⁸ ⁴⁹. These commitments have made Indonesia one of very few 'non-Annex 1 countries' of the UNFCCC (i.e. non-industrialised/OECD countries) that enacted significant and comprehensive regulations for GHG emissions reduction⁵⁰.

Despite these positive developments, there are significant challenges in implementation of the plans – partly due to a lack of capacity and alignment on provincial and local levels⁵¹, but also largely as a result of the influence of the oil palm industry. A recent study of forest cover change found that the rate of deforestation actually increased to two million hectares per year (from an estimated 750,000 – 1,000,00 per year) during the moratorium⁵². The Indonesian Ministry of Forestry however claims that part of this is 'temporary deforestation' which will be compensated through reforestation, leading them to a much lower deforestation figure of 450,000 hectares⁵³.

While planning for mitigation is advancing, planning for adaptation is still in process. In 2014, Indonesia drafted its RAN-API as a precursor of its National Adaptation Plan (NAP)). This document contains specific targets for seven sectors and areas: Food security; Energy security; Health; Settlement; Infrastructure; Urban areas; and Coastal and Small Islands areas⁵⁴. These sectors do not include the water sector. The sections on the Food security and Infrastructure sectors however do mention water aspects. The current status of this document is not entirely clear. It seems to be still in the phase of consultation – it has not (yet) been submitted to the UNFCCC secretariat as an official NAP⁵⁵.

A number of actions have been undertaken by the government that could have a potential positive impact on climate change mitigation and adaptation:

- **Climate change engagement and coordination by Ministries and Agencies is increasing.** Various parties are involved in climate change action in Indonesia. The National Development Planning Agency (BAPPENAS) formulates procedures and planning for climate finance and mainstreams it into national policy; the Ministry of Finance ensures that climate change is reflected in budget priorities; the Ministry for Environment and Forestry prepares the national communications to the UNFCCC and is the national designated authority (NDA) for the Adaptation Fund and the focal point for the UN-REDD program. Although it has been argued that climate change responsibilities are distributed over (too) many governmental

⁴⁸ Austin, K.; Stolle, F.; Alisjahbana, A. (2013): *Indonesia Extends its Forest Moratorium: What Comes Next?* <http://www.wri.org/blog/2013/05/indonesia-extends-its-forest-moratorium-what-comes-next> and <http://phys.org/news/2016-05-indonesia-aim-palm-oil-forest.html>

⁴⁹ <https://news.mongabay.com/2016/05/effective-will-indonesias-palm-oil-permit-freeze-really/>

⁵⁰ Tänzler, D.; Maulidia, M. (2013): *Status of Climate Finance in Indonesia*. GIZ and Adelphi. http://cdkn.org/wp-content/uploads/2012/05/INDONESIA-Country-Report_3Dec2013.pdf

⁵¹ CDKN website: Indonesia. <http://cdkn.org/regions/indonesia/>

⁵² Hansen et al. (2013): High-Resolution Global Maps of 21st Century Forest Cover Change. *Science* 342(6160). <http://www.sciencemag.org/content/342/6160/850>

⁵³ Lang, C. (2013): *Indonesia's rate of deforestation has doubled under the moratorium*. <http://www.redd-monitor.org/2013/12/11/indonesias-rate-of-deforestation-has-doubled-under-the-moratorium/>

⁵⁴ Government of Indonesia (2014): *National Action Plan for Climate Change Adaptation (RAN-API) – Synthesis Report*. https://qc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/programme-info/RAN-API_Synthesis_Report_2013.pdf

⁵⁵ Submitted NAPAs are available for download via http://unfccc.int/adaptation/workstreams/national_adaptation_programmes_of_action/items/4585.php. Submitted NAPs are available for download via http://www4.unfccc.int/nap/News/Pages/national_adaptation_plans.aspx.

parties and lack coordination⁵⁶, there are promising developments. A recent reorganization has resulted in the REDD+ agency and the National Council on Climate Change, which coordinates climate change control policies and formulates Indonesia's position in international negotiations. This Council is to be absorbed into the Ministry for Environment and Forestry and – rather than report directly to the President as before – to become part of a Directorate General of Climate Change.

- **A legal framework for mitigation is evolving.** Commitments to reducing GHG emissions are codified in a National Action Plan (RAN–GRK, 2011) and Local Action Plans (RAD–GRK, 2012), serving as starting points for development of Nationally Appropriate Mitigation Actions (NAMAs) to UNFCCC.
- **A national climate fund is established.** The Indonesia Climate Change Trust Fund (ICCTF) was established in 2009 as the financing mechanism for Indonesia's climate change policies and programs. It is designed to pool funds from various sources and to promote financial coherence. The UNDP acted as an interim trustee until 2013/14; to date this responsibility is transferred to the state-owned Bank Mandiri. The ICCTF currently prioritizes three financing windows: land-based mitigation; energy; and adaptation and resilience. It was successful in attracting core funding from international donors in its first years of operation, but further fund raising has been limited: during the last 18 months (January 2015 – June 2016) the ICCTF has attracted approximately USD 12 million⁵⁷. The ICCTF is registering to be a National Implementing Entity (NIE) to the UNFCCC's Adaptation Fund. The ICCTF has so far been supported financially by the UK, Australia and Sweden⁵⁸. Its transition to becoming Indonesia's NIE to the UNFCCC's Adaptation Fund is being supported by GIZ⁵⁹. Challenges however remain. Although the establishment of the ICCTF is a step in the right direction, there is no overarching mechanism for donor coordination. Moreover, policies and legal framework at provincial and local levels are not adequate to facilitate the delivery and management of climate finance
- **Indonesia's Centre for Climate Finance and Multilateral Policy (part of the Ministry of Finance) is the National Designated Authority (NDA) for the Green Climate Fund (GCF)⁶⁰.**

Intended Nationally Determined Contribution (INDC)

In its Intended Nationally Determined Contribution (INDC), Indonesia presents itself as a poor country, balancing poverty reduction priorities and climate change challenges⁶¹. Indonesia's INDC is built upon four strategic principles:

1. Employing a landscape approach: a landscape approach recognises that adaptation and mitigation are multi-sectoral in nature, therefore Indonesia takes an integral approach covering terrestrial, coastal and marine ecosystems
2. Highlighting best practices: scaling up traditional wisdom as well as innovative mitigation and adaptation efforts by governments, private sector and communities.

⁵⁶ Tänzler and Maulidia (2013)

⁵⁷ <http://icctf.or.id/icctf-fund-received/>

⁵⁸ Rusono and Setyawati (2011); Halimanjaya, A.; Nakhooda, S.; Barnard, S. (2014): *The effectiveness of climate finance: a review of the Indonesia Climate Trust Fund*. <http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8898.pdf>

⁵⁹ Tänzler and Maulidia (2013)

⁶⁰ http://www.greenclimate.fund/documents/20182/318991/NDA_and_Focal_Point_nominations_for_the_Green_Climate_Fund.pdf/eeace75b-aa59-489c-8914-c0940debe01f

⁶¹ Republic of Indonesia (2015). Intended Nationally Determined Contribution. Available via http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Indonesia/1/INDC_REPUBLIC%20OF%20INDONESIA.pdf

3. Mainstreaming climate agenda into development planning: Indonesia includes key climate change indicators in formulating its development program targets
4. Promoting climate resilience in food, water and energy: protecting and restoring key terrestrial, coastal and marine ecosystems to fulfil the needs of a growing population for food, water and energy.

Mitigation. Indonesia is committed to an **unconditional reduction of GHG emissions of 26%** by the year 2020, compared to a Business-as-Usual (BAU) scenario. An additional 12% to 15% reduction of GHG emissions can be achieved when adequate international support is available (conditional contribution). In the INDC Indonesia states that it already took significant steps to reduce emissions from Land use, Land Use Change and Forestry (LULUCF) by instituting a moratorium on clearing of primary forests and conversion of peatlands from 2010–2016. In the energy sector, Indonesia is working towards de-carbonization, by implementing a mixed energy use policy (with at least 23% coming from new and renewable energy sources by 2025) and the establishment of a clean energy sources as national policy. For the waste management sector, Indonesia is promoting a ‘reduce, reuse, recycle’ approach and working on converting waste and garbage into energy.

Adaptation. In the INDC Indonesia refers to its National Action Plan on Climate Change Adaptation (RAN-API, see section above) for a framework for adaptation initiatives. These initiatives are also integrated into the National Development Plan.

Climate finance

Due to Indonesia’s high GHG emissions, estimates of the annual funds required for mitigation are high but varied ranging from USD 925 million to 19.36 billion and even more⁶². Although climate finance is not yet up to that figure, there is certainly a momentum on climate finance in Indonesia. The country has been very successful compared to other countries in mobilizing funding. Some positive developments are the following:

- **Domestic climate expenditure is increasing.** In 2011, Indonesia’s total budgetary expenditure on climate change mitigation actions equalled ca. USD 579 million; an increase of 5% compared to 2008.
- **Green banking may be starting.** A regulation is being drafted on green banking and financing, which will require lenders to assess potential borrowers not only on financial, but also social and environmental sustainability standards, and can help encourage investments in green sectors⁶³.
- **Substantial pledges for climate finance are being made.** International climate funds have approved USD 325 million between 2003 and 2012, focusing primarily on mitigation. Most attention is being paid to reducing forest and land based emissions activities (and the highest portion of these funds is disbursed on REDD+ activities), which is appropriate since up to 85% of Indonesia’s emissions come from these sectors. In process is USD 400 million (with co-financing) from the Climate Investment Fund’s (CIF) Clean Technology Fund for renewable energy and geothermal development, and USD 70 million from the CIF’s Forest Investment Program (FIP). Moreover, Norway has pledged USD 1 billion for REDD. Indonesia has also developed an Emission Reductions Program Idea Note (ER-PIN) to apply for funding from the Forest Carbon Partnership Facility (FCPF).

⁶² Tänzler and Maulidia (2013)

⁶³ <http://unepinquiry.org/country/indonesia/>

This success in mobilizing funding can be attributed at least partly to the fact that Indonesia's current focus on mitigation resonates with current climate finance priorities, which clearly favour mitigation Initiatives. It should be noted that these figures are only pledged and not yet (all) disbursed. It was estimated in 2013 that only 3% of committed funds for Indonesia had been disbursed so far⁶⁴.

The success of both mitigation and adaptation activities depends to a large extent on the 'readiness' of Indonesia to not just mobilize climate funds but also use them effectively. A recent assessment of the current situation of climate financing and the legal and institutional framework in the country suggests four necessary actions to improve climate finance readiness. These are: (1) to support capacities to multi-level planning, programming and coordination; (2) institutional strengthening to meet financial access requirements; (3) to provide good financial governance, including sound measurement, reporting and verification systems; and (4) to increase efforts to engage the private sector. Engagement with the private sector is of special interest since the private sector already makes up the greater proportion of mitigation investment in Indonesia, focusing on renewable/clean energy and energy efficiency. There are currently more than 60 REDD+ demonstration activities developed or supported by private companies. It is anticipated that the ICCTF can be a mechanism for private-public collaboration.

Climate change projects

Numerous climate change related projects are being implemented in Indonesia – some under international climate funds, others through bilateral support. A number of currently implemented projects with relevance for the water and/or food security sectors are the following:

- 'Public Awareness, Training and Education Program on Climate Change Issues for All Levels of Societies in Mitigation and Adaptation', supported by the ICCTF⁶⁵;
- various projects (147 in total) registered the Clean Development Mechanism (CDM) of the UNFCCC, most of them on green energy including hydropower⁶⁶;
- 'Green Prosperity Project' of the USA's Millennium Challenge Corporation (MCC), to support Indonesia's plans for a less carbon intensive future (focusing on renewable energy, improved land use management, protection of natural capital and reduced GHG emissions; 2013–2018);
- several water related projects funded by the Dutch Government and private parties, implemented by NWP⁶⁷;
- 'Building with Nature to Secure Eroding Delta Coastlines', a pilot project in Demak district supported by the Netherlands (launched in 2014);
- 'Knowledge Centre on Climate Change: Adaptation and Best Practices in Agriculture and Natural Resource Sectors', an online knowledge centre for Southeast Asia, supported by the Southeast Asian Regional Centre for Graduate Study and Research in Agriculture (see <http://climatechange.searca.org/>).

For a list of projects in Indonesia funded through bilateral/multilateral climate funds, see the list in the [Annex](#).

⁶⁴ Tänzler and Maulidia (2013)

⁶⁵ ICCTF website: <http://www.climatefundsupdate.org/listing/icctf>

⁶⁶ <http://cdm.unfccc.int/Projects/projsearch.html>

⁶⁷ https://www.nwp.nl/sites/default/files/20161_countryupdate_indonesiemaart%202016_def.pdf

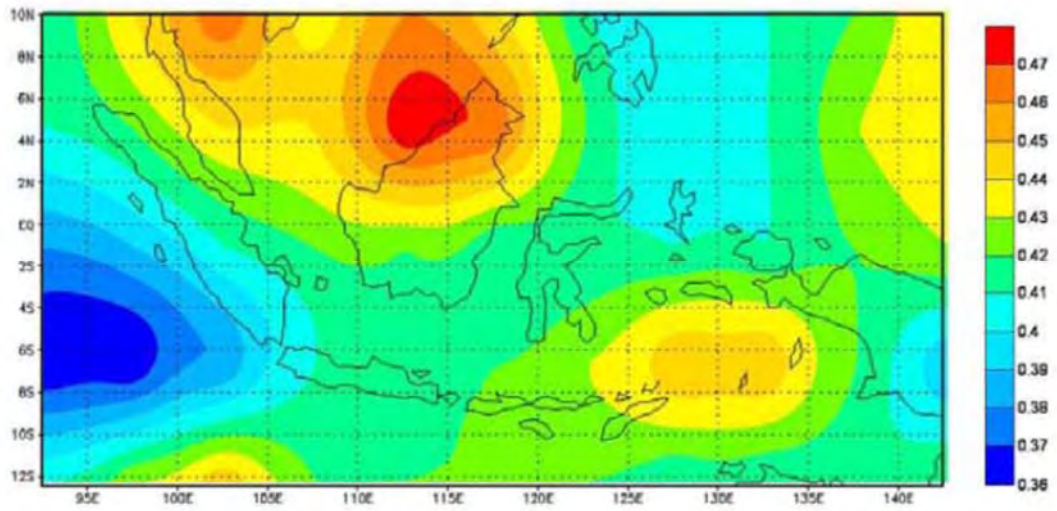
Climate contribution of the Netherlands Embassy: Pitch & Bid

Beginning in 2014, embassies with development programs have annually been preparing a climate Pitch & Bid. The *Pitch* communicates the embassy's climate-smart actions that will address climate change. Based on the actions described in the Pitch, assignment of the Rio Markers and budget information, the embassy prepares a *Bid* which is an estimate of how much is likely to be spent on projects that are relevant for climate in the coming three years. For Indonesia the Bid estimates a climate contribution for 2016–2018 of €4.44 million (1.87 million for 2016; 1.46 million for 2017; 1.12 million for 2018). Of these, nine projects consider adaptation, one project focuses on mitigation and one project focuses both on mitigation and adaptation:

- **Food security program:** 'smart' technologies and practices will be promoted for horticulture, dairy production and animal husbandry, while 'blue economy' (sustainable oceans) will be promoted for fisheries.
- **Water resources management:** the water programme will contain elements concerning flood safety in coastal areas and urban delta's and capacity development on climate and weather. In addition, the embassy will intensify its position as knowledge centre on peatland management.
- **Sustainable energy:** the energy programme will focus on capacity development in the development and utilisation of geothermal energy sources and in assessment of their effects on economy and environment.
- **Education:** in its higher education programme, the Embassy offers scholarships to students in areas related to climate change (including food security and water management).

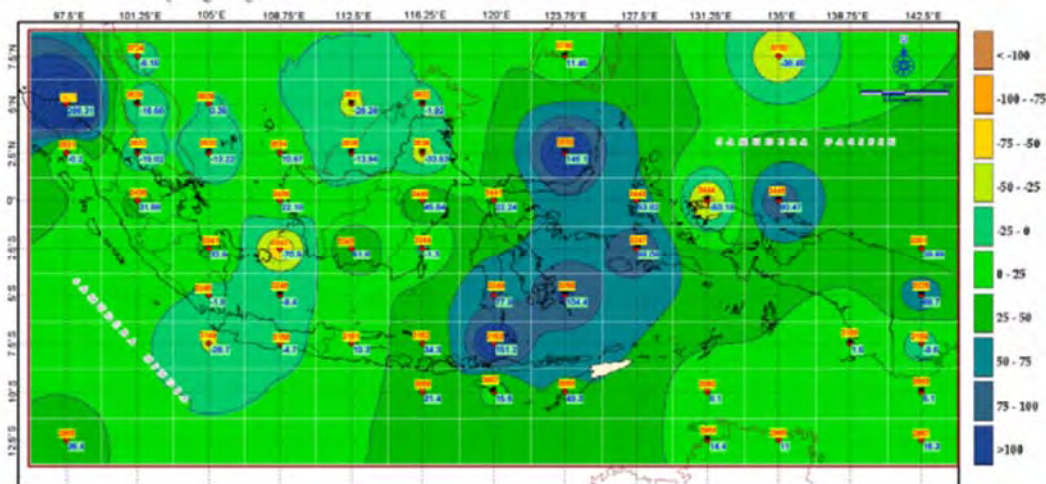
In addition to maps presented below: a report from 2011 contains detailed maps at local level with data on coping capacity, including projections up to 2060. They can be downloaded from <http://adaptasi.dnpi.go.id/filedata/20120730112852.Ringkasan%20Eksekutif%20Pementaan.pdf>.

Map 1: Trends and projections in temperature, 2000–2020, °C increase over 20 years



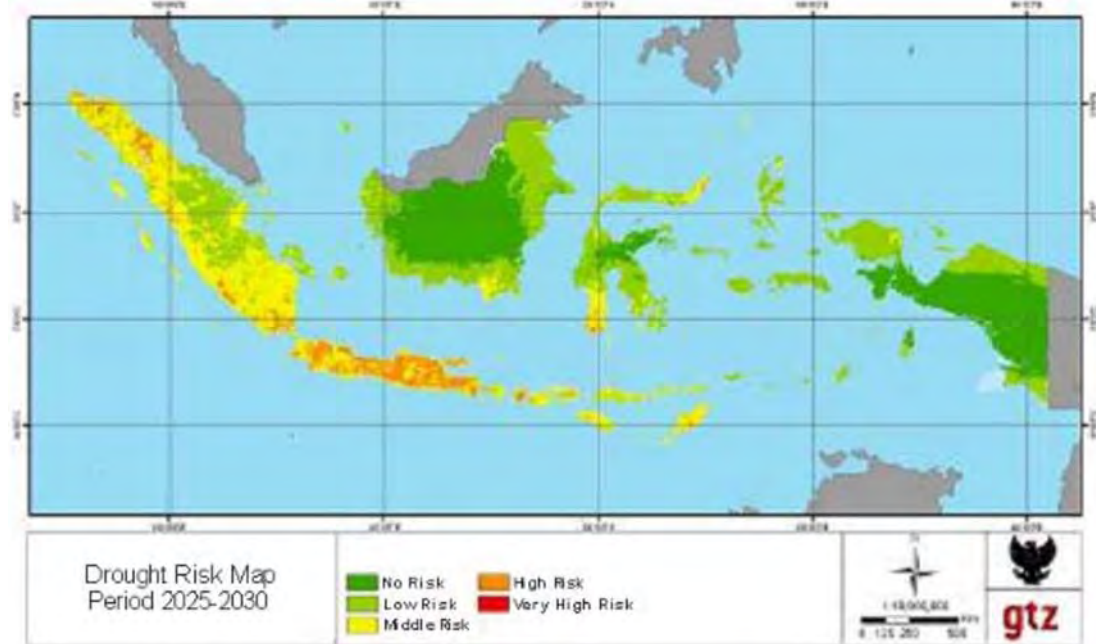
Source: Measey (2010)

Map 2: Trends in precipitation (September–November season), 1900–2000, mm over 100 years

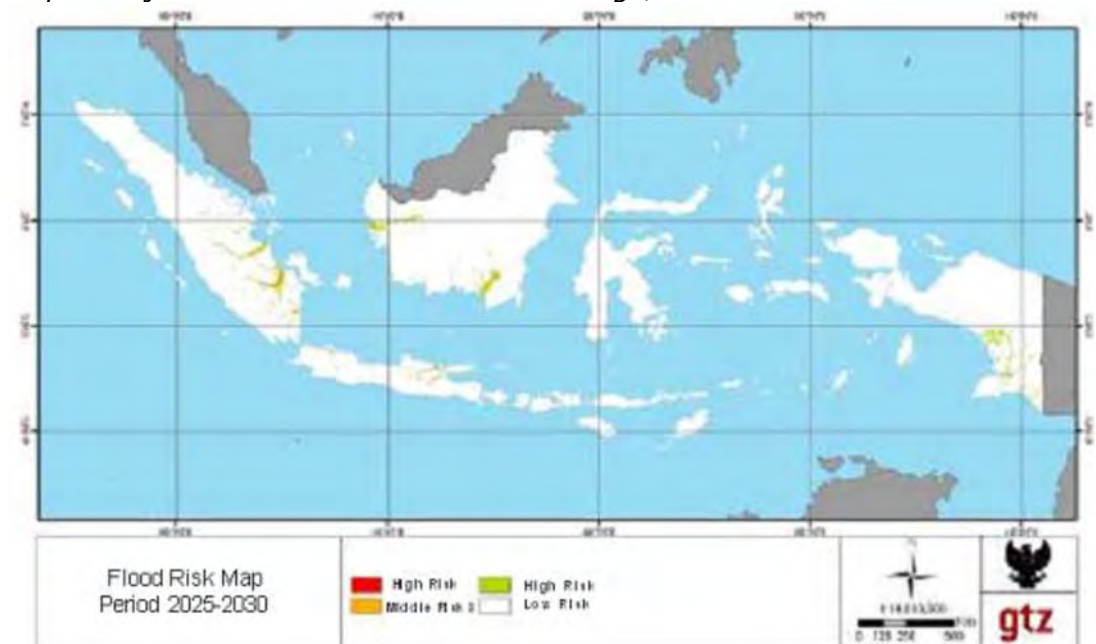


Source: Measey (2010)

Map 3: Projected drought risk under climate change, 2025–2030

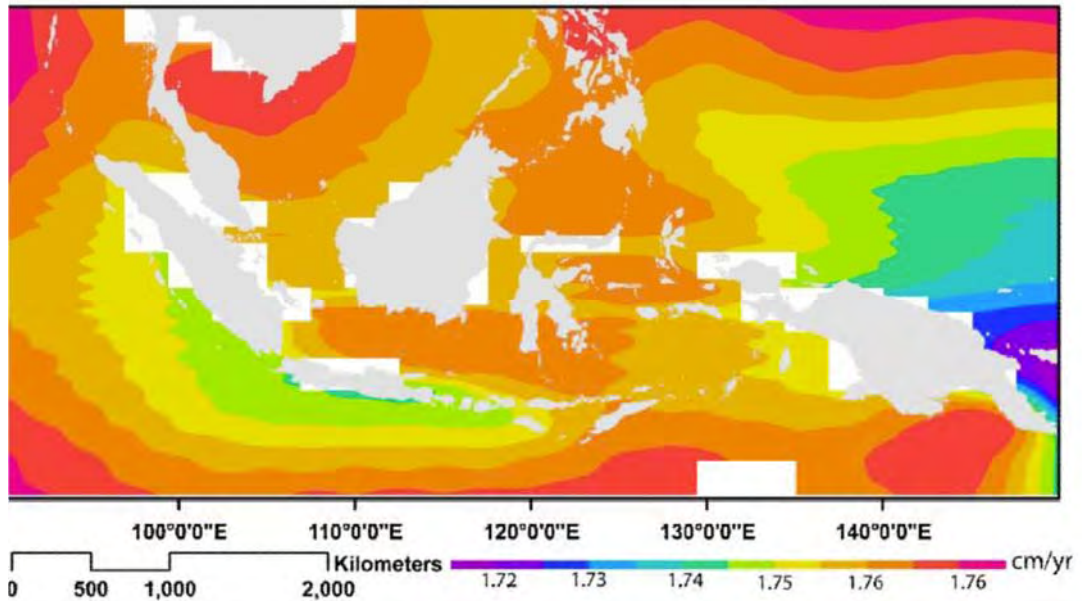


Map 4: Projected flood risk under climate change, 2025–2030



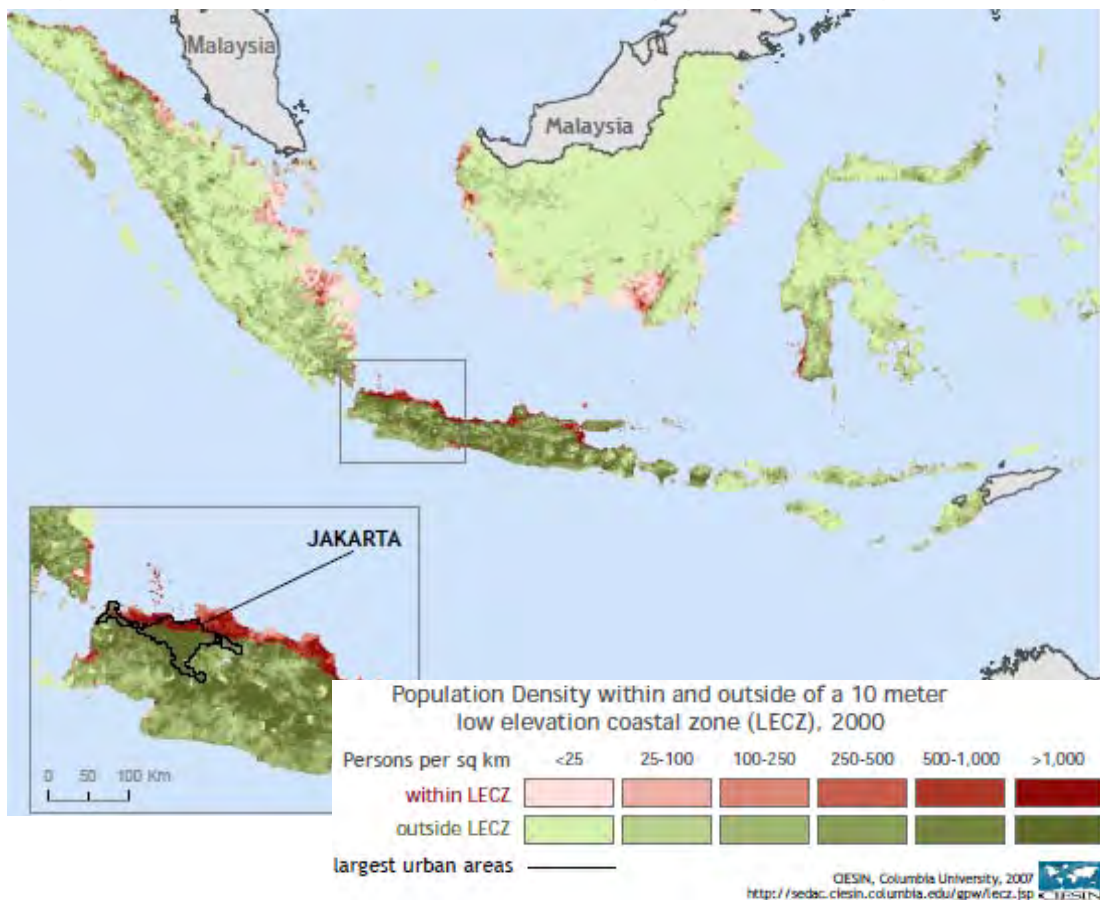
Source: Republic of Indonesia (2009): Indonesia Climate Change Sectoral Roadmap (ICCSR).
http://www.paklim.org/wp-content/uploads/downloads/2011/05/ICCSR-synthesis-report_2010.pdf

Map 5: Projected sea level rise, 2000–2050, cm/year (including melting ice dynamics)



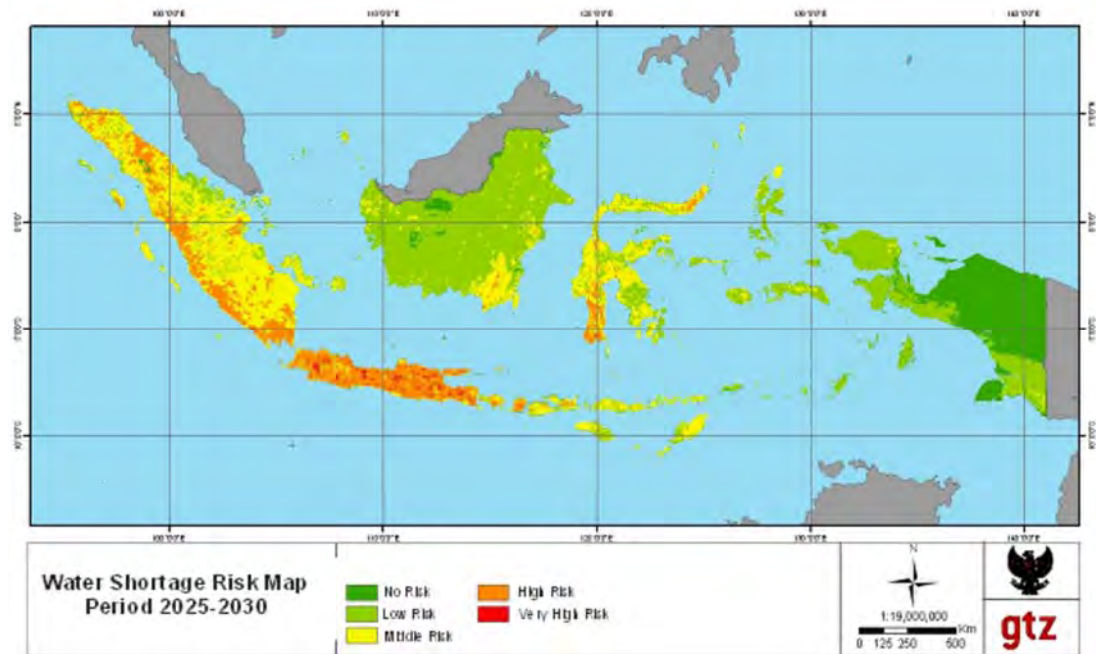
Source: Republic of Indonesia (2013): National Action Plan for Climate Change Adaptation. https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/programme-info/RAN-API_Synthesis_Report_2013.pdf

Map 6: Zones at risk of sea level rise effects and population density



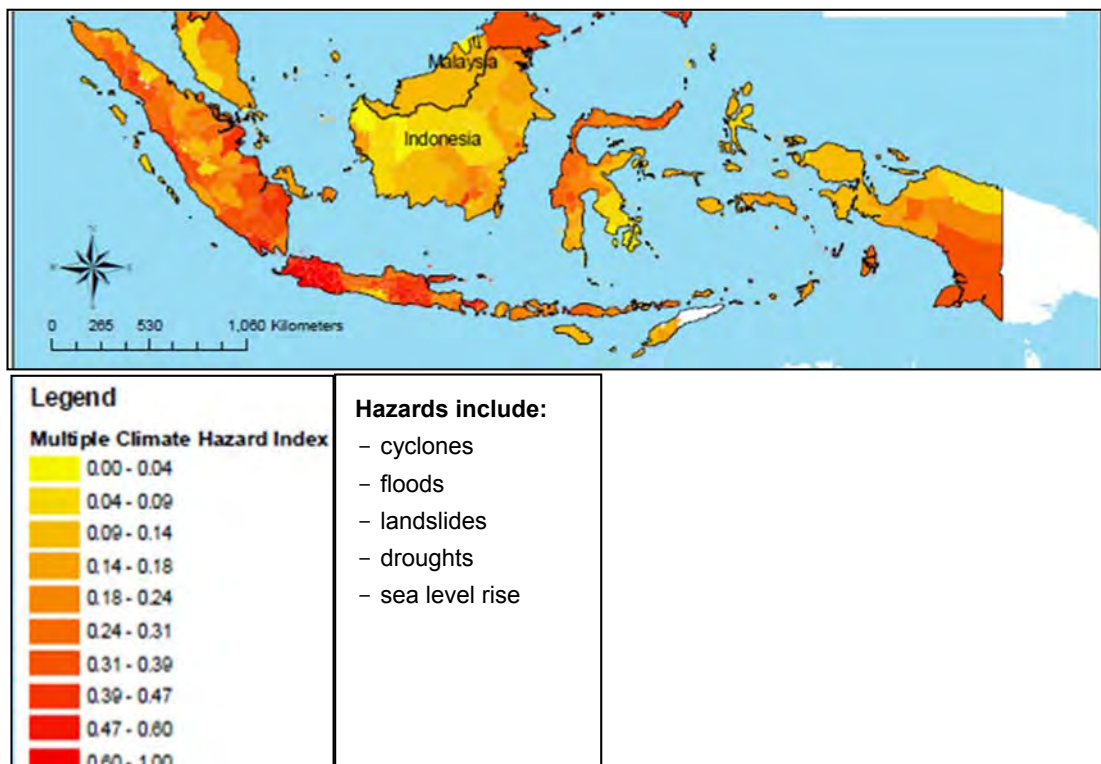
Source: http://www.preventionweb.net/files/7690_Indonesia10mLECZandpopulationdensity1.pdf

Map 7: Water shortage risk under climate change, 2025–2030

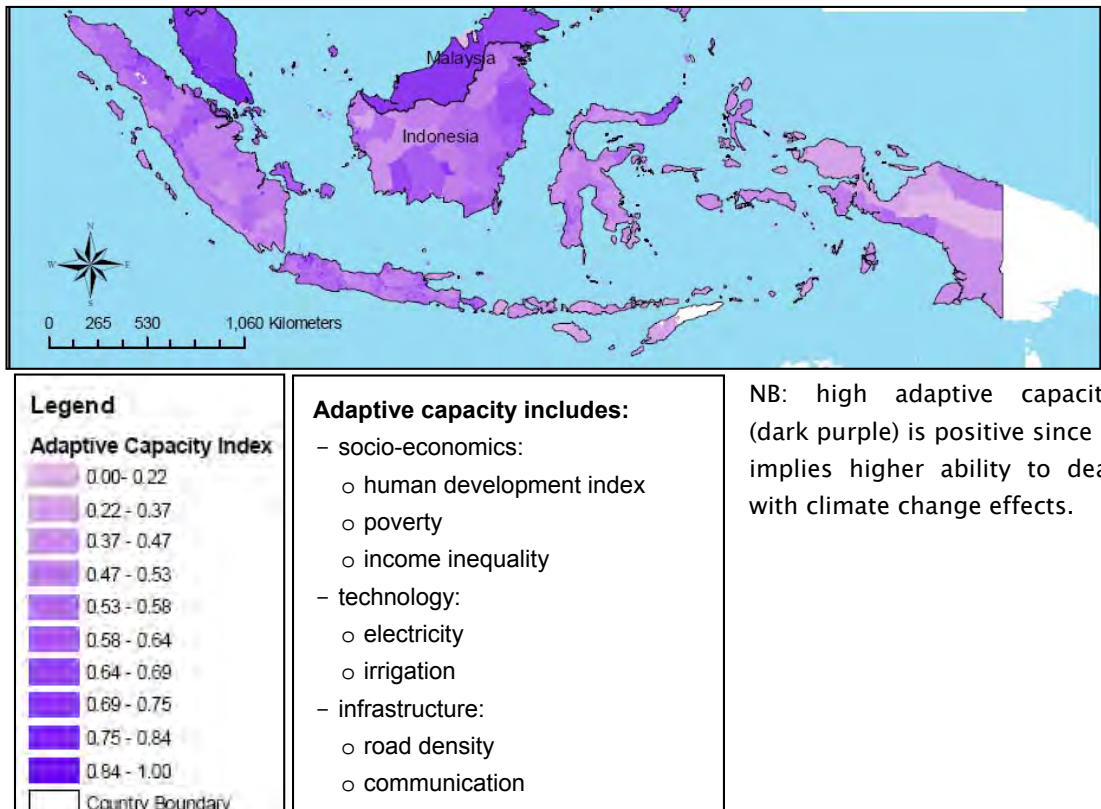


Source: Republic of Indonesia (2009)

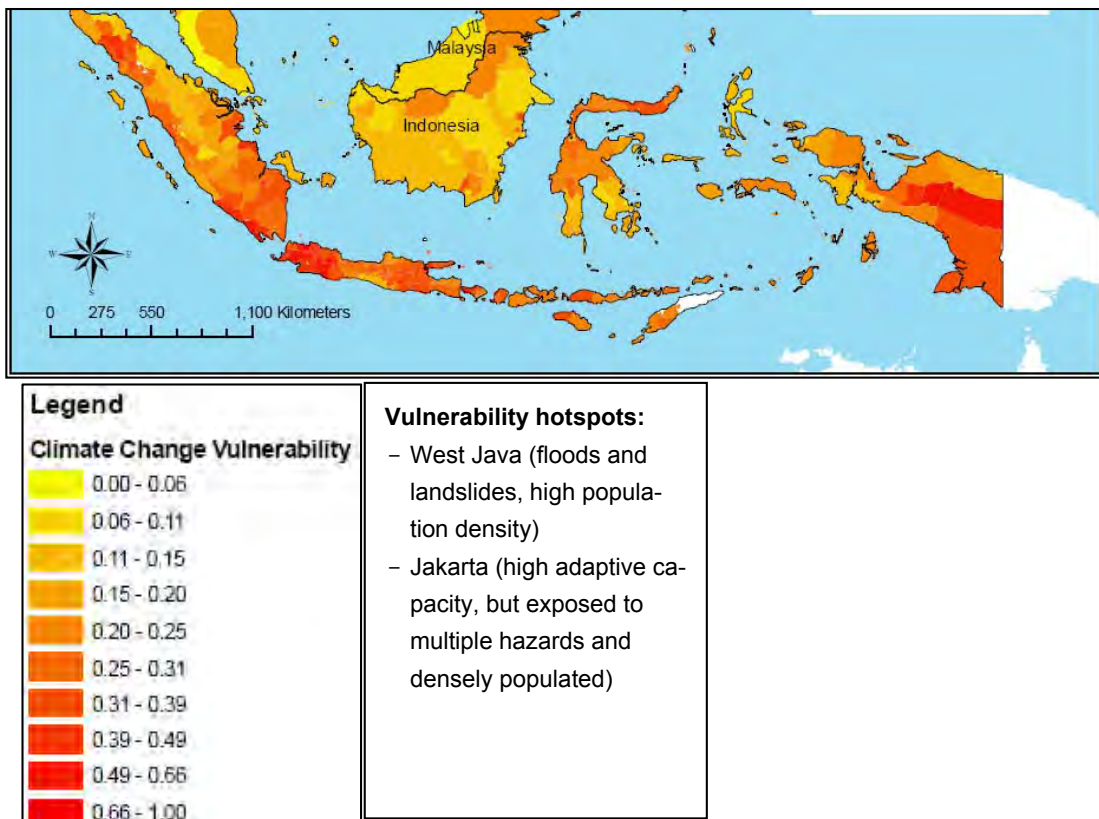
Map 8: Multiple climate hazards



Map 9: Adaptive capacity to climate change



Map 10: Composite climate change vulnerability, combining hazards (map 8) and adaptive capacity (map 9) with population density



Source: Yusuf, A.A. ; Francisco, H. (2009): *Climate Change Vulnerability Mapping for Southeast Asia*. http://www.preventionweb.net/files/7865_12324196651MappingReport1.pdf

Annex: List of projects in Indonesia under bilateral and multilateral climate funds

Main source: *Climate Funds Update (2016)*: <http://www.climatefundsupdate.org/data>

Name of Project	Fund	Funding Approved (USD millions)	Disbursed (USD millions)	Fund Type
Health vulnerability (Ministry of Health)	Indonesia Climate Change Trust Fund (ICCTF)	1.4		Multi Donor National
Public Awareness on Climate Change (to the Bureau of Met, Climate and Geophysics, BMKG)	Indonesia Climate Change Trust Fund (ICCTF)	1.2	1.2	Multi Donor National
Energy Conservation (to the Ministry of Industry)	Indonesia Climate Change Trust Fund (ICCTF)	2.2	2.	Multi Donor National
Sustainable Peat Land Management (to the Ministry of Agriculture)	Indonesia Climate Change Trust Fund (ICCTF)	3.6	1.7	Multi Donor National
Sustainable Forest Management (Wood pellets project for Min of Forestry)	Indonesia Climate Change Trust Fund (ICCTF)	1.2	0.2	Multi Donor National
Adapting to Climate Change for Improved Food Security in West Nusa Tenggara Province	Adaptation Fund (AF)	6		Multilateral
Strategic Planning and Action to Strengthen Climate Resilience of Rural Communities in Nusa Tenggara Timor province (SPARC)	Special Climate Change Fund (SCCF)	5.1	5.1	Multilateral
Market Readiness Proposal MRP	Partnership for Market Readiness	0.4		Multilateral
PMR Program Indonesia	Partnership for Market Readiness	3		Multilateral
Integrated Microhydro Development and Application Program (IMIDAP), Part I	Global Environment Facility (GEF4)	2	2	Multilateral
Bus Rapid Transit and Pedestrian Improvements in Jakarta	Global Environment Facility (GEF4)	5.8	5.8	Multilateral
Geothermal Power Generation Development Program	Global Environment Facility (GEF4)	4	4	Multilateral

Name of Project	Fund	Funding Approved (USD millions)	Disbursed (USD millions)	Fund Type
Micro-turbine Cogeneration Technology Application Project (MCTAP)	Global Environment Facility (GEF4)	2.6	2.6	Multilateral
CF: Promoting Energy Efficiency in the Industries through System Optimization and Energy Management Standards	Global Environment Facility (GEF4)	2.2	2.2	Multilateral
Chiller Energy Efficiency Project	Global Environment Facility (GEF4)	3.7	3.7	Multilateral
Wind Hybrid Power Generation (WHyPGen) Marketing Development Initiatives	Global Environment Facility (GEF4)	2.2	2.2	Multilateral
Indonesia: Geothermal Clean Energy Investment Project	Clean Technology Fund (CTF)	125		Multilateral
Geothermal Electricity Finance (IGEF) Program	Clean Technology Fund (CTF)	49.3		Multilateral
Private Sector Geothermal Program	Clean Technology Fund (CTF)	149.3		Multilateral
Geothermal Energy Upstream Development Project	Clean Technology Fund (CTF)	49		Multilateral
IBRD Geothermal Energy Upstream Development Project	Global Environment Facility (GEF6)	6.3	6.3	Multilateral
Market Transformation through Design and Implementation of Appropriate Mitigation Actions in Energy Sector	Global Environment Facility (GEF5)	8		Multilateral
Large Enterprises Energy Efficiency Project	Global Environment Facility (GEF5)	5.5		Multilateral
Promoting Energy Efficiency for Non-HCFC Refrigeration and Air Conditioning (PENHRA)(RESUBMISSION)	Global Environment Facility (GEF5)	5		Multilateral
Preparation Grant request for Investment Plan	Forest Investment Program (FIP)	0.3	0.1	Multilateral
Promoting Sustainable Community Based Natural Resource Management and Institutional Development (project preparation grant)	Forest Investment Program (FIP)	17		Multilateral

Name of Project	Fund	Funding Approved (USD millions)	Disbursed (USD millions)	Fund Type
Direct support to the design and implementation of UN-REDD National Programmes	UNREDD Program	5.6	5.5	Multilateral
Readiness preparation grant	Forest Carbon Partnership Facility (FCPF)	8.8	3.4	Multilateral
Third National Communication to the United Nations Framework Convention on Climate Change	Global Environment Facility (GEF5)	4.5	4.5	Multilateral
Database to Manage Climate Adaptation Information	Germany's International Climate Initiative	2.7		Bilateral
Energy Efficiency for Sustainable Tourism in Pangandaran, Indonesia	Germany's International Climate Initiative	1.6		Bilateral
Optimising costs and benefits in the promotion of renewable energies	Germany's International Climate Initiative	4.1		Bilateral
Indonesia Low Carbon Growth Project	UK's International Climate Fund	1.5		Bilateral
UK-Indonesia Programme on Climate Change – 705 – 895	UK's International Climate Fund	0.1		Bilateral
Comprehensive Programme on Spatial Planning and Low Carbon Development in Papua	UK's International Climate Fund	0.4		Bilateral
Low Carbon Support to the Ministry of Finance	UK's International Climate Fund	0.9		Bilateral
Programme Design for Spatial Planning and Low Carbon Development in Papua	UK's International Climate Fund	0.2		Bilateral
Promoting Low Carbon Development in Indonesia	UK's International Climate Fund	12.4		Bilateral
Bilateral package of support on forests and climate – 5	Australia's International Forest Carbon Initiative	16.6	6.5	Bilateral
Kalimantan Forests and Climate Partnership (FFCP) – 6	Australia's International Forest Carbon Initiative	43.2	12.2	Bilateral
Sumatra Forest Carbon Partnership – 9	Australia's International Forest Carbon Initiative	27.6		Bilateral

Name of Project	Fund	Funding Approved (USD millions)	Disbursed (USD millions)	Fund Type
Biodiversity Conservation through Preparatory Measures for Avoided Deforestation (REDD) in the Merang Peat Forest Area	Germany's International Climate Initiative	2.2		Bilateral
Forest Management Financed through Emission Certificates in UNESCO World Heritage Site 'Tropical Rainforest Heritage of Sumatra'	German Germany's International Climate Initiative	0.7		Bilateral
Harapan Rainforest - Pilot Restoration of a Degraded Forest Ecosystem on Sumatra	Germany's International Climate Initiative	10.6		Bilateral
Information and Knowledge Management for REDD Pilot Project in the Merang Peat Forest Area	Germany's International Climate Initiative	0.9		Bilateral
Indonesia - 467	Norway's International Climate and Forest Initiative	33.8		Bilateral
Degraded Land Mapping in Indonesia - 646 - 778	UK's International Climate Fund	0.8		Bilateral
Improving Governance of Land Use, Land-Use Change and Forestry (LULUCF) in Indonesia (a) - 807	UK's International Climate Fund	4.1		Bilateral
Indonesia Multistakeholder Forestry Programme II - 668 - 813	UK's International Climate Fund	2.2		Bilateral
Degraded Land Mapping for Kalimantan and Papua Provinces	UK's International Climate Fund	0.7		Bilateral
Biodiversity and Climate Change	Germany's International Climate Initiative	5.2		Bilateral
Building a Marine Protected Area Network Covering the Lesser Sunda Islands Ecoregion	Germany's International Climate Initiative	3.7		Bilateral
Nature conservation concessions to protect tropical rainforests in Indonesia	Germany's International Climate Initiative	11.2		Bilateral

Name of Project	Fund	Funding Approved (USD millions)	Disbursed (USD millions)	Fund Type
Climate Change Mitigation and Species Conservation in the Leuser Ecosystem of Sumatra	Germany's International Climate Initiative	11.3		Bilateral
Rapid Response Facility on Climate Change - (a) - 850	UK's International Climate Fund	0.3		Bilateral
Spatial Planning and Low Carbon Development in Papua - 696 - 872	UK's International Climate Fund	0.2		Bilateral
NWP Water projects	DGIS (Netherlands Government)			Bilateral
Sustainable management of agricultural research and technology dissemination (SMARTD)	World Bank	47.4		Multilateral
Jakarta urgent flood mitigation project	World Bank	139.6		Multilateral
Water resources and irrigation sector management program 2	World Bank	150		Multilateral
Dam operational improvement and safety	World Bank	50		Multilateral