Kementerian PPN/ Bappenas

EXECUTIVE SUMMARY

Atmospheric Climate Projection

Review of National Action Plan for Climate Change Adaptation (RAN-API) 2018

Background

Global climate change has attracted the attention of many people including scientists and policy makers. Ongoing climate change needs to be addressed by understanding the basics, what happens, and knowing the causes and impacts on humans and the environment. Furthermore, steps for adaptation (treatment) and mitigation (mitigation) are needed.

As a form of the Indonesian government's support for climate change, Indonesia contributed to the preparation of the National Communication Report through the United Nations Framework Convention on Climate Change (UNFCCC). With the development of climate change issues occurring on a global and local scale in Southeast Asia, Indonesia then issued a Third National Communication Report (TNC) in 2017. This document is a reference in preparing methods for projecting climate change in Indonesia at this time.

In addition, studies on the impacts of climate change in the Southeast Asia region are increasingly deep with the availability of high resolution climate projection data. This condition will produce many scientific publications with the theme of climate change, impacts and other aspects related to policy. Countries in the Southeast Asia region can formulate climate change adaptation and mitigation strategies based on scientific evidence towards sustainable climate resilience to achieve Sustainable Development Goals (SDG).

Climate change projections in Indonesia use BMKG observation data with improved ensemble models resulting from research collaboration in Southeast Asia (CORDEX-SEA), extreme events and focus on the study of 7 major islands in Indonesia, namely Sumatra Island, Java-Madura-Bali, Kalimantan , Sulawesi, Maluku, Nusa Tenggara and Papua.

The objective of climate projection is to get a picture of Indonesia's climate patterns and produce climate projections with periods of 2020-2035 and 2030-2045. This study is then used as input in the analysis of potential hazards, especially in the water, agriculture and health sectors.

Methods and Models

Indonesia uses an ensemble model with the Intergovernmental Panel on Climate Change (IPCC) scenario that has been agreed upon in the South-East Asia Coordinated Regional Climate Downscaling Experiment (CORDEX-SEA) to project national climate change. The IPCC scenario used in CORDEX-SEA is RCP4.5 Scenario and RCP8.5 Scenario. This is because both scenarios reflect the "business as usual" condition as the lower limit and the worst case scenario as the upper limit. In addition, these two scenarios also consider a rapidly increasing population, land use change and an increasing economy but have an impact on increasing greenhouse gases.

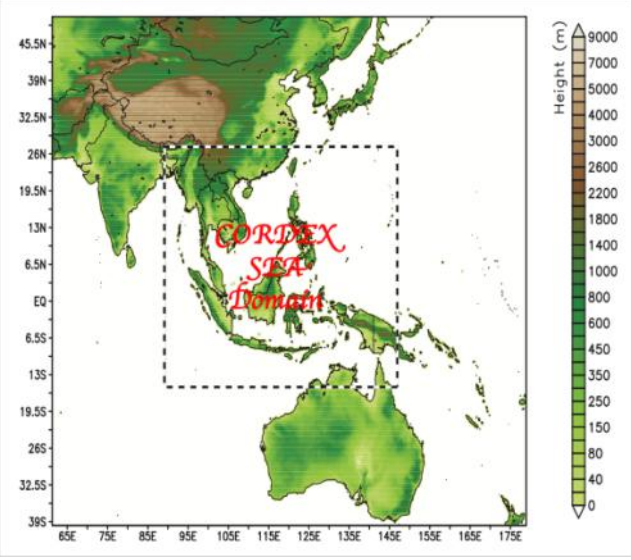


Image Domain location for RegCM simulation for Indonesia in Cordex-SEA activities. The proposed grid resolution is 20 x 20 km

Monthly Rainfall Changes from 2020-2035

RCP4.5 Scenario

The projection of monthly rainfall change with RCP4.5 scenario for the period 2020-2035 shows a decrease in rainfall reaching 2mm / day. This decline occurred in January on the islands of Sumatra, Java-Bali, Nusa Tenggara, Sulawesi and Papua and from May to July on the island of Java to East Nusa Tenggara. In addition to decreasing rainfall, most parts of Indonesia will also experience an increase in rainfall ranging from 1-2.5 mm / day in August and September.

RCP8.5 Scenario

Using the RCP8.5 scenario, most of Indonesia experienced significant variations rainfall changes during year 2020-2035. The decline in rainfall occurred in March in most parts of southern Indonesia, which ranged from 0-2.5 mm / day. In general, this scenario projects Indonesia will have a lower rainfall compared to the RCP4.5 scenario, both in terms of decreasing and increasing rainfall intensity.

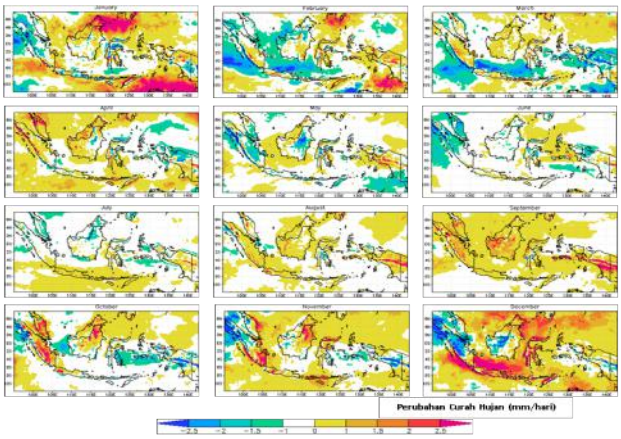
Monthly Rainfall Change Period 2030-2045

RCP4.5 Scenario

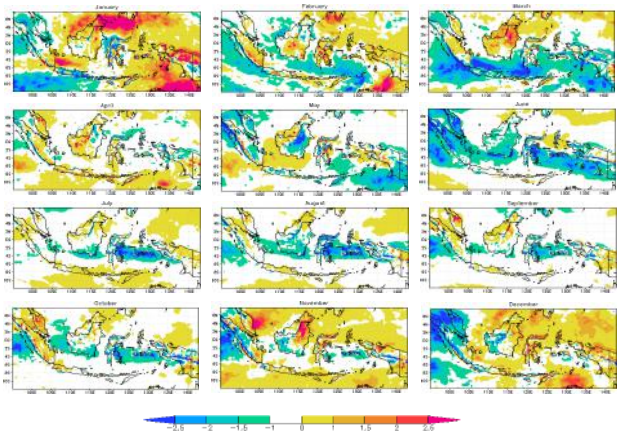
The projection of monthly rainfall changes with RCP4.5 scenario for the period 2030-2045 shows a decrease in rainfall ranging from 1-2.5mm / day in May to August in most parts of Indonesia. This change is relative to the historical period climate data (1990-2005). Likewise, when compared with the short-term RCP4.5 scenario in 2020-2035, the decrease in rainfall is also higher. Overall, this projection shows a drier situation than the projection with RCP4.5 Scenario 2020-2035.

RCP8.5 Scenario

Whereas in the RCP8.5 scenario for the period 2030-2045, January, May to December are dominated by rainfall intensity that varies considerably in most parts of the Indonesian mainland. Whereas in February, March and April is a period where most of Indonesia experienced an increase in rainfall, which varied considerably relative to historical conditions (1990-2005). In addition, it is projected that Indonesia will experience a significant climatological drought compared to the RCP4.5 scenario.



Projected Monthly Rainfall Changes
(RCP4.5 scenario for 2020-2035)



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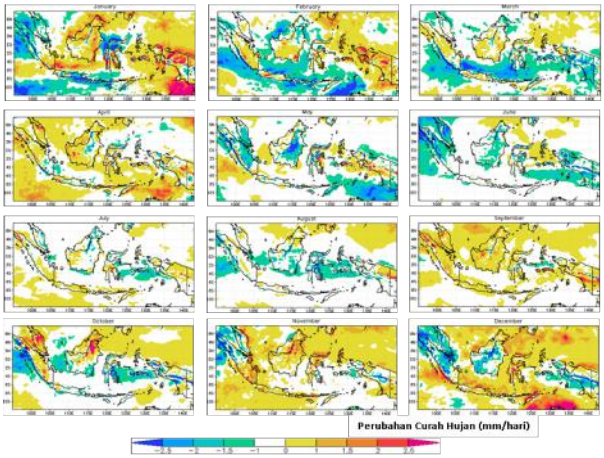
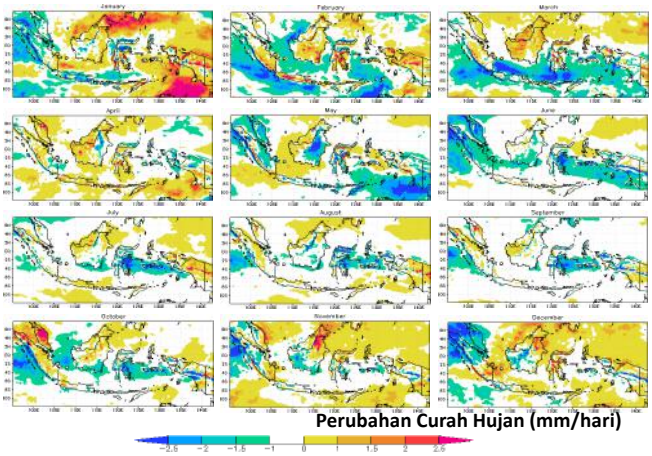


Projected Monthly Rainfall Changes
(RCP4.5 scenario for period 2030-2045)



Projected Monthly Rainfall Changes
(RCP8.5 scenario for the period 2030-2045)

Minimum Temperature Until 2100

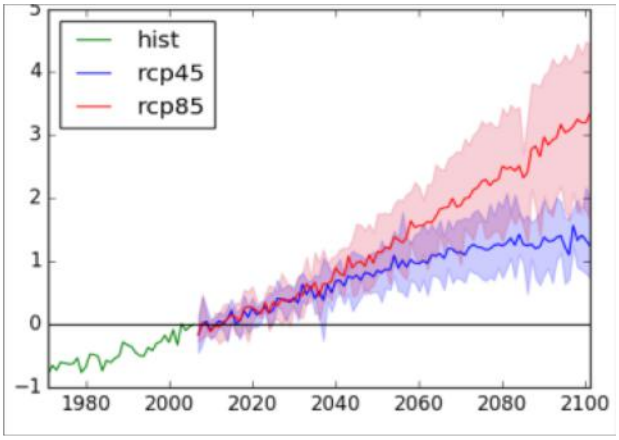
The minimum temperature projection increases consistently for both RCP4.5 and RCP8.5 Scenarios. In general, the minimum temperature changes projected by the two scenarios do not differ significantly until around 2030 but are getting bigger by the end of 2100. With the RCP 4.5 scenario, at the end of the 21st century changes in minimum temperatures are projected to be around 1.5^{0}C at seven big islands in Indonesia.

The models differences in projecting minimum temperatures changes becomes greater along with the further distance from the historical period 1970-2016. However, a larger difference is indicated by projections under the RCP8.5 scenario. As for the RCP4.5 scenario, the change range is not more than 1.5^{0}C for the entire study area.

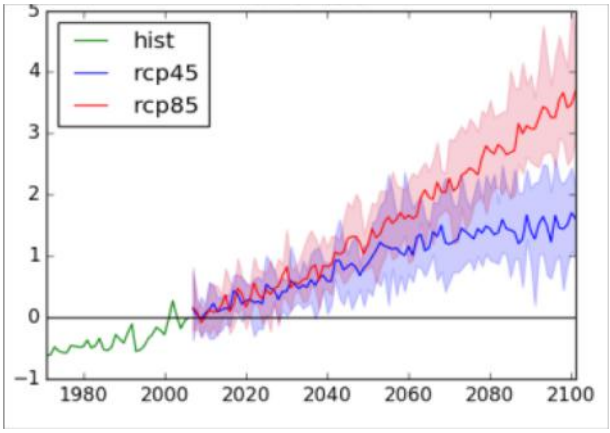
Maximum Temperature Until 2100

Maximum temperature consistently increases, both with RCP4.5 and RCP8.5 scenarios. After around 2070, the maximum temperature projected by the RCP4.5 scenario approaches 1.5^{0}C until the end of the 21st century while the maximum temperature projected by the RCP8.5 scenario increases to around 3.5^{0}C at the end of the 21st century.

This increase is smaller in the 2020-2034 projection period, ie 0.3-1.3^{0}C with RCP4.5 Scenario and 0.5-1.5^{0}C with RCP8.5 Scenario. Whereas in the projection period of 2030-2045, both scenarios project relatively similar increases, ranging from 0.6 to 1.5^{0}C.



Indonesian Minimum Temperature Projection up to 2100



Indonesian Maximum Temperature Projection up to 2100

Potential Implications

Rainfall

1. Water sector: affects the water balance analysis in projecting the danger of flooding, water availability, and drought
2. Agriculture sector: decreases average rice production
3. Coastal sector: influences the process of coastal slope, flooding in coastal environment and changes in sediment supply
4. Marine sector: in this case, the marine sector is more influenced by changes in temperature than rainfall

Temperature

1. Water sector: temperature will also affect the water balance analysis as well as rainfall
2. Agriculture sector: the increase in temperature has resulted in a significant decrease in rice production
3. Marine Sector: increasing frequency of tropical cyclones, extreme storms / waves and increase the potential danger of fishing boat voyages, disappearance or migration of fishing grounds

RAN-API Secretariat
Lippo Kuningan Building, 15th floor
H.R. Rasuna Said No.Kav. B12, South Jakarta
Telephone: 021-8067-9319
Email: admin@sekretariat-ranapi.org
Website: www.sekretariat-ranapi.org

Kementerian PPN/ Bappenas
BMKG
SEKRETARIAT RAN API
USAID DARI RAKYAT AMERIKA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RAN API
www.sekretariat-ranapi.org