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Climate Change Impacts on Indonesia and Opportunities for Partnership

Christi S. Montgomery

CDR, United States Navy

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Abstract

As an island nation, located at or near the equator, Indonesia is also uniquely faced with the daily challenges wrought by an equatorial climate and nearly 55,000 km of coastline. Indonesia is at the proverbial 'ground zero' of the effects of climate change, and is confronted by the delicate balance of an economy, and a population still significantly reliant on agriculture that is sensitive to changes in climate. Considered wholly, this presents a challenge to a newly democratic nation, both in terms of sustaining the health of the population and the economy, and of thwarting the seeds of instability that might arise should Indonesians become maladaptive to a changing climate. The United States Indo-Pacific Command has long been a partner with the Government of Indonesia (GoI) and other international organizations operating in the region to first understand the implications – regionally and locally – of climate change, and then to assist when and where possible in building mutual resiliency for a prosperous future. There are multiple avenues of approach for the consideration of climate change impacts to any global subregion, but the primary focus of this paper is on the anticipated impacts of predicted sea level rise and predicted changes in rainfall patterns affecting the Indonesian archipelago. Specifically, the intent is to identify the potential impacts of increased sea level and modified precipitation patterns on Indonesian agriculture, followed by an assessment of the relative risk to Indonesian food security. As food security is a contributing factor to socio-economic stability in most civilizations, there are broad national security implications if identified risk is not mitigated by the GoI, through investment in agriculture, infrastructure and economic resilience. The Government of Indonesia has devoted, and continues to devote, significant efforts to improving the nation's resiliency to climate change, particularly through emphasis on food security. Rather than approaching a partnership with Indonesia from U.S. centric perspective, the U.S. government, and the U.S. Indo-Pacific Command would best be served by structuring a relationship with Indonesia that allows the U.S. and other regional partners gain advantage from the experience and lessons Indonesia has learned while adapting to climate change.

INTRODUCTION

Indonesia's unique geostrategic situation is shaped by its location in East Asia as well as its vast archipelagic sprawl that is greater in distance from east to west borders than the United States, and encompasses large and richly diverse straits and internal waterways, through which a quarter of all maritime trade flows.¹ As an island nation, located at or near the equator, Indonesia is also uniquely faced with the daily challenges wrought by an equatorial climate and nearly 55,000 km of coastline.² Indonesia is at the proverbial 'ground zero' of the effects of climate change, and is confronted by the delicate balance of an economy, and a population still significantly reliant on agriculture that is sensitive to changes in climate. Considered wholly, this presents a challenge to a newly democratic nation, both in terms of sustaining the health of the population and the economy, and of thwarting the seeds of instability that might arise should Indonesians become maladaptive to a changing climate. The United States Indo-Pacific Command has long been a partner with the Government of Indonesia (GoI) and other international organizations operating in the region to first understand the implications – regionally and locally – of climate change, and then to assist when and where possible in building mutual resiliency for a prosperous future. Admiral Sam Locklear, former Commander of United States Pacific Command, summarized the situation eloquently, "Today we find ourselves in a period of unprecedented global change – change that is offering many new opportunities, but also introducing significant emerging challenges to the global security environment. Foremost among these emerging challenges are the long-term security implications of climate change, particularly in the vast and vulnerable Asia-Pacific region, where the nexus of humanity and the effects of climate change are expected to be most profound."

¹ John Roosa. "The Straits of Malacca: Gateway or Gauntlet?," *University of Toronto Quarterly* 74, no. 1 (2004): 528-530, accessed 25 Oct 2018, <https://muse.jhu.edu/>.

² U.S. CIA, "World Fact Book," accessed 17 Oct 2018, <https://www.cia.gov/library/publications/the-world-factbook/geos/id.html>.

There are multiple avenues of approach for the consideration of climate change impacts to any global subregion, but the primary focus of this paper is on the anticipated impacts of predicted sea level rise and predicted changes in rainfall patterns affecting the Indonesian archipelago. Specifically, the intent is to identify the potential impacts of increased sea level and modified precipitation patterns on Indonesian agriculture, followed by an assessment of the relative risk to Indonesian food security. As food security is a contributing factor to socio-economic stability in most civilizations, there are broad national security implications if identified risk is not mitigated by the GoI, through investment in agriculture, infrastructure and economic resilience. Initial perceptions from English-language research formed a perception that the Indonesian government was ill prepared for adaption to climate change, but further review of Indonesian-language material as well as consultation with an Indonesian colleague modified both perceptions, and understanding of the efforts the GoI has devoted, and continues to devote, to improving the nation's resiliency to climate change, particularly through emphasis on food security. Rather than approaching a partnership with Indonesia from U.S. centric perspective, the U.S. government, and the U.S. Indo-Pacific Command would best be served by structuring a relationship with Indonesia that allows the U.S. and other regional partners gain advantage from the experience and lessons Indonesia has learned while adapting to climate change.

MAIN BODY

On September 25th, 2018, UN Secretary-General Antonio Guterres stated “Our future is at stake. Nothing is immune – climate change affects everything, and everything can be undermined.”³ Indonesia will experience many environmental impacts from climate change, but for the purposes of this research, concentration will be primarily on the threats associated with sea level rise, and changes in the rainfall patterns across the Indonesian archipelago. Sea level rise threatens to erase baseline territorial islands that establish Indonesia’s Exclusive Economic Zone, exacerbates catastrophic flooding in large urban cities, and inundates critical coastal agricultural zones necessary for the production of domestic rice and corn. Changes in rainfall patterns will likely shorten or displace the onset of growing seasons, contribute to dry season drought conditions, and increase the likelihood of damaging flooding during raining seasons. These changes are problematic as they place the lives, livelihoods and health of millions of Indonesian citizens at risk. Consistent, unmitigated threat to lives, livelihood and health can contribute to political instability and threats to national security. Despite the overwhelming challenges to be faced, the Indonesian government has marched out, commissioning additional studies to understand the forecasted impacts and risks of climate change, and creating whole of government development goals to mitigate risks and strive for domestic food security and sufficiency. Contrary to most U.S.-centric approaches, research suggests that the knowledge and experience sharing should flow from Indonesia to the U.S. and other partner nations in the region. Indonesia is on the front line of climate change adaptation and the experiences and lessons learned from policy, planning and execution on this front would greatly benefit not only the United States, but other nations in Indo-Pacific region.

³ Antonio Guterres, UN Secretary General (@antonioguterres), “Climate Change poses an existential threat; the wonders of new technologies may bring serious dangers. Today I spoke to world leaders about these two grave and urgent challenges,” Twitter, 25 Sept 2018, 1:41 p.m., bit.ly/2NDzi8s

To evaluate the potential impacts of climate change on the citizens of Indonesia, it is critical to establish a contextual understanding of population distribution and migration. As of July 2017, Indonesia's population was 264 Million people, which makes Indonesia the fourth most populous nation in the world.^{4,5} Twenty percent (20%) of Indonesia's population, some 51.8 Million, is concentrated in 5 major cities, including Jakarta, Surabaya, Bandung, Medan and Semarang.⁶ Four of the five most populous urban cities in Indonesia are located directly on the coast, or within 12 miles of the coast. Only Bandung is located inland in Central Java. As of 2007, 16% of the population in Indonesia was located within 10 meters of the average sea level, which accounts for roughly 42 million people.⁷ For comparison, the population of the state of California according to the 2017 U.S. Census Bureau census was 39.5 million people. According to the Intergovernmental Panel on Climate Change Fifth Assessment report, "due to projected sea level rise, a million or so people along the coasts of South and Southeast Asia will likely be at risk from flooding."

The spatial distribution of Indonesia's population is important to consider. Intra-national migrations trends are likely to exacerbate socio-economic tensions in at-risk urban areas, as population density increases in major Indonesian coastal cities. An analysis by the World Bank indicates that Southeast Asia urbanization is rapidly growing. Specifically, "Indonesia has the second-largest urban population in East Asia after China – 94 million people in 2010, an increase of 28 million since 2000. The country's urban population density is among the highest in the

⁴ U.S. CIA, "World Fact Book," accessed 17 Oct 2018, <https://www.cia.gov/library/publications/the-world-factbook/geos/id.html>.

⁵ United Nations Development Program, "Human Development Indicators: Indonesia," accessed 17 Oct 2018, <http://hdr.undp.org/en/countries/profiles/IDN#>.

⁶ World Atlas, "Biggest Cities in Indonesia," accessed 28 Sept 2018, <https://www.worldatlas.com/articles/biggest-cities-in-indonesia.html>.

⁷ Gordon McGranahan, Deborah Balk and Bridget Anderson, "The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones," *Journal of Environment and Urbanization* 19, no. 1, (April 2007), <http://journals.sagepub.com/doi/pdf/10.1177/0956247807076960>

region which increased sharply between 2000 and 2010, from 7,400 people per square kilometer to 9,400 – the largest increase in urban population density of any country in the region.”⁸

The strong trend of rural migration to large urban centers in recent past⁹ has placed a considerable burden on the socio-economic support structures in these urban areas. Internal to Indonesia, the path of migration is primarily from rural areas to urban areas.¹⁰ “There are indications that loss of urban land to rising sea levels has resulted in displaced populations and intra-urban migration. The populations that move in these instances are poor and end up living in underserved peri-urban areas.”¹¹ Lack of habitable living space has seen some impoverished members of the migratory population establishing temporary habitation in volatile environmental areas including river beds and banks that frequently flood.¹²

Additionally, over the past three decades, the net national migration rate for Indonesia has been negative, meaning more Indonesians are leaving the country for opportunities abroad, than are arriving annually.¹³ More and more Indonesian citizens are migrating to other countries for work, education and additional economic opportunity. Low-skilled workers comprised the majority of immigrants to nations like Kuwait, Saudi Arabia and Malaysia, whereas students and skilled workers comprised the majority of immigrants to Australia, Singapore and the United States.¹⁴ Many of these low-skilled workers, migrating both to urban centers and internationally,

⁸ World Bank, "Urban Expansion in East Asia – Indonesia," accessed September 28, 2018, <http://www.worldbank.org/en/news/feature/2015/01/26/urban-expansion-in-east-asia-indonesia>.

⁹ A. Ananta, and E.V. Arifin. "Emerging Patterns of Indonesia's International Migration," *Malaysian Journal of Economic Studies* 51, pp 29-41, 2015.

¹⁰ United Nations Education, Scientific and Cultural Organization, "Overview of Internal Migration in Indonesia," 2016, accessed 25 Oct 2018, <https://bangkok.unesco.org/sites/default/files/assets/article/Social%20and%20Human%20Sciences/publications/Brief%203%20-%20Country%20Brief%20-%20Indonesia.pdf>.

¹¹ United Nations International Children's Emergency Fund, "The impacts of climate change on nutrition and education affecting children in Indonesia," UNICEF East Asia, Bangkok, 2011, p. 6.

¹² Michael Kimmelman, "Jakarta is Sinking So Fast It Could End Up Underwater," *New York Times*, 21 Dec 2017, accessed 25 Oct 2018, <https://www.nytimes.com/interactive/2017/12/21/world/asia/jakarta-sinking-climate.html>.

¹³ United Nations, Department of Economic and Social Affairs, "Migration Profile: Indonesia," accessed 25 October 2018, <https://esa.un.org/migmgmprofiles/indicators/files/Indonesia.pdf>.

¹⁴ Ibid

are from rural, agricultural communities where the work is labor-intensive and often low-paying. A study completed in 2009 found that the population of Indonesians employed in agriculture decreased by 30% from 1980 to 2009.¹⁵

The pressures of increasing population density and migration are often exacerbated by the natural disaster threats of earthquakes, tsunamis, volcanos and flooding that dominate the Indonesian archipelago. These threats exist primarily because of geophysical and terrain features surrounding and within the archipelagic country, and persist independent of any climate change induced impacts. The country's predominantly equatorial location spares it from direct landfall of tropical cyclones like those experienced in neighboring Philippines,¹⁶ but the impacts of secondary cyclone genesis and extreme rainfall from nearby tropical cyclones are serious threats, predominantly from December through April, with maximum intensity in February.¹⁷ The GoI, in collaboration with Australia and the World Meteorological Organization, established a Tropical Cyclone Warning Center, operating under Badan Meteorologi Klimatologi dan Geofisika (BMKG, or the Indonesian Agency for Meteorology, Climatology and Geophysics in English). The establishment and reputation of the Tropical Cyclone Warning Center in the international community is in line with the development goals of the GoI, and is a positive example of international support for the development of Indonesian infrastructure and governance that will enable climate resiliency.

The national disaster threats addressed above, added to the anticipated threats of climate change, present a significant challenge to Indonesia's domestic agricultural industry and ultimately, Indonesian food security. Indonesia's agricultural industry contributes roughly 14%

¹⁵ Dyah R. Panuju, Kei Mizuno, and Bambang H. Trisasongko. "The dynamics of rice production in Indonesia 1961-2009," *Journal of the Saudi Society of Agricultural Sciences* 34, no. 12 (2013), <https://www.sciencedirect.com/science/article/pii/S1658077X12000136>.

¹⁶ Indonesian Tropical Cyclone Warning Center, "TCWC Jakarta," 2017, accessed 28 Sept 2018, <http://meteo.bmkg.go.id/siklon/learn/06/en>.

¹⁷ Ibid

to the nation's Gross Domestic Product (GDP), which was \$1 Trillion in 2017.¹⁸ A critical component of that industry, and food security in Indonesia, is the sustained production of rice. Indonesia is the world's third largest rice producer and recent agricultural and economic policies indicate that production goals remain centered around "self-sufficiency" and domestic consumption rather than export trade.¹⁹ Indonesia's production of rice generally meets the demands of population consumption, but is insufficient to achieve and maintain a desired reserve level between 1.5 and 2 million tons, requiring the GoI to import near 1 million tons of rice annually.²⁰

To supplement the consumption of domestic rice crops, Indonesia imports agricultural commodities from a number of nations, including China, Australia, and the United States. According to the U.S. Department of Agriculture (USDA) Foreign Agriculture Service (FAS) estimates from 2013, "the United States is [was] the leading agricultural supplier to Indonesia, with a 17 percent market share,"²¹ and the U.S. agricultural exports to Indonesia in 2017 totaled \$2.9 Billion.²² A consistent growth in the consumption of wheat in Indonesia, both for humans and grain feed for livestock, has been coupled with a heavy reliance on wheat imports since Indonesia's climate is not suitable for wheat yield. According to the USDA FAS Global Agriculture Information Network's 2018 report on Indonesia, the country is "fully reliant on wheat imports to fill demand."²³ Analysis of anticipated 2018 wheat import plans show that

¹⁸ USDA FAS Report, "Indonesia's long-term prospects for US agricultural exports," Jan 2013, accessed 04 Oct 2018, <https://www.fas.usda.gov/data/indonesia-long-term-prospects-us-agricultural-exports>.

¹⁹ Ibid

²⁰ USDA FAS GAIN Report, "Indonesia Grain and Feed Annual Report 2018" March 2018, accessed 05 Oct 2018, https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual_Jakarta_Indonesia_3-29-2018.pdf.

²¹ USDA FAS Report, "Indonesia's long-term prospects for US agricultural exports," Jan 2013, accessed 04 Oct 2018, <https://www.fas.usda.gov/data/indonesia-long-term-prospects-us-agricultural-exports>.

²² USDA FAS, "Indonesia" n.d., accessed 25 Oct 2018, <https://www.fas.usda.gov/regions/indonesia>.

²³ USDA FAS GAIN Report, "Indonesia Grain and Feed Annual Report 2018," March 2018, accessed 05 Oct 2018, https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual_Jakarta_Indonesia_3-29-2018.pdf.

Indonesia is likely to overtake Egypt as the number one wheat importer in the world.²⁴ Given the recent identification of China and Russia as peer adversaries in the U.S. National Defense Strategy,²⁵ China's global engagement strategy as outlined in the Belt and Road Initiative,²⁶ and Russia's dominance as a global exporter of wheat,²⁷ it will be important for the U.S. and Australia to ensure strong trade ties with Indonesia in order to ensure continued access to economic demand in the commodities market.

Susceptibility of the rice harvest to variations in rainfall across the country, coupled with high grain and feed demand from persistent human and livestock population growth has increased the GoI Ministry of Agriculture's efforts to encourage corn crops across all islands in the archipelago, especially during the second growing season in Indonesia, typically from April through June. The consumption of corn, however, is primarily relegated to animal feed, as human consumption of corn in Indonesia has fallen by a rate of 6.33% per year.²⁸

The majority of Indonesian rice is grown in Java (50-60%), South Sumatra (20%) and South Sulawesi (12%).^{29,30} The success of the semi-annual rice harvest seasons is highly dependent upon rainfall and groundwater supplied irrigation. Variation in the start, duration and intensity of the rainy season in Indonesia strongly influences the harvest capacity across all of Indonesia's growing regions. An understanding of the Intergovernmental Panel on Climate

²⁴ Financial Times, "Indonesia set to overtake Egypt as world's largest wheat importer," April 2018, accessed 25 October 2018, <https://www.ft.com/content/a6545786-0da8-11e8-8eb7-42f857ea9f09>.

²⁵ U.S. Department of Defense, "Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge," 19 Jan 2018, accessed 25 Oct 2018, <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>.

²⁶ Shah Suraj Bharat, "China's Belt and Road Initiative and Indonesia's financial security," 01 Oct 2018, accessed 24 Oct 2018, <http://www.thejakartapost.com/academia/2018/10/01/chinas-belt-and-road-initiative-and-indonesias-financial-security.html>.

²⁷ <https://apps.fas.usda.gov/psdonline/circulars/grain.pdf>

²⁸ USDA FAS Report, "Indonesia Grain and Feed Annual Report 2018," 01 Apr 2015, accessed 05 Oct 2018, https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual_Jakarta_Indonesia_4-1-2015.pdf.

²⁹ Ibid

³⁰ Indonesia Investments, "Rice," Jun 2017, accessed 05 Oct 2018, <https://www.indonesia-investments.com/business/commodities/rice/item183>.

Change's Fifth Assessment Report provides evidence that climate change in Indonesia will be most landward evident in the consistent rise of sea level, and increased variation in the start, duration and intensity of rainfall.

In the case of rainfall variation, the report broadly summarizes a future in which "extreme precipitation events over...wet tropical regions will very likely become more intense and more frequent."³¹ Indonesia will experience an increase in the amount of annual rainfall, but that rain will occur over fewer days of the year, which will increase the risk of flooding when rain occurs, and will increase the likelihood of drought conditions during prolonged dry periods.³²

Additionally, changes to the global heat distribution in the ocean and atmosphere will cause significant changes to the onset and termination date of the rainy season across the nation – but most anomalous in regions and islands that dominate agricultural production³³ - making it more difficult to estimate the best windows for planting and harvesting crops. Drought strongly correlated to El Nino/Southern Oscillation (ENSO) events in the 1990s and 2000s resulted in significant loss of agriculture, averaging 48 thousand hectares of harvest failure per event.³⁴

On the matter of sea level rise, the trend is not looking good for Indonesia. Global mean sea-level rose 0.19m (0.62 ft) over the period of 1901-2010, and the projections by the IPCC Fifth Assessment Report is for an additional global sea-level rise of 1 meter (3.28 feet) by 2100 [baseline year = 2005].³⁵ The Fourth Assessment Report, completed in 2007, predicted sea-level rise from 2007 levels by 31 mm (1.2 inches) by 2017 (over period of 10 years – average of

³¹ Intergovernmental Panel on Climate Change (IPCC), "5th Assessment Report: Climate Change 2014 Synthesis Report Summary for Policymakers," 2014, accessed 25 Oct 2018, http://ar5-syr.ipcc.ch/topic_futurechanges.php.

³² Pelangi Energi Abadi Citra Enviro (PEACE), "Indonesia and Climate Change: Current Status and Policies," 2007, accessed 25 Oct 2018,

https://siteresources.worldbank.org/INTINDONESIA/Resources/Environment/ClimateChange_Full_EN.pdf.

³³ Ibid

³⁴ Ibid

³⁵ IPCC, "5th Assessment Report: Climate Change 2014 Synthesis Report Summary for Policymakers," 2014, accessed 25 Oct 2018, http://ar5-syr.ipcc.ch/topic_futurechanges.php.

3.1 mm per year).³⁶ Projections for the experience of localized sea-level rise for the seas surrounding Indonesia – Jakarta Bay as an example – are higher, as many coastal towns and cities have also experienced significant subsidence accompanying sea-level rise.³⁷

“Sea level rise is projected to decrease total arable areas and thus food supply in many parts of Asia.”³⁸ This statement is particularly troublesome for Indonesia, as the areas predominantly used for agricultural production – Java, South Sumatra, and South Suluwesi – are low-lying coastal areas that are particularly vulnerable to inundation from sea-level rise. Malley’s analysis of impacts in Indonesia in 2011 concluded that, “rising sea levels alone threaten the habitability of major cities, the productivity of key rice-growing regions, and even the existence of islands on which its international borders depend.”³⁹ Some rural districts in western Java could experience a loss of up to 95% of local rice production due to sea water intrusion,⁴⁰ and the livelihood of 26 million Indonesians (as of 2014) who earn their living as farmers, fishermen and fish farmers is at risk.⁴¹

Indonesia is the largest island-formed nation in the world with a “coastline of more than 54,000 kilometers.”⁴² A predicted sea level rise of 1 meter could potentially submerge 2000 of Indonesia’s 17,000 islands.⁴³ The International Institute for Economy and Development (IIED) study indicated that 8 of 92 small islands that serve as Indonesia’s territorial baseline were “very

³⁶ IPCC, “4th Assessment Report: Summary for Policy Makers,” 2007, accessed 25 Oct 2018, https://www.ipcc.ch/publications_and_data/ar4/wg1/en/spm.html.

³⁷ Michael Kimmelman, “Jakarta is Sinking So Fast It Could End Up Underwater,” *New York Times*, 21 Dec 2017, accessed 25 Oct 2018, <https://www.nytimes.com/interactive/2017/12/21/world/asia/jakarta-sinking-climate.html>.

³⁸ IPCC, “Climate Change 2014 Synthesis Report Summary for Policymakers,” 2014, accessed 25 Oct 2018, http://ar5-syr.ipcc.ch/topic_futurechanges.php.

³⁹ Michael S. Malley, “Indonesia,” in *Climate Change and National Security* (Washington, DC: Georgetown University Press, 2011).

⁴⁰ Pelangi Energi Abadi Citra Enviro (PEACE), “Indonesia and Climate Change: Current Status and Policies,” 2007, accessed 25 Oct 2018,

https://siteresources.worldbank.org/INTINDONESIA/Resources/Environment/ClimateChange_Full_EN.pdf.

⁴¹ RPJMN Book II, Chapter 10, pg 10-1 (“Rencana Pembangunan Jangka Menengah Nasional”)

⁴² Michael S. Malley, “Indonesia,” in *Climate Change and National Security* (Washington, DC: Georgetown University Press, 2011).

⁴³ Ibid

vulnerable” to rising sea levels.⁴⁴ If these 8 islands are lost to sea level rise, the resultant change to Indonesia’s baseline determination could mean a decrease in Indonesia’s Exclusive Economic Zone and Territorial Waters, with consequential impacts on associated resources.

Of critical importance to Indonesia is the mounting evidence that instability borne of maladaptation to climate change is often a key factor influencing changes to national security. Review of the Fragile States Index for 2018, produced by the Fund for Peace, finds that Indonesia is categorized under “Elevated Warning.”⁴⁵ In 2010, the Council for Security Cooperation in the Asia Pacific distributed a memorandum to all members remarking on the projected impacts of climate change outlined in the IPCC Fourth Assessment Report and calling attention to the “security issue of concern is an increased risk of significant social, economic or political instability in one or more countries in the region.” Highlighting the primary drivers of climate change-induced risk as have been discussed in this paper.⁴⁶

In 2016, the United States passed the Global Food Security Act as Public Law 114-195.⁴⁷ The law quotes a January 2014 Worldwide Threat Assessment of the US Intelligence community that credits food insecurity as a destabilizing force in fragile states, specifically, “food and nutrition insecurity in weakly governed countries might also provide opportunities for insurgent groups to capitalize on poor conditions, exploit international food aid, and discredit governments

⁴⁴ Gordon McGranahan, Deborah Balk and Bridget Anderson, “The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones,” *Journal of Environment and Urbanization* 19, no. 1, (April 2007), <http://journals.sagepub.com/doi/pdf/10.1177/0956247807076960>

⁴⁵ Fund for Peace, “Fragile State Index 2018” (<http://fundforpeace.org/fsi/wp-content/uploads/2018/04/951181805-Fragile-States-Index-Annual-Report-2018.pdf>)

⁴⁶ The Council for Security Cooperation in the Asia Pacific, “The Security Implications of Climate Change,” June 2010, accessed 25 Oct 2018, <http://www.cscap.org/uploads/docs/Memorandums/CSCAP%20Memorandum%20No%2015%20-%20The%20security%20implications%20of%20climate%20change.pdf>.

⁴⁷ 114th Congress, “Public Law 114-195,” 20 Jul 2016, accessed 24 Oct 2018, <https://www.gpo.gov/fdsys/pkg/PLAW-114publ195/html/PLAW-114publ195.htm>

for their inability to address basic needs.”⁴⁸ The United States recognizes the importance of global food security to US National security, and explicitly states that US foreign investment is “...in the national interest of the United States to promote global food security, resilience, and nutrition...”⁴⁹

Findings from 2007 Center for Naval Analysis Report - “Climate change acts as a threat multiplier for instability in some of the most volatile regions of the world.”⁵⁰ At the time the CNA analysis was completed, there was little correlational scientific evidence of a connection between climate change, societal stability and conflict. However, recent interdisciplinary work by climate and social scientists has gone far in establishing a statistically significant correlation between climate induced societal instability and conflict. Hsing and Marshall in found “consistent support for a causal association between climatological changes and various conflict outcomes, at spatial scales ranging from individual buildings to the entire globe and at temporal scales ranging from an anomalous hour to an anomalous millennium.”⁵¹ Given the overwhelming scientific evidence of climate change and the more recently congealing evidence that climate change can induce risk of conflict, it is a wonder to

With foresight and ambition, the GoI has taken encouraging steps to understand, plan for and address the predicted environmental impacts wrought by climate change. Soon after President Widodo was elected in 2014, the GoI released an extraordinarily comprehensive development plan that incorporates targets and strategies for achieving and maintaining domestic food security for Indonesia. The original plan, called the “Nawa Cita,” incorporated nine

⁴⁸ DNI, “Worldwide Threat Assessment of the US Intelligence Community,” (https://www.dni.gov/files/documents/Intelligence%20Reports/2014%20WWTA%20%20SFR_SSCI_29_Jan.pdf), pg. 10

⁴⁹ 114th Congress, “Public Law 114-195,” 20 Jul 2016, accessed 24 Oct 2018, <https://www.gpo.gov/fdsys/pkg/PLAW-114publ195/html/PLAW-114publ195.htm>

⁵⁰ CNA “National Security and the Threat of Climate Change”, 2007, accessed 24 Oct 2018, https://www.cna.org/cna_files/pdf/national%20security%20and%20the%20threat%20of%20climate%20change.pdf.

⁵¹ Solomon M. Hsiang · Marshall Burke, “Climate, conflict, and social stability: what does the evidence say?,” Jul 2013, accessed 24 Oct 2018, https://gspp.berkeley.edu/assets/uploads/research/pdf/Hsiang_and_Burke_2013.pdf.

development goals for Indonesia.⁵² The follow-on plan, the Rencana Pembangunan Jangka Menengah Nasional (RPJMN, or National Medium Term Development Plan in English) 2015-2019⁵³ incorporates all nine development goals from the Nawa Cita, and further provides expansive and detailed targets and strategies for the accomplishment of the development goals. Throughout the RPJMN, there are development goals pertaining to all aspects of Indonesian society. Pertinent to the subjects of climate change and food security, Nawa Cita development goal number seven, reflected in RPJMN Chapter 6.7, is “Realize economic independence by moving the strategic sector on domestic economy.” In this chapter, the GoI sets the vision and national priorities on realizing food security, and building resilience to climate change. Chapter 10 of the RPJMN encompasses the Field Development Manual for the Management of Natural Resources and the Environment. In this chapter, the GoI provided an assessment of the issues affecting the ability to achieve food security and implement resiliency adaptations to mitigate negative impacts of climate change; additionally, it provides guidance for various regions and government ministries to use when establishing policy and budgets.

At a Food Security Summit in February 2015, President Joko Widodo announced that his government was to embark on a three-year program to become food self-sufficient.⁵⁴ This program, called “Peran Tentara Nasional Indonesia Dalam Ketahanan Pangan” (translated: “The Role of Indonesian National Military in Food Security”) involved the establishment of a Memorandum of Understanding between the Tentara Nasional Indonesia (Indonesian National Military) and the Ministry of Agriculture. Publications and statements from members of the

⁵² United Nations Development Program, “Converging Development Agendas: ‘Nawa Cita,’ ‘RPJMN,’ and SDGs,” Nov 2015, Accessed 24 Oct 2018, <http://www.id.undp.org/content/dam/indonesia/2015/doc/publication/ConvFinal-En.pdf>.

⁵³ RPJMN “National Medium Term Development Plan 2015-2019,” 2014.

⁵⁴ Emirza Adi Syailendra, “In the Name of Food Security.” *Inside Indonesia*, 9 Jan 2017, accessed 02 October 2018, <http://www.insideindonesia.org/in-the-name-of-food-security>.

TNI⁵⁵ and the Chief of TNI, Gatot Nurmantyo, indicate support for the initiative with the premise that food security supports national security and national sovereignty.

In addition to national initiatives, the GoI has been increasingly engaged with regional and international partners that can assist Indonesia with achieving its development vision. Regionally, the importance of rice for human consumption across Southeast Asia led to the piloting and ratification of the ASEAN Plus Three Emergency Rice Reserve (APTERR). Agreed to in a 2011 convention, and ratified by all parties in 2012,⁵⁶ APTERR's goal is to maintain an approximate 787,000 metric ton rice reserve to be distributed to ASEAN Plus Three countries in need of humanitarian assistance due to disasters and/or unaddressed poverty. Nations party to this agreement include Myanmar, Indonesia, Laos, Brunei, Cambodia, Malaysia, Philippines, Singapore, Thailand, Vietnam, China, Japan and the Republic of Korea (South Korea).

Internationally, the GoI and its various ministries are closely integrated with the development organizations under the umbrella of the United Nations. The United Nations Fund for South-South Cooperation was established in December 1995 to encourage economic and technical cooperation of developing nations. In September 2015, China pledged \$3.1 Billion to finance the South-South Cooperation Fund on Climate Change.⁵⁷

The United Nations Food and Agriculture Organization (UN FAO) has been engaged in Indonesia since 1978. Recently, in conjunction with the Indonesian Ministry of Agriculture and the GoI, UN FAO released the Country Programming Framework 2016-2020.⁵⁸ The number one priority is "Increased resilience of livelihoods to the effects of climate change, recurrent disasters and emerging pandemic threats," with the sub-goal of "Community resilience to the effects of

⁵⁵ David Suardi, Maj., "Peran TNI Dalam Ketahanan Pangan," Hazairin Media Center, July 18, 2017, accessed 03 Oct 2018, <http://hazairinmc.com/2017/07/18/peran-tni-dalam-ketahanan-pangan/>.

⁵⁶ APTERR (<https://www.apterr.org/>) accessed 05 Oct 2018 (CLEAN UP REFERENCE)

⁵⁷ <https://earthjournalism.net/stories/china-would-facilitate-south-south-cooperation-on-climate-change-as-third-party-said-former-minister-xie-zhenhua>

⁵⁸ UN FAO Country Programming Framework 2016-2020 (<http://www.fao.org/3/17907EN/i7907en.pdf>)

climate change.” The UN FAO and GoI expect funding requirements for this priority to cost \$55.93 million, of which the Government of Indonesia will contribute 40%.

A United Nation Development Program study completed in 2015⁵⁹ found a close tie between the RPJMN development goals and the global UNDP Sustainable Development Goals. Both have been incorporated in the United Nations Partnership for Development Framework 2016 – 2020 (UNPDF) established between the United Nations and the GoI, which guides UN support to, and investment in Indonesia through 2020.⁶⁰

The United States continues to be a contributing partner with Indonesian, providing \$226.5 million in U.S. foreign aid to Indonesia in 2016, second only to the Philippines for foreign aid contributions in the East Asia and Oceania region for the year.⁶¹ The U.S. Agency for International Development reports \$157 million dollars invested in Indonesia in fiscal year 2016 in 36 sectors of development across Indonesia, the largest sector investment, \$38 million, was in General Environmental Protection. The same database identifies the U.S. Department of Defense as a top partner, contributing \$37 million in 2016, with the largest amount going to “Global Train & Equip Program - Communications for Maritime Counter Terrorism Operations”, and \$2.4 million for “DOD - International Military Education & Training (IMET) Program/ Deliveries.”⁶² \$500K for “Humanitarian and Civic Assistance - Engineering. Exercise COOPERATION AFLOAT READINESS & TRAINING-Indonesia 2016 Eng Civic Action Proj (CARAT-ID 16). The program is run through the Department of Defense's Overseas Humanitarian, Disaster and Civic Aid (OHDCA).”

⁵⁹ UNDP, “Converging Development Agendas: ‘Nawa Cita,’ ‘RPJMN,’ and SDGs,” Nov 2015, Accessed 24 Oct 2018, <http://www.id.undp.org/content/dam/indonesia/2015/doc/publication/ConvFinal-En.pdf>.

⁶⁰ UNDP, “United Nations Partnership for Development Framework 2016-2020,” n.d., accessed 25 Oct 2018, <http://www.un.or.id/what-we-do/partnership-for-development-unpdf>.

⁶¹ U.S. Agency for International Development, “Foreign Aid Explorer – Foreign Aid by Country,” accessed 25 Oct 2018, https://explorer.usaid.gov/cd/IDN?fiscal_year=2016&measure=Obligations.

⁶² Ibid

Of special importance to assisting with Indonesia's food security and climate resilience is USAID's Adapt Asia Pacific program. According to USAID's website, the "program helps countries gain access to international climate adaptation funding so they can enhance climate resiliency," but the site is sparsely populated with information on projects and engagement initiatives. While \$226.5 million may seem like an extraordinary amount of foreign aid for any country, it is important to note that this amount is less than each the past 20 years' worth of fiscal year contributions with the exception of 2009. Top partners in U.S. engagement are USAID and the U.S. Department of Defense, with the U.S. Department of State contributing less than \$11 million.

CONCLUSIONS and RECOMMENDATIONS

Climate change presents a threat to the citizens of Indonesia. Sea level rise threatens to erase baseline territorial islands that establish Indonesia's Exclusive Economic Zone, exacerbates catastrophic flooding in large urban cities, and inundates critical coastal agricultural zones necessary for the production of domestic rice and corn. Changes in rainfall patterns will likely shorten or displace the onset of growing seasons, contribute to dry season drought conditions, and increase the likelihood of damaging flooding during raining seasons. These changes are problematic as they place the lives, livelihoods and health of millions of Indonesian citizens at risk. Consistent, unmitigated threat to lives, livelihood and health can contribute to political instability and threats to national security. Despite the overwhelming challenges to be faced, the Indonesian government has marched out, commissioning additional studies to understand the forecasted impacts and risks of climate change, and creating whole of government development goals to mitigate risks and strive for domestic food security and sufficiency. As food security is a contributing factor to socio-economic stability in most civilizations, there are broad national security implications if identified risk is not mitigated by the GoI, through investment in

agriculture, infrastructure and economic resilience. Initial perceptions from English-language research formed a perception that the Indonesian government was ill prepared for adaption to climate change, but further review of Indonesian-language material as well as consultation with an Indonesian colleague modified both perceptions, and understanding of the efforts the GoI has devoted, and continues to devote, to improving the nation's resiliency to climate change, particularly through emphasis on food security. Rather than approaching a partnership with Indonesia from U.S. centric perspective, the U.S. government, and the U.S. Indo-Pacific Command would best be served by structuring a relationship with Indonesia that allows the U.S. and other regional partners gain advantage from the experience and lessons Indonesia has learned while adapting to climate change. The U.S. Agency for International Development and the U.S. Department of Defense, due to long standing relationships building in the region, have a unique opportunity to support an Indonesian lead for spreading the message of climate change resilience in the region. By taking a supportive 'back-seat' and encouraging Indonesian leadership, the U.S. will continue to strengthen ties with Indonesia.

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