



Boiling Point

One of the most vulnerable regions to climate change is witnessing the world's biggest jump in greenhouse gas emissions

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The Blue Dragon, a small riverfront eatery in Hoi An, Vietnam, serves morsels of local trivia to tourists along with \$2 plates of crisp spring rolls and succulent noodles. On its damp-stained walls, the Blue Dragon's owner, Nam, marks the level of annual floods that submerge this popular UNESCO World Heritage town renowned for its bright-yellow-painted buildings.

Last November, days before presidents and prime ministers arrived in nearby Da Nang for a meeting of the Asia Pacific Economic Cooperation forum, the water level at the Blue Dragon rose to 1.6 meters (5.25 feet) when typhoon-driven rains lashed the city. Patrons scurried to safety as pots and pans floated by.

"Every time we get big rains or typhoons, it floods and everything shuts down for three to four days," says Nam, 65, who goes by one name. "Last year people had to escape in boats because the water was too high."

Typhoons and floods are becoming more intense and frequent as Vietnam and the rest of Southeast Asia bear the brunt of climate change. Long coastlines and heavily populated low-lying areas make the region of more than 640 million people one of the world's most vulnerable to weather extremes and rising sea levels associated with global warming. Governments are under pressure to act quickly or risk giving up improvements in living standards achieved through decades of export-driven growth.

Southeast Asia faces a dual challenge. It not only must adapt to climate change caused largely by greenhouse gases emitted over decades by advanced economies—and more recently by developing economies such as China and India—it also must alter development strategies that are increasingly contributing to global warming. The region's growing reliance on coal and oil, along with deforestation, are undermining national pledges to curb emissions and embrace cleaner energy sources.

Economic impact

Average temperatures in Southeast Asia have risen every decade since 1960. Vietnam, Myanmar, the Philippines, and Thailand are among 10 countries in the world most affected by climate change in the past 20 years, according to the Global Climate Risk Index compiled by Germanwatch, an environmental group. The World Bank counts Vietnam among five countries most likely to be affected by global warming in the future.

The economic impact could be devastating. The Asian Development Bank (ADB) estimates Southeast Asia could suffer bigger losses than most regions in the world. Unchecked, climate change could shave 11 percent off the region's GDP by the end of the century as it takes a toll on key sectors such as agriculture, tourism, and fishing—along with human health and labor productivity—the ADB estimated in a 2015 report. That's far more than its 2009 estimate of a 6.7 percent reduction.

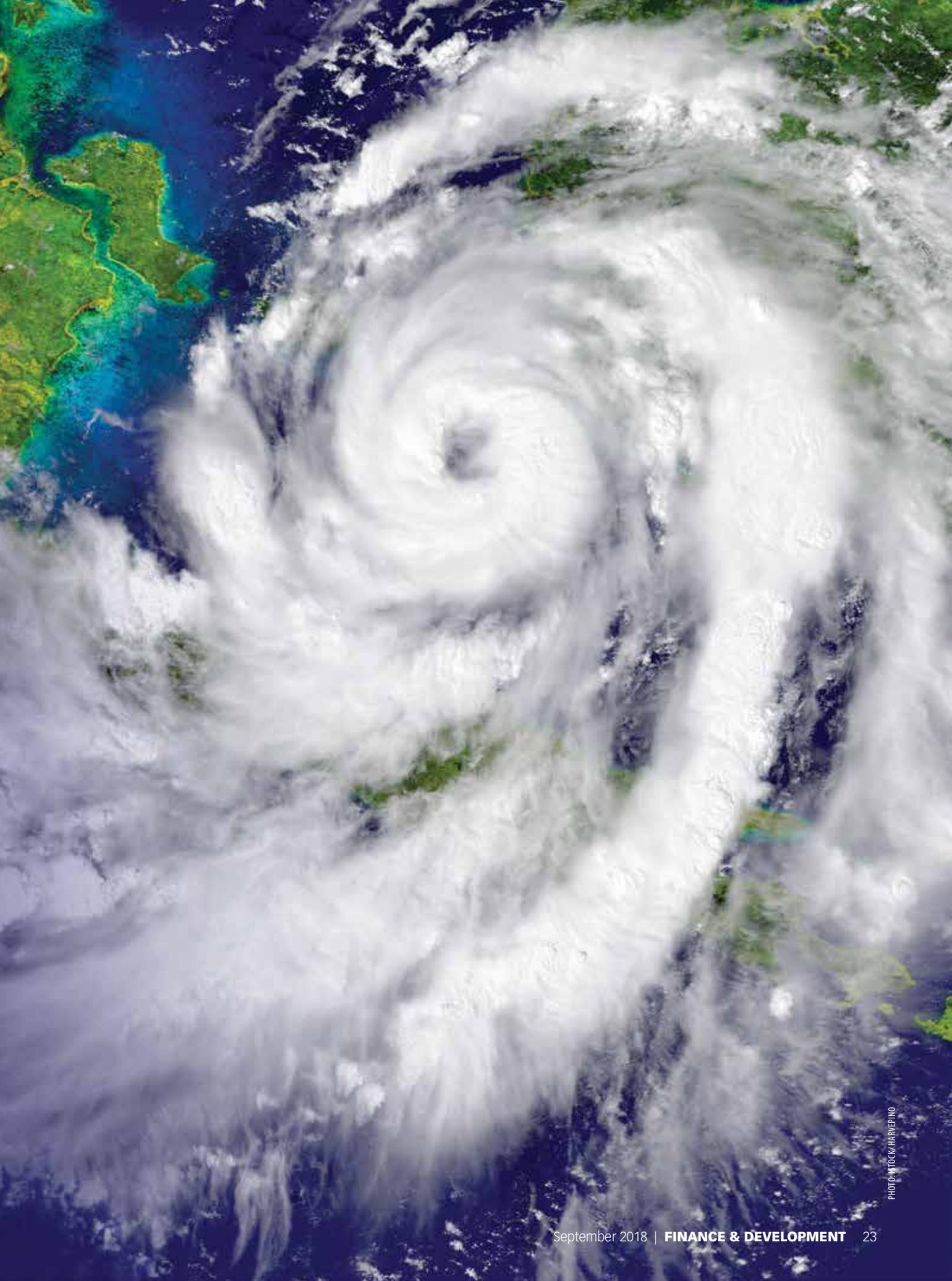


PHOTO: NTOCC/HARVEPHO



Bulldozers clean up a recently constructed road deep in the vast interior of the central Kalimantan jungle, Indonesia.

The region could shift to a “new climate regime” by the end of the century, when the coolest summer months would be warmer than the hottest summer months in the period from 1951 to 1980, says a 2017 study by the ADB and the Potsdam Institute for Climate Impact Research. In the absence of technical breakthroughs, rice yields in Indonesia, the Philippines, Thailand, and Vietnam could drop by as much as 50 percent by 2100 from 1990 levels. Hotter weather is also pushing tropical diseases such as malaria and dengue fever northward to countries like Lao P.D.R., where they were formerly less prevalent.

While the region’s greenhouse gas emissions have been low relative to those of advanced economies in per capita terms, that is starting to change, largely because of its increasing reliance on coal and other fossil fuels. Between 1990 and 2010, emissions of

carbon dioxide increased faster in Southeast Asia than anywhere else.

Energy mix

Energy demand will grow as much as 66 percent by 2040, predicts the Paris-based International Energy Agency (IEA). Coal alone will account for almost 40 percent of the increase as it overtakes cleaner-burning natural gas in the energy mix. That poses a risk to the Paris Climate Agreement’s goal of limiting the average global temperature gain to 2 degrees Celsius above preindustrial levels. All 10 countries that make up the Association of Southeast Asian Nations (ASEAN) signed the Paris Agreement.

“At the present rate, Southeast Asia, coupled with India and China, could wipe out gains from energy efficiency and emissions reductions elsewhere in the world,” says Srinivasan Ancha, the ADB’s principal climate change specialist.

Demand for coal is partly driven by the fuel’s relative abundance and its low cost compared with oil, gas, and renewable energy. Coal-fired power plants are also easier to finance than renewable energy projects. Indonesia is the world’s fifth-largest coal producer and its second-largest net exporter, while Malaysia and Thailand are the eighth- and ninth-largest net importers, IEA data show.

Reliance on coal is projected to grow: Vietnam's coal-power capacity under active development is the third largest in the world after China's and India's, according to a March 2018 report by environmental groups, including the Sierra Club and Greenpeace. Indonesia and the Philippines rank fifth and tenth, respectively.

Vanishing forests

Deforestation is another major source of greenhouse gases. In Indonesia and Malaysia, home to the world's largest forestlands, trees are cut down to make way for farms to feed growing populations and for the production of pulp and paper and palm oil, which are big sources of export revenue. Deforestation accounts for almost half of Indonesia's emissions—more than fossil fuels, though these are fast catching up.

Clearing forests in peatlands and peat swamps poses additional problems. Draining peat swamps releases thousands of tons of carbon dioxide trapped in each hectare of soil. The problem is compounded when farmers burn the dry peat, releasing the gas more quickly. Smoke from such fires has repeatedly choked neighboring Singapore and Malaysia since 1997; emissions from the most recent incident in 2015 exceeded those of the entire European Union, according to Reuters.

Rapid economic growth and urbanization are contributing to climate change while also magnifying its impact. Migrants from rural areas flock to cities, which emit more heat. New construction in floodplains blocks waterways, leaving cities more vulnerable to floods. And the more cities grow, the greater the damage from increasingly frequent floods and storms.

"You have to unravel the impact of climate change, which is certainly there, and economic development and population growth," says Marcel Marchand, a Hanoi-based expert in flood risk management. "The impact of a flood or storm is now generally more than in the past. That is not only because there are more hazards, or because hazards are more severe, but also because there are more people, and cities are becoming bigger."

Marchand is advising on a \$70 million internationally funded project that will provide more timely warning of floods to the residents of Hoi An. He attributes flooding, in part, to the construction of reservoirs in catchment areas upstream, which has changed river flows. The reservoirs become overwhelmed by extreme rainfall events, and excess water released downstream floods Hoi An and nearby Da Nang.

Both cities are growing fast as a tourism boom attracts migrants seeking work. A decade ago, Da Nang, Vietnam's fourth-largest city, had just one luxury resort. Now it boasts almost 90 four- and five-star hotels, many of them dotting the 30-kilometer coastal road to Hoi An. The flow of workers is swelling Da Nang's population, which is forecast to surge to 1.65 million by 2020 from 1 million today, according to World Bank estimates.

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While tourism creates jobs, related infrastructure development also indirectly contributes to coastal erosion that makes the area more vulnerable to storm surges and rising sea levels. The shoreline along Hoi An's popular Cua Dai Beach receded by 150 meters in the years from 2004 to 2012, according to a report prepared by the Quang Nam provincial People's Committee. Floodwalls and sandbags have become eyesores for vacationers.

"In the last two decades the rainfall pattern has changed and increased significantly," says Phong Tran, a technical expert at the Institute for Social and Environmental Transition-International (ISET-International), which works with several Vietnamese cities to develop climate resilience.

Dry spells

Phong worries that rising sea levels, along with prolonged dry spells, will cause salinity intrusion and hurt agriculture in the fertile Mekong Delta, one of the world's most densely populated areas. The delta is Vietnam's food bowl, producing more than half of its rice and other staples and over 60 percent of its shrimp, according to the Manila-based ADB.

Some 70 percent of Vietnam's population lives along its 3,200-kilometer coastline and in the low-lying delta. Other Southeast Asian nations are similarly vulnerable.

Indonesia has one of the world's longest coastlines at 54,700 kilometers. In the Philippines, which has 36,300 kilometers of coastline, 20 typhoons on average make landfall yearly, with increasing destructiveness. Cambodia, Lao P.D.R., and Thailand are also affected by storms and excessive rain, as well as by heat extremes that take a toll on agriculture and human health.



Southeast Asian governments, acutely aware of the magnitude of the threat, have pledged to reduce emissions. They also recognize the need to move toward low-carbon developmental strategies. ASEAN leaders approved a plan that targets a 23 percent share of renewables in the region's energy mix by 2025, up from 10 percent in 2015. The need to curb deforestation also figures prominently in national and regional policy agendas.

Yet, promised emission cuts are partly or wholly conditional on international funding. Indonesia has pledged to reduce emissions by 29 percent by 2030 and said it could increase that to 41 percent with outside support. Vietnam's analogous targets are 8 percent and 25 percent. The Philippines has made only a conditional pledge, of a 70 percent reduction. Even these conditional pledges will result in higher global warming than envisaged under the Paris Agreement, highlighting the need for more ambitious goals.

While the region has seen increases in renewable energy sources, particularly solar and wind, their limited generation capacity means countries remain reliant on fossil fuels. Consumption of all types

and Malaysia stand to earn billions of dollars in carbon credits; preserving forests would also cost less than radically cutting fossil fuel emissions and buying carbon credits.

According to analysts at the World Resources Institute, just enforcing Indonesia's 2011 moratorium, which prohibits clearing certain primary forests and peatlands, could eliminate 188 million tons of carbon dioxide emissions each year, or about 60 percent of France's total output in 2016. Increasing agricultural productivity could eliminate the need to clear forests, the institute said in a 2017 working paper.

Global players

The IEA sees the emergence of affordable low-carbon technologies as a path toward greater energy efficiency as declining costs of solar and wind energy boost investment in local manufacturing. Malaysia and Thailand, for example, are fast becoming global players in the manufacture of solar panels, with the help of Chinese investors seeking to circumvent antidumping duties imposed by the European Union and the United States.

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of fuels is rising as governments strive to provide universal access to electricity and petroleum-based fuels for cooking and transport. The IEA estimates that 65 million Southeast Asians lack electricity and 250 million use biomass, such as firewood and animal manure, for cooking fuel.

Policy conflicts

National goals for reducing fossil fuel use often conflict with policies to subsidize the cost of petroleum products and electricity for the benefit of the poorest sections of society. Such subsidies not only boost fuel demand and render cleaner-burning fuels and renewable energy less competitive, they are also estimated to cost governments more than what it would take to meet the region's Paris Agreement goals, according to the ADB-Potsdam Institute study.

Given the political and practical difficulties of cutting subsidies and encouraging the adoption of low-carbon technology, preventing deforestation may be the most effective way to cut emissions. Indonesia

Both countries may need to seek new markets after the United States this year announced plans for new tariffs on solar-panel imports as part of its crackdown on alleged unfair trade practices by Chinese companies. But with a significant increase in investment in renewable energy generation witnessed in Southeast Asia since the start of this century, the region is potentially a huge market for such products. Even so, incentives such as tax breaks, duty-free imports, and preferential loans, along with easier access to financing, will be needed to increase investment in renewables and encourage adoption of more energy-efficient technologies.

"Policies and recommendations alone are not enough," says Phong, from ISET-International in Vietnam. "Businesses need incentives to embrace renewable energy or environmentally friendly technologies, as well as for encouraging reforestation." **FD**

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