

# Climate change might mean several of Indonesia's small islands have no future

November 16 2021, by Noir Primadona Purba, Muhamad Maulana Rahmadi

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Aerial photo of Bokori Island in Soropia District, Konawe, Southeast Sulawesi.  
Credit: Jojon/Antara

As [the world's largest archipelagic](#) country, Indonesia should be showing more concern about the impact of climate change on small islands.

[Sea level has risen](#) by around 21–24cm globally since the pre-industrial level as a result of melting ice in the [Arctic](#) and Antarctic.

A recent study by [Indonesia's National Research and Innovation Agency \(BRIN\)](#) estimates that at least 115 of Indonesia's small islands are on the verge of sinking. This is due to [sea-level rise](#) and [land subsidence](#).

The research and advocacy organization Climate Central calculates that a one-meter rise in sea level [will flood](#) the northern shore of Java island, one of the [most densely populated islands in the world](#). This is because of the coastal terrain's low slope (between 0 and 20 degrees).

This threat is becoming visible. Our 2011 [research](#) showed sea-level rise had sunk some parts of small islands. Without aggressive mitigation efforts, BRIN's forecast could become a reality.

## **How sea level rise**

As a result of sea-level rise, bigger waves will "redesign" coastlines. The land sediments can also fall into the sea, causing erosion and flooding in other areas—which will sink small islands sooner or later.

Our study [found](#) Rondo Island, located at the western area of the Malacca Strait in Aceh province, lost 1,856 square meters (m<sup>2</sup>) of land each year from 1993 to 2009 because of annual sea-level rise that reached 1.30mm per year.



Berhala Island located in eastern Riau. Credit: Noir P. Purba

Berhala Island, located in the eastern area of Malacca Strait in Riau province, recorded a higher trend (about 3.46mm/year). So has Nipah Island, which is close to Singapore, which sees a 3.48mm annual rise.

These rises reduced the area of the two islands by 3,178m<sup>2</sup> and 3,409m<sup>2</sup> (about half the size of a professional football pitch) per year, respectively, from 1993 to 2009.

The interim result of ongoing study (unpublished) by a research team from the Department of Marine Science of Padjadjaran University in West Java found the area of five of Indonesia's remote islands had

shrunk. Over a decade, these land reductions ranged from  $0.005\text{km}^2$  to  $0.09\text{km}^2$ —nearly equal to 13 football fields.

The change is [estimated](#) by using pixel analysis of several satellite photographs. This image was converted to a polygon—connected dots—which we then we calculated with a [field calculator](#).

We found Miangas Island ([3.2km<sup>2</sup>](#)), which lies near the border of Indonesia and the Philippines, has lost 0.02% of its area (around  $0.00064\text{km}^2/\text{year}$ ) since 2004.

The same fate is facing Sekatung Island ([1.65km<sup>2</sup>](#)) in Kepulauan Riau province, which is experiencing loss by 0.66% of the area ( $0.01989\text{km}^2$ ) per year.

Since 2004, Berhala Island has also lost an area of  $0.002\text{km}^2/\text{year}$ .

Islands in eastern Indonesia face the same risk. For example, in the northern area of Cenderawasih Bay in Papua, Workbondi Island—which covers an area of  $1.62\text{km}^2$  or two times as big as [China's Forbidden City](#)—experienced a  $0.004\text{km}^2/\text{year}$  of area decline.



Satellite photo of Miangas Island in the Talaud Islands, North Sulawesi. Credit: Google

Candikian Island and Gosong Island, both in southern Java Sea, were nearly submerged. Only a few square meters of land remain, with no more than two meters elevation above sea level.

Meanwhile, the area of Biawak Island—located in the same sea—has shrunk by half the size of [Vatican City](#) (0.22km<sup>2</sup>) annually. We predict this island will sink when the [sea-level](#) rise reaches 0.5 meters.

## Immediate prevention and adaption actions

We should accept the fact that climate change has already caused irreversible damage. Even if the best risk-reduction efforts have been made, [sea level is still expected to increase](#) by at least between 0.6m and 1.1m by 2100, under various scenarios.

Adaptation efforts must be undertaken. One example is [planting maritime pine \(\*Casuarina equisetifolia\*\) on a sand-structured island](#) as has been done in Taka Bonerate National Park in the Selayan Islands, South Sulawesi province. Maritime pines help to reduce erosion as well as enhancing soil quality.

Indonesia could also follow the example of [Dubai, in the United Arab Emirates](#), which has developed technology for land reclamation and coastal protection. This approach needs [extensive planning](#) and massive funding.

Communities in the coastal areas, in particular, must increase their resiliency to this crisis. More stilted houses must be built to adapt to the worsening coastal inundation.

In the country's recent [climate pledge](#), Indonesia has committed to cut emissions by 29–41% by 2030. This pledge, which was also submitted by other countries, will be presented at the UN's climate talks (COP26) in Glasgow.

This conference is an important opportunity for Indonesia and other island countries to define actions in working towards zero emissions by 2050, or maybe sooner, which will decide the future existence of small [islands](#).

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