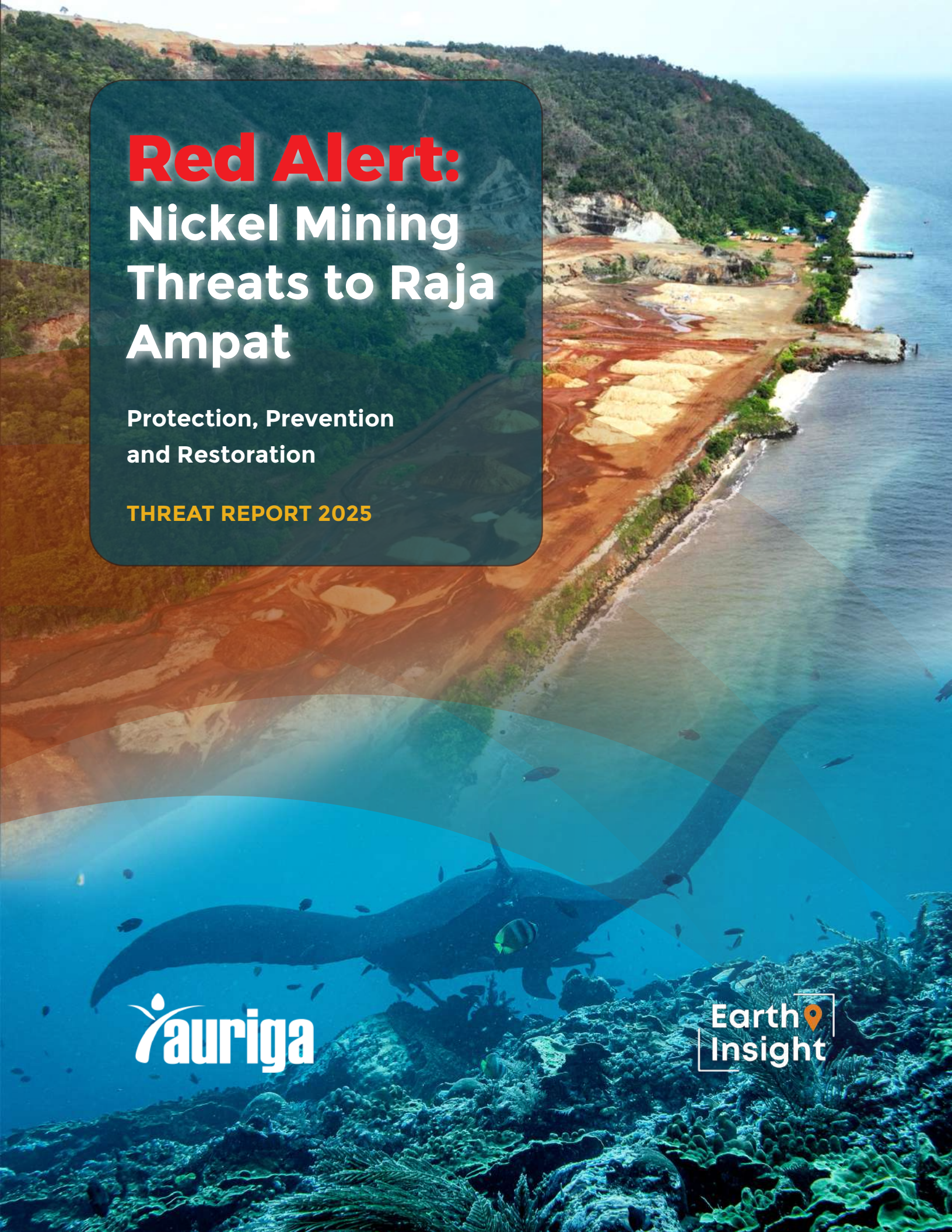

Red Alert: Nickel Mining Threats to Raja Ampat

Protection, Prevention and Restoration

THREAT REPORT 2025

auriga

Earth Insight

Red Alert: Nickel Mining Threats to Raja Ampat

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This image: Manuran Island. Image Credit: Auriga Nusantara

SUGGESTED CITATION

Earth Insight and Auriga Nusantara. (2025).
Red Alert: Nickel Mining Threats to Raja Ampat.

COVER IMAGES

Giant manta rays in Raja Ampat. The impact of nickel sediments on giant manta rays off Kawei Island needs further research.
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Nickel mining sediments on Manuran Island of Raja Ampat are leaching into the surrounding sea waters. Image credit: Auriga Nusantara, December 2024.

Recommendations page: Clown Fish and Anemone in Raja Ampat. Image credit: Mary Kar via Flickr. CC BY-C-ND 2.0.
Sea Turtle in Raja Ampat. Image credit: Carlos Fernandez-Cid, carloscies via Flickr. CC BY 2.0
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Executive Summary

Raja Ampat lies within the Coral Triangle, known as the global epicenter of marine species richness, endemism, and a diver's paradise. But without permanent protection and removal of nickel concessions, Raja Ampat could become a red-alert casualty of an energy transition built on critical minerals.

Field investigations by Auriga Nusantara reveal the enduring environmental toll of nickel mining in Raja Ampat. Photographs from the affected islands capture stark evidence: once-vibrant coral reefs struck by ships left pale and lifeless; others smothered by sediment from deforested hillsides.

Driven by the transition's nickel demand, Indonesia, now dubbed the "OPEC of nickel,"[1] gave permits to extract nickel across more than 25,000 hectares of the archipelago.[2] However, high-profile protests this year prompted the government to revoke four of five permits for "several violations in the environmental context."[3] Yet Raja Ampat's marine biodiversity and communities are still at risk from remaining nickel concessions and the possibility that companies will win back their permits in court. Nickel mining on any island in Raja Ampat could trigger a cascade of coral erosion: A recent meta-analysis of the impact of sediments on coral reefs found a far lower threshold for coral death than previously estimated.[4]

Given the current uncertainty, this threat assessment analyzes how nickel mining could still impact 2,470 hectares of coral reefs and 7,200 hectares of forest cover, as well as the well-being and livelihoods of 64,141 Indigenous and local communities across the 3.66-million hectare Raja Ampat UNESCO Geopark area.[5]

Coral reefs covered by nickel mining sediment in the waters off Manuran Island.

Background image: Excavators operating on Kawei Island, captured on December 2024. Sea water turns to red from mining on top of the hill.
Image credit: Auriga Nusantara

Even after the Indonesian government revoked most nickel permits, Raja Ampat's crystal blue waters could still turn a silty red.

Nickel mining in Raja Ampat is an illustrative case of the threats faced by more than 200 small islands with such concessions across the country.[6] Raja Ampat is an 6.7-million hectare archipelago, half of which includes nine protected areas and a UNESCO Global Geopark. It is the habitat for 75% of the world's coral species, more than 1,600 fish species, and the largest reef manta ray population, along with five species of protected turtles, including the critically-endangered hawksbill sea turtle.[7]

Without enforced "no-go zone" protections and permanent safeguards, nickel mining permits could be reinstated. Revived nickel permits could jeopardize Raja Ampat's UNESCO Geopark designation, which attracted more than 19,000 tourists in 2023.[8,9] While the Indonesian government announced the revocation of four permits, there is still no evidence that any permits were actually revoked or that any environmental restoration is being planned on any of the impacted islands.[10]

As shown below, nickel mining and related infrastructure have already impacted coral reefs, island forest cover, and livelihoods. Auriga Nusantara field investigations show lifeless, broken coral reefs and soil erosion from hills deforested by nickel activity spilled into the coast of Manuran Island. Artisanal fishers on Kawei Island report that noise and vibrations from nickel scared away fish and dolphins.[11]

Nearby islands outside the Raja Ampat Geopark are testament of what can happen across Indonesia: On Gag Island, people are afraid of skin diseases after swimming in contaminated waters.[12] On Obi Island, nickel operations are linked to forced evictions,[13] destruction of sacred groves, contaminated fish, and carcinogens in the drinking water.[14] Carbon emissions from a single smelter on Obi Island are equivalent to 1.8 million four-wheeled drives.[15] Obi Island's blue seas and rivers are turning red.[16,17]

Nickel mining in and near Raja Ampat risks "dual marginalization" of small island communities: they are shut out of permit discussions but suffer environmental consequences.[18] It impacts the ancestral governance and collective memory of Indigenous and local communities who revere Raja Ampat (called the "Four Kings"} as sacred ground and seascape.[19] To these communities, nickel mining constitutes a desecration of living ecosystems.

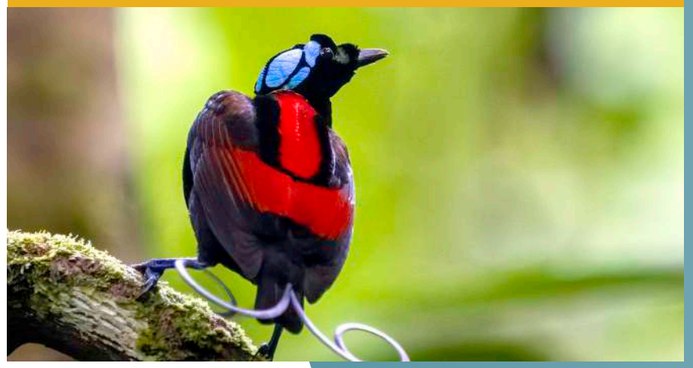
Auriga Nusantara found that land used for mining in Raja Ampat accelerated three times the rate of expansion from the previous five years. Another recent analysis of mining permit overlap with conservation areas in Raja Ampat concluded that significant land cover changes between 2015 to 2023, particularly on Gag, Kawei, and Manuran Islands, provided concrete evidence of "the geospatial impacts of mining activities on coastal and marine ecosystem degradation."[20] It further noted that contradicting policies for protection and exploitation are "misaligned with the principles of ecological justice, intergenerational sustainability, and the rights of local communities to a clean and sustainable living space."

Manuran Island. Image credit: Auriga Nusantara

KEY FINDINGS

Without permanent protection, Raja Ampat[21] could become a red-alert casualty of the energy transition.

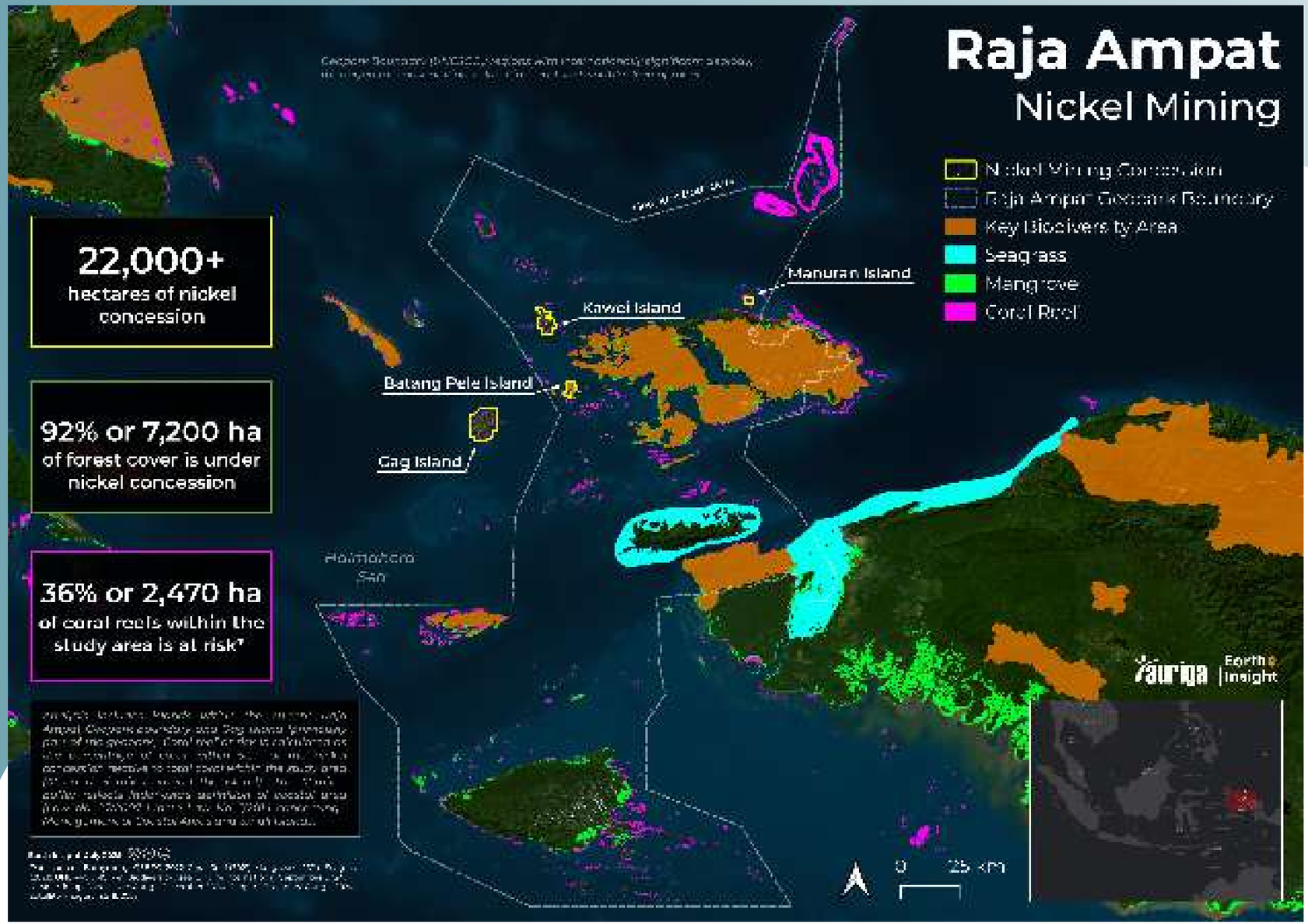
- **Over 22,000 hectares of nickel mining concessions within Raja Ampat;**
- **92% or 7,200 ha, of forest cover is under mining concessions;**
- **36%, or 2,400 ha, of coral reef within the study area is at high risk.**



Wilson's Bird-of-Paradise (Diphyllodes respublica) - NEAR THREATENED Waigeo Island,,Indonesia. Image credit: David Cook via Flickr

Nickel Mining Threats

MAP 1: RAJA AMPAT NICKEL MINING



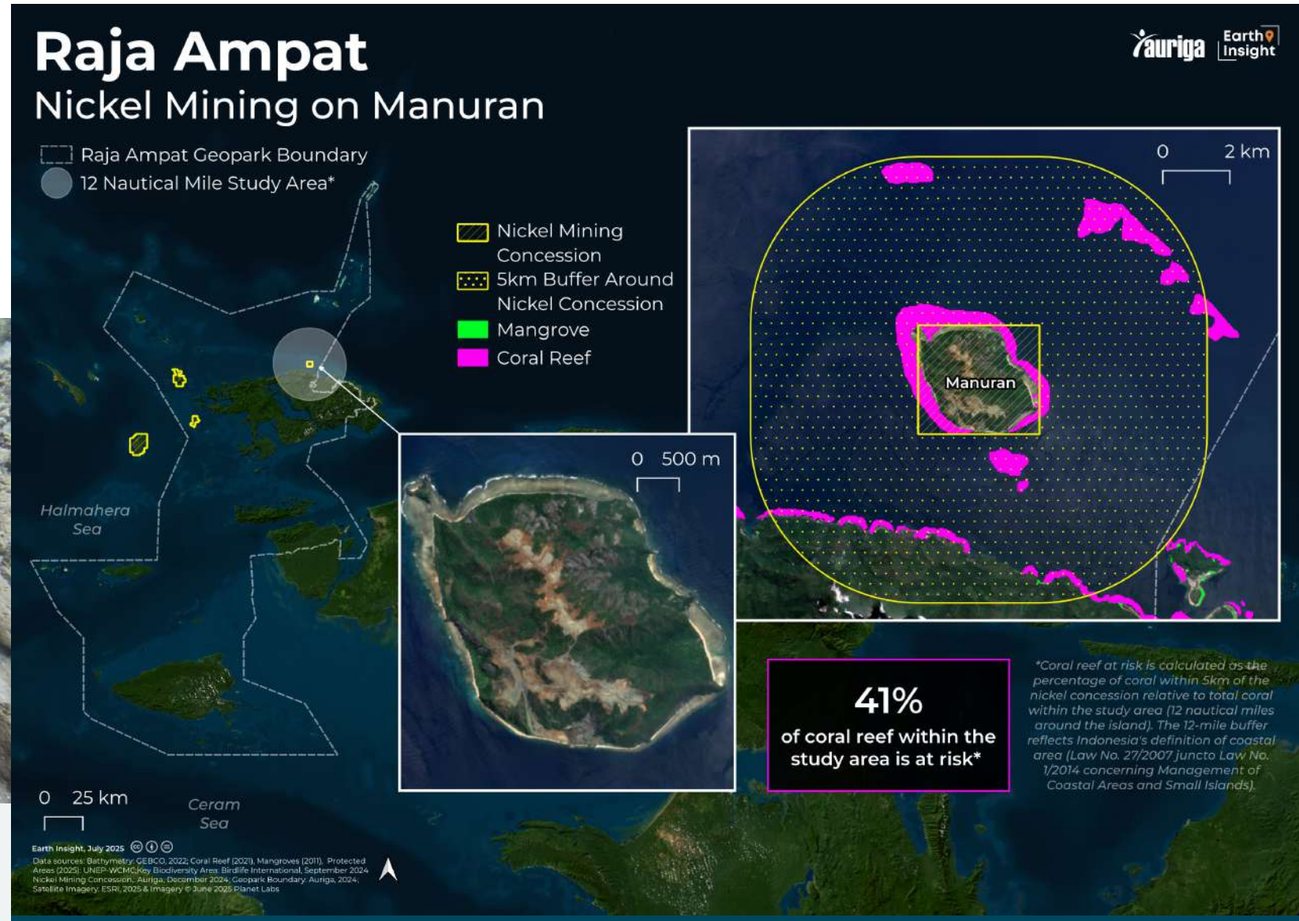
Nickel Industry in Fragile Marine Areas

Of the world's 194 active nickel mines, 14 are in Indonesia, where in ten years production is expected to meet half of global demand.[22] Satellite analyses and field observations in Raja Ampat show that mining-driven deforestation causes significant sedimentation of coastal waters and reef deterioration.[23] Another recent analysis also found "significant land cover changes" from 2015 to 2023, particularly on Gag, Kawei, and Manuran Islands, that provide "concrete evidence" of coastal and marine ecosystem degradation from nickel mining.[24] Initial research further shows the impacts of nickel mining in food chains, from algae, sea grasses and coral reefs,[25] to fish and humans. In one study, heavy metal traces from nickel mining were found in at least 12 marine species.[26]

Deforestation, soil erosion, and runoff from nickel activity on Manuran Island revealed in Auriga Nusantara field investigation. Image Credit: Auriga Nusantara

-Coral reefs covered by nickel mining sediment in Manuran Island. - Auriga

MAP 2: NICKEL MINING ON MANURAN



Stripping community authority over natural resource management

Large-scale nickel mining began in Raja Ampat in the late 1960s, concentrated on Gag, Kawei and Manuran islands. By 2020, despite widespread public opposition, a series of laws, notably the Revisions to the Coal and Mineral Mining Law, curbed the right of local control decision making consent for over large mining projects across the country.[27]

Indonesia's parliament has been fast-tracking amendments that weaken local governance, environmental oversight, and community protections.[28] Some proposals erode transparency and allow unconventional mining candidates, such as religious and academic groups, to obtain licenses without even a public tender. The latest legislative proposals follow a pattern in which regulatory oversight lags far behind nickel extraction. By 2022, the sole authority to issue permits for all metallic minerals was centralized on the national level.[29] Until June 10, 2025 five companies held permits to extract nickel across more than 25,000 hectares.[30]

Manuran: Small Island, Big Concession on a Tiny Island Devastates Coral Reefs and Forest

Auriga Nusantara field investigations captured images of the lasting impact on coral reefs from nickel activity on Manuran Island. On-land, mining-related deforestation destroyed 15% of its total land area.[31] The nickel mining concession covered 1,173-hectares on an island that spans just 746 hectares, locating most of it within Manuran's marine ecosystems.[32] Villagers were told nickel runoff was supposed to be contained inland, but when it rains, the overflow turns coastal waters yellow or even red.[33] Last June, Environment Minister Hanif Faisol Nurofiq publicly acknowledged that sediment from a nickel mine's waste pond goes directly into the sea. He also admitted that because Manuran Island is so small, its ecosystems are overwhelmed."[34]

Threats to Marine Life

Since 2004, the Ministry of Marine Affairs and Fisheries has managed a 2-million hectare network of nine marine protected areas (MPAs) that form the Raja Ampat Marine Park.[36] Other networks with NGOs and local governments also cover at least another 12 MPAs over more than 3.6 million hectares.[37]

Raja Ampat sits in the heart of the Coral Triangle, the most biodiverse marine ecosystem on Earth. The archipelago's vast reef systems, mangrove forests, and seagrass beds provide critical habitat for a trove of marine biodiversity: from whale sharks and giant manta rays to pygmy seahorses and a small walking shark, the Raja Ampat epaulette. Newly documented species are regularly recorded[38] In 2018, Raja Ampat was found to be the habitat of an extremely rare "living fossil" fish: the endemic Raja Laut, a Coelacanth (ancient fish)[39] related to lung fish and tetrapods, with a lineage more than 400 million years old.[40,41]

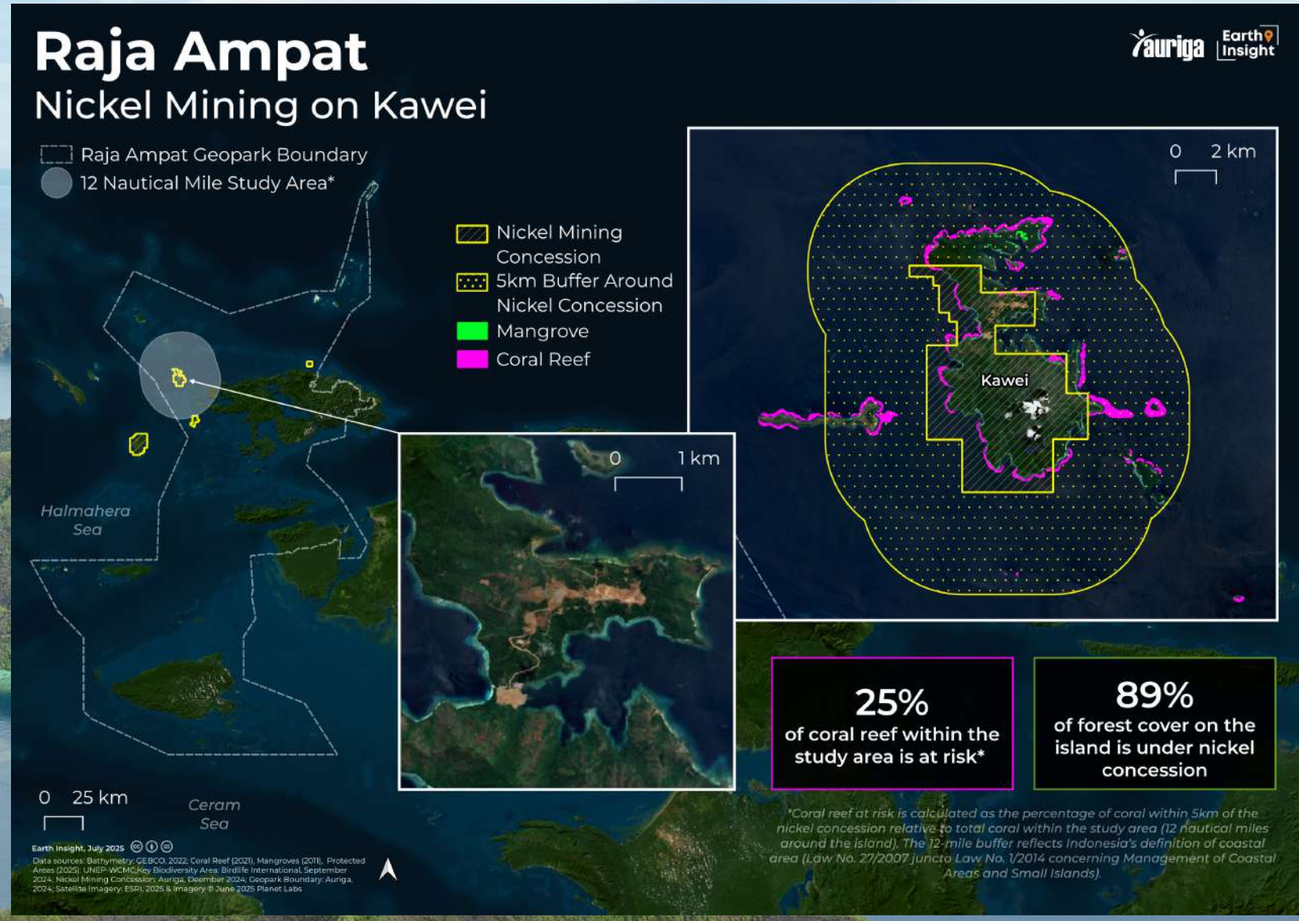
Among its most iconic inhabitants, the giant oceanic manta ray (Mobula birostris) and the reef manta ray (Mobula alfredi) migrate to the nutrient-rich waters around Dampier Strait and Misool. Researchers have noted the risks from nickel sedimentation to Raja Ampat's manta rays. For example, nickel silt flowing from Kawei Island's high rainfall and steep geography could impact a reef manta ray habitat, known as Eagle Rock.[42]

The region also supports large populations of sea turtles, including the endangered hawksbill (Eretmochelys imbricata) and green turtles (Chelonia mydas).

Giant manta ray in the waters of Raja Ampat. Image Credit Valerie Hukalo via Flickr. CC BY-NC-SA 2.0

Lifeless coral reef off of the Batang Pele Island in Manyaifun village from Auriga Nusantara field i nvestigation. - Auriga Nusantara

MAP 3: NICKEL MINING ON KAWEI



Raja Ampat contains 14 distinct reefscapes and 75 habitats.[43] Research on its coral shows unique resilience against climate change, given strong currents, high larval connectivity, and industrial development. However, nickel runoff and dredging are burying coral alive.[44] Nickel mining, along with climate change, are already impacting coral reefs: Preliminary data from a survey at more than 10 popular diving sites found coral reef bleaching at all sites.[45] Other research found nickel concentrations affect coral tissues and change microbiome community structure.[46]

Anemone and clown fish in Raja Ampat. Image credit: Kary Marvia Flickr. CC BY-NC-ND 2.0

Rhynchocinetes durbanensis, commonly known as the camel shrimp and the hingebeak prawn, is a species of shrimp found in the Indo-Pacific. Image credit: John Stevenson. CC BY 2.0

Gag Island: A Microcosm of Nickel Threats

The impact of nickel sediments on giant manta rays off Kawei island needs further research. Image Credit Valerie Hukalo via Flickr. CC BY-NC-SA 2.0

Some 40 km from one the world's most popular diving spots, the Piaynemo Geosite,[47] Gag Island is a microcosm of what could happen across the region, unless nickel concessions are permanently removed.[48] Despite persistent opposition, since the late nineties the government has continued to develop nickel mining on this tiny island, initially with a foreign company and later through a state subsidiary.[49]

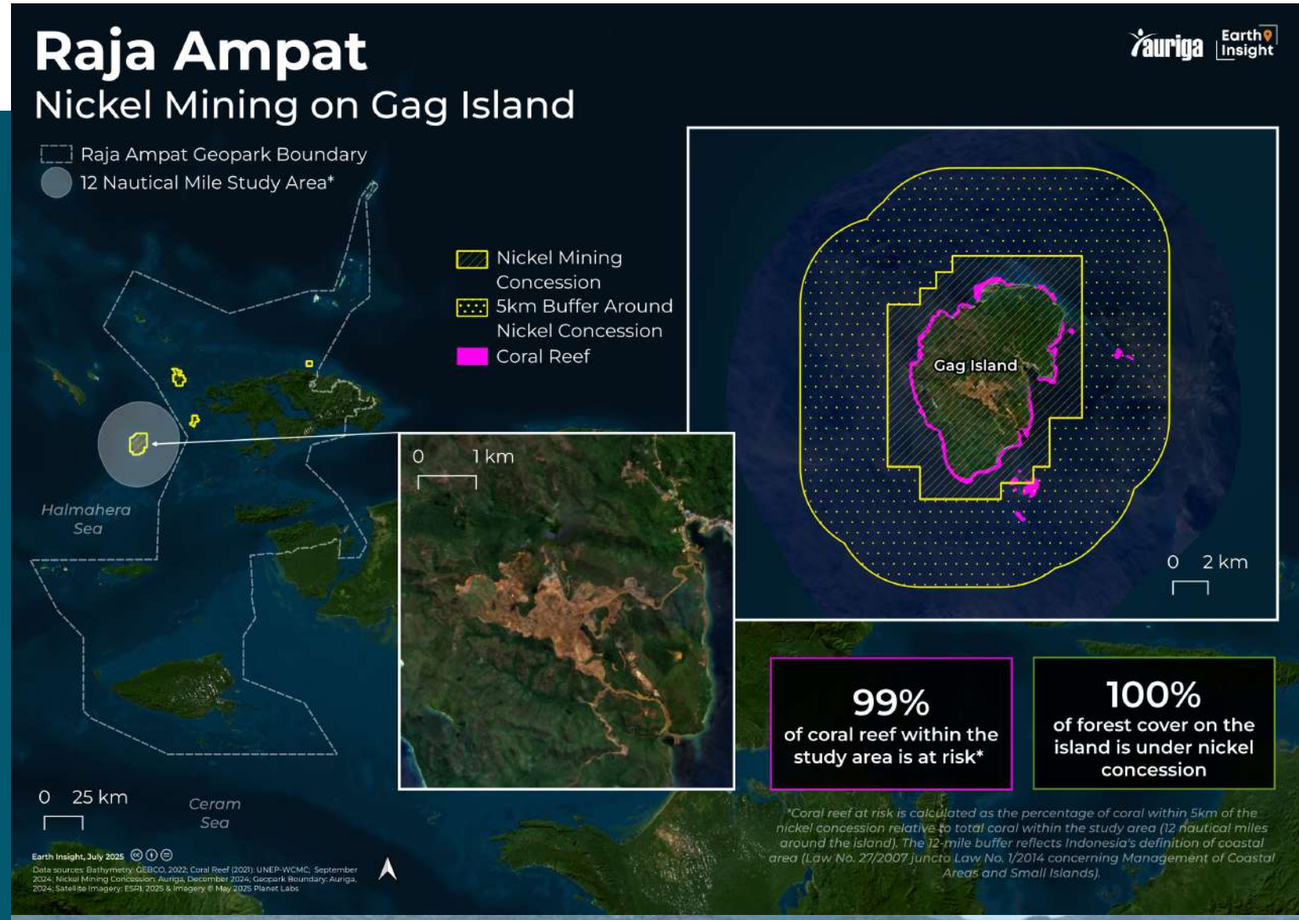
Nickel activity has already led to forest degradation and threats to marine life on Gag Island, which forms part of the Gag–South Waigeo conservation area. The clearance of more over 187 hectares of native forest created a sediment risk from erosion for surrounding coral and marine ecosystems. Migratory maps of manta rays – including the mighty Mobula birostris, the largest species in the world – show they pass through the Gag Island mining concession zone.[50]

A nickel concession on any small island, including Gag Island, violates Indonesia's 2007 coastal and small-island laws, which explicitly prohibit "abnormally dangerous" mining on islands under 2,000 km².[51] (Note: While Gag Island is no longer included in the Geopark boundary area, it is part of this analysis, given its original status and proximity to it.)

Mining operations have likewise eroded traditional fishing practices, increased community health risks, and threatened cultural traditions sustained over generations. Communities report that they are now forced to fish in waters as far as two hours away. Anchors dragged from nickel barges have damaged coral reefs. People report being afraid to swim because the water is now contaminated.[52] Community cohesion and customary governance have changed as traditional livelihoods are dropped for part-time (and temporary) employment with the mining company.[53]

Beyond its shores, the construction of facilities in the Sorong Special Economic Zone to produce up to 160,000 tons of processed nickel a year[54] could increase ship traffic from Gag Island that further threatens marine life and traditional fishing communities.

MAP 4: NICKEL MINING ON GAG ISLAND



-Indonesian law prohibits "abnormally dangerous" mining on small islands. Image Credit: Auriga Nusantara

Threats to Island Biodiversity, Climate, and Forests

More than half (66%) of Raja Ampat's terrestrial area includes seven conservation areas (CA) covering close to 400,000 hectares.[55] Biodiversity identified in the four main islands alone include 47 mammal species, with one endemic and three protected species; as well as 114 amphibian and reptile species.[56] While the 1500 islands remain under-researched, a study of one island alone documented 132 bird species, including six threatened and three newly-described birds, in six distinct habitats.[57]

Nickel mining sediments on Manuran Island of Raja Ampat are leaching into the surrounding sea waters.
Image credit: Auriga Nusantara, December 2024.

Aerial view of the village of Kawassi, District of Obi, Obi Island, South Halmahera Regency, Tuesday, Oct. 18, 2022, showing nickel mining run offs from the River Kawassi streaming behind the village. At least five nickel mining companies are operating in the area behind Kawassi village. The damage from nickel operations on Obi Island, while not in Raja Ampat, is a stark warning of what can happen.
Image Credit: The Washington Post via Getty Images

Indonesia's expanding nickel industry is so far linked to more than 75,000 hectares of tropical forest loss (an area larger than Singapore).[58] Satellite analysis and on-the-ground visits have found a rapid increase in mining pits in Raja Ampat. Auriga Nusantara reports that land used for mining grew by about 494 hectares from 2020 through 2024 – three times the rate of expansion from the previous five years. From 2015 to 2023, land clearing, road construction and other nickel-related infrastructure in Raja Ampat significantly degraded secondary forests and coastal vegetation, particularly on the smaller islands of Gag, Kawei, Batangpele, and Manuran.[59]

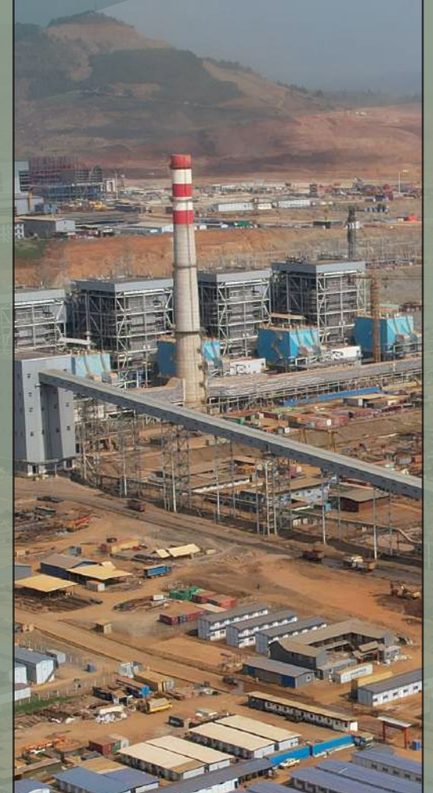
Threats to Communities

Beyond environmental harm, nickel mining threatens community cohesion, local livelihoods and ancestral practices. Under Indonesian law, if an ecologically sensitive area or Indigenous territory is discovered to lie inside a mining area, affected communities have little recourse to challenge the designation.

For some Indigenous communities in Raja Ampat, nickel mining threatens far more than ecosystems. It desecrates their sacred seascape, the living repository of myths and practices that form their identity.[60] These cultural beliefs define their entire ecosystem as "the Forest is the Mother, the Sea is the Father, and the Coast is the Child."[61] As customary forests disappear, fishing grounds turn red, and shores darken with nickel dust, ancient biocultural practices are at risk of extinction.[62] Nickel operations can erode ancestral law, sacred geography, ritual life, and cultural continuity, which combined constitute cosmological and existential threats.

While not in Raja Ampat, what happened on Gebe Island is illustrative: a sacred site is now an excavation zone. The caves of Mount Kaf, essential to the ancestral spirituality of the Magimai, Magpo, and Magtublo people, are being destroyed. Since 2020, Indigenous communities have resisted the PT Bartra Putra Mulia concession, which overlaps their customary territory and was created without their consent.[63,64]

Seven nickel concessions have reshaped Gebe's cultural and ecological heritage as residents report depleted water sources, flooded traditional groves, and pollution from the mine is in local fishing sites.[65]



Bad precedents: The Red Waters of Obi Island

The case of nickel activity in the Obi Archipelago, part of the Spice Islands, is a cautionary tale for the entire region. While mining began on the main island in 2007, in 2019, national and provincial governments gave a local company, PT Trimegah Bangun Persada, permission to dump 6 million tons of smelter tailings into the ocean every year.[66] Local protests forced the company to pull these plans, yet nickel waste still turned Obi's rivers and coasts red.[67]

Both nickel mining and processing has severely impacted Obi's communities. One study found nickel contamination in fish species used both commercially and for local consumption.[68] Local fisheries that exported skipjack tuna found levels of toxicity too high for export.[69] On land, toxins damaged harvests and threatened food security. As groves of sago trees, a staple of local diets, food, disappear, some 39 villages could face hunger in dry seasons or when rice prices rise. When the mining polluted the rivers, villagers had to find other sources for drinking water, which were often contaminated after rainfall. Those unable to afford bottled water were left with no other choice.[70]

Manyaifun island Image Credit: Auriga Nusantara

In 2022, leaked documents suggested a link between nickel operations near the village of Kawasi to carcinogens in the water supply. Water samples collected from a village spring close to a mining site showed levels of carcinogenic Cr6 as high as 140 parts per billion (ppb) – far above the 50ppb-maximum contaminant level permitted under Indonesian law.[71,72]

When communities protested, the government deployed military security to protect the company. At the same time, the influx of nonlocal workers, large-scale industrial facilities and unchecked urbanization triggered an accelerated loss of local traditions.[73]

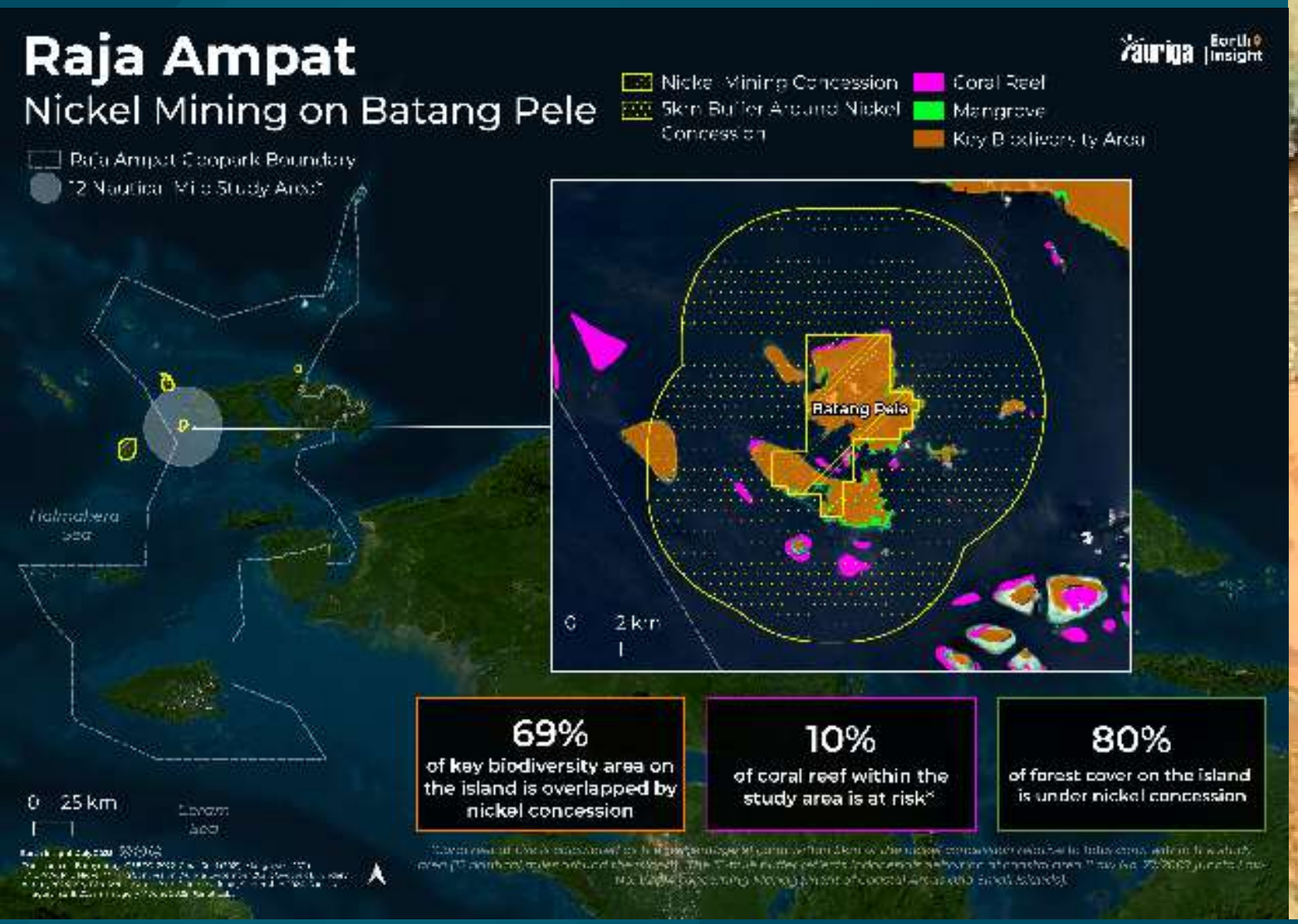
Kawasi Village has been impacted by nickel activities, including nickel mines, two smelters and coal-fired power plants. Residents complain about displacement from their village without their consent,[74] and high carcinogens level in the water.[75]

Nickel Mining on Obi Island, Halmahera North Maluku Indonesia. Image Credit: Photo by Barry Kusuma via Getty Images

Lifeless coral reef off of the Batang Pele Island in Manyaifun village from Auriga Nusantara field investigation. Image credit: Auriga Nusantara

Since Batang Pele Island is zoned as a protected forest area, open pit mining is prohibited under Indonesian law. In a clear illustration of the national policy contradictions inherent in nickel mining in a UNESCO Geopark, while nickel permits were given, government officials have stated that issuance of the required environmental permit is unlikely. However, residents report evidence of prospecting sites.[37]

MAP 5: NICKEL MINING ON BATANG PELE



Legal Risks

Indonesia's mining laws have been characterized as a "complex web" that seems to benefit powerful interests over community and environmental concerns."[76]

As noted above, legal reforms have been tailored to favor mining interests. Under the Omnibus Law (Undang-Undang Cipta Kerja, Law No. 6/2023), the previous restriction limiting offshore mining to within 12 km of the coastline has been removed, allowing mining in all maritime zones under Indonesia's jurisdiction, including deep-water areas. This regulatory shift heightens the risk that cost-cutting yet environmentally destructive practices (such as deep-sea tailings disposal already used by copper and gold operations in Indonesia) could be introduced into the waters of Raja Ampat.

Last year, when the country's constitutional court rejected a judicial review of the law meant to protect small islands from large-scale environmental damage, the judicial system offered some defense from mining.[77] Nonetheless, this year the government still upheld the mining permit for tiny Gag Island.[78]

An Opportunity to Restore or Destroy

Nickel mining in Raja Ampat constitutes a "paradox" of national policy that gives out mining permits in conservation areas, particularly a UNESCO Global Geopark.[79] To many, nickel activity in this biodiverse island region is a "striking contradiction" of the government's Blue Economy agenda.
Beyond short-term mining profits, Raja Ampat holds far greater value as a living ecosystem with intrinsic ecological worth, unique social and cultural benefits, and long-term regenerative economic opportunities.[80]

The government's recent revocation of nickel mining permits in Raja Ampat created an opportunity to choose between two permanent paths: Either these unique ecosystems are permanently protected and restored for local communities to manage, or they are lost, along with the traditional practices and international collaborations that have sustained them.

Recommendations & Call to Action

- Raja Ampat's Protected Areas Should Be Declared **No-Go Zones:** The UN Secretary-General's Panel on Critical Energy Transition Minerals called for a new mining paradigm that encourages governments to declare protected areas as "no-go" zones for transition minerals extraction.
- **Uphold the Law No. 1/2014 concerning coastal and small island management,** which explicitly prohibit "abnormally dangerous" mining on islands under 2,000 km.
- **Protect Raja Ampat's UNESCO Global Geopark Status** and designate it a "strict nature reserve" under Presidential Regulation No. 9/2019, which bans all extractive activity.
- Permanently **remove all nickel concessions** in and around Raja Ampat.
- **Increase investment in sustainable development alternatives,** such as ecotourism infrastructure, and community-led marine conservation and restoration.
- **Restore ecosystems degraded by nickel mining** in Indonesia to prevent further biodiversity loss and protect local community well-being.
- Across Indonesia, develop and **enforce mechanisms for FPIC and meaningful participation** of Indigenous and traditional communities in decisions that impact their local environments, cultures, and livelihoods.
- Uphold the rights of local communities to a sustainable and uncontaminated environment.

Methodology

Data Disclaimer:
The geospatial analyses in this report are an attempt to capture potential threats to ecosystems using the most recently available, most accurate and precise data and methods available. As such, the results of these analyses may change between reports as data and/or methods are updated. The World Database of Key Biodiversity Areas (WDKBA) releases regular updates based on national assessment processes.

Nickel Mining Concession Overlap
The nickel mining concession layer is a filtered subset of the Indonesian mining concession layer shared by Auriga. Analysis in this report is based on mining concession information available as of December 2024. More recent updates to nickel mining concessions on Raja Ampat may not be reflected. The nickel mining layer was intersected with the KBA layer to calculate the overlap of KBAs within nickel mining concessions. The forest cover area under nickel mining concessions was calculated by intersecting the JRC Tropical Moist Forest (TMF) cover product (Vancutsem et al., 2021) with the concession layer using Zonal Histogram, and then summarizing the number of pixels by concession.

Study Area Definition
The focus of this analysis is the islands within the current Raja Ampat Geopark boundary and Gag Island (previously part of the geopark) with onshore nickel mining concessions. The study area for each is defined as a 12 nautical-mile buffer zone around each island, in accordance with Indonesia's definition of coastal area (Law No. 27/2007 juncto Law No. 1/2014 concerning Management of Coastal Areas and Small Islands).

Coral Reef Buffer
A 5 km buffer zone was created around nickel mining concessions to calculate the impacts on coral reef. Though direct studies measuring nickel dispersion distances on Indonesian reefs remain limited, related studies demonstrate heavy metal accumulation in corals within 5km of mining sites (Fernandez et. al, 2006). This approach provides a standardized assessment of nickel mining impacts on coral reefs close in proximity and does not account for sedimentation and turbidity. Coral reef at risk is calculated as the percentage of coral within 5km of the nickel concession relative to total coral within the study area (12 nautical miles around the island). Coral impact metrics are calculated only for reefs within this zone.

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