

Environmental POLLUTION

Asst. Prof. Jan Vincent T. Delos Santos, MAEd, RN
N-12 Public Health Nursing | UP College of Nursing

Philippine Context QUALITY DATA REVIEW



- Explore:
 - <https://www.iqair.com/philippines>
 - https://www.numbeo.com/pollution/country_result.jsp?country=Philippines
 - <https://earth.org/environmental-issues-in-the-philippines/>
- How bad is pollution in the Philippines?

Air Quality Index (AQI)

- fundamental & understandable tool for **gauging air quality** and its **impact on health**
- developed by United States Environmental Protection Agency
- based on **5 major air pollutants** regulated by Clean Air Act: **ground-level ozone, particulate matter (PM2.5/PM10), carbon monoxide, sulfur dioxide, and nitrogen dioxide**
 - **Green (0-50)** – Good: Air quality is satisfactory, and pollution poses little or no risk.
 - **Yellow (51-100)** – Moderate: Air quality is acceptable; however, there may be **concerns for some people sensitive** to pollution.

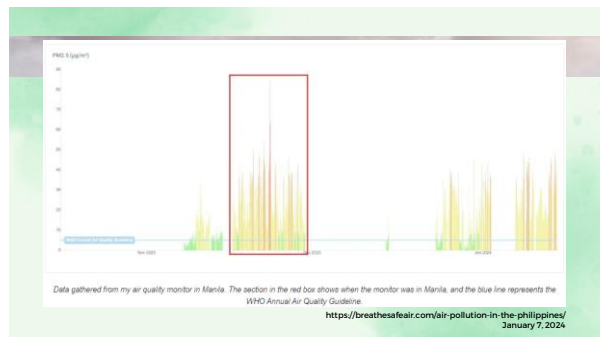
<https://breathesafeair.com/air-pollution-in-the-philippines/>
January 7, 2024

- **Orange (101-150)** – Unhealthy for Sensitive Groups: **Sensitive individuals may experience health effects**, but the general public is not likely to be affected.
- **Red (151-200)** – Unhealthy: **Everyone** may start to experience health effects; sensitive groups may experience more serious effects.
- **Purple (201-300)** – Very Unhealthy: Health alert – everyone may experience **more serious health effects**.
- **Maroon (301-500)** – Hazardous: Health warnings of emergency conditions; the **entire population** is likely to be affected.

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1. AIR POLLUTION

- annual mean for **fine particulate matter**: 24 micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) - **significantly surpassing recommended** maximum level of $5 \mu\text{g}/\text{m}^3$ (<https://earth.org/>)
- **80%** from motor vehicles;
20% from stationary sources: factories, open burning of organic matter (Philippine Air Quality Index, 2024)



2. AIR POLLUTION: Impact/Threat

- **Nitrogen dioxide (NO₂)** and **PM_{2.5}** (particulate matter with diameter of less than 2.5 micrometres) - linked to severe **respiratory and cardiovascular** health diseases
 - high blood pressure, increased asthma risk, ENT irritation
 - increased rates of chronic bronchitis, reduced lung function
- **Black carbon (BC)** and **methane (CH₄)** - accelerate glacial melt due to global warming

(Philippine Air Quality Index, 2024)

Particulate matter

- penetrate lungs & enter bloodstream -> systemic inflammation & oxidative stress -> accelerate atherosclerosis -> increased risk of heart attack & stroke

Polycyclic aromatic hydrocarbons (PAHs)

- increased risk of developing lung cancer

ELDERLY: increased risk of **cognitive decline** (Alzheimer's disease, dementia)

CHILDREN: developing bodies & higher breathing rates -> more susceptible to pollutants -> **asthma & respiratory infections**, reduced lung growth & function

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3. AIR POLLUTION: Laws/Policies

- **Clean Air Act of 1999 (Republic Act No. 8749)**
 - comprehensive air quality management policy: reduce air pollution, **protect public health**, incorporate environmental protection into development plans
 - **Emission Standards:** sets national emission standards, such as for **industrial plants and vehicles**
 - **Monitoring and Reporting:** mandates regular monitoring & reporting of air quality, requiring local governments to maintain and operate **air quality monitoring stations**

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- **Vehicle Emission Control:** enforces emission standards for vehicles and requires **regular emissions testing**
 - **GAP IN IMPLEMENTATION & SCOPE:** not enforced / not widespread: many vehicles do not comply

- **Ban on Incineration:** prohibits incineration as a method of **waste disposal**, which can contribute significantly to air pollution

- **Ecological Solid Waste Management Act (2000)**
 - solid waste reduction and waste minimization measures

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• **POLICY GAPS:**

- **Lack of Strict Enforcement:** non-compliance with emission standards
- **Outdated Standards:** compared to international benchmarks
- **Lack of Public Awareness:** on air quality issues & importance of compliance with regulations
- **Insufficient Monitoring Infrastructure:** need to provide accurate & real-time air quality data across different regions

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4. LAND POLLUTION: Causes / Sources

- **destruction and contamination** of land

1. Soil Erosion

- land **strips its fertile soil** and loses its ability to provide **nourishment** for growth
 - accelerated by **unsustainable activities:** removal of vegetative cover, down-slope tillage, overgrazing, deforestation, land leveling, improper land-use changes
 - can take **1,000 years** to produce 2-3 cm of soil: If nothing is done, soil erosion could lead up to **10 percent loss** in crop production by 2050 (Food and Agricultural Organization of the United Nations, 2024)



2. Agricultural Practices

- chemical fertilizers, pesticides, insecticides, weedicides
- **pest control**, unregulated **disposal** of wastes



3. Mining

- **56 operating metallic mines and 7 processing plants or smelters in the Philippines** (see table in next slide)
- producing **360,000 metric tons of contained nickel in 2022**, equivalent to **11% of global production**

Table 1. Operating metallic mines and processing plants/smelters in the Philippines

	2020+	2021+	2022+
Operating metallic mines			
Copper (with gold and silver)	3	3	3
Gold (with silver)	10	12	12
Chromite	4	4	4
Nickel	30	32	33
Iron	3	4	4
Total operating metallic mines	50	55	56

<https://www.austrade.gov.au/en/news-and-analysis/analysis/mining-in-the-philippines-a-new-chapter>

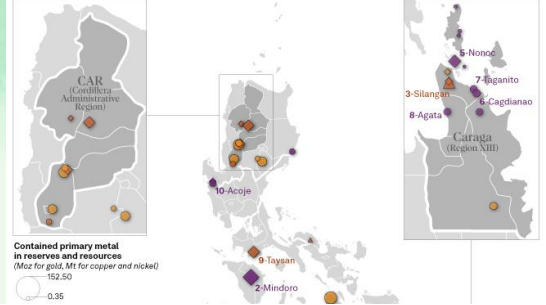
Processing plants/smelters			
Copper	1	1	1
Gold processing plant	2	4	4
Nickel processing plant	2	2	2
Total processing plant/smelters	5	7	7

Source: Mines and Geosciences Bureau, Department of Environment and Natural Resources

<https://www.austrade.gov.au/en/news-and-analysis/analysis/mining-in-the-philippines-a-new-chapter>

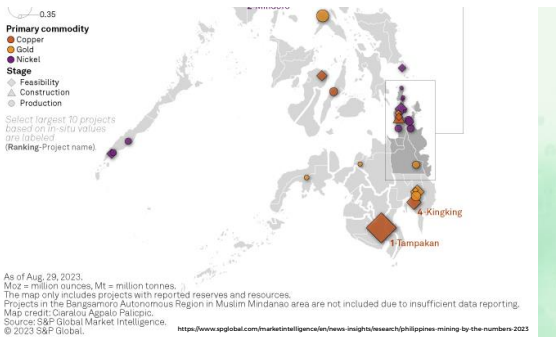
CAR and Caraga are active mining hotspots

<https://www.spglobal.com/marketing/intelligence/en/news-insights/research/philippines-mining-by-the-numbers-2023>



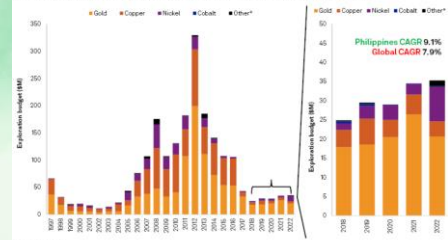
Contained primary metal in reserves and resources (Moz for gold, Mt for copper and nickel) 152.50

0.35



As of Aug. 29, 2023.
Moz = million ounces, Mt = million tonnes.
The map only includes projects with reported reserves and resources.
Projects in the Bangsamoro Autonomous Region in Muslim Mindanao area are not included due to insufficient data reporting.
Map credit: Caralou Agaslo Palapic.
Source: S&P Global Market Intelligence.
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<https://www.spglobal.com/marketing/intelligence/en/news-insights/research/philippines-mining-by-the-numbers-2023>

PH exploration remain gold dominant; nickel exploration gain momentum in 2022



As of Aug. 11, 2023.
*Other includes silver, molybdenum, platinum, zinc-lead and other minor commodities.
Values above and below the bars represent percent change year-over-year.
Source: S&P Global Market Intelligence.
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<https://www.spglobal.com/marketing/intelligence/en/news-insights/research/philippines-mining-by-the-numbers-2023>

5. LAND POLLUTION: Effects, Impact/Threat

Eutrophication

- due to high population density and lack of appropriate sewage and septage treatment systems
 - **Laguna de Bay (Laguna Lake)**
 - biggest inland water body in PH
 - already experiencing effects of eutrophication with regular occurrences of **mass fish mortalities**
 - affects 21.4 million people as major source of **food, water, and livelihood**



Pausta, C.M., Kalbar, P. & Sarag, D. Life cycle assessment of nutrient recovery strategies from domestic wastewaters to quantify environmental performance and identification of trade-offs. Sci Rep 14, 3678 (2024). <https://doi.org/10.1038/s41598-024-54060-4>



Eric Jan Escobar, Maria Pythias Espino, A new trophic state index for assessing eutrophication of Laguna de Bay, Philippines. Environmental Advances, Volume 13, 2023. <https://doi.org/10.1016/j.envadv.2023.100410>.

- excessive inputs of limiting nutrients phosphate and nitrate -> **accelerate growth** of algae
- algae restricts **penetration of sunlight** into water, affecting photosynthesis and not allowing restoration of oxygen levels -> **decrease oxygen** -> **fish kill**

6. LAND POLLUTION: Laws/Policies

- **RA 9003 (Ecological Solid Waste Management Act of 2000)**
 - improvements in land disposal practices for solid waste
- **National Greening Programme**
 - aims to plant 1.5 billion trees across 1.5 million hectares of land by 2028
- Forest Management Bureau's **Community-Based Forest Management Programme**
 - aims to involve local communities in forest management and conservation efforts

www.green.earth
March 9, 2023

7. WATER POLLUTION: Causes / Sources

- Philippines is third largest contributor to **marine plastics**
 - 20% of over 2 million tons (plastic waste every year) ends up in seas
- Manila: subsiding at 20 millimetres per year, surpassing mean **sea level rise** almost tenfold (earth.org)
- Pasig River's **share of plastic is over 6%**, with remainder coming from other rivers (Agusan, Jalaur, Pampanga, Rio Grande de Mindanao, Tambo in Pasay, Tullahan, Zapote) (developmentaid.org)

Mostly wastewater from:

- **Industrial:** lead, mercury, chromium, cadmium, cyanide
- **Agricultural**
 - Organic: decayed plants, dead animals, livestock manure, soil runoff
 - Non-organic: pesticides, fertilizers
- **Domestic sewage:** pathogens threaten human health and life
- **Others**
 - Oil, mine or chemical spills
 - Illegal dumping in or near water

(Greenpeace Reports)

8. WATER POLLUTION: Impact/Threat

- **RED TIDE (TOXIC ALGAL BLOOM)**
 - a type of harmful algal blooms (HAB)
 - caused when **algae, such as phytoplankton**, grow **out of control and generate toxic effects** on fish, shellfish, birds, people. Impacts cut across fishing industry, public health, environment (Gozum, 2023)
 - higher than safe levels of **Paralytic Shellfish Poison (PSP)**, making shellfish collected **unsafe to eat** (Bureau of Fisheries and Aquatic Resources)

Republic of the Philippines
Department of Health
BUREAU OF FOOD AND DRUGS ADMINISTRATION
Bureau Building Complex, 6th Floor, 1201 Legaspi Street, Alabang, Muntinlupa City, Metro Manila 1518
Telephone: (639) 850-5000 | Email: bfar@bfa.gov.ph | Website: bfa.gov.ph

Shellfish Bulletin No. 63
Series of 2024
13 February 2024

Shellfish collected and tested from coastal waters of Marikina in Marikina; coastal waters of Bacay and Taguiguen City in Laguna; San Pedro Bay in Batangas and Marikina Bay in Batangas; Dagupan Bay in Pangasinan del Sur; Urdaneta Bay in Pangasinan del Sur; and coastal waters of San Roque in Surigao del Norte are not suitable for human consumption (PFC) or for use in food that is intended for human consumption.

bfar.da.gov.ph

All types of shellfish and Accretes sp. or alimang gathered from the areas shown above are NOT SAFE for human consumption. Fish, squids, shrimps, and crabs are safe for human consumption provided that they are fresh and washed thoroughly, and internal organs such as gills and intestines are removed before cooking.

The following areas continue to be FREE from toxic red tide: coastal waters of Causa, Las Pallas, Paranaque, Navotas, Bulacan, and Bataan (Mariveles, Limay, Orion, Pilar, Balanga, Hermosa, Orani, Abucay, and Sornat) in Manila Bay; marikultura areas in Infanta, coastal waters of Bolinao, Anda, Alaminos, Sual, and Wawa, Bani in Pangasinan; marikultura areas in Rosario, waters of Walay, Padre Burgos in Quezon; Honda, and coastal waters of Inner Malampaya Sound, Taytay in Palawan; coastal waters of Marikina in Marikina; Sorongon Bay, and Ilang Lagoon, Malinao in Sorsogon; coastal waters of Borongan, San Abdon, Bataan, and New Washington in Bataan Bay, Alilan; coastal waters of Pontevedra; Panay; Pilar; Roxas City and Negros Occidental; Tambobo, and Sit Bay, Siaton, and Bale Bay, Bala City in Negros Oriental; coastal waters of Daram, Cuthayay, and Zumarraga, Cambutay, Inong-Inong, Magueta and Villamor Bays in Samar; coastal waters of Guilan in Tawi-tawi Bay in Zamboanga Sibuyan; Marikigay Bay in Zamboanga del Norte and (Sapang Dalaga, and Ballangao) in Tawi-tawi Bay in Zamboanga Sibuyan; Marikigay Bay in Zamboanga del Norte and (Sapang Dalaga, and Ballangao) in Tawi-tawi Bay in Zamboanga Sibuyan; Pangasinan Bay, Tandang City, and coastal waters of Ozamis City in Misamis Occidental; coastal waters of Misamis Occidental; Pangasinan Bay, Tandang City, and coastal waters of Ozamis City in Misamis Occidental; coastal waters of Bero in Lanao del Norte; Taguiguen Lagoon, Benoni, Malinao in Camiguin; Balite, and Pujada Bays, Mati City in Davao Oriental; Taguiguen Bay and Haulag Bay in Davao Occidental and Davao del Sur; coastal waters of Hinatuan, and Cortes, and Bislig Bay in Surigao del Sur.

ATTY. DEMOSTHENES R. ESCOTO
Director

bfar.da.gov.ph

Weather factors like monsoon rains and temperature changes stimulate bloom of these algae, also known as **dinoflagellates**

(pia.gov.ph)

Red tide poisoning is a life-threatening syndrome associated with eating contaminated shellfish.

Causes
Red tide microorganisms in shellfish (Banggai, Isabela, Iloilo)

Signs & Symptoms
The symptoms are purely neurological and the onset is rapid that it can be felt within 12 hours.

Neurological
• Sense of numbness around the mouth or the face
• Dizziness
• Pricking sensation and/or paralysis of hands and feet
• Body weakness
• Rapid pulse beat
• Difficulty in talking, swallowing, breathing
• Headache

Gastrointestinal
• Abdominal pain, vomiting, and diarrhea

Treatment
• Supportive treatment, especially ventilatory support/artificial respiration, is given in severe cases.
• Fluid therapy may be administered.
• Decontamination (e.g., coconut water and brown sugar) may be done.

Prevention
• Do not eat shellfish.
• Avoid eating alimang and small fishes.
• Wash thoroughly and remove gills and intestines of fish, squids, and crabs.
• Remove heads of shrimps.

doh.gov.ph OfficialDOH.gov

• **Microorganisms: Coliform Bacteria**

- found in soil, water, intestinal tract of animals
- coliform count: frequent hygienic indicator of **unsanitary conditions** in food and beverage industries / production
- standard coliform level for coastal waters to be safe for swimming and recreational activities: **100 most probable number per 100 milliliters [100 MPN/100mL]** (DENR)
 - Manila Bay Coordinating Office:
 - [October 2022] Manila Bay: 51,300 MPN/100mL from 126,000 MPN/100mL in 2019

9. WATER POLLUTION: Laws/Policies

- 2021: Department of Environment and Natural Resources, in partnership with agencies & organizations:
 - 5-year initiative to bring Pasig River back: sustainable **river garbage collecting system** (developmentaid.org)
- DENR Administrative Order No. 2021-19 (Water Quality Guidelines and Effluent Standards)

Water Body Classification	Unit	WQG	GES
Class AA	MPN/100 mL	20	NDA
Class A	MPN/100 mL	50	100
Class B	MPN/100 mL	100	200
Class C	MPN/100 mL	200	400
Class D	MPN/100 mL	400	800
Class SA	MPN/100 mL	20	NDA
Class SB	MPN/100 mL	100	200
Class SC	MPN/100 mL	200	400
Class SD	MPN/100 mL	400	800

Note: NDA - No Discharge Allowed
MPN/100mL - Most Probable Number/100 ml of sample

- Republic Act No. 9275: Philippine Clean Water Act of 2004
 - Water Pollution: any alteration of physical, chemical, biological, radiological properties of water body resulting in **impairment of purity or quality**
 - national research and development program for **prevention and control of water pollution**

10. Implications to Nurses' Care of Families

- In areas with frequent high AQI levels, consider using **air purifiers** to maintain indoor air quality.
- **Ventilation**: to reduce indoor air pollution
- **Monitoring Health**: coughing, shortness of breath, heart palpitations

<https://breathesafeair.com/air-pollution-in-the-philippines/>
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RED TIME WARNING

- Do not eat shellfish. Strictly **avoid eating shellfish** from areas with fishing bans. Avoid eating alamang & small fishes.
- Wash thoroughly. Remove gills & intestines of fish, squids & crabs. Remove heads of shrimps.

<https://pia.gov.ph/features/2023/11/13/public-warning-red-tide-alert-up-in-capiz-zambo-sur-ilolo-surigao-norte>

- When in doubt, don't eat collected shellfish. Get only certified safe seafood. **Cook shellfish thoroughly** as **heat helps destroy some toxins**. Watch local alerts and follow red tide advisories.

<https://pia.gov.ph/features/2023/11/13/public-warning-red-tide-alert-up-in-capiz-zambo-sur-ilolo-surigao-norte>