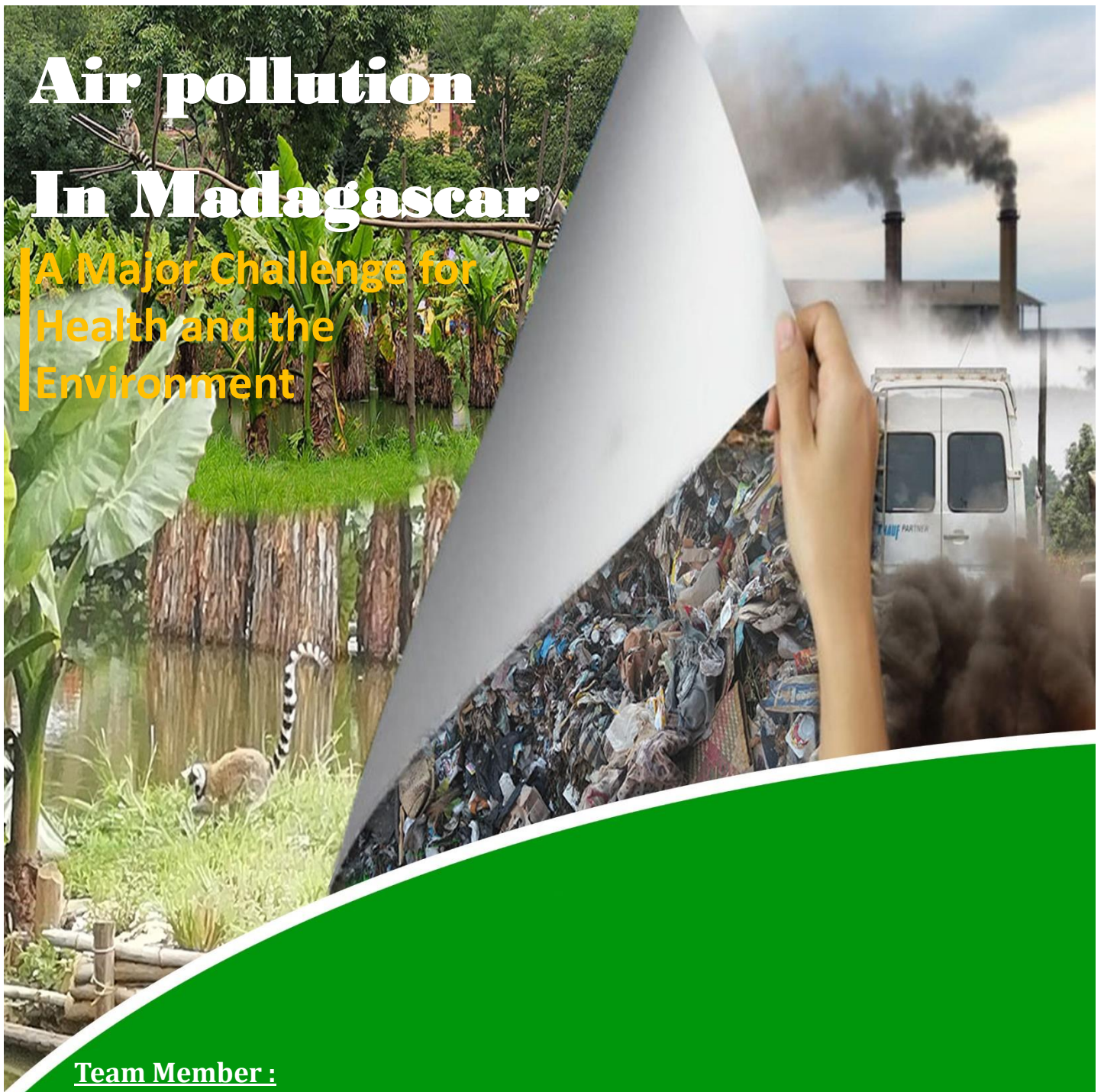


# Air pollution In Madagascar

A Major Challenge for  
Health and the  
Environment



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## ORGANIZATION:

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## Member:

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## Coach(s)/Advisor(s):

- RABENANDRASANA Doris



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## ABSTRACT

Atmospheric pollution represents a growing problem air pollution in Madagascar. Despite its exceptional biodiversity, the island faces increasingly worrying environmental challenges linked to air quality. Emissions from industrial activities, transportation and agricultural practices have increased significantly, directly impacting the health of residents and Madagascar's unique biological diversity. This study examines in depth the specific sources of air pollution in the Malagasy context, assesses its repercussions on public health and the ecosystem, and proposes strategic recommendations to mitigate these effects while promoting sustainable development. The results of this research aim to raise awareness of the issues of air pollution in Madagascar and to guide future actions to preserve the air quality and natural wealth of the island.

## **Introduction**

Air quality represents a crucial element of our environment, having major repercussions on human health and ecological balance. Unfortunately, air pollution is expanding on a global scale, causing worrying consequences for the well-being of populations and the sustainability of our planet. Current data points to a significant increase in air pollution, creating a pressing need for action.

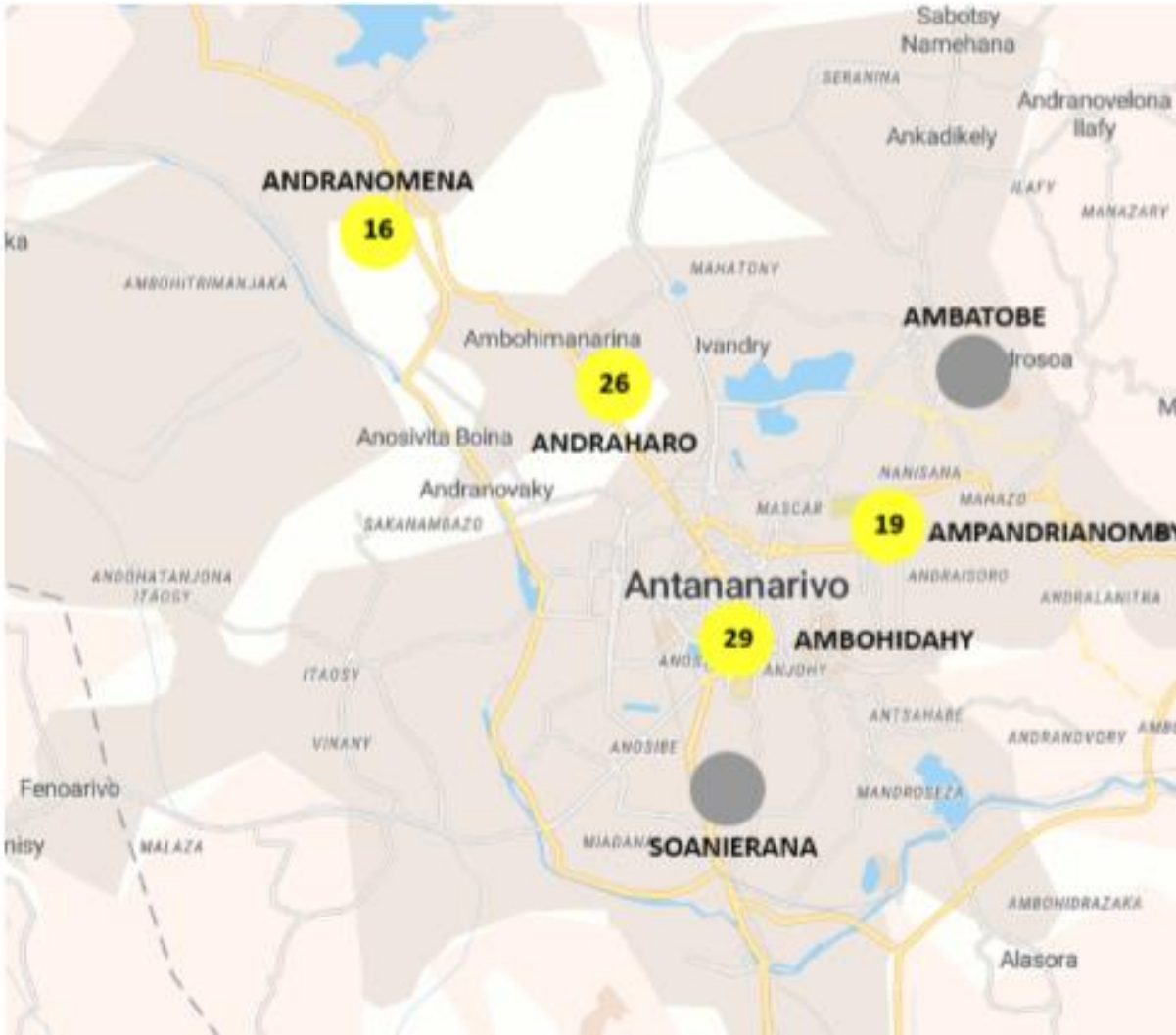
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With this in mind, this study aims to explore the specific sources of air pollution in Madagascar, to assess its consequences on public health and biological diversity, and to formulate recommendations to mitigate these impacts while promoting a sustainable development.

## **METHODS USED**

- Survey from the Mistry of Transport and Meteorology
- Selection of sites represeting air pollution in the capital of Madagascar
- Selectin the righth sensors
- Collect ans analyze data
- Interpret the results

**MAPS OF SAMPLING AREA**



## Results

### Limpects of air quality on health depending on concentration rates of fine PM2.5 particle

Concentrations of $\mu\text{g}/\text{m}^3$	Air quality	health impacts
0-12	Good	Air quality is considered satisfactory and air pollution poses little or no risk
12-35	Moderate	Aire quality is acceptable . however, if people who are exceptionally
35-55	Unhealthy for sensitive people Everyone	sensitive to air pollution are exposed fo 24 hours there may experiencece health effects if exposed for 24 hours, the general public is unlikely to be affected .
55-150	Unhealthy for everone	Anyone can begin to experience health effects if exposed for 24 hours. Sensitive people may experience more serious health effects.
150-350	Very unhealthy	Health Alert: anyone can begin to experience more serious health effects if exposed for 24 hours.
350+	Dangerous	Emergency conditions: the entire population is likely to experience very serious health effects if exposed for 24 hours

#### Air quality

<b>0</b>	<b>12</b>	<b>35</b>	<b>55</b>	<b>150</b>	<b>350</b>
Good	Moderate	Unhealthy for sensitive people Everyone	Unhealthy for everone	Very unhealthy	Dangerous

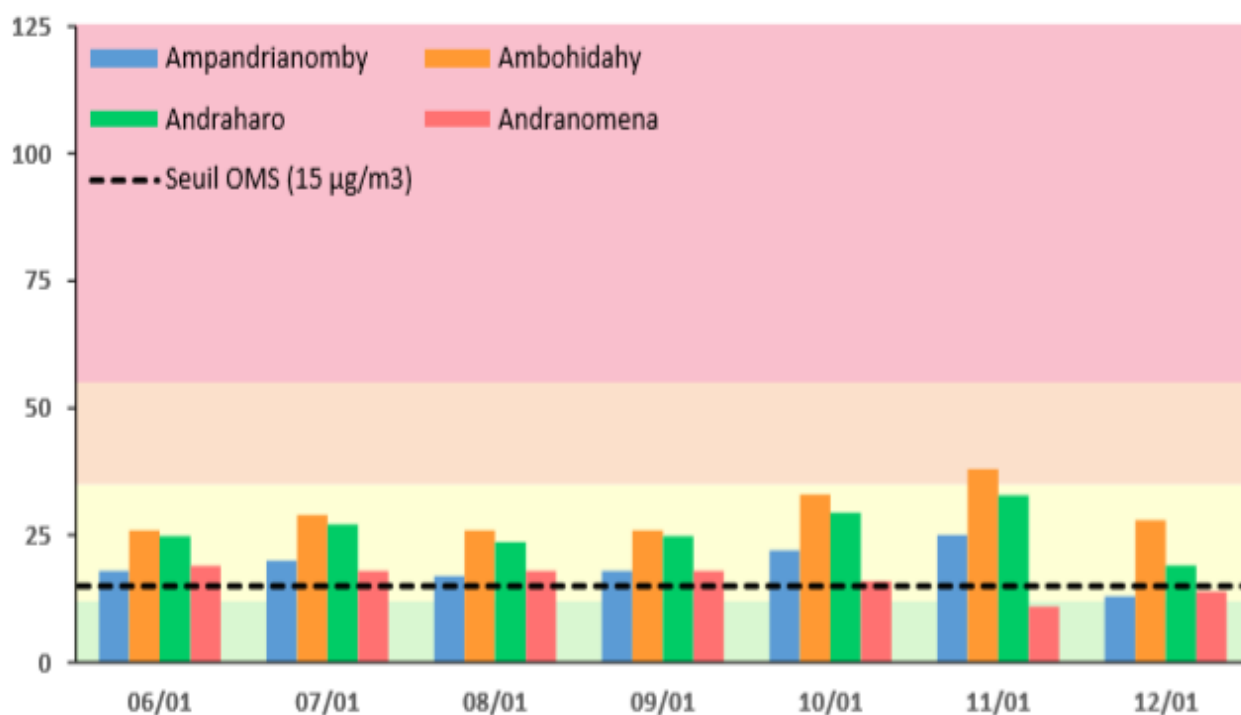


- Here is the court data from last year from 06 to 12 Janvier 2023

Air quality in Antananarivo generally remained moderate during this week. The concentrations of fine PM2.5 particles (with a diameter of less than 2.5 micrometers) are all close to the threshold recommended by the World Health Organization (WHO).

For the next three days, weather conditions should still remain unfavorable for the accumulation of pollutants and air quality should generally remain moderate

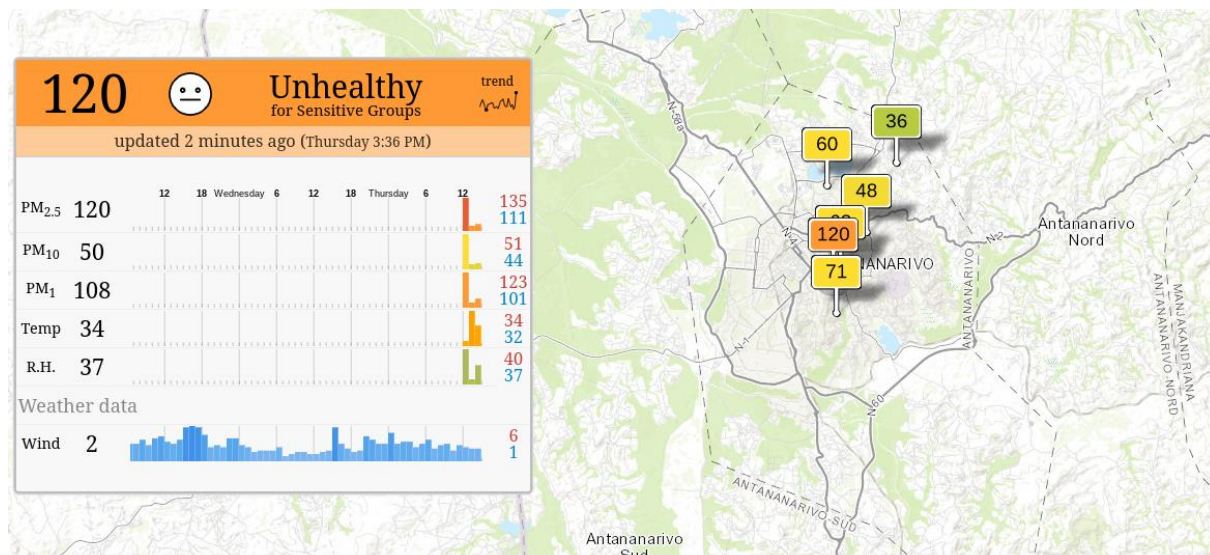
### Daily average concentrations of fine PM2.5 particles ( $\mu\text{g}/\text{m}^3$ ) from January 6 to 12, 2023



- Here is the court data from last year from 23 February 2024

Air quality in Antananarivo generally remained Unhealthy during this week. The concentrations of fine PM2.5 particles (with a diameter greater than 2.5 micrometers) are all close to the greater recommended by the World Health Organization (WHO).

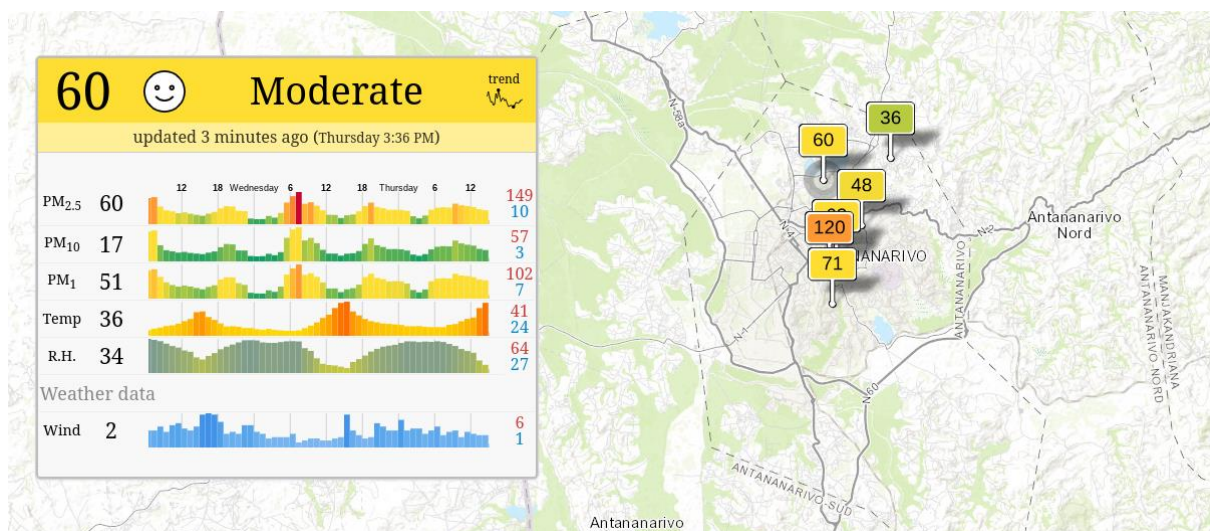
For the next three days, weather conditions should still remain unfavorable for the accumulation of pollutants and air quality should generally remain unhealthy



- Here is the court data from last year from 22 to 29 February 2024

Air quality in Antananarivo generally remained Unhealthy during this week. The concentrations of fine PM2.5 particles (with a diameter greater than 2.5 micrometers) are all close to the greater recommended by the World Health Organization (WHO).

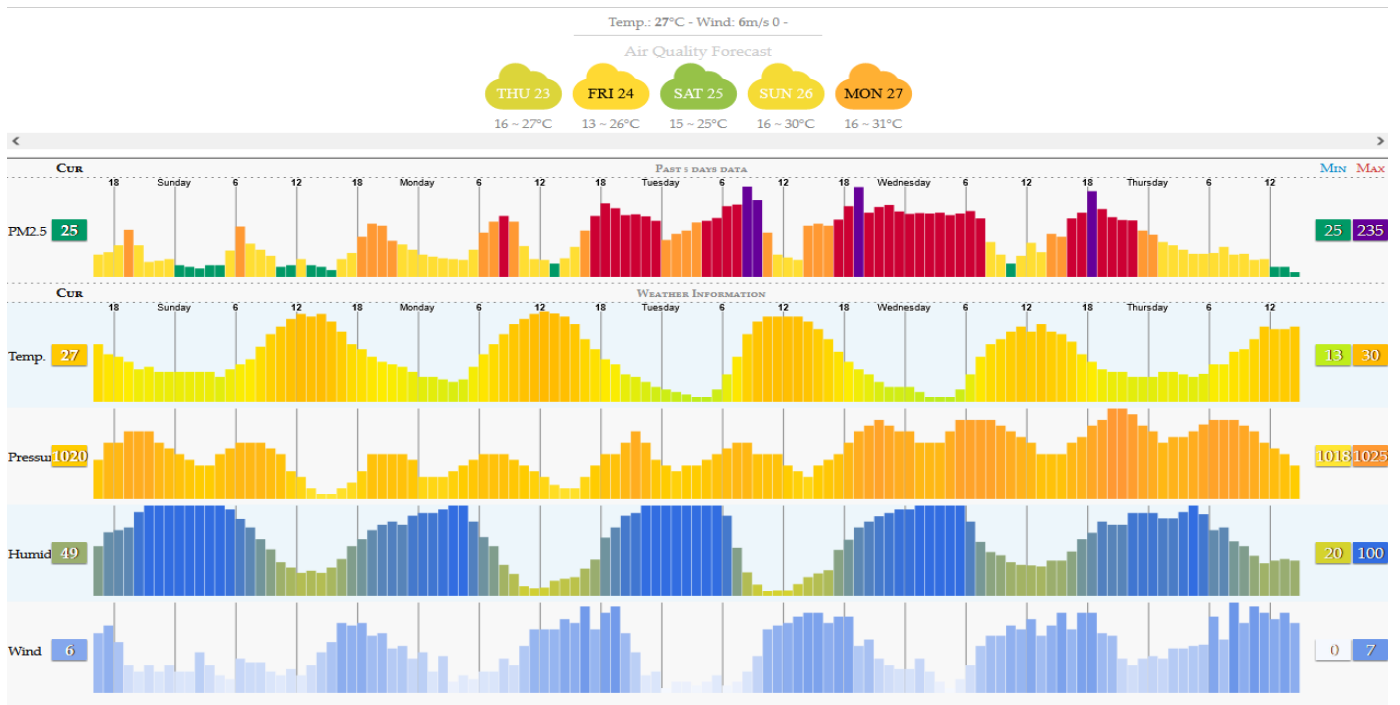
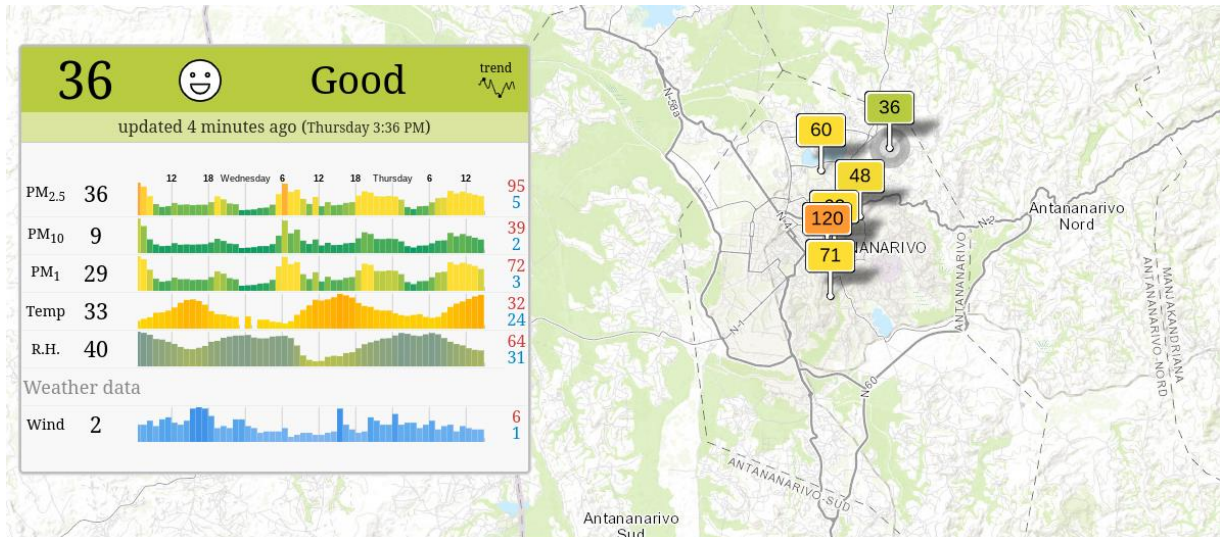
For the next three days, weather conditions should still remain unfavorable for the accumulation of pollutants and air quality should generally remain unhealthy



- Here is the court data from last year from 23 February 2024

Air quality in Antananarivo generally remained good during this week. The concentrations of fine PM2.5 particles (with a diameter of less than 2.5 micrometers) are all close to the threshold recommended by the World Health Organization (WHO).

For the next three days, weather conditions should still remain unfavorable for the accumulation of pollutants and air quality should generally remain good.



## Discussion

After analyzing the results of atmospheric pollution in the different areas of the Analamanga region, we can see that:

- The quality of the air in the next year 2023 shows us that the concentrations of fine particles PM2.5 are twice higher than the standard recommended by the World Health Organization (WHO), but the quality of the air remains moderate. Doc Air quality is acceptable. However, if people who are exceptionally sensitive to air pollution are exposed for 24 hours there may be a moderate health problem.
  
- The quality of the area for this year 2024 the result shows us different daily average concentrations of fine PM2.5 particles in different areas of the Analamanga region.
  - 1- For the city center of Antananarivo, the concentration of fine PM2.5 particles (with a diameter greater than 2.5 micrometers) are all three times higher than the threshold recommended by the World Health Organization (WHO), therefore the quality of the area is unhealthy for sensitive people. So sensitive people may experience health effects if exposed for 24 hours.
  
  - 2- But if we move away from the city center the quality of the area changes, it becomes a little pure. So air quality is acceptable apart from the sensitive ones.
  
  - 3- But if you leave the city of Antananarivo the area is so good and pure that there is no health risk. Therefore, air quality is considered satisfactory and air pollution poses little or no risk.

## **Disadvantages of air pollution on health**

Air pollution is a serious problem that affects the health of millions of people around the world. One of the main disadvantages of air pollution is its impact on the respiratory tract. Fine particles and harmful gases in polluted air can penetrate deep into the lungs, causing irritation, respiratory infections and chronic diseases such as asthma, chronic bronchitis and even lung cancer. Additionally, air pollution is also linked to cardiovascular problems, such as heart attacks and strokes. In short, air pollution constitutes a serious danger to public health, requiring urgent measures to reduce its harmful impact.

1. **Respiratory problems:** Inhaling fine particles and air pollutants can cause or worsen respiratory illnesses such as asthma, chronic bronchitis and lung infections.
2. **Cardiovascular Problems:** Air pollution is associated with an increase in cardiovascular diseases such as heart attacks, strokes, high blood pressure and coronary heart disease.
3. **Effects on the nervous system:** Studies have shown that air pollution can have adverse effects on the development and functioning of the nervous system, potentially contributing to mental health problems such as anxiety and depression.
4. **Cancers:** Certain air pollutants, such as polycyclic aromatic hydrocarbons (PAHs), are considered carcinogens and are associated with an increased risk of lung cancer.
5. **Reproductive Effects:** Air pollution can also have adverse reproductive effects, potentially causing problems such as premature births, miscarriages, and reduced sperm quality.
6. **Impact on Children:** Children are particularly vulnerable to the effects of air pollution due to their still developing airways. Long-term exposure can cause long-term health problems in children, including problems with lung development.
7. **Effects on the Elderly:** Elderly people are also more likely to suffer the effects of air pollution due to their generally poorer health. Air pollution can worsen existing health problems and increase the risk of serious illnesses.

>

## **Disadvantages of air pollution on the environment**

Air pollution has harmful consequences on the environment on several levels. First, it contributes to global warming by increasing the concentration of greenhouse gases in the atmosphere, such as carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>). These gases trap heat from the sun, causing the planet to gradually warm.

1. **Climate Change:** Some air pollutants, such as greenhouse gases, contribute to global warming by trapping heat in the atmosphere. This can lead to dangerous climate changes, such as rising sea levels, more frequent storms and prolonged droughts.
2. **Deterioration of monuments and buildings:** Air pollutants can damage building materials and historic monuments, leading to high restoration and preservation costs.

3. **Impact on water quality:** Some air pollutants can be deposited in surface and ground water, affecting water quality and threatening aquatic life.

➤ *It is therefore essential to reduce air pollution to preserve human health, protect ecosystems and fight climate change.*

## **SOLUTION**

Air pollution in Madagascar is a growing problem that requires urgent solutions. The main sources of air pollution in Madagascar are motor vehicles, industries, biomass burning for cooking and heating, and bushfires. To solve this problem, it is crucial to implement measures.

1. **Reduction of vehicle emissions:** Encourage the use of cleaner vehicles and regular maintenance of existing vehicles to reduce harmful emissions.
2. **Promotion of public transport:** Develop public transport to reduce the number of vehicles on the roads and thus pollutant emissions.
3. **Industry control:** Establish strict standards for industries in order to limit their emissions of air pollutants.
4. **Use of clean energy sources:** Promote the use of renewable and clean energy sources, such as solar and wind energy, to reduce dependence on fossil fuels.
5. **Waste management:** Improve waste management, in particular by promoting recycling and reducing open dumps, which contribute to air pollution.
6. **Sensibilisation et éducation :** Sensibiliser la population aux dangers de la pollution de l'air et promouvoir des comportements plus respectueux de l'environnement.
7. **Air quality monitoring:** Establish an air quality monitoring system to track pollution levels and take corrective action if necessary.
6. **Awareness and education:** Raise public awareness of the dangers of air pollution and promote more environmentally friendly behavior.
7. **Air quality monitoring:** Establish an air quality monitoring system to track pollution levels and take corrective action if necessary.

## Conclusion

In conclusion, the analysis of air pollution in the Analamanga region highlights significant concerns for air quality, with concentrations of fine particles often exceeding WHO recommendations. This situation can lead to health problems, especially for people sensitive to pollution. However, improvements are observed moving away from Antananarivo city center and leaving the city, where air quality is better.

The harmful effects of air pollution on health and the environment are also highlighted, particularly with regard to respiratory and cardiovascular problems and the risk of cancer. Environmentally, pollution contributes to climate change and affects monuments, buildings and water quality.

To solve this problem, measures are needed, such as reducing vehicle emissions, promoting public transportation, controlling industries, using clean energy sources, better waste management, raising awareness and education, as well as air quality monitoring. Concerted action between government, businesses, local communities and individuals is essential to reduce air pollution, protect human health, preserve ecosystems and combat climate change.

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