

CanSat Competition - Air Pollution Monitoring Project

Problem Statement

Air pollution, primarily from greenhouse gases like carbon dioxide (CO₂) and sulfur dioxide (SO₂), has a profound impact on global warming and ecosystem degradation. Despite efforts to monitor air quality, localized data in many areas remains insufficient. Our project addresses this gap by providing precise, actionable data from targeted regions, which can guide more effective environmental measures.

Objectives and Scope

Objectives

- Collect accurate measurements of CO₂ (Carbon dioxide), SO₂ (Sulfur dioxide), CO (Carbon monoxide), CH₄ (Methane) and NO₂ (Nitrogen dioxide) levels in specific locations.
- Analyze and organize data for presentation to local authorities and environmental agencies such as WMO (World Meteorological Organization) or WHO (World Health Organization).
- Raise awareness about the importance of air quality monitoring.

Scope

- The project includes the design, construction, and deployment of a functional CanSat for air pollution measurements.
 - Beyond the competition, the project aims to extend its impact by being used as an educational tool and shared with relevant stakeholders.
-

Proposed Solution

Our solution involves developing a CanSat equipped with sensors to measure pollutants. The satellite will be programmed to collect data during a simulated flight, store them inside a SD card and at the same time send them back to the ground station. Data analysis will highlight pollution levels in the targeted region, identifying patterns and areas requiring attention.

Alternative solutions, such as existing regional monitoring systems, are less precise for localized data collection, which underscores the need for our approach.

Benefits and Value Proposition

- **Environmental Impact:** High-precision data to support local air quality initiatives.
- **Educational Growth:** Hands-on experience in STEM (science, technology, engineering and mathematics), fostering skills in programming, communication and teamwork.
- **Community Engagement:** Increased awareness of air pollution issues and solutions.

- **Global Relevance:** Contribution to Sustainable Development Goals by UN (United Nations), particularly SDG 13: Climate Action.
-

Risks and Challenges

Risk	Probability	Impact	Mitigation Strategy
Sensor malfunction	Medium	High	Perform rigorous testing and carry backups.
Data transmission failure	Medium	High	Implement redundancy in communication systems.
Insufficient time management	Low	Medium	Use a project timeline and delegate tasks effectively.
Human error	Medium	High	Reduce exhaustion and grasp work with organized, efficient and consistent approach

Desirable Outcome

- **CanSat:** Fully operational satellite with pollutant sensors.
 - **Data Set:** Organized and analyzed air quality data.
 - **Report:** Findings and respective recommendations for local authorities.
 - **Presentations:** Educational sessions for schools and community groups.
-

Financial Overview

- **Estimated Cost:** 1 500€
 - Includes: sensors, materials, ground station construction, energies and additional expenses to cover faulty equipment,
 - Excludes: tools and premises such as laboratories, which are provided by our school
- **Funding Sources:** Contributions from school and sponsors.
- **Value Generated:**
 - Data accuracy improvement (expected $\pm 5\%$)
 - Team's education with hands-on experience
 - Expand community awareness.

Stakeholders and Impact

- **Students:** Develop critical STEM skills and experience.
- **Authorities:** Gain high-precision, applicable pollution data.
- **Community:** Increase awareness and engagement on air quality issues.
- **Education Sector:** Promote respective fields through workshops and presentations.

Future Plans

Post-competition, we plan to:

- Present our findings to local authorities for integration into broader air quality monitoring systems.
- Conduct educational outreach, including demonstrations at schools and community events.
- Explore scaling up the project to cover additional environmental parameters or regions.

Conclusion

Our CanSat project represents a unique intersection of education, innovation, and environmental responsibility. By focusing our efforts on air pollution, we aim to deliver meaningful insights while advancing our own knowledge and skills. Therefore, educating a new generation of professionals in their respective field of expertise.