
PurerAir
Empowering every breath
Lite Paper
The Waze of Indoor Health and Well-Being

Table of Contents

Executive Summary

PurerAir leverages advanced technologies and the engagement of local communities to create high-resolution air quality and noise datasets, with focus on indoor venues (hotels, restaurants, shopping centers, etc). By encouraging citizens to carry wearable sensors and earn token rewards for data streams we are able to cover a wide range of locations and venues worldwide quickly and cost effectively.

Currently, no large-scale datasets exist to assess average air quality and noise levels in indoor venues. As poor air quality and excessive noise levels are very detrimental to human health, PurerAir datasets have high societal and commercial value as they fill a big gap in environmental monitoring. Our datasets will be leveraged for example by the travel and tourism industry, by enriching customer reviews for hotels, restaurants, malls, etc, with science-grade noise and pollution data, helping people choose venues which are most suitable and safe for them.

The Dangers of Indoor Noise and Air Pollution

Air Pollution

According to the EPA, we spend about 90% of our time indoors. Yet, there is no widespread culture of indoor air quality (IAQ) monitoring, as international regulations focus on outdoor air quality. In fact, health risks related to poor air quality are potentially greater indoors than outdoors because of prolonged exposure and concentrations of pollutants which can reach much higher levels than outdoors.

Poor IAQ can lead to a variety of health issues, ranging from short-term discomfort to long-term chronic diseases. Here are some key points about the health impacts of IAQ:

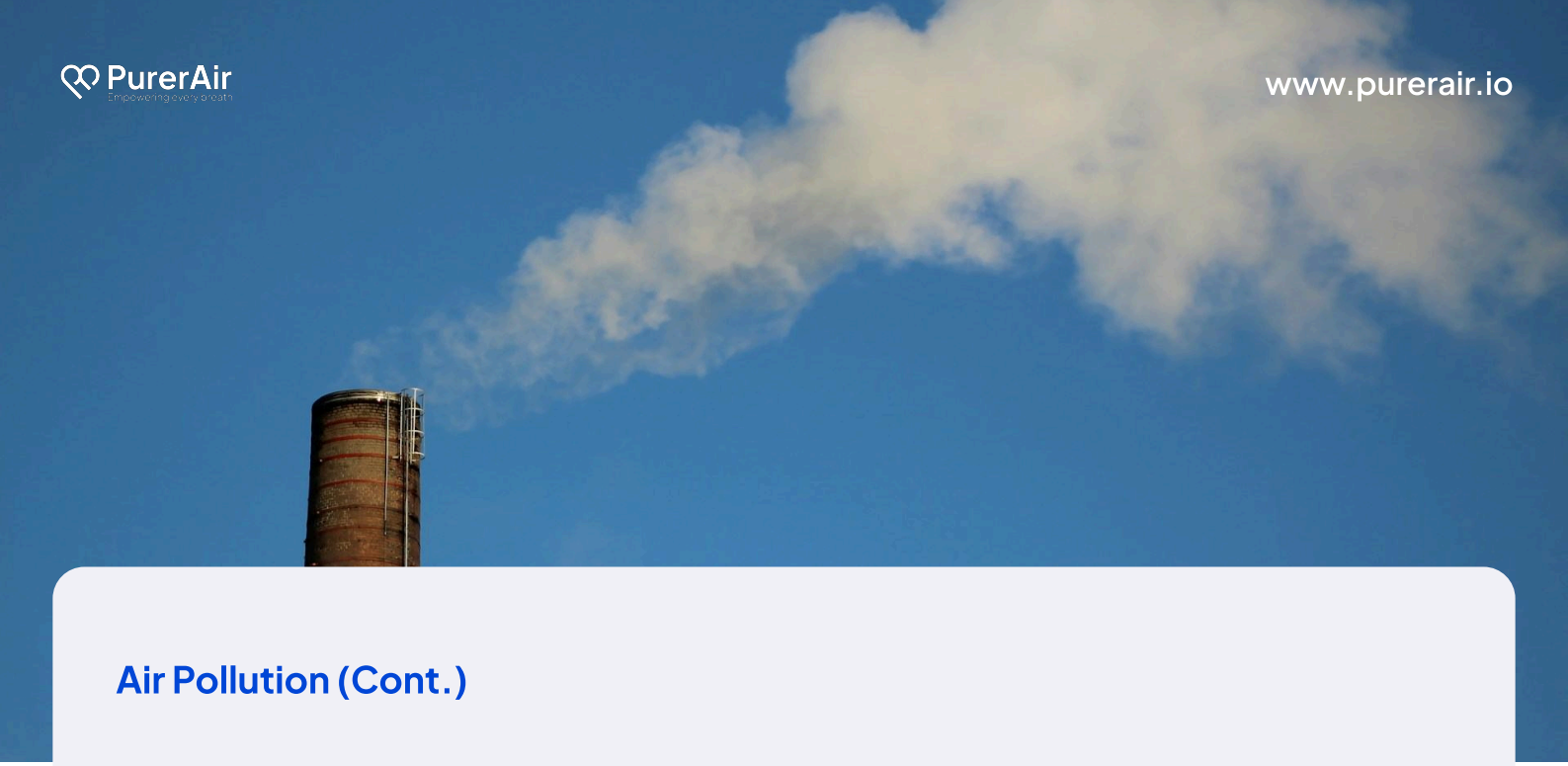
Respiratory Issues
Poor IAQ can exacerbate conditions such as asthma and bronchitis. Common indoor pollutants like dust, pet dander, mold spores, and volatile organic compounds (VOCs) can irritate the respiratory system and cause symptoms such as coughing, sneezing, shortness of breath, and wheezing.

Allergic Reactions
Many indoor pollutants are allergens that can trigger allergic reactions. These include dust mites, mold, pet dander, and pollen. Symptoms can range from mild (sneezing, runny nose) to severe (asthma attacks).

Cardiovascular Effects
Prolonged exposure to poor IAQ, particularly to fine particulate matter (PM2.5), has been linked to cardiovascular problems. These include hypertension, heart attacks, and strokes.

Cancer Risks
Certain indoor air pollutants are carcinogenic. Radon, a naturally occurring radioactive gas, can accumulate in homes and is a leading cause of lung cancer among non smokers. Long-term exposure to VOCs like formaldehyde, benzene, and trichloroethylene can also increase cancer risk.

Neurological Effects
Exposure to high levels of certain pollutants, such as carbon monoxide and lead, can adversely affect the nervous system. Symptoms include headaches, dizziness, fatigue, and in severe cases, cognitive impairments and developmental issues in children.



Air Pollution (Cont.)

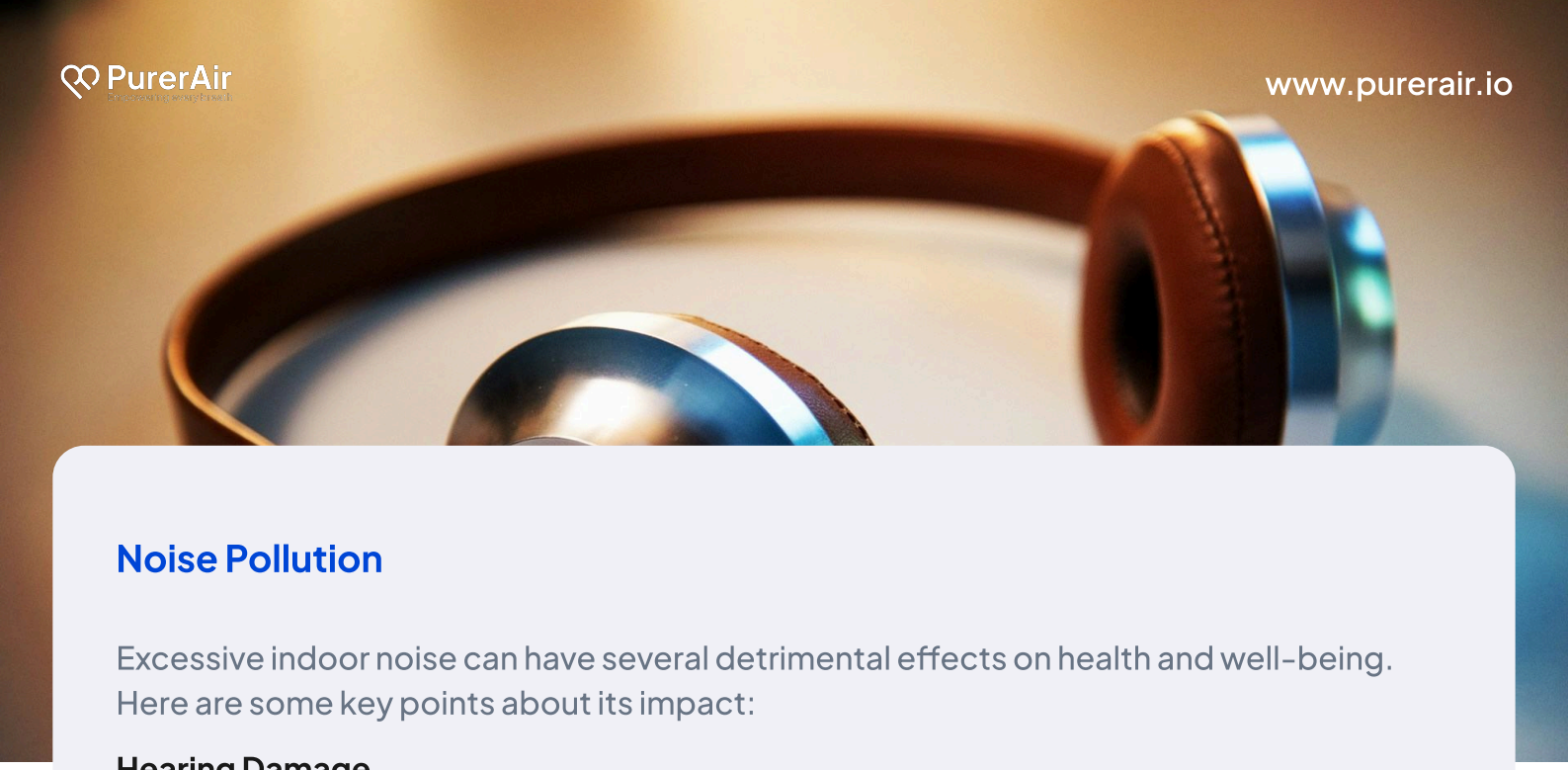
Irritation of Eyes, Nose, and Throat
Many indoor air pollutants can cause irritation of mucous membranes, leading to symptoms such as itchy or watery eyes, sore throat, and nasal congestion.

Impact on Vulnerable Populations
Certain groups, such as children, the elderly, and individuals with preexisting health conditions, are more susceptible to the adverse effects of poor IAQ. Children's developing lungs and immune systems make them particularly vulnerable to pollutants.

Sick Building Syndrome (SBS)
SBS refers to a situation where building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified. Symptoms include headaches, dizziness, nausea, and irritation of eyes, nose, or throat.

Cognitive Function and Productivity
Studies have shown that poor indoor air quality can negatively affect cognitive function and productivity. Higher levels of CO2 and pollutants can impair concentration, decision-making, and overall workplace performance.

The onset of the COVID-19 pandemic has drawn additional attention to air quality. Recent studies have indicated a significant risk of infection via aerosol, i.e. a suspension of fine solid particles or liquid droplets in the air. Aerosol transmission is higher in indoor, crowded and inadequately ventilated spaces, where infected person(s) spend long periods of time with others, such as restaurants, choir practices, fitness classes, nightclubs, offices and/or places of worship. Special attention is needed for venues hosting very vulnerable populations such as hospitals and nursing homes.



Noise Pollution

Excessive indoor noise can have several detrimental effects on health and well-being. Here are some key points about its impact:

Hearing Damage

Prolonged exposure to high noise levels can lead to hearing loss or tinnitus (ringing in the ears). This is particularly relevant in environments with constant loud machinery, music, or other persistent noise sources.

Sleep Disturbance

Noise can significantly disrupt sleep patterns, leading to difficulties falling asleep, frequent awakenings, and overall poor sleep quality. Chronic sleep disruption can result in fatigue, decreased cognitive function, and increased susceptibility to illness.

Cardiovascular Issues

Continuous exposure to loud noise can increase stress levels, leading to elevated blood pressure and heart rate. Over time, this stress can contribute to more serious cardiovascular problems, such as hypertension, heart disease, and stroke.

Mental Health Effects

Excessive noise can contribute to stress, anxiety, and irritability. It can also exacerbate symptoms of mental health conditions, such as depression and anxiety disorders, by creating an environment that is perceived as uncontrollable and stressful.

Cognitive Impairment

Persistent noise, especially in learning environments like schools, can impair cognitive functions such as concentration, memory, and learning. This can negatively affect academic performance in children and productivity in adults.

Communication Difficulties

High noise levels can make it difficult to communicate effectively, leading to misunderstandings, frustration, and increased stress. This is particularly problematic in environments where clear communication is crucial, such as workplaces or healthcare settings.

Noise Pollution (Cont.)

Developmental Effects in Children

Children exposed to chronic noise pollution may experience developmental issues, particularly related to language and cognitive development. Studies have shown that high noise levels can impact reading skills, attention, and overall academic achievement.

General Well-being

Excessive noise can lead to a general decline in quality of life, reducing the ability to relax, enjoy leisure activities, and create a sense of peace and comfort in one's home environment.

Risk Mitigation Requires Data

All the above health risks are amplified by the lack of reliable, large-scale data on indoor air and noise pollution. Currently there is no way to know how safe a venue is before visiting it. This is particularly inconvenient and dangerous for very sensitive people, e.g.the elderly, children and allergic people.

On the other hand, should data sets become available, a wide range of data-driven, low-cost mitigation strategies could be deployed.

Improving indoor air quality involves several strategies, including proper ventilation, using air purifiers, reducing sources of indoor pollutants, regular cleaning, and using materials and products with low emissions of harmful chemicals.

To mitigate the health impacts of indoor noise, several strategies can be employed:

- **Soundproofing**: Installing soundproof windows, doors, and insulation can reduce the intrusion of external noise.
- **Quiet Zones**: Creating designated quiet areas within buildings where noise levels are kept to a minimum can provide relief and a place to focus or relax.
- **Noise-Canceling Devices**: Using noise-canceling headphones or white noise machines can help mask disruptive sounds and create a more peaceful environment.

PurerAir:
A Network of Sensors and People

PurerAir's ambition is to overcome the lack of indoor air quality and noise monitoring and deliver reliable, real-time data while striking an optimal balance between data quality, network deployment time and costs.

In order to achieve this, we have developed a strategy based on:

- Adopting wearable air quality and noise sensors which are at the same time highly reliable, affordable, easy to operate,
- Engaging local residents by incentivizing them to collect data from as many venues as possible in a fast and cost-effective way.
- Developing a seamless data collection process via smartphones' internet connections
- Leveraging advanced AI-driven algorithms for data processing.

Value Creation

Societal Value

Information provided by PurerAir will help people choose where and when to spend time safely with their family and friends in indoor venues, based on science-grade, real-time environmental data. Venues of interest include malls, hotels, restaurants, movie theaters, subway trains and stations, etc. PurerAir information has potentially life-saving relevance for sensitive populations such as asthma sufferers and people with respiratory diseases, as well as young children and elderly people.

In the long term, PurerAir data will build an air and noise pollution track record for each venue of interest. Such data will allow benchmarking new venues against comparable ones, so that venue developers and operators will feel the pressure to ensure that the place is healthy and enjoyable.

Business Value

Google has probably been the first large company to realize that end users of data-powered services could also be instrumental at collecting high-value, real-time data. Apps such as Waze (bought by Google in 2013 for $1.3B) leveraged the power of the data consumer data producer paradigm.

PurerAir will be the Waze of indoor health and well-being.

PurerAir data will allow Google and other providers of location-based services such as Expedia, Tripadvisor, Booking.com, etc, to enrich their reviews and information services for popular venues. Most people, especially Millennials and Gen Z, trust these companies to provide them with timely and accurate information to help them choose places to visit or identify the most suitable times to use public transport. PurerAir data will power indoor “safety scores” and “environmental track record” info along with attendance information.

Technology

PurerAir's technology stack comprises:

- IoT-enabled air quality and noise sensors
- A smartphone App
- A blockchain-based data storage and tracking solution, including a reward engine
- AI-based algorithms, for data analysis and location verification
- A decentralized API service for data delivery to corporate customers
- User interfaces, including dashboard solutions for different types of users

Sensors

The wearable sensor adopted by PurerAir has been especially designed for us by a leading Italian environmental monitoring company, which is a spin-off of a public research organization. It is the only truly wearable sensor which can monitor hyperfine particulate levels (PM1) along with CO2 and Total Volatile Organic Compounds. The device uses the best sensing elements on the market. Every device undergoes a rigorous factory testing process before commercialization. In terms of user experience, the device is easy to pair to one's smartphone (the process resembles pairing a Bluetooth headset). Last but not least, the device is compact, light to carry and aesthetically attractive. Detailed technical specs will be made available on our website.

- Pollutants (PM2,5, PM10)
- VOCs Concentration
- CO_2 & atmospheric pressure
- Tempearture
- Humidity
- Noise

Mobile App

The PurerAir App was developed in native language both in Android and iOS versions in order to offer the best user experience and speed. Special attention was paid to deliver a simple, ergonomic and intuitive design for maximum ease of use.

The first task of the App is to communicate effectively via Bluetooth with the sensor and send sensor data to PurerAir via its internet connection. In addition, via the App it is possible to:

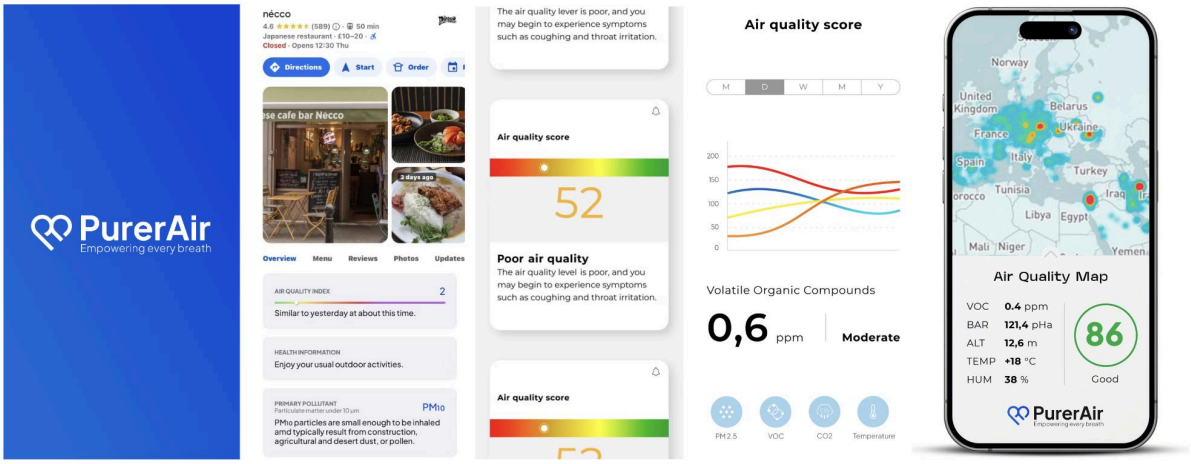
- Create, import and manage one or more blockchain accounts,
- Check the air quality in the current location,
- Receive PurerAir news and updates.
- Show sensor statistics and earned rewards
- Validate a sensor position
- Invite friends and earn with referral code system

Data Analysis

The growth of the sensor network will enable us to leverage machine learning to train our data analysis model and deliver a wide range of compelling alerts and informative indexes.

For example, we'll deliver a **Viral Index** value, which measures the potential risk of airborne virus transmission in indoor spaces. This is based on the real-time of several air quality parameters, including temperature, humidity, PM2.5 and CO2.

We also need algorithms capable of checking that the device is placed indoors. In order to detect indoor/outdoor transitions, we will analyze sudden temperature variations and other indicators (e.g. temperature, humidity, the level of volatile organic compounds) in order to obtain a classifier which can determine if the user is indoors or outdoors.



Data Processing

PurerAir aims to manage a network of thousands of sensors, each transmitting data every few minutes. Our goal is to aggregate and process this data in near real-time to provide timely and valuable information to a broad range of users through various interfaces.

User Interfaces

We are releasing a wide range of user tools and interfaces in order to deliver useful information to all of our partners, which include governmental bodies, academic institutions, corporations, blockchain experts as well as people with no interest in technicalities.

Our main user dashboard enables sensor owners to view live as well as historical data from their sensors in order to analyze trends over time.

In particular, is it possible to check:

- Sensor type
- Last data written on the blockchain
- Number of data streams sent
- Number of venues visited
- The balance on the blockchain account of the sensor owner and third-party infrastructure provider, if any.

Token Model

Overview

The PurerAir token is split across the following allocations:

Allocation	Percentage
Mining Rewards & Marketing	50%
Core Team	20%
Investors	15%
PurerAir Foundation	10%
Public Sale	5%

The maximum supply is 10 billion tokens, so the total reward budget is 5 billion. The mining rewards release schedule will start with 2.5 billion tokens in the first year. This rate will be halved every year (see table below).

Year	Tokens / Year	Total Tokens
1	2,500,000,000	2,500,000,000
2	1,250,000,000	3,750,000,000
3	625,000,000	4,375,000,000
4	312,500,000	4,687,500,000
5	156,250,000	4,843,750,000
6	78,125,000	4,921,875,000
7	39,062,500	4,960,937,500
8	19,531,250	4,980,468,750
9	9,765,625	4,990,234,375
10	4,882,813	4,995,117,188

Out of the yearly reward budget, a daily budget will be computed.

Data Reward Policy

The PurerAir token model aligns incentives for community members with the project's scientific and business goals. We want to provide **high-resolution, real-time air quality and noise data** from as many indoor locations as possible, as well as more general information on user experience in the venue. We therefore incentivize people to collect data via their sensor and, optionally, to provide additional feedback from a large number of locations of interest. The first step for all participants is to download our App and create an account. People wearing the sensors are referred to as “data creators”. In addition, all participants can play the role of “data validators” as described below.

Tokens are earned in the following events:

One-off welcome bonus for App download and account creation

Data Creators

Recurrent whenever the sensor sends data from verified indoor locations subject to the following rules:

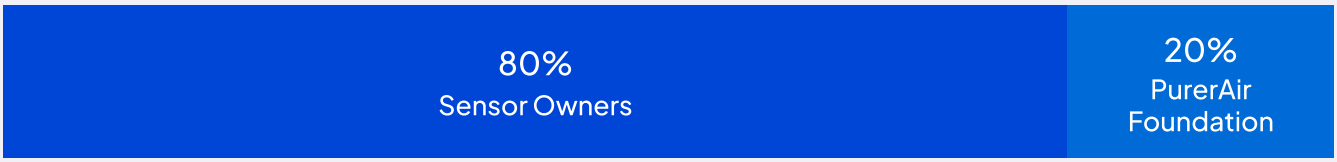
- When one is approximately 100 meters from the venue, the App must be activated and kept active while inside and for at least 5 minutes after leaving the venue.
- Sensor data will be then collected every minute and a basic reward will be issued every 5 minutes while in the venue.
- An additional bonus reward will be earned upon filling a venue questionnaire and receiving a position validation from other users (Validators) , subject to a cap of one questionnaire per day.
- A reward cap of one hour/day per each venue also applies, as well as a maximum of 20 visited venues per day.

Position Validators

Whenever a validator is in the same location where a Data creator is collecting data, he can validate the creator's position and earn a validation bonus

Additional rewards can be earned via marketing activities, e.g. by posting/sharing/commenting PurerAir news on social media and by referring new users to PurerAir.

As a general rule, all rewards earned are split as follows:



Whenever the daily PurerAir rewards budget exceeds the amounts of rewards actually due, leftover tokens are burned. Conversely, if the amount of rewards due exceeds the daily rewards budget, rewards are reduced pro rata.

Staking Bonus

A staking program will be announced to enhance project participation and offer returns for those locking up tokens. Details will be released in due time.

Data Monetization and Value Accrual

The data generated by PurerAir will initially be monetized by selling access with payment in stable/fiat currencies to make it easy for more traditional enterprise actors to engage with us. 50% of the data sales revenue will be used to buy PurerAir tokens from the market.

Governance

In the spirit of Web3, PurerAir will set up a decentralized governance model. Voting power will be based on a reputation system. The more venues you visit, the higher your reputation score and voting power.

PurerAir

Empowering every breath

Visit us at purerair.io

Preorder Now →