Noise Pollution Monitoring

TEAM ID:NM2023TMID446

Name	Department
Sriram	ECE
Madesh	ECE
Ajith kumar	ECE
Vignesh	ECE
Godson	ECE

Mentor: Yamini.V.R

Contents:

1 |Introduction

1.1 | Overview

Noise pollution monitoring is a systematic process aimed at assessing and controlling unwanted or harmful sounds in various environments. This involves the use of specialized equipment such as sound level meters, noise dosimeters, and monitoring stations to measure sound intensity, frequency spectrums, and patterns over time. Data analysis includes noise mapping, statistical assessments, and compliance checks to identify high-noise areas and ensure adherence to regulations. The practice of noise pollution monitoring addresses the impact of noise on public health, wildlife, and surroundings and aims to implement noise-reduction measures, engage communities, and leverage technology advancements, such as remote sensing and AI, for efficient and accurate monitoring. Despite challenges in distinguishing harmful noise and balancing development with noise control, it offers benefits like improved well-being and better urban planning.

1.2 | Purpose

Noise pollution not only affects the ears but also harms concentration. Blood pressure and deafness are also caused due to noise pollution. The deafness can be either temporary or permanent. Along with human lives, it is also detrimental and hazardous to the lives of animals.

2 | Ideation and Proposed Solution

This Phase Contain

- Problem Statement Definition
- Empathy Map
- Ideation and Brainstorming
- Proposed solution

2.1 | Problem Statement Definition

This statement defines who are the customer, what they trying to do,butwhat happens, Because of some reason, that situation how they feel.

Problems statements

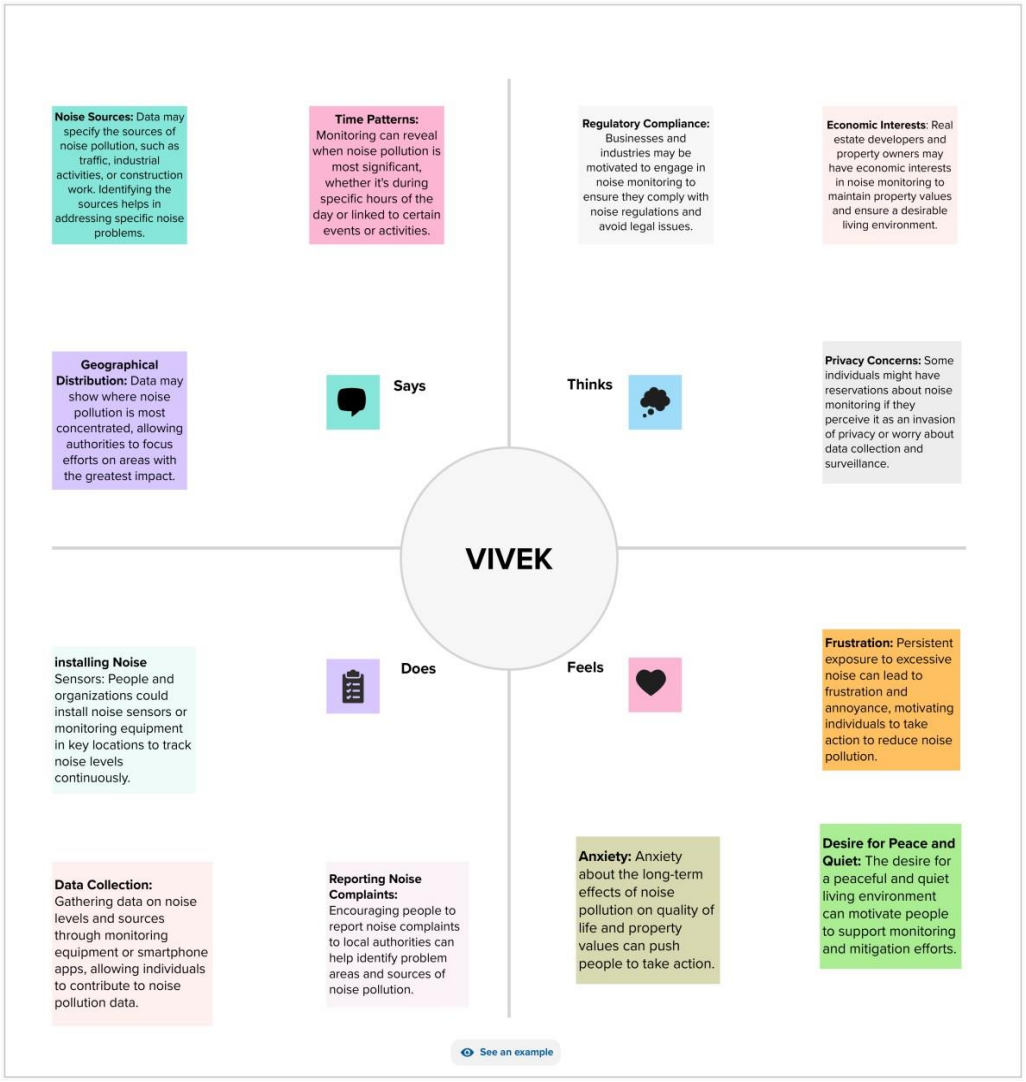
Probelem Statement (PS)	I am (customer)	I'm trying to	but	beacause	Which Makes me feel
PS-1	employee	prevent my hearing	High blood pressure. Stress & anxiety.	exposed to hazardous noise	anxious,anger
PS-2	Student	listen class	listen class	Noise Disturbing	hesitation
PS-3	Patient	Prevent my hearing	high blood pressure,Sleep disuption	heart patient effect by noise pollution	some time make highly discomfort
PS-4	Wildlife	save animal to reduce frequency level to live birds alive many year	affect body	affect the animal place to destroy froest live	Altered Migraion patterns,habitat Intrusion

.

Figure 2.1:I am an Asthma Patient,Trying to Breath Fresh Air,butin air pollution days They struggle for breathing, which makes me feel Indoor precautions

2.2 | Empathy Map

Empathy map talksabout customer feelings, thoughts, what they say,and action did by the customer.



2.3 | Ideation & Brainstorming

Brainstorming combines an informal approach to problem-solving with lateral thinking, which is a method for developing new concepts to solve problems by looking at them in innovative ways. Some ofthese ideas can be built into original, creative solutions to a problem, while others can generate additional ideas. Prioritization was helpful to find immediate demands of customer.

This helps to figure out which demand must be solved immediately

2.4 | Proposed Solution

- **Problem Statement** Developing scalable and cost-effective monitoring solutions that can be deployed across different regions, from urban centers to rural areas, is a significant challenge.

- **Uniqueness** Users can access the drone data through mobile apps, receiving notifications and real-time air quality updates, helping them make informed decisions about outdoor activities.

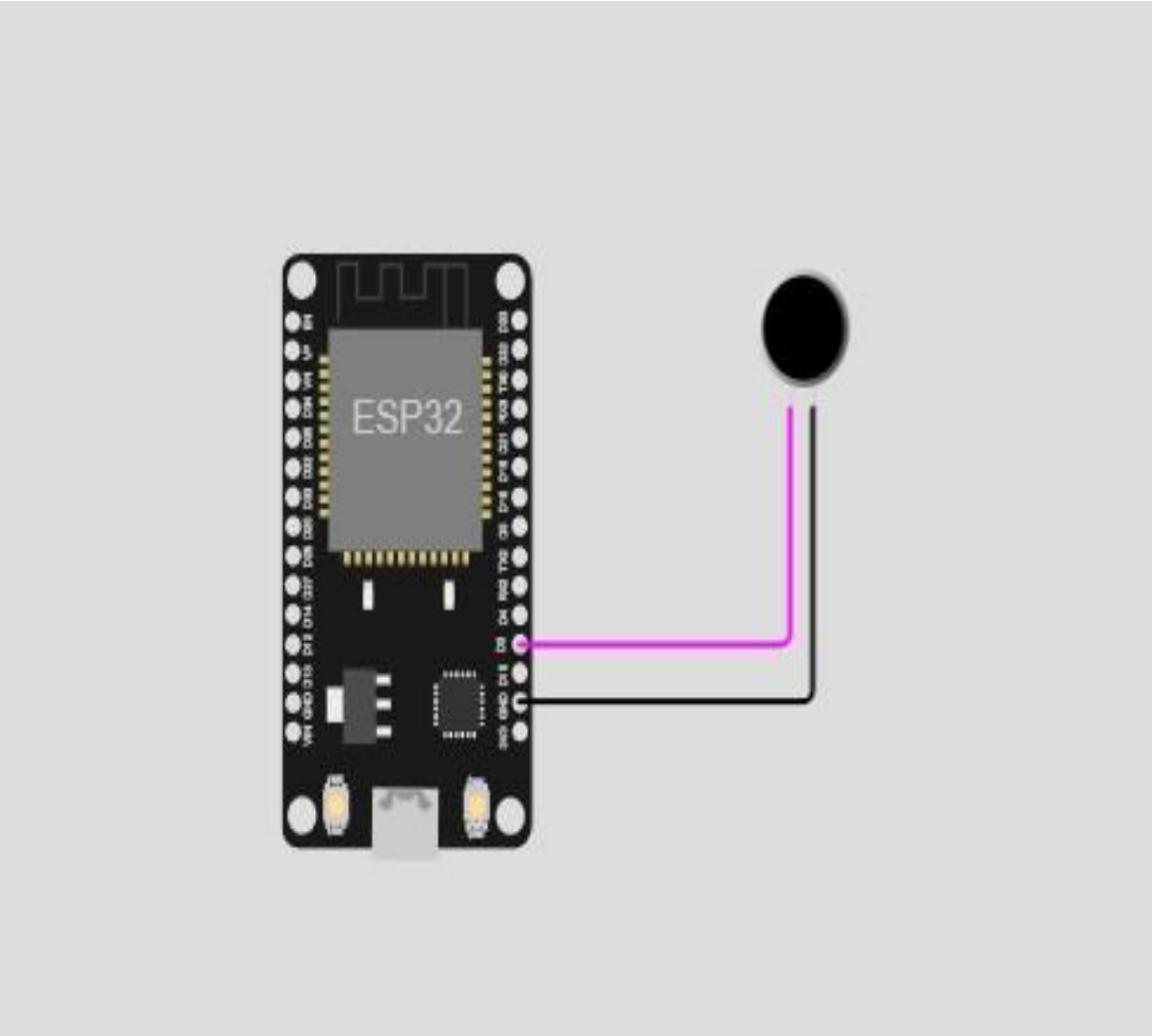
- **Scalability** the ability to make the solution work for a small area and then easily expand it to cover a larger area without a lot of extra effort or cost.

Figure 2.2: Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement(Problem to be solved)	1. Use quieter machines and vehicles. 2. Plant trees to block noise. 3. Build sound barriers near highways.
2.	Idea/Solution description	1. **Quieter Machines**: Make machines like cars and appliances quieter so they don't make as much noise. 2. **Plant Trees:** Planting trees helps because they can block and absorb noise, making things quieter. 3. **Sound Barriers:** Build walls or fences near noisy places like high ways to stop the noise From spreading.
3.	Novelty/ Uniqueness	It disrupts our peace and can harm our health through loud noises from sources like traffic, machinery , and even people. It's unique because it affects our well-being in a different way than other pollutants.
4.	Social Impact/Customer Satisfaction	Customer satisfaction with noise pollution means how happy or unhappy people are with the level of noise in their surroundings. If noise pollution is high, customers, or in this case, regular people, are likely to be unhappy because loud and annoying sound scan disturb Their peace and well-being.
5.	Business Model (RevenueModel)	**Noise-Canceling** Products: Create and sell noise-canceling headphones or devices that help people block out noise and enjoy quieter surroundings. **Soundproofing Services:** Offer services to soundproof homes or buildings, making them quieter. Charge customers for these soundproofing solutions.

3| Project Design

3.1 | Circuit Diagram



3.2 | Program code:

main.py diagram.json

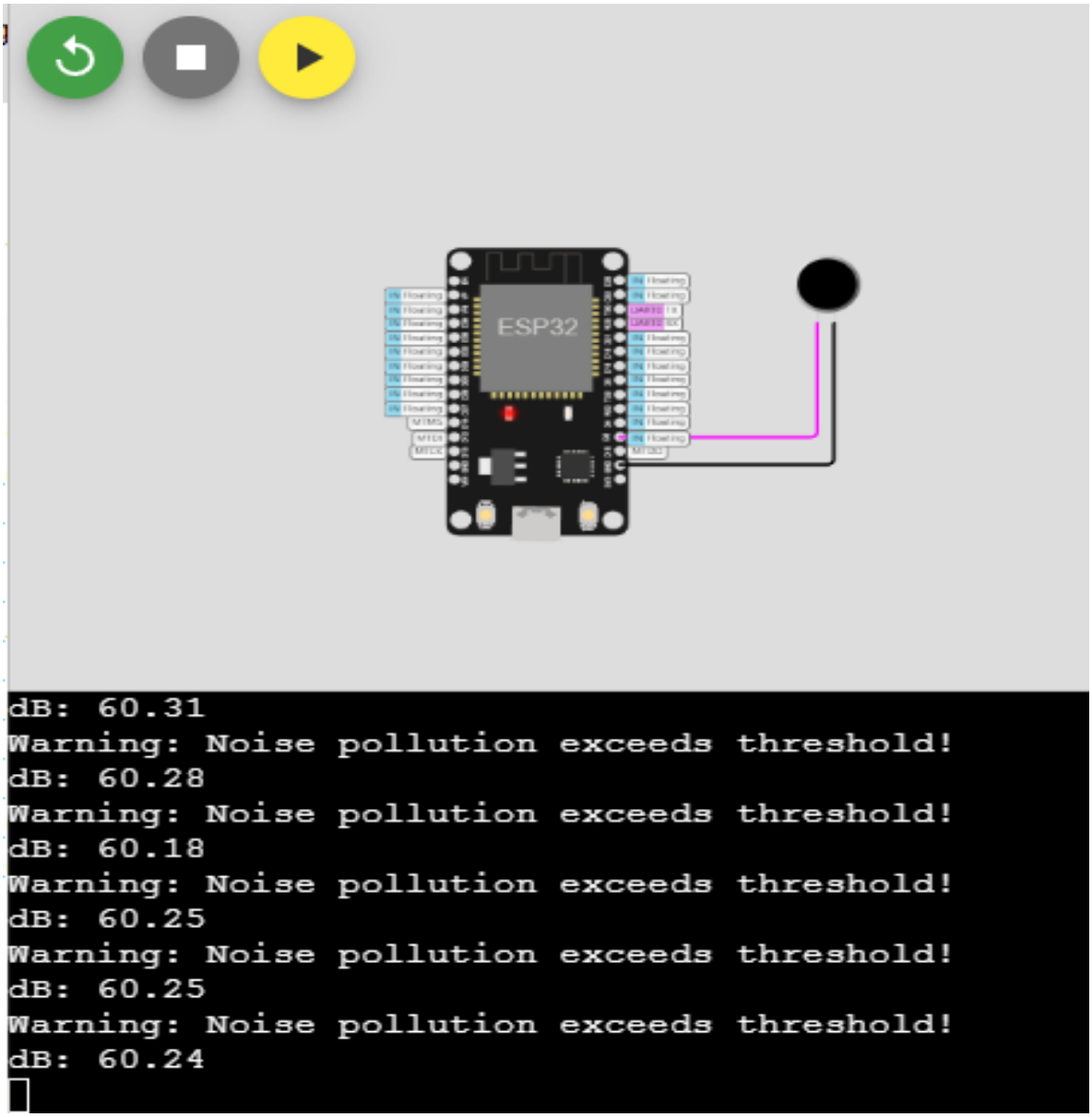
```
from machine import Pin, ADC
from time import sleep
import math

mic = ADC(Pin(2))
mic.atten(ADC.ATTN_11DB)

calibration_constant = 2.0
noise_threshold = 60

while True:
    mic_level = mic.read()
    mic_level_db = 20 * math.log10(mic_level / calibration_constant)
    if mic_level_db > noise_threshold:
        print("Warning: Noise pollution exceeds threshold!")
    print("dB: {:.2f}".format(mic_level_db))
    sleep(0.3)
```

3.3 | Output:



4| Coding Solutioning

4.1 | Python Coding

```
from machine import Pin, ADCfrom time
import sleep import math
```

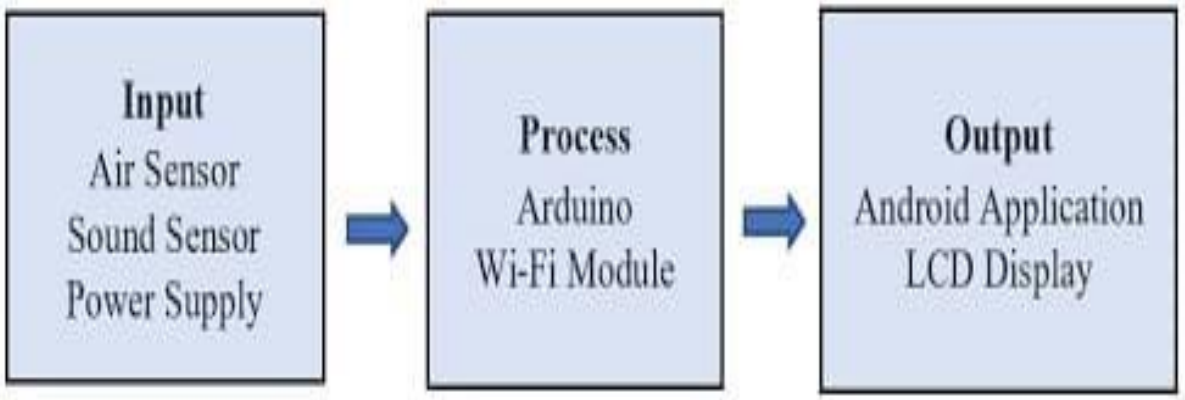
```
mic = ADC(Pin(2)) mic.atten(ADC.ATTN_11DB)


calibration_constant = 2.0
noise_threshold = 60


while True:
    mic_level = mic.read()
    mic_level_db = 20 * math.log10(mic_level / calibration_constant)if
    mic_level_db > noise_threshold:

        print("Warning: Noise pollution exceeds threshold!")print("dB:
    {:.2f}".format(mic_level_db))
    sleep(0.3)
```

4.2 | Block Diagram



4.3 |

Output:

```
load:0x
4008040
0,len:3
368
entry
0x40080
5cc
Warning: Noise pollution
exceeds threshold!dB:
60.18
Warning: Noise pollution
exceeds threshold!dB:
60.18
Warning: Noise pollution
exceeds threshold!dB:
60.18
Warning:                tion
```

5| Results

5.1 | Performance Metrices

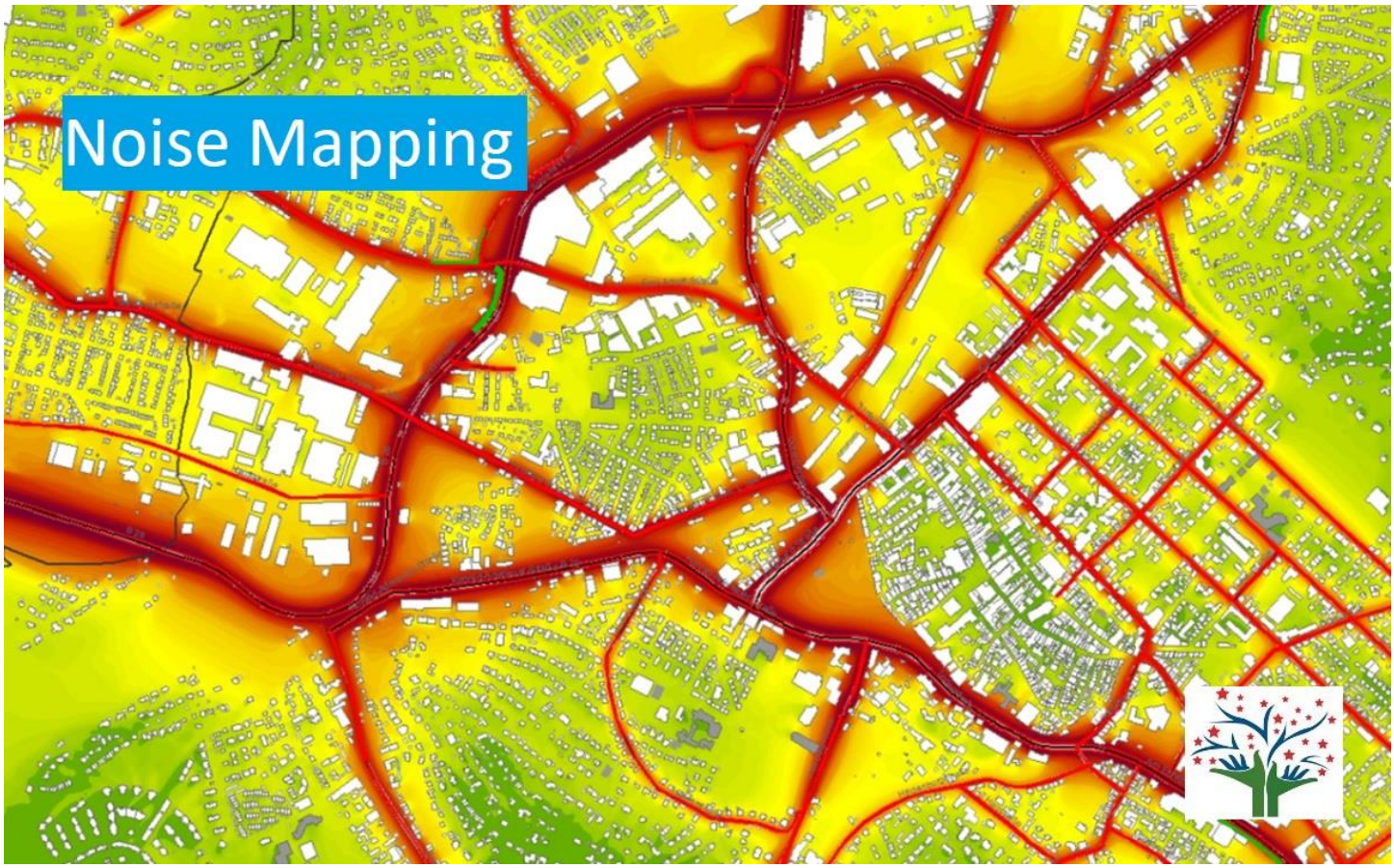
Noise pollution not only affects the ears but also harms concentration. Blood pressure and deafness are also caused due to noise pollution. The deafness can be either temporary or permanent. Along with human lives, it is also detrimental and hazardous to the lives of animals.

- Sound Pressure Level (SPL)
- Frequency Spectrum
- Duration and Time Patterns
- Peak Noise Levels
- Equivalent Continuous Noise Level
- Noise Mapping
- Community Noise Equivalent Level
- Day-Night Average Sound Level
- Percentile Levels
- Peak Noise Index
- Community Response Metrics
- Regulatory Compliance Metrics

5.1.1 Noise Mapping:

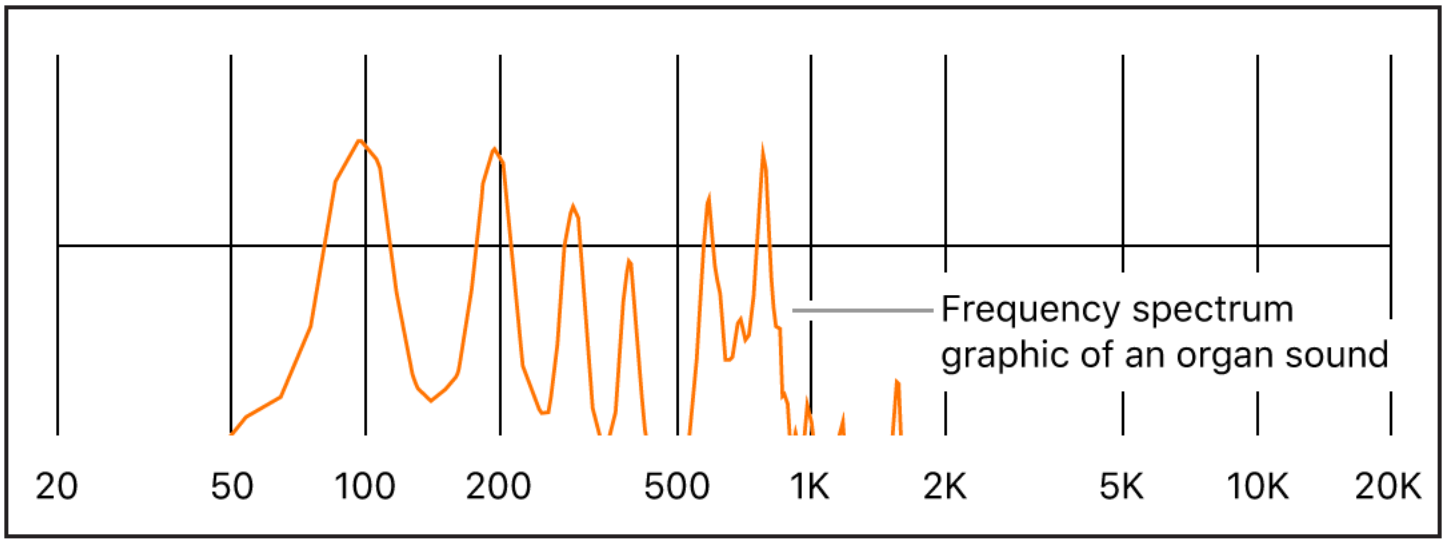
A noise mapping study is a detailed analysis of the noise levels in a specific area. It involves the use of sound sensors, computer modeling or software and data analysis to create a detailed illustration of noise levels in the area of study.

Noise contour mapping are simply colored map to indicate intensity of noise on the map of place of study conducted. It is very helpful to identify area where noise levels exceed recommended threshold.



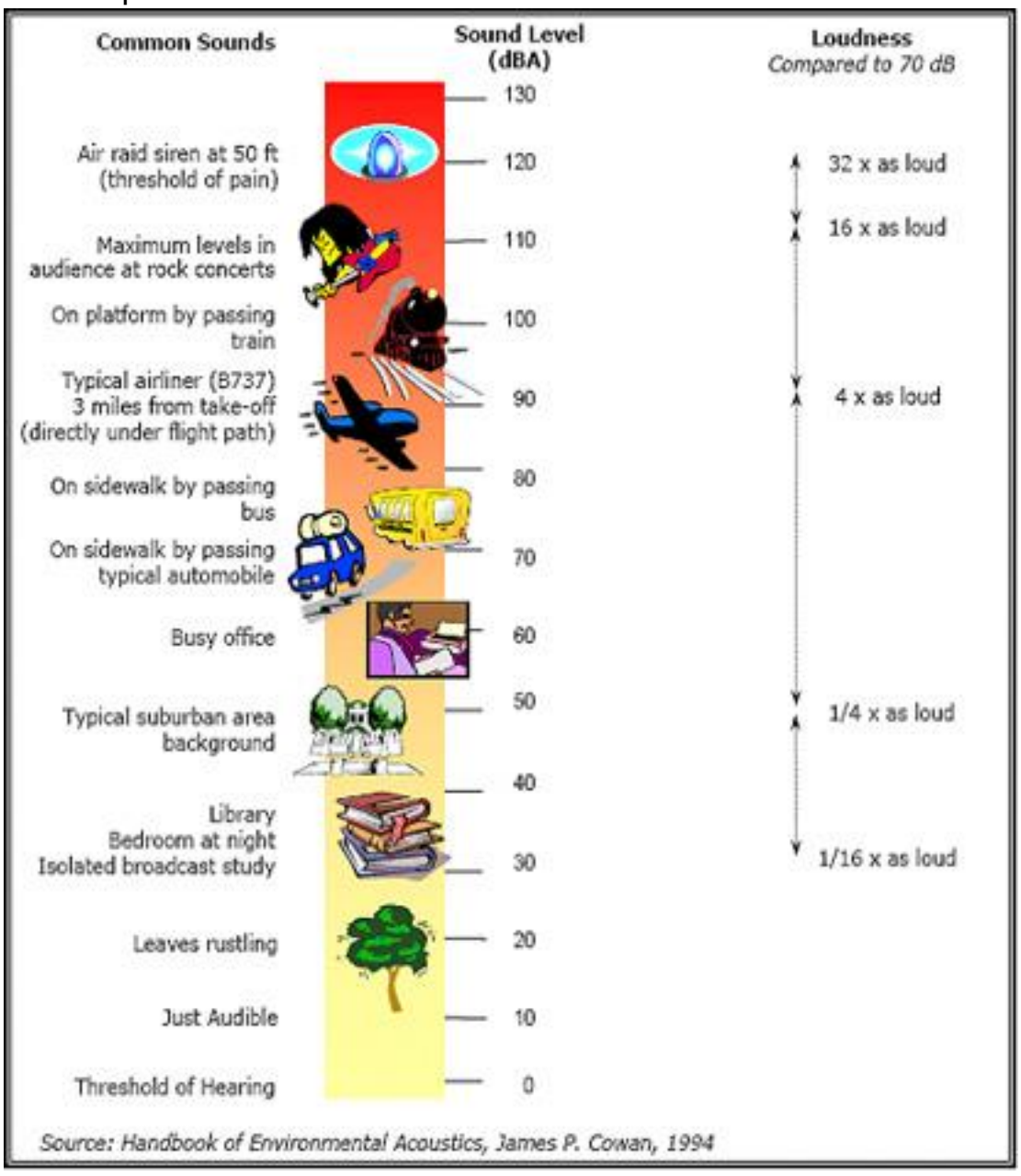
5.1.2 | **Frequency Spectrum**

The combination of a number of harmonics is referred to as the harmonic spectrum or, more commonly, the frequency spectrum. The frequency spectrum shows all individual sonic elements in a sound. It is shown low to high and runs from left to right over time.



5.1.3 | Day-Night Average Sound Level

Day-Night Average Noise Level (Ldn). CNEL is a 24-hour weighted average measure of community noise. The computation of CNEL adds 5 dB to the average hourly noise levels between 7 p.m. and 10 p.m. (evening hours), and 10 dB to the average hourly noise levels between 10 p.m. and 7:00 a.m. hours.



6| Advantages & Disadvantages

6.1 | Advantages

- **Data-Driven Decision-Making:** Monitoring provides objective data on noise levels, enabling evidence-based decisions for noise control measures and urban planning.
- **Identification of High-Noise Areas:** Noise mapping helps pinpoint areas with elevated noise levels, allowing targeted interventions to reduce noise in specific zones.
- **Public Health and Well-Being:** By addressing noise pollution, it contributes to improved public health, reduced stress, better sleep quality, and enhanced overall well-being.

6.2 | Disadvantages

- **Costly Implementation:** Setting up and maintaining noise monitoring equipment and systems can be expensive, which may pose a financial burden for some communities or organizations.
- **Inaccuracies and Technical Issues:** Monitoring equipment may sometimes provide inaccurate readings due to technical issues, calibration problems, or environmental factors.
- **Balancing Noise Reduction and Development:** Striking a balance between noise reduction and the need for economic development and transportation infrastructure can be challenging.

7| Conclusion

- In conclusion, noise pollution monitoring is a vital practice aimed at understanding, mitigating, and managing the impact of unwanted and harmful sounds on our lives and the environment.
- By measuring sound levels, identifying sources, and assessing the effects of noise, we can make informed decisions to create quieter and healthier communities.
- While noise monitoring offers numerous advantages, including improved public health, better urban planning, and environmental protection, it also presents challenges such as costs, privacy concerns, and technical complexities.
- Striking a balance between noise reduction and sustainable development is essential.
- \As technology and community involvement continue to evolve, noise pollution monitoring remains a powerful tool in our ongoing efforts to create quieter, more harmonious living environments.

8| Future Scope

- **Widespread Deployment:** IoT devices will be deployed extensively, covering urban, industrial, and remote areas, providing comprehensive noise data.
- **IoT-Enabled Noise Control:** IoT can be used to trigger noise control measures automatically, such as adjusting traffic signals or altering public transportation routes.
- **Data Visualization:** IoT-generated data will be presented through user-friendly dashboards and mobile apps, making noise information accessible and understandable to the public..

9| Appendix

9.1 | GITHUB Links

https://github.com/Sriram0423/IOT_NPM.git
https://github.com/MADESH1287/IOT_NPM.git
https://github.com/Ajithkumar4345/NPN.git
https://github.com/VIGNESH1426/NMP.git
https://github.com/Godson7305/IOT_NPM.git