



## **AIR QUALITY MONITORING AND ANALYSIS BASED PREDICTIVE SYSTEM**

**Project ID: 2024 - 078**

### **Project Status Document 1 – Individual**

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IT21058028

Supervisor: Ms. Chathurangika Kahandawarachi

Co-Supervisor: Ms. Pipuni Wijeseri

**B.Sc. (Hons) Degree in Information Technology Specialization in Information  
Technology**

**Sri Lanka Institute of Information Technology**

**May 2024**

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# 1. supervision and supervision accept our team.

**From:** Chathurangika Kahanawaarachchi  
**Sent:** Wednesday, December 13, 2023 6:59 AM  
**To:** Inthikhaff M.I.M #T21058028  
**Subject:** Re: Request for Research Supervision

[EXTERNAL EMAIL] This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.  
DeEar Inthikhaff and the team,

Welcome to the research project.  
Thank you for reaching out.  
My research area is related to health informatics, Assistive technologies, ICT for development and process automation.  
If you are interested in these type of areas, please come up with your own idea which could lead you to complete the project within one year and contributes to the research domain while creating an impact in the field.

Your commitment is necessary throughout the project duration and beyond.  
Every project must have some development covering the key pillars in the respective specialization leading to a research outcome.

From 9th to 18th December I will be on overseas leave. However, if necessary I can join online for an initial meeting.

Good luck with your research

Chathurangika

Sent from [Outlook for Android](#)

---

**From:** Inthikhaff M.I.M #T21058028 <[t21058028@my.sliit.lk](mailto:t21058028@my.sliit.lk)>  
**Sent:** Tuesday, December 12, 2023 12:04:28 pm  
**To:** Chathurangika Kahanawaarachchi <[chathurangika.k@sliit.lk](mailto:chathurangika.k@sliit.lk)>  
**Subject:** Request for Research Supervision

Dear Madam,

I hope this message finds you well. My name is Inthikhaff M. I. M (#T21058028), and I am currently a final year undergraduate student specializing in IT. I am reaching out to you on behalf of my research group, which consists of Rimas M. J. M (#T21003714), Kumari J. M. D (#T21152832), Pasan M. G. R (#T21057588).

We would be honored to have you as our supervisor for our final year research work. We understand that we have taken some time to form our group and approach you, and we sincerely apologize for any inconvenience caused by the delay.

We have some initial ideas for our research project, but we are also very open to your suggestions and guidance. We are committed to giving our full cooperation and dedication throughout the entire research process.

We would be grateful for the opportunity to discuss this further at your earliest convenience. Please let us know if you are available for a meeting to go over our ideas and seek your valuable input.

Thank you for considering our request, and we look forward to the possibility of working under your supervision.

Best regards,

Inthikhaff M. I. M (#T21058028)

Fig. 1. supervision

**Requesting and Thanking for accepting as Co-Supervisor – For our Research Group R24-078**

 Inthikhaff M.I.M #T21058028 <[t21058028@my.sliit.lk](mailto:t21058028@my.sliit.lk)>   
2/14/2024 10:03 AM

To: Pipuni Wijesiri

 R24-078.pdf  
347.61 KB

Dear Ms. Pipuni Wijesiri,

I trust this message finds you in good health. My name is Inthikhaff M. I. M (#T21058028), a final year undergraduate student specializing in IT. I am reaching out to you on behalf of my research group, consisting of Rimas M. J. M (#T21003714), Kumari J. M. D (#T21152832), and Pasan M. G. R (#T21057588).

I am pleased to inform you that Ma'am Chathurangika has recommended you as a potential co-supervisor for our final year research project. We appreciate your consideration of this role and would be honored to have you guide us through this academic endeavor.

Our project, identified with the ID R24-078, has been carefully outlined in the attached topic assessment document. We understand that we may have taken some time to form our group and approach you, and we sincerely apologize for any inconvenience caused by the delay.

Your expertise and mentorship would be invaluable to our research, and we are committed to giving our utmost effort, ensuring a successful and fruitful collaboration. We are eager to learn from your insights and guidance as we work towards the successful completion of our research within the designated timeframe.

Please take a moment to review the attached document, and if you have any initial thoughts or suggestions, we would be grateful for your feedback. Your support is pivotal to our success, and we are confident that, with your guidance, we can achieve our research goals.

Thank you for considering our request, and we look forward to the possibility of working together on this exciting research project.

Best regards,

Inthikhaff M. I. M (#T21058028)  
Research Group Leader

Sent from [Mail](#) for Windows

Fig. 2. supervision

## 2. Screenshots of the Calls in MS Teams

### 2.1. MS Teams Calls with Research Team

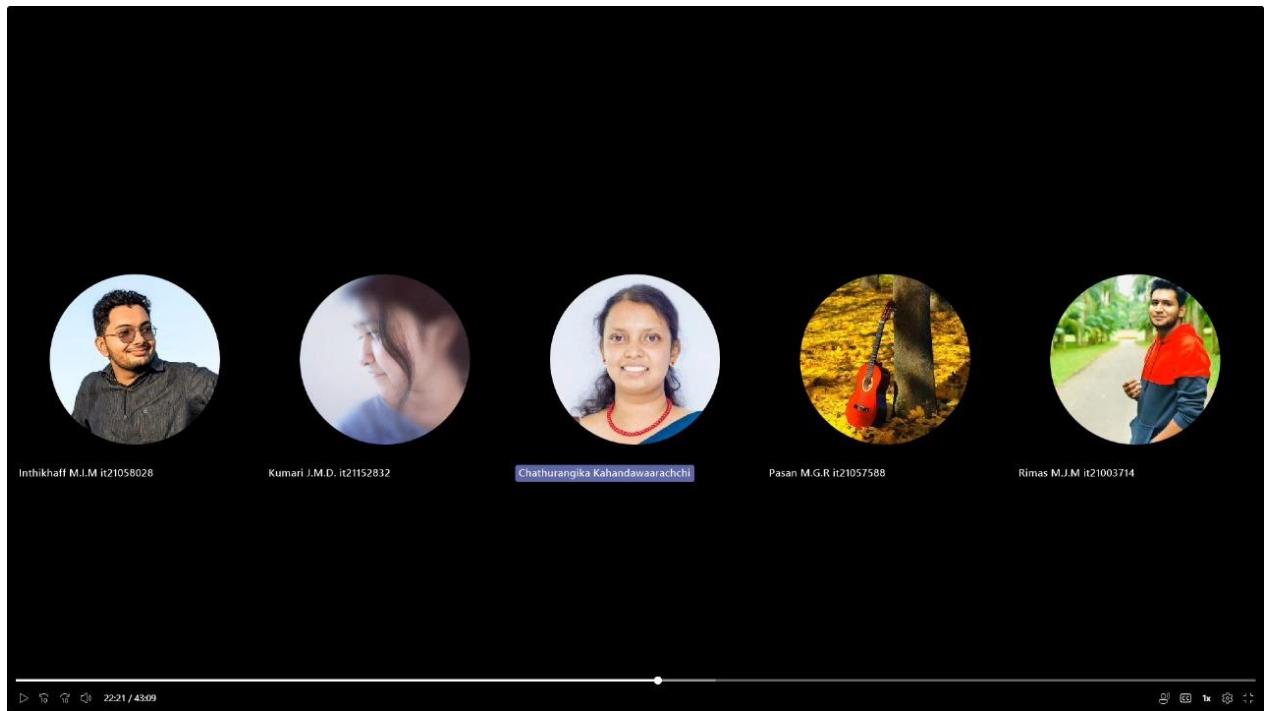


Fig. 3. Teams Call 1 with Research Team

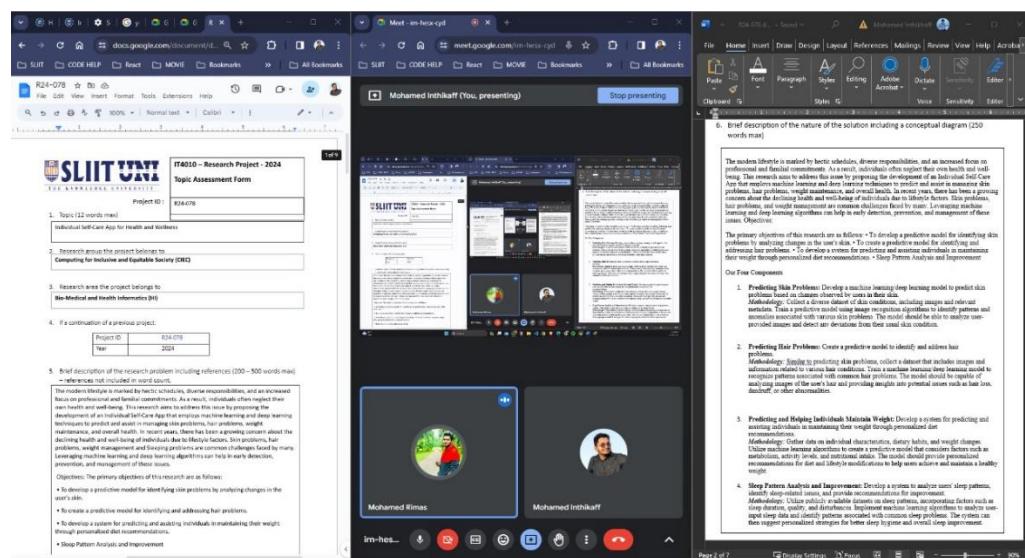


Fig. 4. Teams Call 2 with Research Team

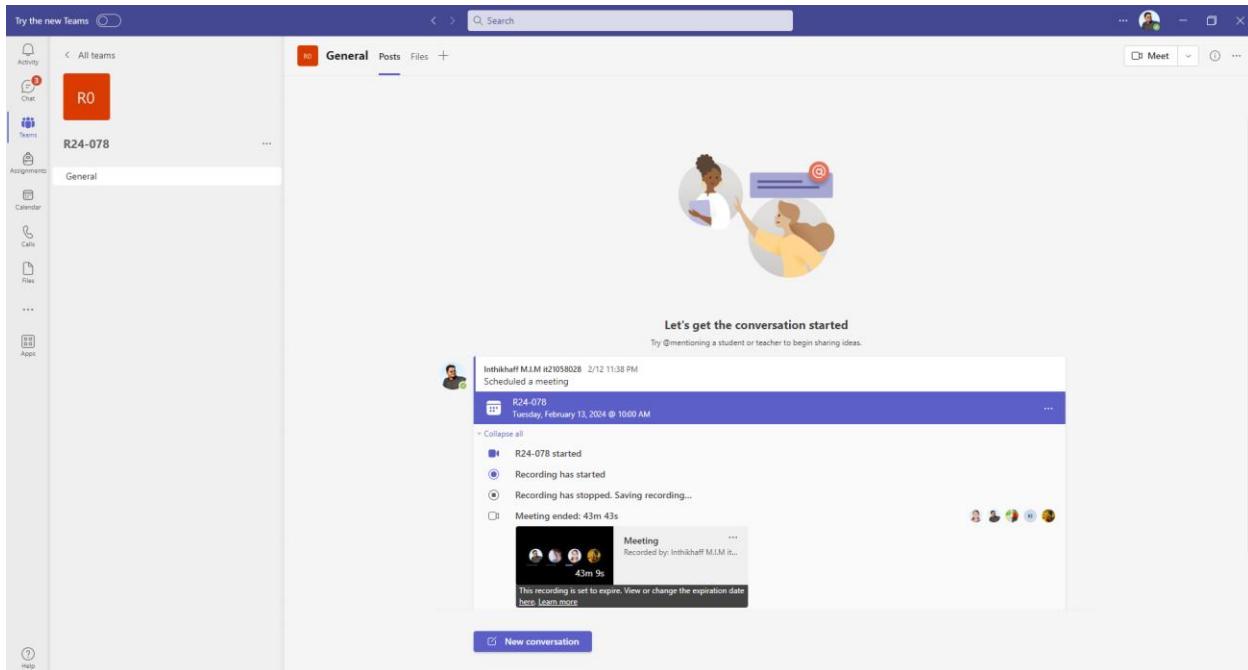


Fig. 5. Teams Call 3 with Research Team

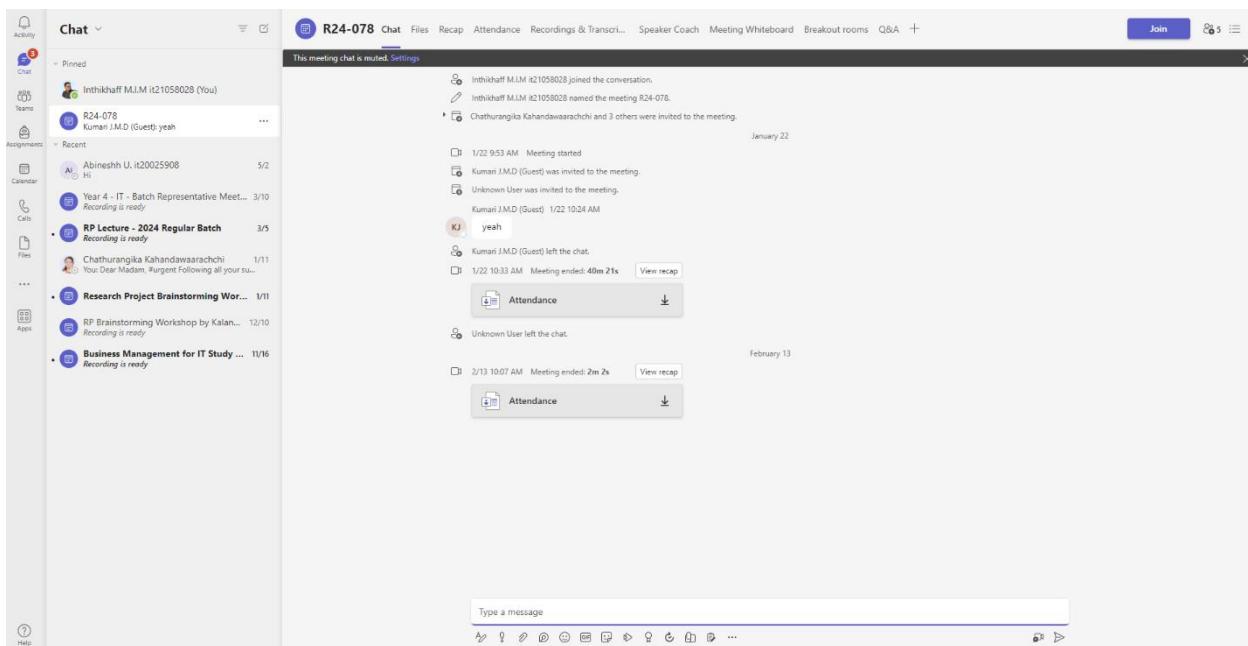


Fig. 6. Teams Call 4 with Research Team

**CDAPSubmissionCloud > 2024RegCloud > R24-078-Students**

Name	Modified	Modified By
1. Project Proposal	February 20	CDAP SLIT
2. Status Document 1	February 20	CDAP SLIT
3. Progress Presentation - 1	February 20	CDAP SLIT
4. Research Paper	February 20	CDAP SLIT
5. Progress Presentation - 2	February 20	CDAP SLIT
6. Final Report & Presentation	February 20	CDAP SLIT
7. Status Document 2	February 20	CDAP SLIT
8. Website	February 20	CDAP SLIT
9. Log Book	February 20	CDAP SLIT
Marking Schemes	February 20	CDAP SLIT
Project Registration Documents	February 20	CDAP SLIT
Panel Comments for the Students.xlsx	February 27	Rimas M.J.M it2100...
RP Handbook for Students.pdf	February 20	CDAP SLIT

Fig. 7. Teams Call 5 with Research Team

**Let's get the conversation started**  
Try @mentioning a student or teacher to begin sharing ideas.

Inthikhaff M.I.M it21058028 2/12 11:38 PM  
Scheduled a meeting

**R24-078**  
Tuesday, February 13, 2024 @ 10:00 AM

**Meeting**  
Recorded by: Inthikhaff M.I.M it...

**New conversation**

Fig. 8. Teams Call 6 with Research Team

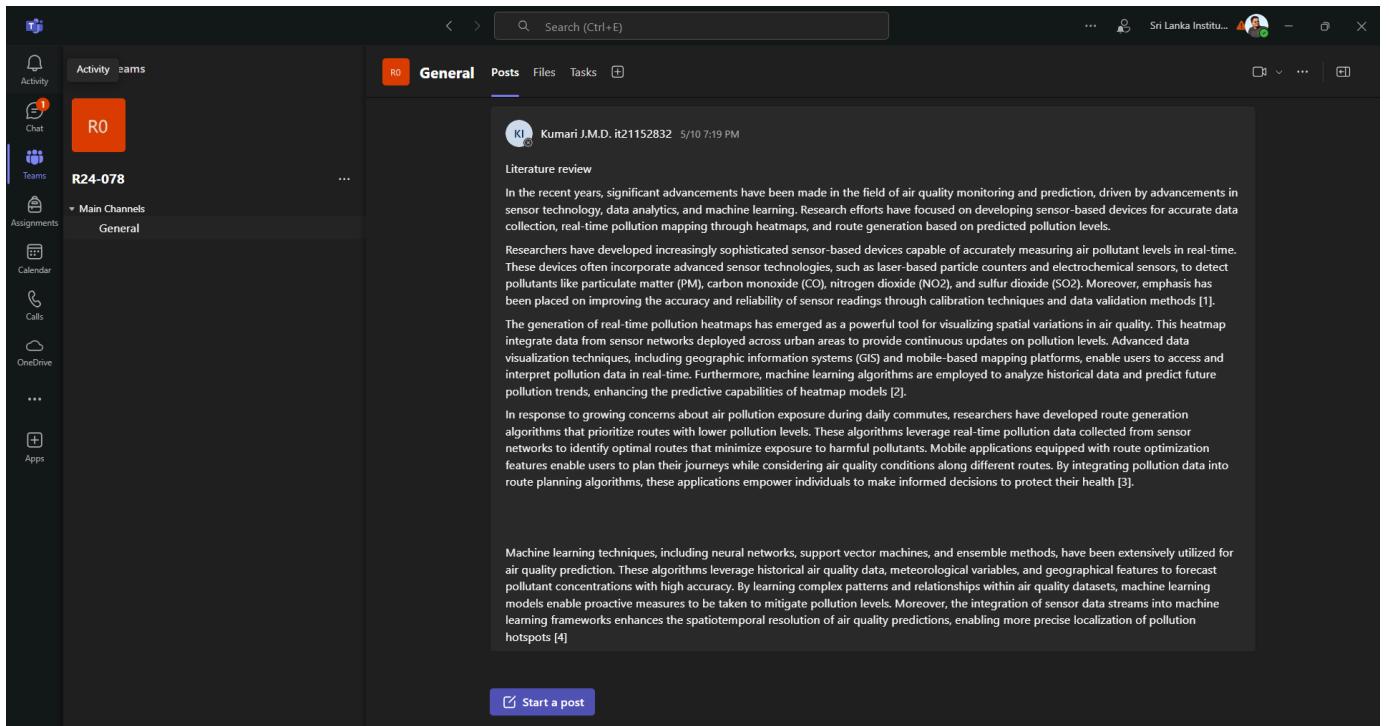


Fig. 9 . Teams Call 6 with Research Team

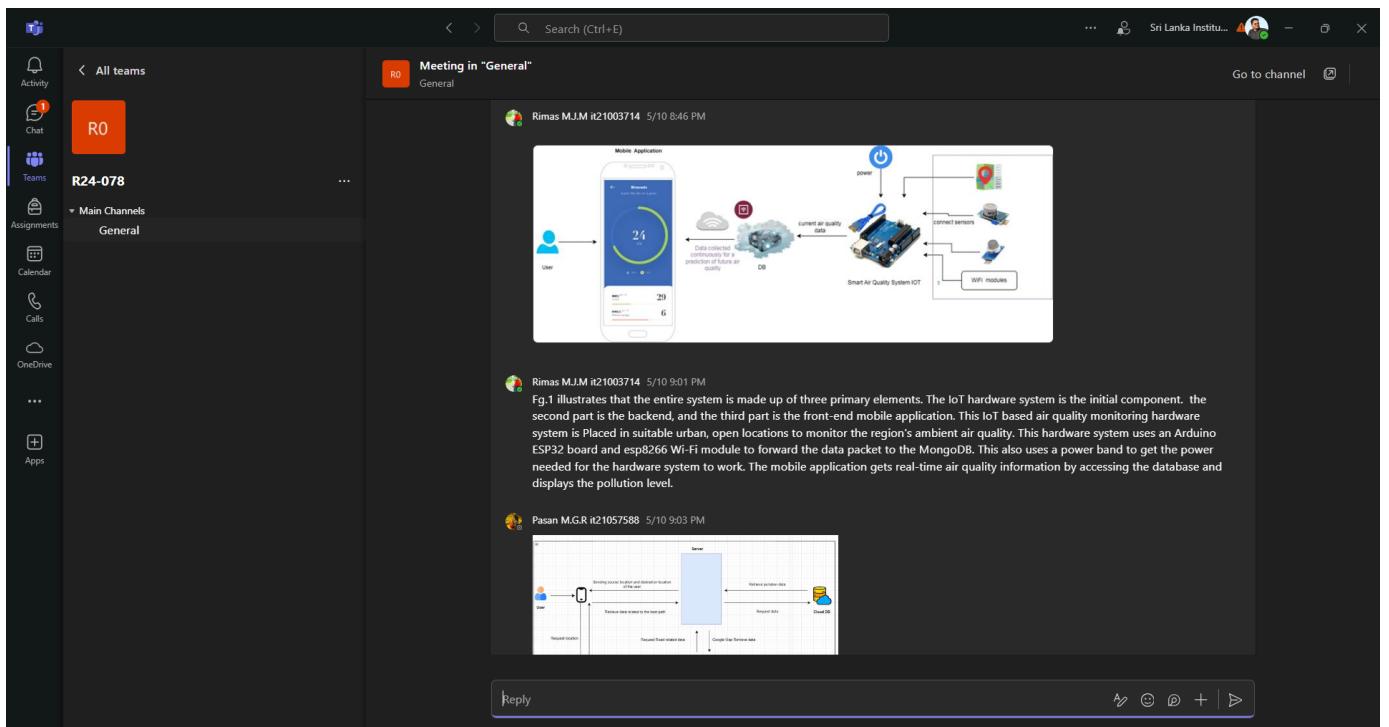


Fig. 10 . Teams Call 6 with Research Team

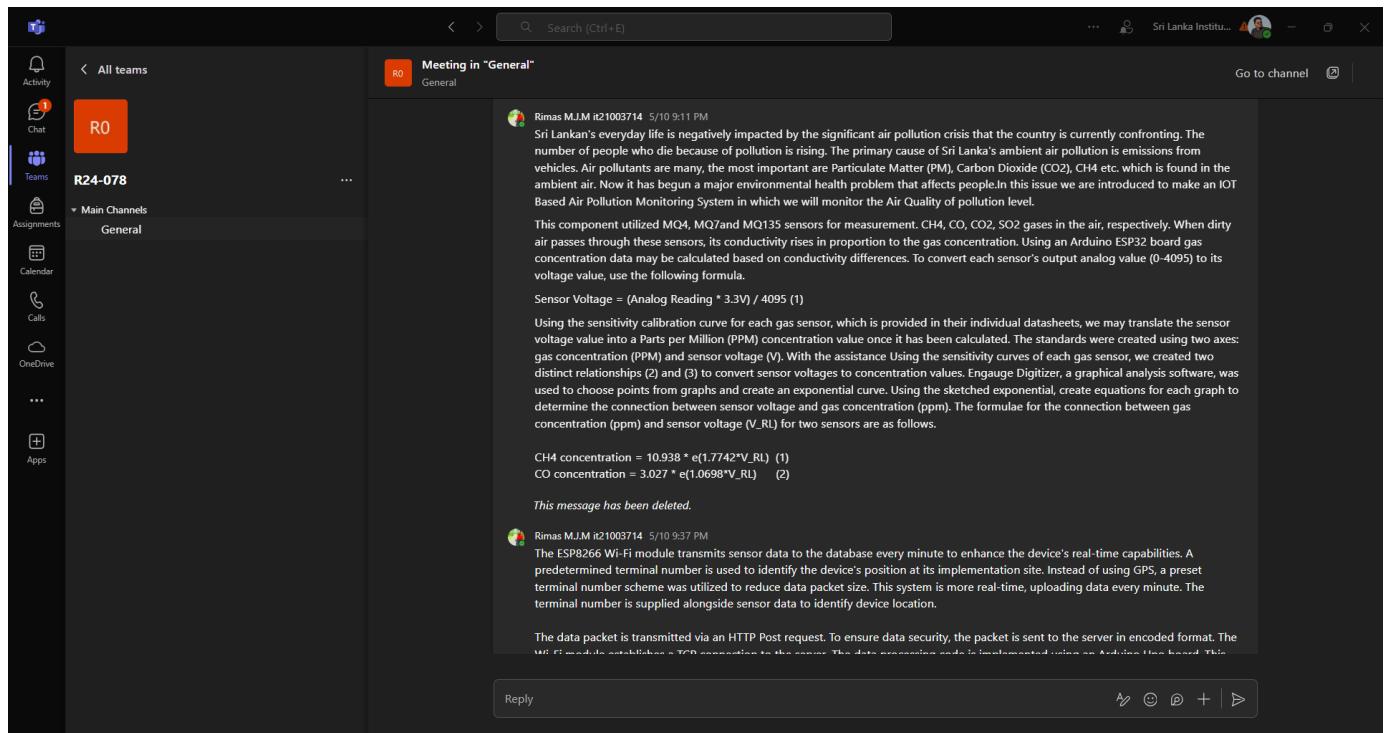


Fig. 11. Teams Call 6 with Research Team

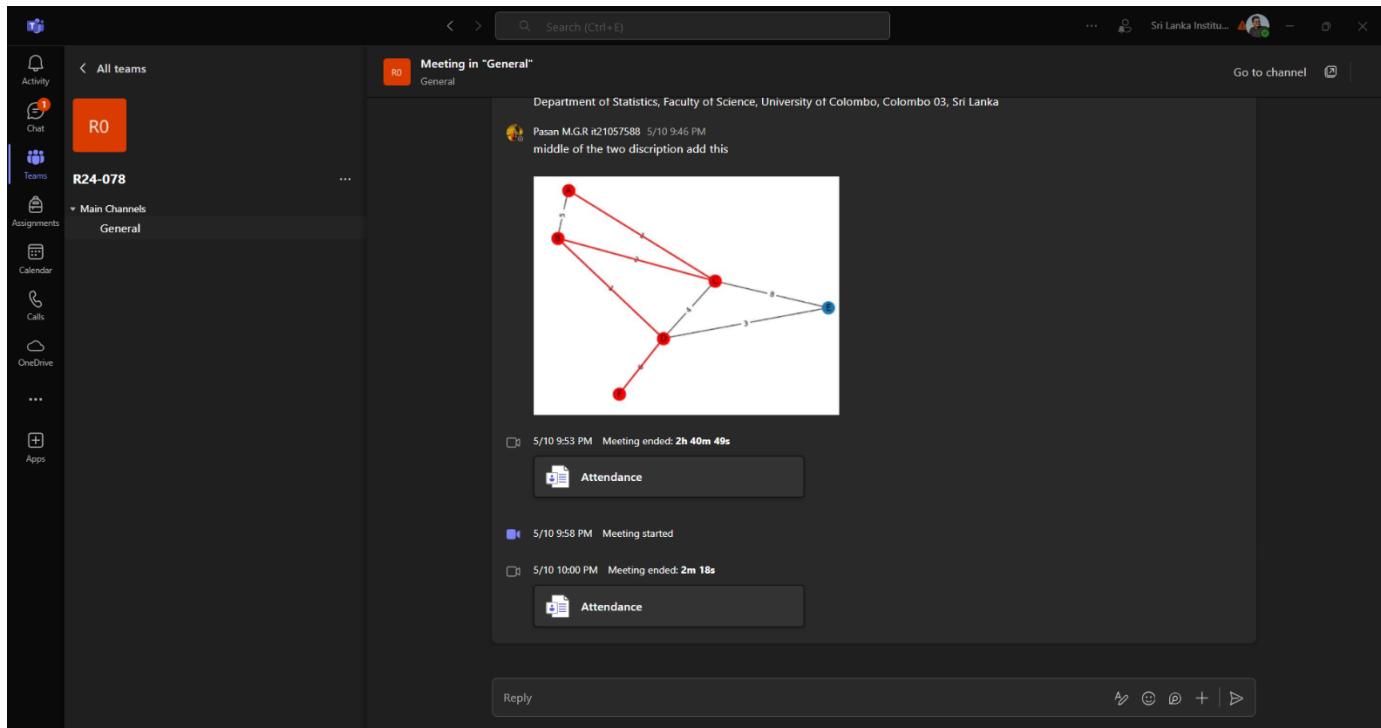


Fig. 12. Teams Call 6 with Research Team

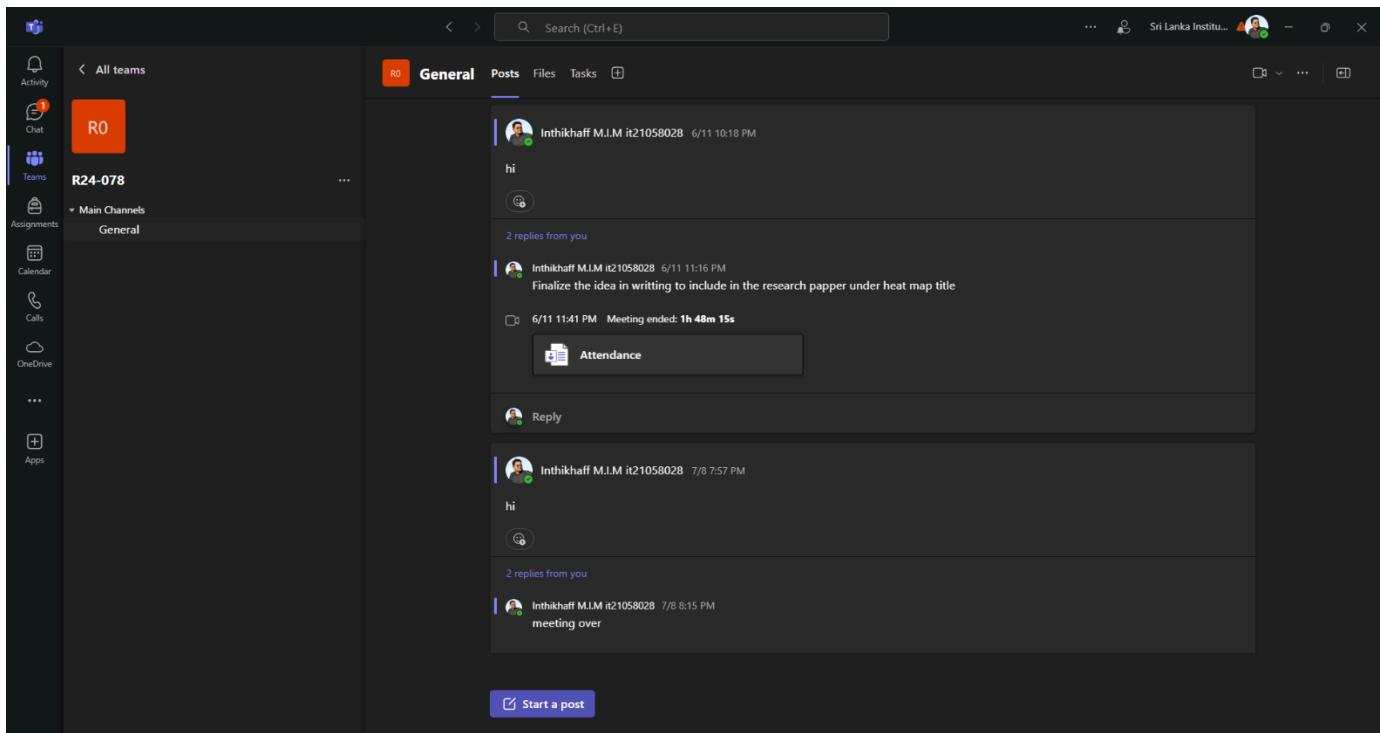


Fig. 13 . Teams Call 6 with Research Team

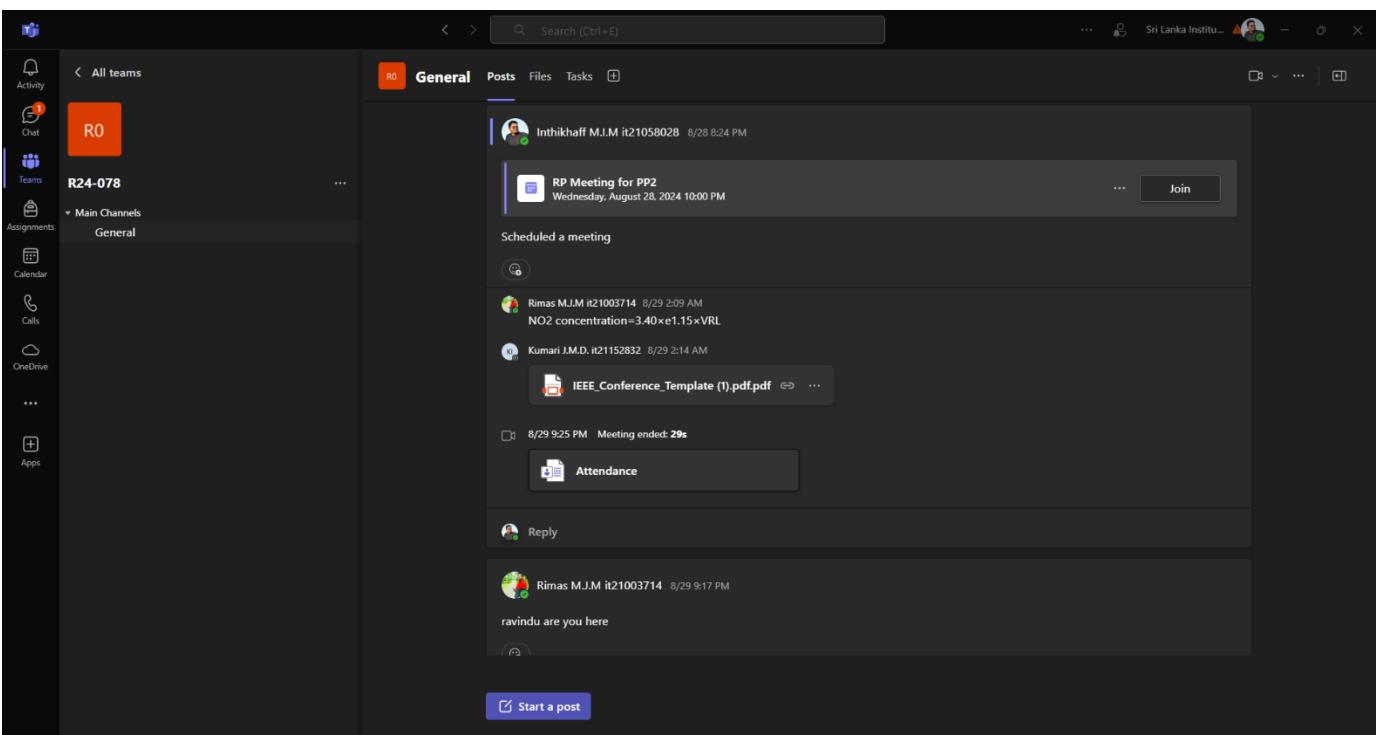


Fig. 14. Teams Call 6 with Research Team

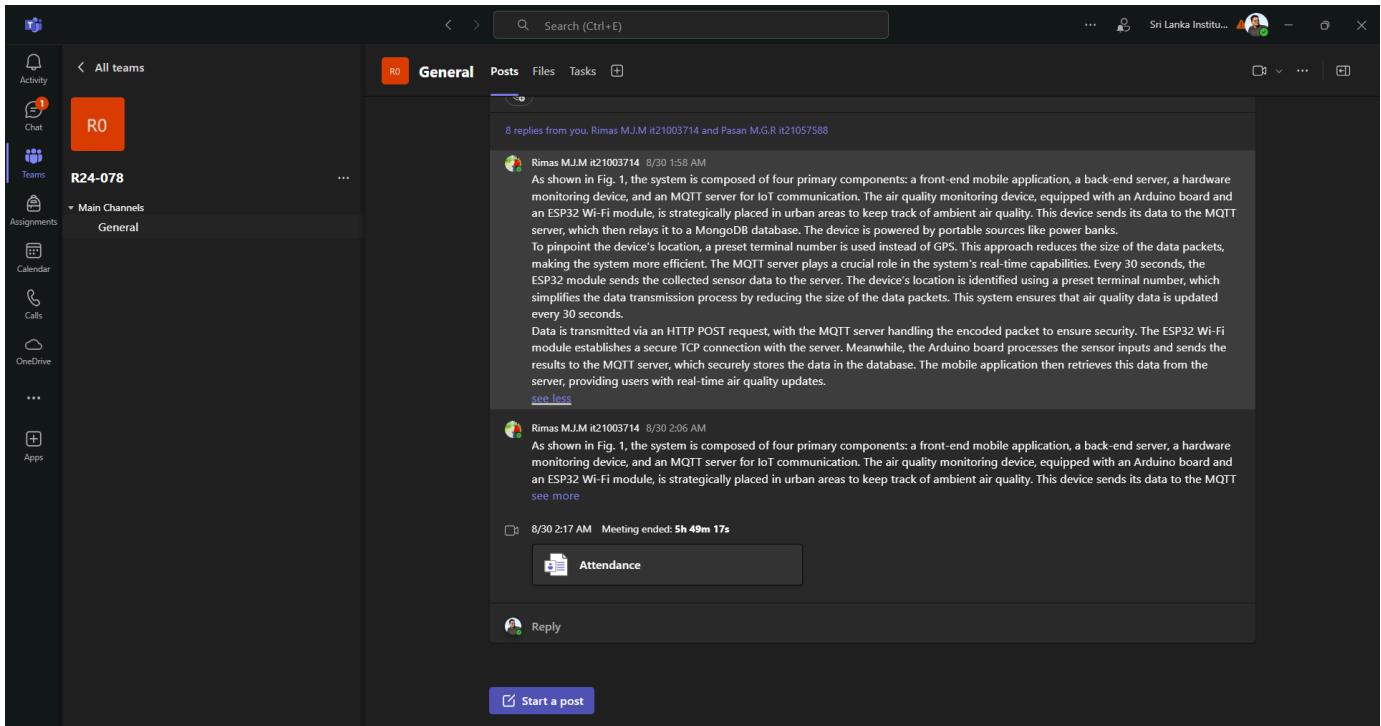


Fig. 15. Teams Call 6 with Research Team

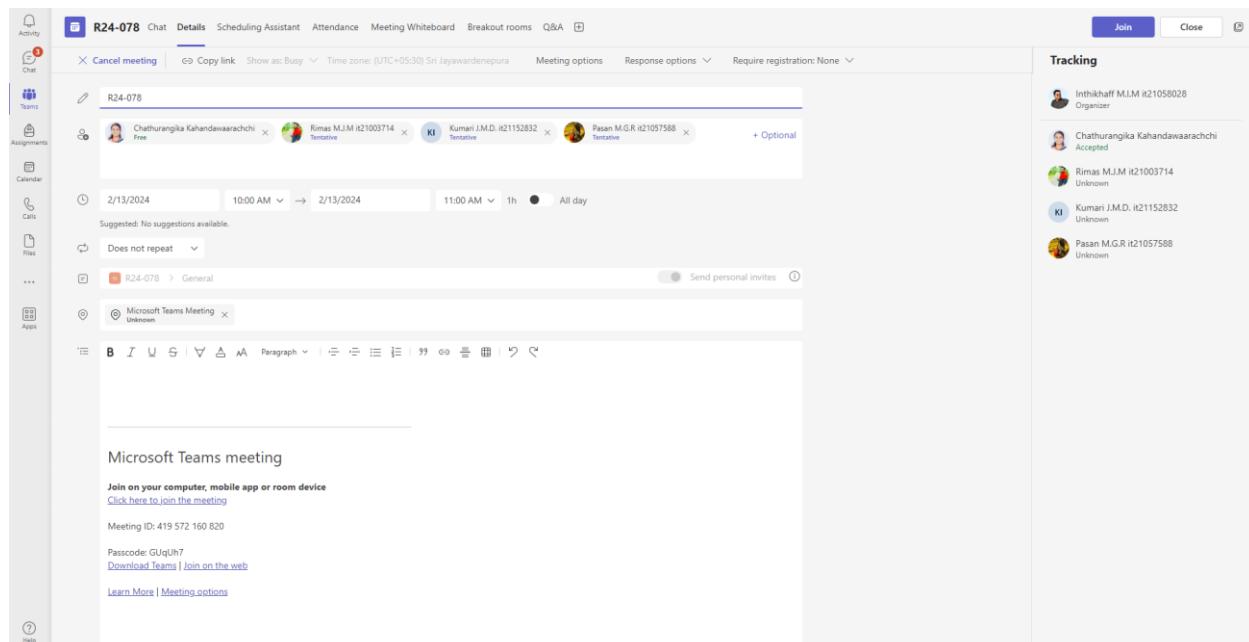


Fig. 16. Teams Call 8 with Research Team

## 2.2. MS Teams Call with Co-Supervisor

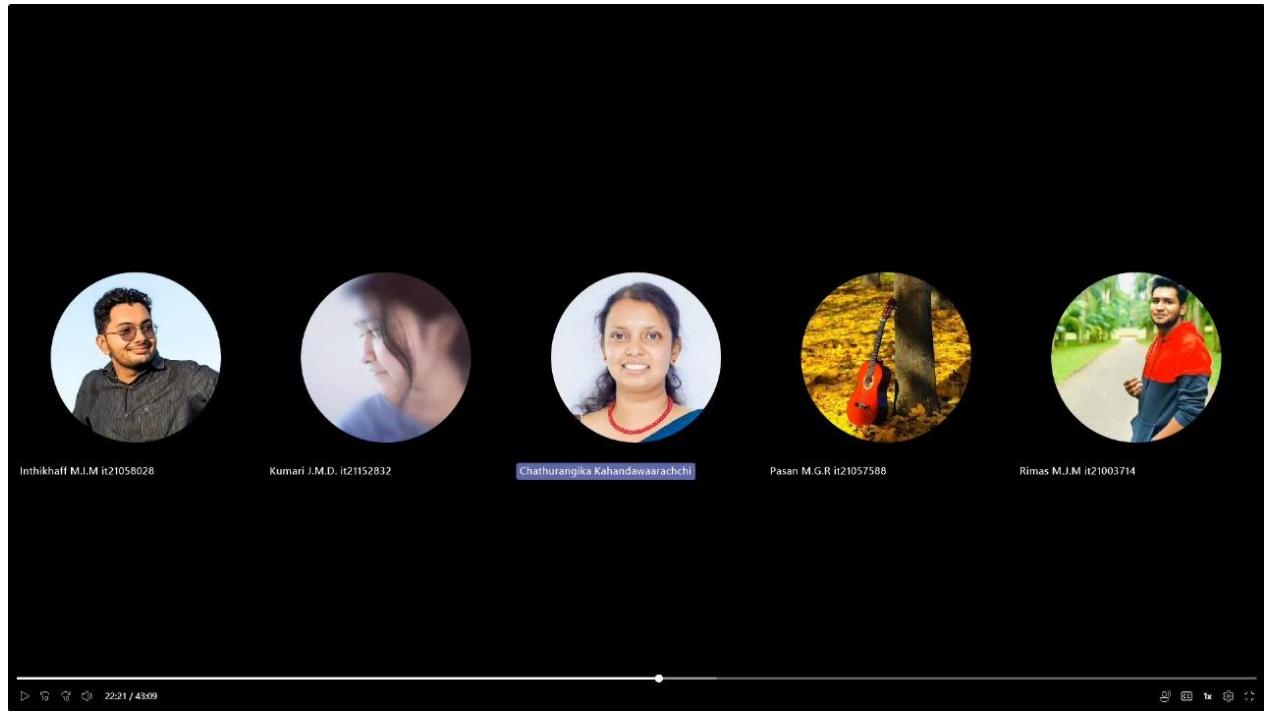


Fig. 17. Teams Call with Research Team Co-Supervisor



Fig. 18. Physically Meeting schedule with supervision

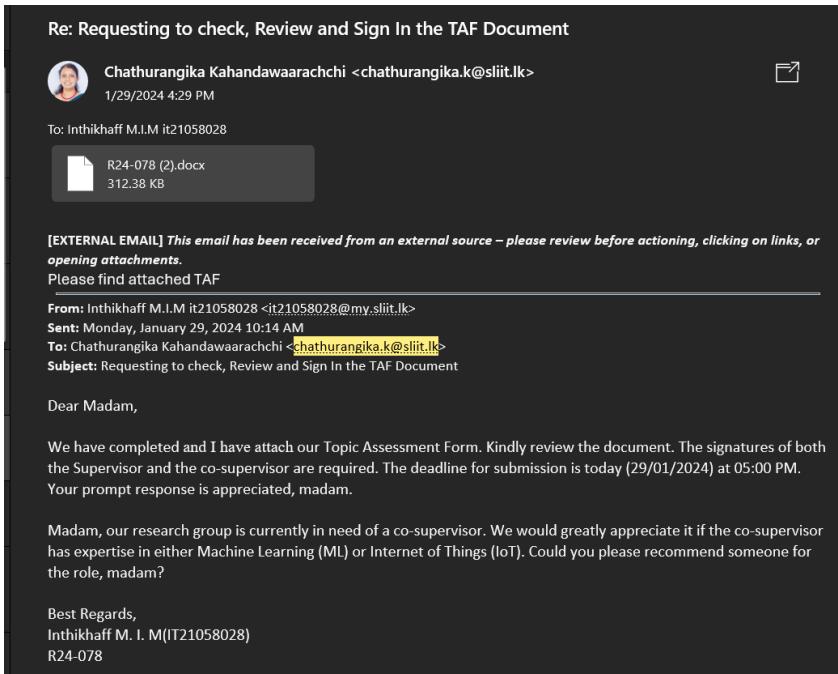


Fig. 19. Physically Meeting schedule with supervision

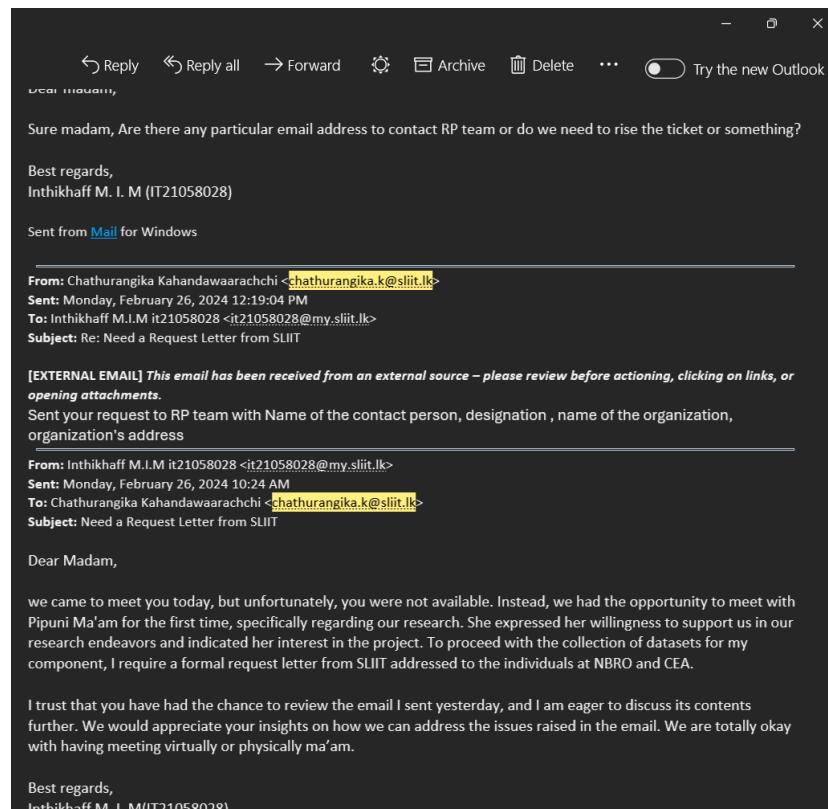


Fig. 20. Physically Meeting schedule with supervision

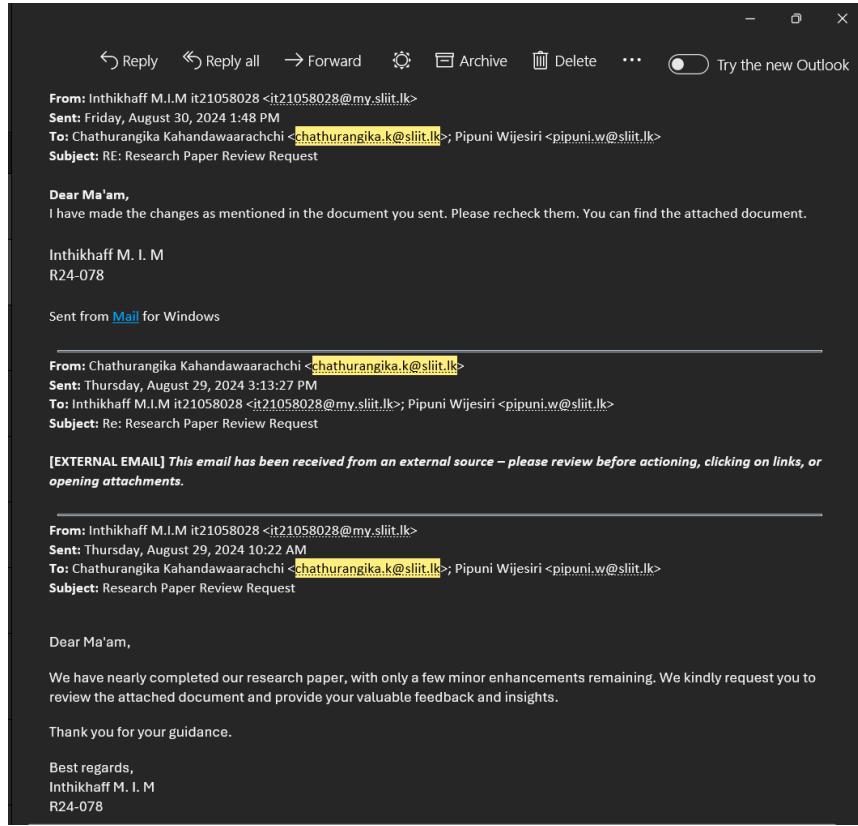


Fig. 21. Physically Meeting schedule with supervision

### 3. Teams Planner Charts

#### 3.1. MS Teams Planner Board

The screenshot shows a Microsoft Teams Planner Board with four columns. Each column represents a user: Inthikhaff M. I. M (IT21058028), IT21003714 RIMAS.M.J.M, IT21152832 KUMARI J.M.D, and an unnamed fourth column. The interface includes a header bar with 'Group by Bucket' and 'Filter' dropdowns, and tabs for 'List', 'Board' (selected), 'Charts', and 'Schedule'. A message at the top says 'A new Planner experience is coming soon to Teams. Learn more'. The 'Completed tasks' count is 13.

User	Task Description	Status
Inthikhaff M. I. M (IT21058028)	Real-time Pollution Data and Comparison and Visualization.	Pending
Inthikhaff M. I. M (IT21058028)	Host the finalized model in the fast server	Pending
Inthikhaff M. I. M (IT21058028)	Displayed the results in mobile application	Pending
IT21003714 RIMAS.M.J.M	Set up the MongoDB database and establish connectivity with the monitoring hardware system	Pending
IT21003714 RIMAS.M.J.M	Send the Alert Notification when reading high pollution level	Pending
IT21003714 RIMAS.M.J.M	Displayed the results in mobile application	Pending
IT21152832 KUMARI J.M.D	Connect with Backend server from IoT devices and send the sensor data in database(DB)	Pending
IT21152832 KUMARI J.M.D	calculate the sensor data values (PPM)	Pending

Fig. 22 . Planner Board Part 1

Fig. 23 . Planner Board Part 2

The screenshot displays two side-by-side views of the Microsoft Planner Board interface.

**Left View:** Shows a task list for user "Inthikhaff M. I. M(IT21058028)". The tasks are:

- Real-time Pollution Data and Comparison and Visualization.  
! (Red exclamation mark)
- Host the finalized model in the fast server
- Displayed the results in mobile application  
! (Red exclamation mark)

**Right View:** Shows a task list for user "Inthikhaff M. I. M(IT21058028)" under the "General" team. The tasks are:

- Real-time Pollution Data and Comparison and Visualization.
- Host the finalized model in the fast server
- Displayed the results in mobile application

Below the tasks, completed tasks are listed:

- Polluted-Air-Data Collection and Preprocessing, Cleaning and Transforming:  
Completed by Inthikhaff M.I.M it...
- Feature Selection and Analysis  
Completed by Inthikhaff M.I.M it...
- Model Development Implement machine-learning algorithms for pollution level prediction:  
Completed by Inthikhaff M.I.M it...

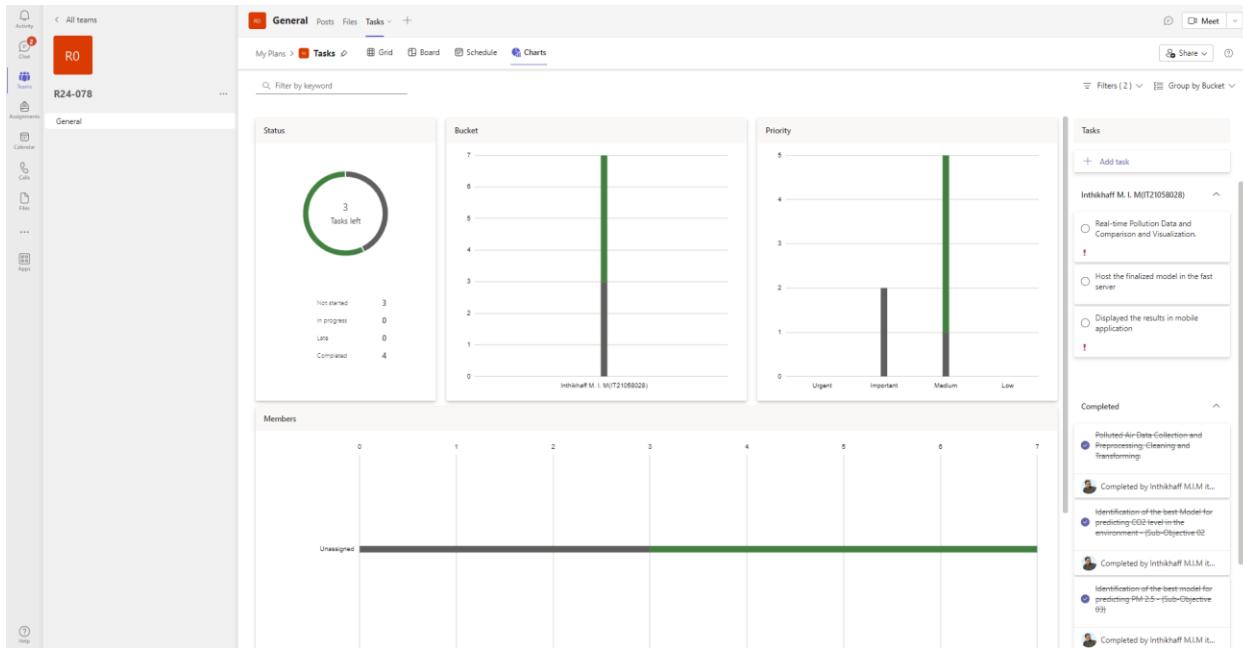


Fig. 24 . Teams Planner Charts

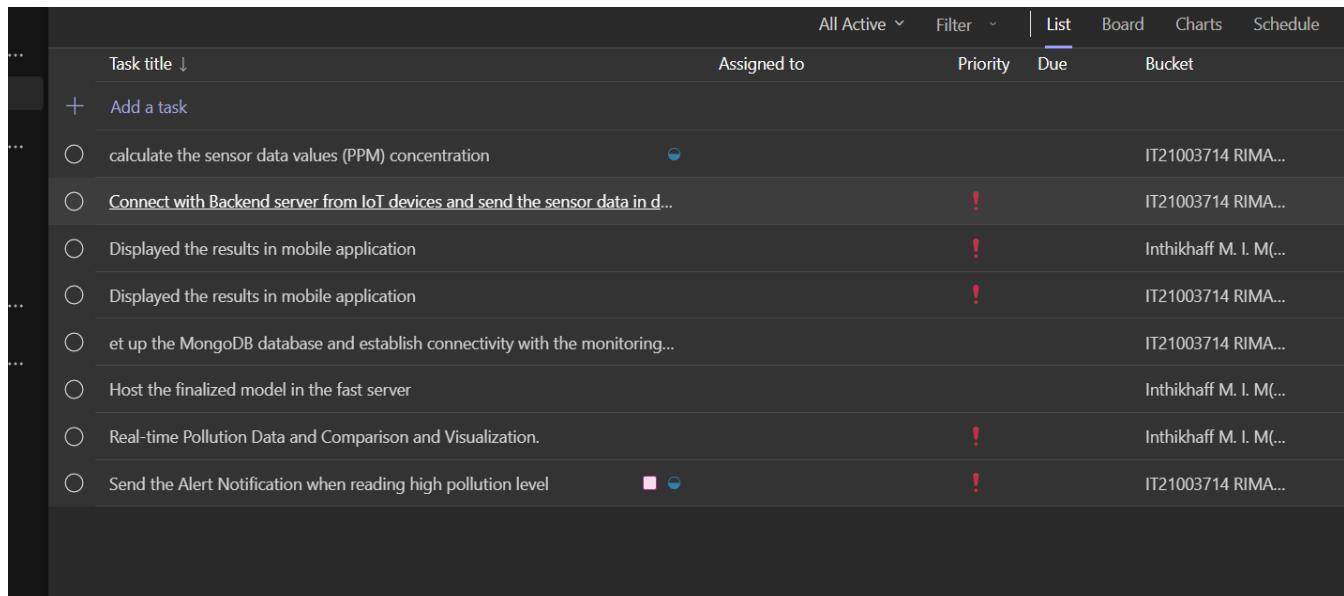


Fig. 25 . Teams Planner Chart Bucket

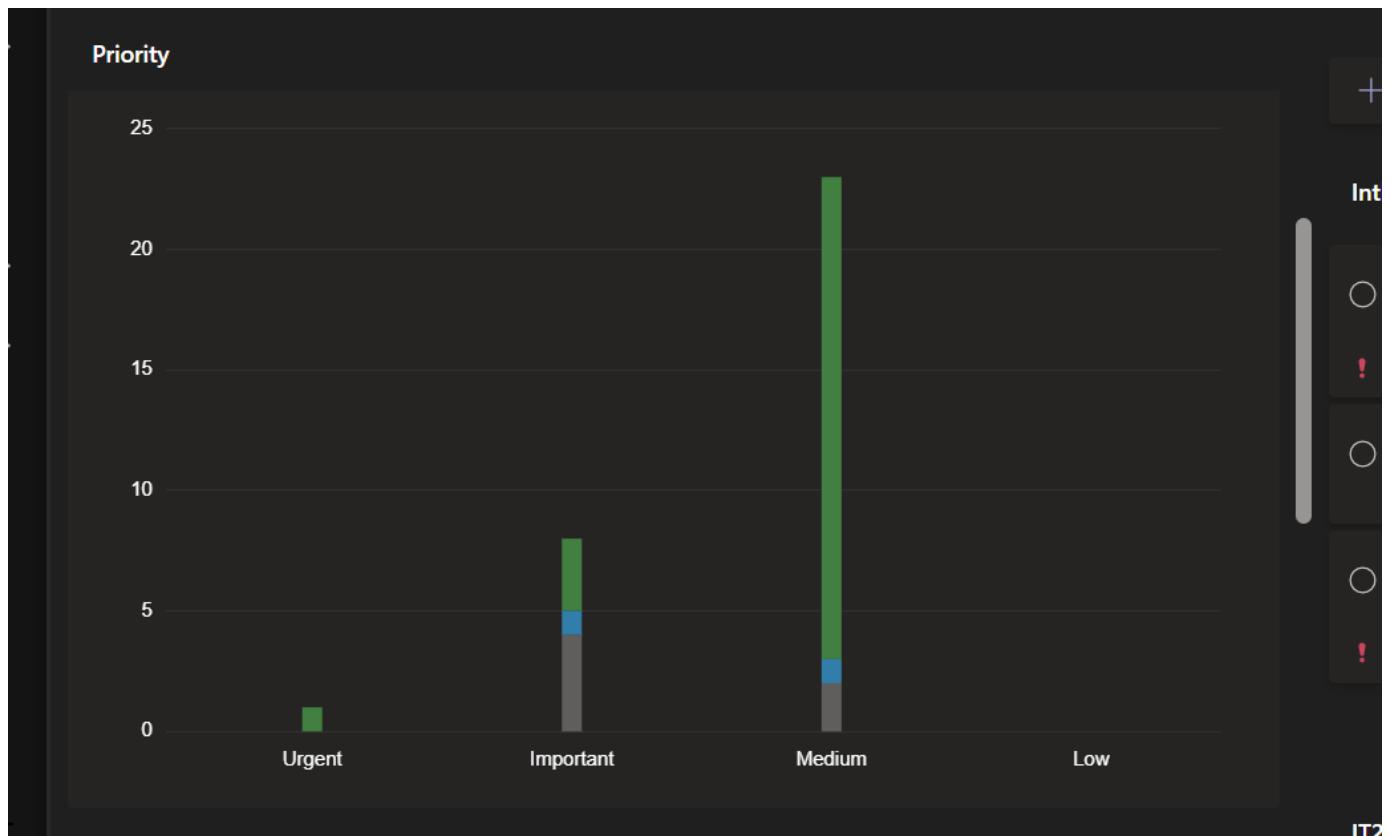


Fig. 26 . Members Assigned Tasks

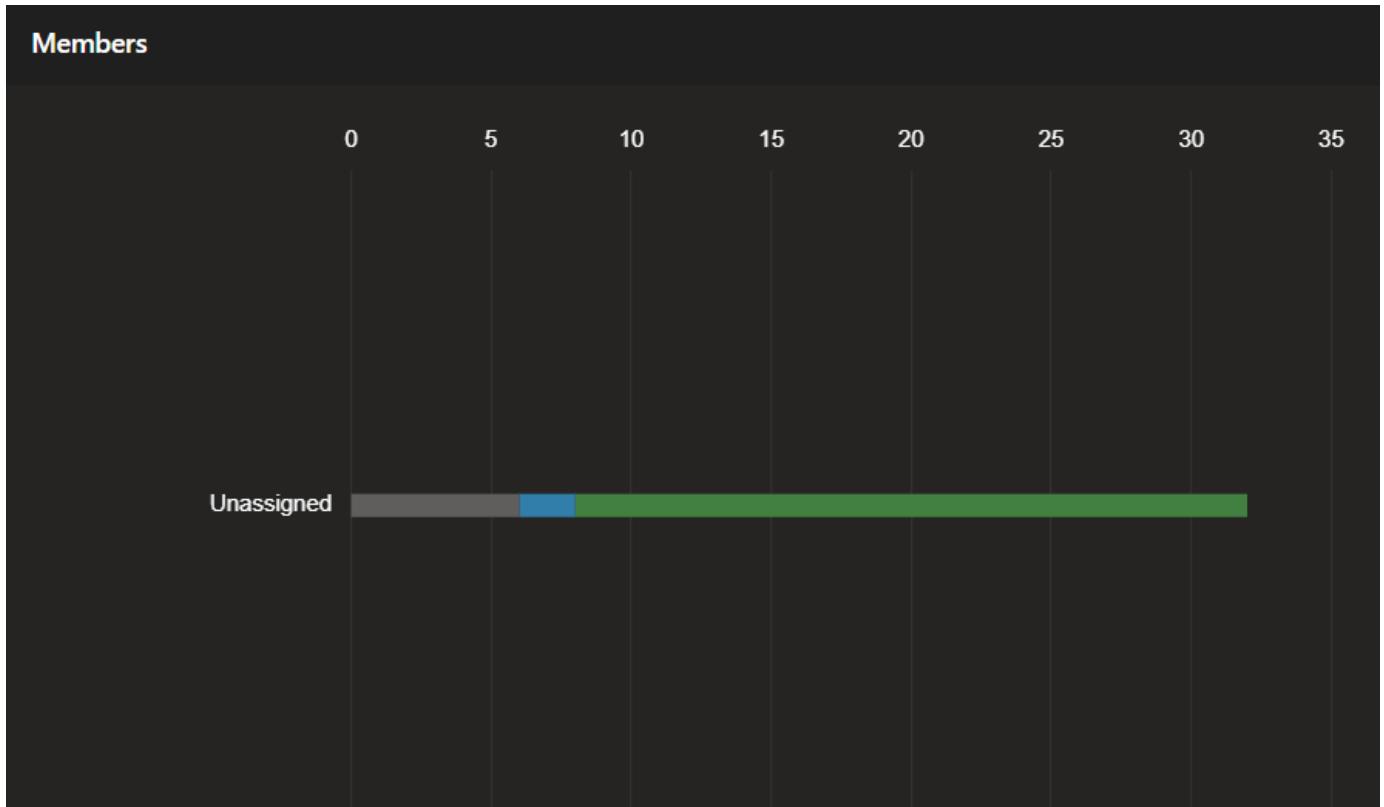


Fig. 27 . Completed Task L

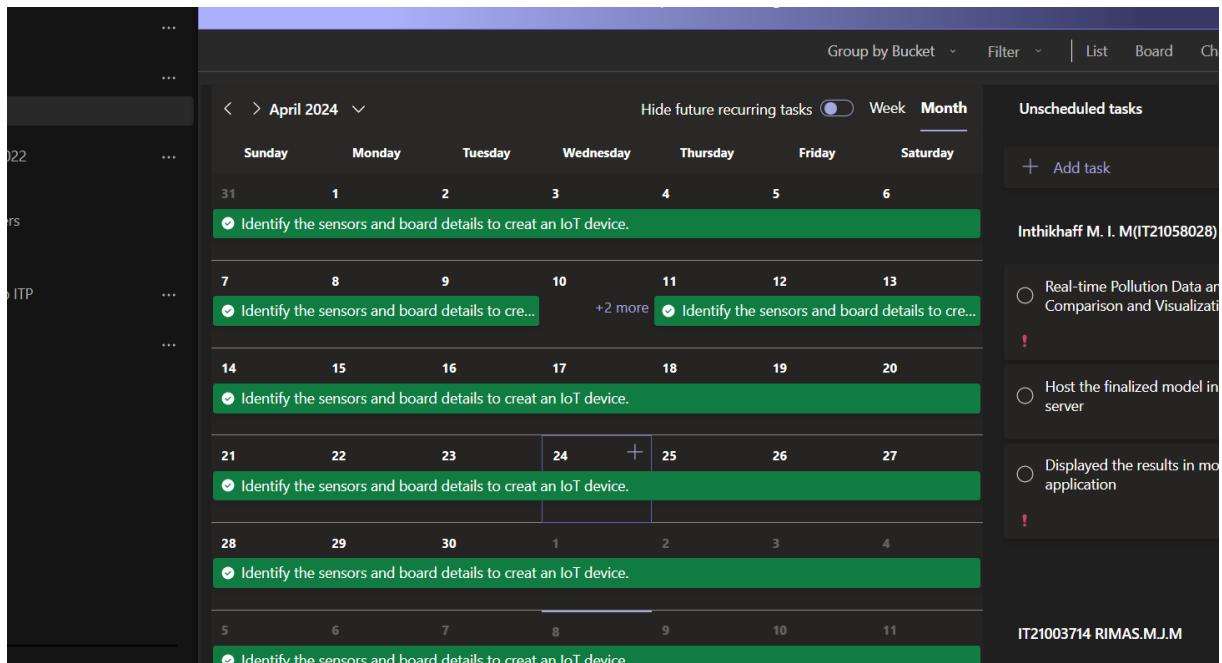
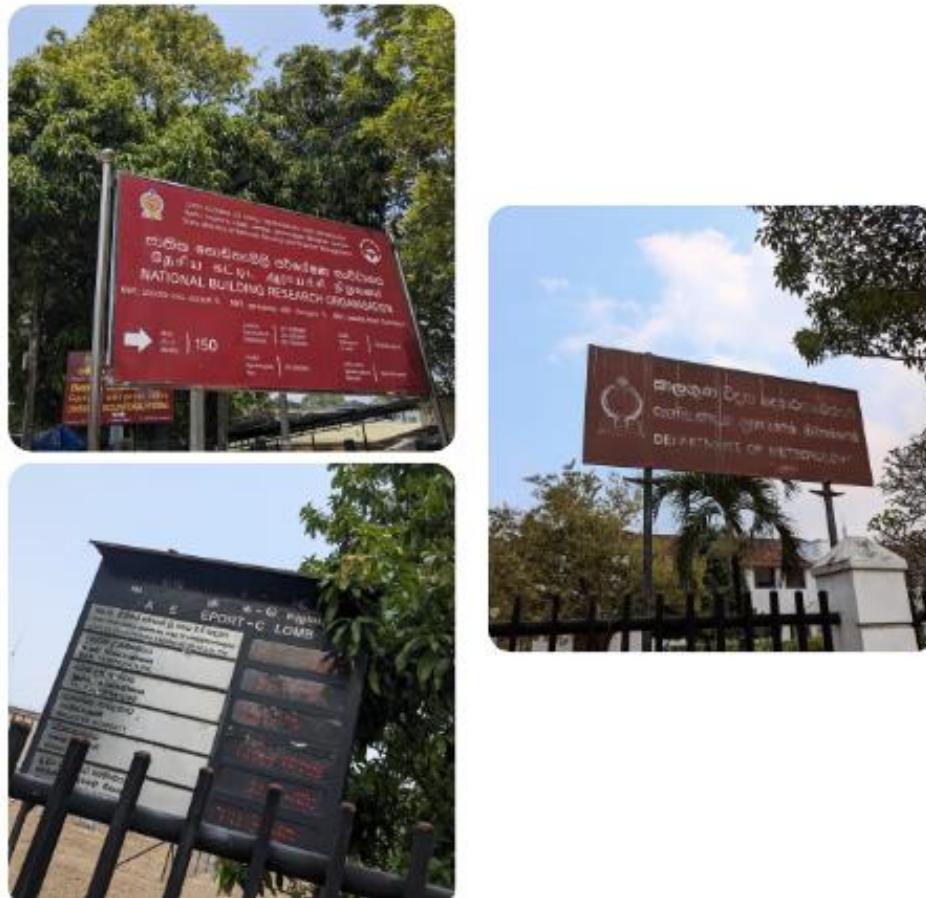


Fig. 28. Completed Task L

## 4. Data Collections and field visits



**Air Quality Data**

NE NBRO ESSD <nbro.essd@gmail.com>  
4/1/2024 4:53 PM

To: mh dinthkaff@gmail.com  
Save all attachments

AAQ daily data\_Colombo\_MET... 71.84 KB AAQ daily data\_Mobile... 108.07 KB AAQ hourly data\_Mobile... 254.81 KB

Air Quality hourly data\_... 216.08 KB

Dear Student,  
Please find related docs.

Thanks & Best Regards

Environmental Studies and Services Division  
National Building Research Organisation  
No. 99/1, Jawatte Road,  
Colombo 05  
Tel: 0112588946, 0112503826 Fax: 0112588365  
Ext : 617 - Head of Division  
589 - Air Quality, Noise & Vibration Studies Unit  
621 - Land & Water Quality Studies Unit

Fig. 29. Datasets

## 5. WhatsApp Group & Calls

### 5.1. Research Team WhatsApp Group Call

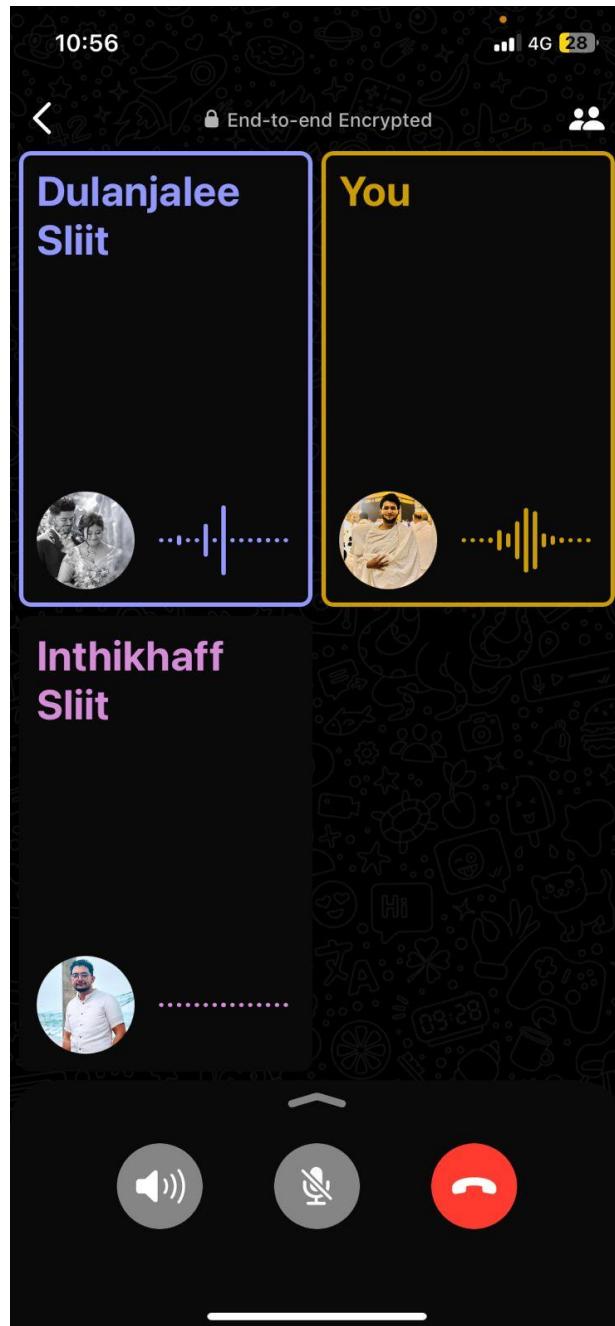


Fig. 30 . Research Team WhatsApp Group Call

## 5.2. Research Team Group

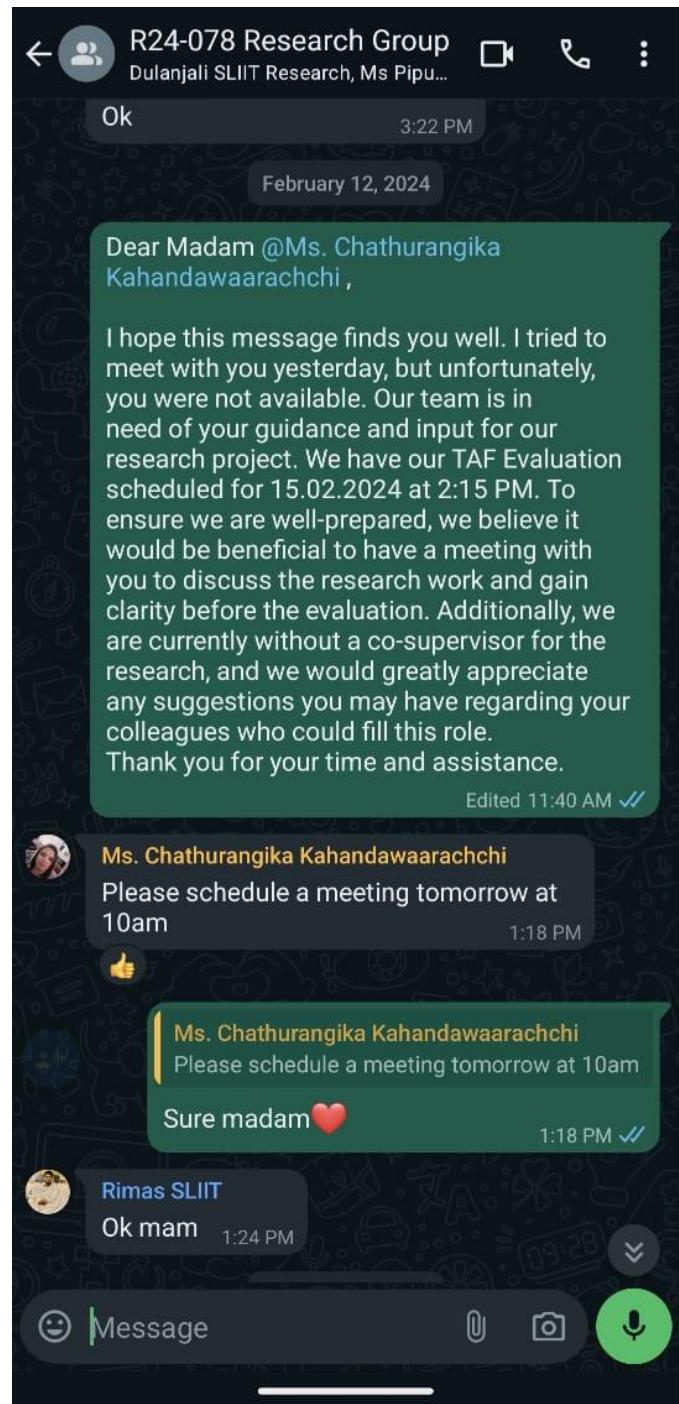
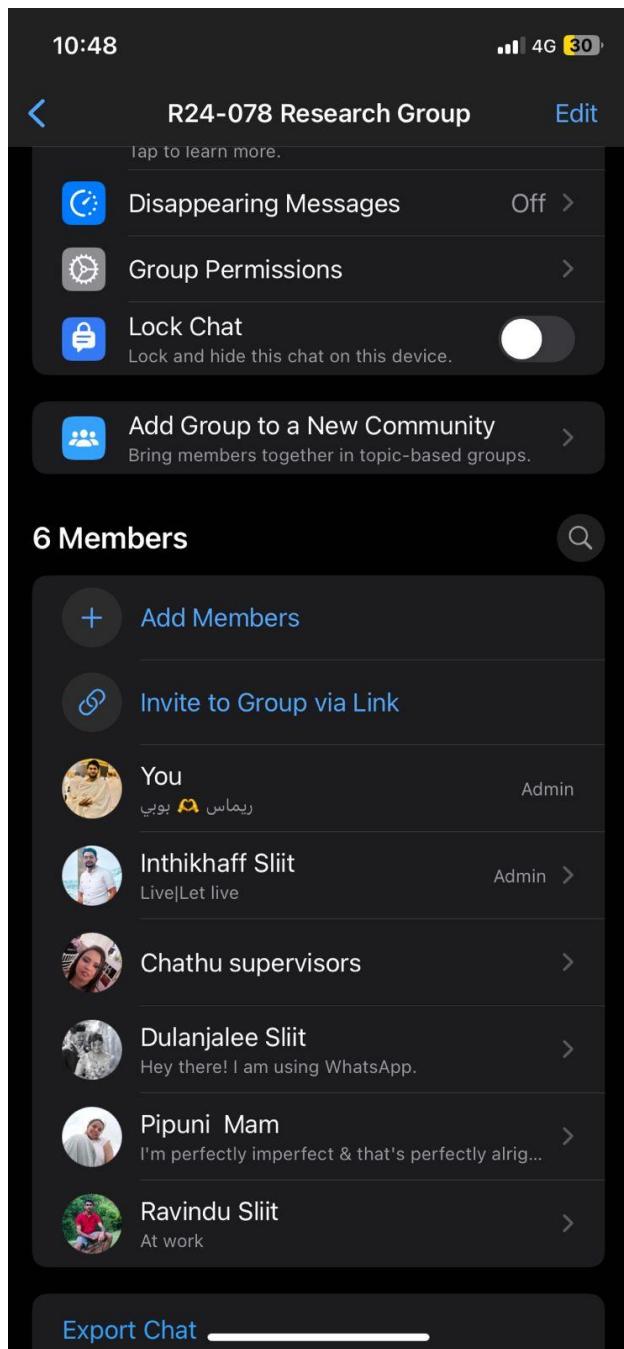


Fig. 31 . Research Team WhatsApp Group Call

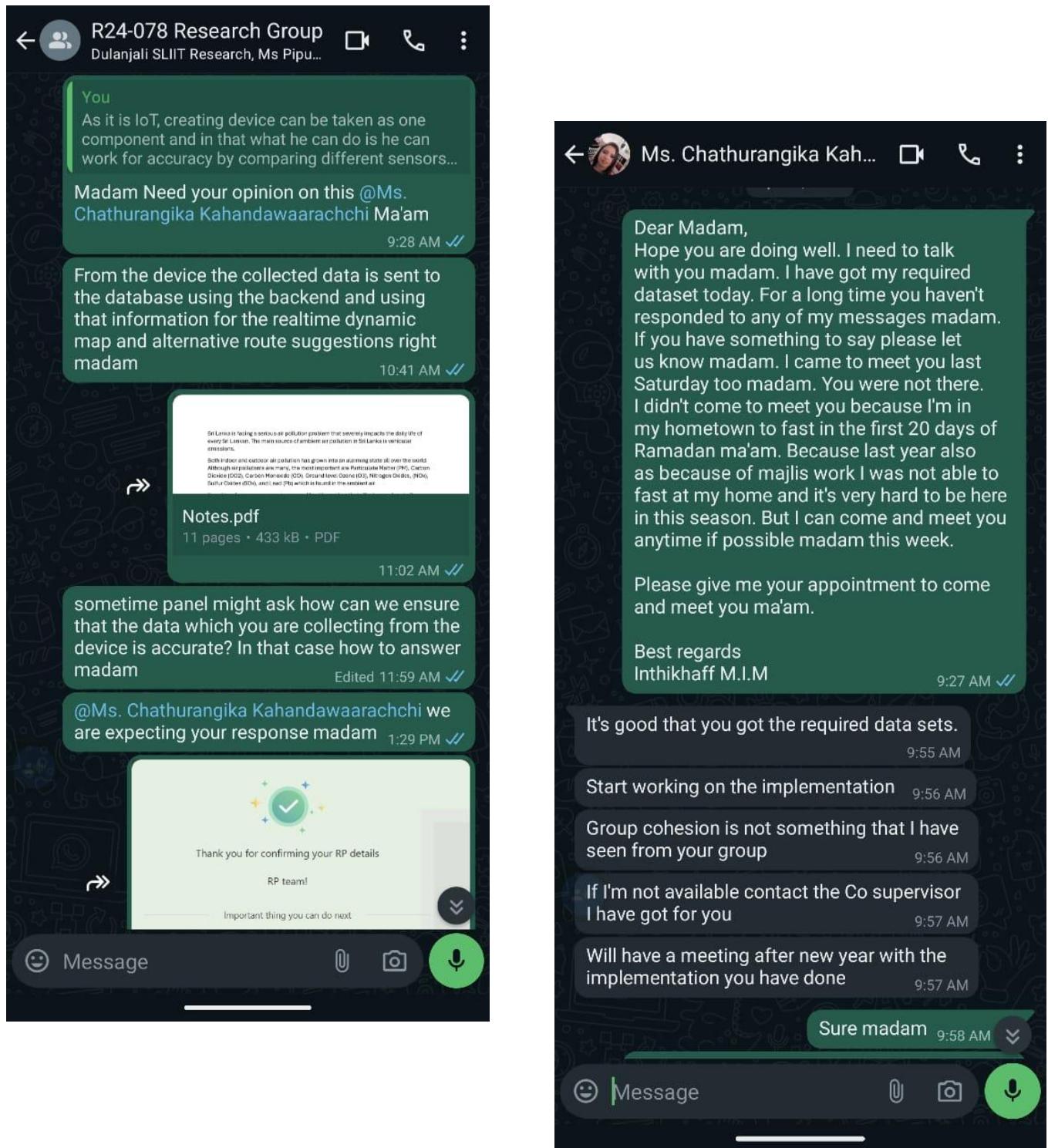


Fig. 32. Research Team Group

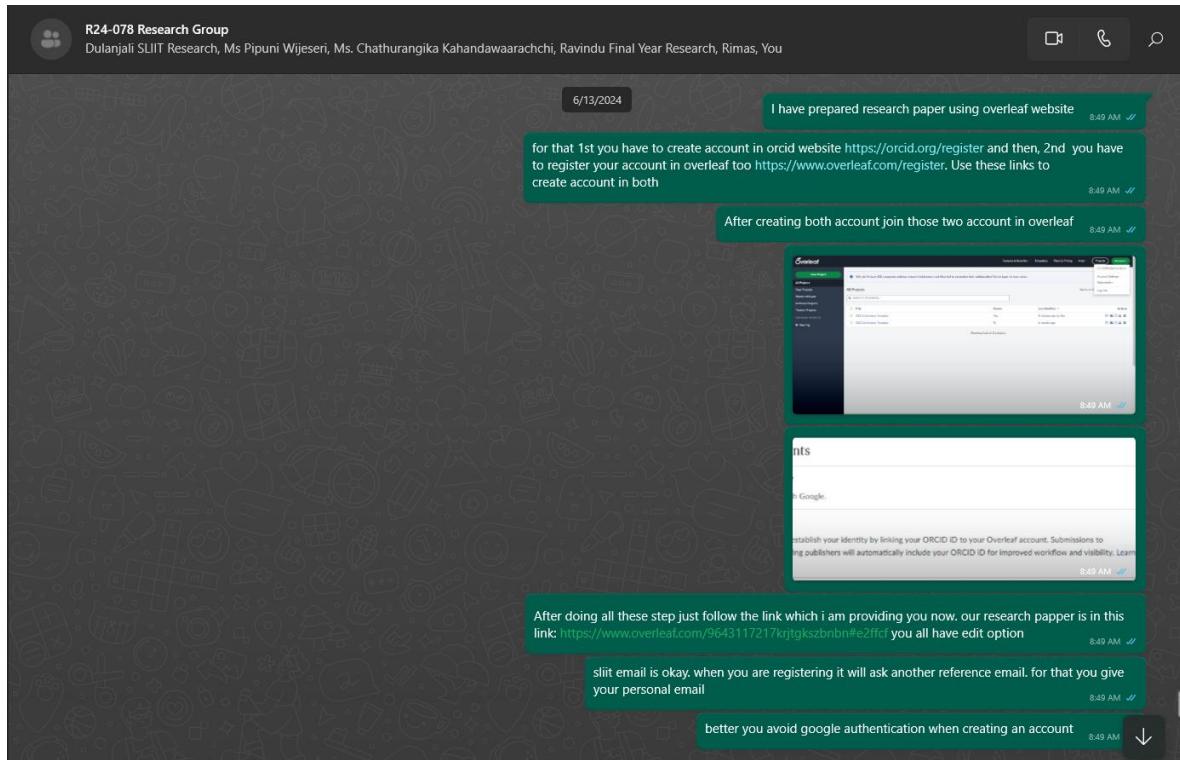


Fig. 33. Research Team Group

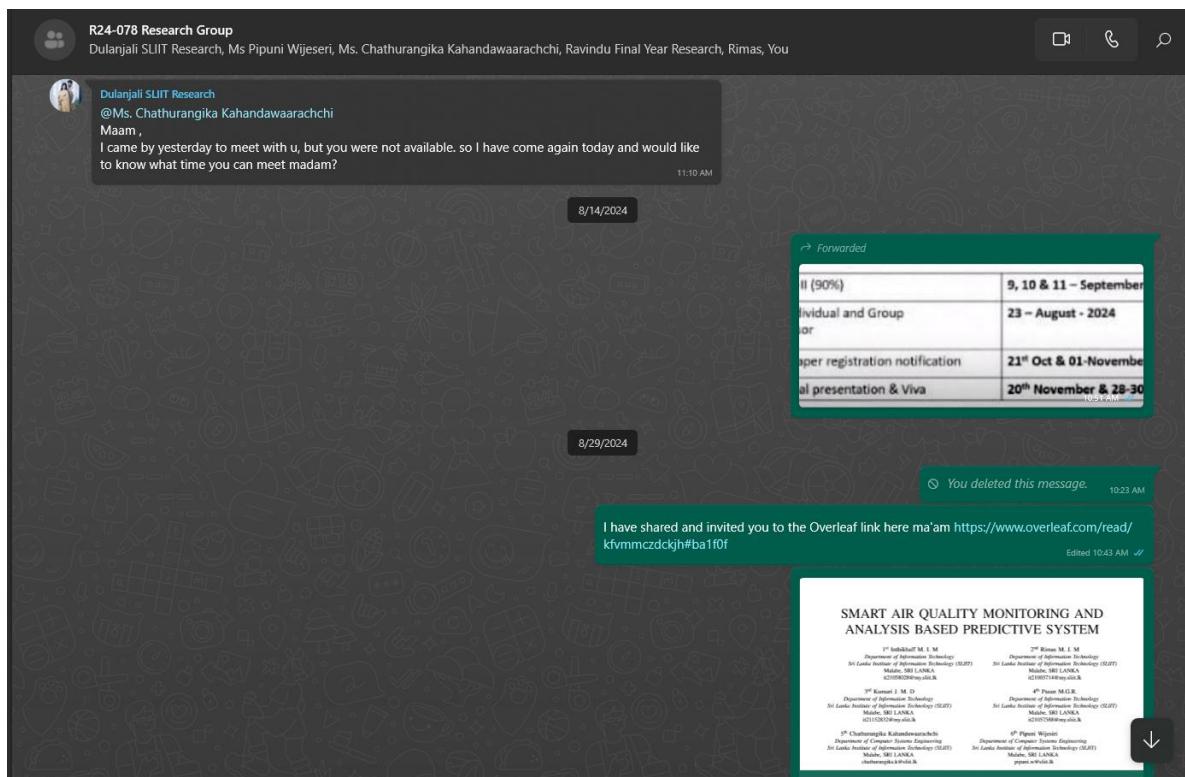


Fig. 33. Research Team Group

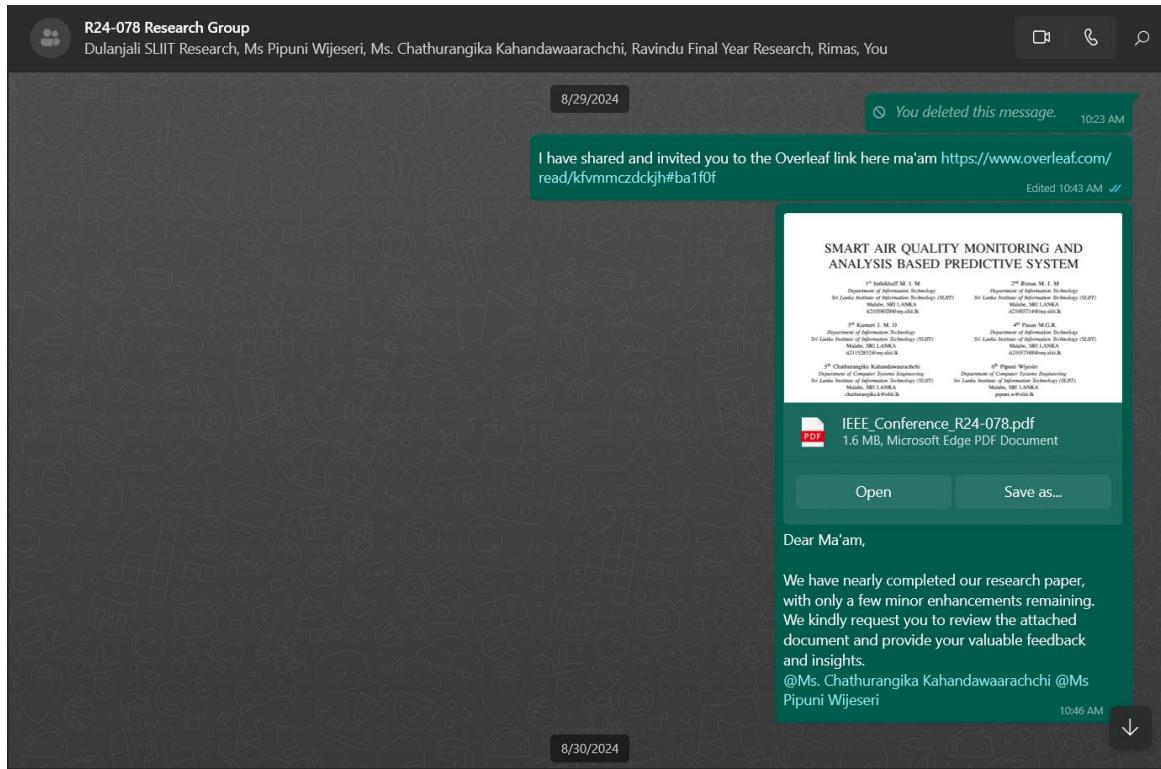


Fig. 34. Research Team Group

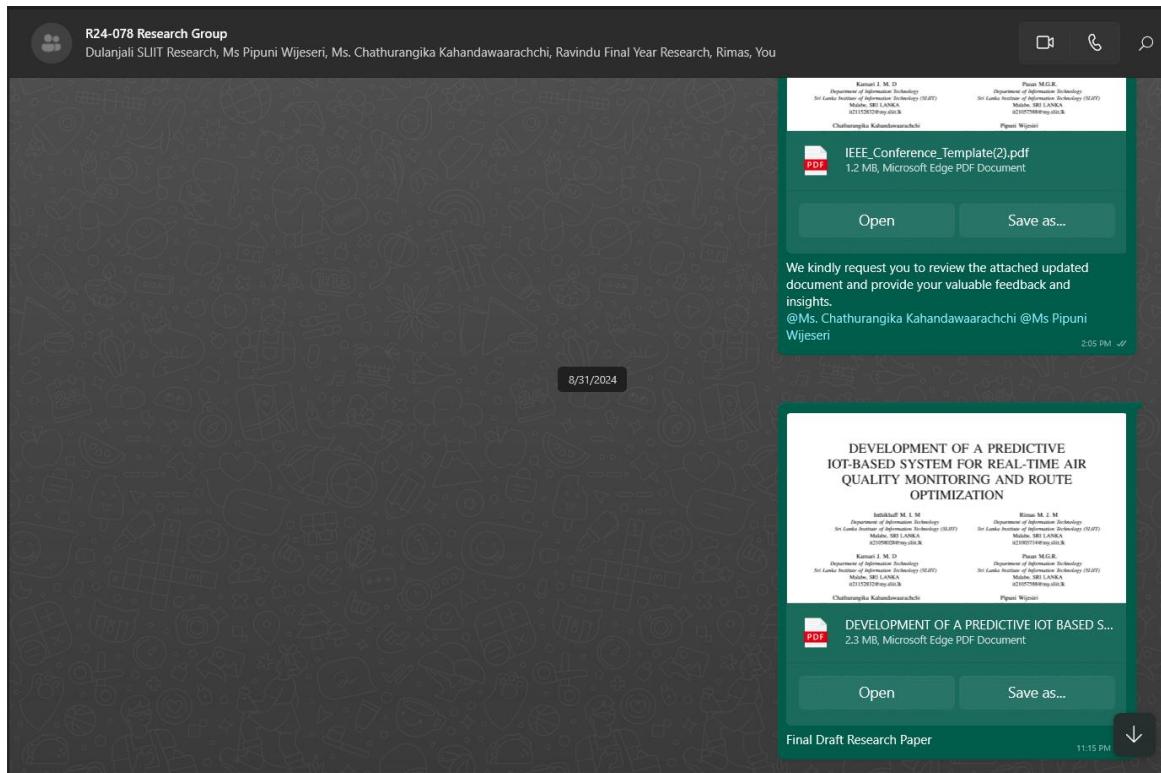


Fig. 35. Research Team Group

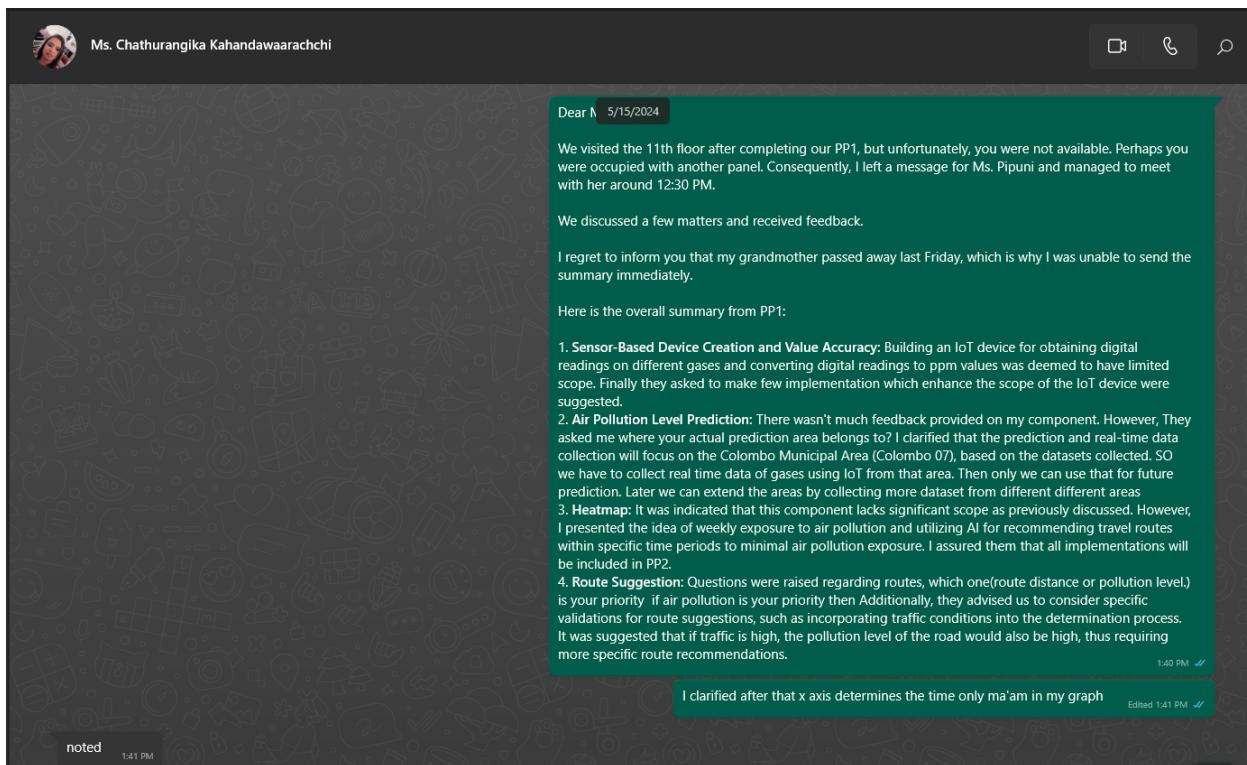


Fig. 36. Research Team Group

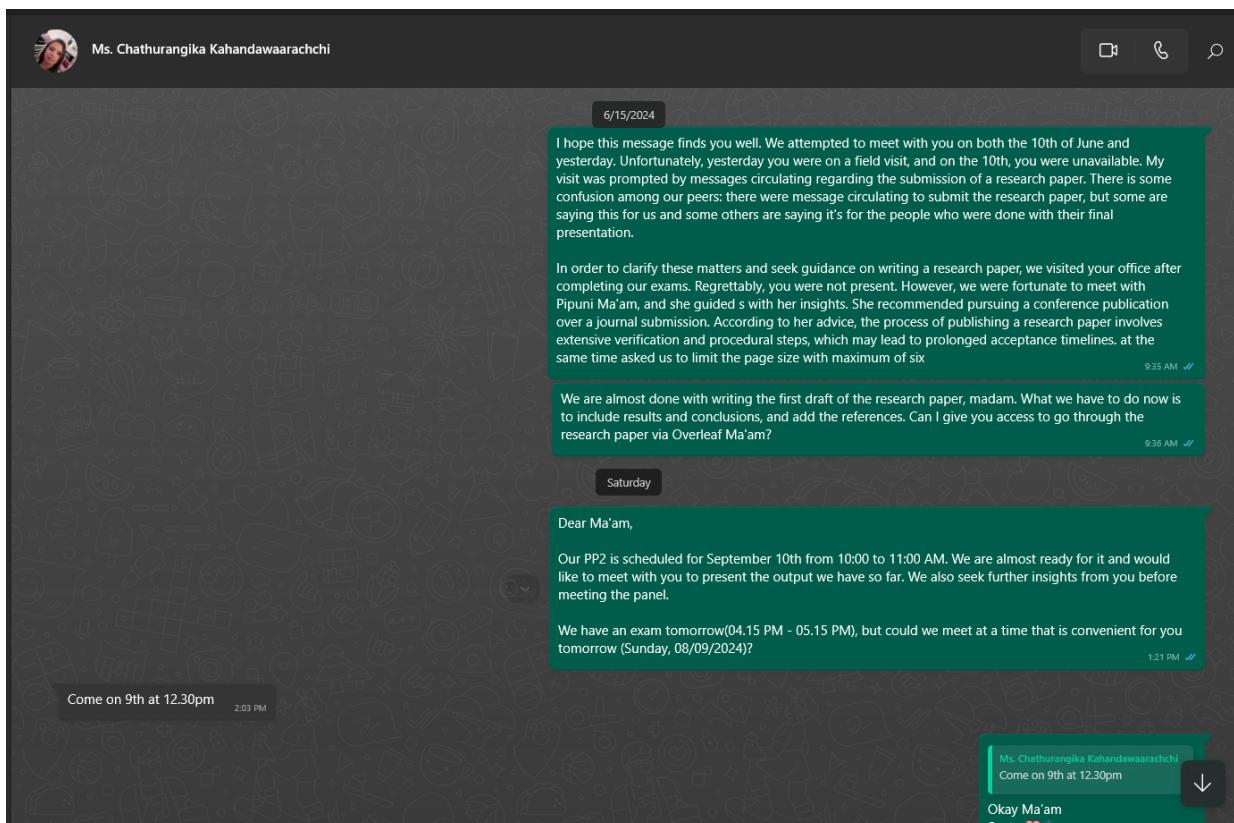


Fig. 37. Research Team Group

## 6. Work Breakdown Structure & Allocate Resources for Each Area.

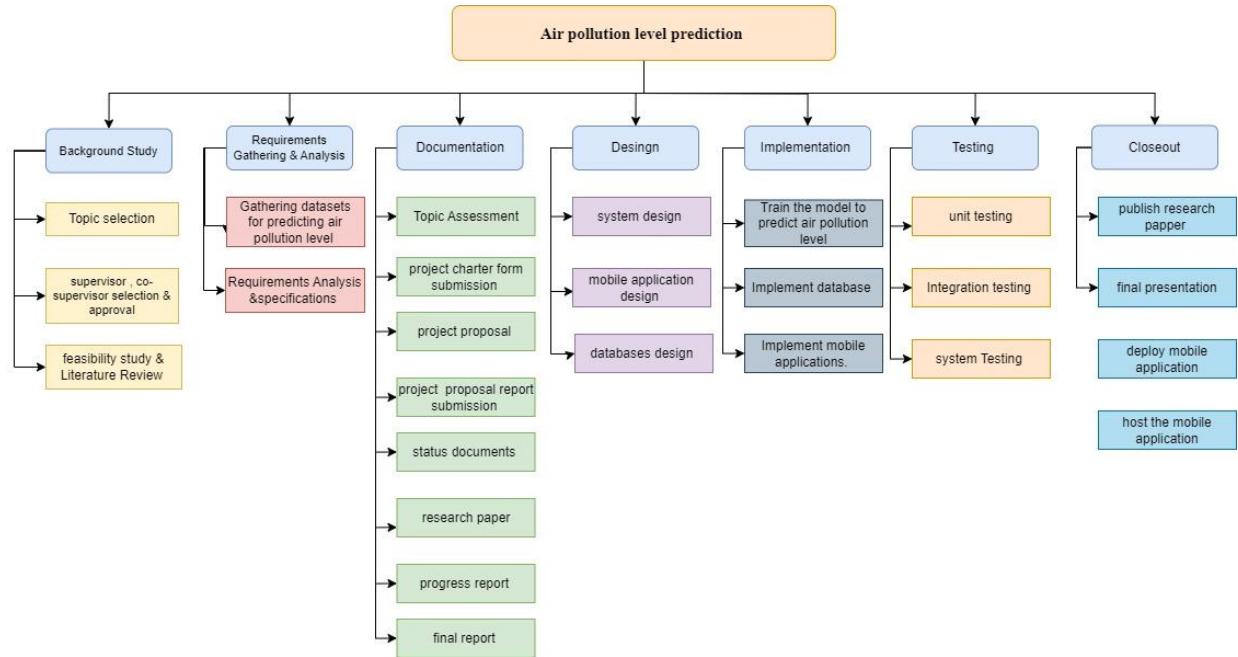


Fig. 38 . Work Breakdown Chart

## 7. Gantt Chart of Finalize Design & Implementation Phase

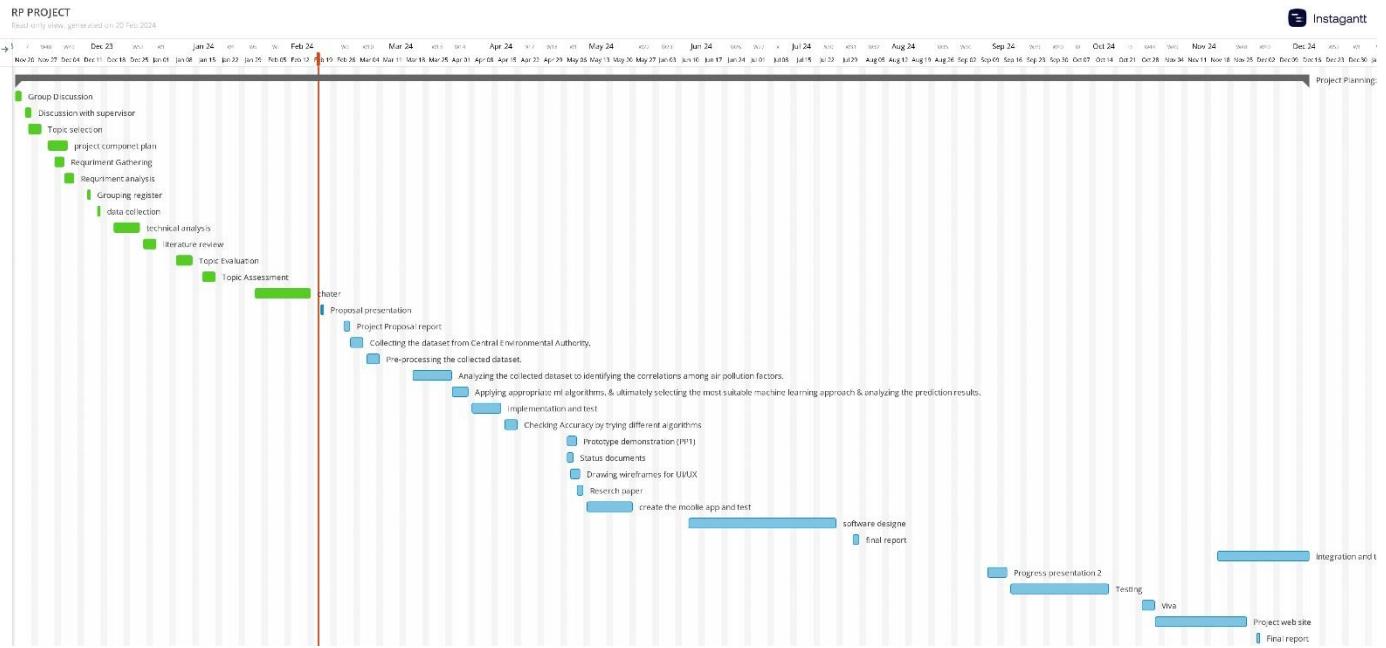


Fig. 39. Gantt Chart

# DEVELOPMENT OF A PREDICTIVE IOT-BASED SYSTEM FOR REAL-TIME AIR QUALITY MONITORING AND ROUTE OPTIMIZATION

Inthikhaff M. I. M

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Pasan M.G.R.

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*Sri Lanka Institute of Information Technology (SLIIT)*  
Malabe, SRI LANKA  
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Pipuni Wijesiri

*Department of Computer Systems Engineering*  
*Sri Lanka Institute of Information Technology (SLIIT)*  
Malabe, SRI LANKA  
pipuni.w@sliit.lk

**Abstract**—Sri Lanka faces severe air pollution challenges, largely due to vehicular emissions, which threaten public health. To address this, we developed a real-time air quality monitoring system that visualizes pollution via a heatmap. The system integrates gas sensors monitoring methane (CH<sub>4</sub>), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO), and particulate matter (PM.). These sensors are connected to an ESP32 board and Wi-Fi module, strategically deployed around smart buildings. Data is transmitted to a centralized hub using IoT technology, enabling real-time visualization and

## I. INTRODUCTION

Air pollution has become a serious global problem, with many harmful pollutants like Particulate Matter (PM), Carbon Dioxide (CO<sub>2</sub>), Carbon Monoxide (CO), Ground-level Ozone (O<sub>3</sub>), Nitrogen Oxides (NO<sub>x</sub>), and Sulfur Oxides (SO<sub>x</sub>) are present in the air we breathe. This issue poses a major health risk for people everywhere, affecting both developed and developing countries. Common sources of outdoor air