# Webinar 28 April 2025:
# Launching Our Open Source Initiative

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# Executive Summary

**Our Background & Motivation:**

- AirGradient originated from a volunteer project we undertook in Northern Thailand (2019) to address severe air pollution during the "burning season." Our initial focus was on building affordable, open-source hardware monitors for schools and communities.
- Since then, we've grown as a company (now over 20 people, with 30,000+ monitors sold), but we've maintained our deep commitment to open-source hardware – making our schematics, firmware, and enclosure designs freely available under permissive licenses.
- Our core vision is to maximize impact. We want to bridge the gap between simply having air quality data and taking tangible action for cleaner air. Our goal is to inform and empower a billion people worldwide.

**Our New Initiative: The "Clean Air Advocates Program" - An Open Source App and Platform**

- Recognizing that achieving such a large vision requires collaboration, we are launching this community-driven project to build an open-source application platform together.
- **Phase 1: The Map Application:**
    - Our first step is to build a powerful, user-friendly, and localized map application designed for everyone.
    - We're focusing on providing clear, health-based information, useful alerts, ensuring data accuracy (through calibration, malfunction detection etc.), and developing reliable forecasting.
    - Key features will include being truly open source (GPL licensed), vendor-agnostic (integrating data from various sources), accessible to all, localized into many languages, and visually engaging.
    - Crucially, we want this app to highlight and properly attribute the vital work done by community organizations collecting data on the ground.
- **Phase 2: Community Engagement & Action Platform:**
    - Building on top of this map application, we envision a platform that fosters community engagement and drives action.
    - We aim to provide tools for local organizations worldwide to connect with their communities and motivate them towards clean air initiatives.
    - We want to develop ways to better support these groups, potentially through facilitating donations or providing monitors.
    - We'll also explore advanced capabilities, such as using the network for hyperlocal emission detection (like traffic pollution).

**How We'll Work Together & Govern This:**

- We were thrilled that over 80 people initially expressed interest in contributing, bringing a wealth of skills in testing, backend/frontend development, and data science (though we are particularly looking for more mobile developers!).
- From our side at AirGradient, we will provide project management support, access to our developers and scientific team, graphic design resources, our server infrastructure, and our established links with communities on the ground.
- We've already set up initial GitHub repositories (frontend/backend), documentation, and a basic map prototype (already pulling OpenAQ data) that you can access and contribute to right now.
- **Transparency & Structure:** We understand the importance of transparency, especially as a for-profit company funding this initiative. We are committed to:
    - Using a true open-source license (like GPL).
    - Avoiding any "open-core" model; the entire project will be open.
    - Addressing potential conflicts of interest head-on.
    - Actively exploring the setup of a separate non-profit entity (likely based in Switzerland) to eventually own and manage the project code and governance, ensuring clear separation and community stewardship.
- **Sustainability:** Our platform will be built on open data principles – we will not sell data or derived forecasts. We aim for sustainability through mechanisms like donations facilitated via the app/non-profit, with 100% of funds staying within the non-profit ecosystem to cover costs of the platform and support local organizations.
- **Contribution:** While this is primarily a volunteer-driven community effort, we are exploring incentives like custom branded monitors for core contributors, giving contributors a say in where we donate monitors, potential future funding for contributions if the project secures donations, and naturally considering contributors if relevant positions open up at AirGradient.
- We've established an initial group of maintainers and advisors (both internal and external experts) and warmly invite interested community members to get involved.

**Getting Started & Our Next Steps:**

- You can get involved immediately by checking out our GitHub repositories, reviewing the documentation, looking at open issues, and joining the discussion forums.
- We plan to organize specific working groups (e.g., on mobile technology choices, data quality) and host recurring, optional "drop-in" meetings for easier communication and updates.
- We'll send out a survey soon to determine the community's preferred communication channels.
- We will share the recording of this webinar and links to all resources shortly.

In essence, we are leveraging our open-source roots and experience working with communities to build this comprehensive software platform together. Our aim is to democratize air quality information, empower local action, and collectively contribute to cleaner air globally. We are incredibly excited about this journey and actively seek your collaboration to make this vision a reality. Let's build something great together!

# Key Questions, Suggestions & Answers from the Webinar:

- **[Kristian Balaj]:** [Regarding the Laos map] How could you fill in the gaps between data points using machine learning? Isn't it just a buzzword here, and linear interpolation the most that could be done? You can't make up data, and simple interpolation seems precise enough, considering potential local sources like chimneys.
    - **[Achim Haug/Anthony M Answer Summary]:** The model (developed by UNICEF data scientists) uses more than just the sensor data points. It incorporates additional layers like topographic info (OpenStreetMap), satellite data (wildfire spots from FIRMS, aerosol optical depth, boundary layer height), weather data (temp, humidity, wind), and potentially traffic/population density. This allows for more sophisticated modeling than simple interpolation. The model and methods are intended to be open source, and more details/a specific presentation are planned.
    - **[Chat Context - Tim Norman]:** Neural networks can use these extra inputs to improve interpolation.
    - **[Chat Context - Anthony M's Links]:** (Shared relevant academic papers on ML/AQ modeling)
        - https://arxiv.org/abs/1906.03975
        - https://arxiv.org/abs/2002.10394
        - https://link.springer.com/article/10.1007/s11869-024-01524-3
        - https://arxiv.org/abs/2204.02093

- **[Ray Lancashire]:** Would there be a WhatsApp messaging group?
    - **[Achim Haug Answer]:** We plan to send out a survey to ask participants their preferred communication platform (e.g., Discord, WhatsApp, etc.) to centralize communication.
    - **[Chat Suggestions - fabriceb, Toby Murray]:** Consider alternatives like GitHub Discussions, Signal, or Mastodon due to open-source principles.

- **[Joshua Post / Jan Bob]:** AirGradient and OpenAQ already have map pages. How will this new initiative differ from contributing to those existing projects? What are the key differences in vision/mission?
    - **[Achim Haug Answer Summary]:** While existing platforms like OpenAQ are vital data repositories (and we partner with/use their data), this initiative focuses specifically on:
        - **User Experience:** Creating a highly user-friendly, localized app for everyday users.
        - **Health Focus:** Providing health-based information and alerts.
        - **Data Quality/Enhancement:** Integrating QA/QC, calibration detection, and forecasting.

        - **Community Highlighting:** Giving visibility and attribution to local organizations collecting data.
        - **Action & Impact:** Building a platform (Phase 2) to facilitate community engagement and action towards cleaner air, which current data maps don't focus on.
    - **[Chat Clarification - Chris Hagerbaumer, OpenAQ]:** OpenAQ focuses on aggregating and sharing raw open data infrastructure, enabling applications like this one, but doesn't build end-user apps or perform analysis itself. Coordination is needed to avoid data duplication.

- **[Nils Kaiser @ kaikai.dev]:** A mobile app is highly requested. Consider simple/expert modes for users with limited experience (like school staff/pupils). Also, include educational aspects and transparency about local source impacts (dust, buses).

    - **[Achim Haug Response Context]:** While not directly addressing "simple/expert modes," Achim acknowledged (in response to Farzana Rahman's related question about UX in Bangladesh) that user experience for diverse audiences (non-tech-savvy, low-end phones, different languages) is a *core issue*. He stressed the need for further discussion on how to best communicate information effectively (e.g., using colors, simple language, educational components) and tailor it to local contexts. A separate meeting on this topic was suggested.

- **[Nils Kaiser @ kaikai.dev]:** How will you capture non-tech requirements? GitHub issues can get crowded; consider Trello or similar.

    - **[Achim Haug Plan]:** The plan is to utilize GitHub Discussions for broader input, feedback on designs, and feature suggestions, alongside GitHub Issues for specific actionable items. We are also planning Zoom meetings for more interactive discussions.

- **[Toby Murray]:** Has a progressive web app (PWA) been considered versus a native app? How much functionality needs native features? Maps often feel better native.

    - **[Achim Haug Answer]:** Yes, PWA (using Capacitor) is possible and the frontend repo is set up for it. However, native apps might offer a nicer UI and better access to features like push notifications. This (Native Swift/Kotlin vs. PWA/Cross-platform) is a key technical decision point we want to discuss with the community, especially as our internal team currently lacks deep native mobile expertise.

- **[Matevž Zorec]:** Where do you plan to host the map from? **[fabriceb]:** What is AirGradient's current infrastructure...? Is it cloud-based?

    - **[Achim Haug Answer Context]:** AirGradient currently uses cost-effective bare metal servers (from Hetzner) running Postgres and Node.js/Express for

its existing platform. We plan to provide the necessary server infrastructure for this open-source project as part of our contribution.

- **[Leo Liberman]:** Interested in discussing the mobile tech direction...
    - **[Achim Haug Confirmation]:** Absolutely, community input and expertise (like Leo's Android experience) are needed and welcomed for the PWA vs. Native decision.
- **[Gary Witt - Better Brazoria]:** Suggestion: Maybe a group for community organizations to share ideas on using data to effect change (like case studies).
    - **[Achim Haug Context]:** This aligns well with the Phase 2 goal of fostering community action and supporting local groups. Setting up specific forums or groups for this purpose can be considered as the project evolves.
- **[Leo Liberman]:** Is there scope to include indoor air quality monitoring (e.g., CO2 for COVID) and internal mapping within places like schools?
    - **[Achim Haug Answer]:** The initial focus will be on outdoor air quality. However, expanding to indoor air quality is definitely interesting for the future. This could start with public spaces or potentially allow users to integrate data from their *own* indoor AirGradient monitors into the app for comparison.
- **[Matevž Zorec]:** What specific information should be presented on the map?
    - **[Achim Haug Suggestion]:** We propose starting with PM (particulate matter) as the primary pollutant and CO2 (as we have a unique network and it relates to carbon emissions). Then, expand to other common pollutants like NO2, etc., based on relevance and data availability. This is open for community discussion.
- **[Farzana Rahman]:** If we imagine success in 6 months, what's the ideal user experience for a first-time user on a low-end Android phone (especially in contexts like Bangladesh)?
    - **[Achim Haug Response]:** This is a critical question representing a core challenge. Defining the ideal UX for diverse users requires understanding local needs, language, tech limitations, and awareness levels. It involves more than just showing data – how we communicate it (visually, textually) and educate users is key. It also needs to ensure that the application runs on low-end devices. This needs dedicated discussion (a separate meeting was suggested).
- **[Jona Haug]:** Are you planning to implement some kind of data archive or history feature?

    - **[Achim Haug Answer]:** We don't plan to replicate the extensive historical data archive that OpenAQ provides. However, we might offer an API in the future to access *processed* or quality-checked data derived from our platform.

- **[Farzana Rahman]:** What are the 'must-have' features for an MVP launch versus 'nice-to-haves' for later?

    - **[Achim Haug Presentation Context]:** The "Phase 1" description strongly implies the MVP will focus on the core map application: displaying key pollutants (likely PM, CO2 initially), integrating data (from OpenAQ etc.), basic localization, a user-friendly interface, and some health guidance. The advanced community engagement, action platform, and detailed forecasting/analysis tools described in "Phase 2" would likely come later.

- **[Nils Kaiser @ kaikai.dev]:** Requirement in Senegal: A backend usable for a national dashboard... Is this in scope?

    - **[Achim Haug Answer]:** There's potential overlap with a separate UNDP project we're involved in, which focuses on toolkits for governments setting up monitoring networks. Direct integration into *this* specific open-source app project needs further discussion to define the exact scope and feasibility, but interfaces could be explored.

- **[Henry Lim]:** What's your experience getting communities to care about air quality? How do you keep people mindful and motivated to take action?

    - **[Achim Haug Answer]:** There's no single magic bullet. Successful approaches we've seen involve: focusing on specific, tangible local problems; starting with education in schools; pursuing policy/legislative changes; engaging youth groups. The goal of our platform's Phase 2 is to provide tools that empower *these diverse local strategies*, rather than imposing one solution.

- **[Matevž Zorec]:** Would it conflict to extend the scope to publishing research or educational curricula?

    - **[Achim Haug]:** The project's strong emphasis on impact, awareness, education, and science/community links suggests these activities are *aligned* with the overall mission. However, they might not be the primary focus of the *initial software development effort* itself, but rather activities the platform could support or integrate with later.

- **[Steve Karmeinsky]:** Suggestion: Consider trademarking the project name.

    - **[Achim Haug]:** I believe we have an automatic protection through copyright protection but we most likely need to evaluate this further.

- **[Abid Omar (PakAirQuality)]:** Suggestion: For regions with poor data connectivity, consider an API for SMS alerts.
    - **[Achim Haug]:** Yes, we do need various integrations for alerts. From emails, messenger notifications to SMS alerts. There is a UNICEF project called RapidPro that we could potentially interface with.
- **[Matevž Zorec]:** Question on next steps: Is the plan to set up GitHub repos with discussions enabled?
    - **[Achim Haug Confirmation]:** Yes, the GitHub repositories are already set up, and we are activating/populating the Discussion forums and Issues sections for community engagement.
- **[Gary Witt - Better Brazoria]:** Will a copy of the Zoom recording be available to share?
    - **[Achim Haug Confirmation]:** Yes, the recording will be shared via email and hosted on a dedicated project landing page on our website.

# Full Transcript

00:00
And especially Johanna, our communications manager, will support me here with the chat to manage all the questions that might come in so that I can focus a little bit on the presentation. And please feel free to introduce yourself on the chat. Maybe mention little bit, you know, maybe from where you are tuning in and what you are normally doing so that people get a little bit of an impression like who is actually joining this session. And I would like to share my screen now and then kick this off.

00:45
Yeah.

00:54
Alright.

00:58
Great, so welcome to the session. And I want to first give a little bit an overview on what we are doing as AirGradient, what we believe in and where we are right now as a company. And then in the second part, really focus on this new initiative where we really want to build with.

01:25
with a lot of contributors together with you basically, this new application. And yeah, I want to kick this off with a little bit of information for the people that might be a little bit new to really show like, yeah, like what, are we coming from? And this is a picture I took in 2019 from the terrace of my house. And at that time I was living in Northern Thailand and

01:55
They have a fifth season called burning season. And 2019 was really, really affecting very hard the whole communities there. I was on a sabbatical at that time and volunteering at my child's school. And the school just didn't know are the classroom safe, do the air purifiers work reliable? So we started really like working with

02:23
with students, with teachers, with parents on building air quality monitors, actually also pretty powerful purification equipment, what you see on the right hand side here, to really say, you can actually do something against this smoke invasion. And then we started also doing workshops where we invited local Thai high schools that are in

02:53
the most affected area of the wildfires. And we had this camp here just, I think a week or two before COVID shut everything down in 2020. And here we really worked with the kids on advocacy skills, on what's the health impacts of the air pollution on their bodies. So we had medical experts, we had also firefighters coming in.

03:22
bringing them to the forest, telling them basically how they extinguish these fires. And so we continued more and more on doing both like the, let's say the community work as well as the technical work. And then one more school came to us and said, Hey, like, can we use the system? Can we use the dashboard? we put the build instructions off the monitors like on the internet and

03:50
Then we got also calls from, from Bangkok and actually from China. And then like, I felt to go with my co-founder, okay, you know, this is something really interesting and I don't want to go back to my old job. So then we actually incorporated the company a couple of months after we actually started. So, so this really started as, as a volunteer project at AirGradient. And, um, now that we are

04:18
Like six years later now, we have a company of more than 20 people. show a picture in a few moments. And what we do is air quality monitors. I think all of you probably know them because I specifically emailed for this initiative, like people that actually in our customer list on our newsletter.

04:47
So what we have is like an indoor monitor on the left, an outdoor monitor on the right. And you probably heard about the Openair Max, which is the one in the middle, which we are just launching, which is our most advanced product. So it also measures gases like NO2, NO3. And I think what's really the important thing here is that all our monitors are open source hardware. And I think that makes us really unique.

05:17
in the space. everything we do has open designs. And you can go on our website, you can download not only the firmware that some of you might already know, but also the schematics, the enclosure, can actually have a special version that's made for 3D printing and then build this whole thing yourself.

05:44
And you can even build it and sell it if you want, because the license allows basically commercial use. And the only thing that's required is like you need to basically

attribute where it's coming from. It is also important, I think, for our community that that helped us, especially on the firmware side with support there. So this model, I think, is something that really comes from

06:13
how we started, it's something that we very, very strongly believe in. And so far, I think it has worked out really, really well. So I think up to date, we sold more than 30,000 monitors, all open source hardware with that approach. I actually have no idea how many people just used it.

06:41
build instructions and build it themselves. I hope it's many because that's exactly what we want to achieve is that we can put out a trusted and well tested design that people can use. I think also what's with the version that we sell, which is exactly identical with the open source hardware model. mean, it is the open source hardware model basically, is that we actually

07:09
one of the most affordable monitors in the market. we can actually make air quality monitoring more accessible for organizations or countries that are maybe having problems buying expensive equipment. We really figured out how to scale this up potentially to a lot more if we want. And I think also what we see today is we actually have a pretty strong

07:38
community are already behind us and we work with them. We actually love to work with them because we really want to focus on the impact. What we are currently working on, which is quite an exciting area, is really trying to put in more and more science, things like calibration or detecting malfunctioning monitors in a way that is kind of working.

08:08
automatically that people can just use it, understand, improve the quality of the monitoring devices. So what's next now after we figured out, let's say the hardware side. And I think it's really about maximizing the impact. And that's where we feel actually a lot of organizations

08:37
I wouldn't say struggle, but it's the most difficult part. can we actually in the end achieve cleaner air? know, it's like, how can we bridge from data to impact basically? And this is something that we have been looking in for quite some time. Starting, I think middle of last year, where we also outlined our vision, which

09:07

really focused on impact, that is that we want to actually reach a billion people and inform them better about air pollution, help them to reduce it. Also like the carbon emissions and thinking about this model that we have started now with this open source community driven model. really like, let's say

09:36
focus it more on also like achieving these impact. And to break this down, we have started a project we called Cleaner Advocates Program. And the important thing is, yeah, like how can we actually bring this vision down to a reality? So we have to become really, really tangible here. And the Cleaner Advocates Program,

10:04
what we envision there. And this is actually the next couple of slides where I want to focus on is that we are building an app, an open source app that connects stakeholders globally. And that you have basically people that getting motivated and incentivized to provide, for example, air quality data or validate data or engage in clean air activities. And then you also have the people that basically

10:33
beneficiaries from this. could be people that use a MED application. It could be cities that want to know more like, where's the pollution coming from? Or people that just want to create generally more awareness and bring them together onto one platform. And we're going to dive into this here. And I outlined that also in that email that I sent around that we foresee two steps there. One is to

11:03
The first one is to really build a very powerful, map application that's really focused on consumers, that's localized, that's reaching the people on the ground, that gives really, really good air quality information. But not only the raw data, that's typically

11:30
use that something that's also providing like health-based information and that you can get like alerts and just make better decisions to protect yourself from let's say harmful air pollution episodes, for example. I think that the key feature here is like, it should be open source. It should also be when diagnostic, we're going to dive on our role in a few moments as well.

11:59
really, really be accessible. think that's the key point. And we will have a few examples on that as well. Focus on health. Also integrate a lot of the scientific side in terms of like, how can we make accurate forecasts, for example, how can we make sure that the data that's being displayed is correct and not coming from malfunctioning models.

12:29
A lot of, I think, effort will go actually on, let's say, the more invisible side, how do we ensure data quality? And I think what's also a really, really important thing, and this is something we're going to see later, is that we really, really highlight the community organizations on the ground, because very often their data is used in a lot of different ways, but they hardly don't get any recognition, but often they have most of the work that they need to do.

13:00
And then on top of that, um, map application, what, what we foresee is really then focusing a lot more on this community engagement and, and action that we say we, we can, um, make a platform basically where like local organizations all around the world can, can then engage their community members, um, for, for their own project.

13:29
a lot more effective and incentivize or motivate them towards cleaner air actions, for example, in the city. And also, I think what's really important there is that we develop ways that we can support these groups better, not only with a platform, but also potentially with things like donations or air quality monitors that

13:58
that they can use in the community to build up their basically capacity on the air quality improvement side.

14:14
And then also like to really look at, communities, how can we look at, you know, with very, very modern technological approaches, for example, seeing what, what are actually certain emissions in the city? How can we measure them? How can we verify them? So it's not only about air pollution. It's also about basically detecting emissions. And I will have an example there in a second. So I put in a few.

14:44
groups that we already work with to just make this a little bit more, more tangible, what we have in mind. So just at the beginning of, of this year, we started a project with UNICEF, the LAO control office, as well as the data science team from, from UNICEF. And what's, what's interesting is that in LAO, when you looked at OpenAQ, there was, I think only one public station back in January.

15:13
which was the US embassy in Vientiane, the capital of Laos. And then we deployed more than 150 monitors with UNICEF into each of the provinces in Laos. And we have now them running on the map. You can see that in March the air quality was pretty bad. And now the...

15:38
There's a lot of discussion going on what we do next. And so what's great on that project is that the UNICEF data scientists are actually developing a very localized machine learning model to fill the gaps between the monitors. So to have very reliable information what's happening in the villages that not necessarily have an air quality monitor, but also how can we actually predict

16:05
for example, the air quality for the next day to enable them, specifically children in that case, to maybe know, tomorrow we should wear a mask because we expect the air pollution is a lot worse, for example. So what can we do here with this particular application? So we are now in discussions, like how can we actually bring this data closer to the people? And in Laos, there's virtually, I think, no localized air quality app.

16:35
in the Lao language, for example, something missing that's really easy to use that people can just install. mean, luckily, now everybody pretty much has a smartphone, but something that they can install and then get very targeted information about the app quality there. So this is one example of, let's say, beneficiary of this app.

17:04
And I have one that came up just recently two projects in South America, actually one is the Stander and Doris while the other one is Patsch. And these are like civic organizations on the ground that are building up their air quality monitoring network. They're basically advocacy for cleaner air in their communities or in the whole country as well. And

17:33
What we want to do there is basically also like really have an app for their communities that the people there can use. But I think what's really missing is that we can highlight actually the great work that these community organizations on the ground are doing in this application and give them a platform that not only gives reliable information about the air quality, but also really engages the

18:02
the citizens basically there to interact, to participate with that local organizations on the ground and help them actually to grow and to do more. So that's why I mentioned earlier this community aspect, I think is a very, very important aspect of the whole project. Another example that came up

18:30

Already, think quite some time ago is that we actually found out that we can very accurately also measure not only PM spikes, but also CO2 spikes. So this is an example. I'm not sure. But I guess a number of people know in Bangkok, we have these canals with very, very dirty boats. You see the black smoke here. And we have one aqua monitor at the pier in Bangkok. And you can actually see.

18:56
these emission spikes from these boats, not only on the PM side, but also on the CO2 side. And this is compared, for example, to a very quiet road in Bangkok at the same time. So we see the same background peaks here in the middle, two peaks, for example, which we see on both sides. we can additionally see these spikes. So this can be used with a very dense network.

19:24
potentially later to really see also how, for example, communities transition towards cleaner transportation modes, for example. And last but not least, I think it's also really important that we build something for ourselves, something that like the app that on, let's say on air quality that everybody of us just say, hey, that's what I want to use. That's what I need. And building it with

19:52
let's say a lot of love and also for the others. to have really something that we are as a community are proud of having and maximizing it for the impact that it really reaches a global audience basically. So what was very clear for us, I mean, was that, yes, as AirGradient, we can probably do a lot, but this might be actually something that

20:23
We cannot do completely alone to really reach this vision. So, and with the open source hardware aspect that we already do since a number of years, we said, hey, why not let's try to do this as a community. so I reached out to you basically over the last couple of weeks, and it was great to see that we actually got more than 80 people responding.

20:53
I see that we have more than 50 in this call, which I think is a great result. here, and I asked them the people to fill out a small questionnaire. And what's great to see is that we actually have a lot of people willing to contribute time to this project. And we can cover actually a lot of areas on the testing side, backend and frontend.

21:22
I think what's also great to see is really like a number of people on the data science side, because I think that will be also very important aspect in terms of developing

this community advocates, a little bit less on the mobile development side. So before we jump into discussion, and I want to...

21:50
just share a little bit from our perspective how we think we can actually make this work. and I want to cover a few things, a few different things now. So I think one of the important things is that, like, when, we work with the community, I think we cannot expect that a lot of them have a lot of time. And so obviously, yes, most people can just maybe dedicate a couple of hours a week.

22:19
So we need to make sure that everything is running as efficient, as smoothly, as productive as possible. So to have really good documentation on the project, not only on the technical side, but also what's the vision behind, what do we actually want to achieve. We can also then bring together like experts. I think it's a great opportunity to actually learn from each other too.

22:48
to connect maybe with things, with technologies that we actually anyway wanted to learn a little bit more. We are already organizing every month webinars. So we can also, you know, organize community events for people that want to learn more. Also really connect to the people on the ground. Some of them I mentioned earlier.

23:15
really understand, like, who are we actually building this for? Like, how are they using it? And I think what's also really important is like showcasing these, these contributions that we highlight who actually put effort into this project. So we already started bringing in a lot of these foundation work, which I will

23:42
But now I think it's time to really introduce the team because of our work in the past on the open source hardware side. I mentioned that actually most of the people here will actually in some capacity really contribute to this open source initiative as well. So, but what we can bring in is really this project management support and obviously our

24:09
developers, some of them are in the call and also scientific support from our in-house team. What's I think really important is this link with the communities on the ground that can help us making sure what we develop is really useful for them as well as obviously for us. And graphic design.

24:37

And obviously our server infrastructure is something that we can easily bring in. And we actually started over the last couple of weeks to already prepare that onboarding and that documentation. So there are two repositories on GitHub that you can actually already access and have a look. I also went actually through the documentation myself and made sure like, okay, I can install it on.

25:08
on my local machine. This is there. And then you can also actually already run a simple first version of the map. And this one is a screenshot I just took a couple of hours ago. So what we already do with the application is we already pull in data from OpenAQ, a couple of thousand reference stations, I think from the US, from Europe.

25:36
a bit of Asia and here I just took a screenshot of Los Angeles. So we already have, I think, a good base to start with on the coding side, as well as already issues here. You can see that actually people could start working on if they want. What's also great to see is that we work on giving ideas

26:04
into this and this will end up very soon on the GitHub discussion forum so that people can comment like how does this application really look in detail. And you can see here a really strong focus should be this attribution and integration of the community aspects here, but also then here at the bottom, for example, to really showcase all the contributors that participated in

26:34
in this project with their code contribution or scientific contributions or other things. So this is just basically a discussion base that we will put up. And then we also thought it's always good to start a little bit of design. we have Cid, our graphic designer. He already started to really develop some

27:04
I think really nice looking art that we can then use in the application. Because what I said, the focus is really that we build something that people really love to use. And I think the visual aspects are also very, very important in that aspect. Now, I think what's really important to highlight also like we as AirGradient as much as we do.

27:31
open source and open source hardware. It's also, think really important to point out, could there be a potential conflict of interest? I mean, we are still a for-profit company. We don't get any grants, so we finance ourselves through selling the open source hardware monitors. And then this helps us actually also fund this kind of project. So there are a few things that we want to make sure.

27:58
we put in place and also just make it very, very transparent from the start. And one thing I think is super important that we say, okay, this project should be really licensed under a true open source license like GPL, for example. Then we also have no plans to go for like an open core model and then have something in parallel that's closed source. That's not our intention at all. That's also not something we have done in the past with the, on the hardware side.

28:27
This is something that we don't want to do. Then obviously address these type of potential conflicts at interest heads on like what I'm doing now. And I think what's really important is we already started looking into setting up a separate nonprofit entity, which will probably be based in Switzerland, either as an association or a foundation.

28:57
And then moving actually this project and the code into that entity to also just have a clear separation from the AirCradian company. It's a bit similar to what Home Assistant, for example, did with the OpenHome Foundation last year. And I think that's also very, very clear as this platform should be and will be and is already actually because we put in data from OpenAQ.

29:25
like monitor agnostic. So it's not, it should work with all types of monitors on the market.

29:38
I think another really important aspect to cover is like, how do we make this sustainable? Because I mentioned already, like we want to support these organizations on the ground. Many of them actually face a lack of funding just recently because some countries are like significantly reducing their funding for these types of projects. So one thing is like, how can we...

30:08
actually help them to continue with their work on the ground. And so it would be great if you find ways to actually also kind of tap into funding sources for them. But what's important, I think, is that we stay true to also the open source spirit that we say, okay, we believe in open data. We want, we don't want

30:37
to sell data or also derivatives like forecasts. So this should be really, really remain open. And we have this responsibility, I think, towards the community. How can we

support them? What I mentioned earlier. And some ideas that we have later on is, for example, we can use that app that hopefully gets popular then to actually

31:05
enabled donations that would go to the organizations on the ground. that, you know, individuals, also maybe large organizations or philanthropic organizations can actually put money into the system, potentially also for a very specific purpose. For example, if they want more data on a specific city or a specific program that can then connect them to these local actors that then

31:34
can help actually setting this up. And I think what's really important is that a hundred percent of the money stays within that, let's say non-profit system. And obviously some of that might then be used to run server infrastructure and these kinds of things, but it should be really run like meant for this purpose here. And then use that nonprofit entity that we plan to set up.

32:02
to run that program as well. I think what's also, and that came actually up with from two or three people in the questionnaire, they asked like, hey, is this a volunteer contribution or is there also a way that I could get incentivized when I help with that project? So first of all, mean, we obviously super thankful for everybody that contributes and

32:31
I have a couple of ideas. So I think if we have core contributors, we can actually create some custom branded quality monitor sent to them. did that in the past actually with people that helped on the open source from the side. And also what could be interesting for contributors just to have influence on like which organizations we donate monitors to. Obviously the whole acknowledgement will be there.

33:00
And then I think if, if things go well and if we can really manage to create this kind of income donation stream, then obviously some of that can also then finance some open source contributors. And obviously also if our AirGradient increases our, if you increase our staff then, and if you already work with open source contributors, think that's obviously a very

33:31
easy higher than if we know people that would fit into our team and if we have the position available. What's I think also really important that the maintainers, advisors and partners in that project are not only coming from our side, but also from external side or third parties or just basically the community.

34:01
just to make the project, I think, really targeted and effective. I think it's important that we all share the same vision of where we want to go here, that we have a broad range of stakeholders. So not only like software developers, also like involved scientists, community advocates, and so on. That we have certain kind of

34:29
rules, how we work together, that everybody understands this. And what's great is I already asked a couple of people if they want to volunteer to be maintainers or advisors. And it's great to see that we already have four people with Professor Rod Jones and Joshua Post, Paolo Del Fadro and Anthony Mockler that I know very well already. And

34:57
If anybody is interested from the community, then, you know, send, send an email and we can have a call and discuss to really extend that maintenance advisory committee or whatever we call it later. I think what's also great, we have a pretty long relationship already with OpenAQ as a data sharing partner. So in the past we, we share our

35:27
Acquire data with them and now actually with this new project and it's already on GitHub. We actually are now pulling also data from OpenAQ and so OpenAQ is, think, a really essential partner in that project as well.

35:45
Okay. Finally, I come to the last slide. I think it's time to open the discussion. So, how to get started and maybe one more thing as well. Like I think nobody in the AirGradient team is an open source management expert yet. So it's also a really big experiment from our side. have, I think the passion, have a really strong

36:12
desire to make that work, also to make it work in a really fair way for everybody involved. But we also really thankful to everybody who can give us tips, where maybe run a similar project on how we can make sure that we really provide the infrastructure in a way that's helpful for this. But what can you do already? I know some people are really interested to get started. So we have

36:40
We have two repositories for the front end, for the back end. I think we had a good initial documentation for them. We are also starting to the GitHub issues, the discussion forums that you can actually then engage with and actually start working

on some issues if you like. What I mentioned earlier, if some of you are interested in...

37:07
doing a little bit more on the maintainer side, for example, then contact us and we can discuss that in more detail. And then what I foresee also to build certain groups or discuss certain things. One thing that we actually internally discussed a lot and where we don't really have a good direction yet is for example, should we go for the mobile app?

37:36
into a cross-platform app or a native Swift and Kotlin app. At the moment, inside the AirGradient team, we don't really have the expertise for the native phone. On the other hand, I think it might have a better performance. So this might be something where we invite people to just have a very focused discussion on this. And also if there are people in the call here that's actually focused on mobile development and are interested to...

38:05
really out there, then please let us know. Another discussion we could have could center around like how can we actually ensure the performance of the monitors, the data quality and so on. Our scientific team is already working there and we have some good external partners that can help with that as well. Then also things like just very simple like how should we implement certain features.

38:32
Like for example, for alerts and notification and so on. And the author want to, and that's really an optional thing, like just have something like a recurring thing that people can just drop in and ask questions and, and so on, just, just to provide this infrastructure. So this should not mean like we want to like pressure people to do a lot of things, but we just want to offer like these different possibilities to.

39:02
participate basically. Yeah, so it took a little bit longer than I expected. So I hope that gave a good overview on the project that we want to do. I could see a little bit that there's a lot of things in the chat, but I couldn't really read it at the same time. I'm not good at multitasking. So I would like to maybe first ask are there

39:32
Specific questions.

39:39
that somebody wants to raise as a discussion or should I just go through the chat? Maybe if somebody wants to ask something directly, they can raise their hand.

Otherwise I would start looking at the first question. Or maybe Johanna, you could help me a little bit and just scrolling up there and see like where do I start?

40:04
Sir, I can help you with the first question from Christian. When you were showing the map of Lau, how could you fill in the gaps between the data points using machine learning? Isn't machine learning just a password here? Isn't just linear interpolations the most therapy done or some other interpolations, since you can't make up data in between? And I don't see a way to produce such information from just the existing air monitor data points.

40:33
For example, that can be a chimney in between two data points that is a source of 2.5 pollution, et cetera. A simple interpolations will approximate it precisely enough, in my opinion.

40:46
Okay, great question. I'm not sure if Anthony wants to answer this. He was part of developing this, but I can give a little bit of background. this was, there's a model being developed by the UNICEF data scientists and they're going to be, I think in a week's time and we're going to send this around a bigger presentation around that.

41:14
approach, but what it basically does, uses a lot of additional, it not only uses the air quality data, but also additional information, like for example, topographic information from OpenStreetMap, also satellite information from firms that actually has wildfire spots. Also, think things like cloud coverage information. So a lot of these things went into the model and they actually did some

41:43
are doing a lot of testing on the performance of it. But I think this would, we can send around a lot more information on how this works. And this can also then really be discussed openly on the discussion forum. And okay, I see, Anthony, please go ahead. I can have a quick go that one, Akeem. Thanks for the question, mate. It's a really good one.

42:12
So you're kind of right. If all we had was the low cost and the reference grade sensors, then some kind of like Gaussian critching or even a linear interpolation will get you some of the way to a good answer. A couple of the new and emerging machine learning models try and combine a whole bunch of satellite data, including things like the aerosol optical depth, the boundary layer height, which is a measure of how much atmosphere is collecting low down.

42:38
along with other measures like temperature, humidity, and wind speed. And by stacking all of those on top of that initial linear interpolation or cringing or however you want to spread the reference sensor values gets you a lot closer to the true value. We were really inspired by the Deep Plume paper, which I can send you a link to. There's quite a bit of academic research around it at the moment. I think the things that I'm excited about for this UNICEF project, which we're doing with AirGradient,

43:07
is that the model that we're building is open source, open methods, open data, and it will shortly be in a GitHub repo where everyone can go and play with it. And in answer to your question, like, what do we add? Basically, we add the reference sensors, the low-cost sensors, and a number of satellite-derived indices, including things like traffic density, road density, population depth, and a couple of others. But we can talk about it lots more if you're curious. And hopefully, we'll have a paper out soon and also a GitHub repo for you to look at.

43:41
Great, thanks, Anthony. Okay, I found also one more question from Joshua with AirGradient already having a map page and data from AirGradient devices able to be shared with OpenQQ who also has a map page. Can you speak to how this initiated would be different compared to contributing to one of the existing projects? So we actually had a look on

44:08
What are existing projects out there? And for example, the, the open a queue map is also open source, but it's, it's really focused on more on like this kind of repository approach. Like, like we collect data and then people can, can use it. And, and things that, for example, like QAQC or certain calibrations are not part of their scope, for example. And I think the main thing is also like, how do we actually

44:38
really reach the people on the ground. And that's where we need to have a lot more of a kind of easy to use localized app that gives you this focus on what's what's the current situation, how, how does it impact my health, for example, what can I do? And I think also this whole aspect that I mentioned earlier, like how we can integrate the communities on the ground and give them a stronger voice or help them in their

45:07
in the missions is, think, not part of pretty much any app that I saw out there. So they are all focused on, yeah, pretty much presenting the same data and not really focusing on how can we achieve this kind of impact on the ground. Let me see.

45:38
Okay, we talked about the map.

45:51
Maybe, Johanna, you can give me one of the next questions I'm still trying to run through. I've note one question here.

46:03
Maybe we can start from Toby. Has a progressive web app been considered? I'd be curious how much of the functionality makes sense to be captured in app versus a mobile friendly web page. That said, if the map is big piece of DUI, that always ends up nicer native. Yeah, we actually saw that front end that you can clone from GitHub actually contains already a way to

46:30
Basically packaged us. think it's called capacitor and into an app. also did our existing map application is a progressive web application. So this could be a potential way to go, but there are, think, certain native features that we might want to implement, like, you know, like push notifications and song, which might be more difficult with. PWA, but that's exactly like what.

46:58
We want to discuss with the community and also see are there members in the community that would like to contribute towards an app there. And I also agree that a native app has a nicer UI.

47:20
Johanna, you have anything else for me? I do have some from Fabrice. What infrastructure is AirGradient currently using for storing monitor measures, monitoring user metadata, for publishing the data on an HTML map? And is it a cloud infrastructure? Yeah, so that's a really good point. So we use basically bare metal servers from Hetzner. So we have, I think, four or five servers.

47:48
such a pretty high spec'd running a Postgres database. And then I think Express, Node.js on top. So it's not a cloud infrastructure and we actually are running very well with this because I think if we would be on the cloud, we would pay probably a factor more on server costs because we have quite already a lot of traffic from

48:17
our existing monitors that we have on the platform.

48:26

Okay, next question from Leo. I know that AirGradients started as a way to monitor pollution. Is there any possibility of using it and caring about indoor air quality and mapping that internally in school, let's say? Yeah, that's actually a good point that came up yesterday also when I had a discussion with a community member. I think the first step would be really focusing on

48:53
on outdoor air quality, but then I think it would be really interesting to also see what can we do with all the indoor air quality data. And maybe starting with something like public spaces, know, shopping centers, restaurants, fitness centers, and so on that, you know, that could be an intermediate between the city outside and the indoor air quality could also be interesting to put on a map, for example. I think what could also be really interesting for lot of people here, I think

49:21
Most of you actually have an ARanian monitor and probably a lot have the indoor one. If we can then actually use the app to also show the data from your own indoor monitor and the outdoor station and then compare this a bit like what we have with the existing dashboard, but in a much more user friendly way. So that's definitely something I would also be personally interested actually in having this.

49:53
Um.

49:56
You see?

50:05
I also have some questions, but I think it's more like in terms of like communications moving forward. There's also a question from Ray, would there be a WhatsApp message group moving forward? Yeah, that's actually a really good point I forgot to mention. So we're going to probably send out a quick survey later to all the people and ask them what's their preferred messenger application.

50:34
And it could be this card or WhatsApp or something, something like this that, that we can actually put people together.

50:46
Then I see one question from Abit. I have a look at the Paco app for simple map interface to communicate air quality in an easy to understand and elegant manner. Something like this for Android iOS web would be nice. Yes. I agree. think it's a nice app. It's something that we also looked at. And I think that really the idea is to firstly, I have something like a real open source map that's also like

51:16
You know, that doesn't belong to us or anybody. It's really community driven that people can also later on fork for let's say specific application that they want to do and then really bring in a much stronger focus, I think on the community side and, and also think about, and I think that's what the open source aspect really allows us to, think about it as a platform that we can also plug in. Like for example, different forecasting models that Anthony also mentioned in

51:46
on top of that application. So that's not something that's just proprietary and you don't know like how are these forecasts, for example, generator, but something very, very transparent and open. think that's the key difference here.

52:09
So what information should actually be presented on the web? I think that's a really good question. I probably forgot to mention this a little bit. So we're probably going to start with PM because I think that's the most important criteria. And then what's really interesting also from a carbon emission point of view is CO2. that's, think, the

52:37
We are quite uniquely positioned because we have already this pretty big network with real time CO2 data. And then I think it will go into these typical pollutants like NO2 and others that are just like...

52:58
already provided with a lot of stations from OpenAQ that we can tap into. that's also, think there are always regional differences, like which pollutants are more important. Like in Europe, it's sometimes NO2 is more in the focus than PM, for example, because it's higher and so on. So I think we need to look into this more, but I think we would probably start with PM and CO2 and then just...

53:28
extend from there. But it's also something that I think we should really discuss as a community.

53:43
Um.

53:49
Yeah, I think also the indoor air quality again, yes, I think that's something, I think a really good point that we can really look into like, how can we actually bring this into the scope here?

54:06
Are you planning to make some kind of archive or history? So I think that's where actually OpenAQ is providing a great service because they have so much data, which probably we don't want to put on our server to that extent. But what I could imagine is that we also have an API later, maybe more than on data that maybe we ran through.

54:35
You know, data cleaning, for example, and, and, and these kinds of things and, and make it available for, for other applications. I think, I think it can be totally open on that, but I don't think we want to replicate all the big data that OpenAQ has. Basana, you raised your hand, please go ahead.

55:01
Asana, I see you raised your hand. Do you want to ask a question? Yes. Hi, everyone. I'm an AI engineer from Smart Air Bangladesh. I'm talking from Dhaka, Bangladesh. So extreme air quality, extreme air pollution in Bangladesh. So I asked two questions in chat. And my overview of my two questions is that

55:29
I want to know that if we can imagine success in six months from now, what does the ideal user experience feel like for a first time user on a Bangladesh basis because people are not tech savvy here. Okay, so what for the first time user on a low end Android phone or whoever have no internet connection or have

55:59
network connection issues, and also not take service. So in extreme air pollution, how we can educate them with these specific user experiences that we are developing an app. So what features would you suggest?

56:21
Yeah, I think it's, it's, I mean, this is really a community driven project. So I think this actually is one of the things that I had on my last slide, you know, to have a meeting and discuss this in detail. I think if you also look at what we are implementing in Laos, for example, with this monitors that we set up, I think it's, it might be very similar to Bangladesh. Sometimes they have very, very bad air quality. You have to reach the people on the ground.

56:50
You have to speak their language, obviously not only in terms of the real language, but also like, like how do they access? How do they understand air quality information? How do we actually need to communicate it? You know, like, we use like colors? Do we use text? Do we use, you know, like, I think a lot of, a lot about this app is also really creating awareness and, and education.

57:19
We're also integrating a chatbot that will answer questions and get the user feedbacks. And based on those, we'll be developing our apps and how we can connect and how we can educate people like you, like AirGradient. So you guys are so much awesome in educating people and giving open source data. So I want to know how to interact with

57:49
with these kinds of people who doesn't really feel what to question because many people, like almost most of the people don't know what to ask about air quality, how to prevent themselves, how to help themselves. So if I'm not concerned about the problem around me,

58:19
I can't ask questions. So to get those user experience from those users, how can we interact with them and what features rather than that chatbot? Because people are also not used to chatbots. Chatbots are still a state of the art product in AI industry and the whole world. So what advice would you give to us?

58:49
based in Bangladesh. Arsana, we could probably talk an hour on this and I would really call it a special meeting on this because I think it's a core feature of the application. And I think it would also be really interesting then to learn a little bit more from your experience. So just keeping an eye on the time. I think we make a separate meeting on that. I hope that's okay for you.

59:20
And it's something I think we really, really need to look into. So it's not, it's really a core issue. So let me just have a, Johanna, you have another question for me? Yes, maybe we can start from MK. Besides the mobile app would be very easy to use interface. Another requirement in Senegal would be to have a backend that can be used for a national dashboard with data from different centers.

59:50
manufacturers and help the ministry of environment have a single database, which could then be pushed or pulled from OpenAQ. Is that something that will be on the scope?

01:00:01
Um, I potentially, yes, I see some overlap. Um, we are working on a project with the United Nations development program, where we actually develop a toolkit that helps like cities or potentially even governments to set up an air quality monitoring network in, in, let's say, in a very effective way with, um, uh, um,

01:00:30
a very, let's say user friendly interface and so on. So we are currently developing all this documentation. can also send some information out there and I could imagine that there's some interface that we can actually then use that data and combine it. But yeah, like so I see certain touch points there, but I think we really need to look into detail there.

01:01:02
Yeah, Joanna, you have any more questions? We have two last questions if we can make it to time. Maybe we could finish with Henry, what's been your experience getting the community to care about air quality and how do you get people to stay mindful and take action to improve it?

01:01:24
That's a really tough question. So I think we work with a lot of communities around the world. And I think what they do is they really look at what are very specific, let's say, cases within their communities, what are the actual air quality problems they want to tackle.

01:01:52
Often they start in schools, for example, on the educational side and then start projects from schools. Then there are other actually initiators that go more on the legislative route, like in Thailand, for example, a civic group actually drafted a clean air act to say like, that's the approach we want to take.

01:02:16
Then there are also a lot of youth driven organizations like Sustenda Honduras that just, yeah, like, um, get a lot of, um, young people involved in, in, in like making them aware of air quality issues and then basically, um, helping them with, with the NGO. I think that's like so far, I don't think there's like a one size fits all solution. And, and that's also one of the reasons why I actually see.

01:02:46
especially the second part of this more as a kind of building a platform where then like local organizations can go and set up their project but also allow them like individual approaches that's most fitting for their community. So yeah, that's my quick answer on that.

01:03:15
Yeah. And maybe I know we already like nearly 10 minutes behind the time and I really don't want to push this too much further. But, but, but I would suggest, um, I mean, what's great. I need to really read through all these comments. Um, I'm sorry, I can't present and read at the same time. And then I think what we can do is really

give answers from, from our perspective, maybe some of these, um, interesting topics we can also put up and on, the discussion board and on, on, on GitHub.

01:03:45
For example, that people can then actually engage more and we can discuss this together basically. Matej, you have a question? Not a question. Thanks for sending this up. I have a suggestion to keep things running smoothly and for a minimum of maybe once per month we all meet up.

01:04:12
If you're going to have segregated groups working dynamically together, still having one parent setup where we all meet to keep the momentum going, I would suggest as minimum. yeah, just the next steps. Like you mentioned before, set up a good discussion so we have centralized communications. A good project might work well for managing backlogs, et cetera. I'm already overstepping at that point. You guys need to maybe take the lead on that.

01:04:42
I think, yeah, this is wonderful stuff. I hope to extend the work, a lot of information from the chat as well as you guys are going to learn a lot as well. Cause there's been like parallel, divergent conversations going on all the time. Yeah. And I, I agree. think a fixed meeting would be great. And, and really I don't want to push too much work on everybody, but just have an optional and people can drop in and, and, and, um,

01:05:11
then reconnect and hopefully then we also have a little bit more time on discussing things. Like today, the presentation went a little bit longer than I intended to be, but it's really great to see. think we never had so much actually conversation on a chat. So this is really great to see. And yeah, we're going to go through this and then send an email out and really like further like this kind of infrastructure and then yeah, and then plan the follow up.

01:05:41
meetings and everybody here, also please feel free to reach out directly to us. If you want to just talk with one of our team members on certain things, like you have my email, just send a message, we can talk. One more thing, we will also distribute this video. want to actually

01:06:11
create a small landing page for that project on our website. And then obviously put that video up there as well as link them to all these resources and discussions. Yeah, so a really big thanks, you from our side and I'm really excited and to get this started and hopefully we can really create something great.

01:06:41
together here. So thanks a lot for coming and hope I see many of you soon as well. Yes, Gary was just asking, yes, we will share a video of this soon as well. And I will also email it around so that everybody has the information.

01:07:06
Great. So I would close this now. We already 10 minutes past you and hopefully we can really reconnect soon and drive this forward. Thank you.