

Mining the air - pollen and air quality



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About Airmine

- Founded in 2018
- Strong competencies in environmental technologies and modelling
- Based in Norway

Our mission is to develop products and services that reduce the negative impact of air pollution and pollen on individuals, by enabling people to make changes in their everyday life.

The cost of air pollution

4.2 million

Premature deaths globally every year caused by ambient air pollution¹

9.4%

Children with asthma in the EU²

\$8.1 trillion

Annual losses, globally³

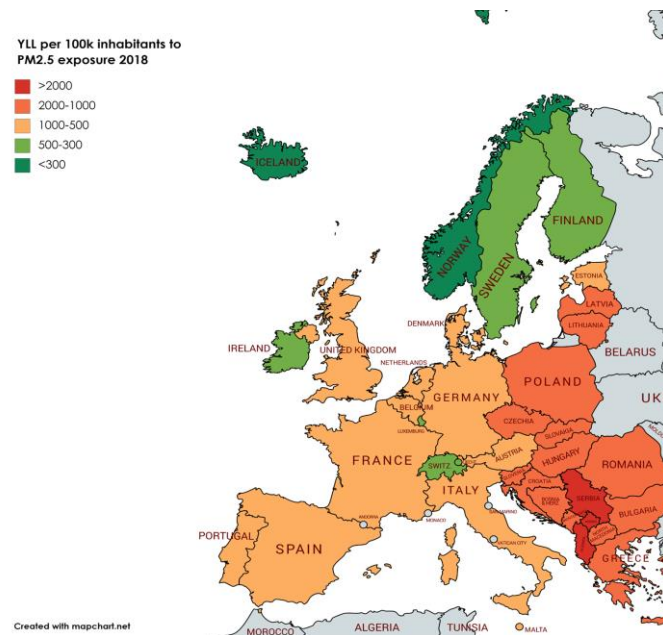
1) Estimates for 2016, <http://www.who.int/airpollution/en/>

2) https://ec.europa.eu/eip/ageing/sites/eipaha/files/results_attachments/err-0081-2014.pdf

3) Estimates for 2019, <https://www.worldbank.org/en/topic/pollution#1>

Air pollution – a major health risk

- Affects cardiovascular and respiratory health
- One of the major environmental health risks
- In 2019, 99% of the world population was living in places where the WHO air quality guidelines levels were not met¹



Years of Life Lost to PM2.5 exposure in European countries in 2018. Grey areas: Not covered. Years of Life Lost (YLL): The years of potential life lost as a result of premature death. Sources: from Air Quality in Europe – 2020 report, map by Airmine.

¹[https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)

Air pollution - why measurements and forecasts?

- Is today a good day to do outdoor activities where I live?
- Where in the city should I live if my child has asthma?
- Where and when should I exercise to maximize my outcome?



Pollen

- Few measurement stations for pollen
- need for better measurements and prognoses
- Climate change gives longer pollen seasons
- 20-30% of the population in the Western world is estimated to be affected by pollen allergies¹



1) <https://www.naaf.no/en/fokusomrader/allergi-og-overfølsomhet/pollenallergi/useful-facts-on-pollen-allergy-pollenallergi/>

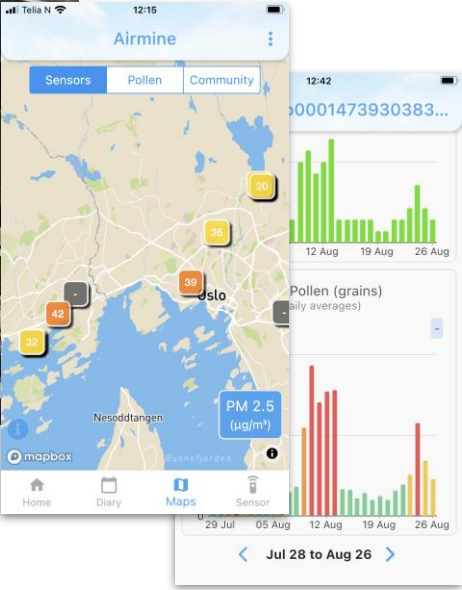
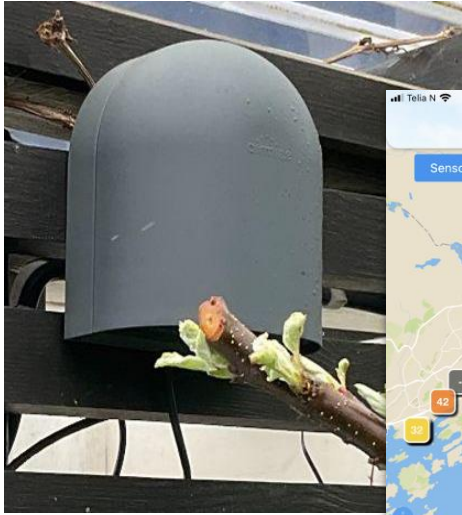
Pollen - why forecasts?

- When will the pollen season start?
- How are the pollen levels tomorrow?
- At what time of day is it best to open the windows?



Our services

- Air quality (particulate matter PM2.5)
 - Measurements by our sensor
 - Air quality forecasts
- Pollen
 - Nowcasts and forecasts
 - Total pollen levels
 - Key allergens



From raw data to meaningful insight

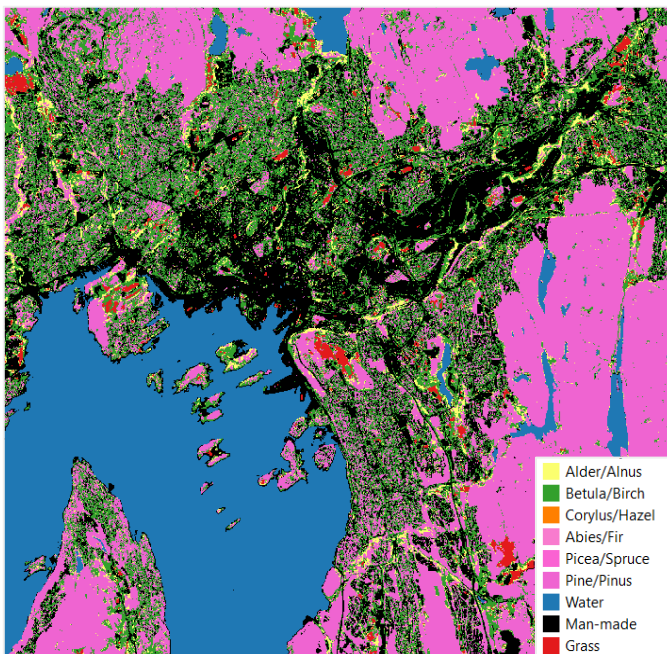


The Airmine sensor

- Measures particles
 - Dust, pollen
- We focus on PM2.5
 - Fine particles
 - Main air pollutant
 - Significant health risks
- Deducing pollen fractions based on machine learning
 - Not trivial to measure pollen particles specifically
 - Traditionally measured by Hirst traps, requiring manual work



Plant classification - input to the pollen model

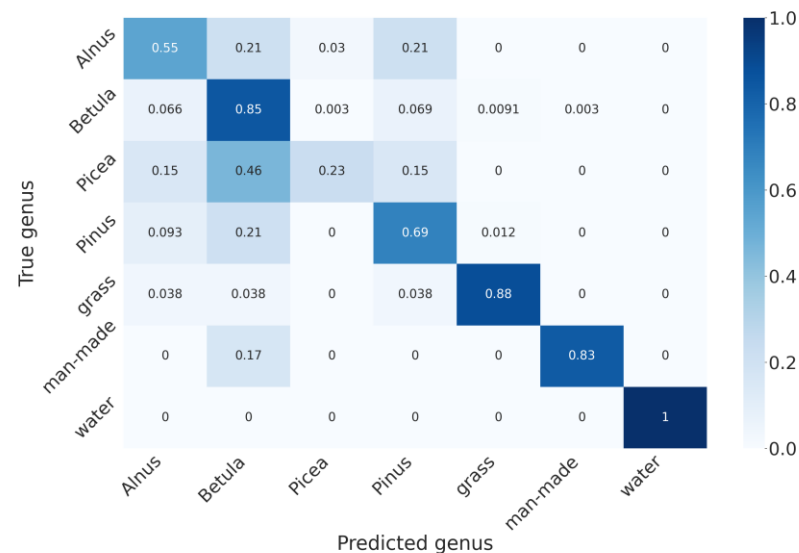


Plant classification around Oslo

- Images from Sentinel-2
- Random forest algorithm for machine learning

Prediction of plant types with random forest

- Reference data from public databases and manual mapping of vegetation
- Fairly good accuracy for plant classification: 0.82
- Good at distinguishing between man-made structures (houses, roads) and vegetation
- Difficult to distinguish between the different conifers



Lessons learnt

- Growing awareness of air pollution
- Need for better pollen forecasts
- Listening to pilot customers essential
- Data is gold - lack of data gives poorer model results
- Hardware development is fun – and challenging
 - Supply chain - dependencies on strained international market
 - Testing of physical constraints (weather, wifi signals etc)



Going forward

- Putting out more pilot sensors in Norway
- Collecting and analysing data
- Improving our models
- Selling sensors with subscription!



Mine your own air!