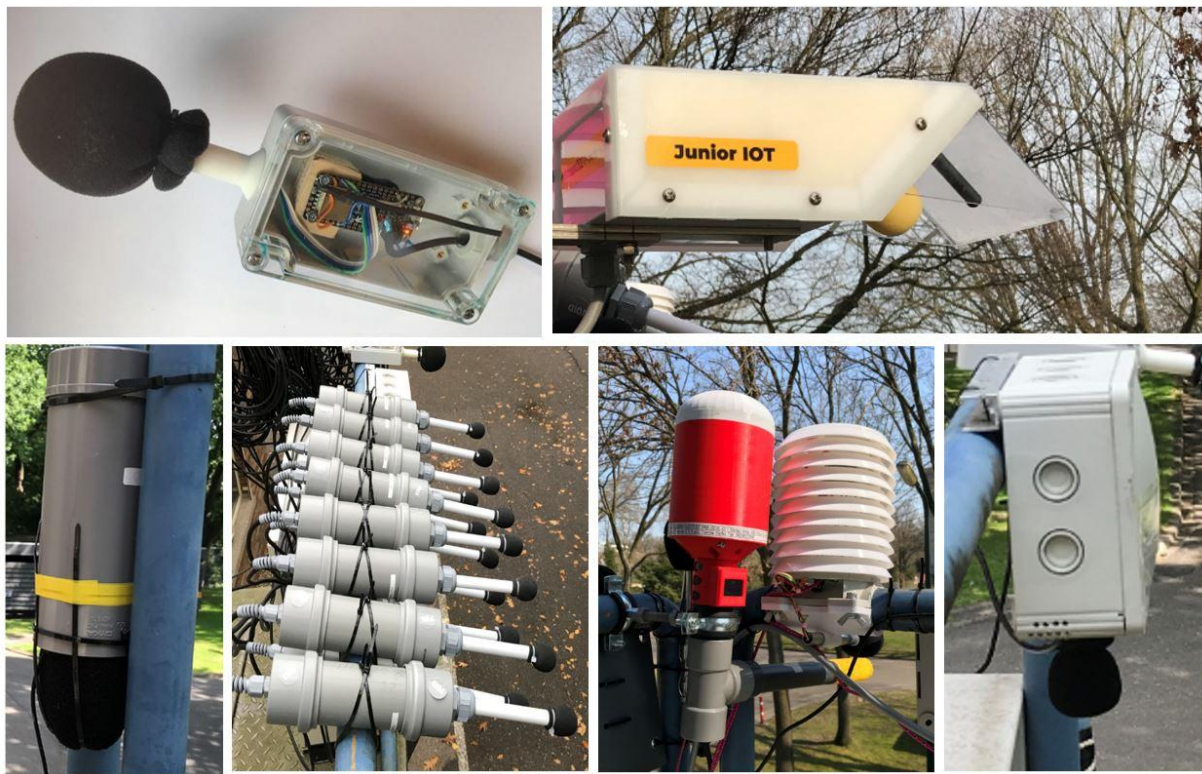




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Citizen science and noise

Nick Mabjaia, RIVM

nick.mabjaia@rivm.nl

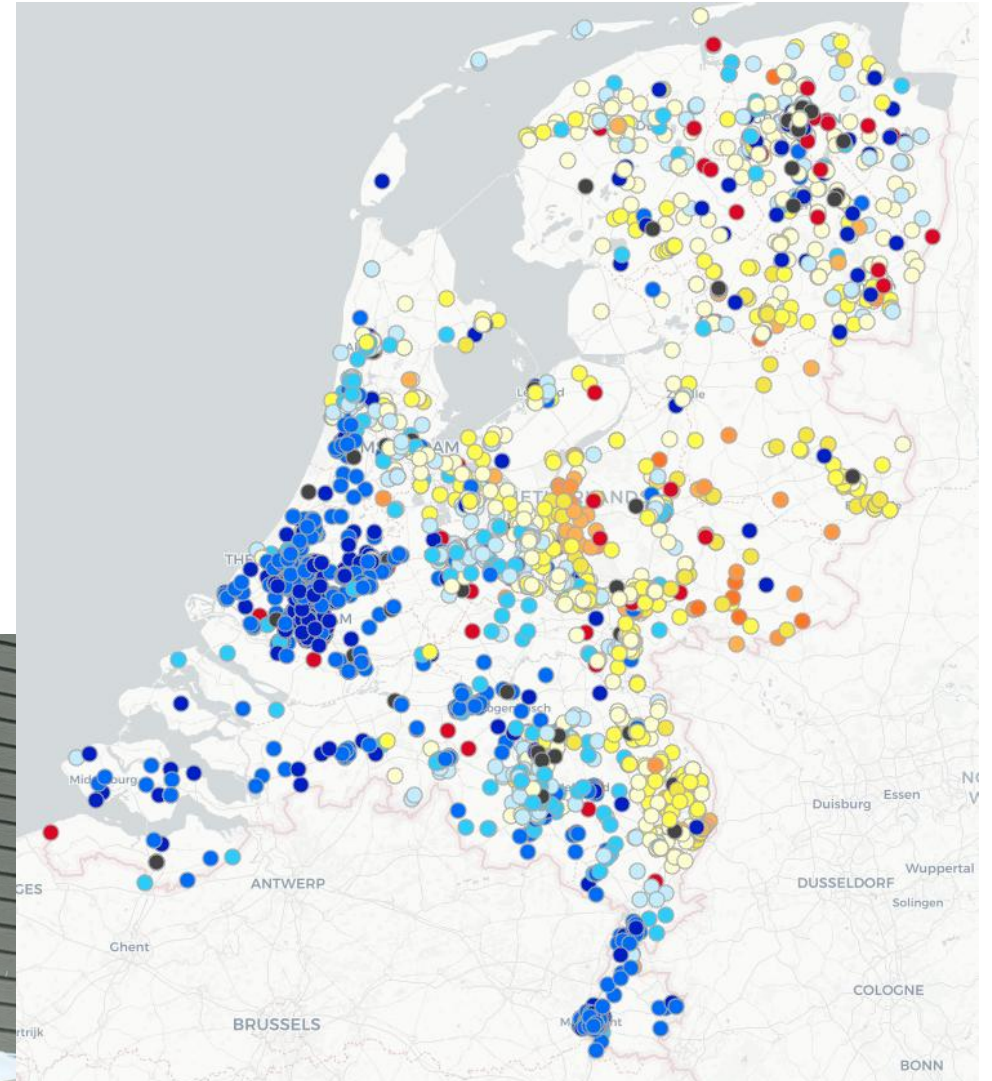


Citizen science and noise

- › Intro
- › Smartphones
- › DIY noise monitors
- › Example: Annoyance study
- › Outro

Intro

- Environmental monitoring
- Democratization of data



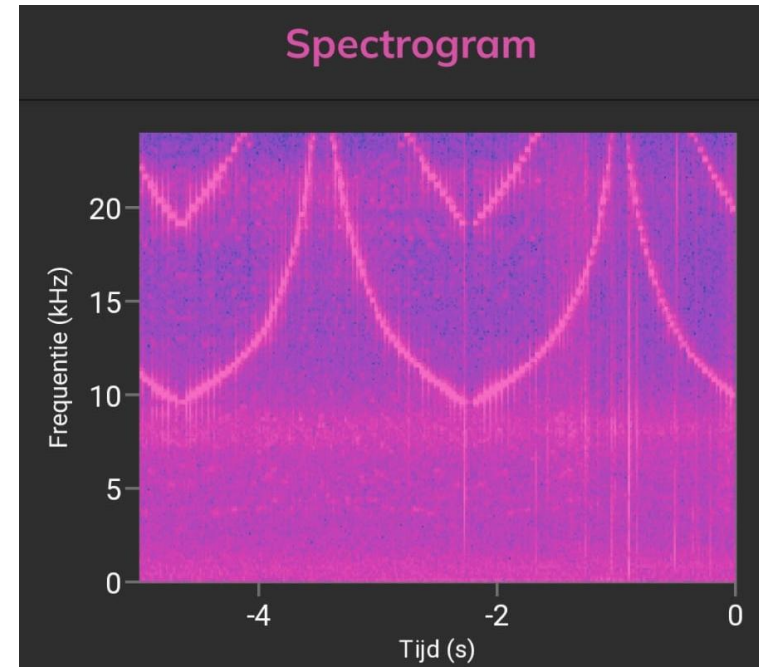


Citizen science and noise

- › Intro
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Smartphones

- Frequencies ✓
- Noise levels ?
 - Calibration
 - Microphone/processing/app





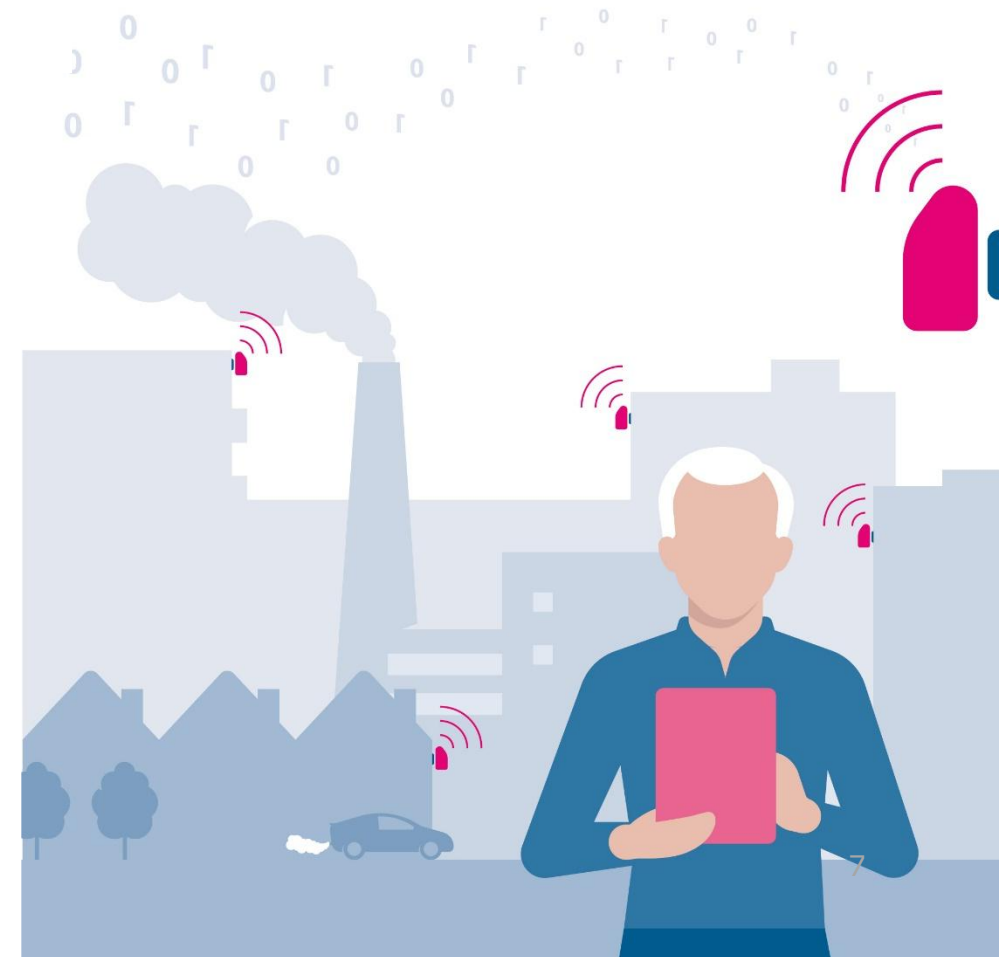
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DIY noise monitors

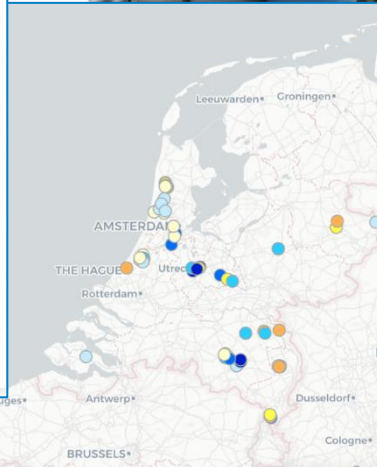
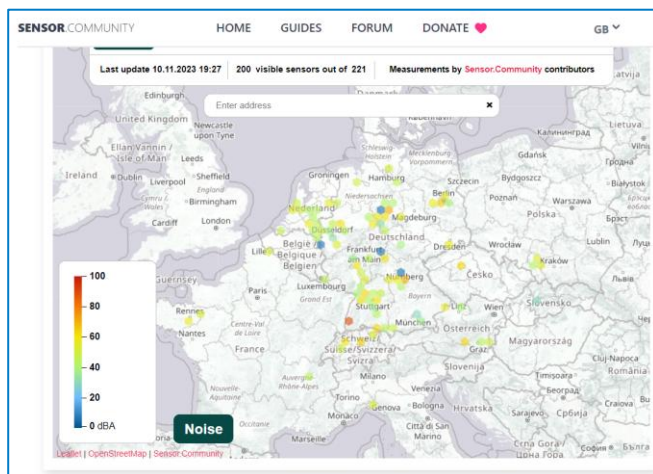
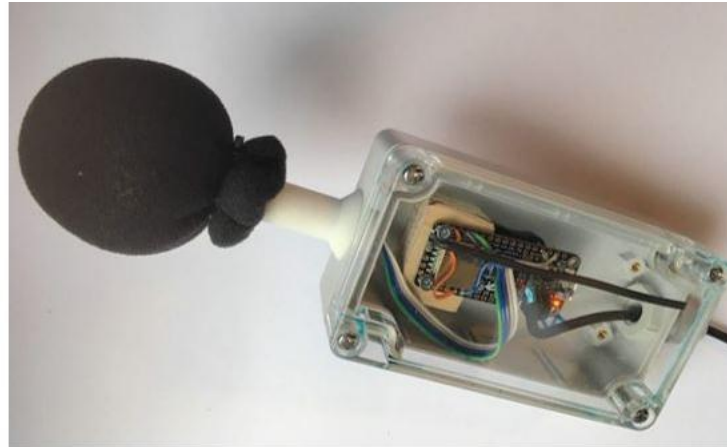
- Low Cost
- Long term monitoring
- Outside





Sensors in our test

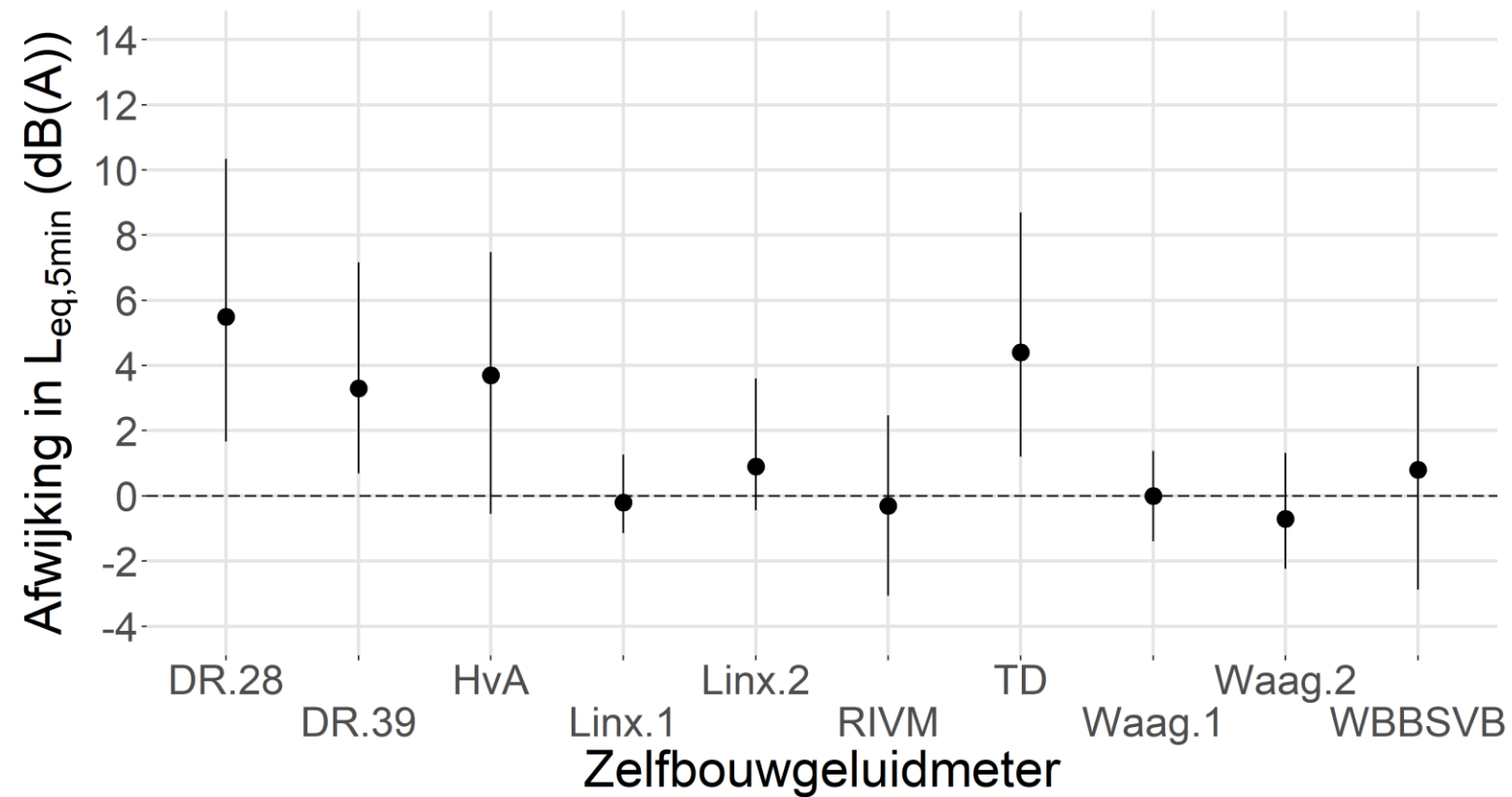
- > Stability ✓
- > User friendly ~
- > Accuracy ...



SENSOR.COMMUNITY

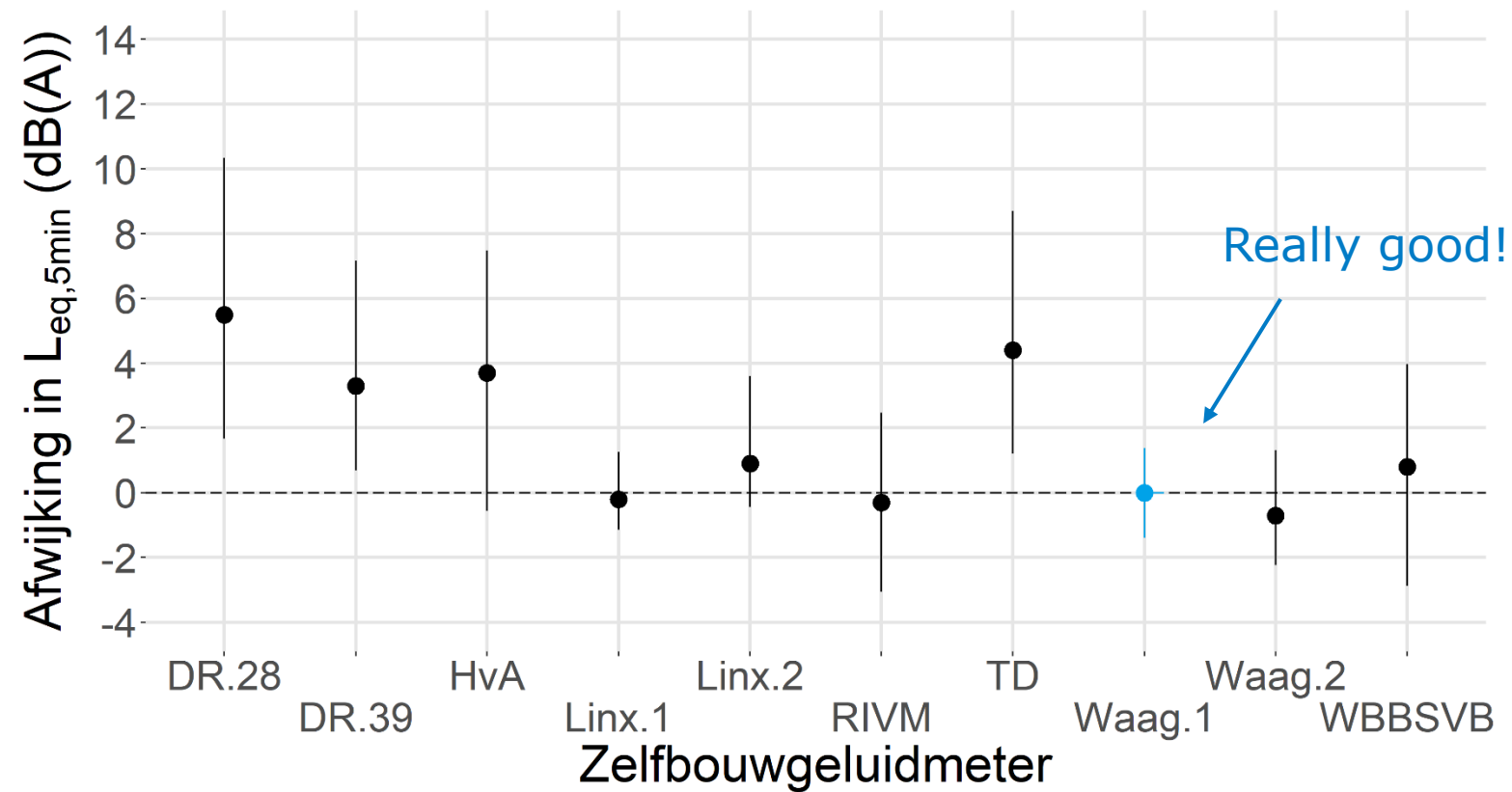


Accuracy



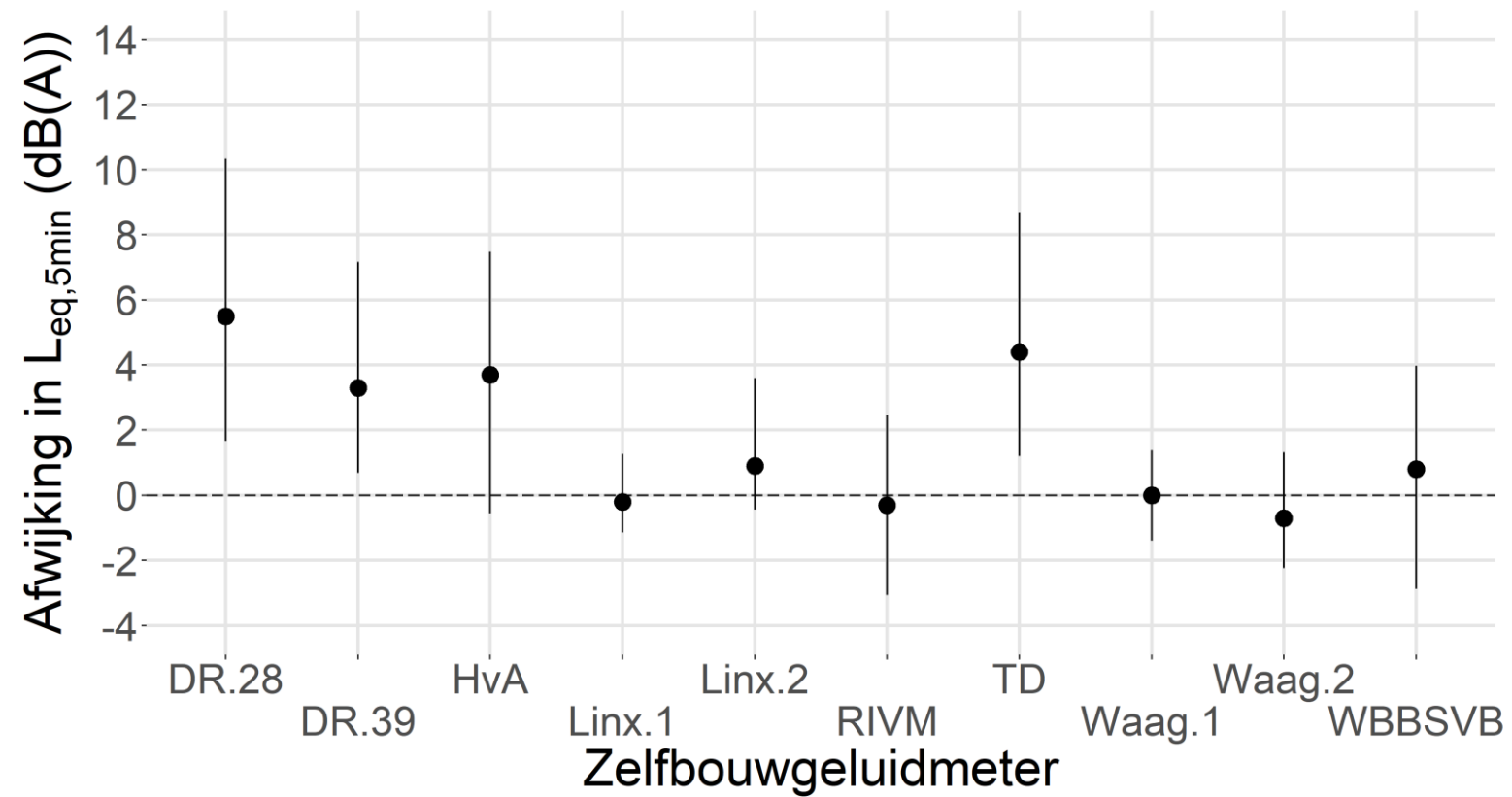


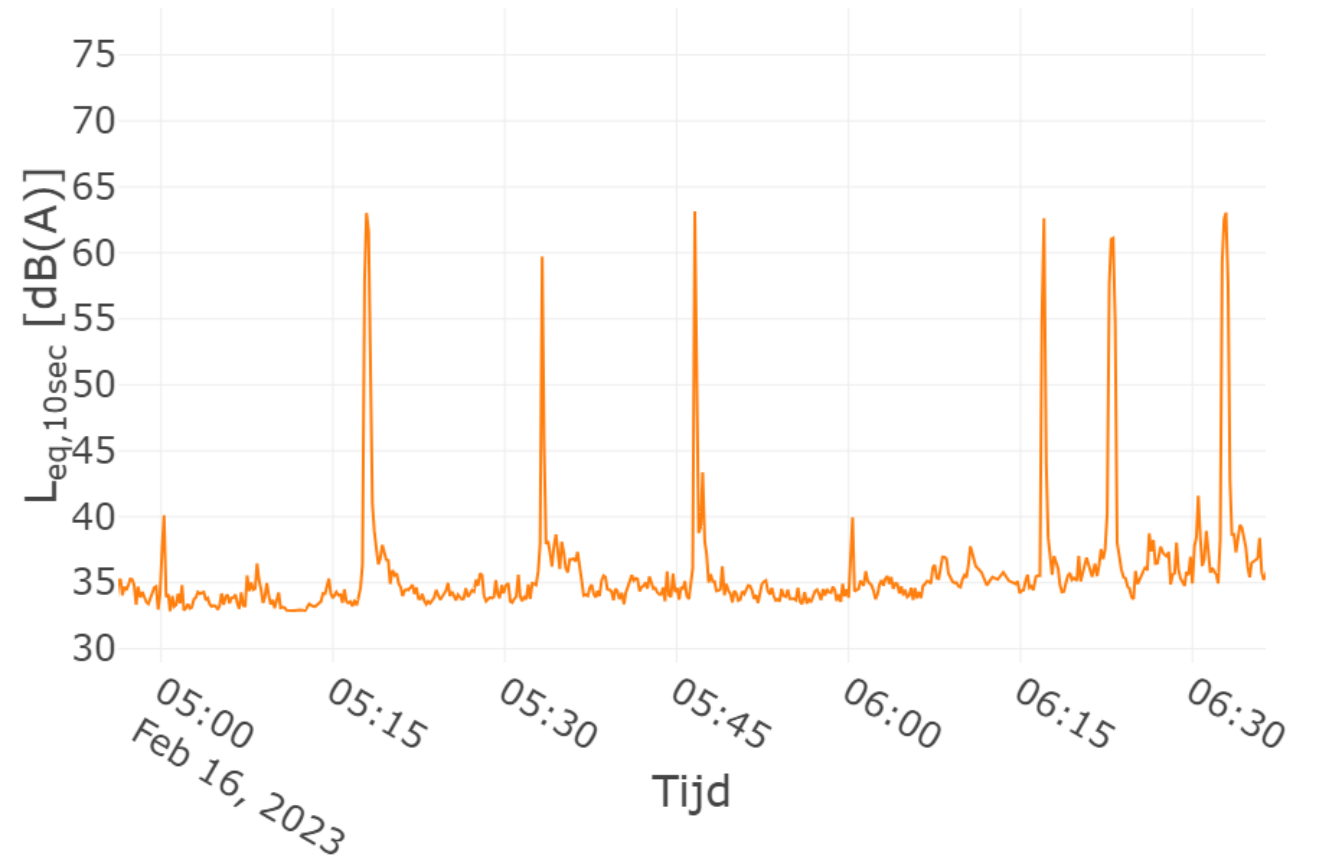
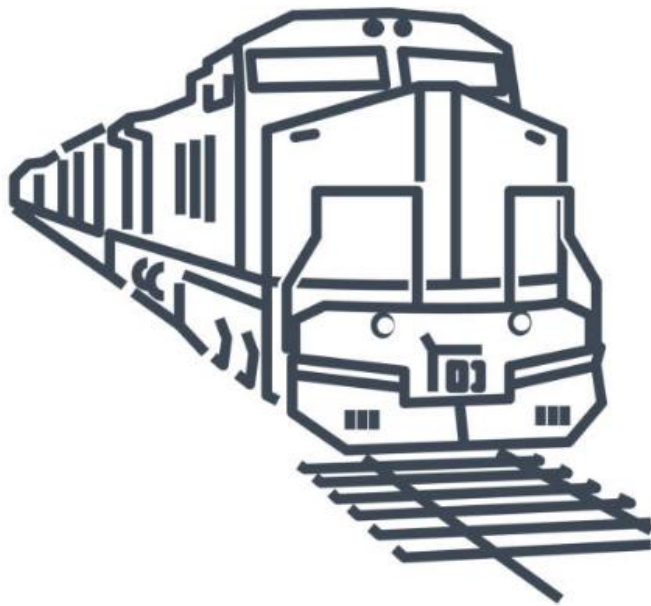
Accuracy

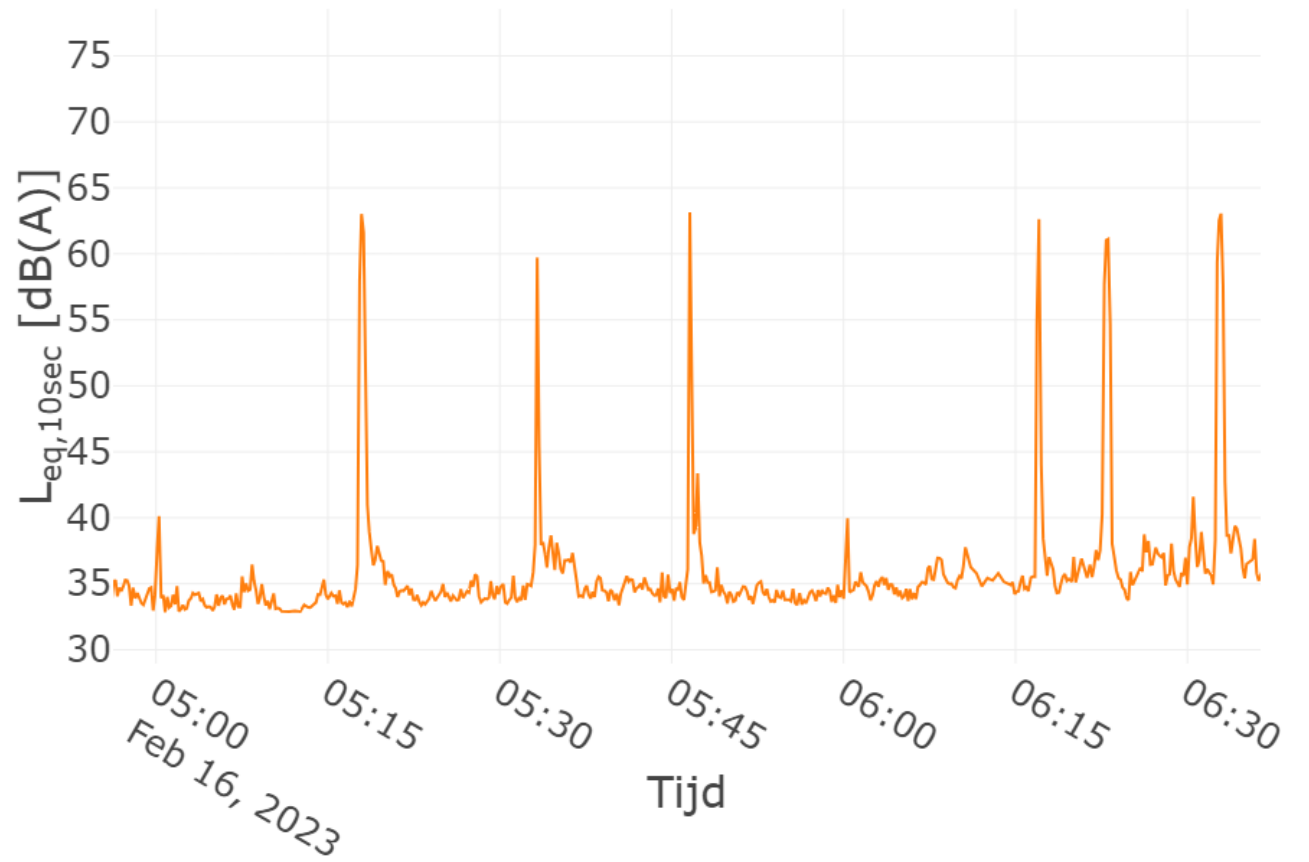




Accuracy vs goals









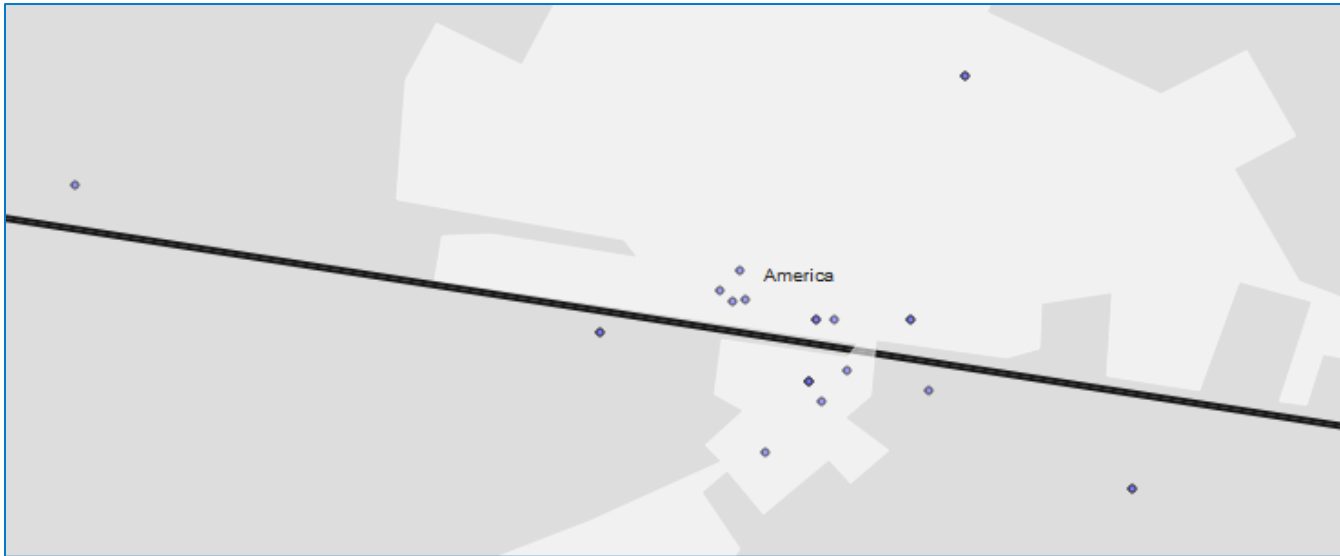
Citizen science and noise

- › Intro
- › Smartphones
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- › Outro



Annoyance study: America

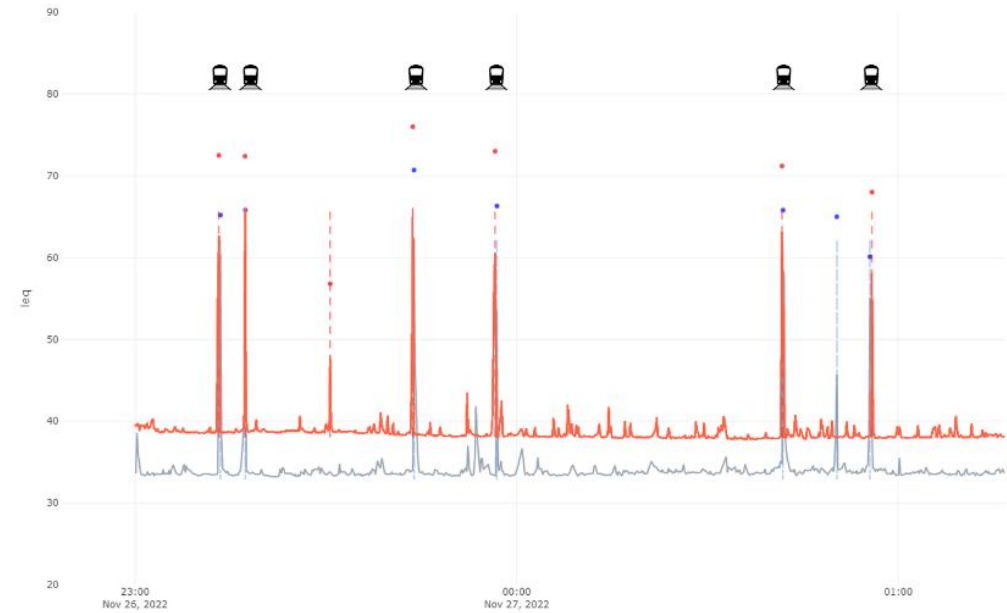
- > 20 DIY sensors + app survey





Annoyance study: America

- > 20 DIY sensors + app survey





Annoyance study: America

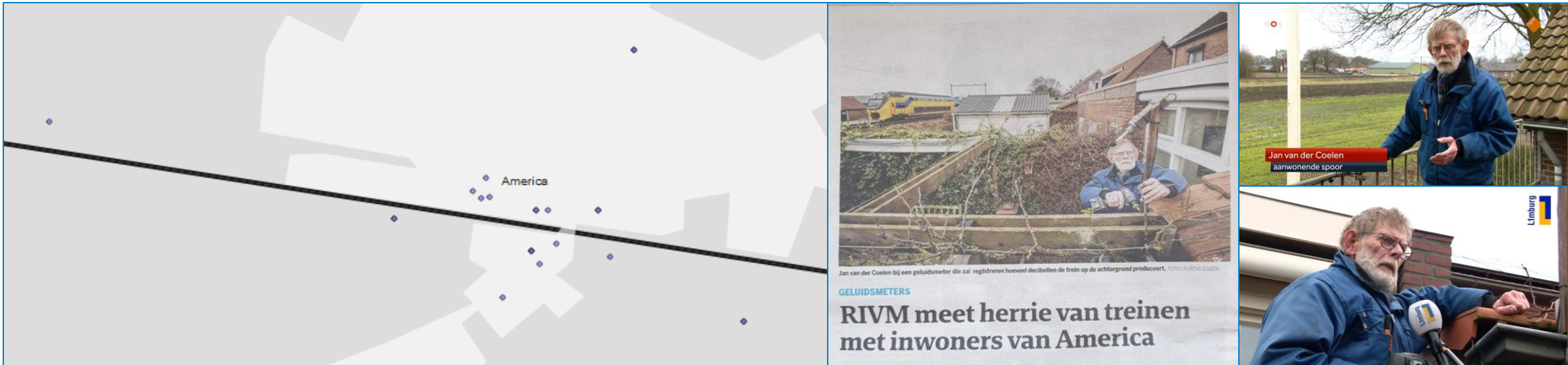
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Annoyance study: America

- 20 DIY sensors + app survey





Citizen science and noise

- › Intro
- › Smartphones
- › DIY noise monitors
- › Example: Annoyance study
- › **Outro**



samenmeten.rivm.nl

sensor.community

nick.mabjaia@rivm.nl

Summary

- › Measure noise yourself
- › DIY sensors can perform great!
- › Goals
- › Annoyance surveys

DIY noise level meters: www.rivm.nl/publicaties/vergelijkende-metingen-met-betalbare-zelfbouwgeluidmeters

America: <https://www.rivm.nl/nieuws/burgerwetenschap-geeft-in-america-meer-inzicht-in-hinder-treinverkeer>

Schiphol: <https://www.rivm.nl/publicaties/samen-meten-aan-geluid-en-beleving-rond-luchthaven-schiphol-verkennend-citizen-science>



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EXTRA SLIDES



Annoyance study: Schiphol

- 28 DIY sensors



Annoyance study: Schiphol

- 28 DIY sensors





Annoyance study: Schiphol

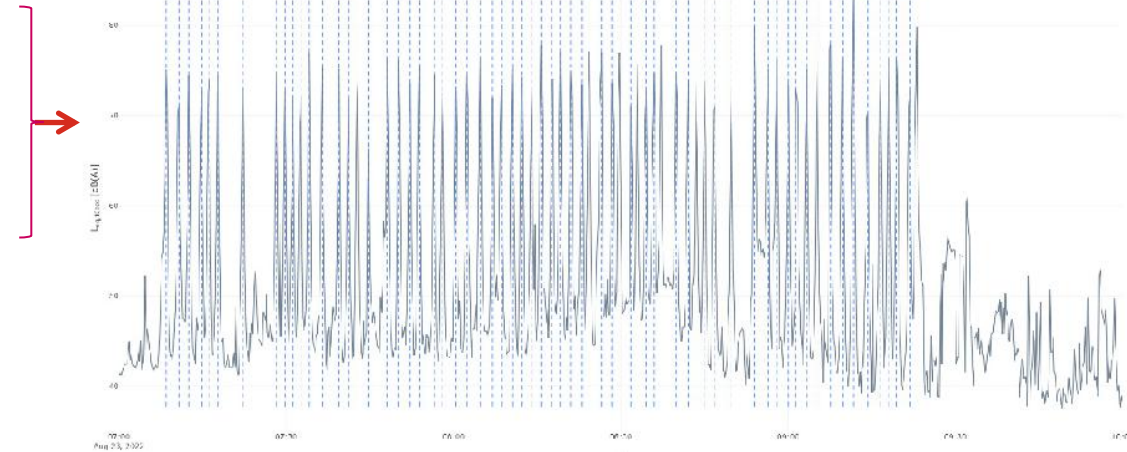
- 28 DIY sensors + flight data





Annoyance study: Schiphol

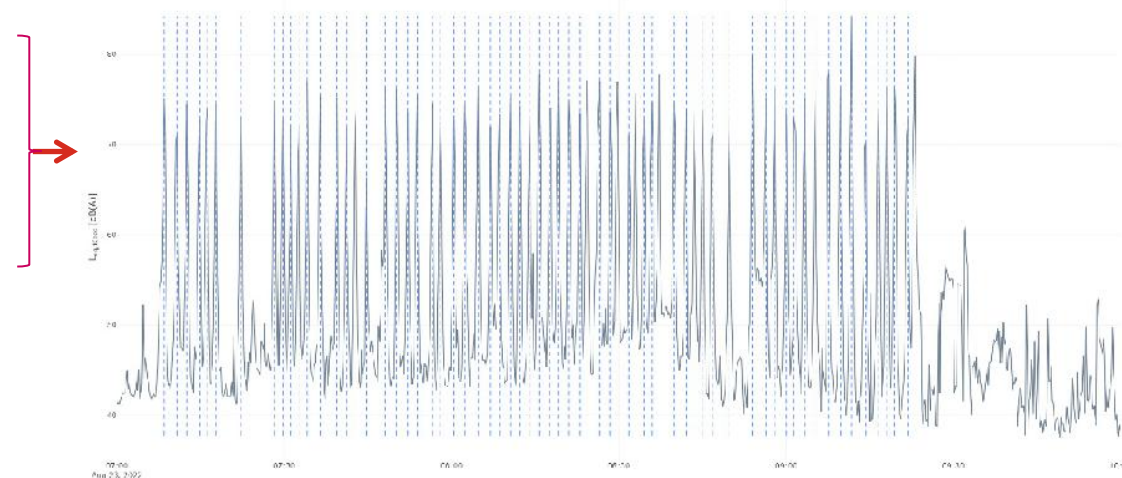
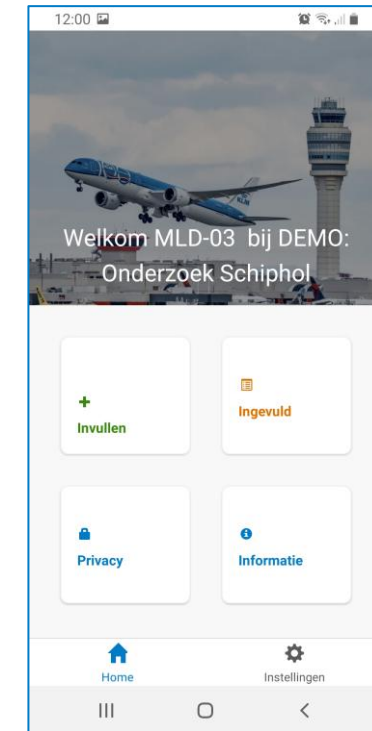
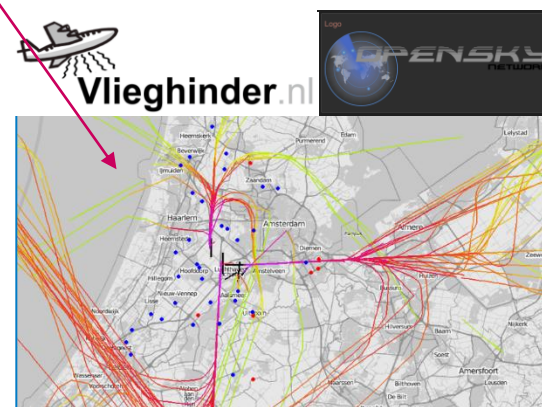
- 28 DIY sensors + flight data





Annoyance study: Schiphol

- 28 DIY sensors + flight data + app survey



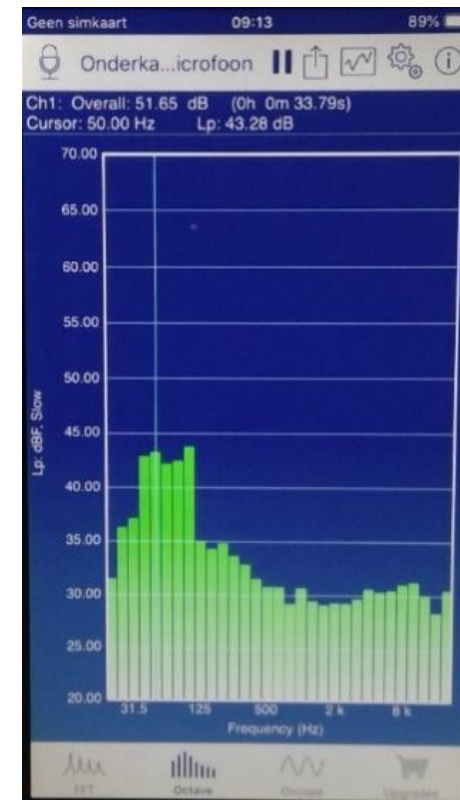
Website: <https://www.vliegtuiggeluid.nl/projecten/samen-meten-van-vliegtuiggeluid>

Report: <https://www.rivm.nl/publicaties/samen-meten-aan-geluid-en-beleving-rond-luchthaven-schiphol-verkennend-citizen-science>



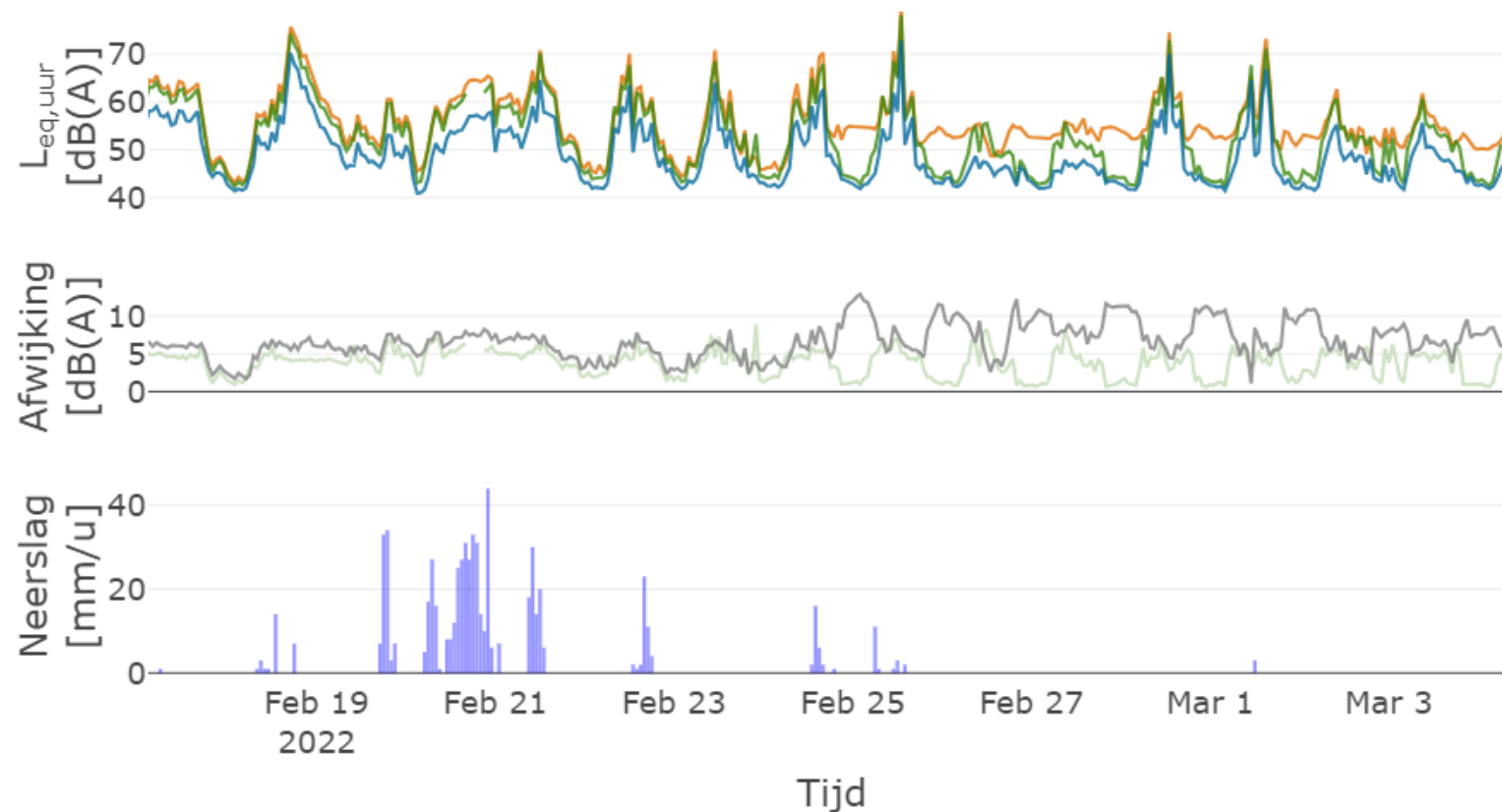
Smartphones: LFG meten met iPhones

- Laagfrequent geluid (LFG)
 - ≤ 100 Hz
- GGD pilot 2024
- Gehinderde meet zelf
- LFG aanwezig?



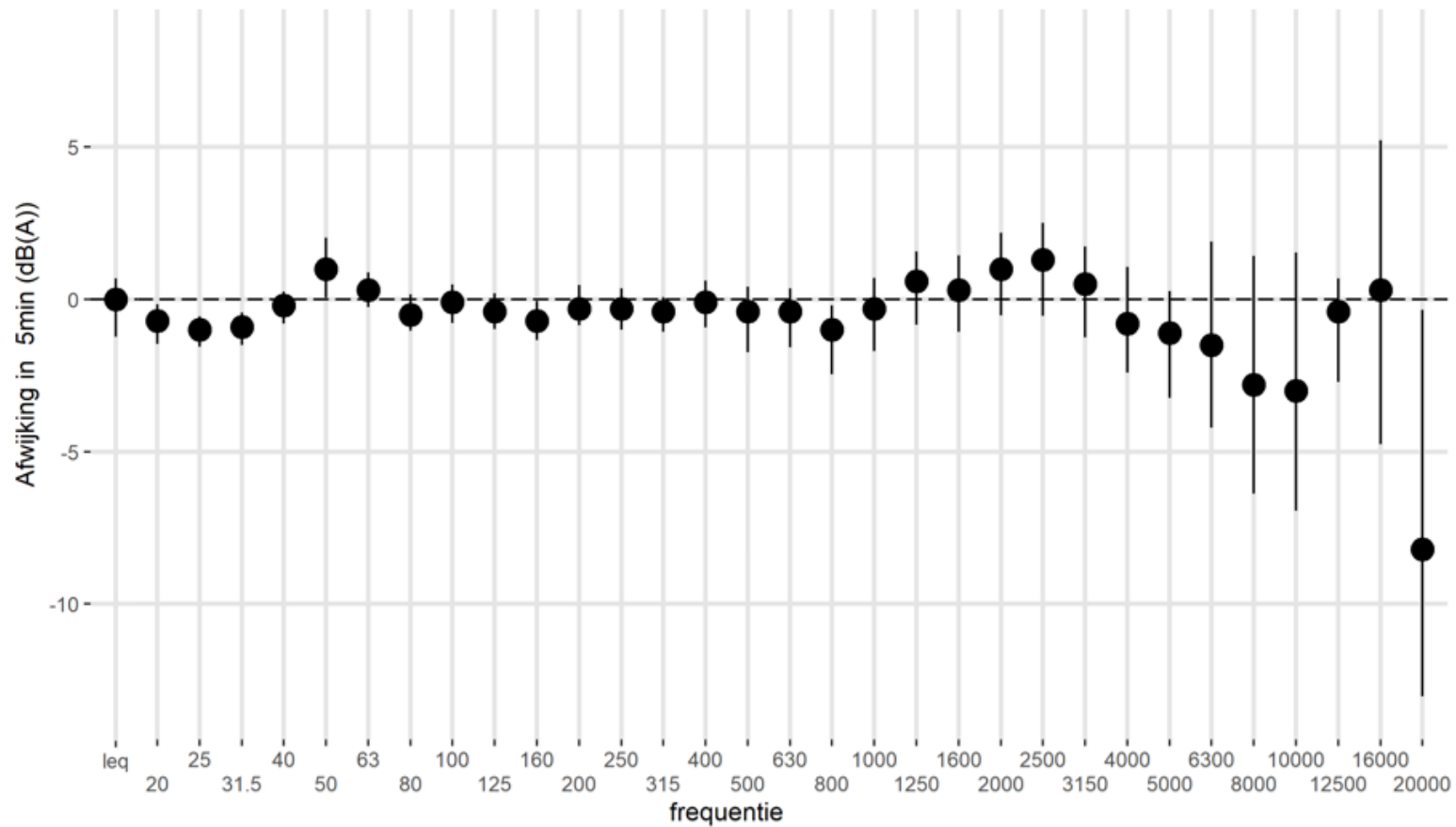


Resultaten: Lange termijn effecten





Frequencies

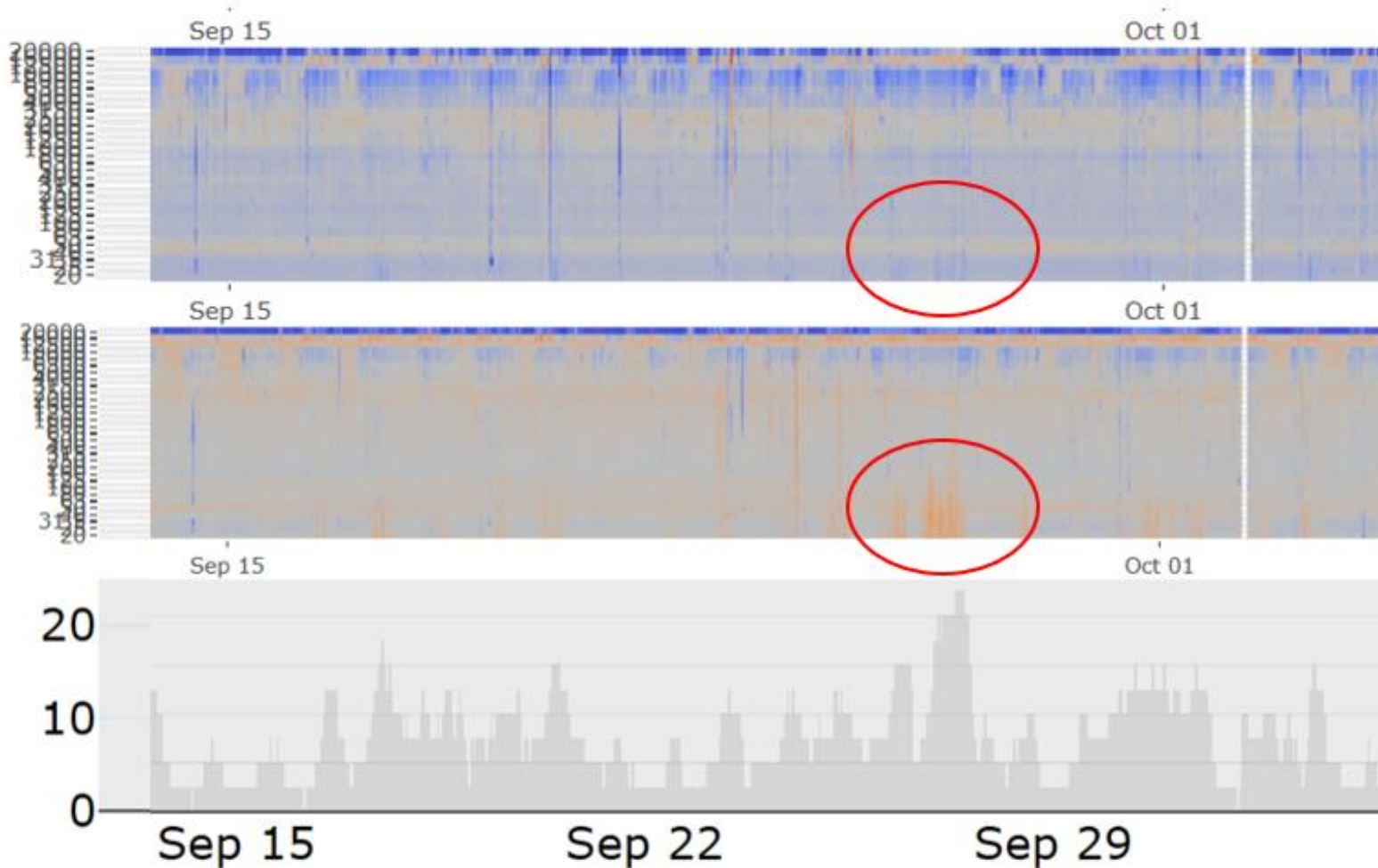




Max allowed wind speeds at microphone (dutch regulations)				
pass by LA,max [dB(A)]	40	50	60	70
Hourly average wind speed [m/s]	4	6	8	11

Weather effects: wind

ISO 3891 (airplane noise)
5 m/s



bad windscreen

good windscreen

Wind in m/s

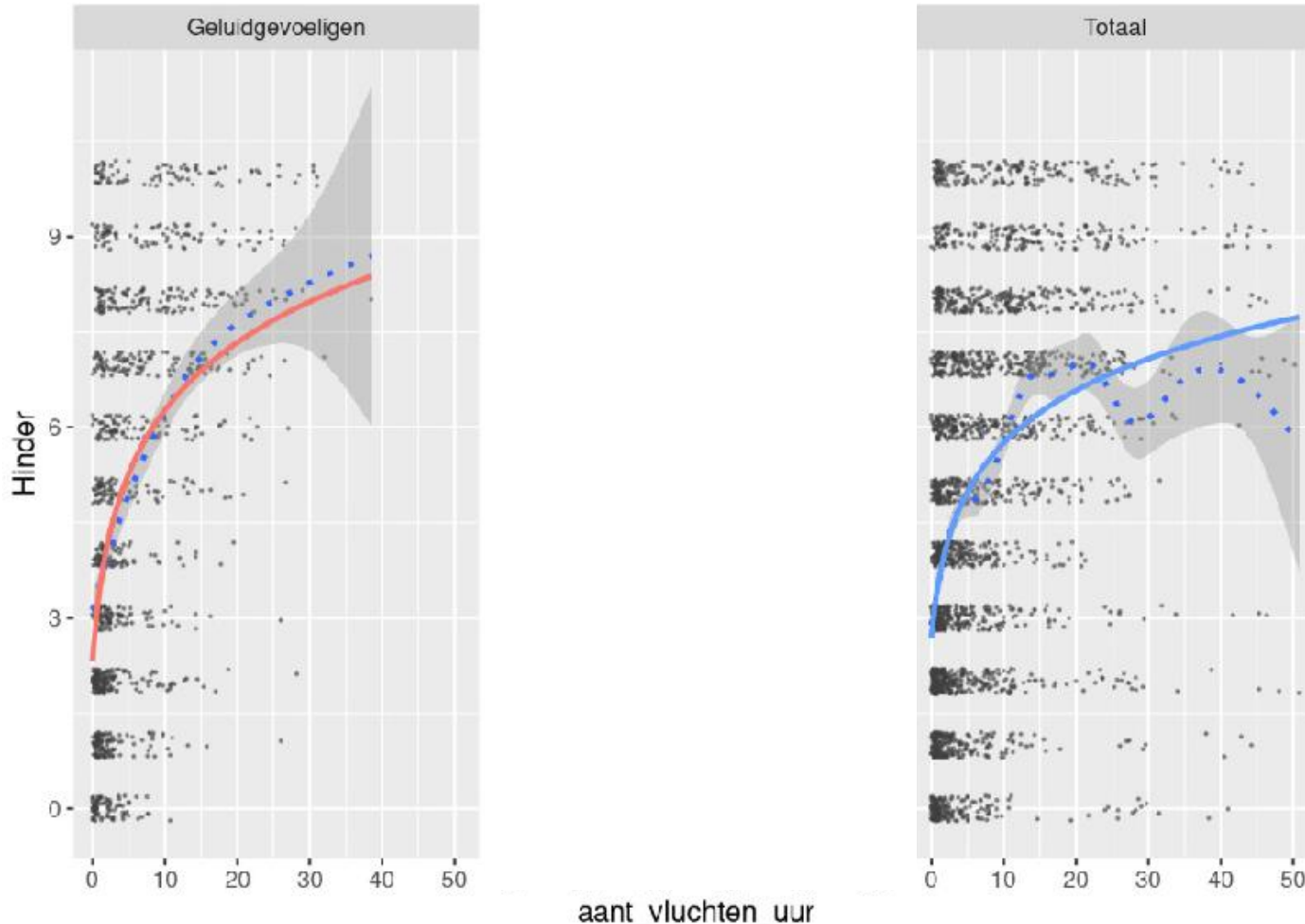


Goals of noise monitoring

- > Measurement devices
 - Accuracy
 - Measurement interval
- > Location
 - Near source
 - Near you
- > Duration
 - Seconds, hours
 - days, years



Annoyance study: Schiphol

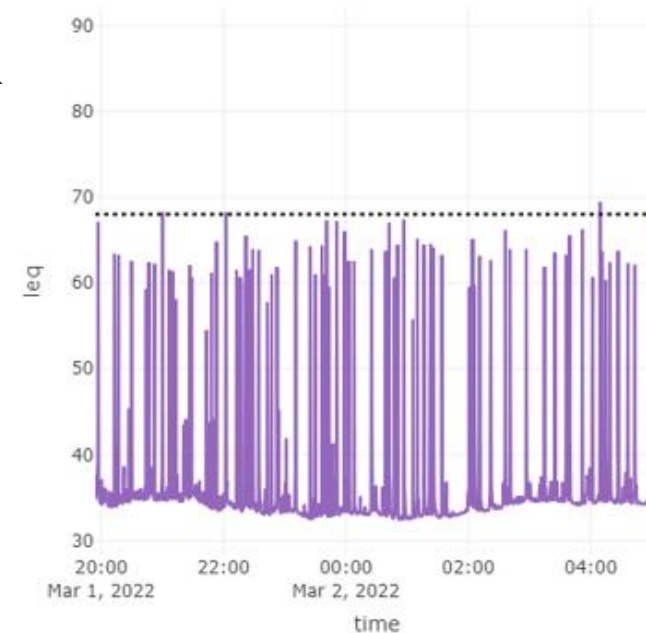


- Short term annoyance
- Dose-Response curves
- Important indicators:
 - $SEL \times L95$
 - $NA_{75} \times \text{aantal/uur}$
 - NA_{60}

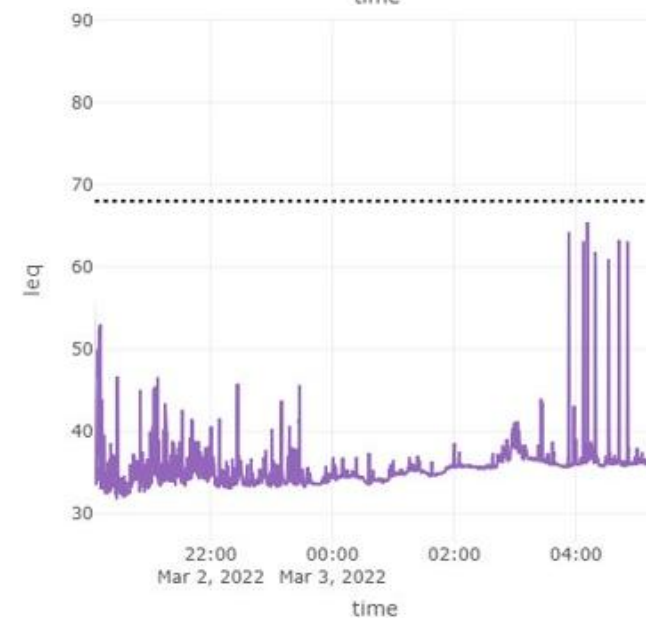


Annoyance study: America

- > 20 DIY sensors + app survey



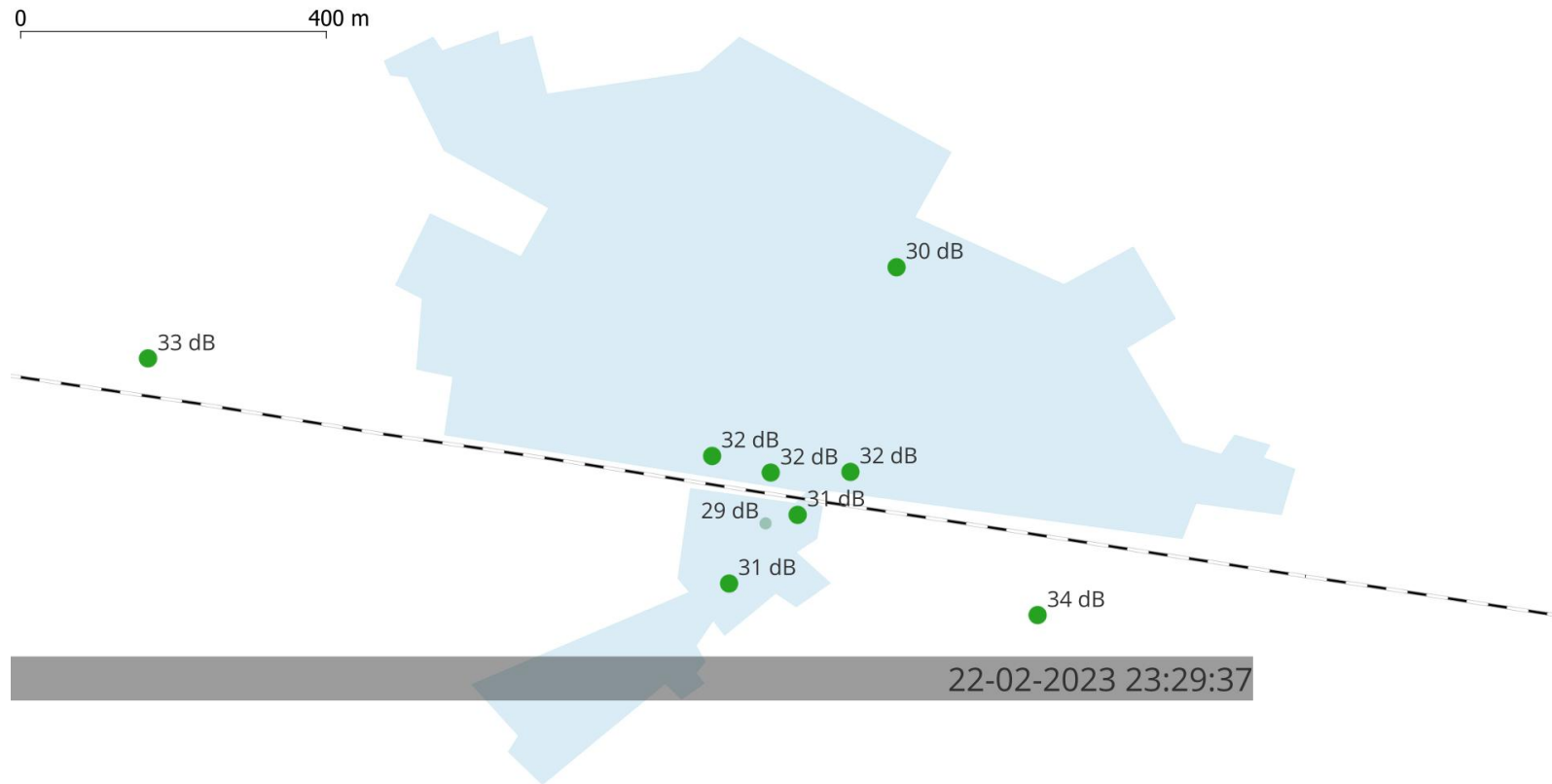
Normal night



No trains due to works on railway



Annoyance study: America





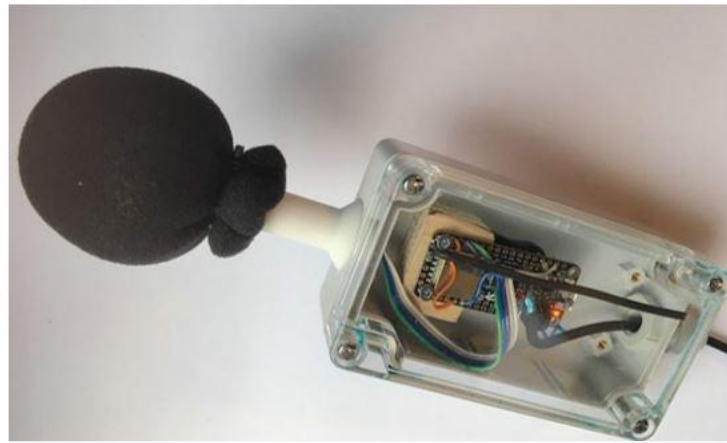
Belevingsonderzoeken: ervaringen

- › Harvesting knowledge and insights of citizens
- › Potentieel relaties verbeteren
- › Inzicht in lokale situatie
- › Hinder acuut/korte termijn in beeld



Sensors in our test

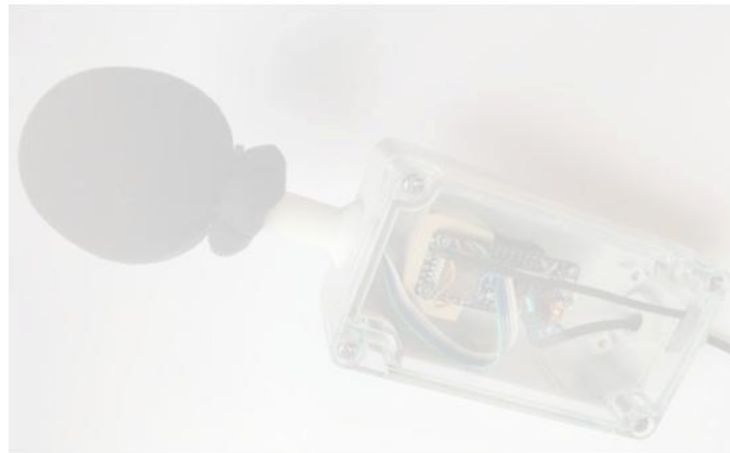
- Waag FutureLab
- Hart van Alkmaar
- WBBSVB
- RIVM
- Sensor.Community





Sensors in our test

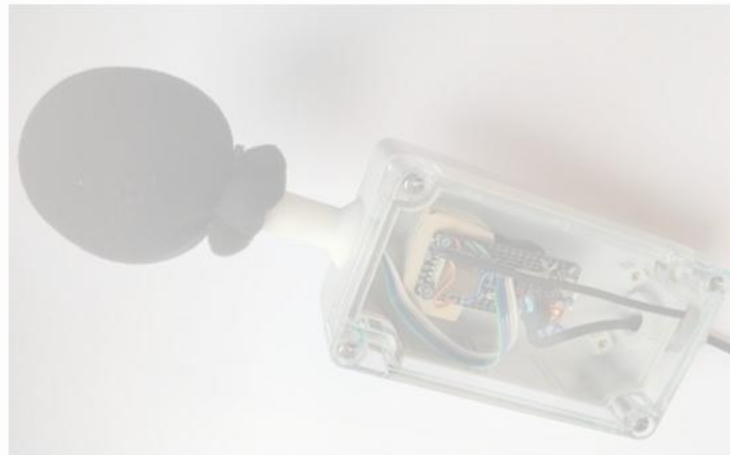
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Sensors in our test

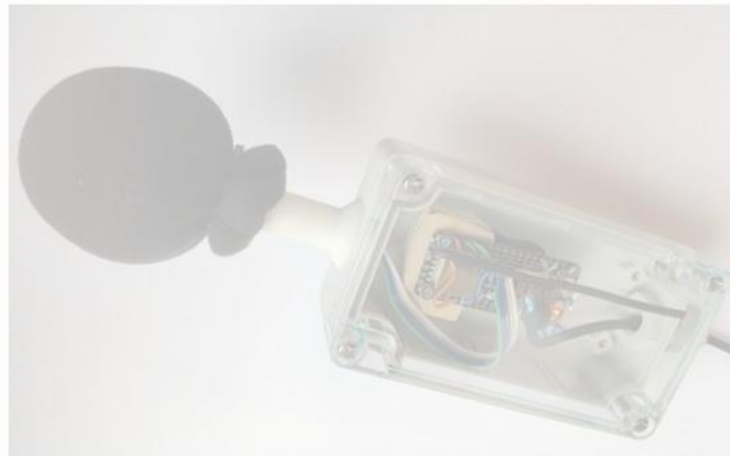
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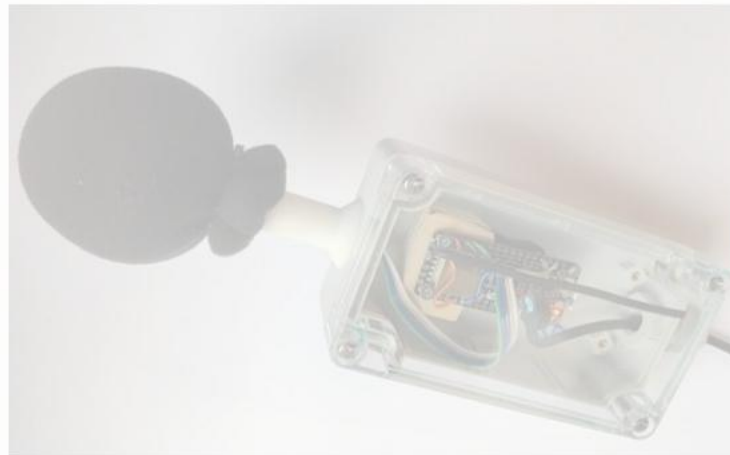
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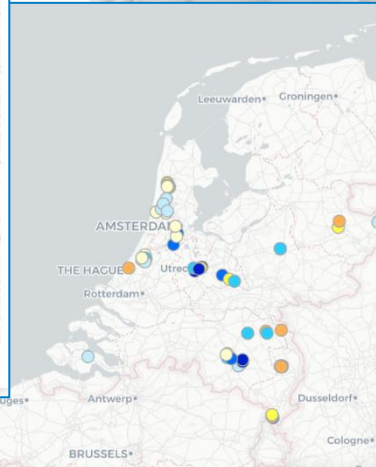
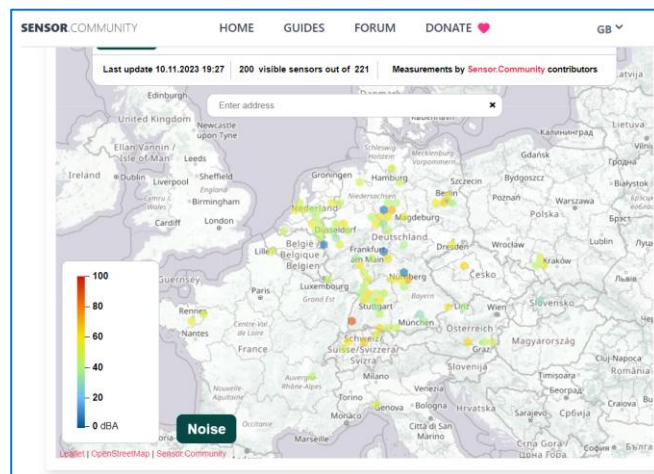
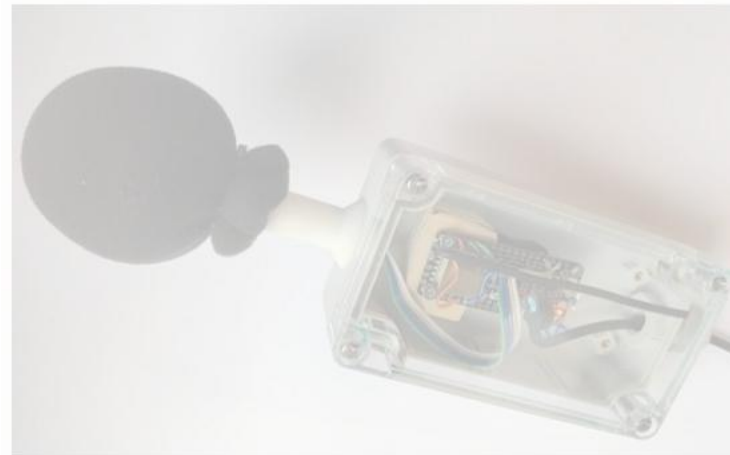
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Sensors in our test

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Water
Geluid



Verdict:

- > Stability ✓
- > User friendly ~
- > Accuracy ...