



foto: lo Cooman, Volkskrant

“samen meten” is zweten: burgeronkunde, boerenonwijsheid en bestuursonkunde

luchtkwaliteit meten in agrarisch gebied : het glas is half vol en we krijgen het maar niet vol

► werkkaders van het project:

duidingsfase

ontwikkelfase

toepassingsfase

actiefase



► wat en waar gaat het voorspelbaar fout:

polarisatie problematiek “*het zwarte gat tussen burger en overheid*”

► citizen science volhouden met een half vol glas

teus hagen

email: mysense@theunis.org



vereniging Behoud de Parel
<http://behouddeparel.nl>

luchtkwaliteit in agrarisch gebied: bio-industrie, vrachtverkeer, houtstook

zuid-oost van Brabant

noorden van Noord Limburg

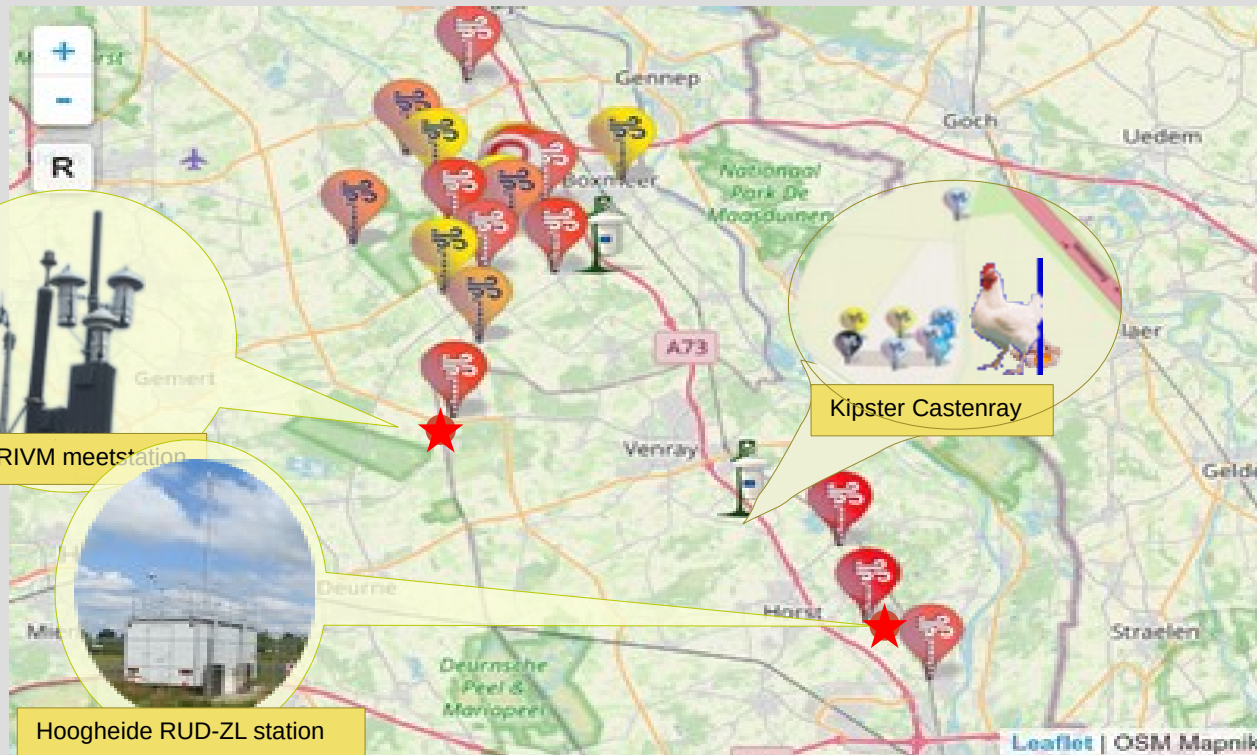


wat en waar meten we:

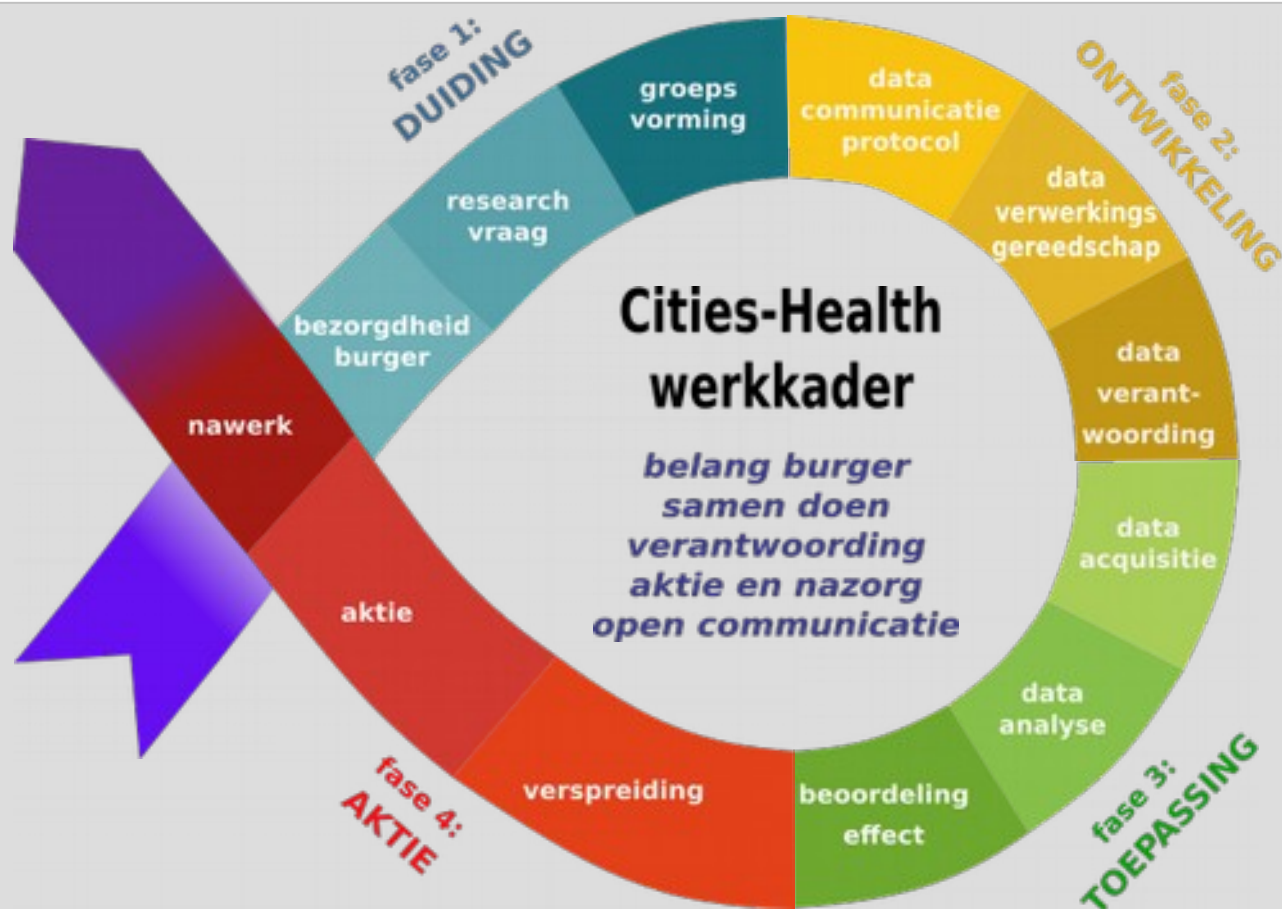
PM massa en telling deeltjes, vocht, temperatuur, luchtdruk, 'VOC', GPS, lading accu



waar: St Anthonis en Horst a/d Maas



Cities-Health werkkader “het *samen* doen”



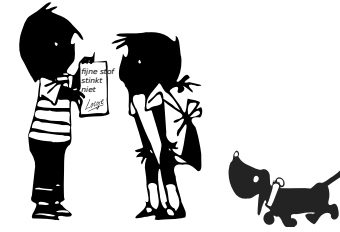


NIETS

*Jij doet alsof er
aan de hand is*



fase 4: we weten het een beetje ... de hamvraag 'wat nu' ? verlies elkaar niet !



- ♦ **bepaal vooraf** mogelijke acties en beleidsdoelen
- ♦ **wederzijdsbegrip**
 - of en wat er aan de hand is
 - wat mogelijk is aan acties
- ♦ **terugkoppeling**
 - of acties zin hadden
 - aanpassingen van regels en beleid



➔ hoe houden we **samen** de moed er in ?

vertrouw *J'* maar
lekker op die

*"*WETENSCHAPPERS*"*

van jullie



meetkit fase 1: milieu mens en technologie

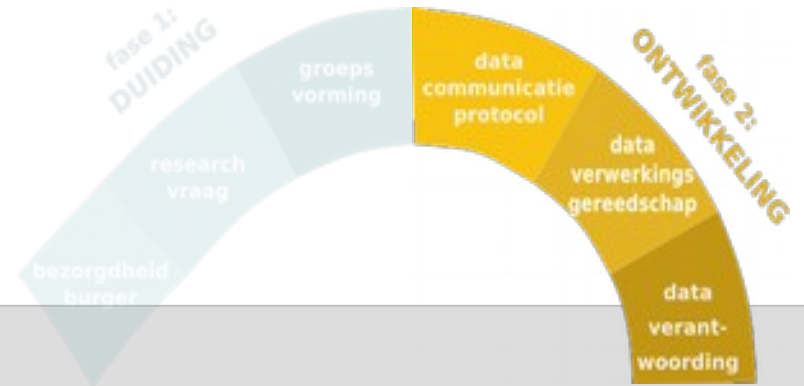
de techno nerd fase



probleem: klopt de informatie met de werkelijkheid
oplossing: technologie ...
randvoorwaarden: de kosten verdubbelen elke 2 jaar

- ♦ low-cost sensors ontwikkeld voor indoor toepassingen ...
- ♦ basic data communicatie low-cost ?
 - €50/yr/kit, niet volledig open, € ?! data acquisitie server
- ♦ low-cost microprocessor: ESP \Rightarrow ARM, C++ \Rightarrow microPython
 - nog veel voer voor de techno nerds
- ♦ complex behuizing (Processor Connecting Board, 3D printing)
- ♦ energie: \Rightarrow solar ?

fase 2: data verwerking



data communicatie via internet

- „ wireless Internet of Things (IoT)
- „ data acquisitie https ⇒ mosquitto of influxDB



data opslag en data uitwisselingsformaat

- „ ieder voor zich, nog steeds geen standaard



data controle

- „ monitoring, validatie, correctie, calibratie



data doorgifte bijv. Samen Meten dataportaal, Sensors.Community

Citizen Science en Open Source technologie gedachte

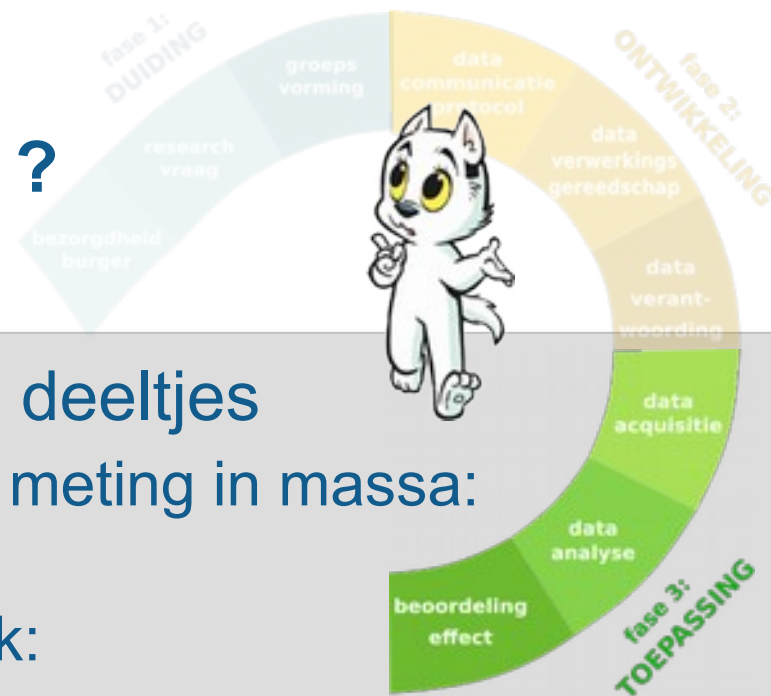
Community Science Manifest o.a. Meet je Stad

1. **kennis:** ontwikkelen en **delen**
2. **open:** beschikbaar stellen
3. **blijvend:** vrij beschikbaar en vrij delen
4. **inclusief:** vrij beschikbare gereedschappen, vrij toegankelijk
5. **wederkerig:** bijdragen blijvend vrij beschikbaar



het glas is nu half vol en dit is geen rondje vrij bier !

fase 3: data duiding voor iedereen ?



- ♦ fijn stof metingen sensors tellen de deeltjes
 - probleem de norm is conventionele meting in massa: conversie is fabrikant afhankelijk
 - correctie is (lokaal) weersafhankelijk: rel.vocht en temperatuur
- ♦ data analyse: statistiek kennis, complex
- ♦ duiding is gericht op ver uiteenlopende doelgroepen
omwonenden, ondernemers, lokaal beleid en handhaving

met dank aan RIVM en RIVM dataportaal

lokatie: Tata Steel regio



-

WAR / Meet je Stad & de Waag, Amersfoort, 1^{ste} juni 2023,

Teus Hagen, "luchtkwaliteitsmeten: het glas is nog steeds half vol"

final

15 slides minus 14 to go

verlies
elkaar niet

als polarisatie dichtbij komt



SIRE

DE MAATSCHAPPIJ
DAT BEN JIJ



Veel dank aan:

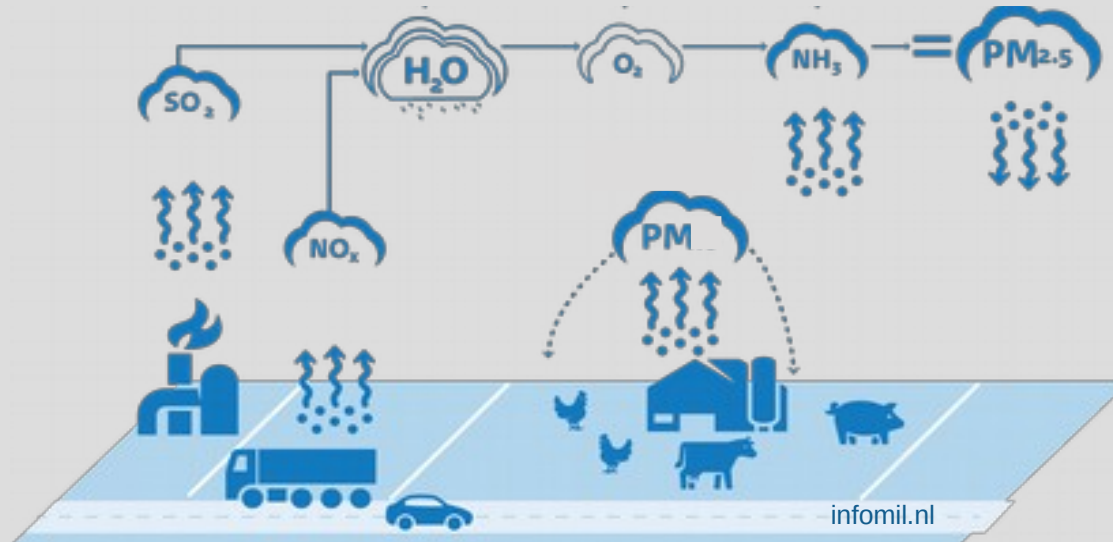
Fontys Venlo GTL, MilieuDefensie, Kipster, Frank Koenders e.a., gem. St. Anthonis en stichting Burgerwetenschappers Land van Cuijk, vereniging Behoud de Parel, RIVM, dagbladen Trouw en de Volkskrant, lokale dagbladen de Gelderlander en de Limburger

foto: Io Cooman, Volkskrant

the Dutch 'Clean Air Agreement'

Schone Lucht Akkoord (SLA)

air quality improved to WHO '2021 limits' in 2030



- ★ started Januar 2020: 50% better clean air as in 2016, most municipalities signed
 - ♦ one should have implementation plan defined by 1st March 2022
 - ♦ one should complete executive plans before 1st March 2023
- ★ execution plan should start by 1st July 2023 - Environmental and Planning Act

4 examples of air quality initiatives with an undefined framework **Phase 4 ACTION**



★ April 2011 Horst a/d Maas Hoogheide LML meetstation (PLIM/RUD-ZL)

- ♦ 2015 Horst a/d Maas (Behoud de Parel & RIVM) financial and operational support denied
- ♦ 2018 Horst a/d Maas (Behoud de Parel, 11 MySense kits e.g. Kipster)

★ Januar 2020 municipalities in the region signed Schone Lucht Akkoord (SLA)

- ♦ 2020 St. Anthonis:
 - foundation Citizen Science Land van Cuyk (20 MySense sensor kits)
 - consultancy group (6 MySense sensor kits, 1 year)
- ♦ 2020 Venray:
 - consultancy group (6 MySense sensor kits. 1 year)
 - RIVM farmers and neighbours (Boeren en Buren) project (30 RIVM sensor kits, 1 yr)

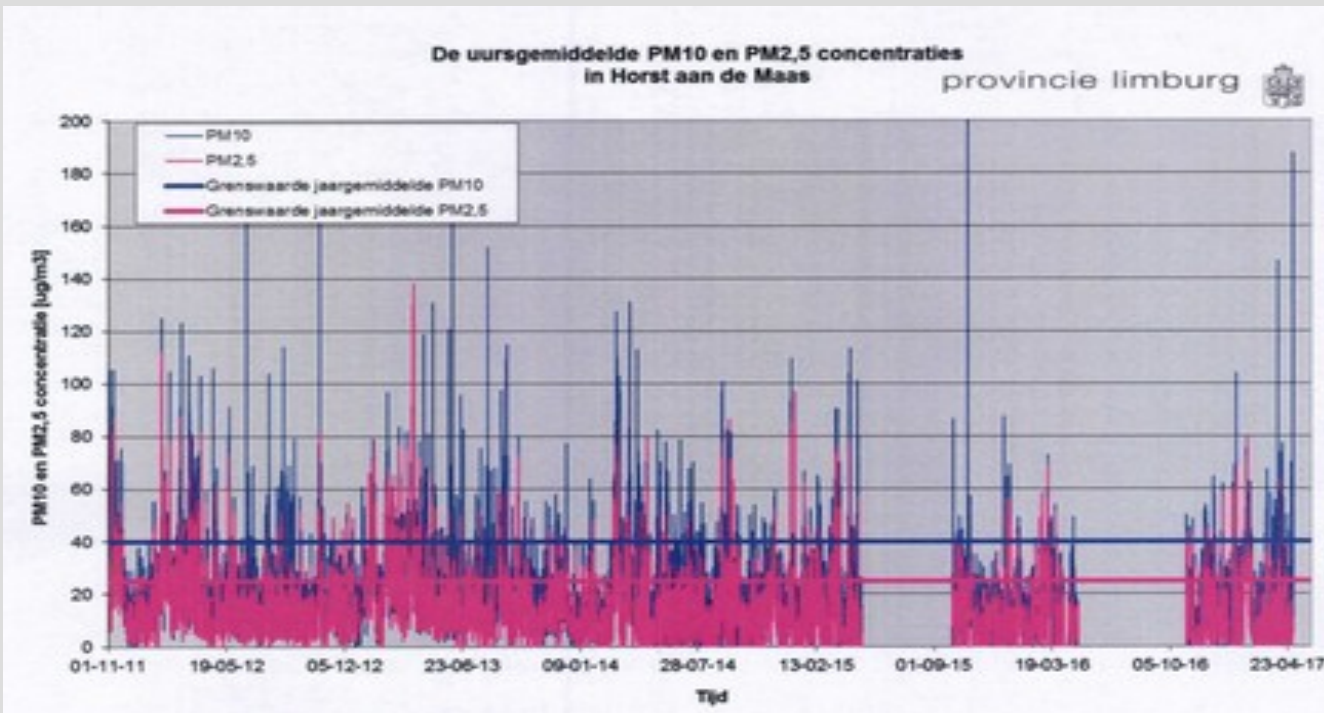
★ April 2021 project **Grenzeloos Meten**, Horst a/d Maas, Venray, and Maas en Peel

RUD-ZL air quality station Hoogheide

only PM_{2.5} and PM₁₀ BAM1020 hourly measurements



- ♦ Nov 2011 – Dec 2021 in Horst a/d Maas
goal: silence citizen worries, budget 5 years € 100K (real costs ca € 40K/yr)
- ♦ May 2017: environmental permit and start building 2 meat farms

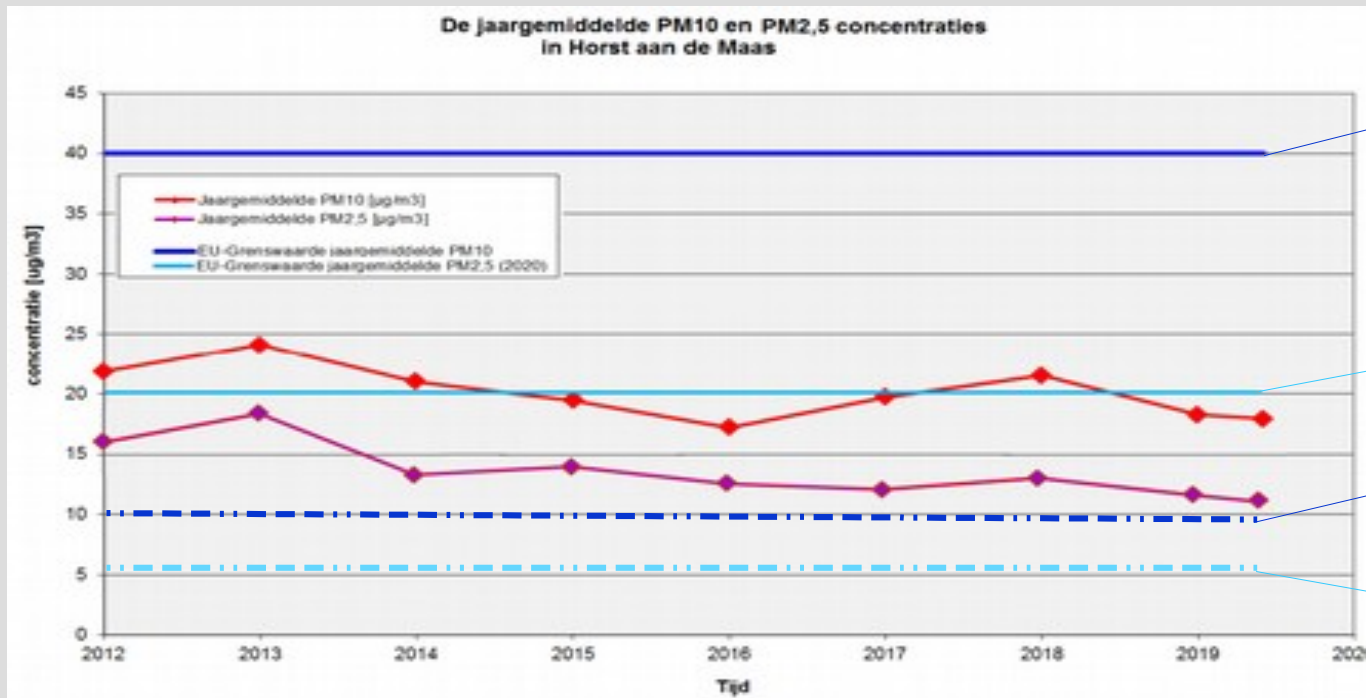


measurement LML station Hoogheide

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EU 2011:
PM₁₀ 40 µg/m³

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WHO 2021:
PM₁₀ 10 µg/m³

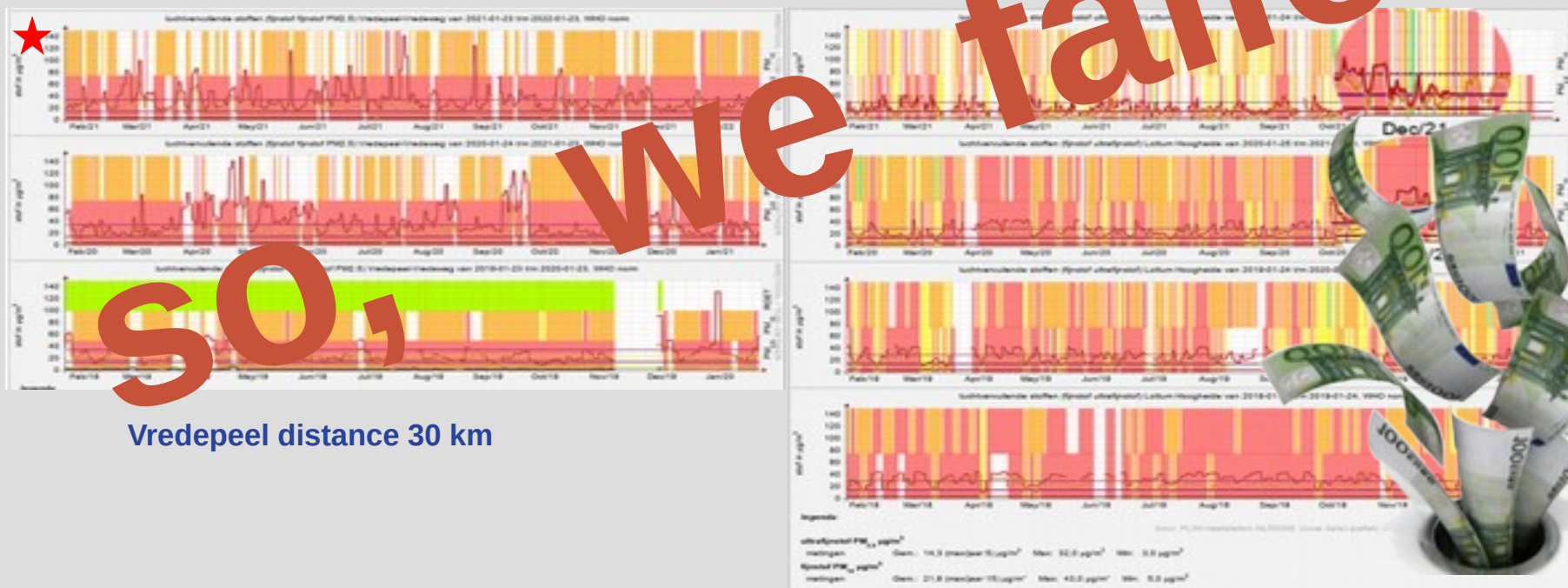
WHO 2021:
PM_{2,5} 5 µg/m³

the real Hoogheide goal?

the problem: technology driven



- ★ **local government:** silence the citizens' anxiety?
- ♦ **local citizens:** doubt on innovative air filter installations of bio-industry
- ♦ **local new meat 'farms'** (45.000 pigs, 1.200.000 chickens, ...): economics



year 2022

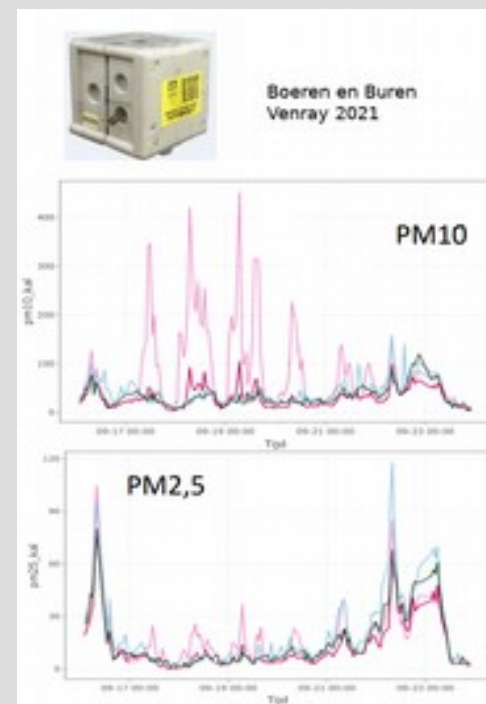
Grenzeloos Meten project

region: north of Limburg, Holland



the preplay: the story of technology – executives mismatch

- ★ **2016** Dec: start development MySense sensor kits. Know how exchanges RIVM, etc.
- 2017 Mar: request municipality (financial & quality) support MySense ... denied
- ♦ **2019** May: intensive livestock farms get permissions to start building farms
- ★ **2020-2021**: 5 measurement projects in the region:
 - Castenray: Kipster 9 MySense sensor kits (permanent)
 - St Anthonis: 20+6 MySense sensor kits (20 kits permanent)
 - Venray: 6 MySense sensor kits
30 RIVM sensor kits (¾ year)
- 2020 Nov: MySense gets national acknowledgement
- ★ **results 2021** end reports for St. Anthonis and Venray:
yes we can measure: different sensor types, humidity/wind problems



year 2022

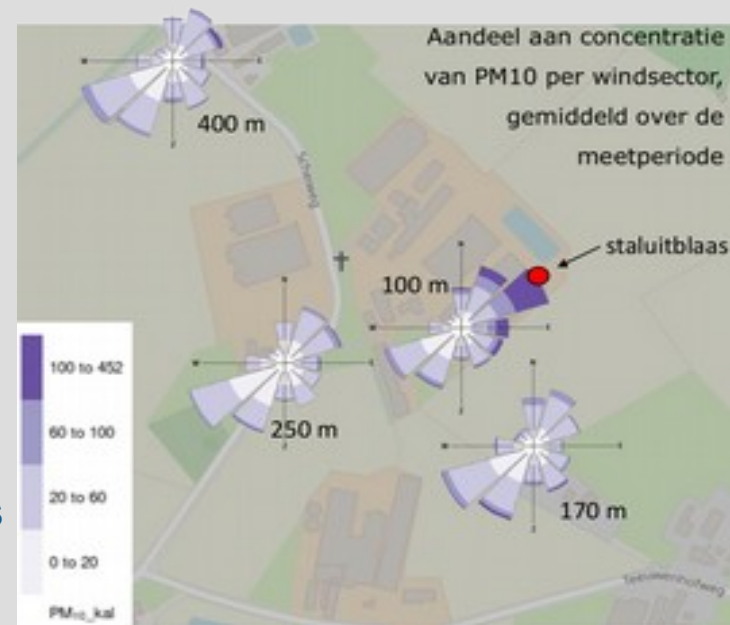
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30 RIVM sensor kits ($\frac{3}{4}$ year)
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- ♦ **results 2021** end reports for St. Anthonis and Venray:
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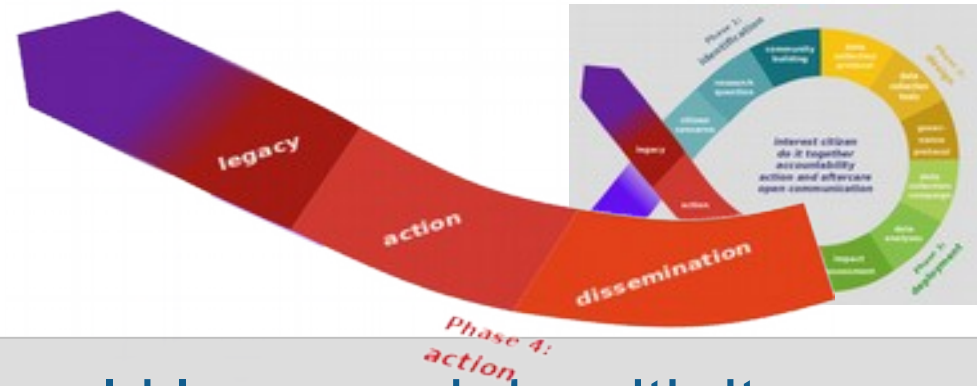


Tompoes contrives a trick: apply the Dutch Clean Air Agreement SLA goal 50% reduction to WHO 2021 (?) levels by 2030

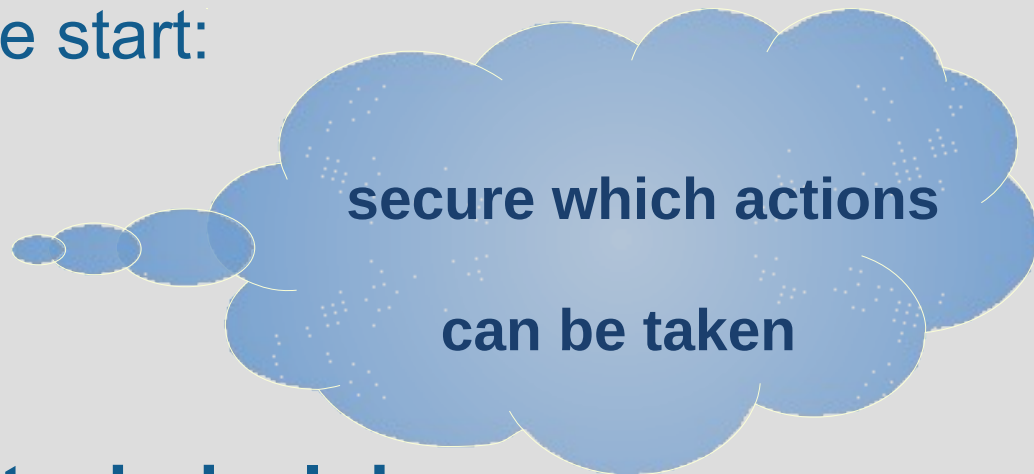
- ★ **2021 Apr:** retry meeting with local government
result: yes! to the measurement network north of Limburg
- Sep:** first meeting: 6 municipalities take part
- Dec:** consultancy group writes a subsidiary proposal
- ★ **2022 Jan:** project plan written without feedback stakeholders
... local government says they are busy with it?
- ★ **Nov:** stakeholder Behoud de Parel rings the alarm bell
status about the implementation measurement network plan?
3 municipalities take part
- ★ **Dec:** Behoud de Parel is told
to refurbish RIVM sensor kits from 3 years ago

so, we failed

our lessons learned (1)



- ★ define first what the world should learn and do with it
 - ♦ rethink twice about data analyse and actions planned for whom am I doing this and which dialect do they use?
 - ♦ incorporate from the start:
 - decision makers
 - politicians
 - your neighbours



★ forget your own technical dreams

our lessons learned (2)

this is only for the technology nurds

- ★ better robust meteo and dust sensors appear on the market
 - ♦ data communication via LTE-M and on-line maintenance
 - ♦ usual firmware software (C/C++) approach is antique
- ★ data acquisition and monitoring software is far more work as expected
 - ♦ monitor everything and build fault recovery in
 - ♦ urgent need for **measurement data exchange format**: together we measure
 - ♦ analysing measurements is still in a naive (too technical) state
- ★ w're not ready for a full scale up
 - ♦ commerce business plan needs to be redefined
- ★ **technology driven approach is misleading and needs to change**

some humble suggestions



★ how to use the measurements:

measure effectiveness SLA implementation actions?

require a real interest in the results

★ and **start to learn:**

- “ why and how people *listen*
- “ what the different people want to *hear*
- “ and how one get *commits* to actions