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Predstavitev nove evropske direktive o kakovosti zraka

May 27th, 2025

FINE AND ULTRAFINE PARTICLES MONITORING IN URBAN AREAS

On the Road to Improved Air Quality

Tomas Prokop – Area Manager, Palas GmbH

Agenda

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02 Road to Improved Air Quality

03 Urban Air Quality Monitoring

04 How Palas Technology Could Help

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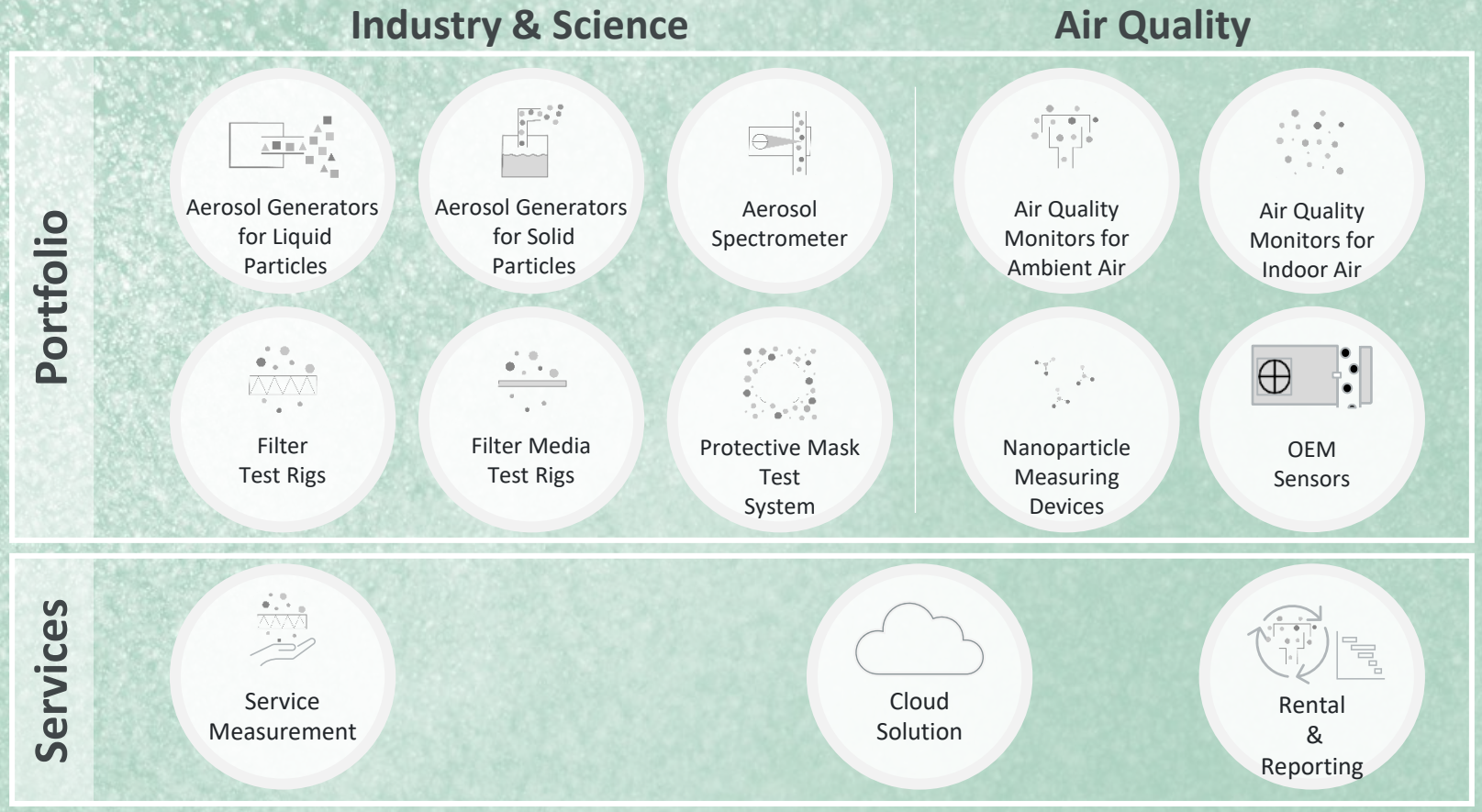
Palas at a Glance

Palas at a Glance

Palas GmbH is a leading developer and manufacturer of high-precision devices for the **generation**, **measurement,** and **characterization** of **particles in air**.



Founded 1983

Headquarters in Karlsruhe, Germany

~ 100 Employees

ISO 9001:2015

Regulatory Monitoring of PMx

Experts for Aerosols in the Environment

More than 5,000 systems dedicated to **regulatory air quality monitoring,** situated at **different climate zones and altitudes in more than 40 countries,** are currently operative in governmental networks for PM limit observation

- US/EU regulatory AQM: ca 50% market share

2

Road to Improved Air Quality

Rising Global Initiatives

EUROPE - new European Ambient Air Quality Directive (EAAQD) - International Context

World Health Organization

Urgent actions needed

- Revised limit recommendations
- Increasing No. of Monitors in general
- Increasing number of $PM_{2.5}$ location
- UFP-Monitoring
- BC Monitoring

European Commission

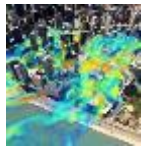
Urgent actions needed

- Lower limits for PM_{10}, $PM_{2.5}$ and NO_2
- Right to sew authorities to meet the limits

- Request to measure UFP

- Request to measure Black Carbon

- More $PM_{2.5}$ stations
- More stations

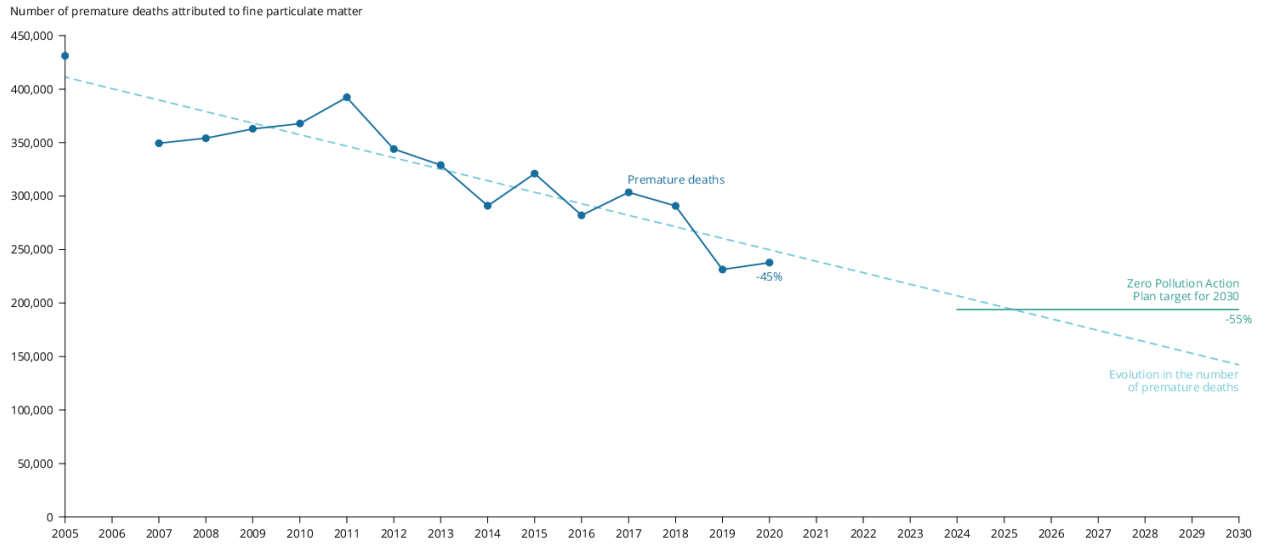


- Usage of indicative sensors in hybrid grids
- Dispersion modelling

… and more

Progress Towards Zero Pollution – Fine Particulate Matter

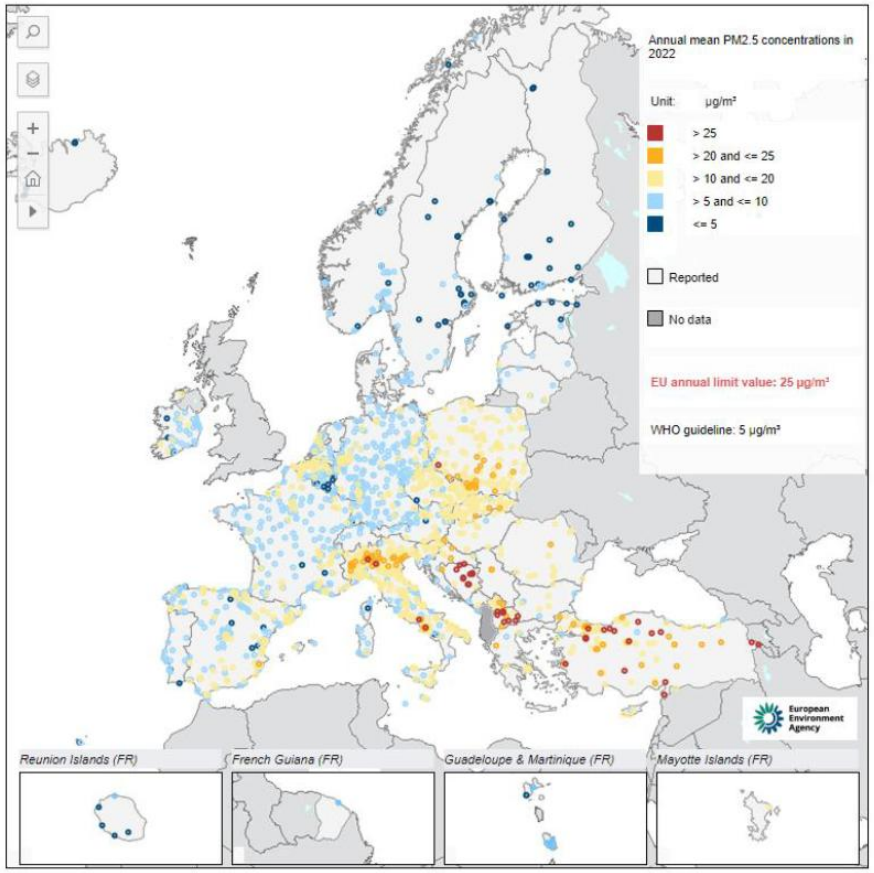
- EU has implemented a **Clean Air Policy**, where the majority focus on **reducing NO_2 and PM levels**
- Fine dust (**$PM_{2.5}$**) is considered as **dominant air pollutant,** where exposures to $PM_{2.5}$ in the EU have **fallen by 45%** since 2005
- EU is on track to reach **55% reduction** level **by 2030**
- **Further efforts needed** to reach the pollution level no longer considered harmful to health by 2050
- Need to tackle air pollution **at its source**

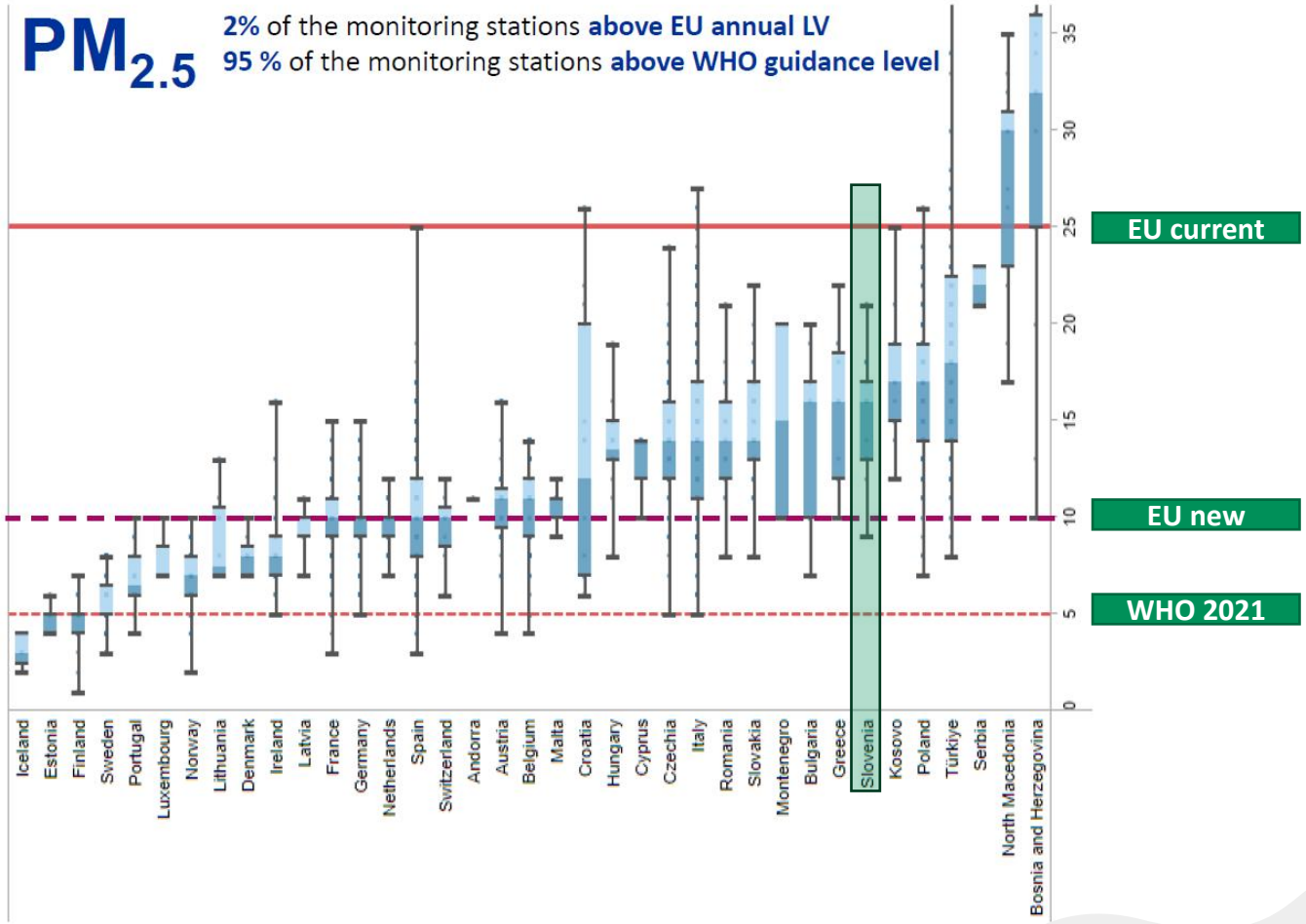


Source: European Environmental Agency – Air Pollution and Health, 2022

Where is air pollution (still) a problem in EU?

$PM_{2.5}$ (2022)





Source: The revised Ambient Air Quality Directive, Thomas Henrichs, Deputy Head of the Clean Air & Urban Policy Unit (European Commission), AQF 2025

WHO Air Quality Guidelines 2021

Interim Targets Projections - Germany

- **Exceedance of WHO AQG Levels and Interim Targets at German Monitoring sites in 2020**

German Environmental Agency, June 2022: "We consider a binding long-term limit value in the range of Interim Target 4 for $PM_{2.5}$ (10 µg/m³) as **feasible**.

For PM_{10} the AQG Level (15 µg/m³) would be attainable with **additional effort**, e.g. addressing residential heating by wood firing."

EU 2030*

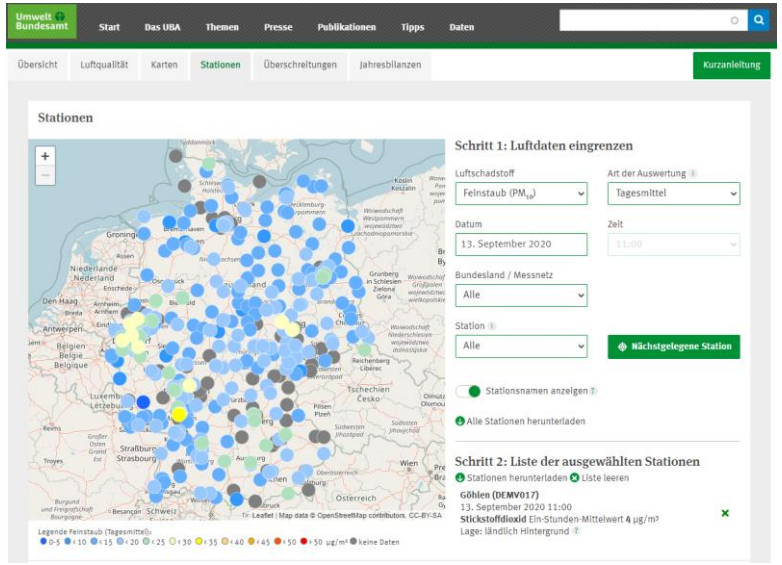
Pollutant		Share of Stations in exceedance				
		Interim Target 1	Interim Target 2	Interim Target 3	Interim Target 4	AQG Level
$PM_{2.5}$	Annual mean	0% > 35 µg/m³	0% > 25 µg/m³	0% > 15 µg/m³	14% > 10 µg/m³	99% > 5 µg/m³
	24 h[a] mean	0% > 75 µg/m³	0% > 50 µg/m³	2% > 37.5 µg/m³	78% > 25 µg/m³	99.5% > 15 µg/m³
PM_{10}	Annual mean	0% > 70 µg/m³	0% > 50 µg/m³	0% > 30 µg/m³	5% > 20 µg/m³	36% > 15 µg/m³
	24 h[a] mean	0% > 150 µg/m³	0% > 100 µg/m³	0% > 75 µg/m³	7% > 50 µg/m³	16% > 45 µg/m³

Scientific Opinion Paper – Considerations on the Revision of the AAQD 2008/50 EU (German Environment Agency, June 2022)

Particulate Matter Monitoring in Urban Areas

Current Situation - Germany

- **Germany** - according to the station database of the Umweltbundesamt [1] in all networks of the states - in total
  - **379 active stations** measuring **PM_{10}**
  - **224 active stations** measuring **$PM_{2.5}$**
  - **1 active station** measuring **PM_1**
- According to a study[2] for the European Parliament, **Germany,** France, Austria, Italy and Poland **are fully compliant with the minimum requirements of the European Regulations** [3]
- Top 23 German cities (> 250,0000 inhabitants), except Berlin and Hamburg (which are states), must develop **clean air plans and mitigation strategies** based on the information only from three PM measurement stations in average – **is it based on sufficient information?**



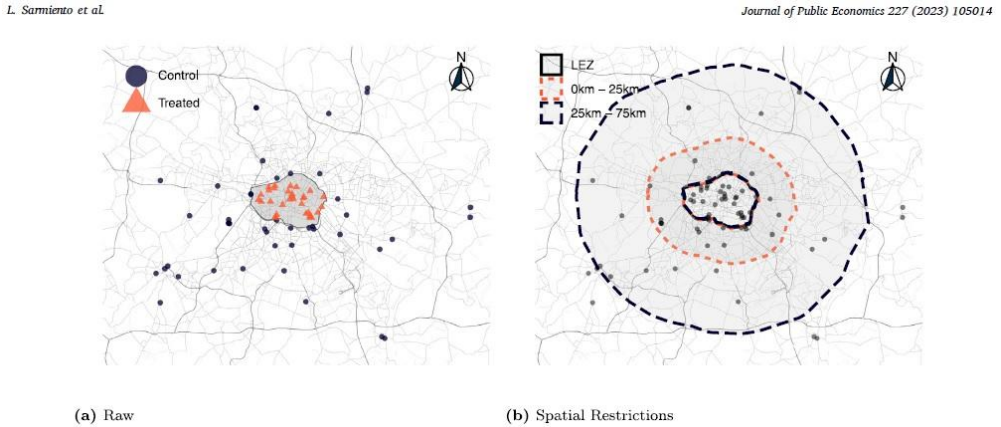
1) https://www.env-it.de/stationen/public/searchLookupDispatch.do sowie https://www.umweltbundesamt.de/daten/luft/luftdaten/stationen
2) „Repräsentativität und Vergleichbarkeit von Messungen gemäß der Richtlinie 2008/50/EG über Luftqualität und saubere Luft für Europa“, Christian NAGL, Wolfgang SPANGL und Iris BUXBAUM PE 631.055 - Juli 2019
3) RICHTLINIE 2008/50/EG DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 21. Mai 2008 über Luftqualität und saubere Luft für Europa
4) Statistisches Bundesamt, Bericht September 2020

3

Urban Air Quality Monitoring

EU Mission: Climate-Neutral and Smart Cities by 2030

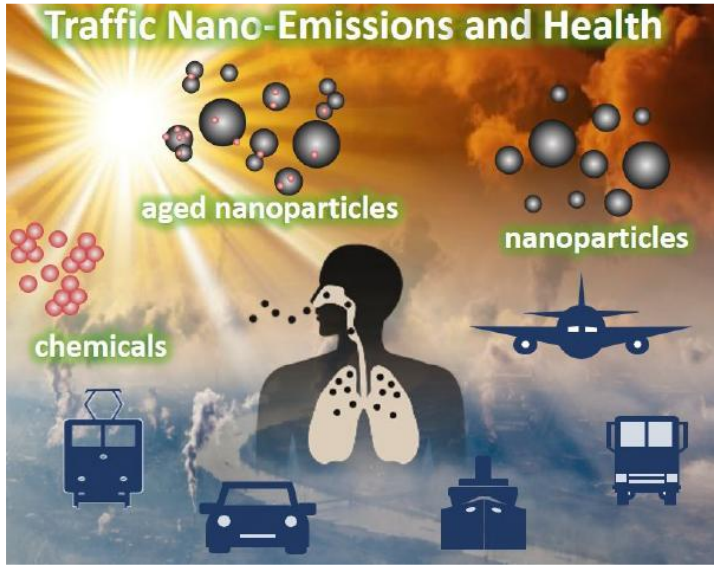
- **Municipalities** are enforcing the environmental zones to **reduce air pollution** in the environmentally sensitive urban areas, and **meeting the** national and international **ambitious targets** (EAAQD - Air Quality Plans, Air Quality Roadmaps)
- Urban air pollution mitigation strategies are based on **reduction of traffic emissions (LEZ/ZEZ)**, and **limitation of fossil fuels burning** as a part of the Clean Air Action Plan
- Monitoring of air quality in those critical zones is to play key role, and we need to accelerate and expand policy interventions to **eliminate $PM_{2.5}$ and UFP emissions**
- Actual input data (stationary AQMS) considered are **without any local specific data available** – indicative solutions to be used (spatial and temporal resolution)

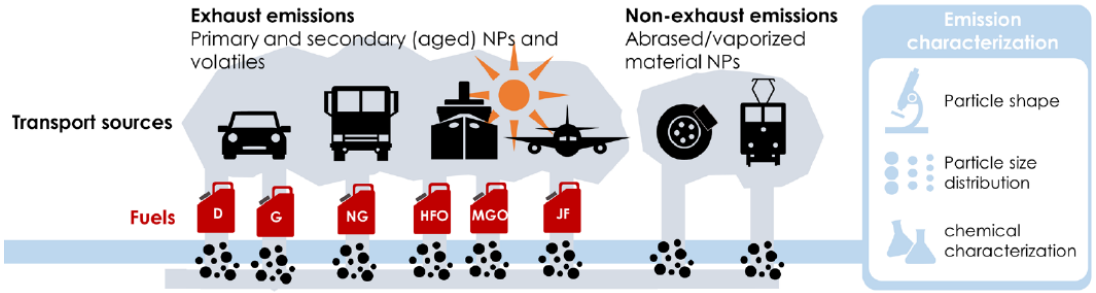


Pollutant	Averaging time	EU current	EU 2030	WHO 2005	WHO 2021
$PM_{2.5}$ µg/m^3	Annual	25*	**10**	10	5
	24 hour	-	**25**	25	15
PM_{10} µg/m^3	Annual	40	**20**	20	15
	24 hour	50	**45**	50	45

Emerging Ultrafine Particles Pollution

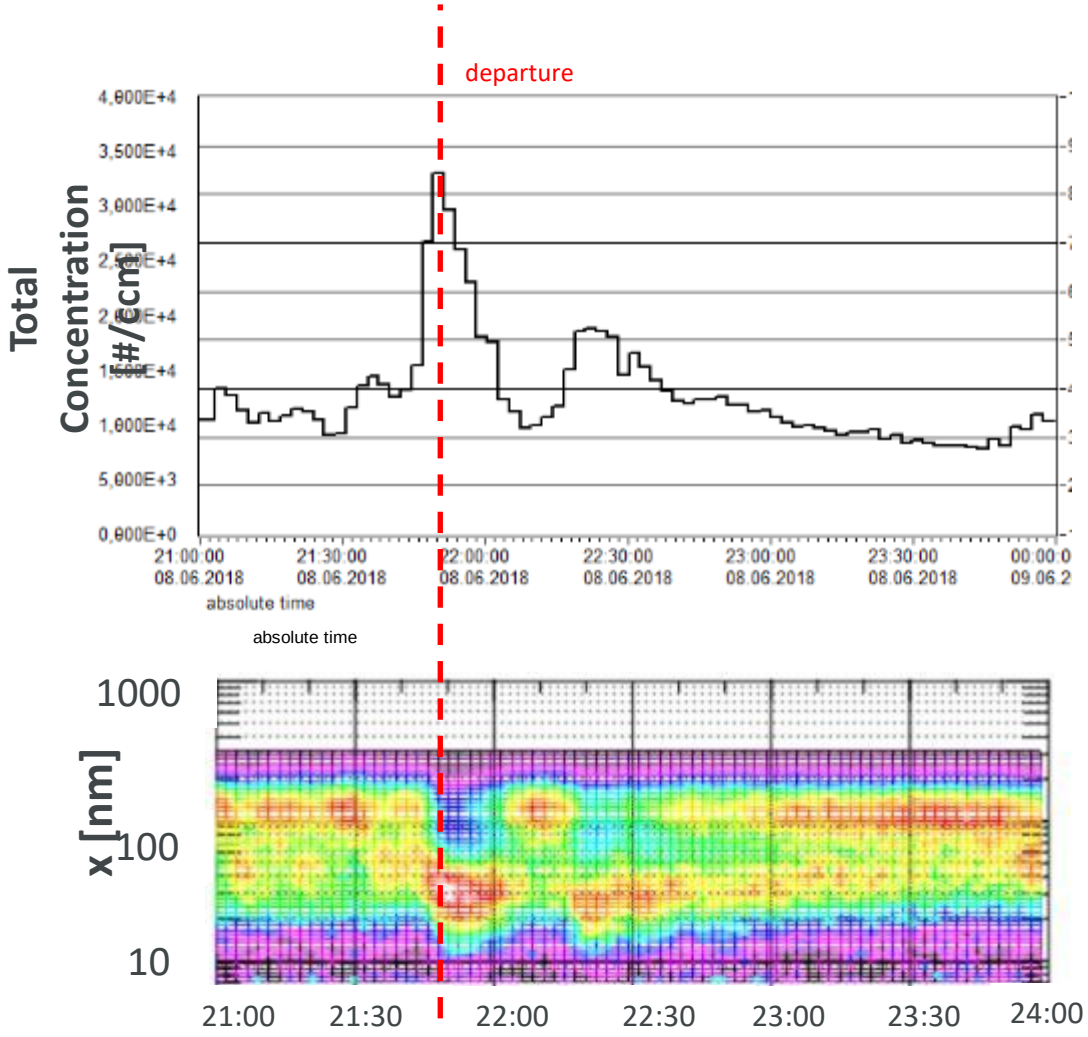
- We can clearly see raise of public awareness of the associations between high air pollution, incl. Ultrafine Particles (UFP, ≥10 nm), and health risks related
- **UFP monitoring** is becoming **part of AQ monitoring** in EU (EAAQD – UFP-stations & Urban/Rural Supersites)
- There is the lack of an established national ambient air monitoring network for ultrafine particles
- Priority monitoring at locations **where high concentrations of UFP occur** that are mainly influenced by sources from air, water or road transport (seaports, airports …), industrial sites or domestic fossil fuel burning





Source: Ultrafine particles from transportation – Health Assessment of Sources, ULTRHAS, 2021

UFP Monitoring at Hotspots (Air-/Sea-Ports)



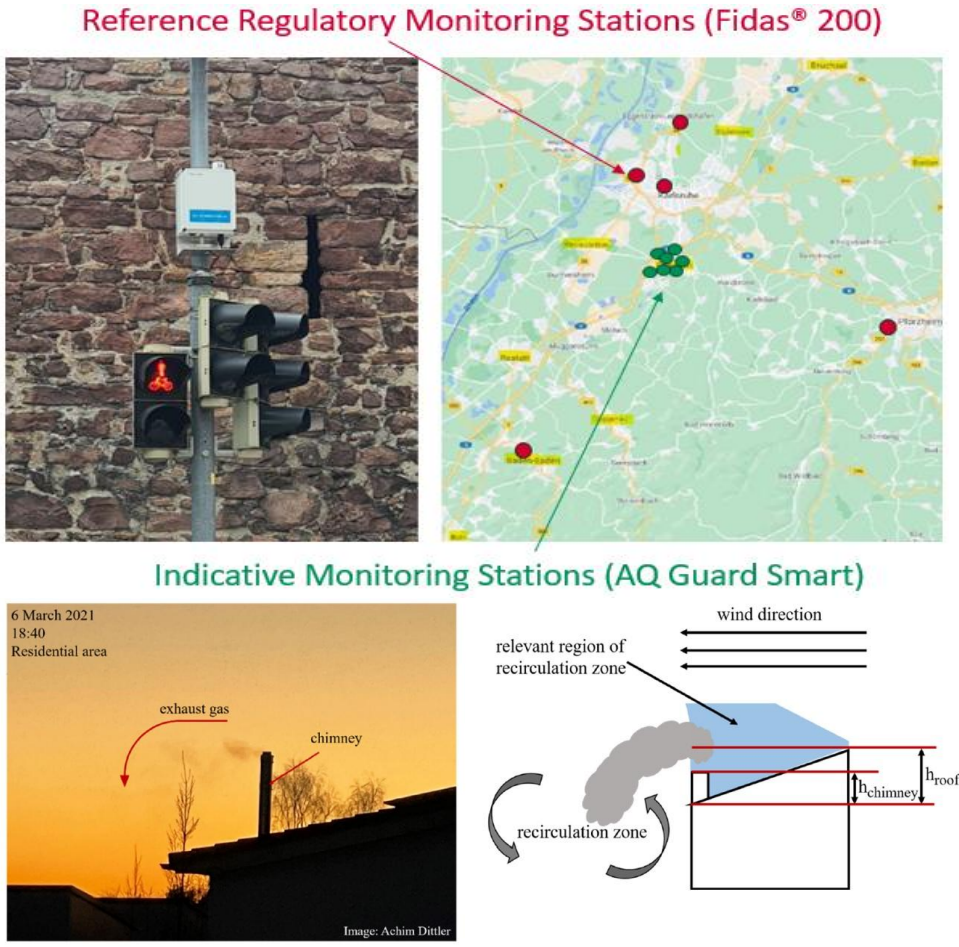
WHO/2021 – **20,000 P/cm³ to be considered as high concentration value** of UFP (1h AVG)

Urban areas – 10,000 – 100,000 P/cm³ (daily AVG 2,000 – 10,000 P/cm³)

Impact of Residential Real-World Wood Stove Operation

PMx and UFPs Measurements in a Residential Areas

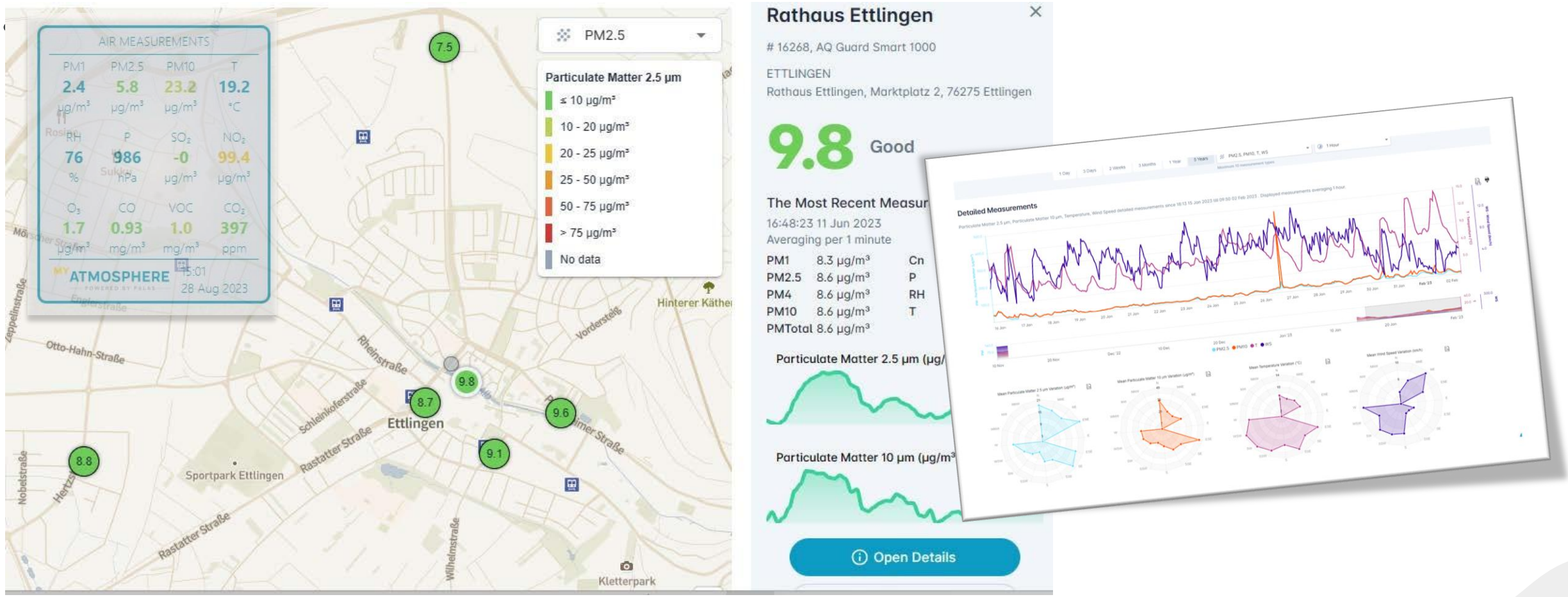
- Several KIT studies to **investigate the local ambient particle concentration (PM/UFP) in** an urban, sub-urban and **residential areas** close to Karlsruhe during summer/winter seasons
- In the winter months, the particulate matter pollution is dominated by **wood-fired heating systems** at residential areas (based on levoglucosan tracing), where a similar PM level observed as in large cities (with pre-dominant traffic pollution)
- Fuel and boiler quality (old/new) as key factors behind related to the combustion conditions, where increased air pollution concentrations measured also related to **improperly installed chimney** - exhaust gas to remain in a recirculation zone (low level chimneys – horizontal flows)
- High dependance on meteorological/dispersion conditions



Source: Dittler, A. et al., Impact of Residential Real-World Wood Stove Operation on Air Quality concerning PM2.5 Immission. Processes 2022

Public Access to Real Time Data Is Needed

Data Visualization and Presentation - Online Data Platforms - “MyAtmosphere”



https://www.ettlingen.de/entwickeln/digitalisierung/sensorik/umweltsensorik

4

How Palas® Technology Could Help

Palas® Technology

Air Quality Monitors (reference/equivalent)

Fidas® 200

Certified devices specially for regulatory monitoring of ambient air

Fidas® Smart

Compact certified devices specially for regulatory monitoring of ambient air

Air Quality Monitors (indicative / near-reference)

AQ Guard Smart

Optimized for harsh environments supported by emerging gas measurements (e.g., NO_2, O_3) or UFP

Environmental Connection Box (low-cost)

ECoB

Indicative measurement solution connected via Bosch Cloud Service for monitoring of PMx, CO, NO_2, SO_2, and O_3

PALAS®

Palas® Technology

What distinguishes our technology from our competitors

- On-site calibration
- Highly effective and proven technology

- High res. particle size distribution available
- Self-Monitoring (channel deviation, tightness)

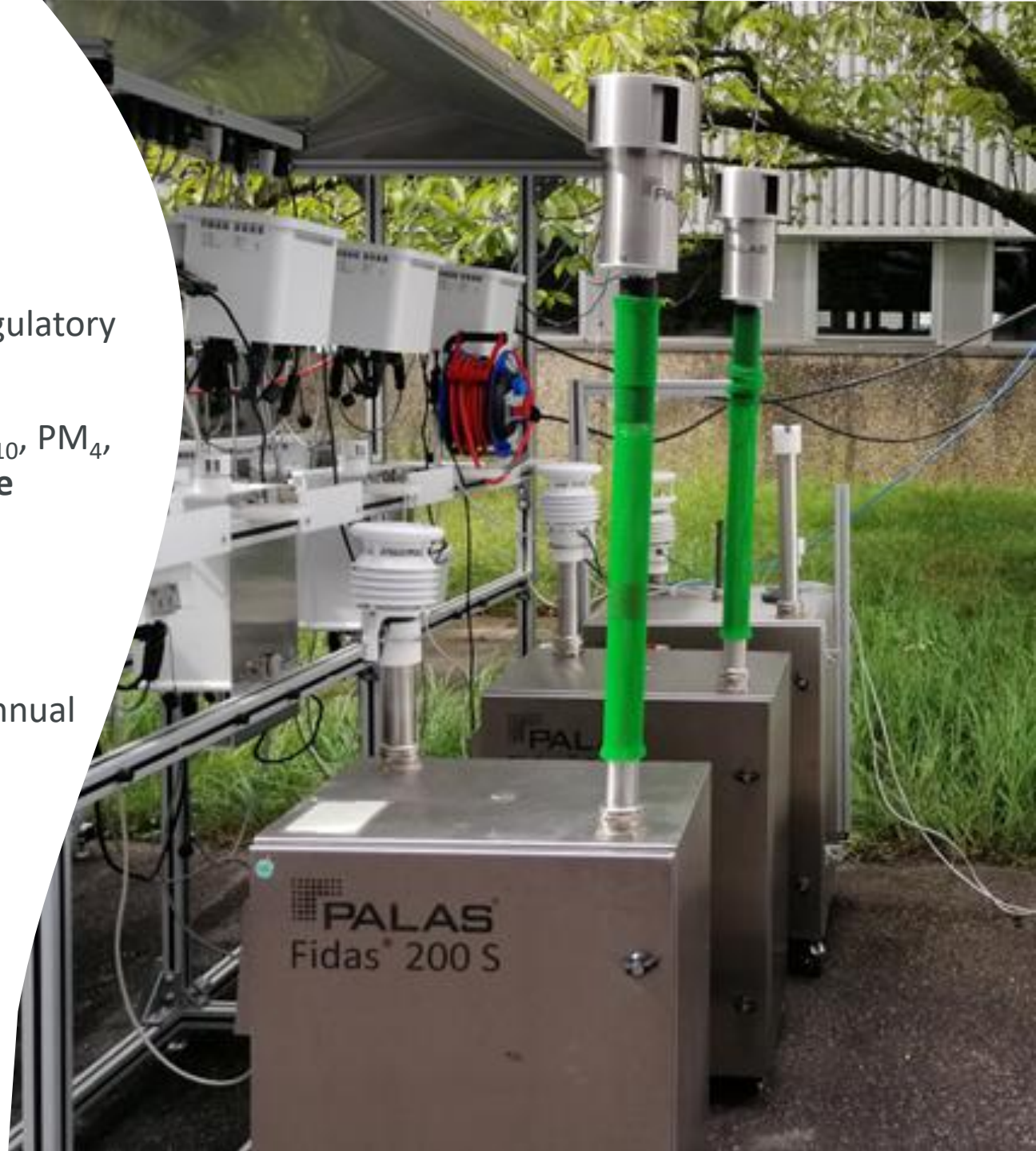
- Fast setup
- Flexible solution for all applications
- No additional computer necessary

- Low service demand
- Lowest total cost of ownership

Palas® Technology

Fidas® 200/E/S as Reference (EN 16450 Certified)

- Fidas® Series - more than 5,000 systems dedicated to regulatory air quality monitoring (**50% market share**)
- **Simultaneous and continuous measurement** of TSP, PM_{10}, PM_4, $PM_{2.5}$, PM_1, and also particle size distribution **in real-time** (1 sec time resolution)
- **Intelligent aerosol drying system** allows measurement independent of humidity and amount of semi-volatiles
- High data availability: Measuring cycle 60/60min, 99% annual data availability. **Redundant sampling system with two pumps**
- **Unique on-site calibration** by calibration standard
- Continuous **self-diagnostic** and status reporting
- **Built-in computer** – no extra datalogger needed



Palas® Technology

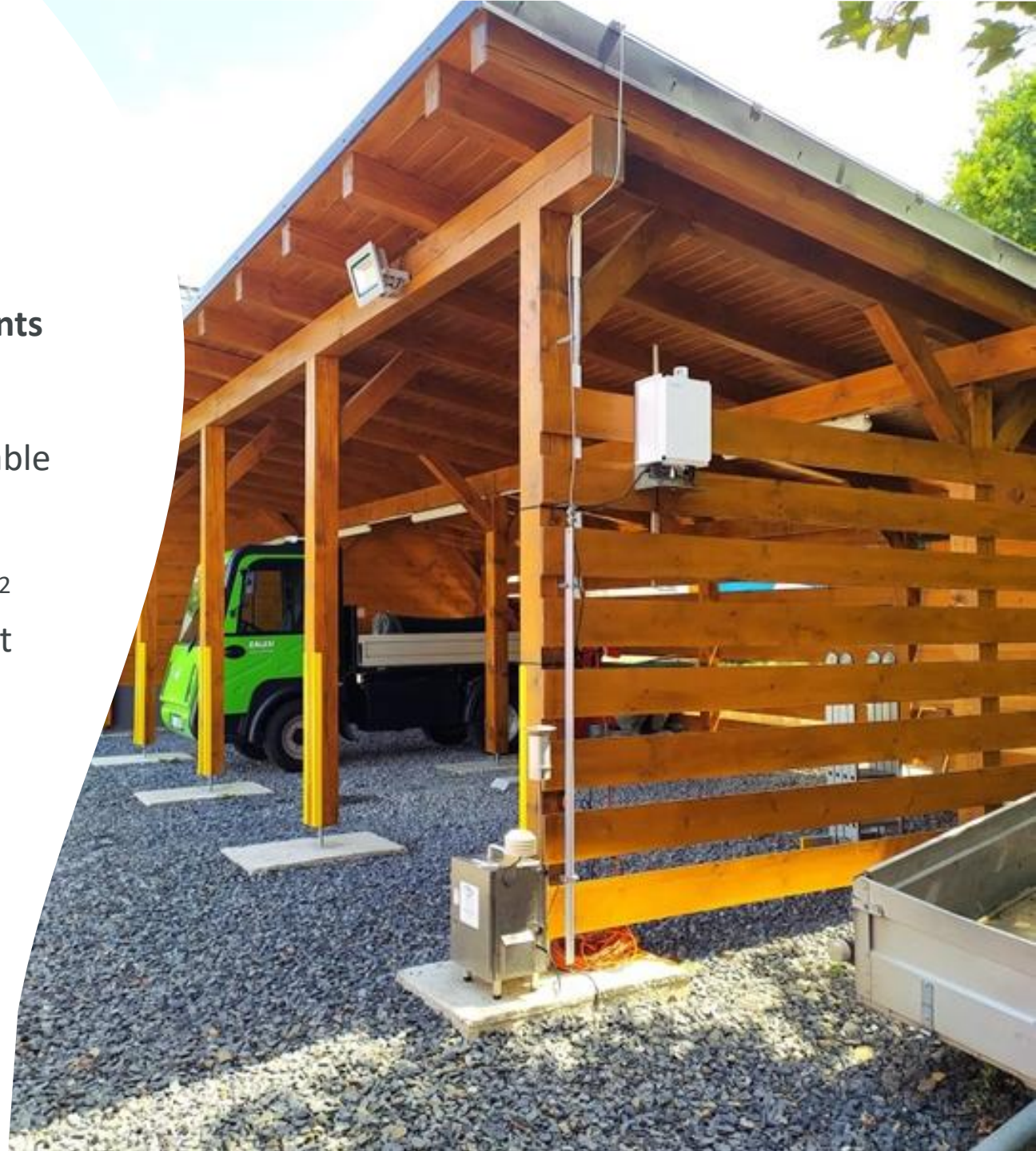
Fidas® Smart 100 as Transfer Standard (EN 16450 Certified)

- Fidas® Smart 100 **standalone device** requires no infrastructure except power (AC or 12V DC)
- **Precise optical technology** & signal evaluation derived from Fidas® System, the most frequently used PM monitor (EU)
- Simultaneous and continuous measurement of TSP, PM_{10}, PM_4, $PM_{2.5}$, PM_1, and also particle size distribution in real-time (1 sec time resolution)
- Intelligent aerosol drying system allows measurement independent of humidity and amount of semi-volatiles
- Unique on-site calibration by calibration standard
- Continuous self-diagnostic and status reporting
- Built-in computer – no extra datalogger needed
- **Low cost of ownership & energy consumption**

Palas® Technology

AQ Guard Smart as Near-Reference

- **Near reference quality & simultaneous PM measurements**
- New, efficient **temperature regulated inlet**
- **Fidas® derived** optical module, incl. unique onsite traceable **calibration features** (calibration standard included)
- Optional gas sensor measurements SO_2, NO_2, O_3, CO, CO_2
- External sensor for T/rH/p, optionally wind measurement
- Housing IP66/IK09/NEMA 4X in polyester/polycarbonate
- Ready for wall/pole/tripod mounting
- Cloud based data storage & management (MyAtm.)
- Instant and intuitive data visualization
- **Attractive pricing**
- **Dedicated UFP Monitoring – AQ Guard Smart 2000**



Palas® Technology

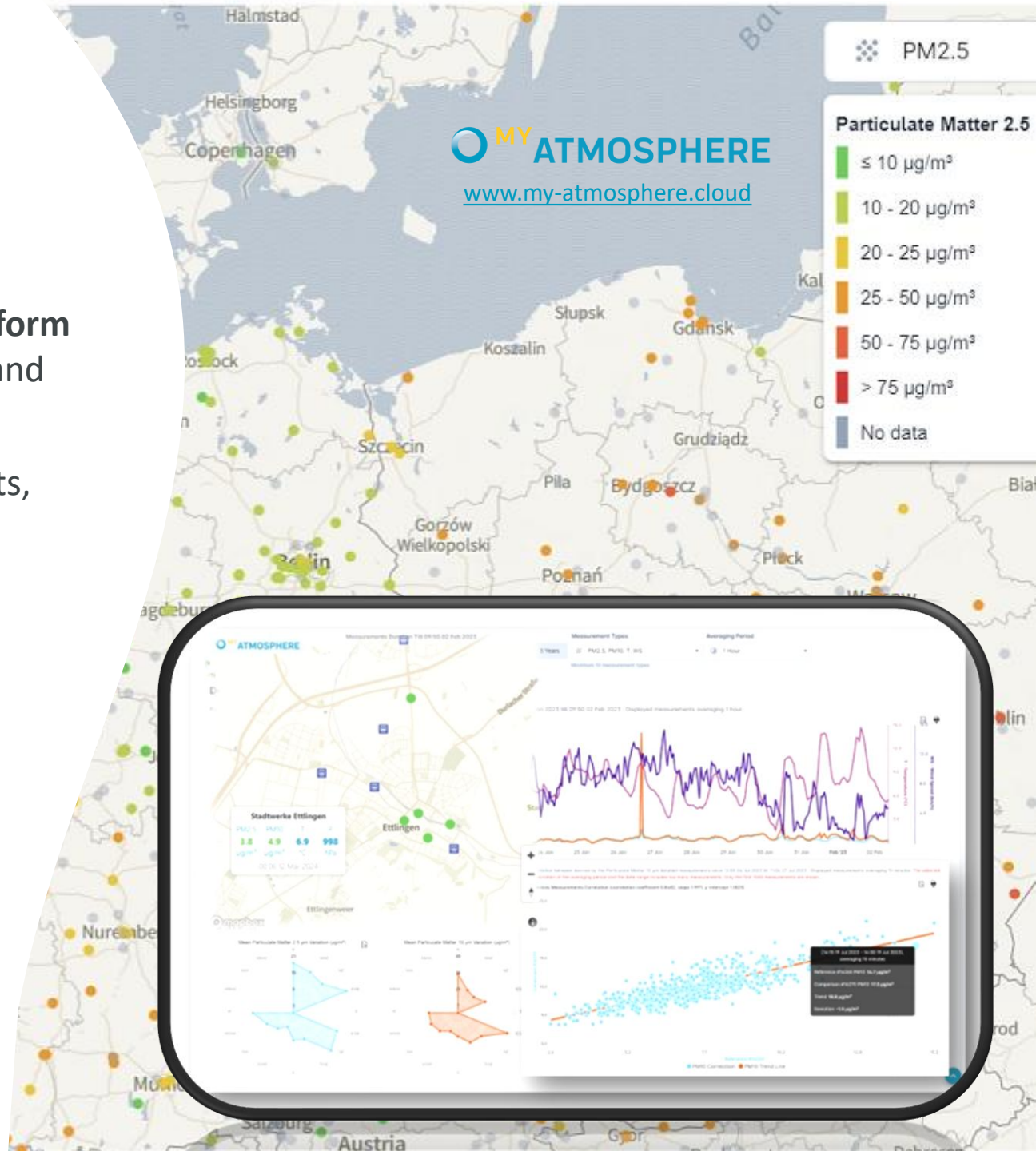
ECoB as Low-Cost Sensor Solution

- **Environmental Communication Box** (ECoB) by Palas in cooperation with Bosch
  - Laser based particle monitoring of PM_1, $PM_{2.5}$, PM_{10}
  - Integrated sensors for SO_2, NO_2, O_3, CO
  - Sensors for T/rH/p integrated
  - Rugged plastic housing lightweight for outdoor use
  - Ready for wall/pole/tripod mounting
- **Extensive factory calibration** against reference systems for best agreement, accuracy and precise data
- **Continuous validation** of the data via the Bosch Cloud Services
- Possible Integration into **Bosch Mobility Solutions** & **Traffic Management Systems**

Palas® Technology

MyAtmosphere as Online Digital Platform

- Online **Data Management, Visualization & Analysis Platform** supporting data harmonization, validation, aggregation and correction processes
- Different types of **data visualization and reporting** (charts, wind/concentration roses, interactive map, …)
- **Data comparison** of up to 5 stations, **correlation** plots
- Various formats of **export data**, including real-time data streams, Website Data Widgets, OData Feed and other
- Device **status management** and **self-diagnostic** feat.
- Advanced **account management**, MetaData records
- **API communication** support (multiple platforms)
- Live-DEMO available – **just REGISTER**, please!



Rental & Reporting

Your Rental Service for Environmental Monitoring Technology

Choose the device that is right for you

- AQ Guard Smart System
- Fidas® Smart System

How do you want to manage your data?

- MyAtmosphere Cloud

For how long will you need the devices?

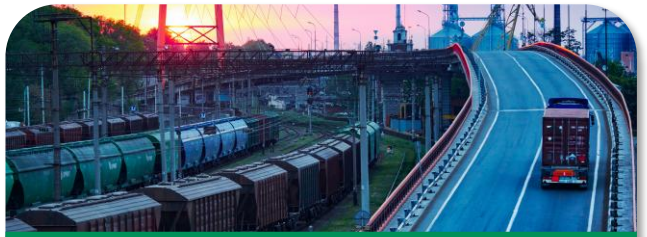
- Package S:
  <4 weeks
- Package M:
  >4 weeks, <12 months
- Package XL:
  >12 month, <36 months

Can we offer you additional services

- API for MyAtmosphere Cloud
- Standardized weekly or monthly report
- Training

Applications

Overview



NETWORK WITH ROADS, RAILS & PORTS

SMART CITY APPLICATIONS

OPEN PIT MINING & LANDFILLS

CONSTRUCTION SITES

INDUSTRY

NATURAL RISK AREAS

Air Quality Forum 2025 – Webinar Series

Have You Missed the Air Quality Forum?

We decided to offer a webinar series giving you the chance to revisit the key presentations and insights.

There will also be an additional webinar on our solutions for the new air quality directive.

10.06.2025: Thomas Henrichs, Deputy Head of the Clean Air & Urban Policy Unit (European Commission)

11.06.2025: Rosamund Adoo-Kissi-Debrah, J. K. Smith (Ella Roberta Foundation)

17.06.2025: Anna-L. Franke (Deutsche Umwelthilfe e.V)

18.06.2025: Emma Bud (ClientEarth): Legal Obligations and Opportunities for Cities

***25.06.2025**: Dr. Stefan Hogekamp: AAQD Directive (EU) 2024/2881

https://count.palas.de/airqualityforum/air-quality-forum-webinars/

PALAS®

Our products monitor fine and ultra-fine particulates wherever it matters.

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