



Atmosphere Monitoring

How does **CAMS** contribute to better modelling for assessment and planning, in the context of the Ambient Air Quality Directive?

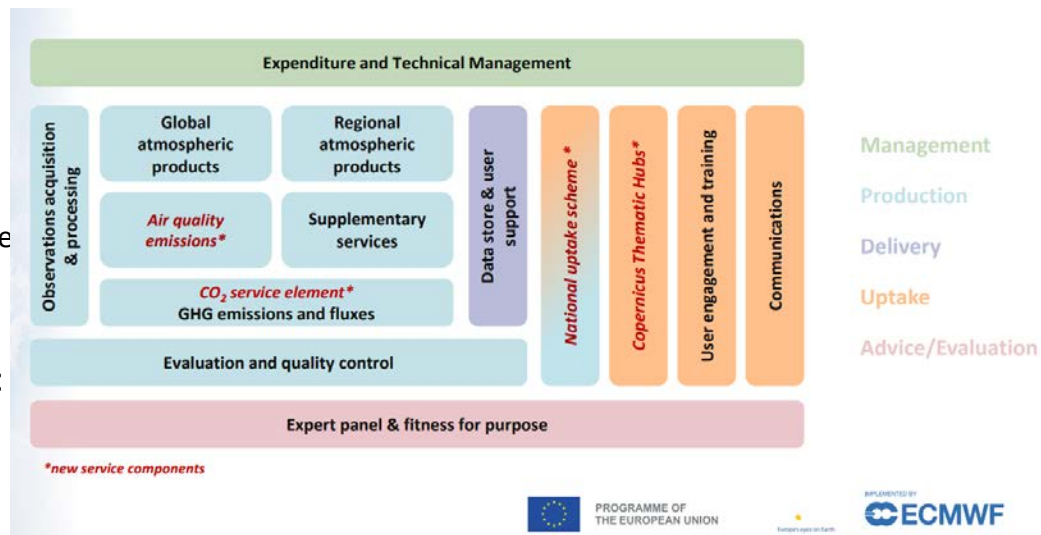
Augustin COLETTE (Ineris)

FAIRMODE Plenary Meeting
Prague, March 5th, 2025





- Difference phases in Copernicus:
 - Copernicus 1 (2015-2020),
 - Copernicus 2 (2021-2028),
 - Copernicus 3 (2028 -)
 - Several Services are now entering their second phase within Cop 2 (2025-2028), therefore in line with the tri-annual FAIRMODE Workplan
- Services most related to European air quality :
 - CAMS2_40: Regional Production
 - CAMS2_71: Policy Support
 - CAMS2_61: Emissions
 - CAMS2_83: Evaluation and Quality Control
 - CAMS2_72: National Collaboration Prog.



FAIRMODE

Benchmarking

CAMS Policy Support

AAQD
Modelling applications

AQ Planning



AQ Forecast

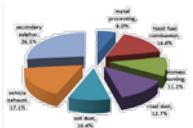


AQ Model quality



Source & emissions

Source appt.

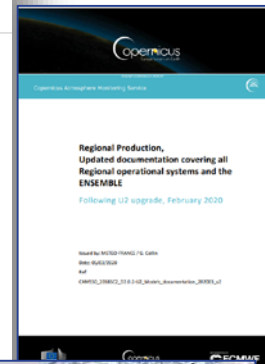


QAQC	WG2, WG3	↔	EQC (C82, C83)
Dust	WG8	↔	C40, C71
Emissions	WG7	↔	C61
Comp Map	WG2	↔	NCP, C40 (IRA/VRA)
Data Fusion	WG6	↔	NCP, C40 (IRA/VRA)
Src. App.	WG1	↔	C71
Planning	WG5, WG9	↔	C71
Forecast Info		...	C40
Short Plans	WG5, WG9	...	
Microscale	WG4	...	

Overview

Regional products

- City & Country impact
- Country contribution
- Sector apportionment
- Policy scenarios
- Chemical speciation
- Model evaluation



Emission products



Guidance & recommendations



- A one-stop-shop website with daily updated modelled diagnostics to understand air pollution
- Assessment reports
- Policy User Community (workshops)

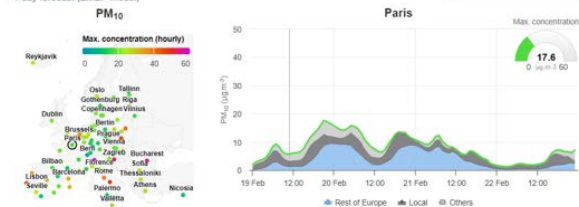
- User Support
=> <https://atmosphere.copernicus.eu/help-and-support>

Implemented by ECMWF as part of the Copernicus Programme News Events Press Tenders Help & Support

Data About us What we do

Policy Support Daily Source Attribution Yearly Air Pollution Analysis Reports Workshops Documentation FAQ

Air pollution at target cities 4-day forecast (EMEP model)



For more information and additional results (past results, comparisons with [observations](#), [source apportionment](#), and [satellite observations](#)), check out the other [data source attribution](#) products.

Our services

CAMS policy support provides a number of products and results that aim at supporting decision and policy making in the management of **air pollution episodes** and reporting under European Directives. Policy services are based on the air quality regional services capacities to elaborate added value products describing the evolution of air quality in Europe and the influence of the main anthropogenic sources, helping in designing appropriate and efficient policy responses to episode situations.

Country impact/contribution

Sector apportionment

Policy scenarios

Chemical speciation

Model evaluation

Air Quality Reports



What's new in the 2025-2028 phase ?

- **Assessment reports**
 - Interim Assessment Report for the year 2024 scheduled for publication 30/5/2025 (using UTD data)
 - Annual Assessment Report for the year 2023 scheduled for publication 30/10/2025 (using Validated data)
- **What's new:**
 - More attractive look & feel to increase public visibility
 - Align with 2024/2881 AAQD
 - Quartely Report including focus on episodes and 3-monthly statistics, including consultation with national representatives (JFM published 30/4/2025, etc..)
 - Include dedicated chapters on dust/fire contribution and ozone regimes (starting 2026)



Issued by: Meri Norvaly / Michael Schult, Augustin Morlet, Serliana Thoni
Date: 2023-09-22
Ref: CAM2-71_AnnualReport_2022.docx

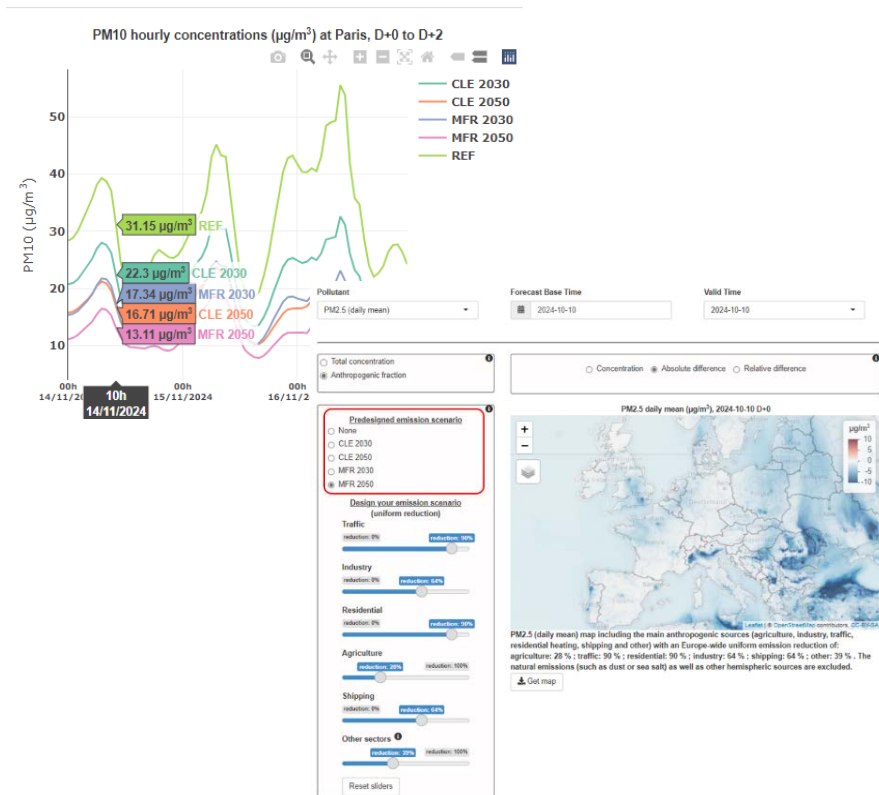




What's new in the 2025-2028 phase ?

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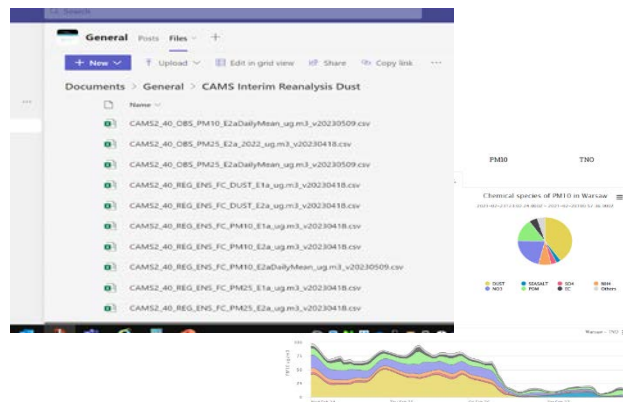
- **Policy Products:**
 - Air Control Toolbox: « Potential Impact » sector allocation, custom scenario and chemical regime based on surrogate modelling (CHIMERE)
 - City/Country Source/Receptor based on brute force (EMEP) or tagging (LOTOS-EUROS)
- **What's new:**
 - Revision of the website
 - Increase spatial resolution, number of target cities in the web tool (120), numerical data through API
 - Display policy relevant scenarios (CAO3)
 - More sub-sectoral details (TOPAS, tagging)
 - Comparison with JRC SHERPA





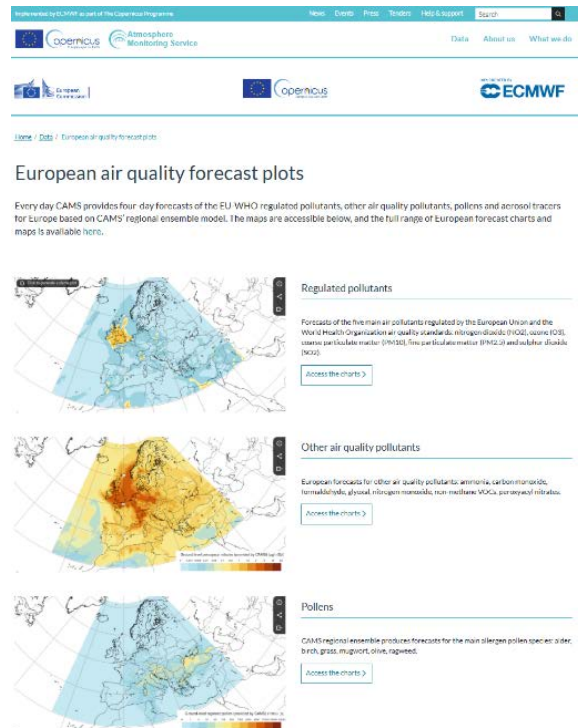
What's new in the 2025-2028 phase ?

- Support to the implementation of the European legislation
 - Task 7141 Quantification of natural dust contribution to PM air pollution exceedances in Europe
 - Task 7142 Impact of wildfires on European air quality
 - Task 7143 Typology of ozone concentrations in European Countries
- Follow-up of the joint CAMS/FAIRMODE initiative on dust discounting in 2023/2024.
- Deliverable: Written-up report and numerical data (API or json files at monitoring stations/AQ Zones)
- Methodology consistent with DG-ENV Guidance and Implementing Acts
- Planning :
 - Fall 2025: Methodological concept
 - Dec 2025: Web prototype and start of production
 - Dec 2026: Operational web-based interface
 - Spring 2027: Annual report for the year 2026 in IAR2026





- Business as usual
 - 11 member AQ forecast at 10kmx10km resolution
 - Near Real Time 96hrs forecast, analysis, interim and validated reanalysis
 - Ten vertical levels (surface to 5000m)
 - Air pollutants: O3, NO2, NO, PM10, PM2.5, SO2, CO, NH3, total Peroxy-Acetyl Nitrates (PANs), total Non-Methane Volatile Organic Compounds (NMVOC), formaldehyde (HCHO), glyoxal (CHOCHO) PM speciation: PM10 from wildfires, PM10 from dust, PM2.5 secondary inorganic aerosols, and PM2.5 from ammonium, PM2.5 from nitrate, PM2.5 from sulfate, PM2.5 from residential elementary carbon, PM2.5 from total elementary carbon, PM2.5 from total organic matter
 - Pollens: Birch, olive, grass, ragweed, mugwort, alder pollens (forecast data only, noanalysis)
- What's new
 - Deposition fluxes of nitrogen, sulfur, ozone and BC
 - Pollens; hazel and cypress
 - More timely VRA production (Q1/YY+2)
 - Harmonization of landuse, vertical grid, boundary condition and emission injection
- Development (scheduled for production after 2028)
 - Increase of the resolution to 3 to 5 km² (physics or data-driven)
 - Assimilation of Sentinel 4 observations
 - Initialisation of the forecast with analysis
 - Spatialized MOS (machine learning enhanced production)

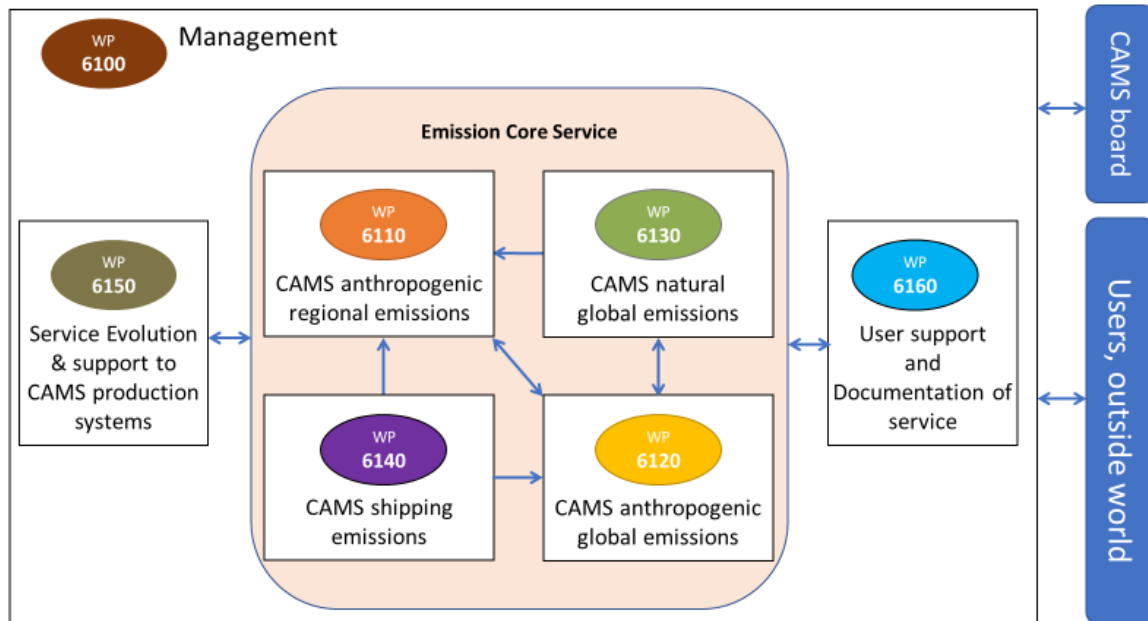




- CAMS emission service provides annually updated emission datasets for both anthropogenic and natural sources, at various scales

- Anthropogenic emissions at Eur + global scale
- Natural emissions (biogenic, ocean, soil, volcanoes)
- Shipping emissions

All developed in support of modelling activities





CAMS2_61 anthropogenic emissions : Europe

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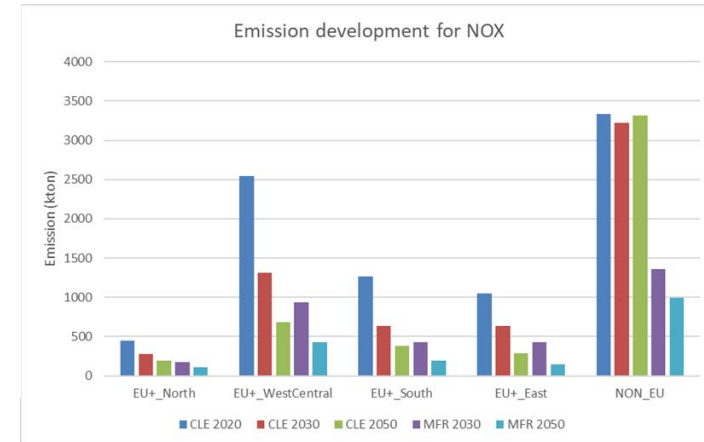
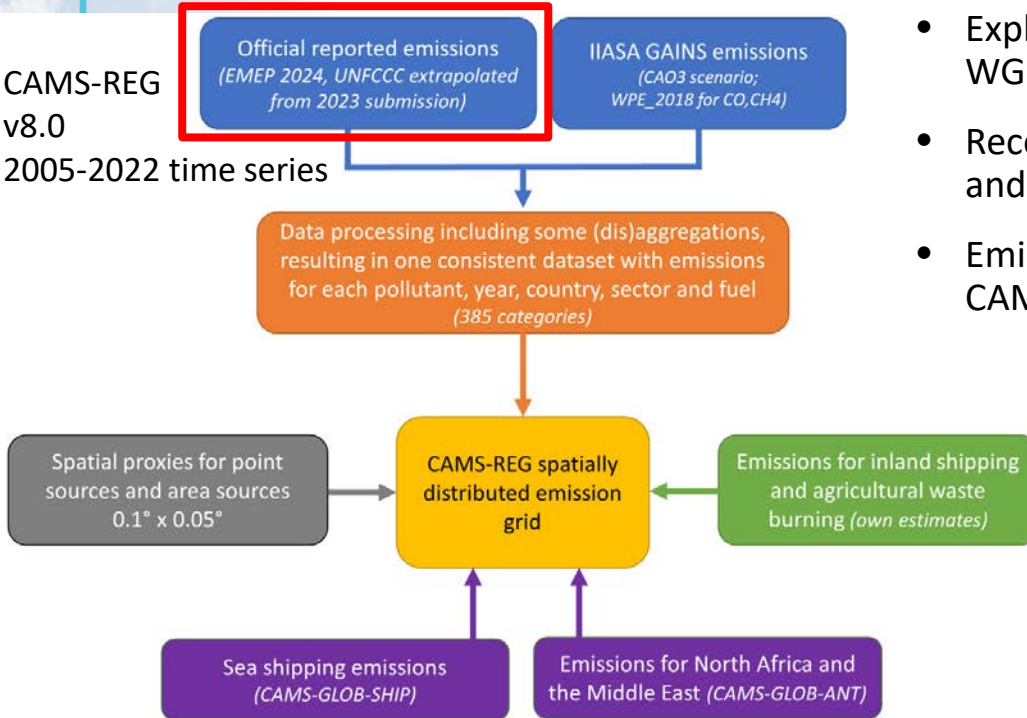
CAMS-REG provides consistent emission input for modelling work in support of AQ Directive

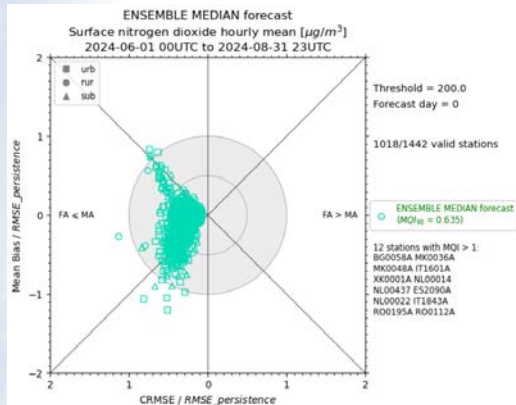
Recent/new developments:

- Exploring higher resolution/downscaling (FAIRMODE WG7, CAMS-NCPs, HEU projects)
- Recent years: bridge the gap between reporting year and current year
- Emission scenarios (CAO3) prepared in framework of CAMS policy: supporting AQ planning

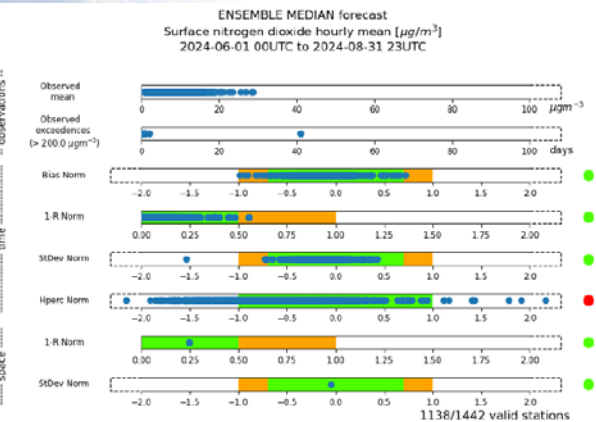
CAMS-REG
v8.0

2005-2022 time series





Forecast target plot and summary report for the daily regional ENSEMBLE forecasts: NO_2 , summer season of 2024 (figure made by Météo France)

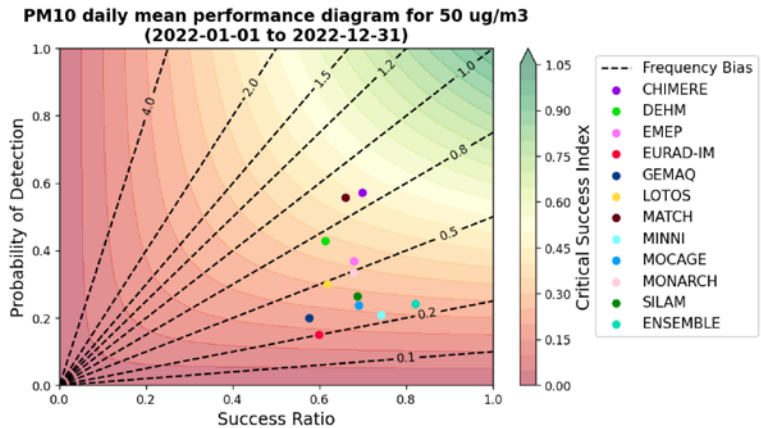


Use of FAIRMODE-type of plots in CAMS regional evaluation

Regional models meet MQO most of the time! (against measurement stations that are representative for the regional scale)

One exception is the Hperc norm for NO_2 – very few exceedences difficult to reproduce by regional models.

Performance diagram for the Validated Reanalysis produced by the CAMS regional models: PM_{10} , 2022 (figure made by INERIS)





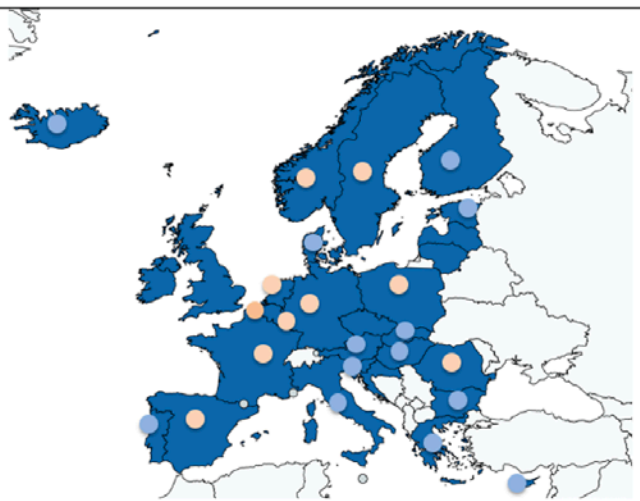
Forthcoming:

- Update of AAQD, with new and lower thresholds
- We will need to update plots correspondingly
 - Need to bear in mind that uncertainties increase at lower concentrations (true for both models and measurements)
- Other developments (in CAMS2_83_bis, if accepted):
 - Considering 'radar plots' presented by Alexander de Meij at earlier CAMS-FAIRMODE meetings (focus on different temporal and spatial gradients)
 - Improving daily FAIRMODE plots on our web server (esp. forecast targets)
 - Include ACTRIS observations in evaluation (esp. ACSM)
 - Increased contact both with model teams and FAIRMODE
 - The new contract would start on 1 May 2025

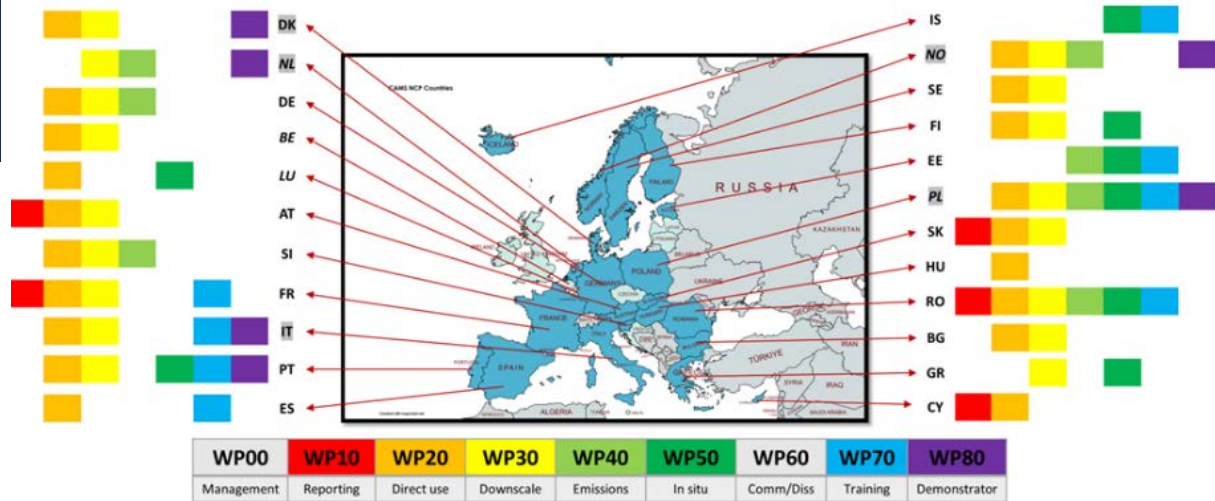


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Users' uptake: NCPs status



Current CAMS NCP (dynamic mapping Q4/2024)



NOTES

WP00 and WP06 are mandatory for all projects.
 Countries with highlighted codes are in their bis phase.
 Belgium and Luxemburg (1st contract), Netherlands, Norway and Poland (2nd contract) have not started yet.
 WP80 added in Phase 2





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Many thanks for your attention !
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