



**CoCo2**

Prototype system for a  
Copernicus CO<sub>2</sub> service

# Engagement and implementation plan

## V2

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[coco2-project.eu](http://coco2-project.eu)



Co-ordinated by  
 **ECMWF**





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## D8.8 Engagement and implementation plan V2

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# CoCO2: Prototype system for a Copernicus CO<sub>2</sub> service

Coordination and Support Action (CSA)  
H2020-IBA-SPACE-CHE2-2019 Copernicus evolution –  
Research activities in support of a European operational  
monitoring support capacity for fossil CO<sub>2</sub> emissions

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# 1 Introduction

## 1.1 Background

To support EU countries in assessing their progress for reaching their targets agreed in the Paris Agreement, the European Commission has clearly stated that a way to monitor anthropogenic CO<sub>2</sub> emissions is needed. Such a capacity would deliver consistent and reliable information to support policy- and decision-making processes.

To maintain Europe's independence in this domain, it is imperative that the EU establishes an observation-based operational anthropogenic CO<sub>2</sub> emissions Monitoring and Verification Support (CO<sub>2</sub>MVS) capacity as part of its Copernicus programme.

The CoCO<sub>2</sub> Coordination and Support Action is intended as a continuation of the CO<sub>2</sub> Human Emissions (CHE) project, led by ECMWF. In the Work Programme, ECMWF is identified as the predefined beneficiary tasked to further develop the prototype system for the foreseen CO<sub>2</sub>MVS capacity together with partners principally based on the CHE consortium. In addition, ECMWF will continue some of the work initiated in the VERIFY project as well.

The main objective of CoCO<sub>2</sub> is to perform R&D activities identified as a need in the CHE project and strongly recommended by the European Commission's CO<sub>2</sub> monitoring Task Force. The activities shall sustain the development of a European capacity for monitoring anthropogenic CO<sub>2</sub> emissions. The activities will address all components of the system, such as atmospheric transport models, re-analysis, data assimilation techniques, bottom-up estimation, in-situ networks and ancillary measurements needed to address the attribution of CO<sub>2</sub> emissions. The aim is to have prototype systems at the required spatial scales ready by the end of the project as input for the foreseen Copernicus CO<sub>2</sub> service element.

## 1.2 Scope of this deliverable

### 1.2.1 Objectives of this deliverable

The main purpose of work package 8 was to develop a mechanism and the tools to provide diverse, but targeted, information to the relevant stakeholders and user communities. Examples of stakeholders are the relevant Directorate-Generals of the European Commission (e.g., DG-CLIMA) and the EU member states. Examples of user communities are local and regional policy makers, scientists, companies, and investment banks. This was achieved by several user consultation meetings and workshops, but also by using existing international communication and planning mechanisms.

D8.8 provides the implementation plan, which reflects on the CoCO<sub>2</sub> engagement plan and makes recommendations based on the lessons learned. Engagement entails the provision of information about the project goals and outcomes, but also, more importantly, discussions with the stakeholders and user communities to collaboratively define added-value products in support of their existing activities in the context of emission monitoring,

### 1.2.2 Work performed in this deliverable

As per the Description of the Action, D8.8 should provide the user implementation plan for the project.

The work to create the plan included collection of input from the partners and summarise the feedback received on the various user engagement activities carried out in the project.

### 1.2.3 Deviations and counter measures

None.

## 2 Engagement Plan

### 2.1 Background

To deliver the prototype systems of the new anthropogenic CO<sub>2</sub> emissions Monitoring & Verification Support capacity (CO<sub>2</sub>MVS), CoCO<sub>2</sub> is strongly collaborating with the European Commission and its CO<sub>2</sub> Task Force, ESA and its CO<sub>2</sub>M Mission Advisory Group, EUMETSAT, the CO<sub>2</sub> science community, and the Copernicus Services. For the latter, a very close relationship exists with the Copernicus Atmosphere Monitoring Service, which is implemented by ECMWF on behalf the European Commission. CoCO<sub>2</sub> is also aligning as much as possible with development plans that have been defined within the WMO-GGGW, WMO/IG3IS, CEOS, GCOS and GEO frameworks.

To ensure the prototype systems are fit-for-purpose and therefore can maximise the impact, CoCO<sub>2</sub> has been engaging with the relevant user communities. The European Commission, EU member states, UNFCCC, cities and regions, and science were among these user communities. This interaction is especially important to support the European Commission with the definition of an adequate service portfolio that not only addresses the needs for the 5-year Global Stocktake process but tries to support as many climate mitigation and adaptation efforts as possible.

The main purpose of WP8 (User engagement) was therefore to engage with the various user communities to co-design a fit-for-purpose CO<sub>2</sub>MVS service portfolio and develop mechanisms and tools to provide diverse, but targeted information to these user communities. This was achieved by several user consultation meetings and workshops, but also by using existing international communication and planning mechanisms. At local scale, city networks like C40 or Covenant of Mayors will help disseminating the results. CoCO<sub>2</sub> enlisted ICLEI (Local Governments for Sustainability) to help organising these contacts. Closer links with the IPCC working groups and inventory agencies and other data providers were established as well as the relevant working groups of DG-CLIMA. In this process we also involved organisations like the United Nations Environment Programme (UNEP), WMO and the Group on Earth Observations (GEO). In addition, CoCO<sub>2</sub> continued the discussion framework between national reporting agencies and the CoCO<sub>2</sub> scientific partners, as established in the VERIFY project, with the aim to align the development of the CO<sub>2</sub>MVS capacity with the diverse requirements from these national reporting agencies. Ultimately, the Copernicus CO<sub>2</sub>MVS should be embedded in the national processes providing information that is currently missing or difficult to generate at national scale. For this purpose, CoCO<sub>2</sub> has included several of these national agencies as 3rd-party members to the Consortium to facilitate open discussions on how the future CO<sub>2</sub>MVS can support Member States' activities relevant for the Paris Agreement. As part of this user engagement process, and in response to the Call and in support of discussion within the CO<sub>2</sub> Task Force on this topic, WP8 also developed a blueprint for a Decision Support System (DSS). The DSS is a general label for a set of tools that can make the large amounts of data that will be produced by the CO<sub>2</sub>MVS digestible for especially the policy sector. This can range from graphical material, such as developed within the [Global Carbon Project](https://www.globalcarbonproject.org/carbonbudget/21/files/GCP_CarbonBudget_2021.pdf) ([https://www.globalcarbonproject.org/carbonbudget/21/files/GCP\\_CarbonBudget\\_2021.pdf](https://www.globalcarbonproject.org/carbonbudget/21/files/GCP_CarbonBudget_2021.pdf)) or the VERIFY project, to specific interactive tools, such as for instance exist on the Copernicus Climate Data Store (<https://cds.climate.copernicus.eu/cdsapp#!/toolbox>). While the development of such a final all-encompassing DSS will likely take many years, and requires extensive consultation and feedback from stakeholders, CoCO<sub>2</sub> set the first steps by developing a blueprint for a DSS that would be part of the Copernicus CO<sub>2</sub> service. To ensure the overall fitness-for-purpose of the CO<sub>2</sub>MVS, CoCO<sub>2</sub> interacted with all the mentioned user communities. Especially, the 1<sup>st</sup> Global Stocktake was used as an opportunity to provide

specific services and results that can be assessed by the EC and EU Member States in terms of usefulness to support their activities related to the Global Stocktake process. This feedback is immensely valuable to adjust the prototype systems, where needed, to ensure the final prototype systems are capable of delivering the required services.

## 2.2 Activities during the project

### 2.2.1 Inventory Agency Advisory Board

At the start of the project an Inventory Agency Advisory Board (IAAB) was established containing representatives from the following countries: Austria, France, Germany, Ireland, Italy, the Netherlands, and Poland. The main purpose of the IAAB was to inform inventory agencies from interested EU countries about the progress of the project and receive feedback from them on the various developments. During the first 18 months of the project the main interaction with the IAAB happened through similar activities in the VERIFY project to avoid duplication of effort. CoCO<sub>2</sub> was for instance present at the VERIFY networking meeting in May 2022. The IAAB has been kept informed about the project through occasional Newsletters and through attendance of the General Assemblies. More specifically, a dedicated session was organised during the last General Assembly in November 2023, to discuss the progress in the report and the needs from the agencies. Four other projects were also present at this meeting: CORSO, AVENGERS, EYE-CLIMA, and Paris. This was the result of a new collaboration effort for user engagement coordinated by the Coordinator of CoCO<sub>2</sub>. This coordination will continue after CoCO<sub>2</sub> finishes. Finally, the IAAB was strongly involved in providing feedback on the first version of the Blueprint for a Decision Support System, which resulted in a much improved final version.

### 2.2.2 User consultation meeting for cities

In collaboration with ICLEI, which is a sub-contractor of ECMWF within the project, two user consultation workshops were organised. The first one on 6 October 2021 was entitled “How can atmospheric observations support city-scale GHG inventories”. All presentations as well as a workshop report are available on the CoCO<sub>2</sub> website: <https://coco2-project.eu/events/how-can-atmospheric-observations-support-city-scale-ghg-inventories>. The second one, entitled “Supporting city-scale GHG inventories - opportunities and challenges” was held on 26 May 2023. Presentations are available on the CoCO<sub>2</sub> website: <https://coco2-project.eu/events/supporting-city-scale-ghg-inventories-opportunities-and-challenges>.

### 2.2.3 COP26, COP27, and COP28

At the 2021 UNFCCC Conference of the Parties (COP26) in Glasgow, CoCO<sub>2</sub> was presented at the EU side event “EO for climate action: mitigation, REDD+, and the Global Stocktake”, organised by the JRC, DG DEFIS, DG RTD, the European Space Agency (ESA) and ECMWF. This event focused on building awareness on the substantial, and increasing, potential of Earth observation (EO) for addressing climate mitigation – from both EU and international perspectives. This session looked at how EO provides a global, objective and transparent evidence base on which to develop, implement and assess mitigation policies. CoCO<sub>2</sub> also teamed up with the VERIFY project presenting a combined poster at the poster session of the Earth Information Day.

The CoCO<sub>2</sub> project also took part in COP27, in Sharm el-Sheikh, Egypt. The aim was to show the results from the project, as well as the roadmap towards the Copernicus greenhouse gas emissions monitoring service, at global and local scales. The project coordinator presented at a side event organised by the ICOS Research Infrastructure, entitled “Systematic observation of greenhouse gases (GHG) to support climate action in cities and regions”. The presentation included the outcomes from the CoCO<sub>2</sub> workshop that was organised together with ICLEI.

The project was also visible at the UNFCCC Earth Information Day with two poster presentations. One poster showed the prototype results that were submitted to the 1st Global Stocktake and another poster, in collaboration with ICOS, showed the results of methane emission estimates for the Nord Stream pipeline leaks. Finally, references to the CoCO<sub>2</sub> project were made as part of the European Union side event on “Supporting nations – the global stocktake and CO<sub>2</sub> monitoring and verification”.

At COP28 in Dubai, CoCO<sub>2</sub> results were used in various side events, most notable the Earth Information Day, a side event organised by Germany on the development of their national emission monitoring system, and a side event organised by the JRC on the EDGAR emission inventory and the potential of Copernicus to provide observation-based emission estimates.

#### **2.2.4 European Commission’s DG-Climate**

Through CoCO<sub>2</sub> partner JRC and in collaboration with EEA, the project and its progress has been presented at the Climate Change Committee Working Group 1 from DG-CLIMA. This is an important mechanism to interact with stakeholders and users at EU national level. JRC is also involved in the annual GHG inventory exercise kick-off meeting, where they will promote the use of Earth Observation and inverse modelling, in particular for better AFOLU estimates. A representative from DG-CLIMA now also attends meetings of the CO<sub>2</sub> Monitoring Task Force, to which CoCO<sub>2</sub> contributes with its results and recommendations.

#### **2.2.5 International frameworks**

CoCO<sub>2</sub> has been actively involved in various user engagement activities through CEOS and WMO/IG3IS. CoCO<sub>2</sub>’s Coordinator, ECMWF, has been accepted as an Associate Member of CEOS, which allows participation in the relevant working groups, teams, and virtual constellations (e.g., WG Climate, GHG Task Team, and AFOLU Task Team). CEOS recently published its Earth Observation Handbook 2023, which includes results from CoCO<sub>2</sub> (<https://www.eohandbook.com/gst/case-studies/co2mvs>).

Several members of the CoCO<sub>2</sub> consortium are also members of the IG3IS Steering Committee, which supports alignment of the relevant activities. More recently, several CoCO<sub>2</sub> consortium members have been actively contributing to the scoping of the new WMO Global Greenhouse Gas Watch. The CoCO<sub>2</sub> outcomes are taken as an example for the definition of this new GGGW framework.

#### **2.2.6 Interaction with CAMS**

The ramp-up phase of the CO<sub>2</sub>MVS, and more generally observation-based emission monitoring capabilities, within CAMS foresees strong interaction with stakeholders and user communities in the coming years and CoCO<sub>2</sub> has supported these activities, where meaningful, with expertise and example products.

A first example is the CAMS National Collaboration Programme (NCP), which is a dedicated scheme to support the Member States in achieving maximum benefit from CAMS products and services in the implementation of their mandate. The idea is that within a few years, all European Union and Copernicus associated countries would have Copernicus data underpinning their national air quality information systems and/or national activities related to GHG emissions. EU Member States are responsible for the implementation of the Air Quality Directives. This includes:

- air quality monitoring strategy (measurement and modelling).
- air quality objectives (limit and target values).
- analysis of main drivers of air pollution episodes, including transboundary and natural contributions.
- information to the general public.



- conception and implementation of short-term and long-term action plans to comply with Air Quality objectives.

For the reporting of Greenhouse Gas (GHG) emissions under the United Nations Framework Convention on Climate Change (UNFCCC), the Conference of the Parties (COP) has established a set of requirements for reporting national GHG inventories to be fulfilled in accordance with Intergovernmental Panel on Climate Change (IPCC) guidelines and guidance. In addition, the Paris Agreement has introduced an Enhanced Transparency Framework (ETF) applicable to all Parties to report their GHG balance and to track individual countries' progress towards achieving their targets (i.e., the nationally determined contributions, NDCs) and a Global Stocktake (GST) to assess the countries' collective progress towards the long-term goals of the Paris Agreement based on the best available science. Building on the already ongoing CAMS' collaboration with national authorities on user engagement, existing good practices at national level will be captured and fed back to the programme to inform service evolution and maximise the usefulness of the programme's outputs at a national, regional or even local level. The NCP funds specific activities in all European Union and Copernicus associated countries to support the uptake of existing and new products. The prototype results coming out of CoCO<sub>2</sub> have supported the engagement with the countries and the assessment of the added value these products can provide at the national level.

### 2.3 Recommendations for future user engagement

The main goal of CoCO<sub>2</sub> was to prepare the building blocks for the future CO<sub>2</sub>MVS that is being implemented as part of the Copernicus Atmosphere Monitoring Service. While CAMS has its own user engagement activities, CoCO<sub>2</sub> has strongly supported these using the results coming out of the project. ECMWF is coordinator of CoCO<sub>2</sub> as well as Entrusted Entity for CAMS and this has ensured that user engagement activities were fully coordinated between CoCO<sub>2</sub> and CAMS and that the lessons learned from CoCO<sub>2</sub> can be directly used in future CAMS activities.

It is clear that continual interaction with the relevant DGs at the European Commission, most notably DG-DEFIS, DG-CLIMA, and DG-ENER, is critical for proper uptake of the new greenhouse gas emission monitoring services, once products become operational. CoCO<sub>2</sub> already supported these discussions, but CAMS will have to continue to invest in regular interactions with representatives of these DGs to ensure full awareness at the different DGs of what is on offer and maximise the uptake of the CO<sub>2</sub>MVS outputs. Collaboration with both the Joint Research Centre and the European Environment Agency should be part of this.

Interaction with Copernicus member states is also critical for the success of the CO<sub>2</sub>MVS. There is clear interest from at least a subset of these countries, as is illustrated by their active participation in the various discussion meetings and even some of the current projects. CoCO<sub>2</sub>/CAMS initiated a collaboration with AVENGERS, PARIS, and EYE-CLIMA to ensure coordinated interaction with national inventory agencies, and this will continue after the project finishes. This ensures CAMS stays connected to these scientific projects and can benefit from the latest scientific results. It also avoids creating confusion among the national agencies in terms of who is producing what and for which purpose. From CoCO<sub>2</sub> experience it is clear that one-to-one interaction with each interested member state is important and the CAMS National Collaboration Programme could support such an approach. Countries have different requirements linked to their own ambitions for national monitoring. The CO<sub>2</sub>MVS will need to be flexible enough that it can cater to these different needs at national level.

At the local to regional scale (e.g., cities) user engagement is less straightforward. The CoCO<sub>2</sub> workshops showed that there is clear interest, but user requirements vary considerably. Working through existing coordinated activities (e.g., ICLEI, Covenant of Mayors, NEREUS) remains the recommended option. The two workshops organised by ICLEI were very useful in that regard and the workshop reports will be valuable input to future engagement with this user community.

User engagement can also benefit from internationally coordinated frameworks. For instance, the WMO IG3IS programme is already very active on this front and the new WMO GGGW will only strengthen this. Several activities within CEOS also support user engagement. ECMWF is active in both WMO and CEOS and can therefore use these coordinated activities to reach out to a wider user community. Regular interaction with the UNFCCC and the IPCC will be an important component of a comprehensive user engagement plan. ECMWF is already establishing a more direct relationship with the UNFCCC and CoCO<sub>2</sub> (as well as CAMS) has been active in workshops organised by the IPCC Task Force on National Greenhouse Gas Inventories (TFI).

Finally, a key part of any user engagement plan as part of the CO<sub>2</sub>MVS ramp-up is the provision of prototype products and services, for which feedback can be acquired from the different user communities. Implementing new services has to be done by co-design with users and the development plan needs to be sufficiently flexible to take feedback into account. Existing CAMS greenhouse gas products, prototype results from CoCO<sub>2</sub>, but also outcomes from other projects, such as the one named above, can be used for this purpose.

### **3 Conclusion**

This deliverable has developed the implementation plan for the CoCO<sub>2</sub> project, reporting on activities during the project and providing recommendations for future activities and collaborations.

CoCO<sub>2</sub> has significantly supported the user engagement relevant for the future CO<sub>2</sub>MVS and various recommendations have come out of the workshops, meetings, and reports. This knowledge will feed directly into the future user engagement activities that will be carried out by CAMS, but they are also relevant for other Horizon funded projects with related aims.

## Document History

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