



CO<sub>2</sub>  
Human  
Emissions

# Newsletter No 1

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



Co-ordinated by  
 ECMWF

# CO<sub>2</sub> Human Emissions

## Welcome to the 1st Newsletter of the CHE project

Having officially started on 1st of October 2017 with a duration of 39 months, the CO<sub>2</sub> Human Emissions (CHE) project is coordinating efforts towards developing a European monitoring and verification support capacity for anthropogenic CO<sub>2</sub> emissions. This challenging target is aligned with the European Commission's stepwise approach for a requirement-driven integration of Earth observations, from remote sensing and in situ, with enhanced modelling capabilities for CO<sub>2</sub> fossil fuel emissions, along with other natural and anthropogenic CO<sub>2</sub> emissions and transport. The project pursues a consolidated methodology for integrating the monitoring system components, as well as innovation for estimating fossil fuel CO<sub>2</sub> fluxes. These include reconciling bottom-up and top-down approaches and handling systematic errors of satellite observations. Earth observations from satellites will be combined with in situ CO<sub>2</sub> observations and information from co-emitters or isotopes to support the attribution of fossil fuel emissions and uncertainty reduction. [Read more about the CHE project.](#)

### The CHE Structure

To tackle the challenges of an integrated support capacity on a global scale, it is paramount to identify the complementarity between observations, modelling and data assimilation methodologies by establishing their limitations and strengths. CHE will address these aspects in four work packages (WP1 - WP4) that will use existing capabilities to provide supportive datasets and assessments of the current state of affairs, while at the same time bringing innovation to the various components with an eye on overall integration in a fully comprehensive system (Scientific Layer). In addition, CHE will identify the operational aspects of all the components to ensure a realistic architecture (WP5). Together with the capacity-building aspects (WP6) and coordination (WP7), this is summarized in Figure 3, with a work breakdown structure that illustrates the seven CHE work packages interconnected and clustered in

layers. The work packages are described in the next section. [Read more...](#)

### The CHE Library of Simulations

One of the critical elements of a European contribution to a global "CO<sub>2</sub> emission monitoring system" identified in the [CO<sub>2</sub> report](#) commissioned by the European Commission is a constellation of CO<sub>2</sub> satellites with imaging capability. Between 2011 and 2015, ESA conducted a detailed Phase A/B1 assessment for the CO<sub>2</sub> imaging satellite concept CarbonSat ([Bovensmann et al., 2010](#)). In two science studies (LOGOFLUX-1, 2014; LOGOFLUX-2, 2015) supporting this assessment, it was demonstrated that such a satellite would allow observation of CO<sub>2</sub> plumes of strong localized sources such as large cities and power plants and would help constrain emissions at the regional and national scale.

However, such emission quantification faces substantial challenges due to the limited precision of the satellite measurements, systematic biases introduced by incompletely accounting for the effects of aerosols and other factors in the retrieval, the limited spatial and temporal coverage and resolution of the observations, and the difficulty in separating the signals from natural CO<sub>2</sub> fluxes from those of anthropogenic emissions. To support the assessment of the requirements for a future space mission and the challenges introduced by the issues listed above, a library of realistic CO<sub>2</sub> simulations for present-day and future emission scenarios, from the global to the regional and point-source scale is needed. [Read more...](#)

### Mapping CO<sub>2</sub> fossil fuel uncertainty representation

CO<sub>2</sub> Human Emissions' uncertainties, estimated by the [2006 IPCC Guidelines for National Greenhouse Gas Inventories and 2015 global emission data](#) to be around 9-10% for countries with well-developed statistical



systems, and 16-18% for countries with less-developed statistical systems, have been the focus of a meeting in Ispra (Italy), 4-5th June 2018.

Being able to specify (and progressively improve) the accuracy level for fossil fuel emissions globally is essential to combine bottom-up and top-down estimates for anthropogenic CO<sub>2</sub> Emissions in support of the Paris Climate Agreement, and it is a key study area in the CHE project (with a dedicated work-package, [WP3](#)). [Read more...](#)

### First Strategic Research Agenda released

The aim of the first Strategic Research Agenda released on the 30<sup>th</sup> on June 2018 is to summarise current research activities, within and outside CHE, and to outline the future strategies required for establishing the CO<sub>2</sub> monitoring and verification support capacity and the required capabilities.

CHE will produce a clear set of outputs in reports summarizing the current state-of-affairs, including a gap analysis, providing recommendations on needed developments including first innovative steps for current systems and system integration, and the operational aspects of the various needed components. [Read more...](#)

### CHE Collaborations with other H2020 projects

Monitoring CO<sub>2</sub> emissions at the surface requires unprecedented levels of precision of measurements at global scale, involving both in-situ observing networks and space-based remote sensing, combined with models that are capable to disentangle the signal of natural and anthropogenic emissions. Between the last quarter of 2017 and first quarter of 2018, under the European Commission vision outlined by the CO<sub>2</sub> Task Force (link to CO<sub>2</sub> report), three Horizon 2020 projects have been approved for funding and initiated the work: CHE (CO<sub>2</sub> Human Emissions, focusing on outlining integration requirements of observations, modelling and assimilation components for a future global monitoring and verification support capacity), VERIFY (focusing on quantifying more accurately carbon stocks and the fluxes of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) across the EU based on independent observations in support of inventories) and SCARBO (focusing on exploring new technologies to improve the space-based observations of CO<sub>2</sub> and CH<sub>4</sub>).

For the CHE project, as a H2020 Coordination and Support Action, key activities are to liaise with and contribute to other projects in the area of CO<sub>2</sub> monitoring. As such CHE has established links with SCARBO and VERIFY, via participative interactions (e.g. at the level of expertise in each of the teams and in programmatic board meetings). [Read more...](#)

### Recent Events

The CHE project had its Kick-Off meeting at the premises of the European Commission's Research Executive Agency in Brussels on the 2<sup>nd</sup> and 3<sup>rd</sup> October 2018. [Read more...](#)

The first [CHE General Assembly](#) has taken place between the 5th and 7th of February 2018 at ECMWF in Reading, United Kingdom. The meeting has consisted of discussions on CHE WPs, external lectures and working groups. [Read more...](#)

### Upcoming Events

Meet members of the CHE team at the following events:

[IG3IS - TRANSCOM meeting](#), Lund, 17 - 20 September 2018.

[3<sup>rd</sup> ICOS Science Conference](#), Prague, 11 - 13 September 2018

[EUMETSAT Meteorological Satellite Conference 2018](#), Tallinn, 17 - 21 September 2018

### Project Fact Sheet

**Start Date:** 1<sup>st</sup> October 2017

**End Date:** 31<sup>st</sup> December 2020

**Total cost:** EUR 3 765 190

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### Contact

Web: <http://www.che-project.eu>

Email: [che-coord@lists.ecmwf.int](mailto:che-coord@lists.ecmwf.int)



## CHE Consortium



- European Centre for Medium-Range Weather Forecasts, INT/ UK
- Airbus Defence and Space SAS, FR
- Airbus DS GmbH, DE
- Fondazione Centre Euro-Mediterraneo sui Cambiamenti Climatici, IT
- Deutsches Zentrum fuer Luft- und Raumfahrt e.V., DE
- Eidgenoessische Materialpruefungs- und Forschungsanstalt, CH
- The European Organisation for the Exploitation of Meteorological Satellites, INT/ DE
- The Inversion Lab Thomas Kaminski Consulting, DE
- JRC -Joint Research Centre- European Commission, BE
- Koninklijk Nederlands Meteorologisch Instituut-KNMI, NL
- Commissariat a l'Energie Atomique et aux Energies Alternatives, FR
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- Thales Alenia Space France, FR
- Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek TNO, NL
- University of East Anglia, UK
- Universitaet Bremen, DE
- University of Leicester, UK
- Wageningen University, NL

[Read more about the Consortium Partners.](#)

