Towards monitoring anthropogenic CO_2 emissions in support of the Paris Agreement

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The Paris Agreement (PA) is a landmark agreement because for the first time all 195 participating countries are committed to take climate change mitigation and adaptation actions and track progress with implementation of such action through an enhanced transparency framework with common modalities, procedures and guidelines. While regularly updated inventories of national anthropogenic GHG emissions, also referenced to as bottom-up estimates (more than three quarters being CO_2 emissions from fossil fuel burning and cement production), will form the core of monitoring and tracking progress with efforts to reduce global emissions towards PA goals, so-called top-down atmospheric measurements are required to provide observation-based evidence of emission trends in near-real time at higher spatial and temporal resolution. The scientific community already brings together top-down and bottom-up information in the yearly update of the global carbon budget, but no international system exists to monitor and support emission reductions estimated from national inventories on an operational basis that is useful for the following up on the Paris Agreement. Such a system should provide information at scales from large power-plants and cities to regional areas and countries.

The European Commission, together with European Space Agency and supported by the European Centre for Medium-Range Weather Forecasts, the European Organisation for the Exploitation of Meteorological Satellites and international experts, is developing a new operational capacity for monitoring and verifying anthropogenic CO_2 emissions spelling out the ingredients for a dedicated European CO_2 Earth Observation service under the Copernicus Programme. Design studies are carried out to help define the underpinning requirements and foundational building blocks of such a CO_2 emission monitoring capacity with: (i) atmospheric space-borne and in-situ measurements, (ii) near-real time bottom-up CO_2 emission maps, (iii) an operational data-assimilation system integrating top down and bottom-up information, (iv) a decision support tool for policymakers.

The ultimate goal is to build an observation system with capabilities to monitor anthropogenic CO_2 emissions with operational and internationally coordinated capabilities likely to be established by 2026. This can complement the enhanced transparency framework foreseen by the Paris Agreement, providing governments and citizens with actionable information on the anthropogenic CO_2 actually emitted into the Earth System's atmosphere, such that they can reflect on the trends and on the effectiveness of the reduction measures and react correspondingly.