Support for the Implementation of the Paris Agreement : Role of the Integrated Global Greenhouse Gas Information System (IG³IS)

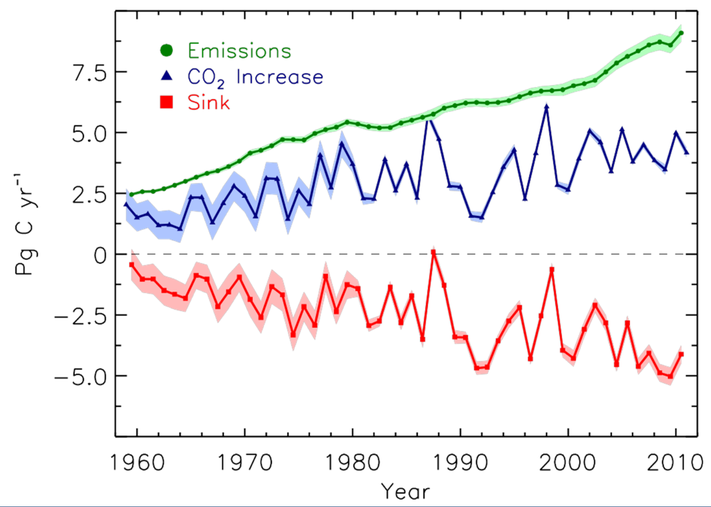
Phil DeCola and IG³IS Science Team*

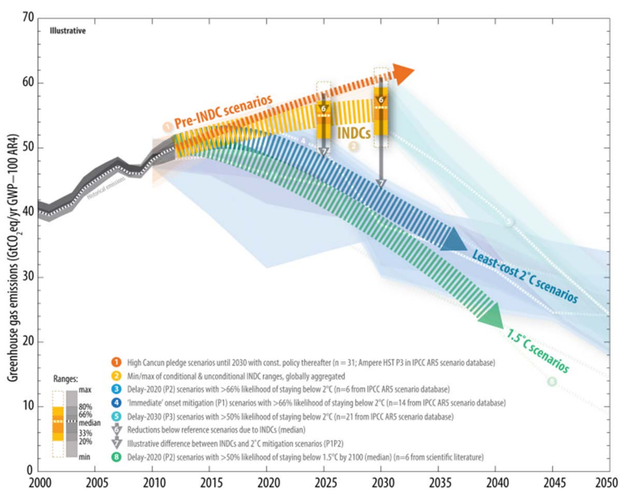
❑ In recognition of the progress that has been made in atmospheric research, measurement and modelling, WMO has initiated the development of an Integrated Global Greenhouse Gas Information System (IG³IS). WMO GAW provides the standards for atmospheric measurements, and IG³IS will establish, propagate and, over time, improve the methodological standards for how atmospheric transport inverse model analyses of atmospheric GHG concentration measurements ("top-down") can be combined with spatially and temporally explicit socioeconomic emission inventory data ("bottom-up") to better inform and manage emission reduction policies and measures.

❑ **Support the success of post-COP21 actions of nations, sub-national governments, and the private sector to reduce climate-disrupting GHG emissions through a measurement-based approach that:**

- Support efforts to reduce uncertainty of national emission inventories;
- Provide actionable information at the needed spatial, temporal and sectoral resolution;
- Help to inform the "stock take" (trends) of emission reduction strategies over time.

The average increase in atmospheric CO_2 during the last decade corresponds to ~44% of the CO_2 emitted by human activity with the remaining ~56% removed by the oceans and terrestrial biosphere. Ocean uptake of CO_2 leads to ocean acidification.





Observations-based information can further guide mitigation options

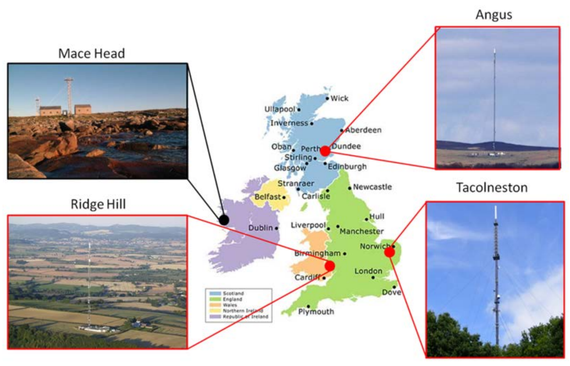
IPCC *Source:* IPCC Synthesis report on the aggregate effect of intended nationally determined contributions

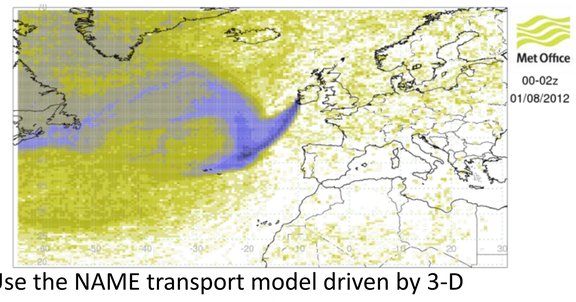
❑ IG³IS Principles

- IG³IS takes a ***unified approach*** that combines and analyzes ***atmospheric concentration measurements*** together with ***socioeconomic data*** and ***information on natural fluxes*** to better ***quantify and attribute greenhouse gas emissions and sinks*** as well as their trends.
- IG³IS will provide a common platform, co-developed with stakeholders, for establishing benchmarks, good practices utilizing diverse measurement and analysis approaches inside a reliable framework.
- IG³IS matures in concert with the evolution of user-needs, policy and technical skill. This will enable researchers to learn the value of envisioned information products and users are introduced to previously unknown capabilities
- **The ultimate criterion for success is that the information produced *guides additional and valuable emission-reduction actions*.**

National scale examples

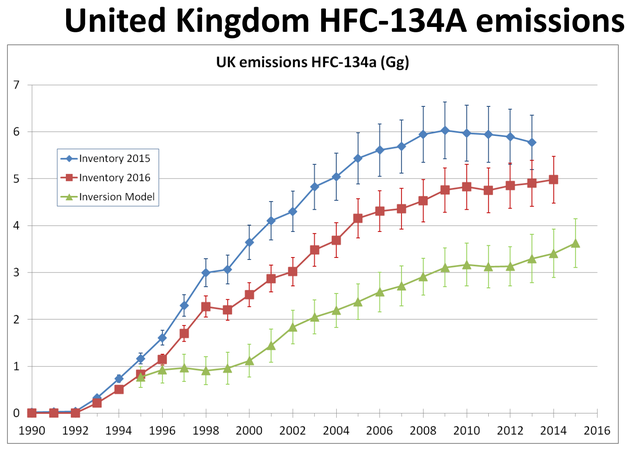
United Kingdom Measurement Network





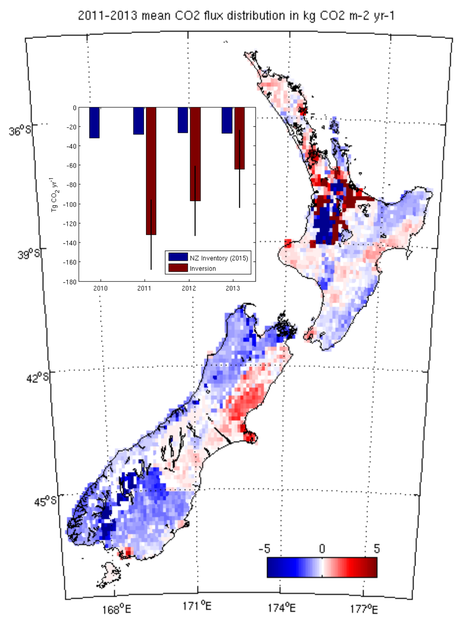
Use the NAME transport model driven by 3-D meteorology to understand the recent (3-4 weeks) history of the air arriving at measurement stations

Emission inventories and inverse modelling United Kingdom HFC-134A emissions



A large discrepancy between inverse modelling of atmospheric measurements and the reported inventory for the refrigerant HFC-134a led to a revision of UK's inventory by correcting the emission factor for HFC-134a losses from mobile air-conditioning

CO_2 inversion for New Zealand indicates larger land carbon uptake than expected

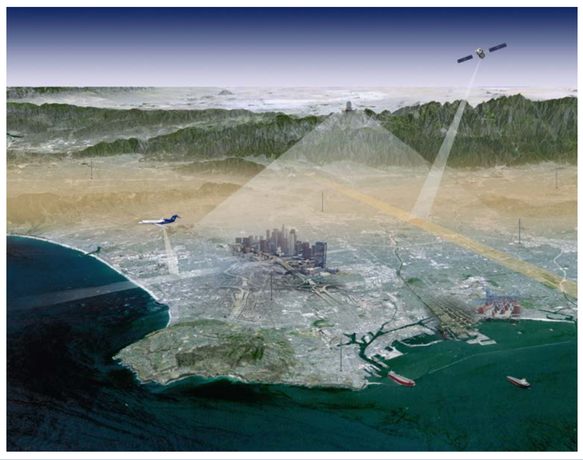


Inverse model analysis of atmospheric measurements indicates that the terrestrial biosphere in New Zealand is a much stronger net annual CO_2 sink and removed 98 $TgCO_2\ yr^{-1}$ from the atmosphere on average during 2011–2013. This sink is much larger than the reported 27 $TgCO_2\ yr^{-1}$ in the national inventory for the same time period.

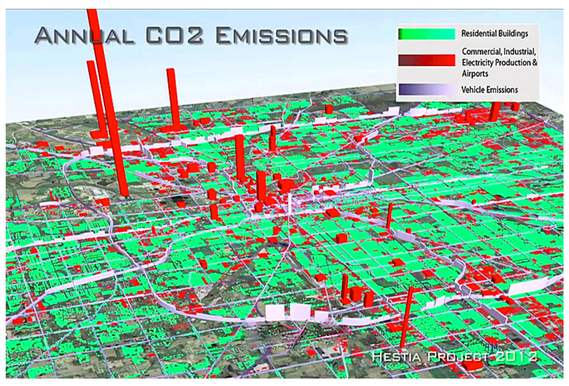
Ongoing collaboration of atmospheric scientists and inventory builders work to refine both approaches and provide best estimates of land carbon exchange.

City-Scale examples

Los Angeles GHG observing system



The Hestia Project: Quantifies all fossil fuel CO_2 emissions at building and street scale



A number of research projects around the world have developed and tested methods for independent estimation of greenhouse gas emissions (e.g. the Los Angeles / Paris Megacity Project, and Recife, Brazil). This work has established urban greenhouse gas information methods that combine atmospheric monitoring, advanced inventory data-mining and model analyses. IG³IS will design individual observation systems suitable for a given city's requirements and applications to be deployed in different parts of the world, particularly in the developing countries where GHG information needs are growing fast and capacity is limited.

IG³IS Science Team

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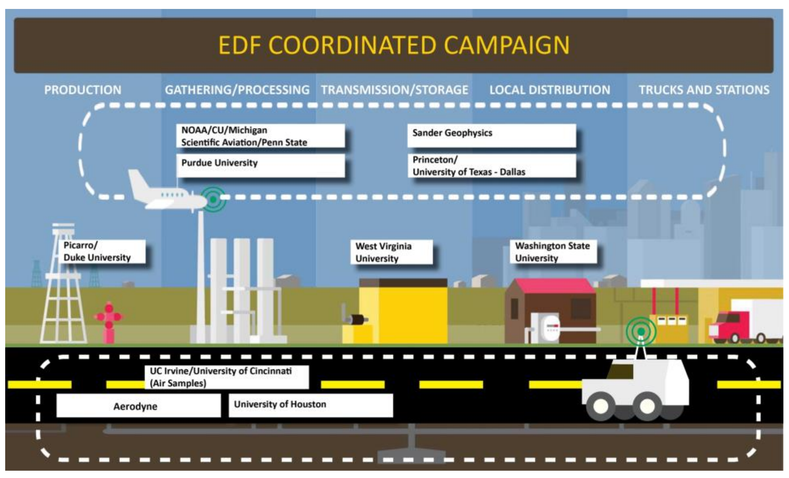
Oil and Gas industry example



This IG³IS objective intends to extend to the world the significant successes in detecting methane super-emissions and leaks in North American oil and gas supply chain. By informing oil and gas system operators of large leaks, significant methane emissions reductions are achievable. Exploring these solutions and applying them to new types of sites and emissions profiles around the globe, for example offshore platforms or coal bed methane, can guide facility operators to locate, quantify and reduce emissions.