



## Methane Emissions from Industrial Activities: Quantification of Selected Polish and Middle East Sources by a Unique Helicopter Probe

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Global warming is proceeding rapidly and quick actions are required to suspend the increasing temperatures globally. Here we give an overview of a series of measurement studies, supported and funded by UNEP´s International Methane Emissions Observatory (IMEO) in 2022-2023. Methane (CH<sub>4</sub>) is the primary focus of all these studies, since it is one of the most potent greenhouse gases, which at the same time has a relative short lifetime. Due to these specific characteristics, CH<sub>4</sub> is presently the prime target for mitigating emissions from industrial activities.

Our approach focused on a variety of CH<sub>4</sub> emissions from the coal, oil and gas (O&G), and waste industry in Poland and in the Middle East within the framework of METHANE-To-Go-Poland and METHANE-To-Go-Oman. A unique helicopter-towed probe, HELiPOD, was equipped with in situ CH<sub>4</sub> instrumentation complemented by mobile ground-based CH<sub>4</sub> measurements. The well-known mass balance approach was applied to quantify the CH<sub>4</sub> emissions from the targeted sources. Final comparisons of our top-down estimates with bottom-up industry or inventory data have been carried out to assist the involved companies and related governments in prioritizing their CH<sub>4</sub> emission mitigation actions and policies for future endeavours. Several non-captured CH<sub>4</sub> source strengths, compared to the available bottom-up data, were discovered in the course of these top-down studies. For a number of reasons evaluated during our operations, the novel HELiPOD set-up is proposed to be a suitable platform for upcoming satellite evaluation studies focusing on CH<sub>4</sub>. In particular, the HELiPOD measurements (CH<sub>4</sub> mixing ratio plus 3D wind) can capture the whole vertical and horizontal extension of targeted CH<sub>4</sub> plumes, which is necessary for the CH<sub>4</sub> mass flux quantification, a number that can be directly comparable to available satellite-based flux rates in UNEP´s Methane Alert and Response System (MARS).