



Moving towards better measurement of methane emissions: A focus on Saudi Arabia

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Comprehensive, timely, transparent and accurate measurement of greenhouse gas (GHG) emissions is crucial to meeting the goals of the Paris Agreement.



Better information on GHG emissions helps decision makers take the **right actions** needed to reduce emissions of all GHGs across all sectors and at all levels.



Different methods can be used to measure and track GHG emissions:



Bottom -up methods

Ground-based sensors

Activity-based



Top -down methods

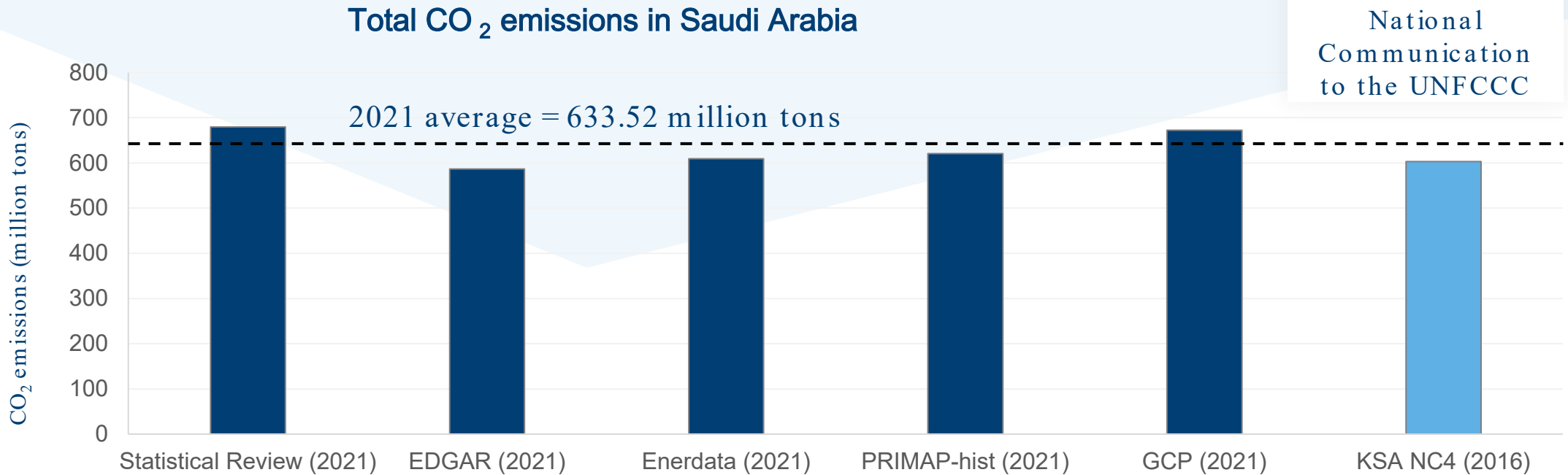
Satellite technology

Aircraft-based



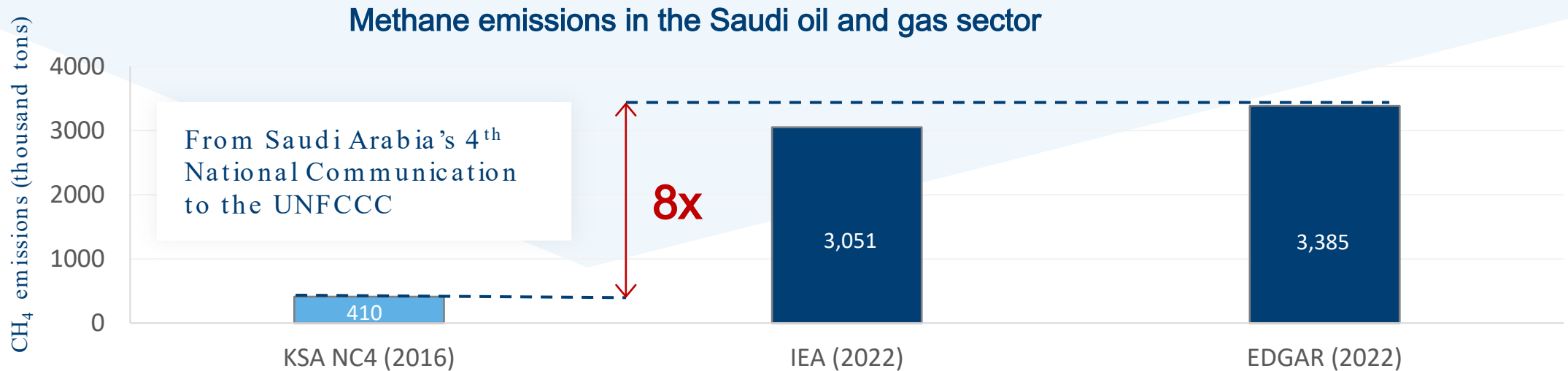
Hybrid methods (a mix)

Different methods or assumptions can produce different estimates of emissions. We find differences in estimates of carbon dioxide (CO₂) emissions in Saudi Arabia.



Differences in CO₂ emissions estimates exist for all countries, including Saudi Arabia, even though these estimates were mainly obtained using **bottom -up methods**.

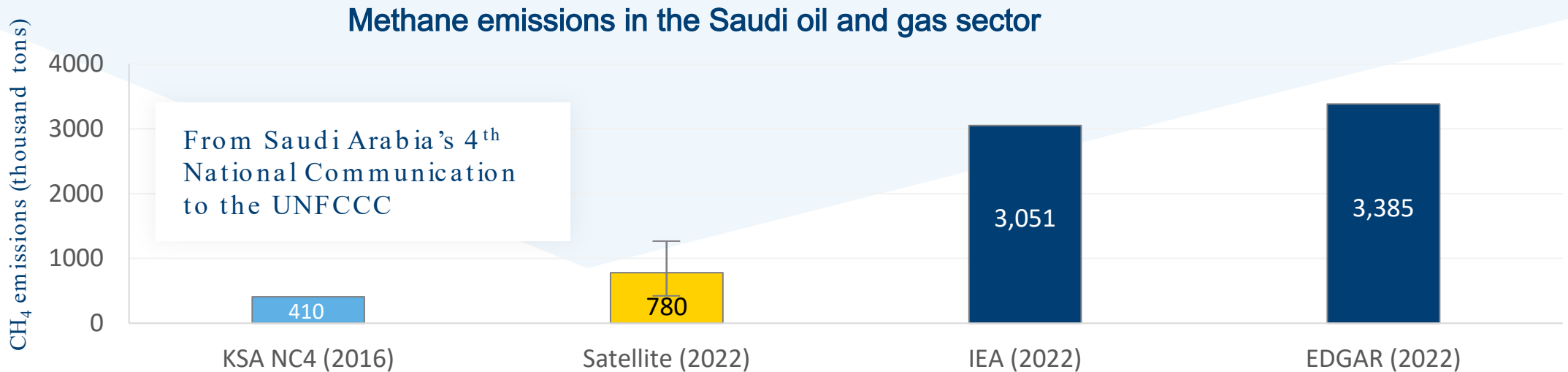
In the case of methane emissions, the differences are much, much larger. These differences are particularly massive for the oil & gas sector.



▶ Methane emission estimates can differ by large amounts due to methane measurement challenges. These differences exist for many countries, including Saudi Arabia.

▶ In the case of Saudi Arabia, there is a massive difference of up to 8 times between estimates of methane emissions for the oil and gas sector.

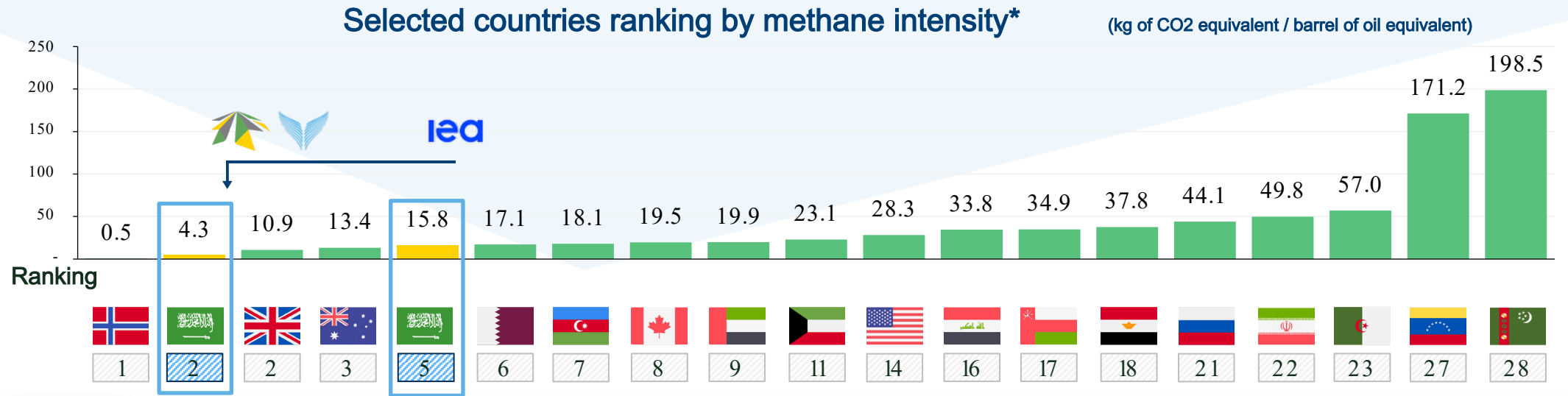
Given the challenges with methane emission measurement, KAPSARC partnered with Kayrros to measure methane emissions using satellites.



▶ Using **satellites** (specifically Sentinel-5P and Sentinel-2), we estimated methane emissions to be **780 kilotons in 2022** in the **oil and gas sector**.

▶ Among the 3 other estimates, only **KSA NC4** falls within our satellite estimate's **uncertainty range**.

Using our satellite estimates, Saudi Arabia improves its standing to the oil -producing country with the second lowest methane intensity



Satellite estimates yield a **73% decrease** in methane intensity versus the intensity value reported by the IEA.

KSA improves its ranking to the country with the **2nd lowest methane intensity** after Norway.

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There are limitations to the use of satellites for measuring methane emissions, but the technology continues to develop

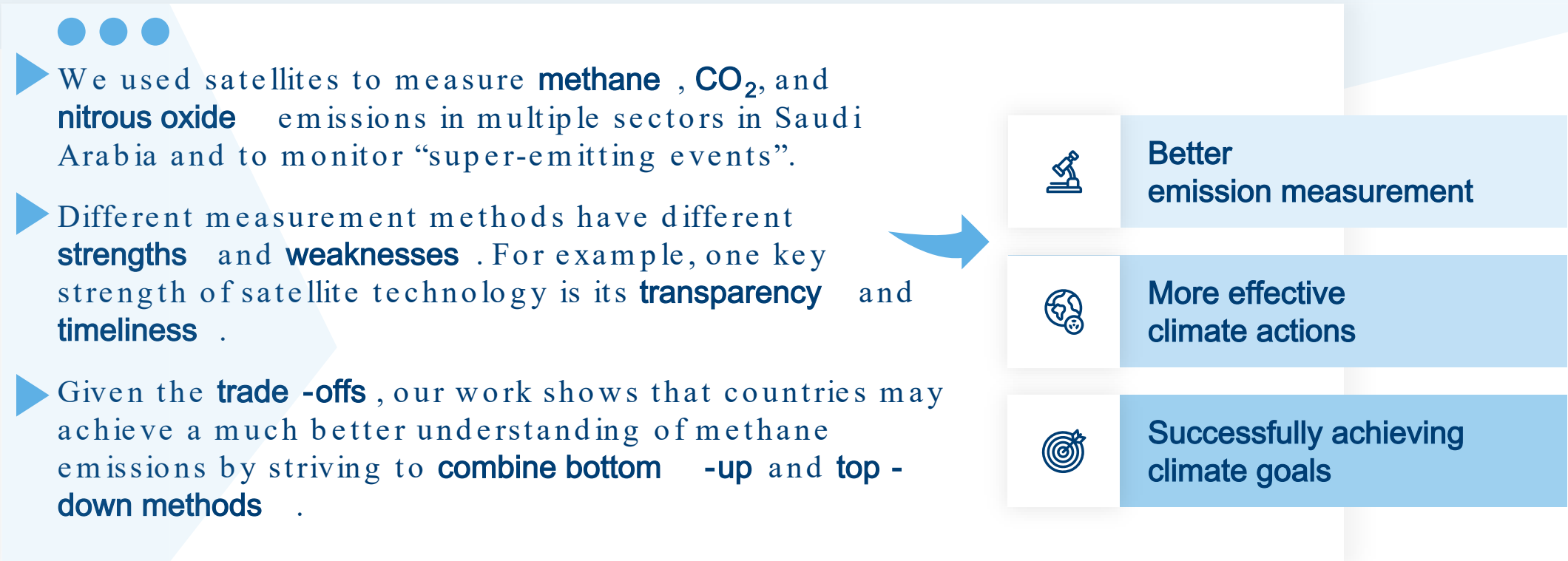
Some of the challenges we faced in our satellite -based measurement of methane emissions for Saudi Arabia:

- ▶ We were unable to directly measure methane emissions from **offshore oil and gas fields** in Saudi Arabia (so we extrapolated their emissions based on onshore measurements).
- ▶ Satellite coverage of assets was impacted by **terrain topography** (e.g., lower coverage in mountainous terrain) and **weather conditions** (e.g., lower coverage when cloud cover was high).
- ▶ **Detection thresholds** of existing satellites, especially the public ones, remains limited, although there are expected to be big improvements in newer satellites.
- ▶ Greater efforts are needed to validate and fully understand and **quantify the uncertainties** associated with satellite-based estimates.
- ▶ Difficulties attributing methane emissions to specific small point sources (the need for **higher spatial resolution** and the **trade-offs**).

Measurement of methane emissions remains challenging. Satellites can help resolve some of these challenges, but there are benefits from combining different methods

but there

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Thank You!

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