A Comprehensive Survey of Methane Detection Technologies

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1. Project Summary

- This project aims to develop and deploy an integrated monitoring system through creating a comprehensive plan. The plan will consider various monitoring strategies at different scales, including in-situ and remote-sensing observations, as well as both bottom-up and top-down modeling.

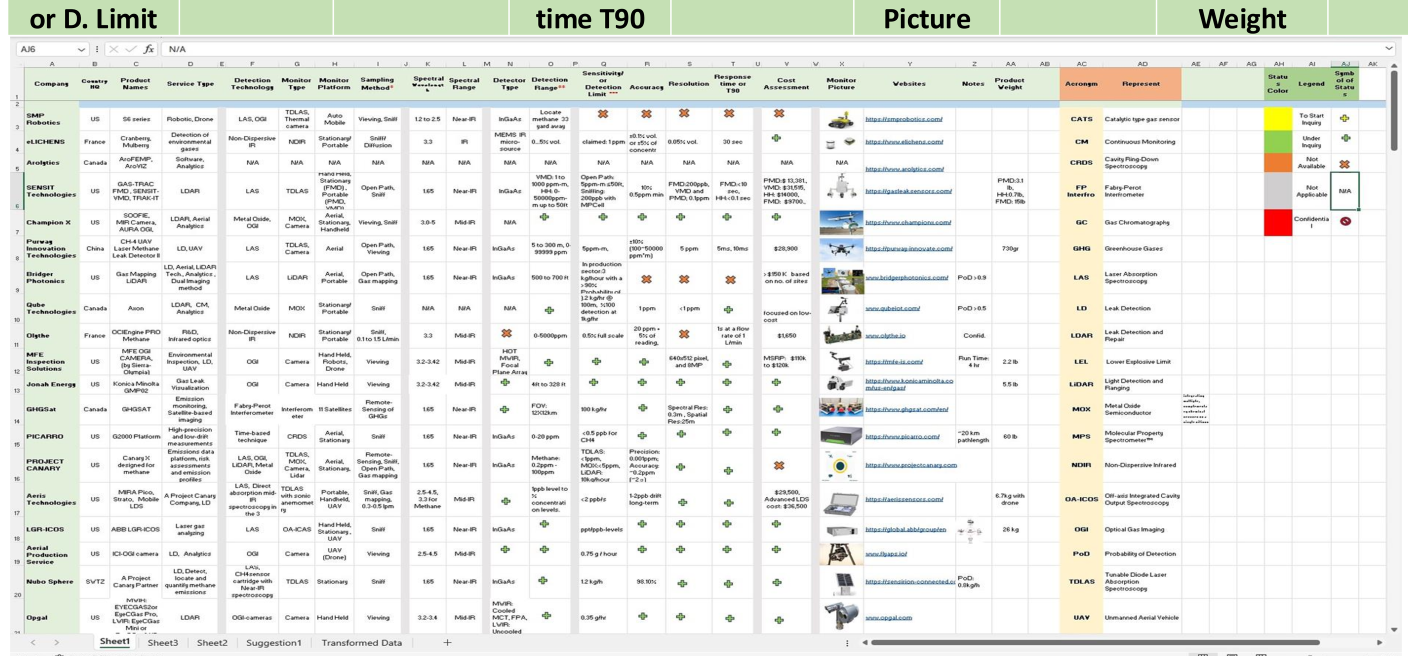
2. Project Objectives

- Gathering data from companies or solution providers involved in methane emission monitoring,
- Analyze and evaluate the data collected in the database,
- Review and evaluate modern methane sensor technologies,
- Classification and technical assessment of monitoring platforms,
- Classification of methane sensors based on cost.

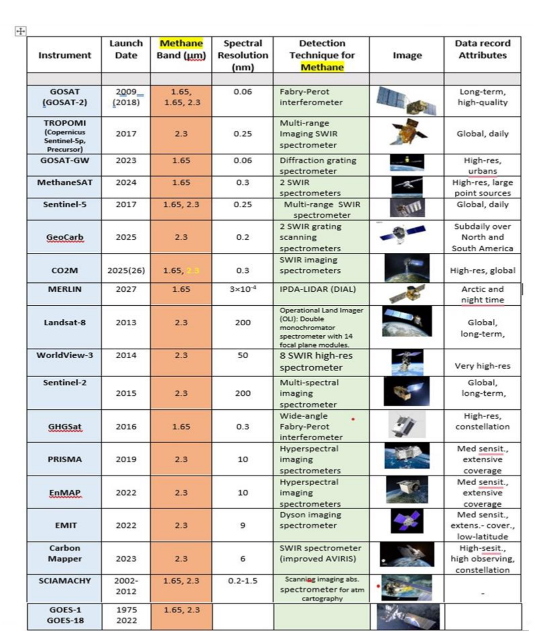
3. Analyses and Results

Data from 106 providers was surveyed, collected, and stored in a database,

Company	Country (HQ)	Product Names	Service Type	Detection Technology	Sensor Type	Monitor Platform	Sampling Method	Detection Wavelengths	Spectral Range	Detector Type	Detection Range
Sensitivity or D. Limit	Accuracy	Resolution	Response time T90	Cost	Monitor Picture	Websites	Product Weight	Legend	Symbol of Status	Notes	

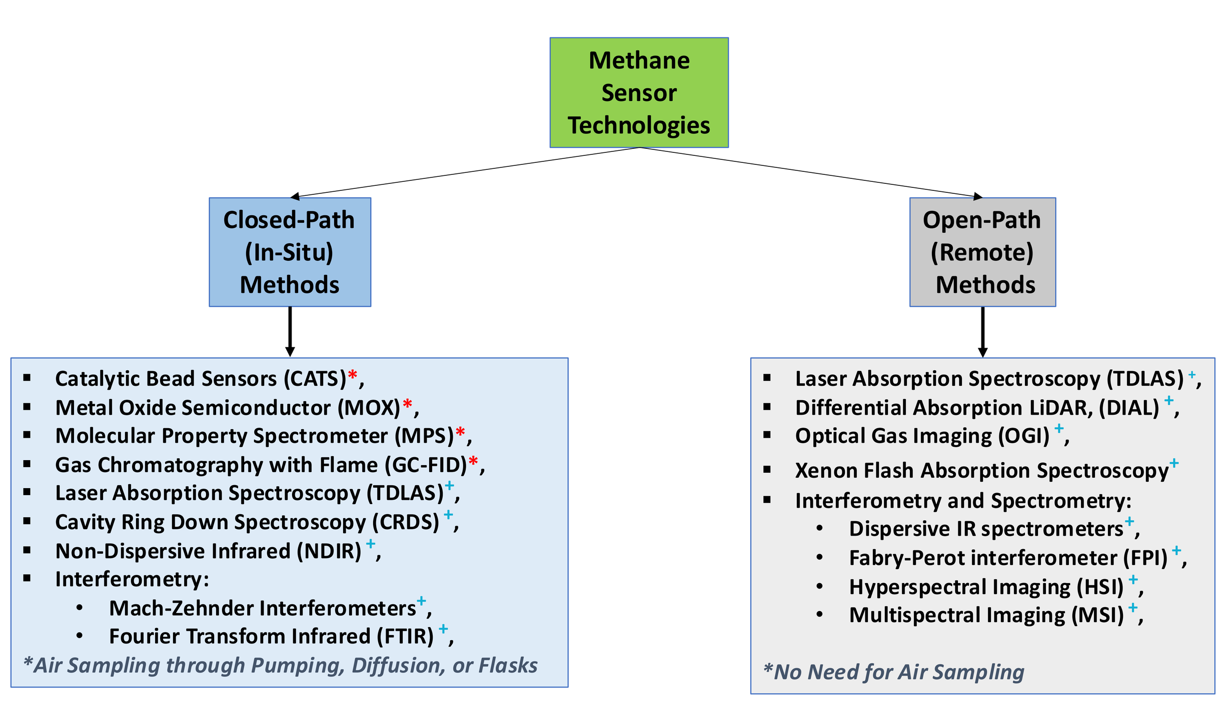


*The link to this database will be available at the end of the project,



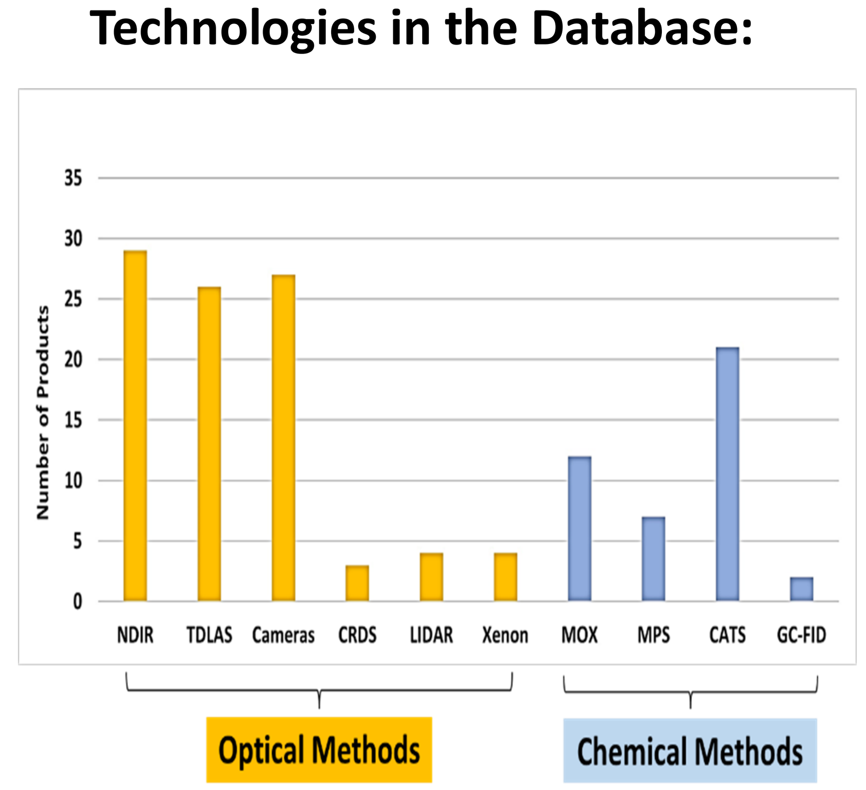
A Data-table for Satellite Platforms Measuring Methane Emissions.

4. Dividing Methane Sensors



*CATS, MOX, MPS, and GC-FID are chemical reaction methods used for methane sensing, based on Changes in Resistance or Conductivity.
+ Infrared optical methods for methane sensing rely on Changes in Spectral Response.

Distribution of CH_4 Sensor Technologies in the Database:

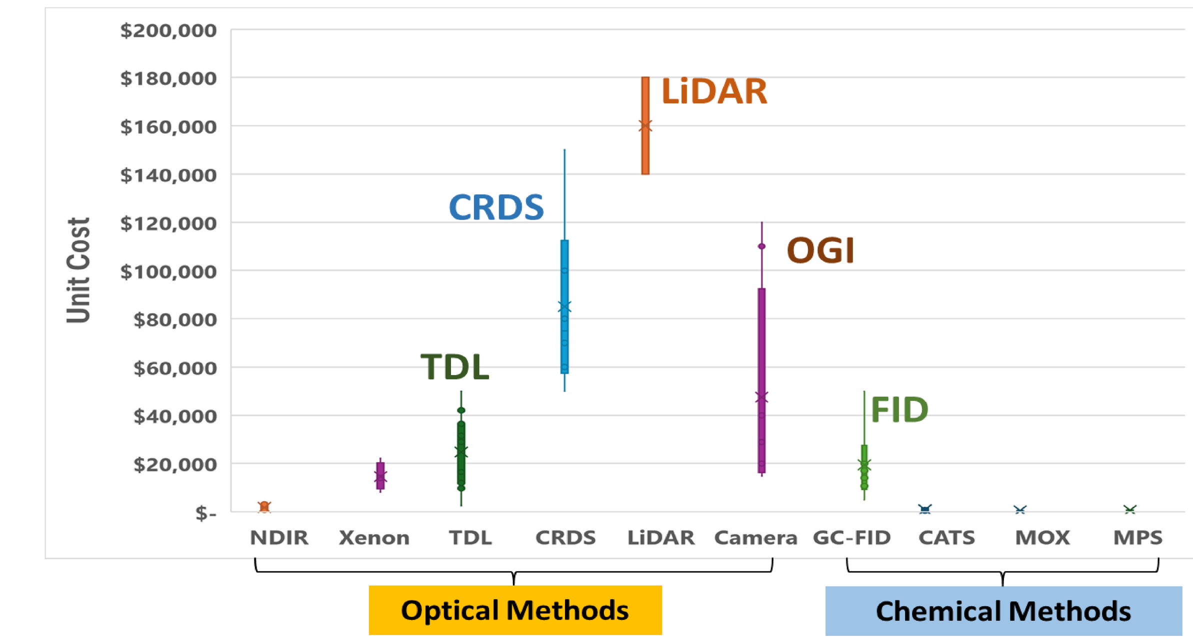


5. Examples of Technologies Comparison

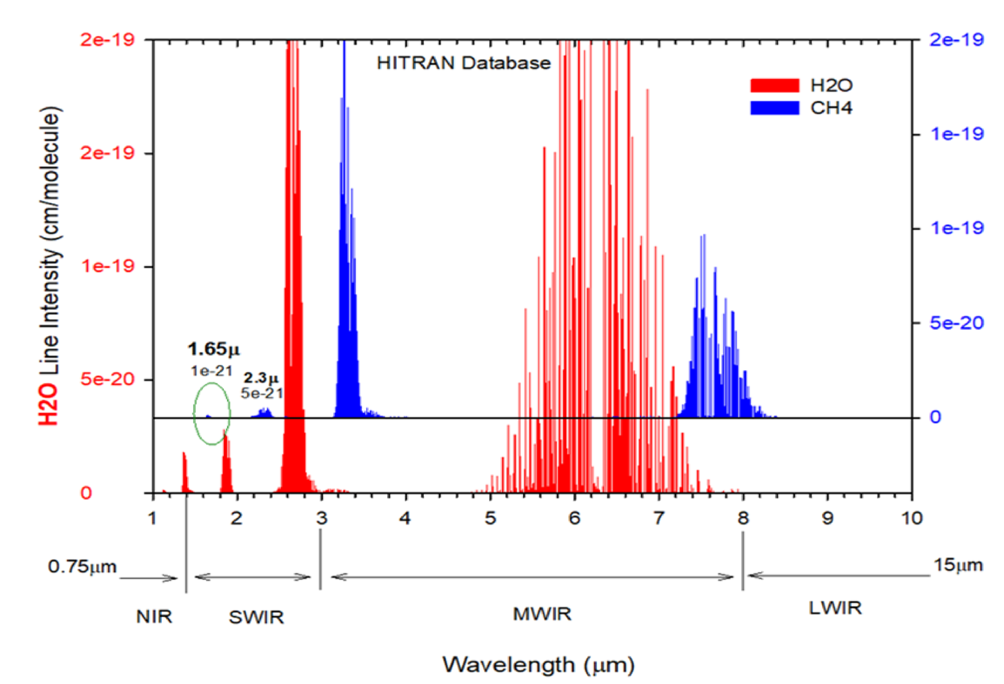
➢ MOX vs TDLAS:

Comparison factors	Metal Oxide Sensors (MOX)	Laser Absorption Spectroscopy (TDLAS)
Sensitivity	Lower sensitivity	Higher sensitivity
Detection Limits	Higher detection limits	Lower detection limits
Selectivity	Cross-sensitivity to other gases	Highly selective
Response Time	Moderate response time, a few seconds to minutes	Fast response times, milliseconds to seconds
Stability	Affected by changes in temperature, humidity, and pressure	More stable across different environmental conditions
Cost	Cheaper, suitable for cost-sensitive applications	Higher cost, its complexity ensures high accuracy and reliability
Applications	Portable methane gas detectors, where cost is a critical factor	Leak detection in pipelines, where high precision and fast response needed
Maintenance	Regular calibration and maintenance	Less frequent calibration and maintenance

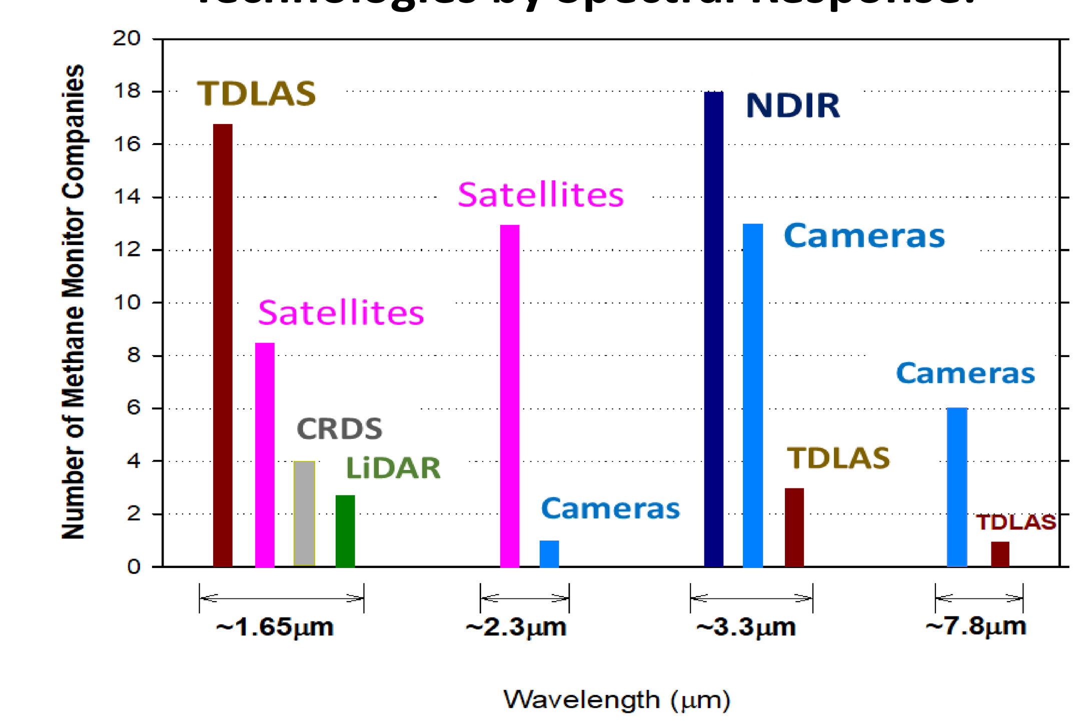
➢ Average Unit Cost per Technology:



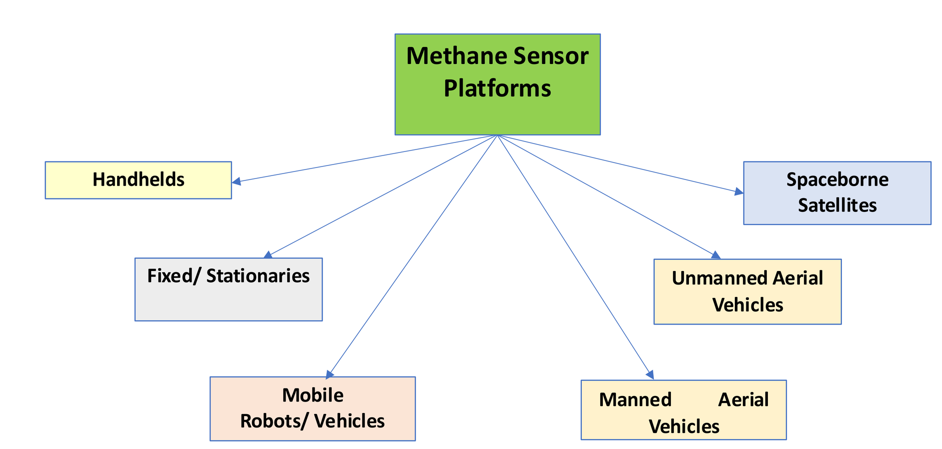
Comparing Methane Absorption Bands with Water Vapor Interferences in IR-Based Sensor Technologies :

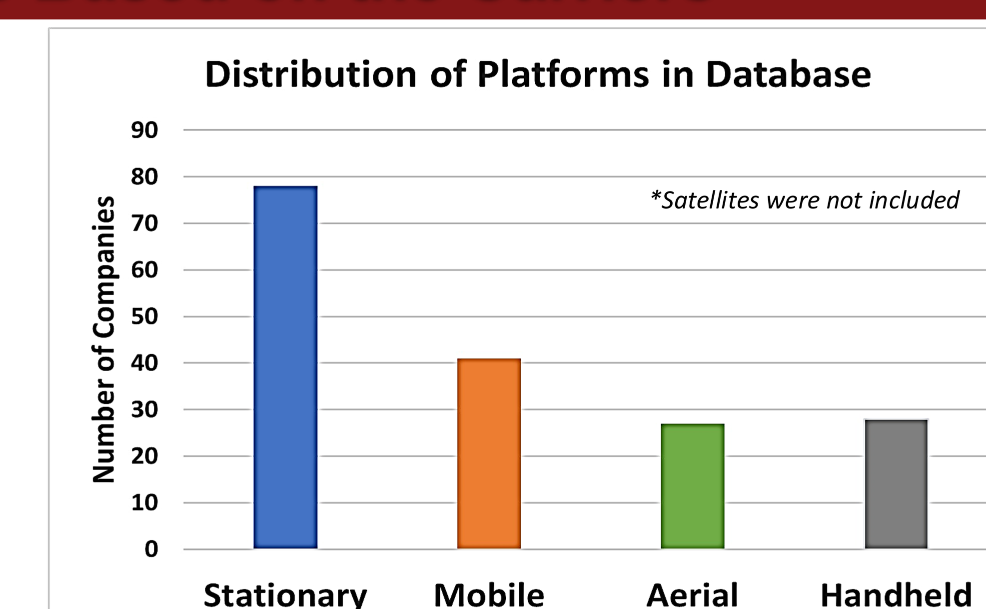


Distribution of IR-based Methane Sensor Technologies by Spectral Response:

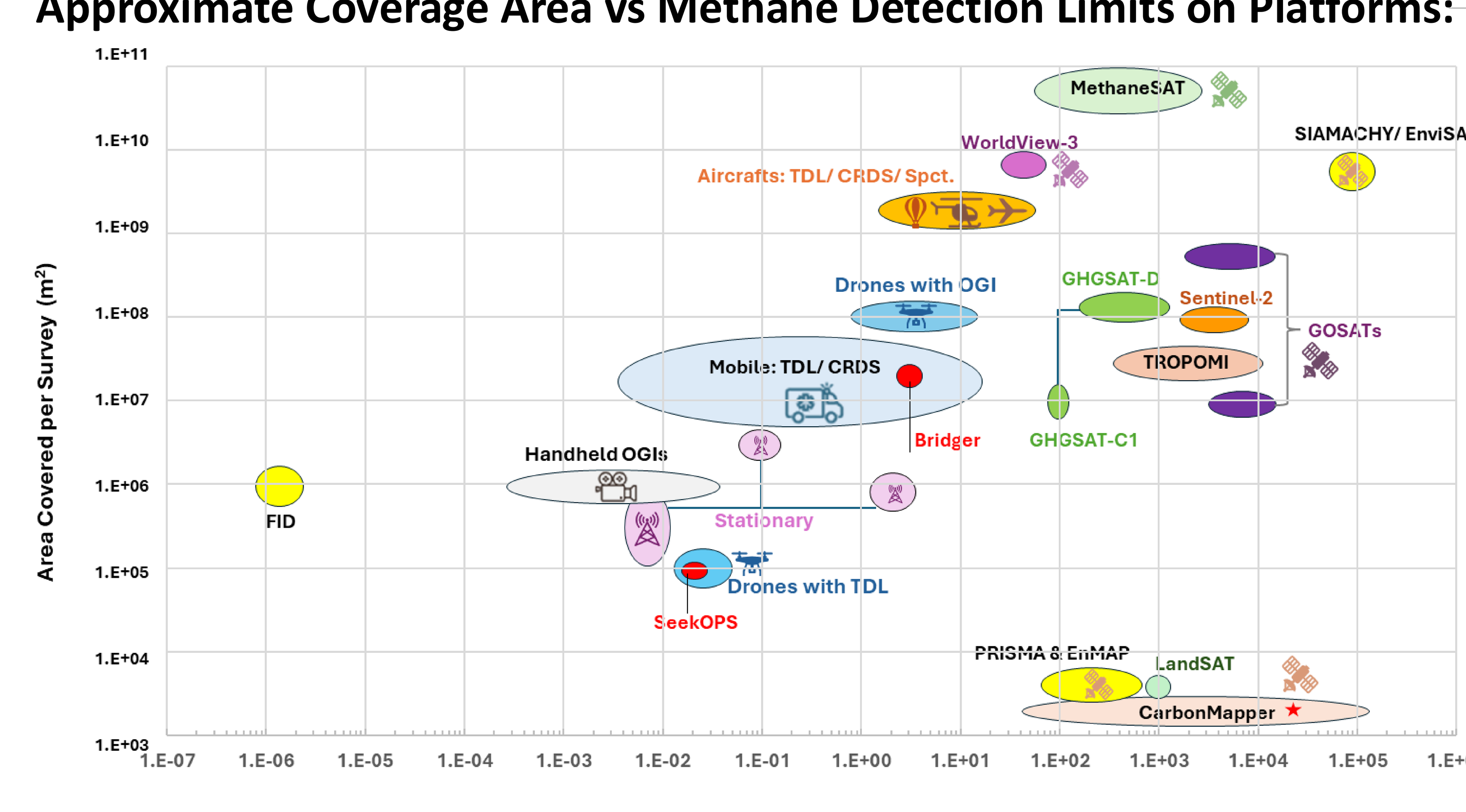


6. Methane Measurement Platforms Based on the Carriers

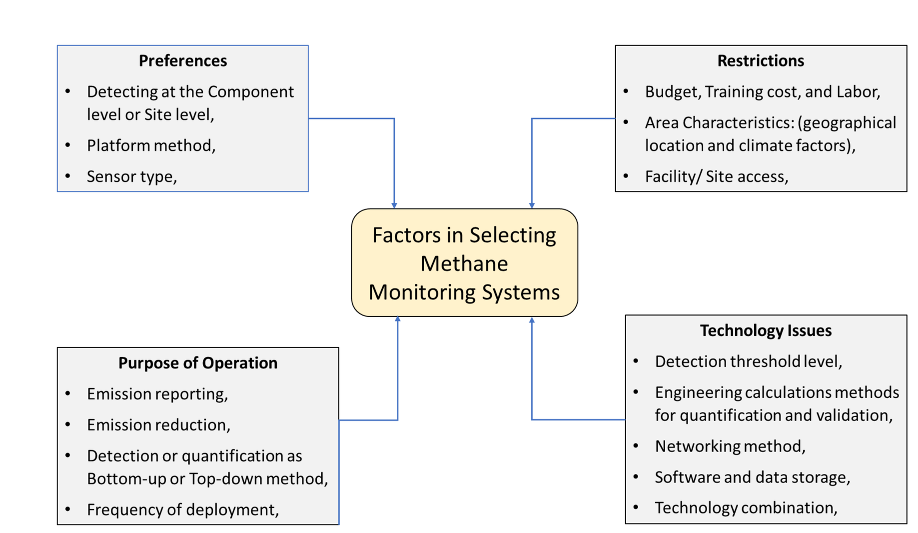




Approximate Coverage Area vs Methane Detection Limits on Platforms:



Proposed Points in Choosing a Methane Monitoring System:



Refs: 1-The Database, 2-Related references are available in the "Executive Document".