

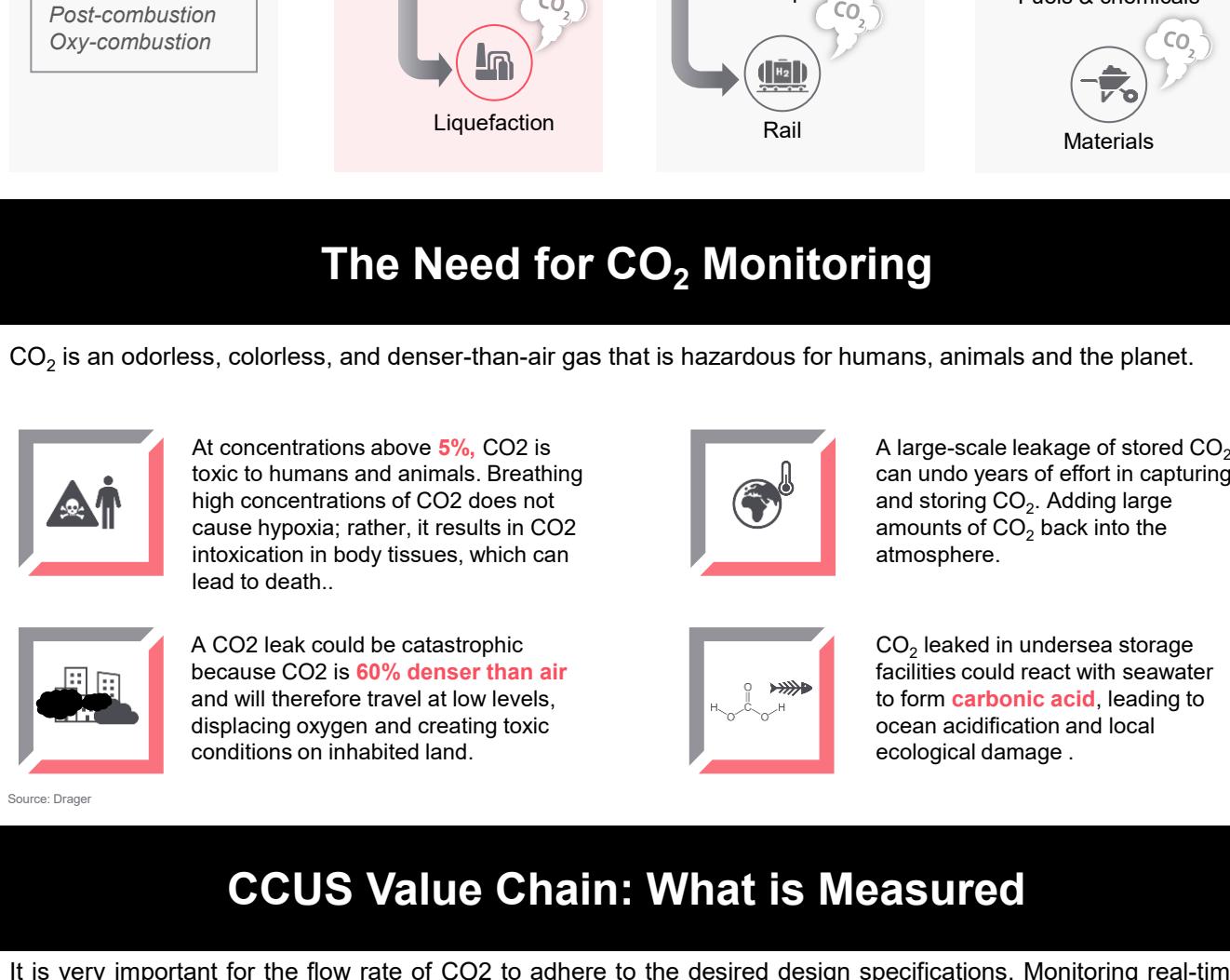
FutureBridge

CO₂ MONITORING

Carbon visibility across CCUS value chain

CCUS Value Chain: Emission Sources

CO₂ monitoring is the systematic measurement and analysis of carbon dioxide (CO₂) levels at each stage which ensures safety, environmental protection, regulatory compliance and operational efficiency and for that emission source identification is of utmost importance.



The Need for CO₂ Monitoring

CO₂ is an odorless, colorless, and denser-than-air gas that is hazardous for humans, animals and the planet.



At concentrations above **5%**, CO₂ is toxic to humans and animals. Breathing high concentrations of CO₂ does not cause hypoxia; rather, it results in CO₂ intoxication in body tissues, which can lead to death..

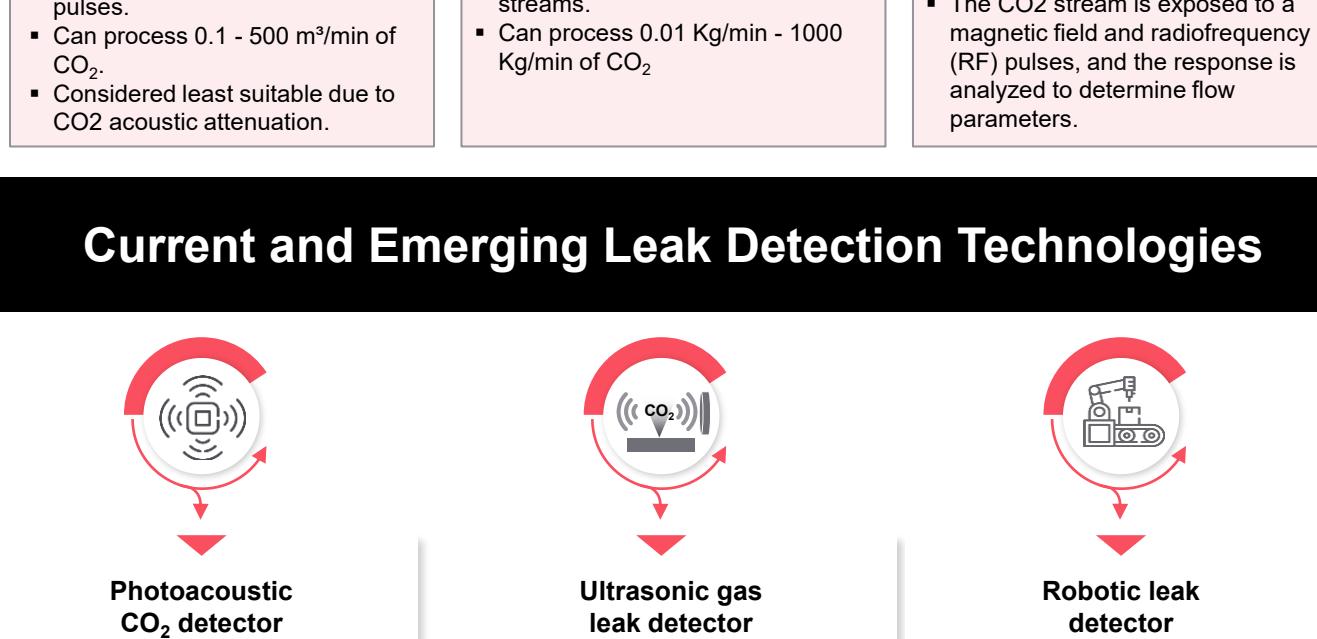


A large-scale leakage of stored CO₂ can undo years of effort in capturing and storing CO₂. Adding large amounts of CO₂ back into the atmosphere.

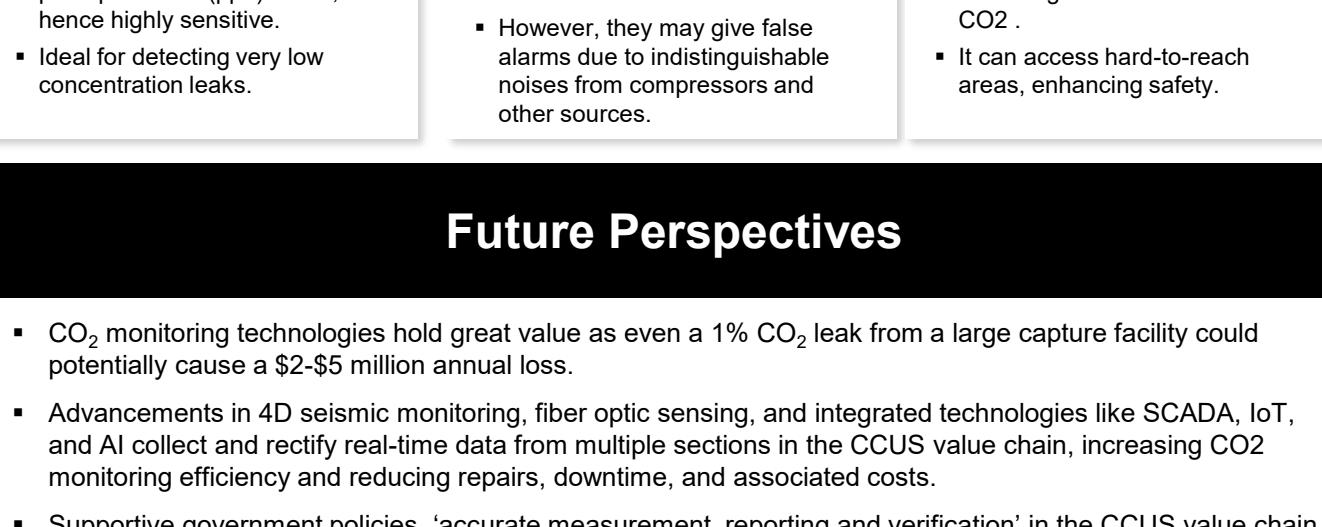
Source: Drager

CCUS Value Chain: What is Measured

It is very important for the flow rate of CO₂ to adhere to the desired design specifications. Monitoring real-time leak detection is crucial to avoid fugitive emissions, and the placement of flow meters and leak detectors is essential at all stages of the CO₂ value chain.



The Evolution of Flowmeter Technologies

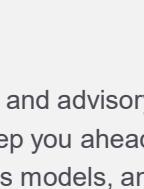


Current and Emerging Leak Detection Technologies



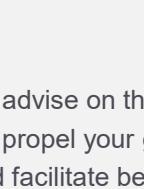
Photoacoustic CO₂ detector

- Photoacoustic detector operates on the photoacoustic effect which generates sound waves to identify and measure possible CO₂ leaks.
- Can process CO₂ concentrations at parts per billion (ppb) levels, hence highly sensitive.
- Ideal for detecting very low concentration leaks.



Ultrasonic gas leak detector

- Ultrasonic detectors use an array of microphones sensors to detect the high-frequency hissing of compressed gas leaks.
- They are effective for detecting larger leaks and useful in noisy industrial environments.
- However, they may give false alarms due to indistinguishable noises from compressors and other sources.



Robotic leak detector

- Robots equipped with advanced sensors and algorithms can detect CO₂ leaks with sensitivity depending on the type of sensor used.
- They can be designed to detect low to high concentrations of CO₂.
- It can access hard-to-reach areas, enhancing safety.