



Bundesministerium
für Wirtschaft
und Technologie



Projektträger Jülich
Forschungszentrum Jülich

Project “DIVMALDA”

Digitization and Verification of Marine Live Emission Data

2026-06-25 Hinrich Brumm



Most spoken words since 2008 in shipping

- Digitalization

- Today many processes aboard are done manually (noon report)
- Even CO₂-Reporting IMO DCS, EU MRV, etc. based on manual measurements, assumptions, etc
- Shipowner, charterers and governments aim for (internal & external) transparency



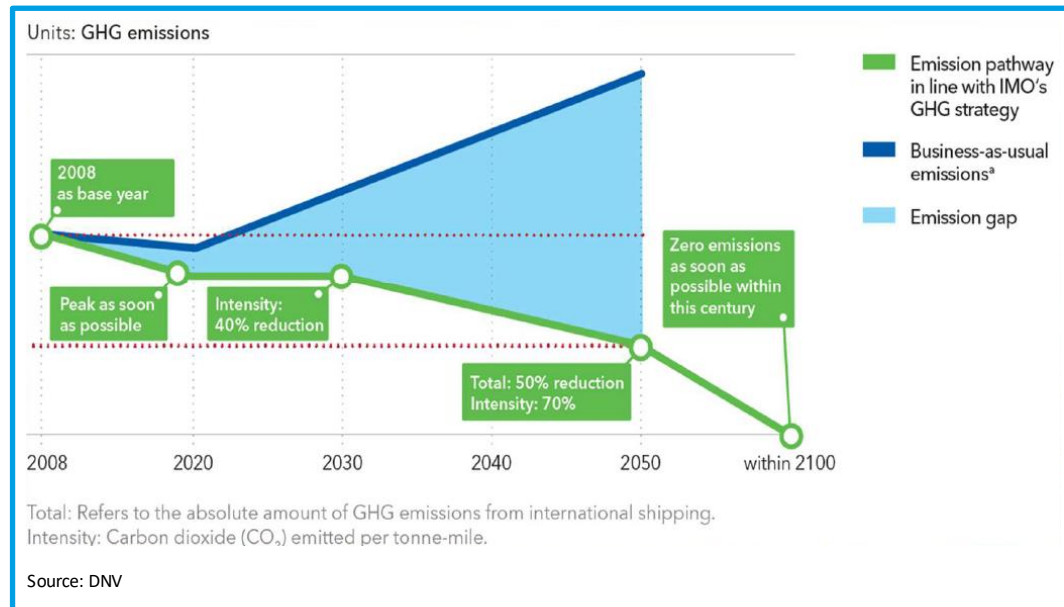
- Decarbonization

- Even shipping is the most efficient transport, it contribute to global warming with ~3%
- Newbuildings and existing fleets must reduce GHG (CO₂, N₂O, CH₄, etc)
- New fuels are on the market with new emissions to control
- IMO ambitions in critic as to slow

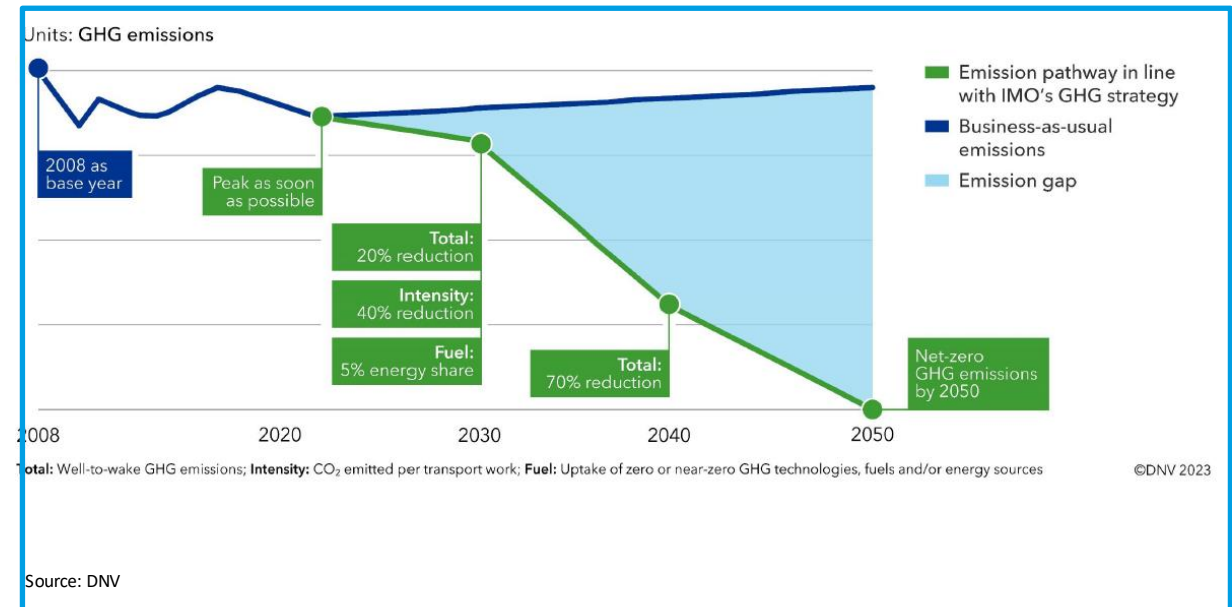


IMO Decarbonization Plan

- MEPC72 – April 2018 –Initial IMO Strategy on Reduction of GHG Emission from Ships

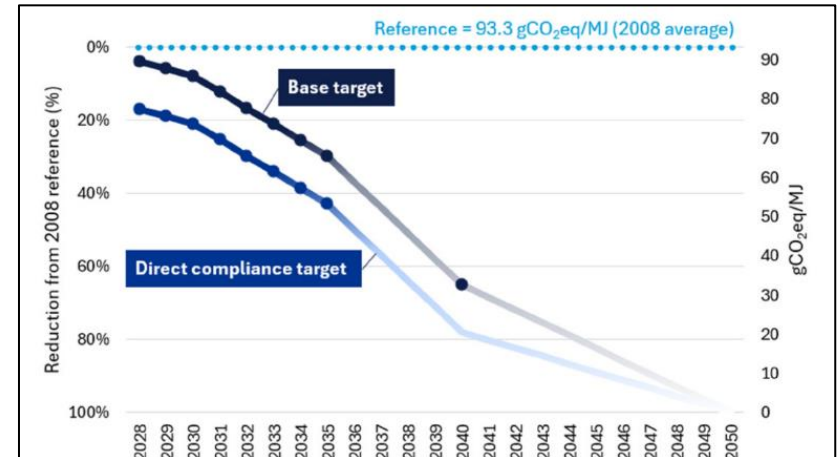


- MEPC80 – July 2023 - The revised Strategy on Reduction of GHG Emissions from Ships

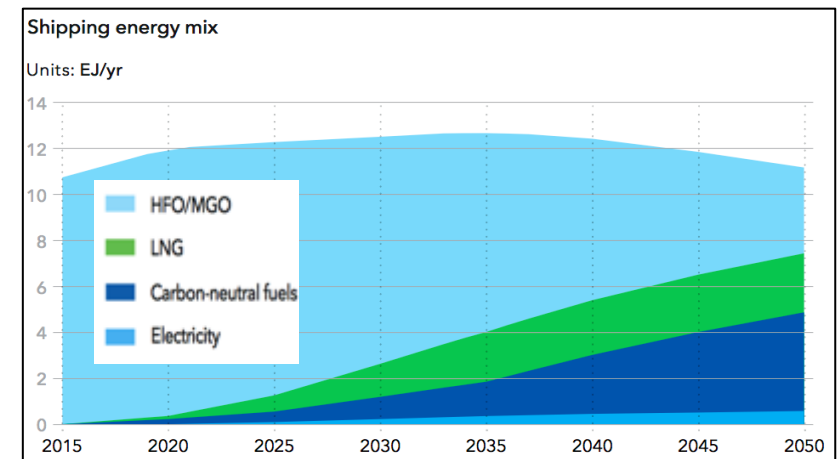


Marine Future fuels and Opportunities

- Down to zero
 - All ships must bring down GHG emissions
 - On existing ships, max. 20-30% can be achieved, but a ship is built for at least 20+ years
 - Many newbuildings with LNG -> **CO₂ + CH₄ slip**
 - New technology for retrofitting available -> **HFO with EGCS and CCUS**
 - GHG emissions needs to be controlled -> **Reporting Systems**
- Marine Future Fuels and Impact
 - 120.000 ships running on conventional fuel for the next years
 - LNG on the rise
 - Ammonia, Methanol, Hydrogen, electric...
 - Reporting difficult due to several tanks aboard with different fuels

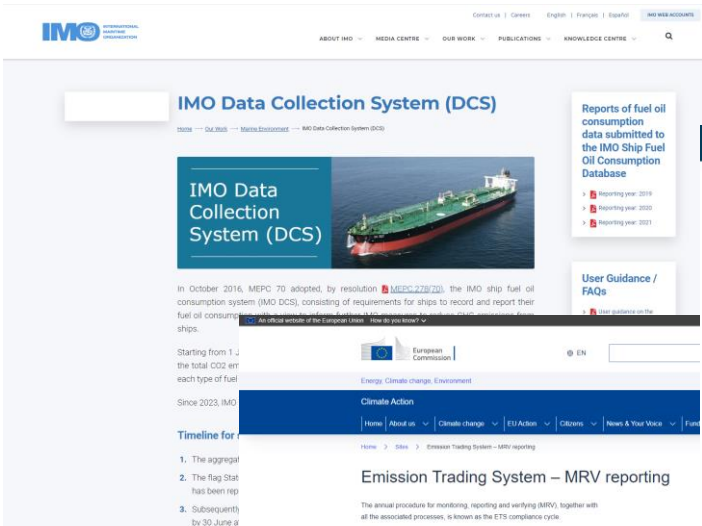


Source: DNV



Source: DNV

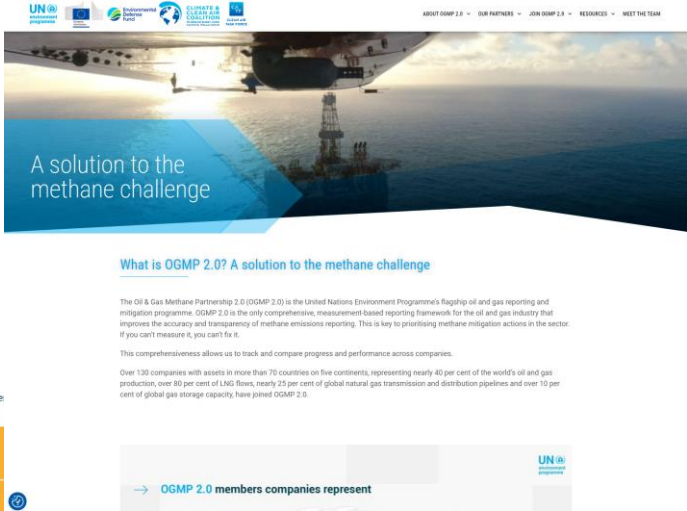
Emissions Transparency Becoming More Relevant



Source: <https://www.imo.org>



Source: <https://www.poseidonprinciples.org>



Source: <https://ogmpartnership.com/a-solution-to-the-methane-challenge/>

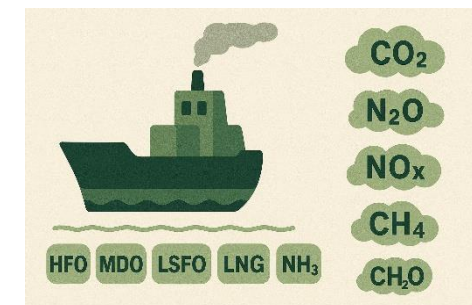
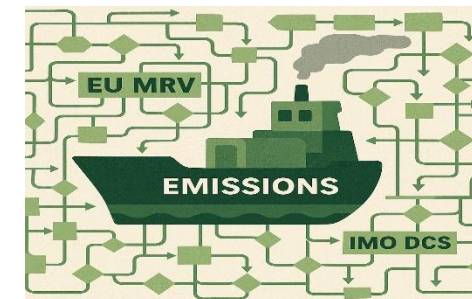


Source: <https://www.seacargocharter.org/>

Source: <https://www.climate.ec.europa.eu/>

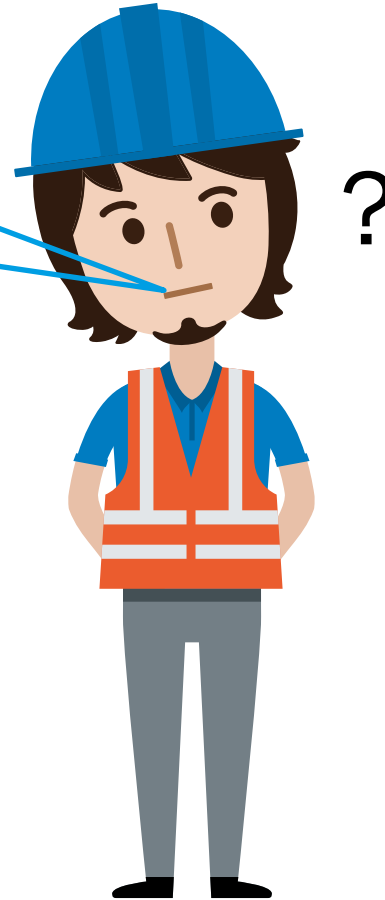
Challenges of Emission Control & GHG Reporting

- Decarbonization/GHG Reporting relevant for the whole lifetime of the vessel
 - Starting from financing (Poseidon Principles)
 - Design, Building & Operation (EEDI, EEXI, SEEMP, CII, GFI,....)
 - Reporting (EU MRV, IMO DCS),...
 - Owner motivation and generation responsibility
 - Sustainability commitment
- Different emission reporting schemes require different processes
 - Different data, processes, formats, tools
 - Manual effort for crew, backoffice and therefore prone to errors
 - The entire information chain is not tamper-proof
- Models are mainly based on fuel consumption
 - Calculation of CO₂ from fuel simple, but N₂O, CH₄,...?
 - Often based on historical data (e.g. EIAPP)
 - Partly conservative fuel factors might not reflect the real emissions



New Approach...

Why not measuring and reporting GHG direct
by using digital solutions?...?!
Real-time measurement is state of the art for
land-based applications.



DIVMALDA – The future of digital emission reporting

Digitization and Verification of Marine Live Emission Data(DIVMALDA)

Challenges:

- In order to report emissions based on mass flow requirements, both the gas concentrations and the exhaust gas mass flow must be measured.
- Measuring an exhaust gas mass flow can be very challenging (each ship has different conditions, non-ideal intake sections, etc.).
- Current measurement technology for measuring emissions from 5-7 emission sources is expensive and not attractive enough as alternative
- Data needs to be trusted by authorization and data sovereignty must be guaranteed
- Too complex/risky for one company

Approach

Public founded R&D Project with the aim of digitization and verification of live emission data from ships for transparent and credible reporting and monitoring processes and CO₂-optimized ship operation

Strategic Goals

- First-time use of IDS (International Data Space) technology in the field of maritime emissions as a basis for emissions-based fees
- Development of a new CO₂ sensor concept for MRV/DCS reporting as a basis for acceptance by flag states
- Cloud connection to shipping company and port operator
- Live implementation on two container ships and a harbor ferry
- Blue-Print for an innovative trustful marine emission reporting system

[maritime-forschungsstrategie-2025](#)

Kick-Off DIVMALDA 9th of July 2024



DIVMALDA – The future of digital emission reporting

Consortium



Bundesministerium
für Wirtschaft
und Technologie



DNV



CPO Containerschiffreederei



Hamburg Port Authority



Endress+Hauser



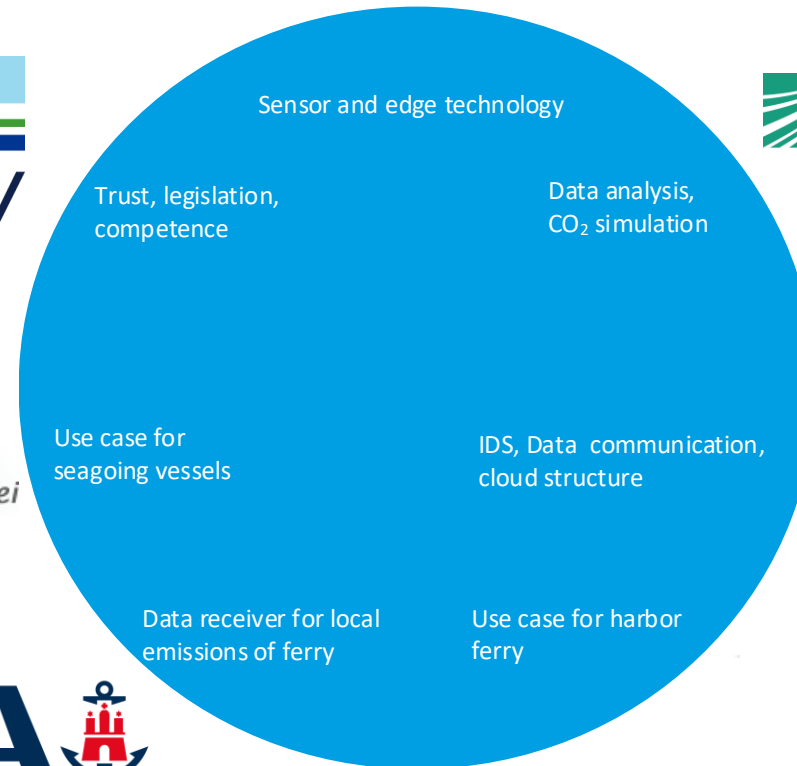
Fraunhofer
CML



Fraunhofer
ISST



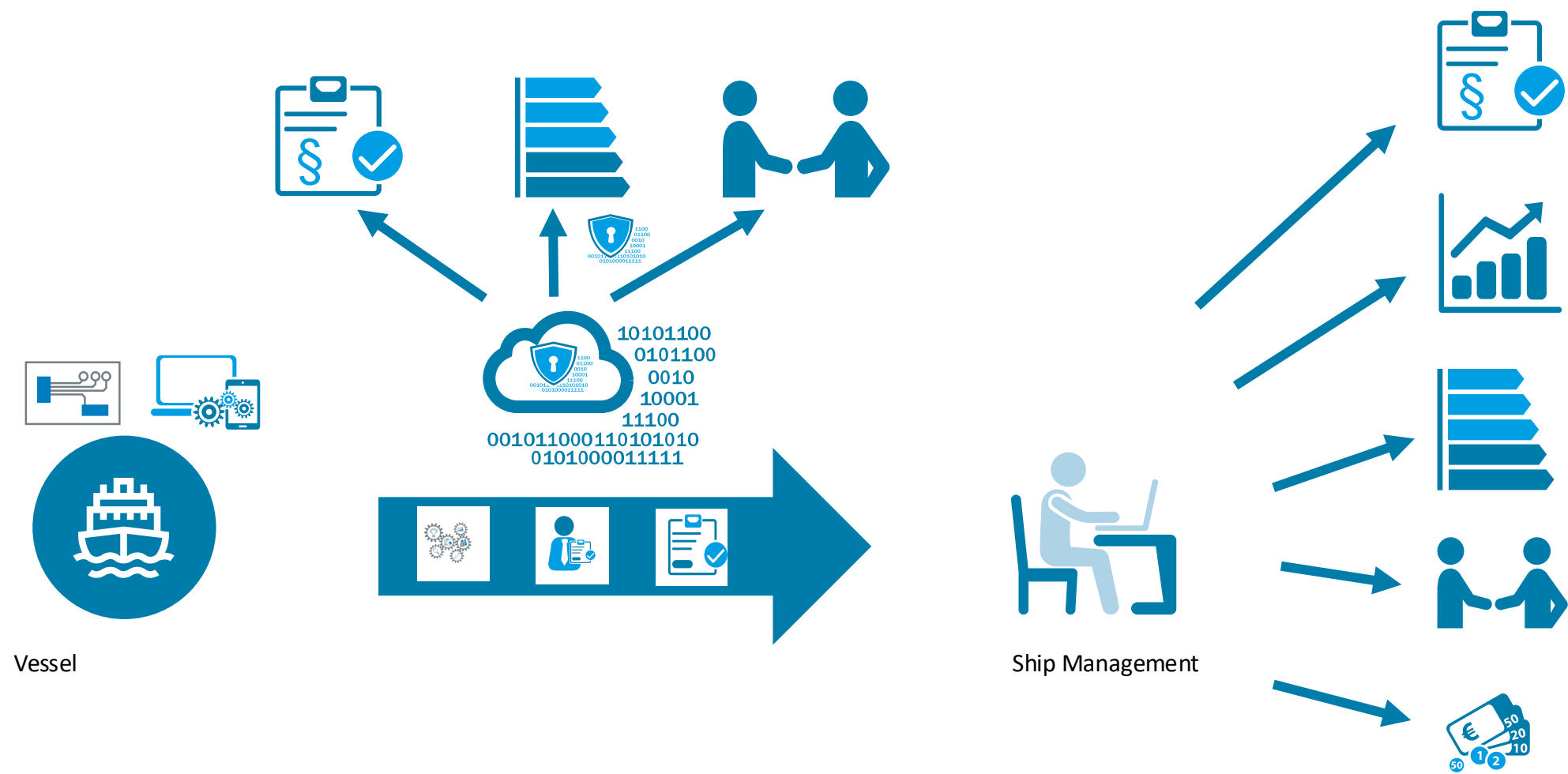
Flotte Hamburg



Todays Reporting

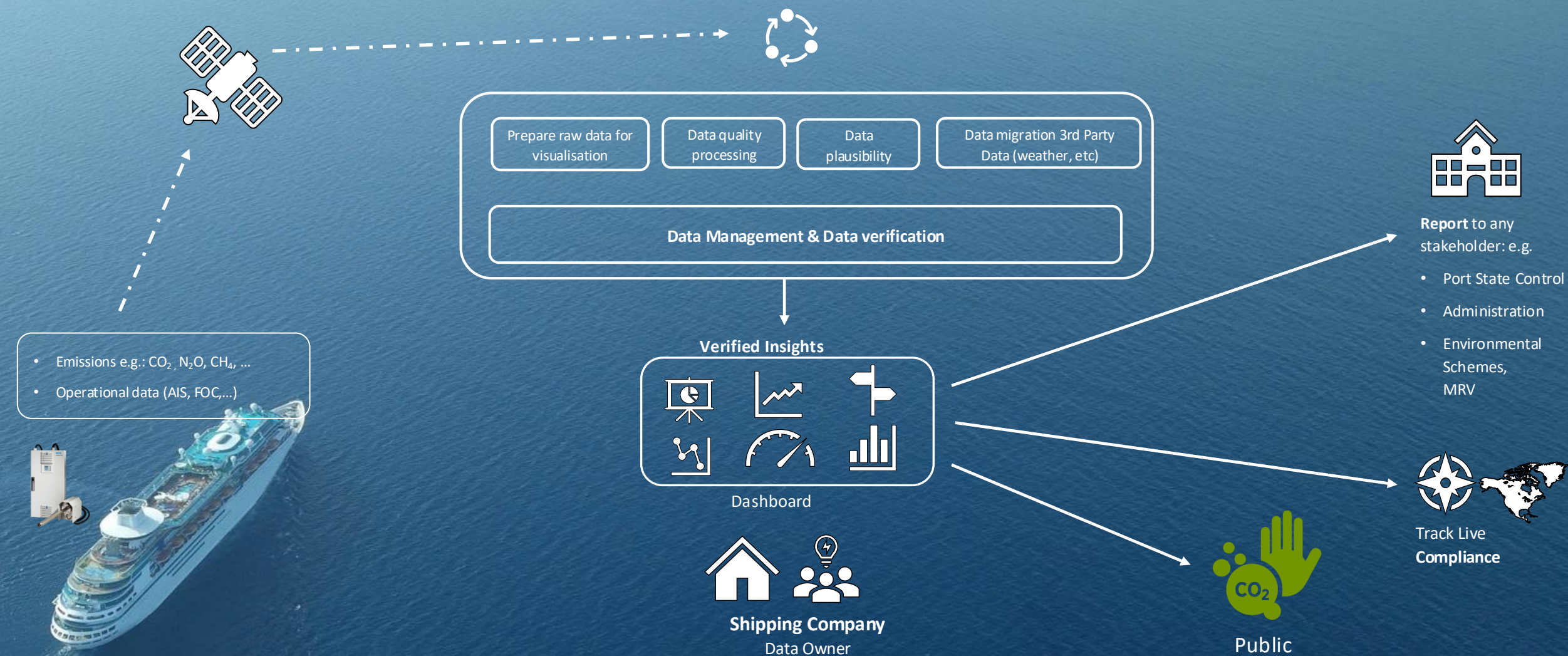


Modell of full automated Reporting

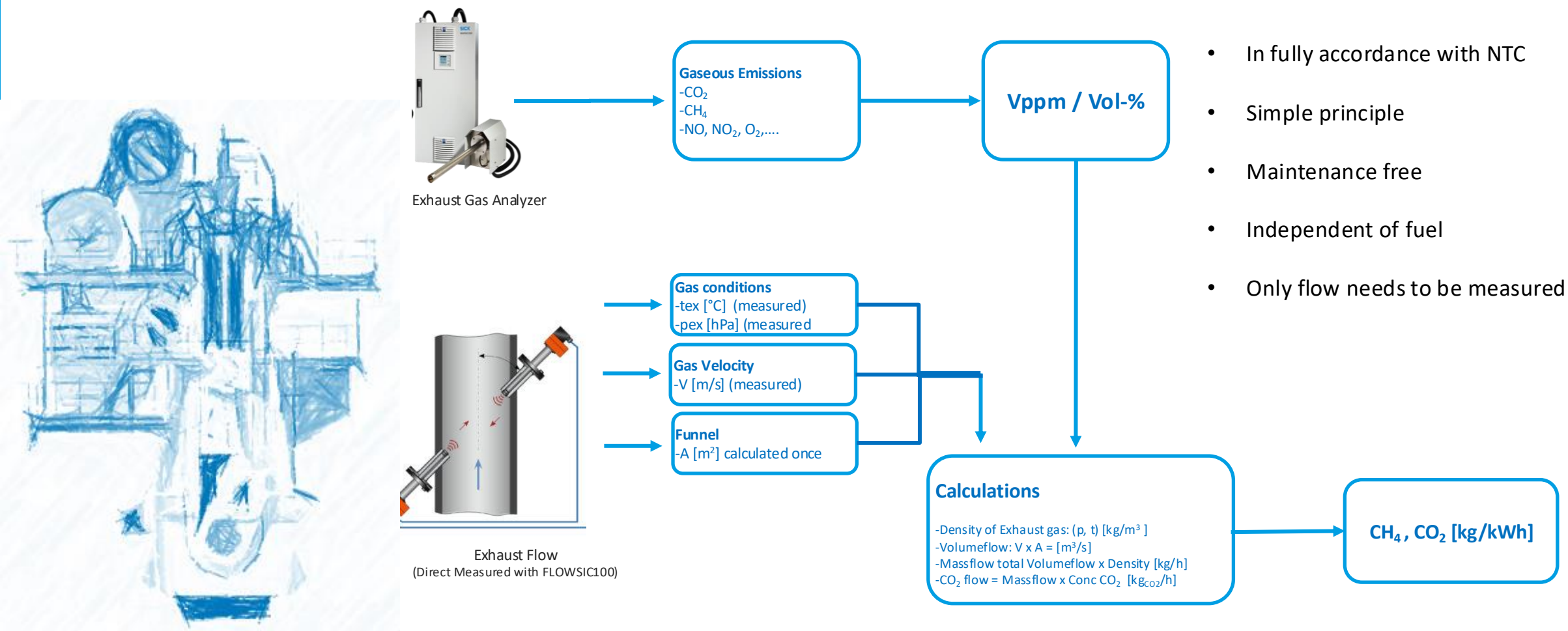


DIVMALDA – The future of digital emission reporting

At a Glance



Maritime GHG Measurement and Reporting Solutions



The benefits of real time GHG emission monitoring...

Real time GHG measuring and cloud-based reporting



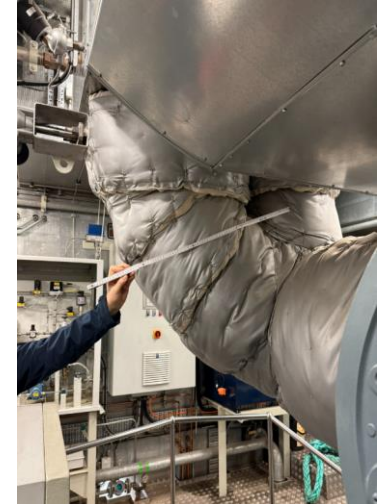
Prototype Installation on MSC Savona



Prototype Installation on MSC Savona



Next Prototype Installation on Johannes Dahlmann





Thank you for your attention!

Hinrich Brumm

Industry Manager Endress + Hauser