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INNOVATION STORIES

How global shipping liner Hapag-Lloyd automates emissions calculations.

Agenda

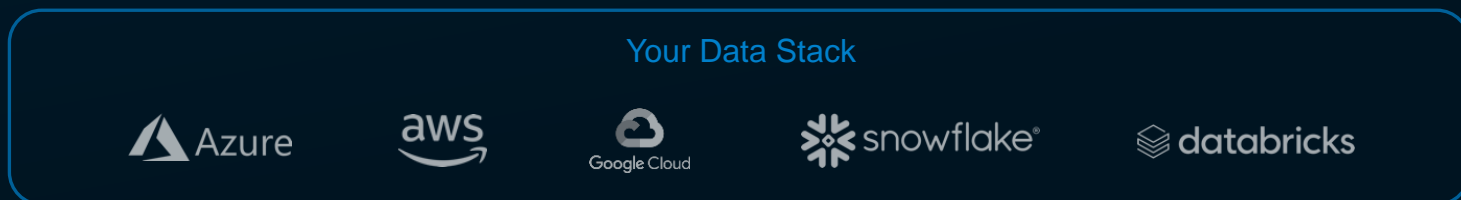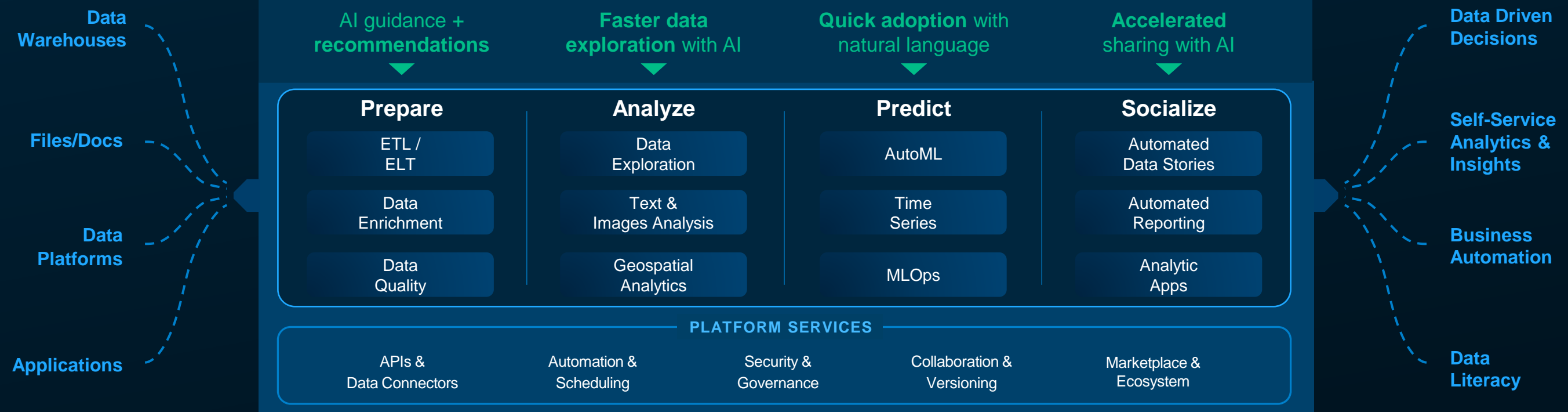# alteryx
INNOVATION STORIES

Hapag-Lloyd's Use Case on CO2 emissions calculations for shipping containers launches the 'Innovation Stories' series, spotlighting analytics for business transformation.

Facing ESG regulations and organizational sustainability goals particularly with CSRD and Emissions Trading Systems expansions have increased the need for innovative data analytics.

3

alteryx | AI PLATFORM
FOR ENTERPRISE ANALYTICS

Powered by AI with **AiDIN**

AI guidance + **recommendations**	**Faster data exploration** with AI	**Quick adoption** with natural language	**Accelerated** sharing with AI
Prepare	**Analyze**	**Predict**	**Socialize**
ETL / ELT	Data Exploration	AutoML	Automated Data Stories
Data Enrichment	Text & Images Analysis	Time Series	Automated Reporting
Data Quality	Geospatial Analytics	MLOps	Analytic Apps

PLATFORM SERVICES

APIs & Data Connectors	Automation & Scheduling	Security & Governance	Collaboration & Versioning	Marketplace & Ecosystem

Data Warehouses

Files/Docs

Data Platforms

Applications

Data Driven Decisions

Self-Service Analytics & Insights

Business Automation

Data Literacy

Your Data Stack

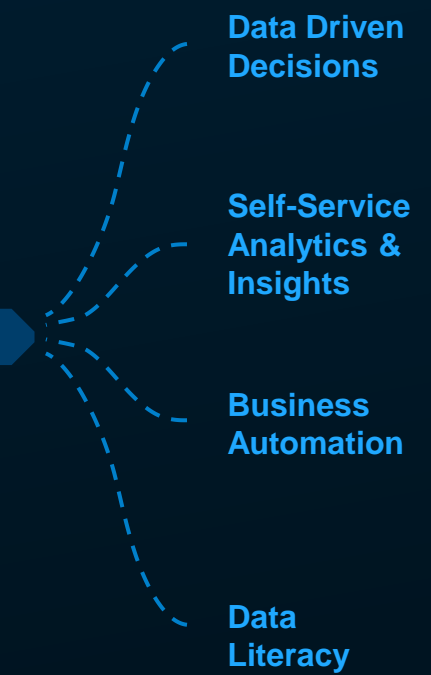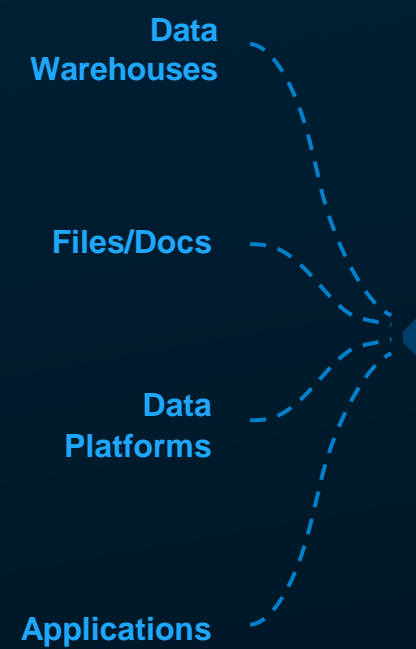Azure · aws · Google Cloud · snowflake · databricks

Alteryx is a comprehensive platform for data analytics, streamlining the conversion of raw data into actionable insights through automation.

4

Common ESG data challenges
- data availability
- data sourcing
- traceability
- data security
- unlocking insights from ESG data

In the realm of ESG analytics, a unified analytics platform can help to tackle common challenges such as data availability, sourcing, traceability, security and unlocking insights from ESG data as well as coping with the multidimensional and decentralized nature of ESG data.

OUR EXPERT SPEAKERS!

Benjamin Lösken

Director - ESG and Finance
Transformation
PwC Germany

Lukas Kreth

Data Insights & AI –
Developer
Hapag-Lloyd AG

Niklas de Boer

Data Insights & AI –
Analytics Solution Owner
Hapag-Lloyd AG

CSRD – From Data to Disclosure

14th of May 2024

The Corporate Sustainability Reporting Directive (CSRD) at a glance

Key innovations

Who?	Significant **expansion of the scope of application**
What?	• **Expansion of the content** of sustainability reporting • Development of own **reporting standards** in the EU • **Double materiality** defined
Where?	Sustainability report becomes a mandatory component of the annual (group) report (in a separate section)
How?	Mandatory **electronic format** and **tagging** of the sustainability report
Responsibility?	Responsibility of corporate management and **new (EU) or more specific (DE) role of the Supervisory Board / Audit Committee**
Enforcement?	Clear responsibilities for **preparation, supervision and enforcement**
Audit?	**Mandatory content review** of the sustainability report with **limited assurance**; later transition to assurance with **reasonable assurance**

from 2024

Attention!
The initial application of the reporting obligations is staggered depending on the respective area of application.

CSRD: What is behind the upcoming regulatory requirements?

The CSRD as the new urging ESG regulatory to solve

On 31 July 2023, the European Commission (EC) adopted the final delegated act of the European Sustainability Reporting Standards (ESRS) incl. 12 finalised ESRS listed below.

Cross-cutting Standards		Environmental		Social		Governance	
ESRS 1	General requirements	**ESRS E1**	Climate change	**ESRS S1**	Own workforce	**ESRS G1**	Business conduct
ESRS 2	General disclosures	**ESRS E2**	Pollution	**ESRS S2**	Workers in the value chain		
		ESRS E3	Water and marine resources	**ESRS S3**	Affected communities		
		ESRS E4	Biodiversity and ecosystems	**ESRS S4**	Consumers and end-users		
		ESRS E5	Resource use and circular economy				

12 Standards	~ 350 Pages	> 80 DRs	> 1,000 Datapoints	~ 20 Templates

Requirements are defined by the stakeholders needs

72 % of the participants say, they are using **Excel for reporting** of non-financial data
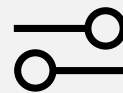
78 % of the participants say, that the one of the **biggest challenges is regarding the data**: acquisition, quality, processing and analysis

67 % of the companies say, they **have not yet** established the **standardized processes** e. g. for reporting on the EU Taxonomy

„EU-Taxonomie – Nachhaltigkeitsberichterstattung im Wandel", Nov. 2022
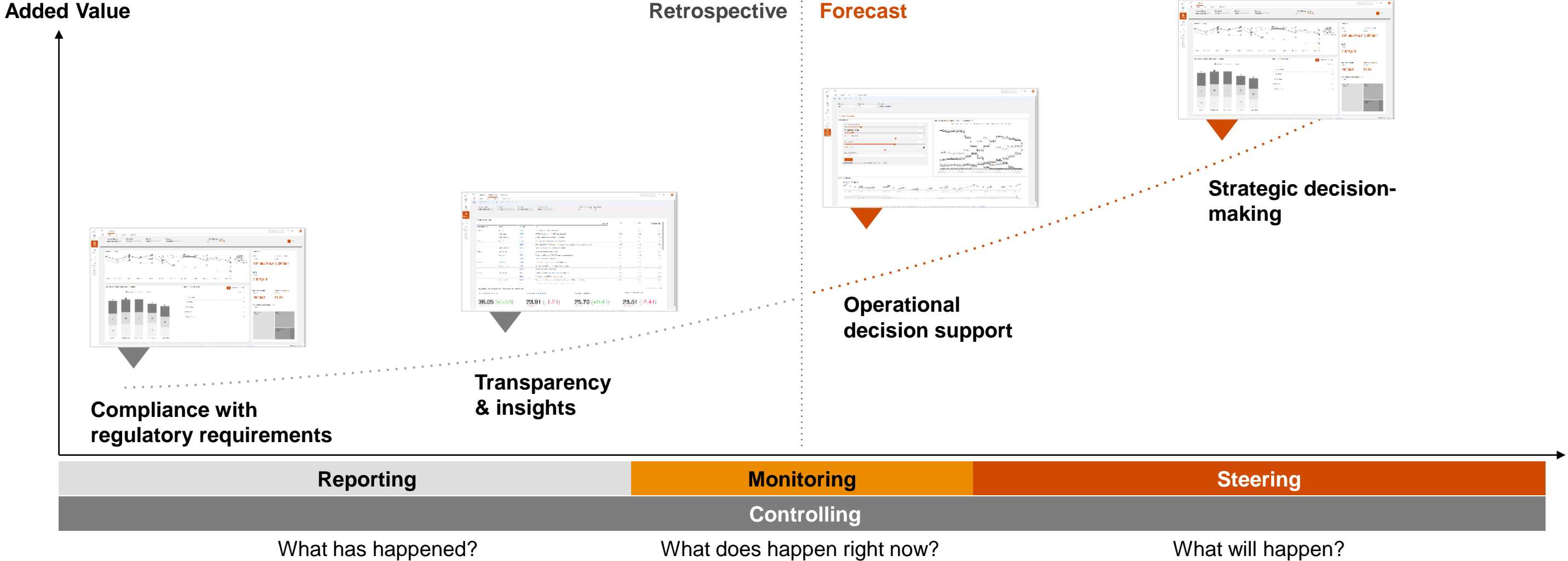https://www.pwc.de/de/im-fokus/accounting-reporting/eu-taxonomie-nachhaltigkeitsberichterstattung-im-wandel.html

„ESG-Strategie und -Berichterstattung – Status und Umsetzung im deutschen Mittelstand", Feb. 2023
https://www.pwc.de/de/mittelstand/esg-strategie-und-reporting-im-mittelstand.html

ESG reporting and steering is more than compliance with regulatory requirements

Added Value

Retrospective   **Forecast**

Compliance with regulatory requirements

Transparency & insights

Operational decision support

Strategic decision-making

Reporting	Monitoring	Steering
Controlling		

What has happened?   What does happen right now?   What will happen?

Regulatory ESG requirements including EU ETS present companies with different challenges

Data

- Mix of **quantitative and qualitative** information required
- Availability and quality of data (real-time data)
- Numerous data points
- **Various data sources** (external and internal)
- Centralized data collection, data consolidation, data management and calculation of KPIs

System

- Integration of different **data from different sources**
- Integration into existing IT projects
- **Interface management** to existing IT system landscapes
- Adaptability / **flexibility** required for IT solutions (focus not only on reporting, but also on steering)
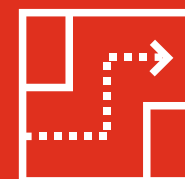
Processes

- **Different departments** and functions that are affected / need to be involved
- Varying degrees of maturity of the individual process areas
- **Internal control systems** must be set up / integrated into the existing framework

Thank you
for your attention.

pwc.de

EU ETS & Analytics

Hapag-Lloyd @ Alteryx

5/14/2024   May 2024

Setting the scene – EU CSRD & EU ETS require data to ensure compliance

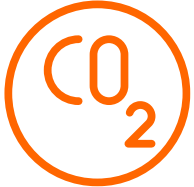**C**orporate
Sustainability
Reporting
Directive

> **Requirement to report on corporate activities that impact the environment & people.**

To report CO2 emissions, they first need to be measured.

Emission **T**rading **S**ystem

CO2 emissions **per TEU**[1]

With the help of **Alteryx**

Hapag-Lloyd

Hapag-Lloyd

Who are we?

Lukas Kreth

- **Data Insights & AI –** Developer
- Specialized on analytics for Trade Management, Utilization and Pricing

Niklas de Boer

- **Data Insights & AI –** Analytics Solution Owner
- Special focus on analytics for sustainability and CO_2 calculation topics

Hapag-Lloyd

We are connecting countries, markets, and people

5

Global liner shipping company

135

countries and 398 offices

~ 16,100**

experts globally from ~100 nationalities

113*

liner services with over 600 ports called worldwide

Headquarter in Hamburg

2.0 Mio.

TEU of transport capacity

264

modern vessels

~ 2.9 Mio.

TEU container stock

Hapag-Lloyd

Source: Company data; Note:
*FP1 Service listed twice (Asia – North America / Europe – Asia) Last Update: 10.11.2023
**Liner Shipping and Terminal & Infrastructure combined

Hapag-Lloyd

We offer more than 100 Services in the main trades

19
SERVICES
Europe –
North America

20
SERVICES
Asia / Oceania –
North America

16
SERVICES
Asia

8
SERVICES
Middle East

17
SERVICES
Africa /
Mediterranean

25
SERVICES
Latin America

9
SERVICES
Europa – Asia /
Oceania

5/14/2024   EU ETS & Analytics - HL @ Alteryx

Last Update: 10.11.2023

Hapag-Lloyd

We offer more than 100 Services in the main trades

20
SERVICES
Asia / Oceania –
North America

19
SERVICES
Europa –
North America

→ ~50% of all TEU

EU ETS emissions

16
SERVICES
Asia

9
SERVICES
Middle East

17
SERVICES
Africa /
Mediterranean

25
SERVICES
Latin America

9
SERVICES
Europa – Asia /
Oceania

Hapag-Lloyd

Why are we calculating the CO2 emissions per container and why is it relevant for EU ETS?

CONTAINER
Calculation is required to define the emissions per TEU and not only per vessel. Measuring emissions is the first step to reducing them.

CUSTOMERS
Emissions per TEU is the KPI that customers are interested in.

TRANS-PARENCY
Analysis provides transparency how the ETS emission calculation & the costs per TEU are affected by the EU ETS legal framework.

Hapag-Lloyd

What questions do we need to answer to calculate the EU ETS relevant CO2 emissions?

What is the legal framework?

What are the CO2 emissions (per TEU) and how many of those are EU ETS relevant?

DATA & ANALYTICS

How do we implement that into a standardized calculation?

DATA & ANALYTICS

Hapag-Lloyd

What questions do we need to answer to calculate the EU ETS emissions?

What is the legal framework?

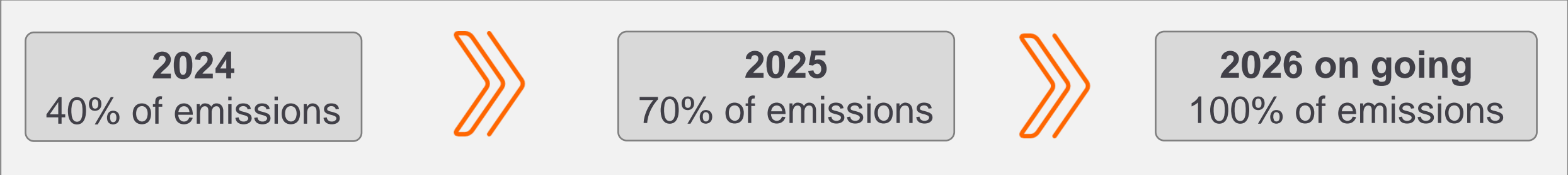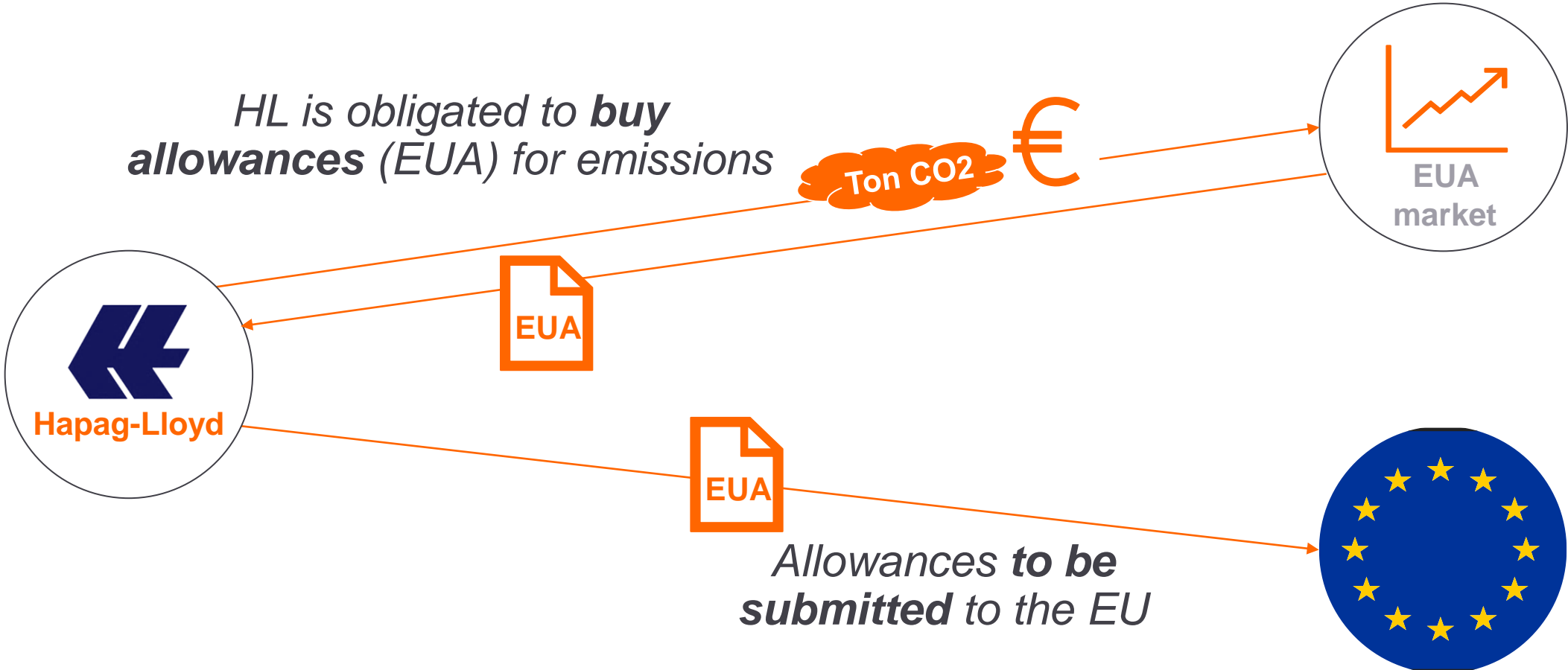**What are the CO2 emissions (per TEU) and how many of those are EU ETS relevant?**
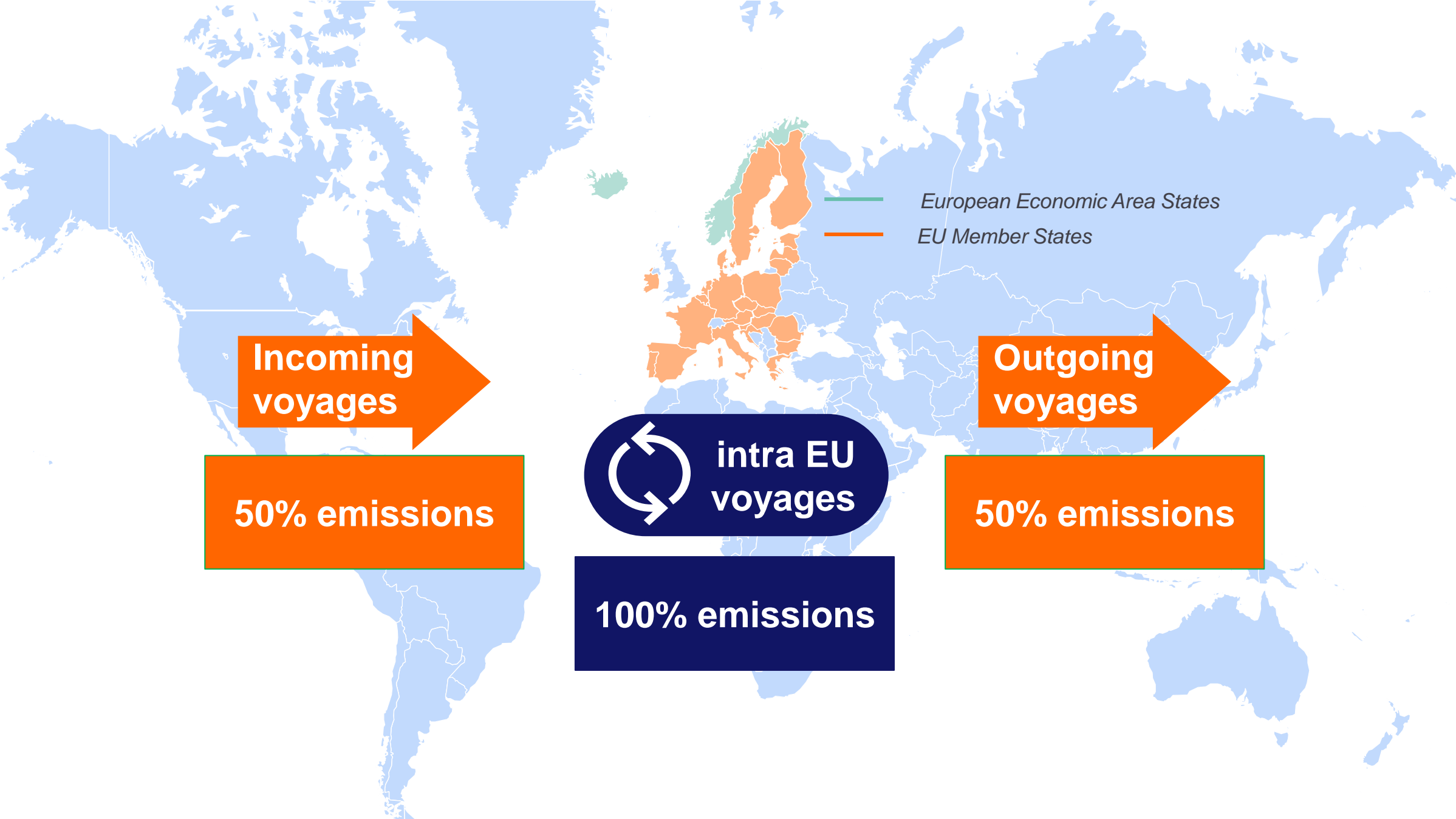
DATA & ANALYTICS

How do we implement that into a standardized calculation?

DATA & ANALYTICS

Hapag-Lloyd

Carriers like Hapag-Lloyd must pay to emit CO2 within the European Economic Area by buying allowances – scope increases over time

*HL is obligated to **buy** allowances (EUA) for emissions*

Ton CO2 €

EUA

Hapag-Lloyd

EUA market

EUA

*Allowances **to be submitted** to the EU*

| **2024**		**2025**		**2026 on going**
40% of emissions		70% of emissions		100% of emissions

Hapag-Lloyd

# Scope for the EU ETS covers 100% of shipping emissions within EU waters and 50% of emissions of in- and outbound voyages

European Economic Area States
EU Member States

Incoming voyages

50% emissions

intra EU voyages

100% emissions

Outgoing voyages

50% emissions

Hapag-Lloyd

EU ETS scope for shipping - Example

— European Economic Area States
— EU Member States

Singapore

50%

Piraeus

100%

Rotterdam

Rotterdam

Piraeus

Singapore

Hapag-Lloyd

EU ETS scope for shipping - Example

European Economic Area States

EU Member States

Singapore

0%

Jeddah

50%

Piraeus

100%

Rotterdam

Hapag-Lloyd

What questions do we need to answer to calculate the EU ETS emissions?

§ **What is the legal framework?** ✓

What are the CO2 emissions (per TEU) and how many of those are EU ETS relevant?

DATA & ANALYTICS

How do we implement that into a standardized calculation?

DATA & ANALYTICS

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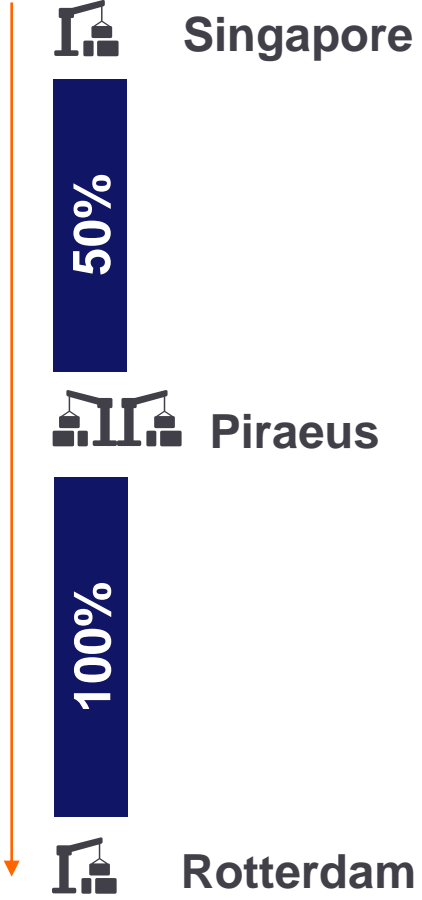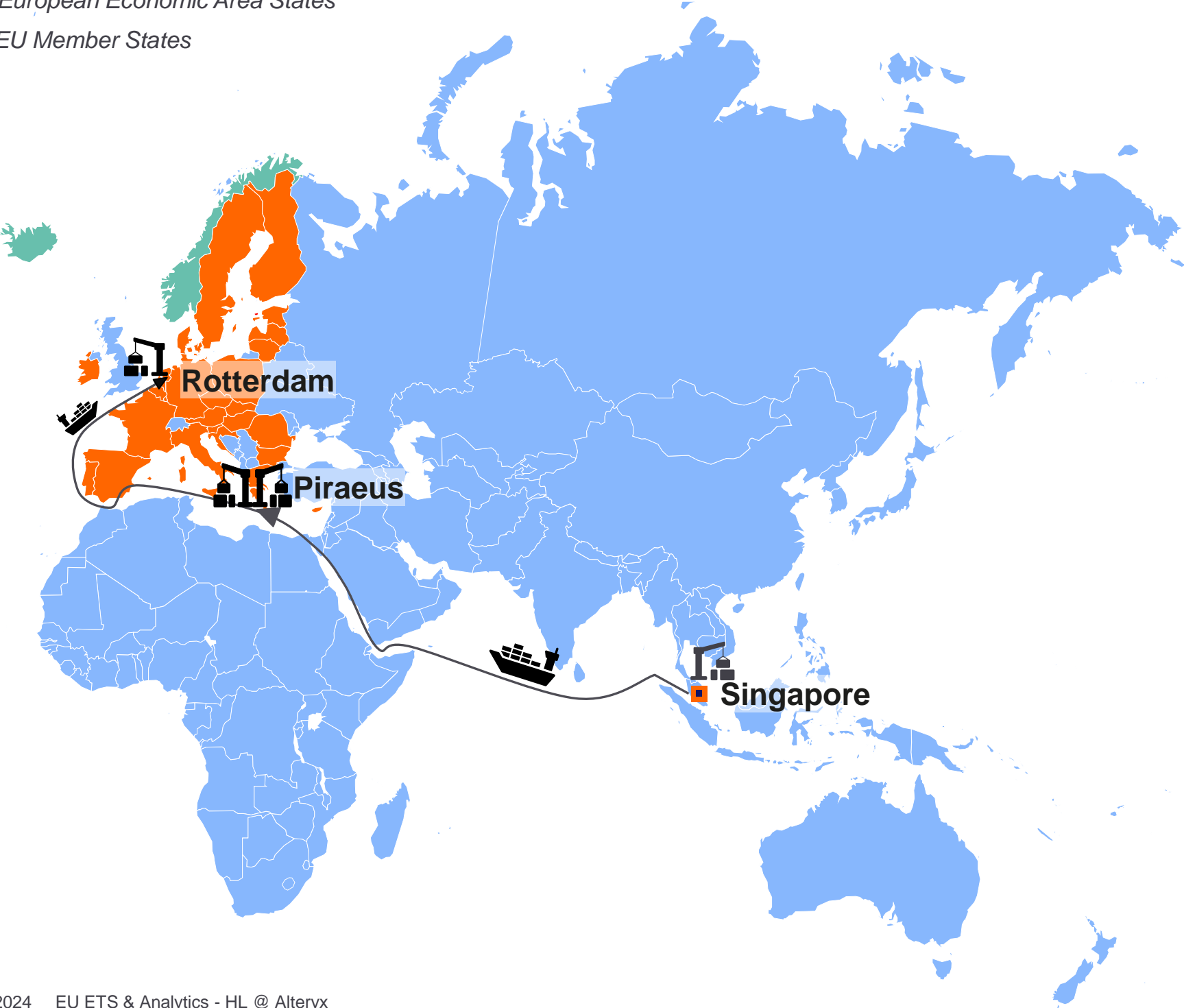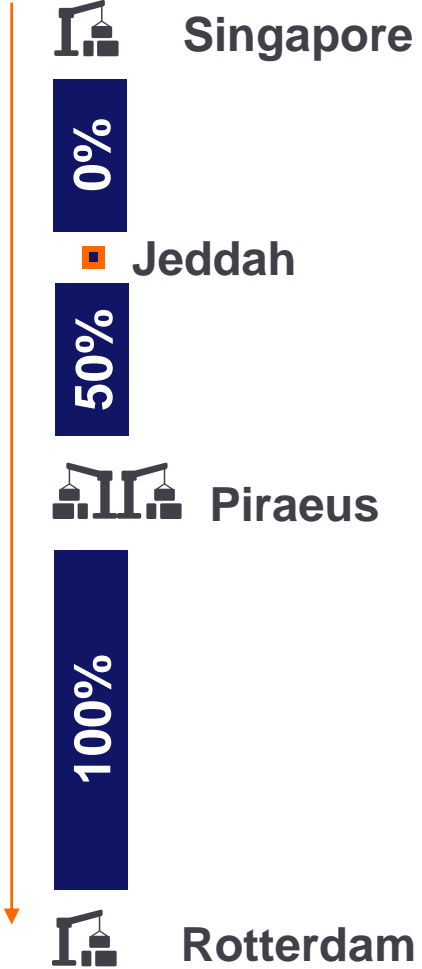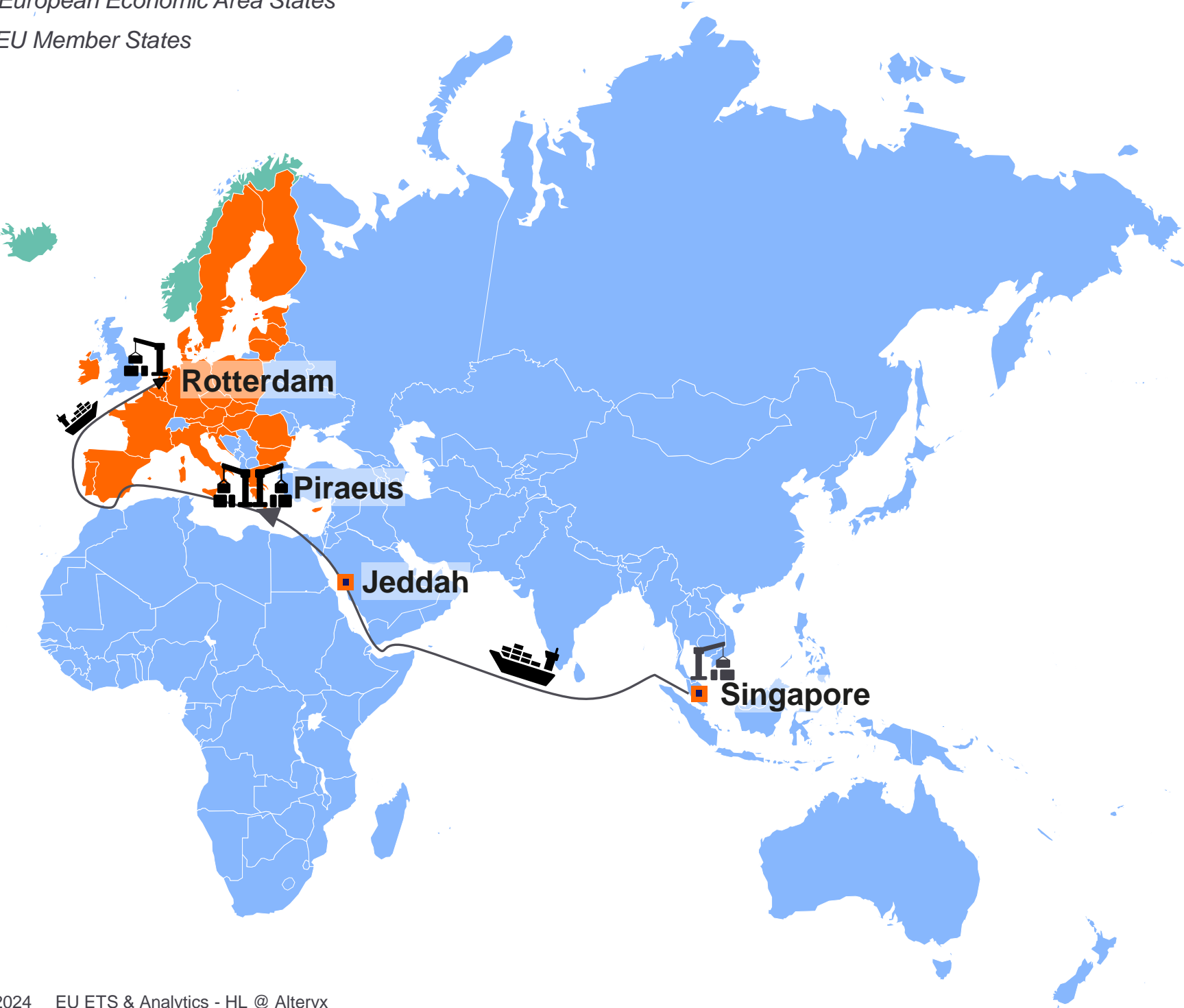
We can measure the CO2 emissions of our vessels by tracking the fuel consumption…

**Fuel Consumption in the EU
x
CO2 emission factor**

But we need to know the emissions of one specific container on that vessel…

?

Divide total CO2 emissions with number of containers?

And we also need to know the CO2 emissions if this container was loaded on a partner vessel.

Carrier XYZ

Hapag-Lloyd

X
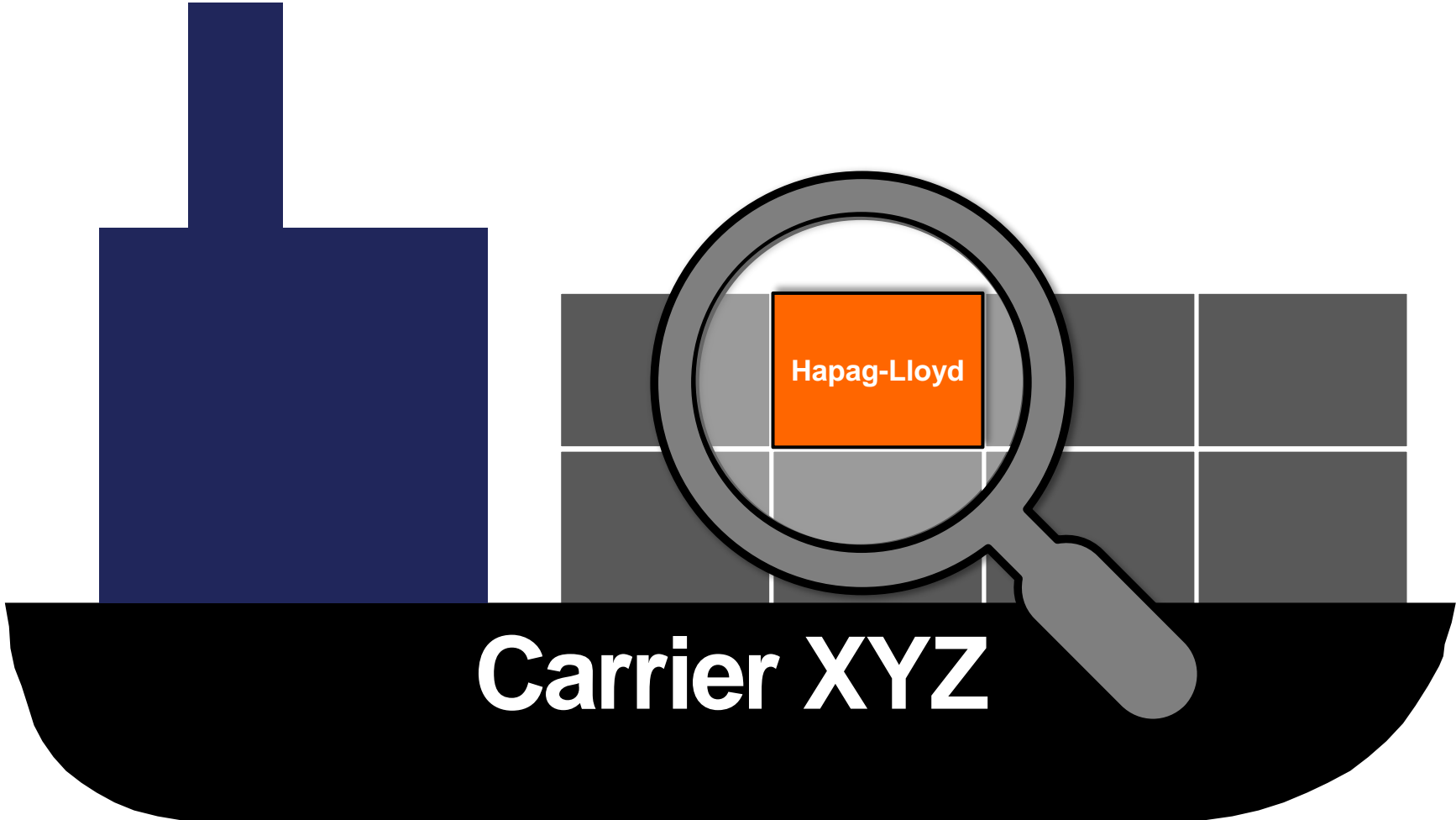
We do not know the consumption of partner vessels.

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The share of one unit is higher if the total number of units (= vessel utilization) decreases
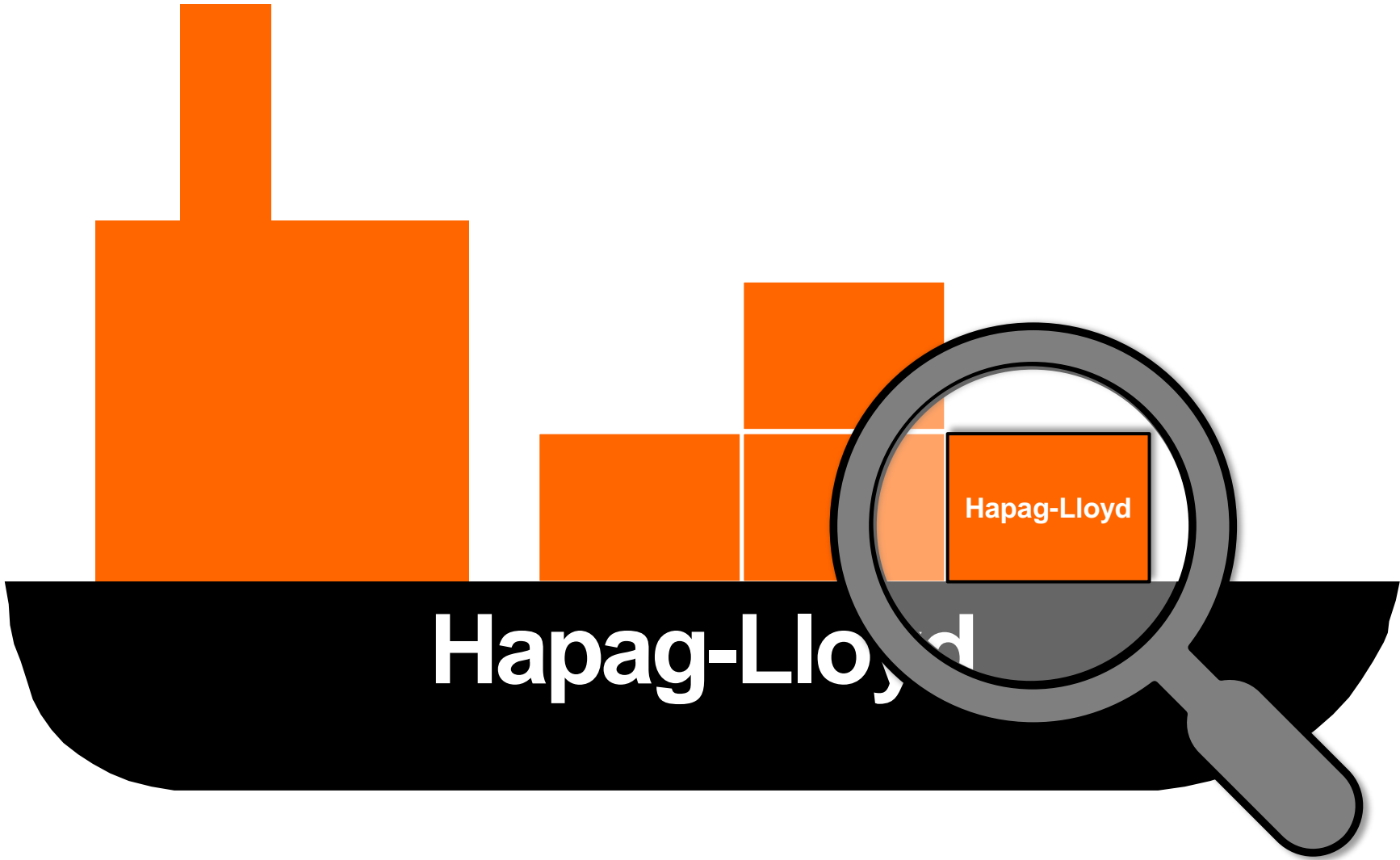
1/8 of the Total CO_2 emissions

→

1/4 of the total CO_2 emissions

Hapag-Lloyd

Hapag-Lloyd

Hapag-Lloyd

Reefer containers have significantly more CO2 emissions because their cooling needs to be powered by additional energy

CO2 per dry TEU < **CO2 per reefer TEU**

Solution: Standardized calculation framework for CO2 emissions for one container provided by Clean Cargo
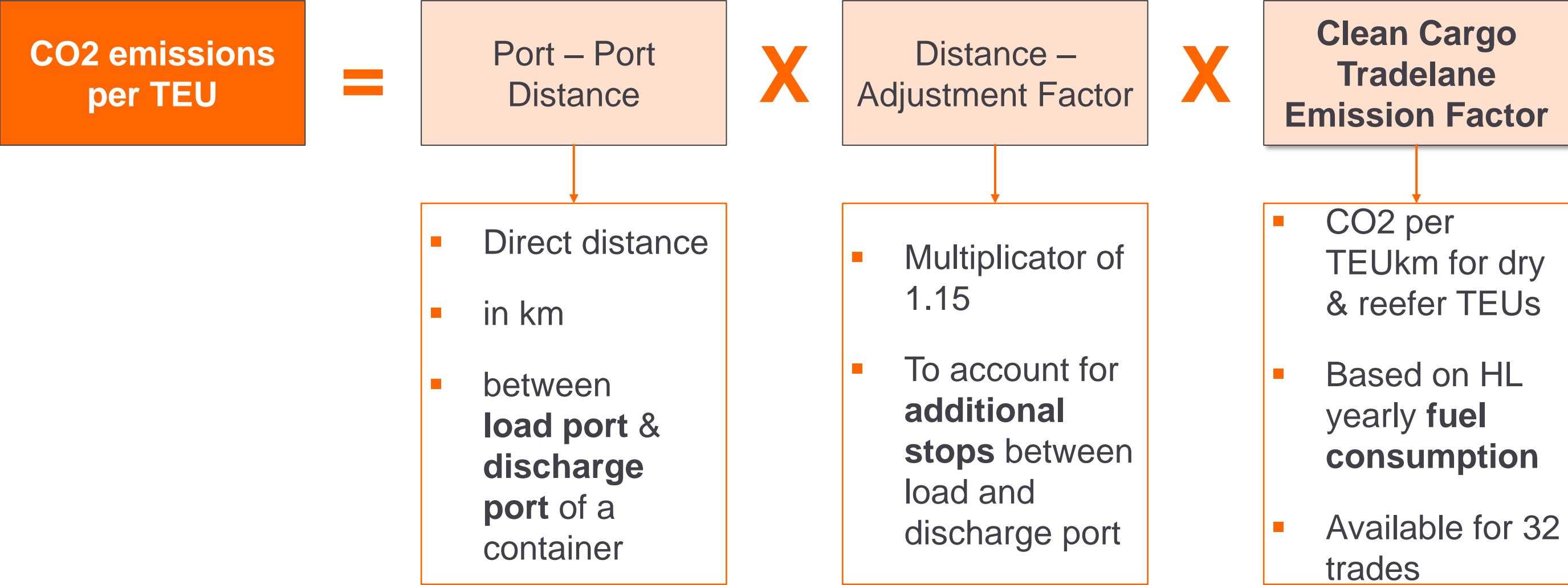
CO2 emissions per TEU = **Port – Port Distance** X **Distance – Adjustment Factor** X **Clean Cargo Tradelane Emission Factor**

Port – Port Distance	Distance – Adjustment Factor	Clean Cargo Tradelane Emission Factor
▪ Direct distance ▪ in km ▪ between **load port** & **discharge port** of a container	▪ Multiplicator of 1.15 ▪ To account for **additional stops** between load and discharge port	▪ CO2 per TEUkm for dry & reefer TEUs ▪ Based on HL yearly **fuel consumption** ▪ Available for 32 trades

Clean Cargo: Smart Freight Centre

Hapag-Lloyd

What questions do we need to answer to calculate the EU ETS emissions?

§ **What is the legal framework?** ✓

CO2 **What are the CO2 emissions (per TEU) and how many of those are EU ETS relevant?** ✓
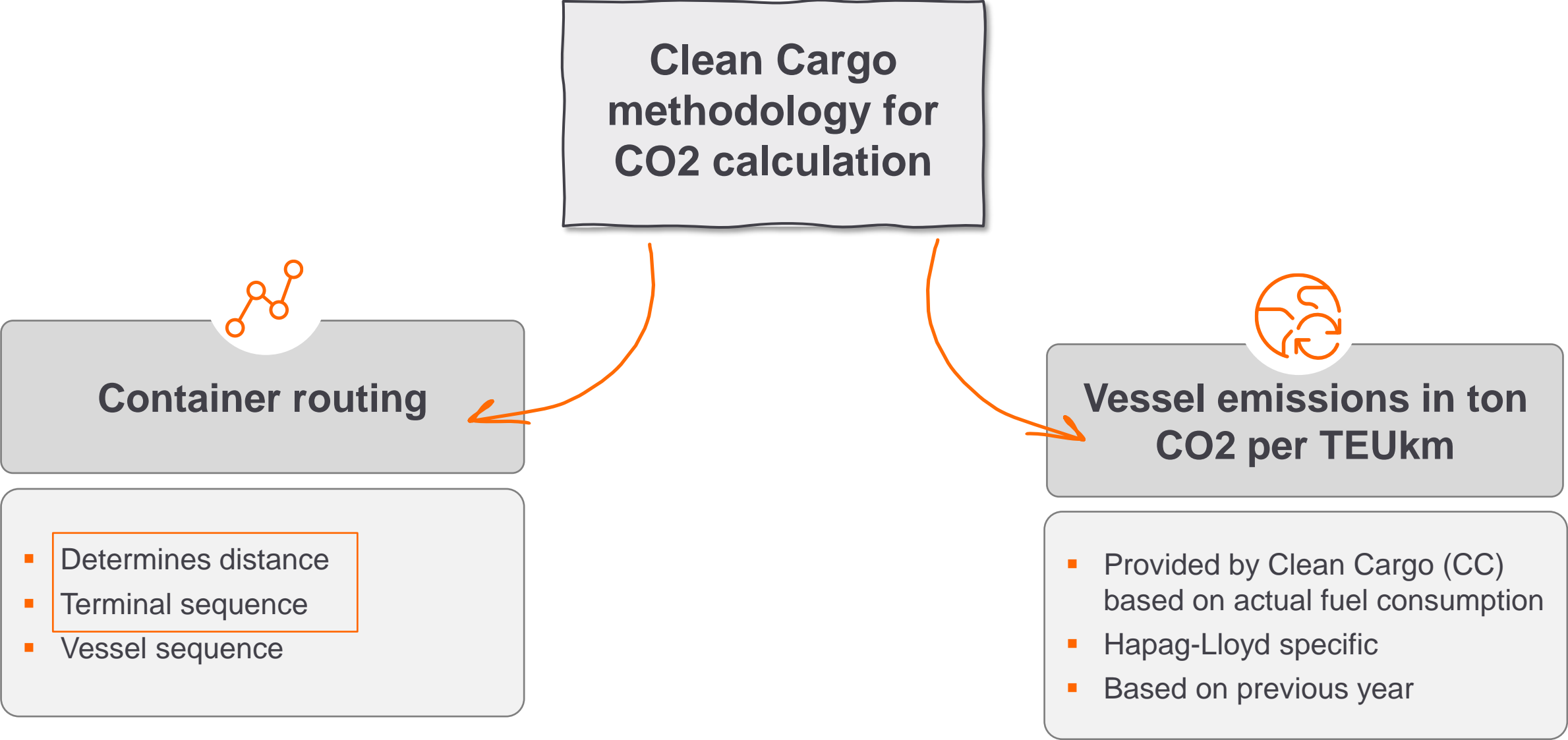
DATA & ANALYTICS

How do we implement that into a standardized calculation?

DATA & ANALYTICS

Hapag-Lloyd

Emission calculation uses Clean Cargo methodology to assess CO2 emissions and factors
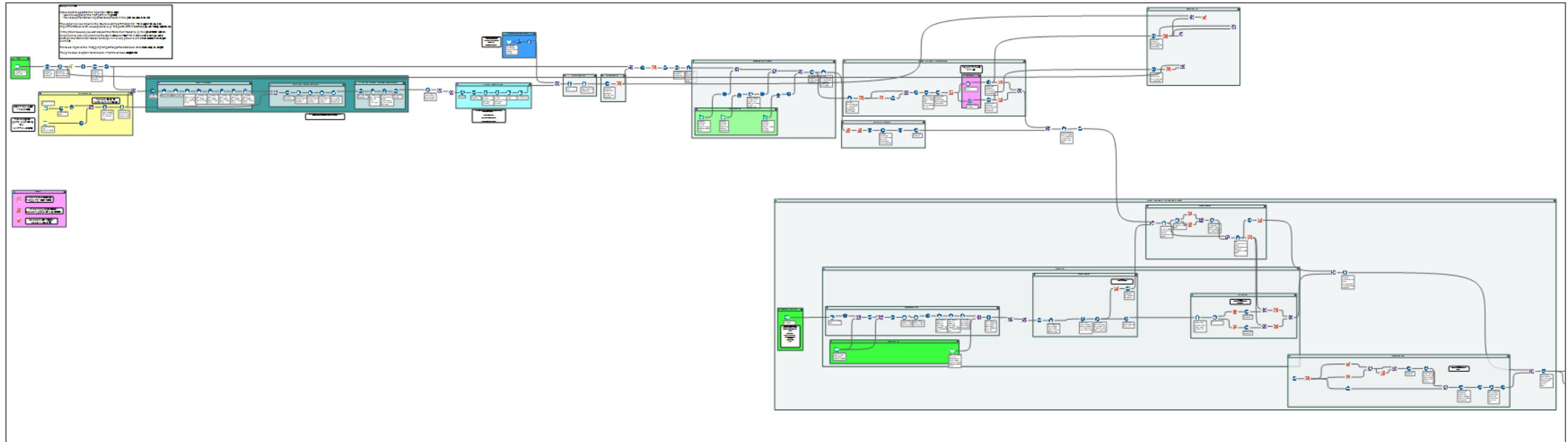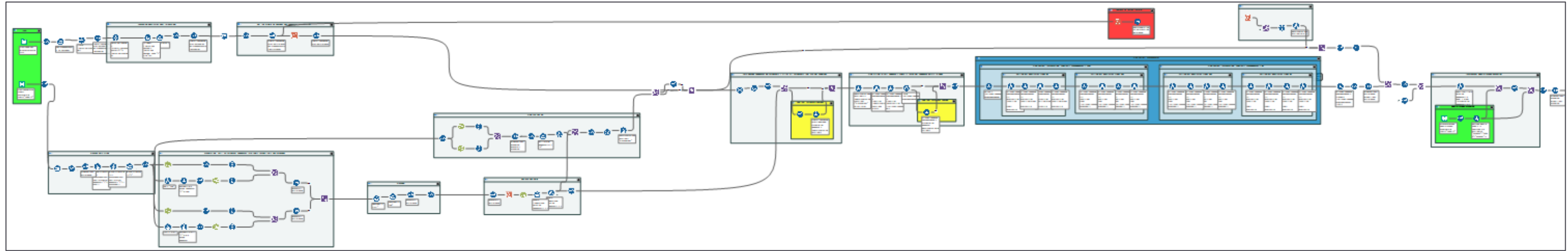
Clean Cargo methodology for CO2 calculation

Container routing

- Determines distance
- Terminal sequence
- Vessel sequence

Vessel emissions in ton CO2 per TEUkm

- Provided by Clean Cargo (CC) based on actual fuel consumption
- Hapag-Lloyd specific
- Based on previous year

Hapag-Lloyd
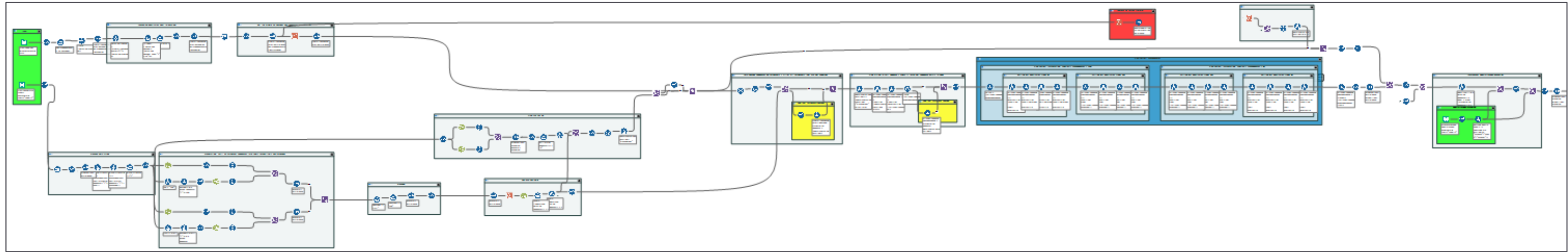
Clean Cargo methodology for CO2 calculation

Container routing

- Terminal sequence
- Vessel sequence

Inputs first part

Container	Port-Sequence	SSY-Sequence
987654	SGSIN-GRPIR-NLRTM	MD1-IRE

Voyage	SSY	Order	Port Call
123456	MD1	1	Busan
123456	MD1	2	Singapore
123456	MD1	3	Jeddah
123456	MD1	4	Piraeus
123456	MD1	5	Genoa
555555	IRE	1	Damietta
555555	IRE	2	Piraeus
555555	IRE	3	Lisbon
555555	IRE	4	Le Havre
555555	IRE	5	Rotterdam

Outputs first part

- Load and Discharge port
- All vessel calls in between

Container	Port from	Port to	Order	SSY
987654	Singapore	Jeddah	1	MD1
987654	Jeddah	Piraeus	2	MD1
987654	Piraeus	Lisbon	3	IRE
987654	Lisbon	Le Havre	4	IRE
987654	Le Havre	Rotterdam	5	IRE

Please note: For illustrative purposes, all shown data is dummy data

Hapag-Lloyd

EU ETS terminal sequence vs. container sequence - example
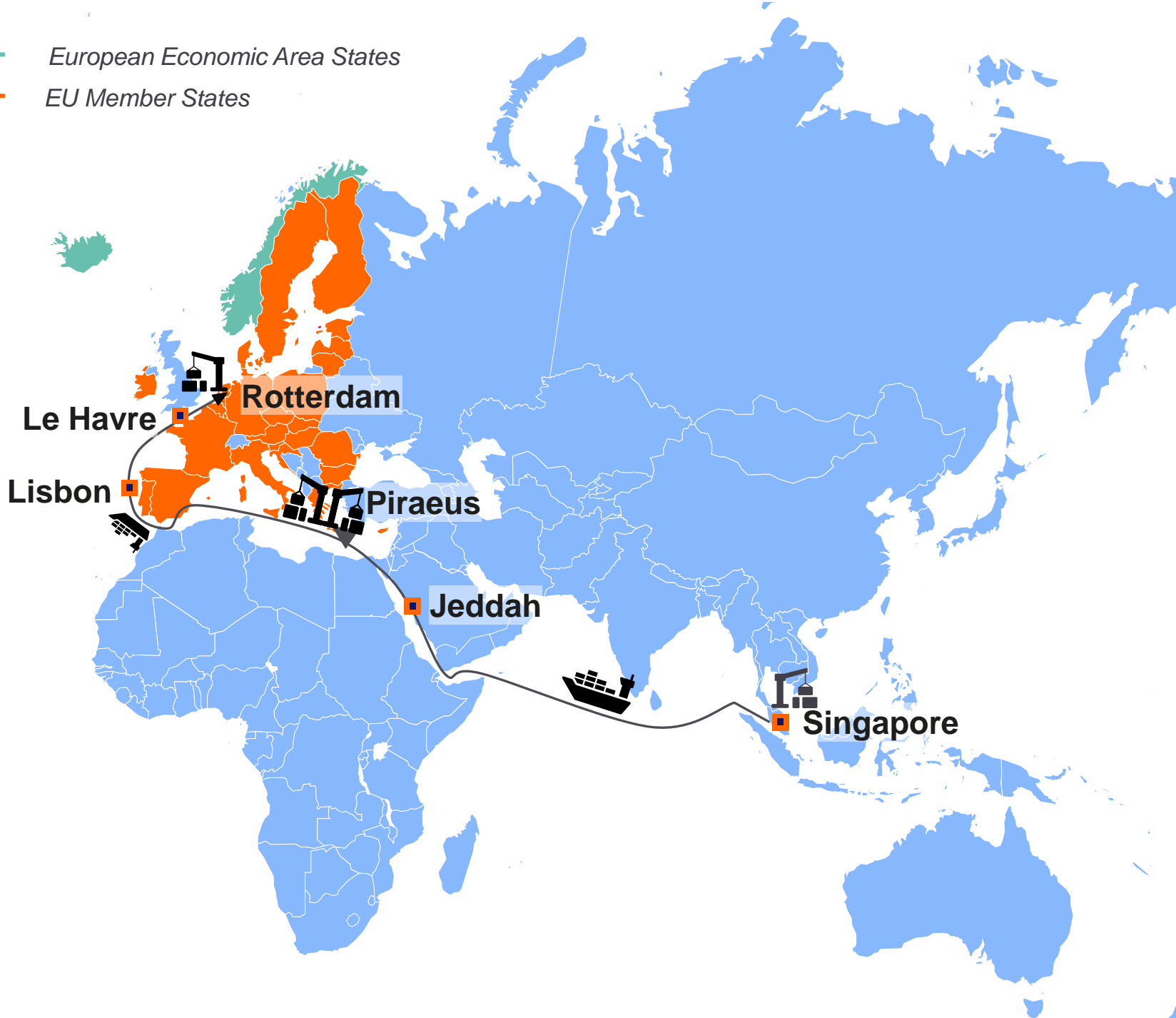
Legend:
- European Economic Area States
- EU Member States

Container	Port-Sequence	SSY-Sequence
987654	SGSIN-GRPIR-NLRTM	MD1-IRE

Container	Port from	Port to	Order	SSY
987654	Singapore	Jeddah	1	MD1
987654	Jeddah	Piraeus	2	MD1
987654	Piraeus	Lisbon	3	IRE
987654	Lisbon	Le Havre	4	IRE
987654	Le Havre	Rotterdam	5	IRE

Please note: For illustrative purposes, all shown data is dummy data

Hapag-Lloyd

Which route does our container travel?
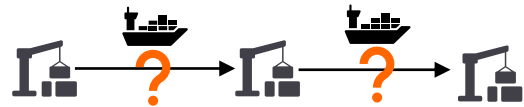
What do we know?

- Where the **container has been moved** e.g., Load, Discharge or change of vessel

- How the **vessels are routing**

- What the **container type** is

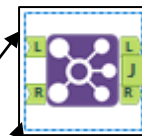| Container	Port-Sequence	SSY-Sequence
987654	SGSIN-GRPIR-NLRTM	MD1-IRE

Container	Port Pair	Order	SSY
987654	SGSIN-GRPIR	1	MD1
987654	GRPIR-NLRTM	2	IRE

Voyage	SSY	Order	Port Call
123456	MD1	1	Busan
123456	MD1	2	Singapore
123456	MD1	3	Jeddah
123456	MD1	4	Piraeus
123456	MD1	5	Genoa
555555	IRE	1	Damietta
555555	IRE	2	Piraeus
555555	IRE	3	Lisbon
555555	IRE	4	Le Havre
555555	IRE	5	Rotterdam

Container	Port Pair	Port Call	Order	SSY
987654	SGSIN-GRPIR	Busan	1	MD1
987654	SGSIN-GRPIR	Singapore	2	MD1
987654	SGSIN-GRPIR	Jeddah	3	MD1
987654	SGSIN-GRPIR	Piraeus	4	MD1
987654	SGSIN-GRPIR	Genoa	5	MD1
987654	GRPIR-NLRTM	Damietta	1	IRE
987654	GRPIR-NLRTM	Piraeus	2	IRE
987654	GRPIR-NLRTM	Lisbon	3	IRE
987654	GRPIR-NLRTM	Le Havre	4	IRE
987654	GRPIR-NLRTM	Rotterdam	5	IRE

Container	Port Pair	Full Sequence	SSY
987654	SGSIN-GRPIR	KRPUS-SGSIN-SAJED-GRPIR-ITGOA	MD1
987654	GRPIR-NLRTM	EGDAM-GRPIR-PTLIS-FRLEH-NLRTM	IRE

Container	Port Pair	Full Sequence	SSY
987654	SGSIN-GRPIR	SGSIN-SAJED-GRPIR	MD1
987654	GRPIR-NLRTM	GRPIR-PTLIS-FRLEH-NLRTM	IRE

Please note: For illustrative purposes, all shown data is dummy data

Hapag-Lloyd

Calculation of the emissions of a single container
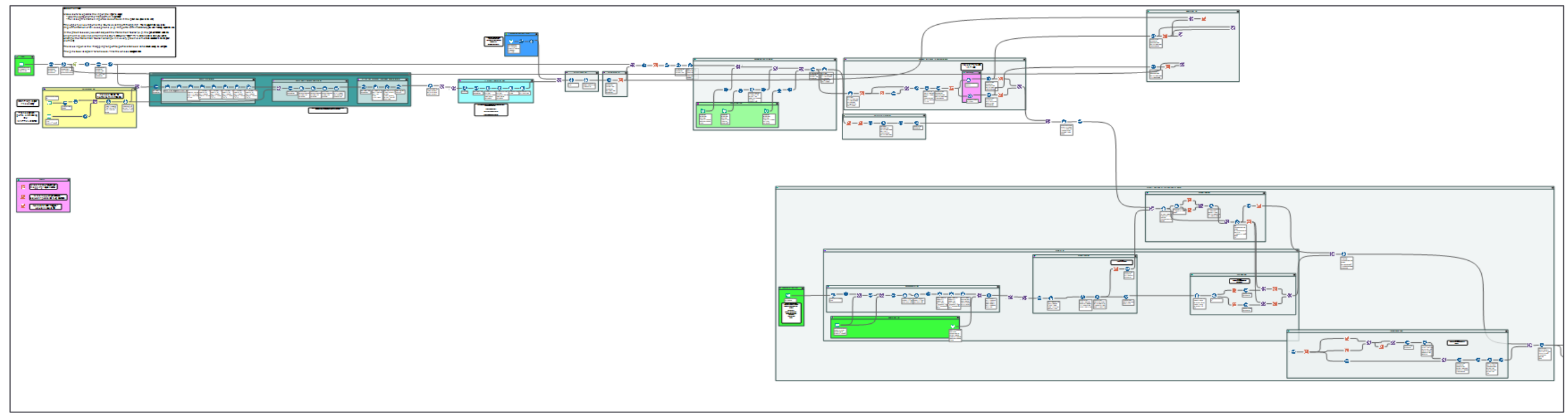
Clean Cargo methodology for CO2 calculation

Apply EU regulations

Vessel emissions

- Provided by Clean Cargo (CC) based on actual fuel consumption
- Hapag-Lloyd specific
- Based on previous year

Input second part

Container	Port from	Port to	Order	SSY
987654	Singapore	Jeddah	1	MD1
987654	Jeddah	Piraeus	2	MD1
987654	Piraeus	Lisbon	3	IRE
987654	Lisbon	Le Havre	4	IRE
987654	Le Havre	Rotterdam	5	IRE

Output second part

- Container specific emissions
- All vessel calls in between

			Emissions in t	
Container	Port Sequence	SSY	DRY TEU	REEFER TEU
987654	SGSIN-SAJED-GRPIR	MD1	0,05	0,125
987654	GRPIR-PTLIS-FRLEH-NLRTM	IRE	0,33	0,66

Please note: For illustrative purposes, all shown data is dummy data

Hapag-Lloyd

How much CO2 is our container emitting?
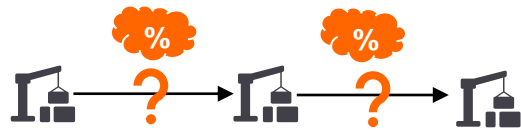
- What is the **relevant routing,** according to EU ETS regulations?

- For how much **relevant distance** is our container on board?

- How much CO2 is a container **emitting per km and per SSY**

Container	Port from	Port to	Order	SSY
987654	Singapore	Jeddah	1	MD1
987654	Jeddah	Piraeus	2	MD1
987654	Piraeus	Lisbon	3	IRE
987654	Lisbon	Le Havre	4	IRE
987654	Le Havre	Rotterdam	5	IRE
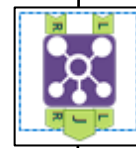
Container	Port Pairs	SSY	EU ETS
987654	SGSIN-SAJED	MD1	NN
987654	SAJED-GRPIR	MD1	NY
987654	GRPIR-PTLIS	IRE	YY
987654	PTLIS-FRLEH	IRE	YY
987654	FRLEH-NLRTM	IRE	YY

Container	Port Pairs	SSY	EU ETS	Distance
987654	SGSIN-SAJED	MD1	NN	8000
987654	SAJED-GRPIR	MD1	NY	2500
987654	GRPIR-PTLIS	IRE	YY	2800
987654	PTLIS-FRLEH	IRE	YY	2200
987654	FRLEH-NLRTM	IRE	YY	500

Container	Port Pairs	SSY	EU ETS	Factor	Distance
987654	SGSIN-SAJED	MD1	NN	0	8000
987654	SAJED-GRPIR	MD1	NY	0.5	2500
987654	GRPIR-PTLIS	IRE	YY	1	2800
987654	PTLIS-FRLEH	IRE	YY	1	2200
987654	FRLEH-NLRTM	IRE	YY	1	500

Container	Port Sequence	SSY	Relevant Distance
987654	SGSIN-SAJED-GRPIR	MD1	1250
987654	GRPIR-PTLIS-FRLEH-NLRTM	IRE	5500

Container	Port Sequence	SSY	Relevant Distance	Emissionfactor g/km	
				DRY TEU	REEFER TEU
987654	SGSIN-SAJED-GRPIR	MD1	1250	40	100
987654	GRPIR-PTLIS-FRLEH-NLRTM	IRE	5500	60	120

Container	Port Sequence	SSY	Emissions in t	
			DRY TEU	REEFER TEU
987654	SGSIN-SAJED-GRPIR	MD1	0,05	0,125
987654	GRPIR-PTLIS-FRLEH-NLRTM	IRE	0,33	0,66

Please note: For illustrative purposes, all shown data is dummy data   Hapag-Lloyd

Calculation of the emissions of a single container - example

European Economic Area States
EU Member States
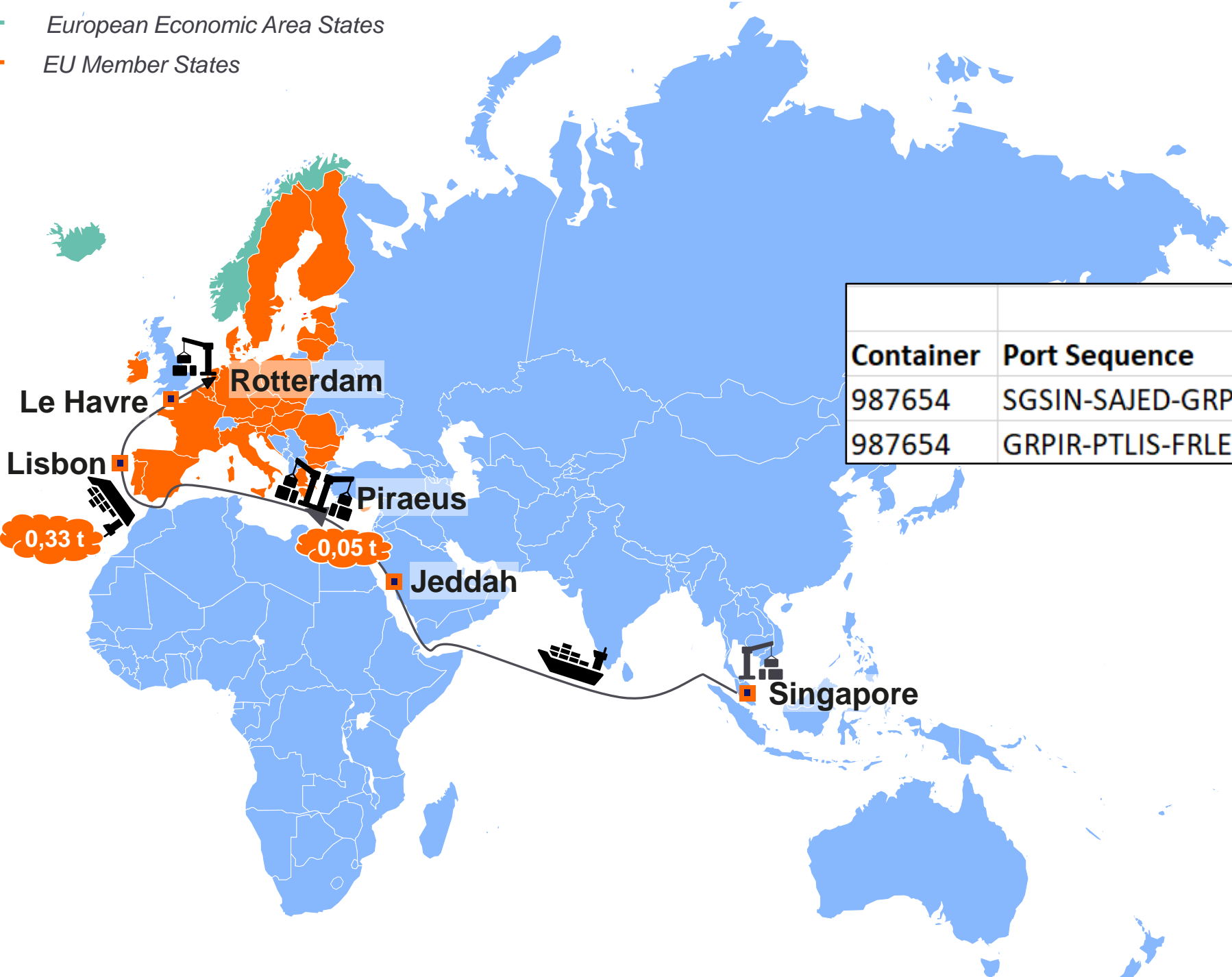
Container	Port Sequence	SSY	Emissions in t		
			DRY TEU	REEFER TEU	
987654	SGSIN-SAJED-GRPIR	MD1	0,05	0,42 t	125
987654	GRPIR-PTLIS-FRLEH-NLRTM	IRE	0,33	0,33 t	56

EU ETS relevant emissions

Total emissions

Please note: For illustrative purposes, all shown data is dummy data

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Why Alteryx? A Perfect Fit for Our Analytical Needs

alteryx

Scalability: scales seamlessly to handle **growing data demands**

Effort: automation of emission calculation, continuously using **standardized calculation** saves time and effort for analysts

Traceability: tracking **data lineage** and calculation steps ensures transparency → enables us to **handover** workflow to business experts

Flexibility: accommodation of diverse data sources and analysis needs allows us to remain flexible to **changing calculation requirements**

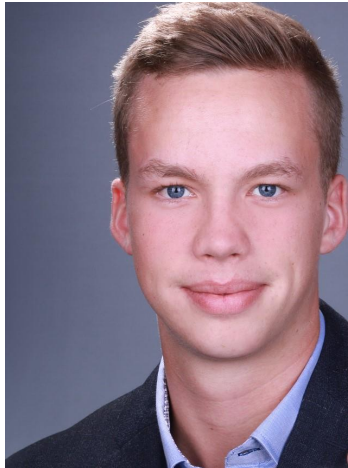**Simplicity:** **intuitive interface** simplified complex analytics task

5/14/2024   EU ETS & Analytics - HL @ Alteryx

Hapag-Lloyd

Questions? Feel free to reach out to us at any time

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Thank you for your interest.

KEY TAKEAWAYS

Benjamin Lösken

CSRD reporting will become effective as a **mandatory component of the annual report starting 2025.**
The biggest challenge for CSRD reporting is related data as there are **numerous quantitative and qualitative information** required.
The **integration of IT systems and implementation of audit proof processes will be a key success factor** for CSRD reporting.

Niklas de Boer

We need data and analytics to create **transparency** over and determine CO_2 emissions per TEU.

Lukas Kreth

We can leverage Alteryx to **generate insights & standardize** emission calculation.

Your next steps for

MASTERING ESG DATA CHALLENGES

1 **PODCAST** *(DE)* „My Data is better than Yours"
Data Democracy durch ein NoCode-Tool ermöglichen
– with Robert Z., Hapag-Lloyd; download the slides or
learn more about Hapag-Lloyd's ESG strategy *(EN)*

2 **E-BOOK** "Accelerate Your ESG Impact with
Automated Analytics" by Alteryx *(EN)*

3 **KEEP UPDATED** on Sustainability Reporting:
measure impact, monitor progress and
meet regulatory needs by PwC *(DE)*