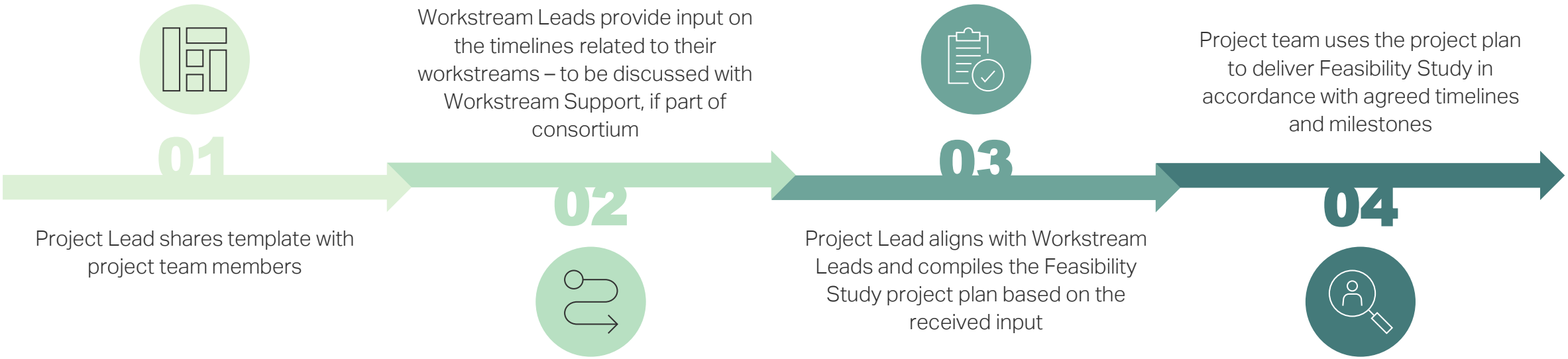
2E. Project plan

	Methodology – steps	Inputs
01	Share **project plan template** with project team members	• Feasibility Study Project Plan guide
02	Incorporate **input on timelines** related to workstreams	• Work Scope Definition [Methodology 2D] • Input from Workstream Leads
03	Compile **final project plan** based on the received input	• Outcome of the above

Project plan

The project plan serves as a common point of reference throughout the entire project



Template: Develop a Feasibility Study project plan using the template

TEMPLATE

Feasibility Study		Year																							
		June				July				August				September				Ocotber				November			
ID	Workstream	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Corridor baseline (optional)																								
2	Alternative fuels supply chain																								
3	Port and bunkering infrastructure																								
4	Low/zero emission vessels																								
5	Cargo demand dynamics																								
6	Summary of technical and regulatc																								
7	Roadmap and commitments																								
Milestones		Month				Month				Month				Month				Month				Month			
ID	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A	Steering group meeting																								
B	Workshop																								
C	Status Meeting																								

2	Alternative fuels supply chain	Year																							
		Month				Month				Month				Month				Month				Month			
ID	Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
2																									
2.1																									

1. Enter the duration of the **workstreams** here and indicate with lines (use the "Draw Border" tool) if they depend on each other

2. Insert key milestones here

3. Detailed tasks
Workstream Leads list tasks, their duration, and key milestones – Can serve as input to overarching project plan at the top of the sheet

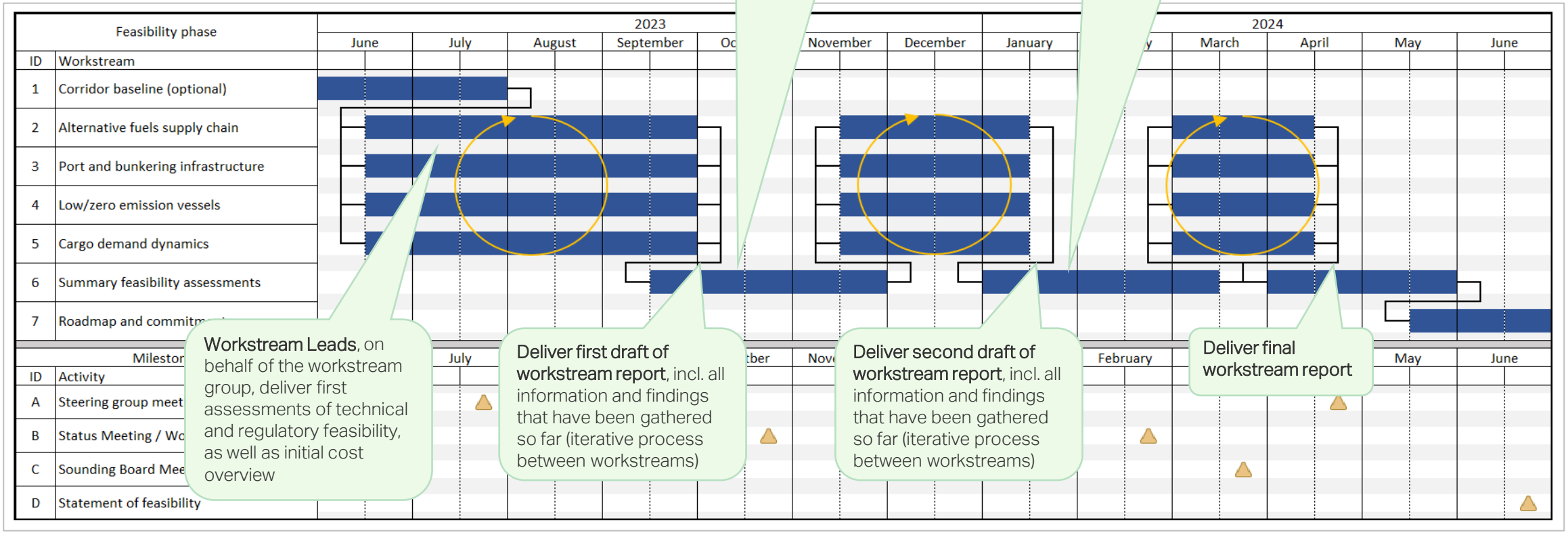
High-level project plan for a Feasibility Study over one year

ILLUSTRATIVE

EXAMPLE

Project Lead consolidates input from ongoing Feasibility assessments (Workstreams 2-5) and **identifies gaps** to be addressed by Workstream Leads

Project Lead consolidates input from ongoing Feasibility assessments (Workstreams 2-5) and **identifies gaps** to be addressed by Workstream Leads



Workstream Leads, on behalf of the workstream group, deliver first assessments of technical and regulatory feasibility, as well as initial cost overview

Deliver first draft of workstream report, incl. all information and findings that have been gathered so far (iterative process between workstreams)

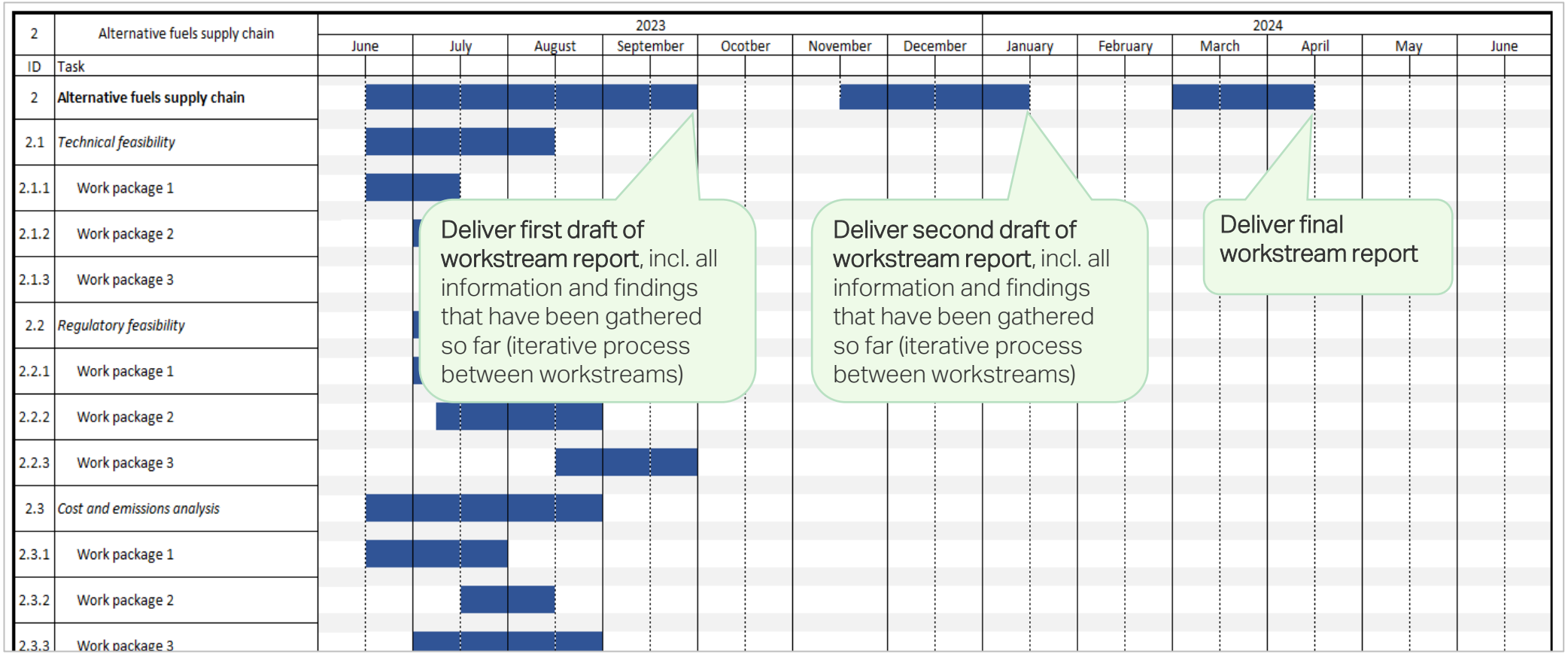
Deliver second draft of workstream report, incl. all information and findings that have been gathered so far (iterative process between workstreams)

Deliver final workstream report

Tasks in each workstream should be clustered into actionable, but high-level work packages

ILLUSTRATIVE

EXAMPLE



1 Consortium formation & goal definition

- A Consortium formation, incl. assignment of roles and project governance
- B Project vision, goals, and requirements
- C Conceptual scope drawing

2 Customization & modeling

- D Work scope definition
- E Project plan
- F Scenario modeling

3 Baselining & agreement

- G Green corridor project baselining
- H Project commitment letter

2F. Scenario modeling

Purpose

- Evaluate the high-level **CO_2 abatement potential** for the specific corridor.
- Provide an **initial estimate of the incremental cost of green** and incremental cost per cargo unit for the selected corridor.
- Serve as a **first point of discussion with consortium members** on the residual cost gap.

Key questions

- How much **CO_2 emission** can be abated by the specific corridors as vessels move from fossil-based fuel to the alternative fuel of choice?
- What is the total **CAPEX and OPEX** for establishing the corridor:
  - Renewable energy
  - Fuel production
  - Port Infrastructure
  - Vessels

Importance

- A **good understanding** of the incremental cost, amount of abated CO_2, cost impact on cargo, and cost of abated CO_2 is important for the **communication regarding the project**.
- These initial estimates give an important indication and **allow stakeholders to understand** if the corridor is likely to be impactful in terms of CO_2 abatement, cost effectiveness, technological enabling, etc.
- Ultimately, the estimates allow the very first assessment as to whether **it makes sense to do** a Feasibility Study.

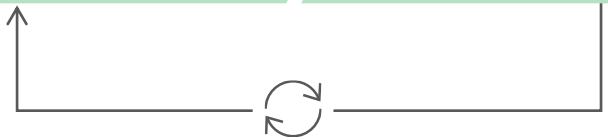
2F. Scenario modeling

	Methodology – steps	Inputs
01	**Use Green Corridor Scenario Modeling Tool** according to the **corridor's specifics** and initial assumptions, if and where needed	• Green Corridor Cost Model • Initial assumptions and input from Workstream • Output from the Pre-Feasibility Study 1st Wave Assessment
02	**Review output in the tool**, e.g., CO_2 abatement potential, incremental cost of green, etc.	• n/a
03	Conduct **additional scenario modeling** if required	• Input from Workstream Leads

The cost and scenario assessment provides preliminary insights on the incremental cost of green and CO_2 abatement potential of the green corridor

Focus on the following pages

1. **Initiate the Green Corridor Scenario Modeling tool** according to the corridor's specifics and initial assumptions from the project team
2. **Review output in the tool** (table and graphs), e.g., incremental cost of green, CO_2 abatement potential, etc.
3. **Conduct additional scenario modeling** if necessary
4. Use output as input for **baseline document**



Re-adjust input if needed

The Green Corridor Scenario Modeling Tool[6] is a configurable, automated Excel tool that provides insights on costs and CO_2 abatement potential of a corridor

How to use the tool

The tool has 5 main sheets ...

Cover | TableOfContents | UserGuide | Configurator | SummaryReport

Review the license agreement, table of contents and **how to use the tool**

Configure the input according to your corridor's specifics

View summary of output

... and 9 hidden sheets with detailed results, calculations and assumptions

ResultTables | ResultGraphs

If required, **review more detailed results** from the configuration

CorridorCalculation | VesselCalculation | GraphCalculation

If required, **review the corridor and vessel calculations**

VesselAssumptions | FuelAssumptions | PortAssumptions

If required, **review the assumptions** of the tool

Index

An index sheet for **underlying mapping**

! For now, the tool has a range of limitations:

- In the output, electricity and fossil fuel costs are considered OPEX only.
- Lost cargo space from larger fuel tanks. Currently, the model assumes same size fuel tanks independent of the configuration.
- Electrical and heat energy demand assumed constant no matter the operational profile to simplify vessel calculation
- Port costs are input with very simple assumptions. Please change these when configuring a corridor if you have a better view on these values.

(6) Can be downloaded: https://cms.zerocarbonshipping.com/media/uploads/documents/green_corridor_model_v0.9.xlsx

Configurator: This sheet allows users to configure the model to fit the selected green corridor's specifics

x Deep dive follows x 2 main output graphs

A

Input values

Only red cells should be adjusted by the user – some of the cells have a drop-down menu that opens when clicking on the cell or pressing the 'alt' and '↓' keys simultaneously.

Override function (optional)

The red cells in this column can be used to override the values to their left, if needed.

B

Goal seeking (optional)

The green buttons help the user understand the impact of adding a carbon price or adjusting the willingness to pay on the incremental cost of green (i.e., the cost gap).

C

Output

The graphs provide the following output:

1. Incremental cost of green by alternative fuel type, split into transport and cargo
2. Total cost by alternative fuel type, split into vessel, port, fuel, emissions
3. Emissions compared to fossil-fuel baseline by alternative fuel type

Fuel configuration	Unit	Option 1	Option 2	Option 3	Option 4	Baseline
Main fuel	-	e-methanol (PS)	e-methane liquefied (PS)	e-ammonia	Blue ammonia (CCS)	LSFO
Main fuel type	-	Methanol	Methane	Ammonia	Ammonia	Diesel
Vessel types for fuel	-	DF Methanol	DF Methane	DF Ammonia	DF Ammonia	MF Diesel
Pilot fuel	-	LSFO	LSFO	LSFO	LSFO	LSFO

Corridor configuration	Unit	Value	Override
Bunker region	-	Europe	
Year	-	2025	
Vessel segment	-	Container	
Vessel size	-	8000 TEU	
Number of vessels	-	1	
Lifetime of corridor	Years	25	
Average vessel speed	Knots	18	
Cargo per vessel	TEU	8,000	
Cargo value	USD/TEU	50,000	
Distance for one roundtrip	Nautical miles	8,000	
Days at sea	Days	240	
Number of roundtrips per year	-	13.0	
Cargo utilization	%	65%	

Regulatory configuration	Unit	Value
Corridor carbon price	USD/tCO2eq	-
Willingness to pay from cargo owners/customers	% of cargo value	-

Close cost-gap to Option 1 by adding a **carbon price**

Close cost-gap to Option 2 by adding a **carbon price**

Close cost-gap to Option 3 by adding a **carbon price**

Close cost-gap to Option 4 by adding a **carbon price**

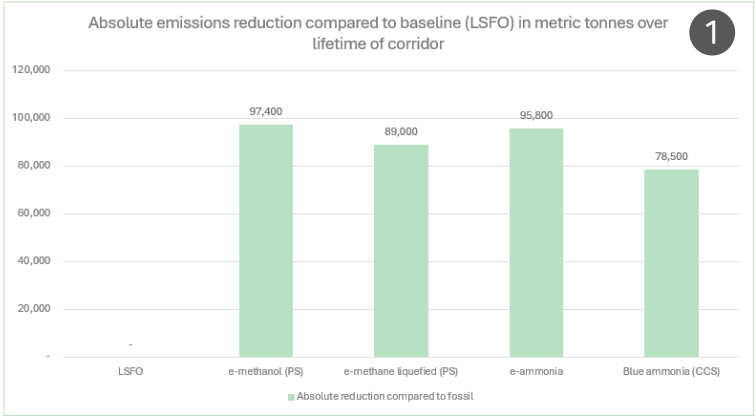
Close cost-gap to Option 1 by adding a **willingness-to-pay**

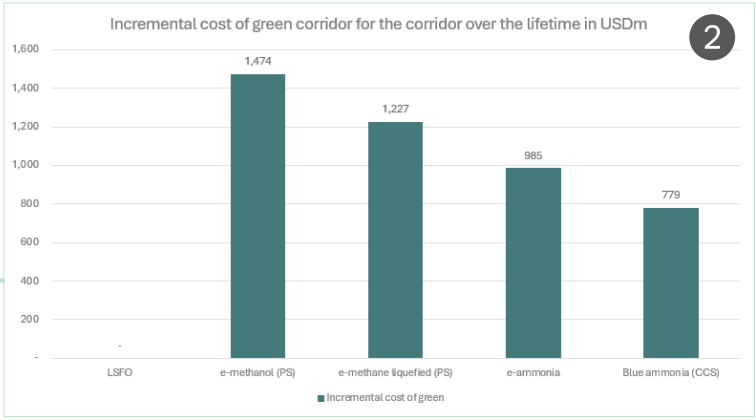
Close cost-gap to Option 2 by adding a **willingness-to-pay**

Close cost-gap to Option 3 by adding a **willingness-to-pay**

Close cost-gap to Option 4 by adding a **willingness-to-pay**

Reset regulatory configuration





A. Input values: Fuel configuration – The user can select different fuel types to be compared to the fossil-fuel baseline

Fuel configuration

Fuel configuration	Unit	Option 1	Option 2	Option 3	Option 4	Baseline
Main fuel	-	e-methanol (PS)	e-methane liquefied (PS)	e-ammonia	Blue ammonia (CCS)	LSFO
Main fuel type	-	Methanol	Methane	Ammonia	Ammonia	Diesel
Vessel types for fuel	-	DF Methanol	DF Methane	DF Ammonia	DF Ammonia	MF Diesel
Pilot fuel	-	LSFO	LSFO	LSFO	LSFO	LSFO

Corridor configuration	Unit	Value	Override
Bunker region	-	Europe	
Year	-	2025	
Vessel segment	-	Container	
Vessel size	-	8000 TEU	
Number of vessels	-	1	
Lifetime of corridor	Years	25	
Average vessel speed	Knots	18	
Cargo per vessel	TEU	8,000	
Cargo value	USD/TEU	50,000	
Distance for one roundtrip	Nautical miles	8,000	
Days at sea	Days	240	
Number of roundtrips per year	-	13.0	
Cargo utilization	%	65%	

Regulatory configuration	Unit	Value
Corridor carbon price	USD/tCO2eq	-
Willingness to pay from cargo owners/customers	% of cargo value	-

Options 1-4 can be customized by the user by **adjusting the red cells**. The white cells are automatically filled based on input in the main fuel row.

The **Baseline** in column H includes the **standard fossil fuel** as a comparison.

See the **"FuelAssumptions" sheet for fuel data.**

A. Input values: Fuel configuration – The model is backed up by a granular and robust data set including multiple bunker fuels

Granularity of data – selected elements (exemplary)

Bunker fuels

- e-hydrogen (liquefied)
- e-hydrogen (compressed)
- e-ammonia
- e-methanol (DAC)
- e-methanol (PS)
- e-methane liquefied (DAC)
- e-methane liquefied (PS)
- e-diesel (DAC)
- e-diesel (PS)
- Blue ammonia (CCS)
- Bio-methanol
- Bio-methane (liquefied)
- Bio-oil (HTL)
- Bio-oil (Pyrolysis)
- LNG
- LSFO

Yearly data points for e-hydrogen (liquefied) for the following parameters:

- CapEx (Global)
- OpEx (Africa)
- OpEx (Americas)
- OpEx (Asia)
- OpEx (Europe)
- OpEx (Middle East)
- Total emissions – WTT – GWP100 (Global)
- Total emissions – TTW – GWP100 (Global)
- Total emissions – WTW – GWP100 (Global)

A. Input values: Corridor configuration – Users can adjust multiple parameters to ensure the data model matches the specific corridor's characteristics

Corridor configuration

Fuel configuration	Unit	Option 1	Option 2	Option 3	Option 4	Baseline
Main fuel	-	e-methanol (PS)	e-methane liquefied (PS)	e-ammonia	Blue ammonia (CCS)	LSFO
Main fuel type	-	Methanol	Methane	Ammonia	Ammonia	Diesel
Vessel types for fuel	-	DF Methanol	DF Methane	DF Ammonia	DF Ammonia	MF Diesel
Pilot fuel	-	LSFO	LSFO	LSFO	LSFO	LSFO

Corridor configuration	Unit	Value	Override
Bunker region	-	Europe	
Year	-	2025	
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Days at sea	Days	240	
Number of roundtrips per year	-	13.0	
Cargo utilization	%	65%	

Regulatory configuration	Unit	Value
Corridor carbon price	USD/tCO2eq	-
Willingness to pay from cargo owners/customers	% of cargo value	-

Customize the corridor configuration **by adjusting the red cells**.

The white cells are automatically filled based on input on the vessel segment and size. They are based on assumptions from the underlying data model but **can be adjusted using the override function.**

You can also test the impact of adding a **carbon price on the corridor** or adding a **willingness-to-pay** from the cargo owners/customers.

A. Input values: Corridor configuration – The model is backed up by a granular and robust data set including multiple vessel types

Granularity of data – selected elements (exemplary)

Vessels

- Container (3500 TEU)
- Container (8000 TEU)
- Container (15000 TEU)
- Bulk carrier (Handy)
- Bulk carrier (Panamax)
- Bulk carrier (Capesize)
- Tanker (35k dwt)
- Tanker (100k dwt)
- Tanker (300k dwt)
- RoRo (4000 CEU)
- RoRo (7000 CEU)
- Gas Carrier
- Cruise (25k GT)
- Cruise (100k GT)
- Cruise (175k GT)
- Fast Ferry
- Ferry
- General Cargo
- Offshore
- Tug

Yearly data points for Container vessels (3500 TEU) for the following parameters:

- Nominal capacity
- Days at sea
- Average speed
- Main engine thermal efficiency - MF Diesel
- Main engine thermal efficiency - DF Methane
- Main engine thermal efficiency - DF Methanol
- Main engine thermal efficiency - DF Ammonia
- Main engine pilot fuel share - MF Diesel
- Main engine pilot fuel share - DF Methane
- Main engine pilot fuel share - DF Methanol
- Main engine pilot fuel share - DF Ammonia

B. Output: The summary report provides a summarized output from the corridor calculations including two main sections on emissions and cost

Summary report

Emissions section

The four selected options will result in reducing emissions of between:

78500 - 97400

Metric tonnes over the lifetime of the corridor

The resulting emission reduction is due to the four selected options having emissions factors of:

9% - 26%

compared to using LSFO, meaning that the emissions reduction potential of the corridor is:

74% - 91%

Cost section

The incremental cost of green for the full corridor over its lifetime is between

779 USDm - 1474 USDm

when considering the full corridor and

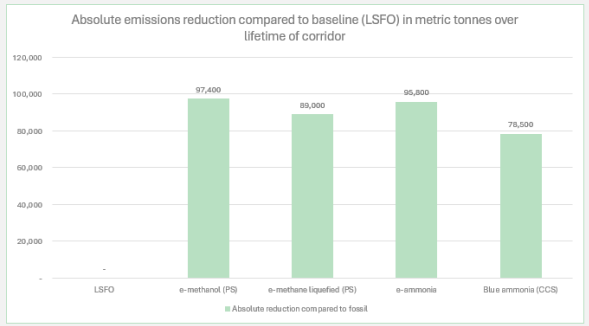
450 USD/TEU - 880 USD/TEU

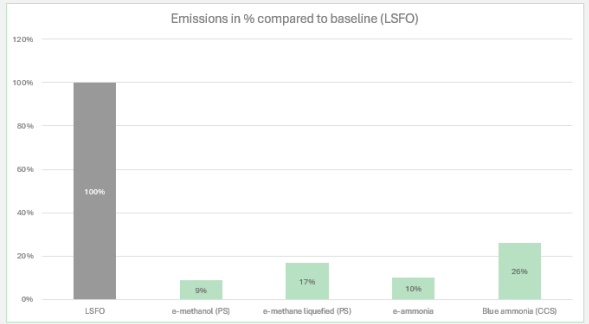
when considering the cost per transport unit.

In order to close the cost gap using a carbon price, the range required is:

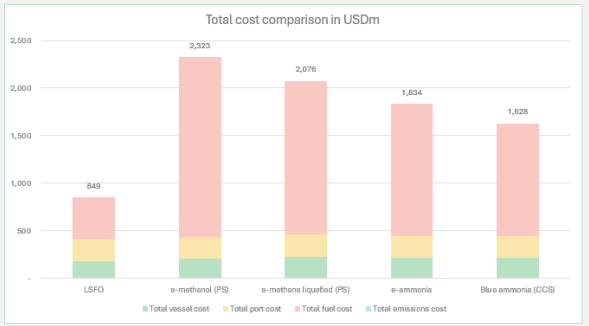
390 USD/tCO2eq - 610 USD/tCO2eq

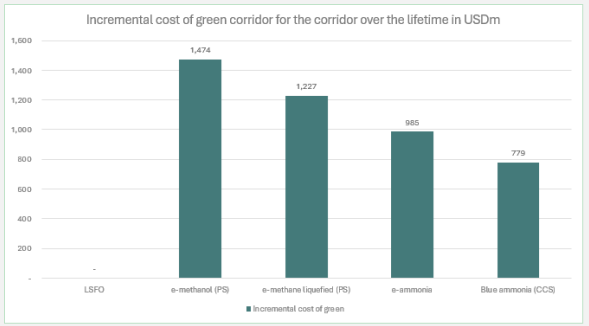
Emissions graphs (key)

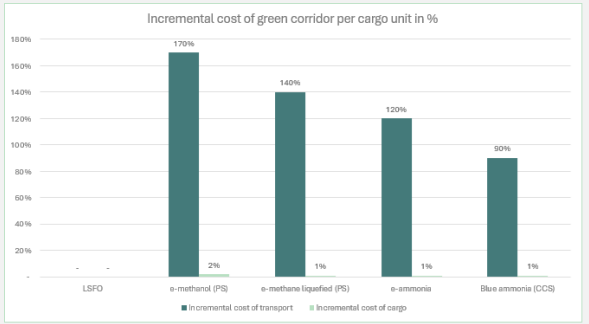


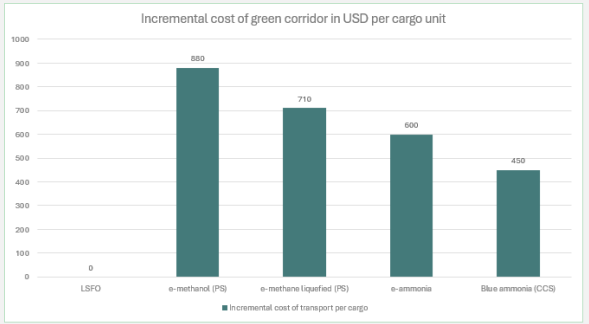


Cost graphs (key)









C. Goal seeking: Examine simple ways to close the cost gap through a carbon price or willingness-to-pay

Goal seeking

Corridor configuration	Unit	Value	Override
Bunker region	-	Europe	
Year	-	2025	
Vessel segment	-	Container	
Vessel size	-	8000 TEU	
Number of vessels	-	1	
Lifetime of corridor	Years	25	
Average vessel speed	Knots	18	
Cargo per vessel	TEU	8,000	
Cargo value	USD/TEU	50,000	
Distance for one roundtrip	Nautical miles	8,000	
Days at sea	Days	240	
Number of roundtrips per year	-	13.0	
Cargo utilization	%	65%	

Regulatory configuration	Unit	Value
Corridor carbon price	USD/tCO2eq	-
Willingness to pay from cargo owners/customers	% of cargo value	-

Close cost-gap to Option 1 by adding a **carbon price**

Close cost-gap to Option 2 by adding a **carbon price**

Close cost-gap to Option 3 by adding a **carbon price**

Close cost-gap to Option 4 by adding a **carbon price**

Close cost-gap to Option 1 by adding a **willingness-to-pay**

Close cost-gap to Option 2 by adding a **willingness-to-pay**

Close cost-gap to Option 3 by adding a **willingness-to-pay**

Close cost-gap to Option 4 by adding a **willingness-to-pay**

Reset regulatory configuration

Understand how the cost gap between Alternative fuel options 1-4 and the Baseline can be closed by using the green buttons to (1) add a **carbon price** or (2) add a **willingness-to-pay** for each of the 4 options selected in the fuel configuration.

The value cells in the two red cells in the regulatory configuration as well as the graphical output will be adjusted automatically based on the selected green buttons.

1 Consortium formation & goal definition

- A — Consortium formation, incl. assignment of roles and project governance
- B — Project vision, goals, and requirements
- C — Conceptual scope drawing

2 Customization & modeling

- D — Work scope definition
- E — Project plan
- F — Scenario modeling

3 Baselining & agreement

- G — Green corridor project baselining
- H — Project commitment letter

3G. Green corridor project baselining

Purpose

- Outline the **goals and objectives** for the Feasibility Study.
- The **technical session** provides context and background information in relation to fuel, ports, vessel, cargo dynamics, etc.
- The **scenarios modeling** provides an insight into, and discussion hereof, of the CO_2 abatement potential and incremental cost
- The document is an internal project document, which ensures an **aligned partnership in advance of starting** the Feasibility and signing the Project Commitment Letter.
- The document serves, in an updated version, also as **Chapter 1** in the Feasibility Study

Key questions

- What are the agreed **project technical terms: project members, goal, objective, governance, etc?**
- What are the **initial positions** on choice of fuel(s), port(s), vessel segment, for the Feasibility Study?

Importance

- A common **baseline document** for all project members ensures an **efficient and swift process for signing** the Project Commitment Letter, as the baseline document outlines **all relevant parts of the project.**
- The document will **not be publicly available** and does not require a thorough review. It only serves as a common reference point for starting the project.

3G. Green corridor project baselining

	Methodology – steps	Inputs
01	Describe the project's **vision, goals, and requirements** in detail to identify the **desired target state.**	Feasibility Scoping [Methodology 1A]
02	Identify **sources of alternative fuel** best suited to meet future demand, considering import options, announced projects, etc	What are the **potential alternative fuels and sources** best suited for the corridor?
03	Assess the **current and expected storage and bunkering infrastructure** for the corridor (based on geography, fuels, segment, volume, etc.)	Which are the key **ports** and what are their respective **bunkering & storage infrastructure**?
04	Understand the administrative scheme in place within the green corridor	Which tax and tax exemptions are applicable? What are the laws and who are the relevant authorities for handling/bunkering?
05	Specify the **technical characteristics of vessels** in the corridor (incl. types, sizes, ages, fuel consumption, voyage characteristics)	What are the key **technical characteristics of the vessels** expected in the green corridor?
06	Describe the high-level trade flows, incl. **type** (cargo types), **nature** (e.g., origin-destination), **ownership**, etc.	What is the nature of the **trade flows** and the **end-customer** characteristics related to the corridor?
07	Estimate the **CO_2 abatement potential** and **cost gap to be closed**. Define the target state and compare with a **fossil-based 'current state'**	Feasibility Scoping [Methodology 2F]
08	Summarize **key insights** into a **corridor project baseline** that can serve as the starting point for the Feasibility assessment (max 10 pages)	

A. Describe the vision, goals, and requirements of the Feasibility Study

Methodology – steps	Inputs
i Describe the desired **target state** in a **foundational narrative**	– Conversations with key project stakeholders – Output from Pre-Feasibility Study
ii Create a **Scoping factsheet** with key data on fuel, port, bunkering, and storage, as well as regulatory factors, and update it as more insight is acquired	– Conversations with key project stakeholders
iii Describe the project's **vision, goals, and requirements** as precisely as possible	– Combination of the above

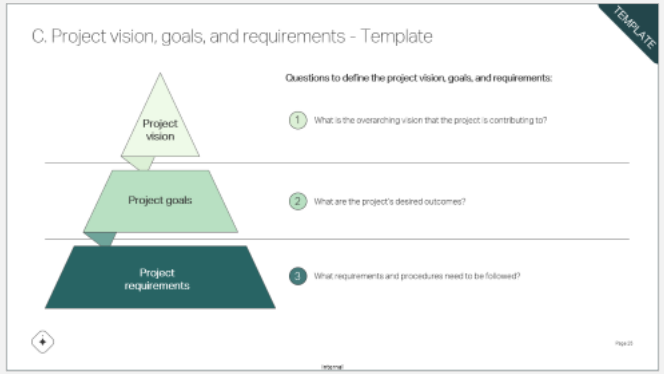
Refer to project vision, goals, requirements, and narrative guideline

Illustrative examples

A.i

A.ii

A.iii

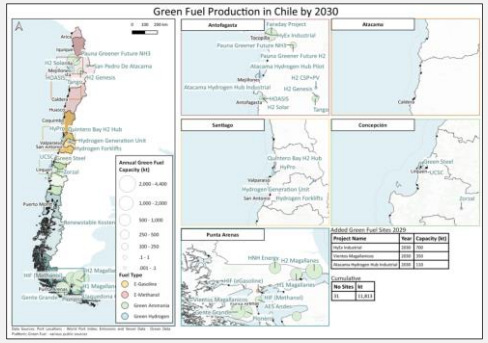


B. Identify sources of alternative fuel best suited to meet future demand

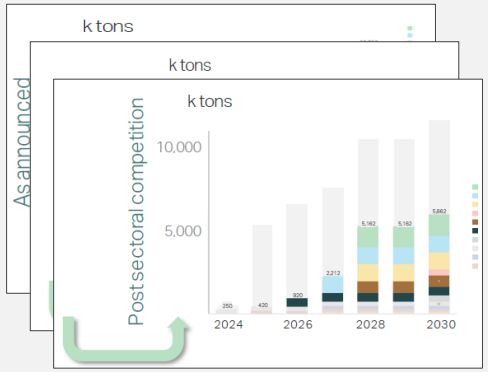
Methodology – steps	Inputs
i **Fuel demand of decided alternative fuel(s):** Create high-level estimate for future **demand for alternative fuel(s)** over time for the specific corridor	– Expected fuel consumption for vessels operating on specific corridor – Distance of corridor – Days at sea / days at port
ii Create overview of **existing and planned alternative fuel production sites for relevant fuel (near corridor/import to corridor = intra-regional)** (overview by volume, type, capacity, operator, and location) Align with workstream lead if already defined	– Current and expected projects by company, production levels and maturity level for agreed fuel type(s) – Location of expected production sites and import routes to corridor
iii If intra-regional fuel is not an option or uncertain, provide insight into timing, and assess capacity and cost of **extra-regional** fuel	– Literature / announcement screening – Transportation cost
iv **Estimate the cost of the alternative fuel** to be used for the specific corridor on a high level Use Fuel Cost Calculator if no known cost is available	– Estimates from literature – Input from early consortium partners
v Select **potential sourcing and type of alternative fuel** to be used in the green corridor Align with workstream lead if already defined	– Combination of above

Illustrative examples

B.ii



B.iii



B.Iv [7]

7: Inspired from: GMF_WA-East-Asia-Iron-Ore-Green-Corridor-Feasibility-Study.pdf (globalmaritimeforum.org)