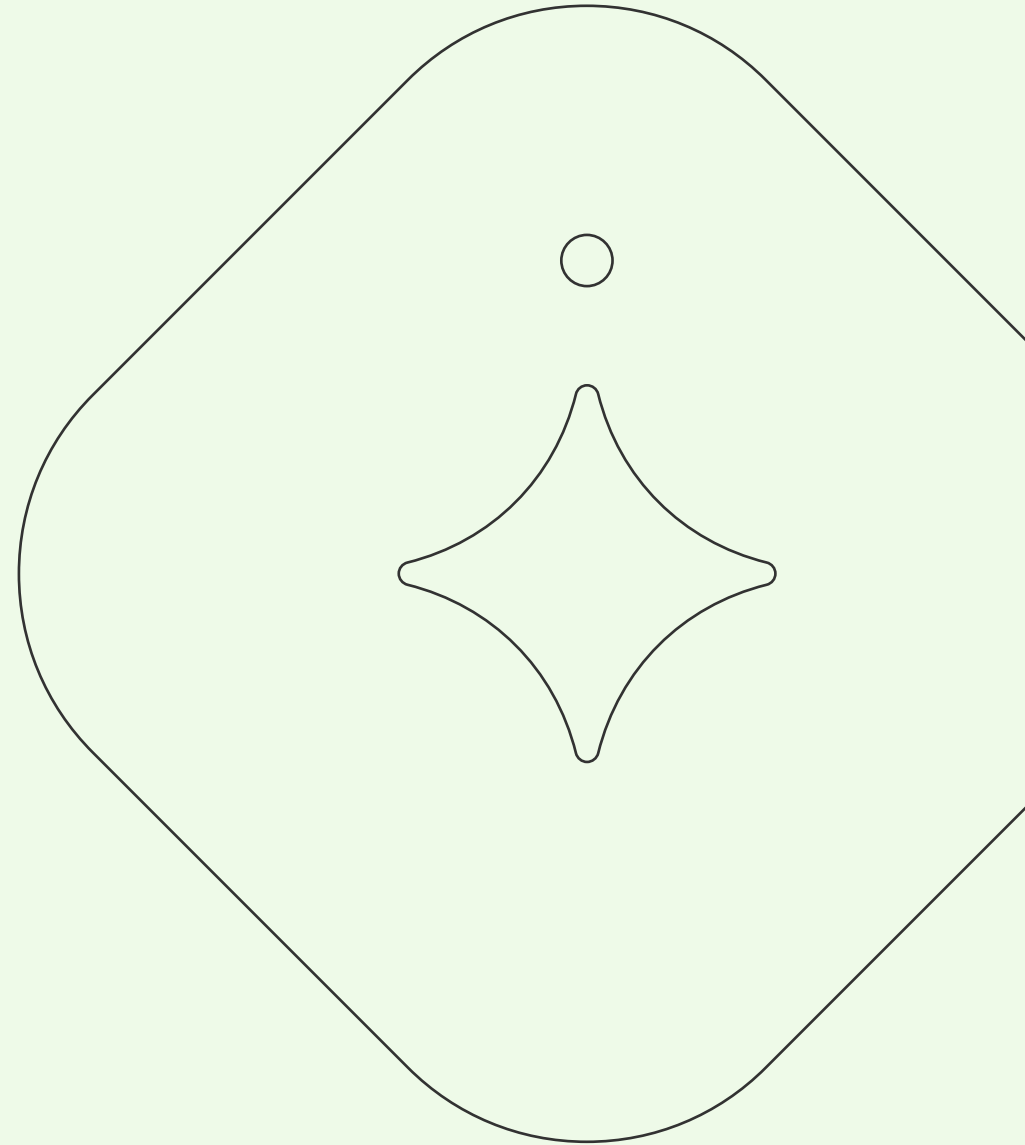


# METHODOLOGY

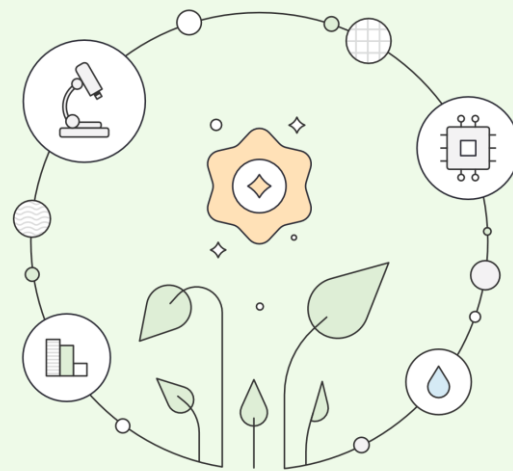
## Green Corridors Feasibility Study Phase



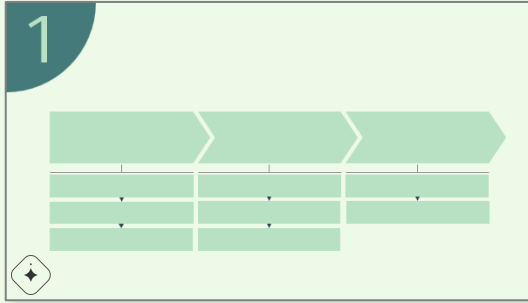
# Expected outcomes of Feasibility Study phase

During the Feasibility Scoping phase, as well as before and during the Pre-feasibility Study, thorough work has been carried out to establish a solid project baseline across all dimensions. The management of some projects may commence at the Feasibility Study phase; however, the purpose of this phase is to gather essential information to form the foundation for a comprehensive feasibility assessment — encompassing technical, financial, and regulatory aspects — and to enhance the existing work.

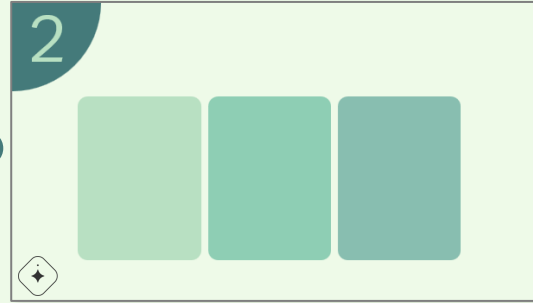
Subsequently, project team members will develop a comprehensive roadmap for advancing to the next stage. This entails selecting the final project concept, defining commercial and financing frameworks, and initiating the solution-building process.



# How this document is constructed



Navigation through the document



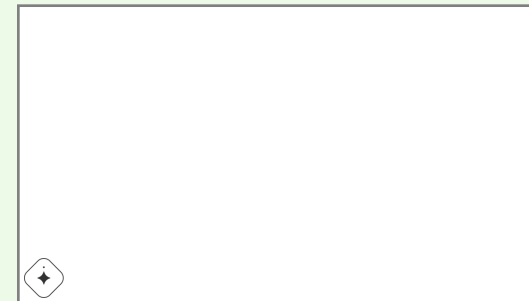
What's the purpose, key questions and importance of the subject



Summary of chapter findings and outcomes

To be noted:

If a thorough Pre-feasibility phase and/or feasibility scoping have been conducted earlier, certain aspects of workstreams 2-5 may have been addressed to some extent. In such instances, it's advisable to conduct a gap analysis to determine which remaining tasks need to be completed.



Further detailing of proposed activities



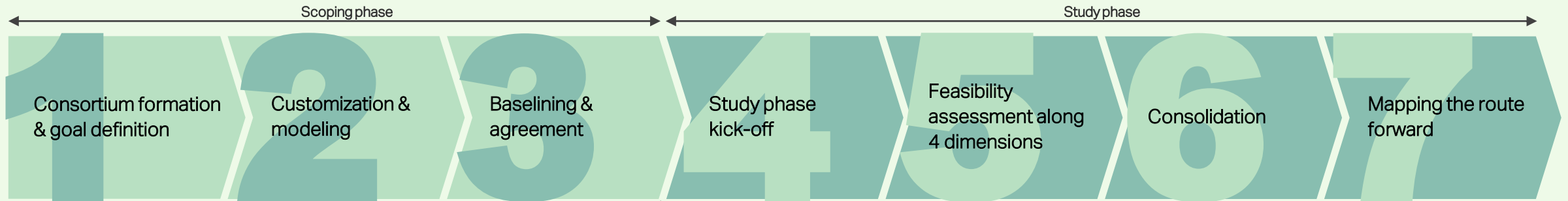
Templates



Examples



# The Feasibility Phase



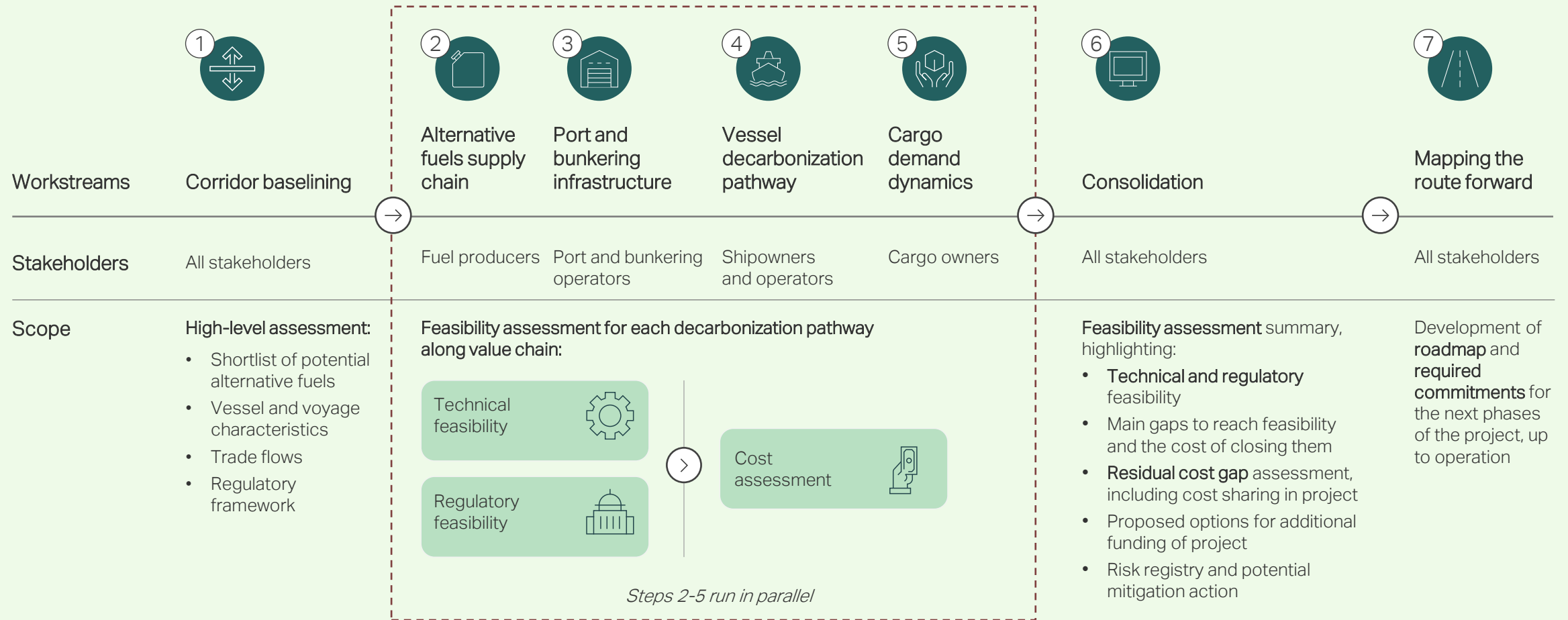
The Feasibility Scoping Phase enables participants to **form a consortium** and project team members to **agree on roles** as well as **ways of working** in the upcoming Feasibility Study. It also aims at clearly **defining the focus and goals of the Feasibility Study** as well as the **work that needs to be done** for the specific corridor to reach these goals.

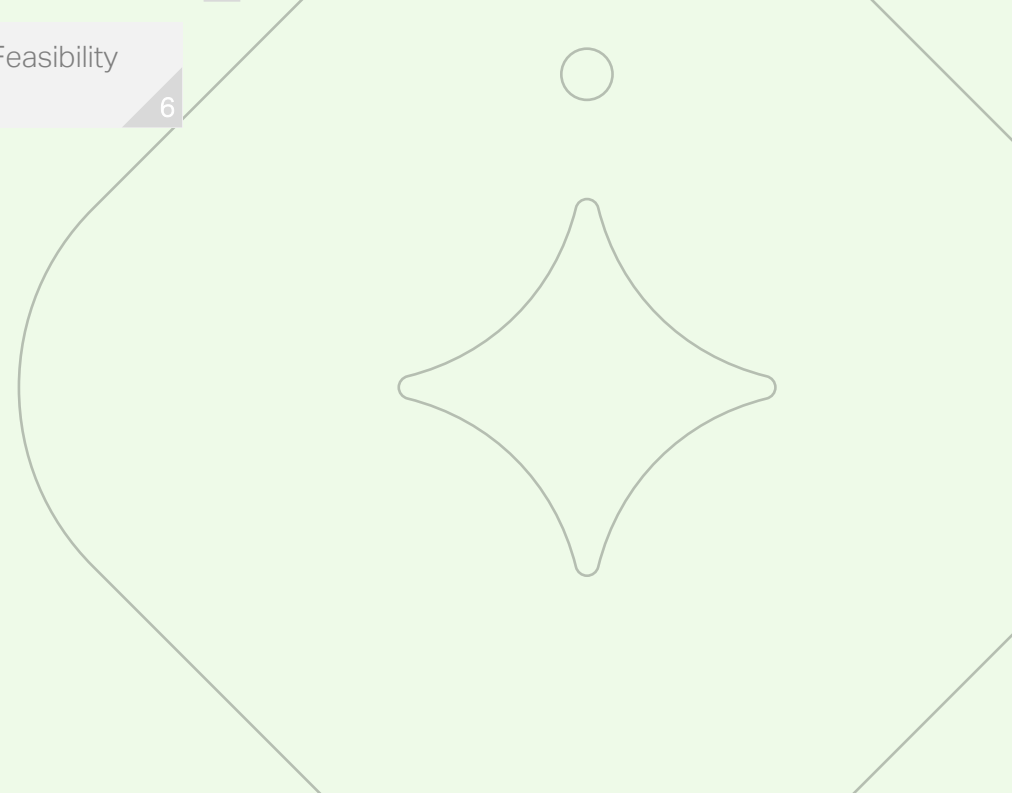
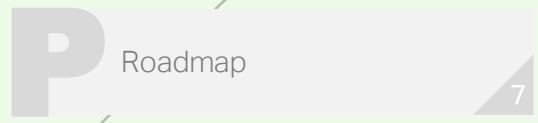
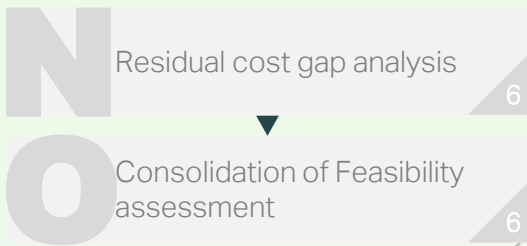
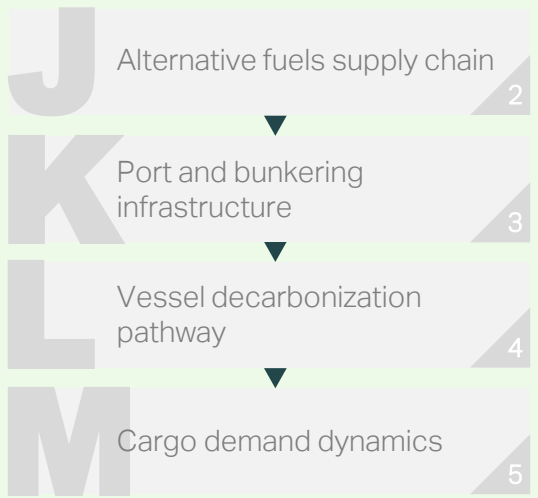
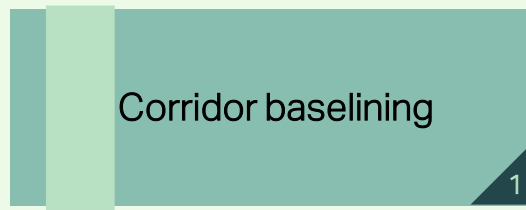
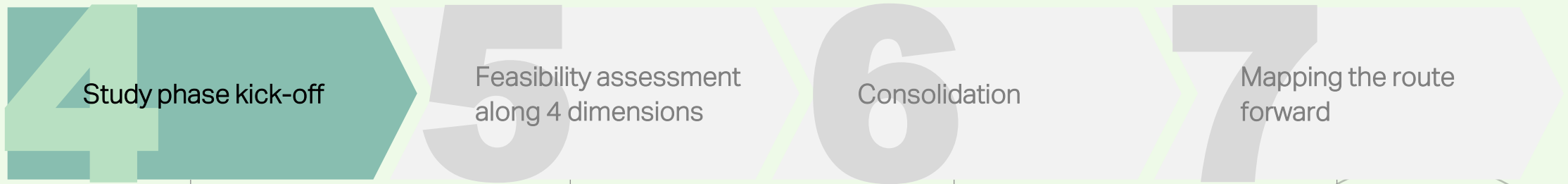
The Feasibility Study aims at **assessing the technical and regulatory feasibility of a specific green corridor** along the fuel, port, vessel, and cargo dimensions as well as **defining the residual cost gap**. It further includes a **risk registry** and **roadmap**, all of which are outlined together with the **consolidated findings** of the Feasibility Study.

Project Commitment Letter



# The Center methodology for Feasibility studies is structured around seven workstreams





## 4I. Corridor baselining

### Purpose



- Conduct a **corridor project baselining** to create an initial view on relevant **fuel, ports, and bunkering infrastructure**, relevant **vessel characteristics** and **trade flow** as well as just and equitable specifics.
- Summarize **key insights** into a **corridor project baseline** that can serve as the starting point for the Feasibility assessment (max 10 pages).
- Include **scope drawing**.

### Key questions



- What are the **key characteristics** of the green corridor at hand?
- What are the **initial positions** on choice of fuel, port(s), and vessel segment for the Feasibility Study?

### Importance



- Typically, corridor project baselining is conducted in Feasibility Scoping, but may in some cases be conducted at the beginning of the Feasibility Study instead.
- A common **baseline document** for all project members outlines **all relevant parts of the project** and ensures the **study is conducted in an efficient and swift process**.
- The scope drawing ensures that the project team always knows what the project is about and where the interfaces are located.



# 4I. Corridor baselining

## Summary of chapter findings and outcomes

---

- 01
- Description of the **target state** — including **vision, goals, and requirements** for the green corridor
  - Conceptual drawing of scope and workstream delineation
- 

- 02
- Technical:
- Recommendation of the **alternative fuel** to be used in the green corridor, including its required volume, if possible, its **source / feedstock** and its **production location**
  - Description of **current port, storage, and bunkering infrastructure** along the green corridor, including current capacity, as well as the future **target port, storage, and bunkering infrastructure**, including necessary capacity
  - Overview of current and expected **vessels** in the corridor, including their specific **characteristics** and **emissions**
  - Understanding of **trade flows, cargo type, volume and value, cargo owners** and **consumers**
- 

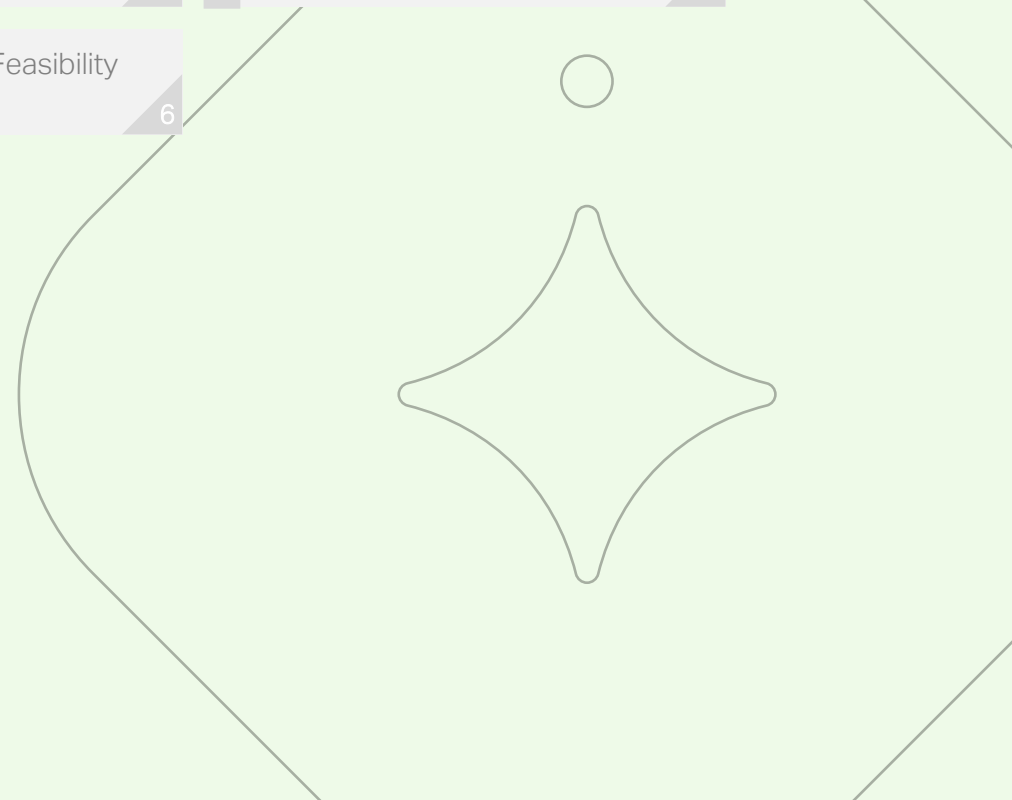
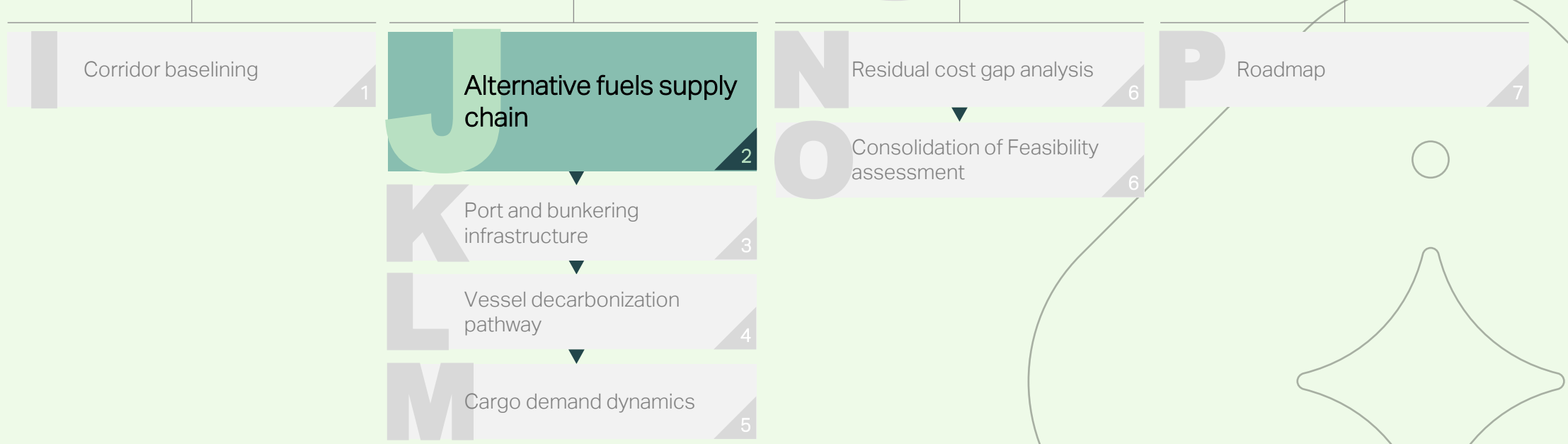
- 03
- Regulatory:
- Overview of the administrative scheme in place within the green corridor
- 

- 04
- Cost:
- Preliminary cost assessment for **alternative fuels supply chain, port and bunkering infrastructure, vessel decarbonization pathway**
  - Potential CO<sub>2</sub> abatement, initial total **cost estimate** (CapEx and OpEx over 25 years) as well as an initial view on the **incremental cost of green**
- 

- 05
- Initial thoughts and findings on just and equitable aspects







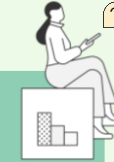
## 5J. Alternative fuels supply chain

### Purpose



- Assess the technical and regulatory feasibility of **delivering the amount and type of fuel needed** for the green corridor at the required timeline, and quantify related **costs (CapEx and OpEx)** (insights from workstream 4)
- Define **expected production center(s)** for alternative fuel
- Outline measures related to the alternative fuel supply chain to ensure a **just and equitable implementation** of the project
- Identify cost and **cost-down trajectories** for drivers of fuel costs (e.g., technology CapEx, electricity prices)
- Perform just and equitable assessment for the fuel supply chain (Matrix)

### Key questions



- Can the **alternative fuel supply** meet the **demand for the specific green corridor**?
- What is the **required volume of alternative fuel** for this corridor and **range of expected production**?
- What are the main **drivers impacting the cost of alternative fuels** and how will they evolve over time?
- What is the **investment/financing required** to match the expected demand in the specific green corridor?
- Which **workers, communities and ecosystems** are affected by the transition to a low/zero emission fuel supply chain?
- What are the **socio-economic opportunities and risks**, and how can they be maximized/minimized, respectively?
- How do we ensure a **just and equitable** alternative fuel production?

### Importance



- There are 3 critical cost elements to be considered for the technical and regulatory feasibility for the green corridor:
  - Delivering the **amount and type of fuel**
  - Meeting the **timeline**
  - **Quantifying** related costs



## 5J. Alternative fuels supply chain

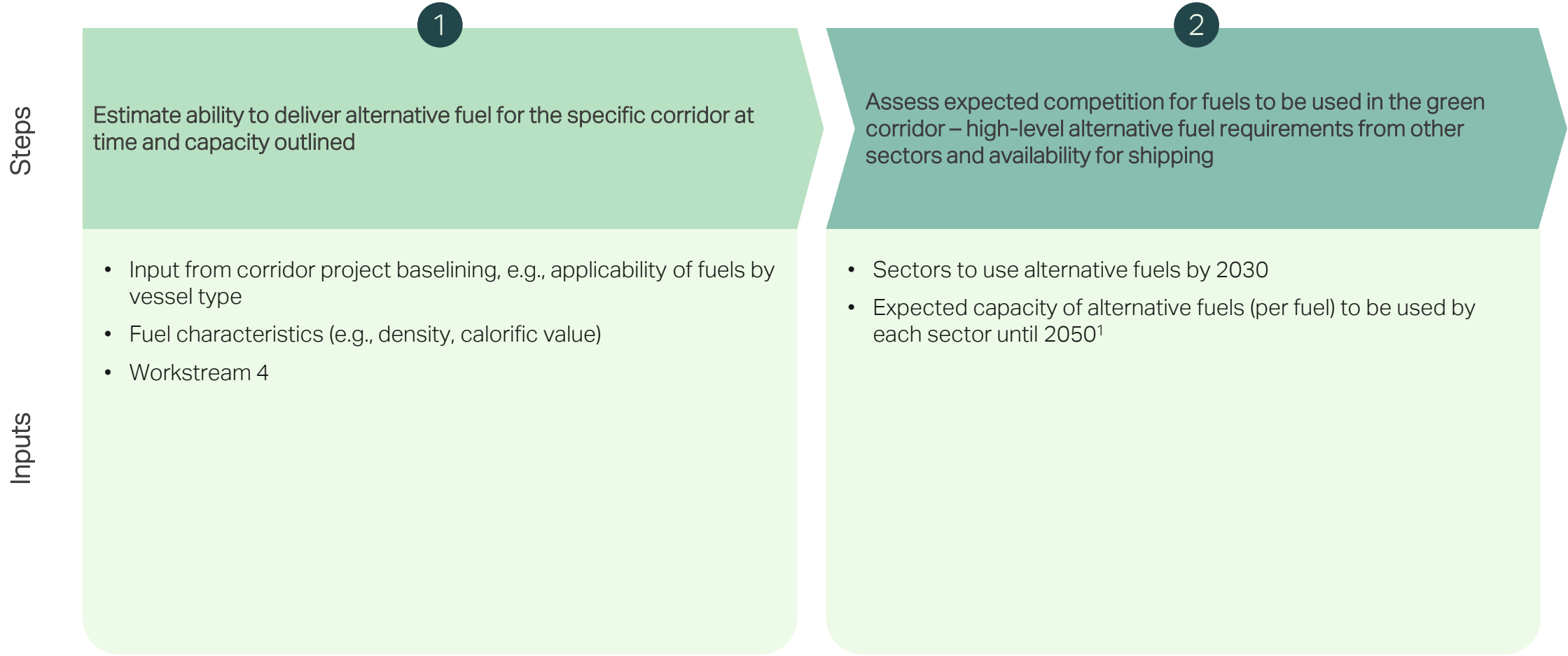
### Summary of chapter findings and outcomes

---

- 01 • **Proposed source of alternative fuels** for the specific green corridor (source of renewable energy, feedstock, and fuel production centers) and **evolution of alternative fuel supply and demand** over time for regions relevant to the corridor (local or international/ imported)
- 
- 02 • **Technical feasibility** of alternative fuel production for the specific green corridor, including:
- Expected feedstock production locations and capacity
  - Fuel production locations and capacity
  - Transportation of fuel to relevant region in corridor
- 
- 03 • **Regulatory feasibility** of alternative fuel production projects and permits related to their development for a specific green corridor:
- Regulatory and policy structure to allow/enable alternative fuel and feedstock production, storage and distribution (e.g., for hydrogen, carbon capture, storage, and transport)
  - Regulations on scale of alternative fuel production, and health and safety guidelines on handling, storage, and use
  - Carbon credits and other tailwinds
  - Measures to ensure a just and equitable alternative fuel production
- 
- 04 • **Cost assessment** of alternative fuel production project development relevant to the specific green corridor, including:
- Resulting CapEx requirements
  - Expected cost of production and potential price of alternative fuels, and their evolution over time
  - Financing and funding options
- 
- 05 • **Just & Equitable:**
- An analysis from a J&E perspective will provide insights on how workers, communities and ecosystems might be affected by the offtake of alternative fuels within the green corridor. There might be socio-economic opportunities and risks. It is important that work is done to maximize the opportunities and minimize the risks



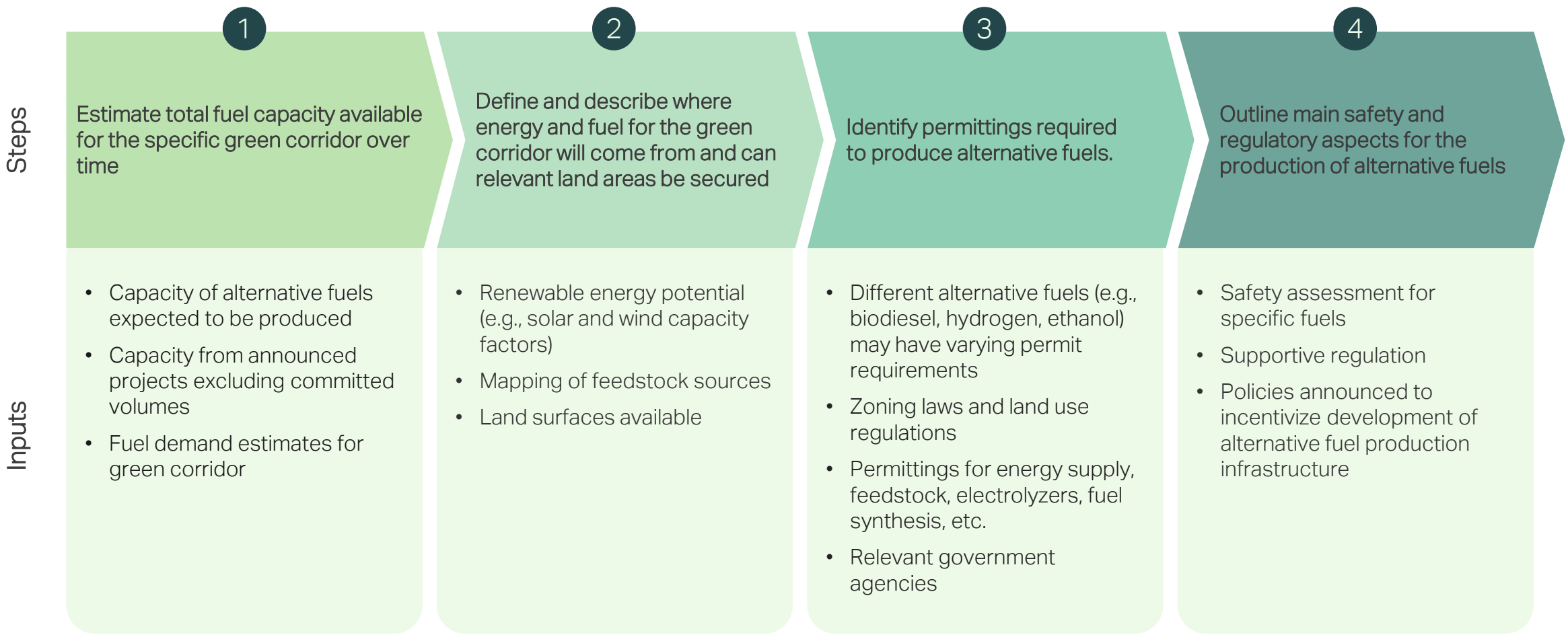
# Estimate fuel demand for the specific green corridor



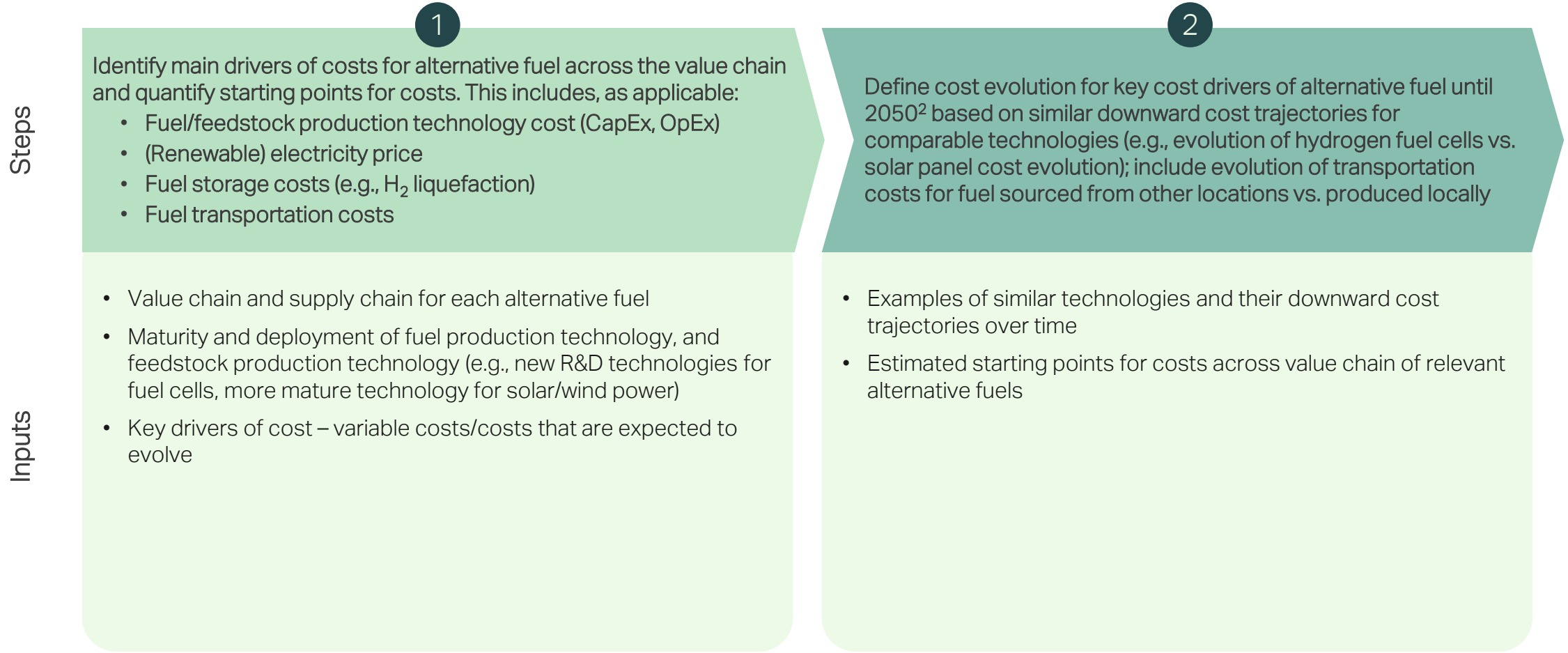
1. Depending on project timeline



# Define expected production centers for alternative fuels, assess their technical and regulatory feasibility



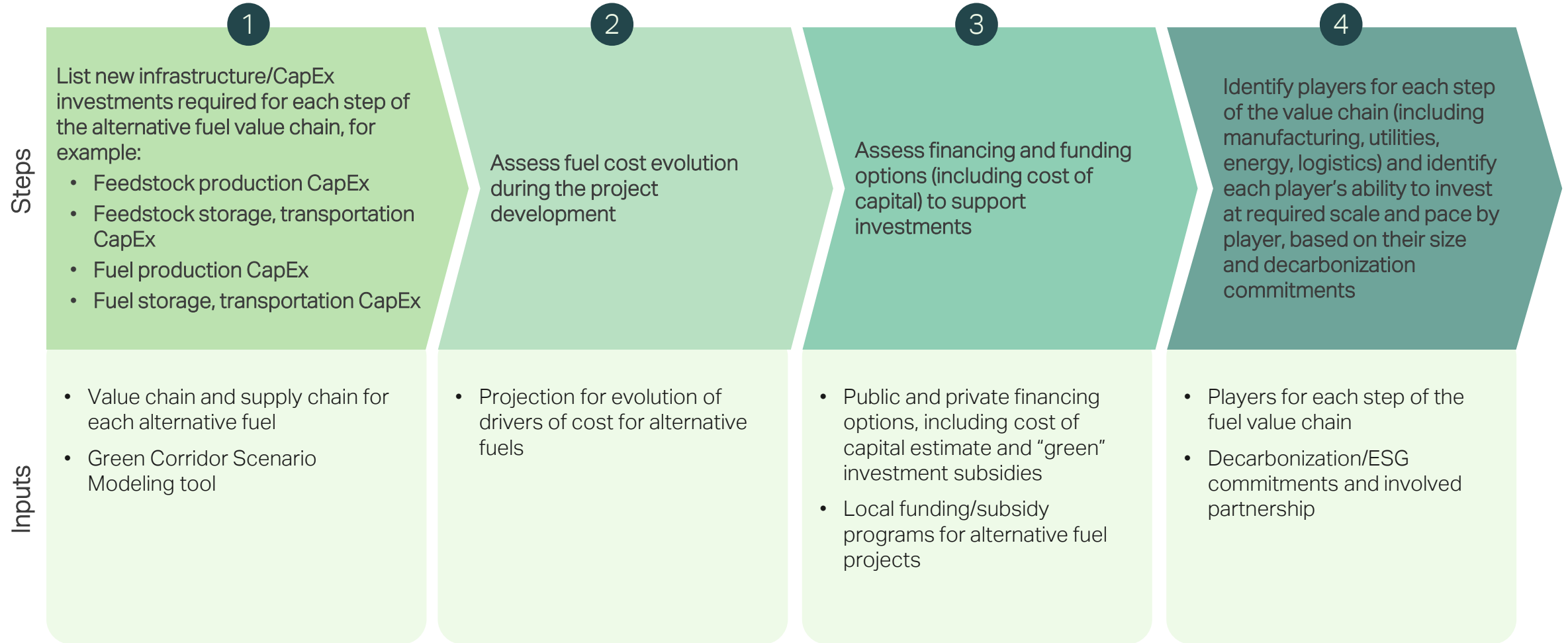
# Identify and quantify fuel cost and downward cost trajectories



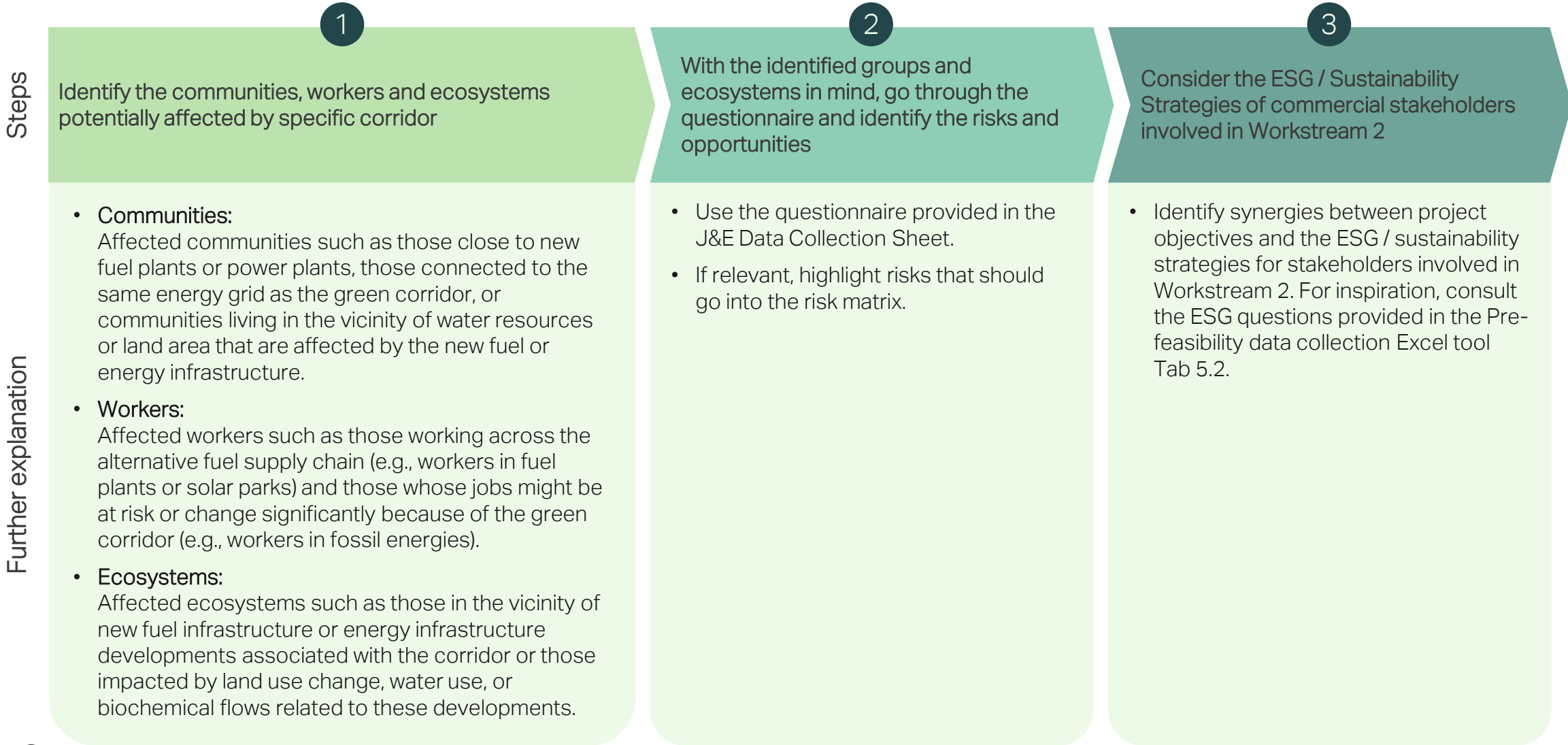
2. Depending on project timeline



# Quantify CapEx and OpEx requirements



# J&E assessment – Alternative fuels supply chain





# Workstream gap analysis – Alternative fuels supply chain

Project Vision												
Workstream Scope / Targets												
Workstream	Topic	Feasibility Assessment	Elements	Description	Main Gaps	Solution/ Mitigating Actions	Timing	Cost to Close Gap	Investments	Dependencies/ Commitments	Gap Factor	Criticality
		<b>Technical</b> Specify main gaps to target state (scope) and mitigating actions. What are the key technical challenges and mitigating actions? How are they expected to evolve over time? How does this align with the target state time line?										
		<b>Regulatory</b> Specify main gaps to target state (scope) and mitigating actions. What are the key regulatory challenges and mitigating actions? How are they expected to evolve over time?										

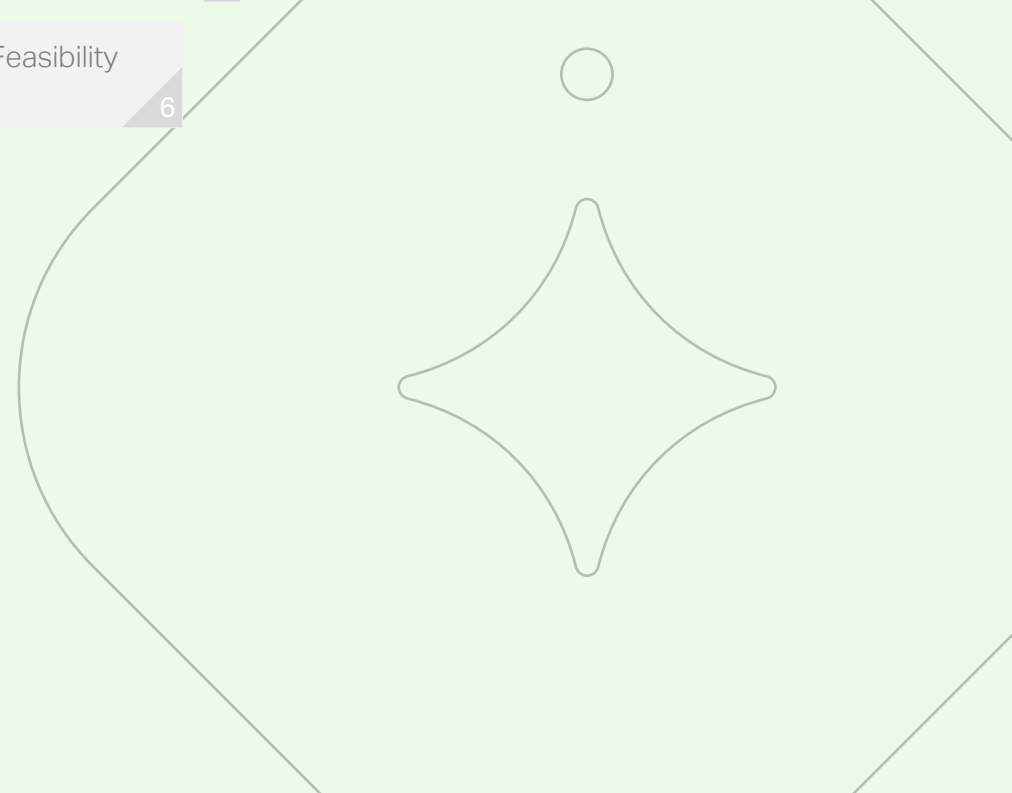
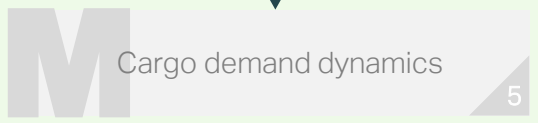
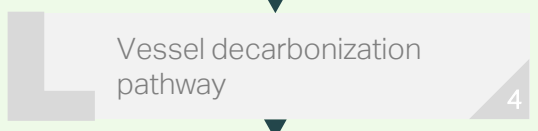
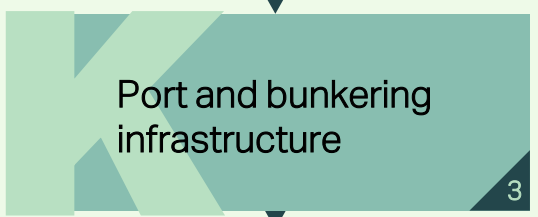
Header Definitions		
<b>Elements</b>	[see workstream-specific spreadsheets for a list of elements]	
<b>Description</b>	[describe element]	
<b>Main Gaps</b>	[describe gap]	
<b>Solution</b>	[describe solution to close gap, i.e. demonstrators, SOPs, studies, etc.]	
<b>Time</b>	[timeframe to close gap]	
<b>Cost to close gap</b>	[demonstrators, pilots, etc.] [\$M]	
<b>Investments</b>	[Capex/Opex to reach project scope]	
<b>Dependencies</b>	[describe pre-requisites and timing/sequence for solution]	
<b>Gap factor</b>	[rate the gap based on the means required to close gap] [traffic light]	
<b>Criticality</b>	[to ensure operation] [traffic light]	
Traffic Light Table Definition		
<b>Color</b>	<b>Gap Factor/Severity (How large is the gap?)</b>	<b>Criticality/Impact (How high is the impact of this gap?)</b>
Low	Low	Low
Medium	Medium	Medium
High	High	High
Feasibility Definitions (Gaps related to ...)		
<b>Technical</b>	The technical readiness (development, adaptation, availability) Operational readiness over time	
<b>Regulatory</b>	The regulation regarding the use, handling and onboard storage of the alternative i.e., safety and operational risk guidelines, methodologies and procedures for use	

Throughout the Feasibility assessment, fill the table with insights on **technical and regulatory feasibility**<sup>3</sup> – specifically, use this table to highlight **gaps and ways to close them**

**Legend and definitions**



3. Cost assessment is covered under the residual cost gap analysis methodology



## 5K. Port and bunkering infrastructure

### Purpose



- **Identify potential ports** for the specific green corridor.
- For the ports of choice, identify:
  - Capacity for storing and bunkering alternative fuels
  - Existing and planned infrastructure
  - Regulatory frameworks for storage and bunkering
- Estimate the required **investments for retrofitting/building** new storage and bunkering infrastructure (CapEx/OpEx over 25 years) to meet corridor demand.
- **Assess the feasibility** of developing storage and bunkering infrastructure for alternative fuel.
- Perform **just and equitable assessment** for port and bunkering infrastructure.

### Key questions



- What are the **expected port and bunkering sites** for this specific corridor?
- What does the current **fuel storage and bunkering infrastructure** look like and what **additional investments** are required?
- How much of the required capacity can be covered by **retrofitting existing infrastructure**?
- How much **extra infrastructure** is required?
- Will it be **feasible from a regulatory perspective to develop** the storage and bunkering infrastructure?
- What are the **required investments and financing potential** for retrofitting/developing the required infrastructure?
- What will be the running cost for these facilities?
- Which **workers, communities and ecosystems** are affected by port, storage and bunkering infrastructure for low/zero emission fuels?

### Importance



- The ports play an important role in the green corridor, but the **activities related to the corridor are often managed by several stakeholders**.
- As the new fuel (chemical) will be stored and bunkered at the port (most likely the most-populated port along the green corridor), the **safety, permits and regulation** are crucial items to map in the early phases.
- There might be **socio-economic opportunities and risks**. Therefore, it is equally important that work is done to maximize the opportunities and minimize the risks.



# 5K. Port and bunkering infrastructure

## Summary of chapter findings and outcomes

---

- 01 • **Overview of required port and bunkering infrastructure** to meet the specific corridor's demand for alternative fuel (location, capacity, technologies)
- 

- 02 • **Technical feasibility** of alternative fuel bunkering, storage, and logistics connected to the green corridor ports, including:
- Potential for **conversion/retrofitting** of infrastructure for alternative fuels
  - Logistics solution for transporting alternative fuel to storage sites
  - **Potential availability of land** for new infrastructure (if required)
  - **Operational capacity** based on fuel type (e.g., required skills to handle fuel)
- 

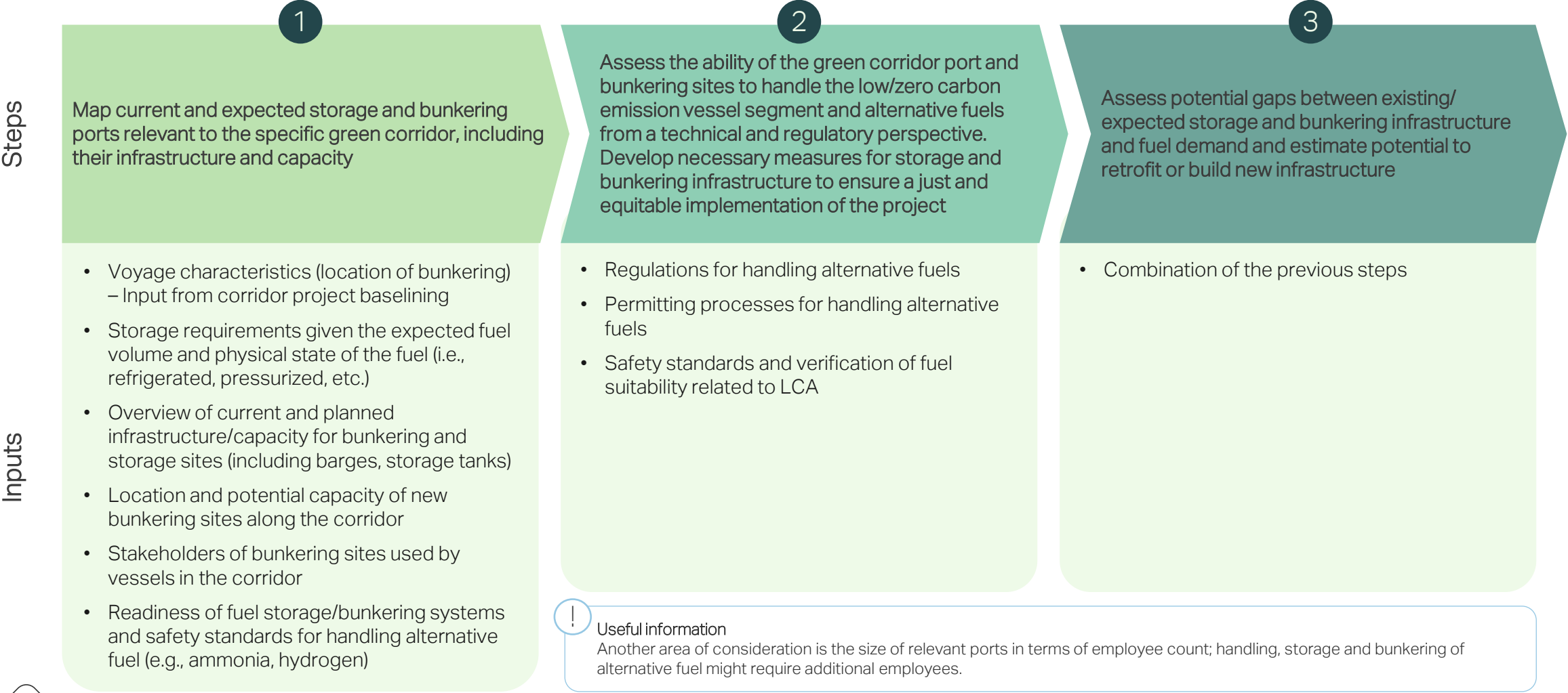
- 03 • **Regulatory feasibility**, including the ability to **store/bunker** fuel at green corridor ports; **health and safety guidelines** for storage, bunkering, logistics; and fuel handling **process definitions**, as well as measures to ensure a **just and equitable** development of the alternative fuel along the entire storage/bunkering process.
- 

- 04 • **Cost assessment** for conversion/retrofitting and development of the infrastructure required for the specific green corridor, including:
- Resulting CapEx requirements
  - OpEx costs (for storage tanks, ports, new bunkering barges, etc.)
  - Opportunities to share bunkering and storage infrastructure based on demand from vessels outside the corridor
  - Financing capacity and potential
- 

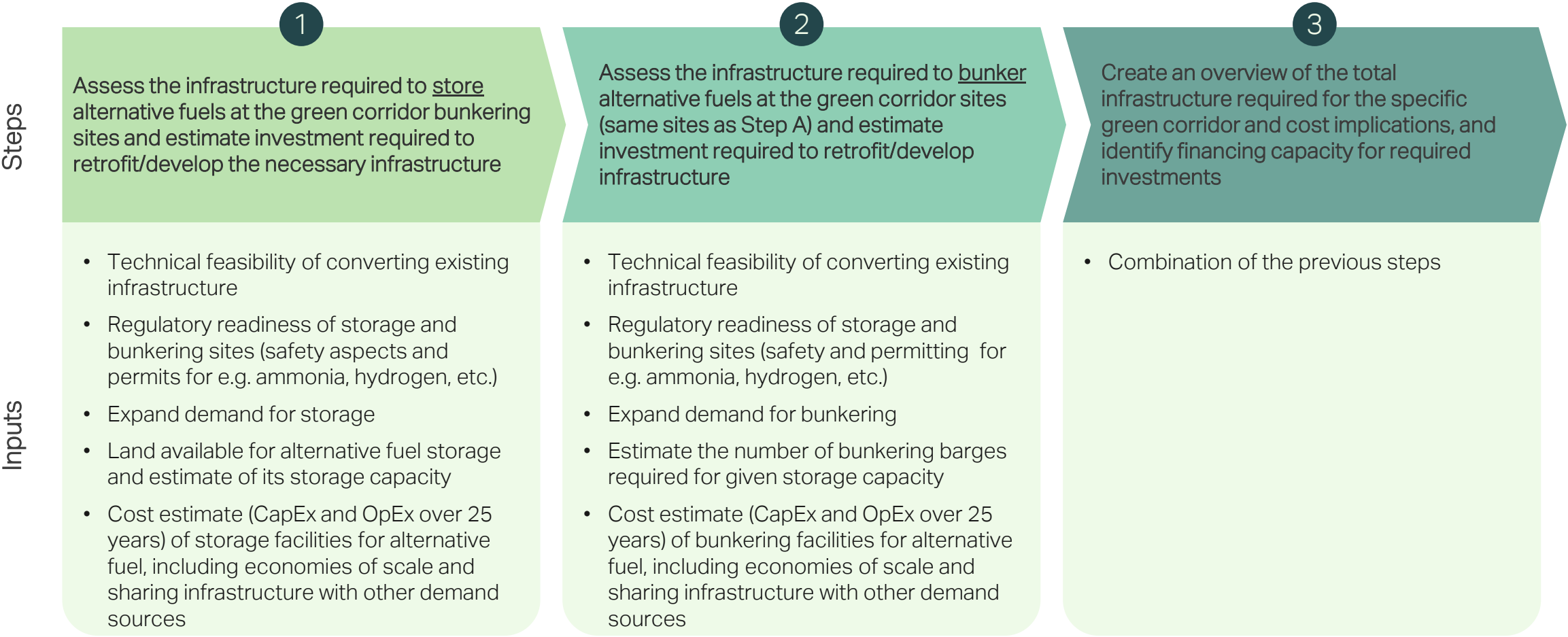
- 05 • **Just & Equitable:**
- An analysis from a J&E perspective will provide insights on how workers, communities and ecosystems might be affected by the development of fuel storage and bunkering facilities. There might be socio-economic opportunities and risks. It is important that work is done to maximize the opportunities and minimize the risks.



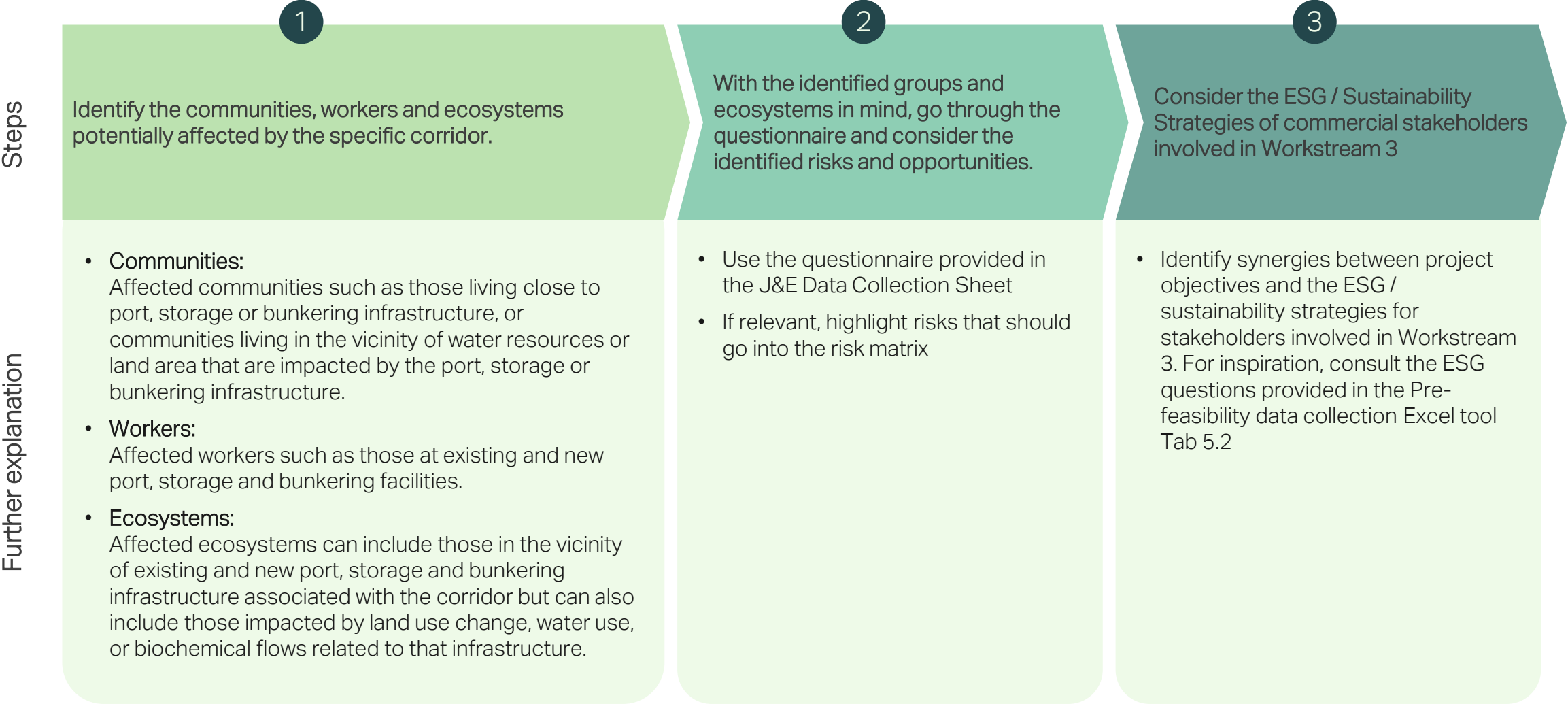
# Estimate the demand and capacity for storage and bunkering of alternative fuels for the specific green corridor, and identify potential ports



# Estimate the investment required to retrofit/build new storage and bunkering infrastructure to meet corridor demand



# J&E assessment - Port and bunkering infrastructure



# Workstream gap analysis – Port and bunkering infrastructure

Project Vision													Header Definitions														
Workstream Scope / Targets																											
Workstream	Topic	Feasibility Assessment	Elements	Description	Main Gaps	Solution/ Mitigating Actions	Timing	Cost to Close Gap	Investments	Dependencies/ Commitments	Gap Factor	Criticality															
		<b>Technical</b> Specify main gaps to target state (scope) and mitigating actions. What are the key technical challenges and mitigating actions? How are they expected to evolve over time? How does this align with the target state time line?											<b>Traffic Light Table Definition</b> <table border="1"> <thead> <tr> <th>Color</th> <th>Gap Factor/Severity (How large is the gap?)</th> <th>Criticality/Impact (How high is the impact of this gap?)</th> </tr> </thead> <tbody> <tr> <td>Green</td> <td>Low</td> <td>Low</td> </tr> <tr> <td>Yellow</td> <td>Medium</td> <td>Medium</td> </tr> <tr> <td>Red</td> <td>High</td> <td>High</td> </tr> </tbody> </table>			Color	Gap Factor/Severity (How large is the gap?)	Criticality/Impact (How high is the impact of this gap?)	Green	Low	Low	Yellow	Medium	Medium	Red	High	High
Color	Gap Factor/Severity (How large is the gap?)	Criticality/Impact (How high is the impact of this gap?)																									
Green	Low	Low																									
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		<b>Regulatory</b> Specify main gaps to target state (scope) and mitigating actions. What are the key regulatory challenges and mitigating actions? How are they expected to evolve over time?											<b>Feasibility Definitions (Gaps related to ...)</b> <table border="1"> <tbody> <tr> <td><b>Technical</b></td> <td colspan="2">The technical readiness (development, adaptation, availability) Operational readiness over time</td> </tr> <tr> <td><b>Regulatory</b></td> <td colspan="2">The regulation regarding the use, handling and onboard storage of the alternative i.e., safety and operational risk guidelines, methodologies and procedures for use</td> </tr> </tbody> </table>			<b>Technical</b>	The technical readiness (development, adaptation, availability) Operational readiness over time		<b>Regulatory</b>	The regulation regarding the use, handling and onboard storage of the alternative i.e., safety and operational risk guidelines, methodologies and procedures for use							
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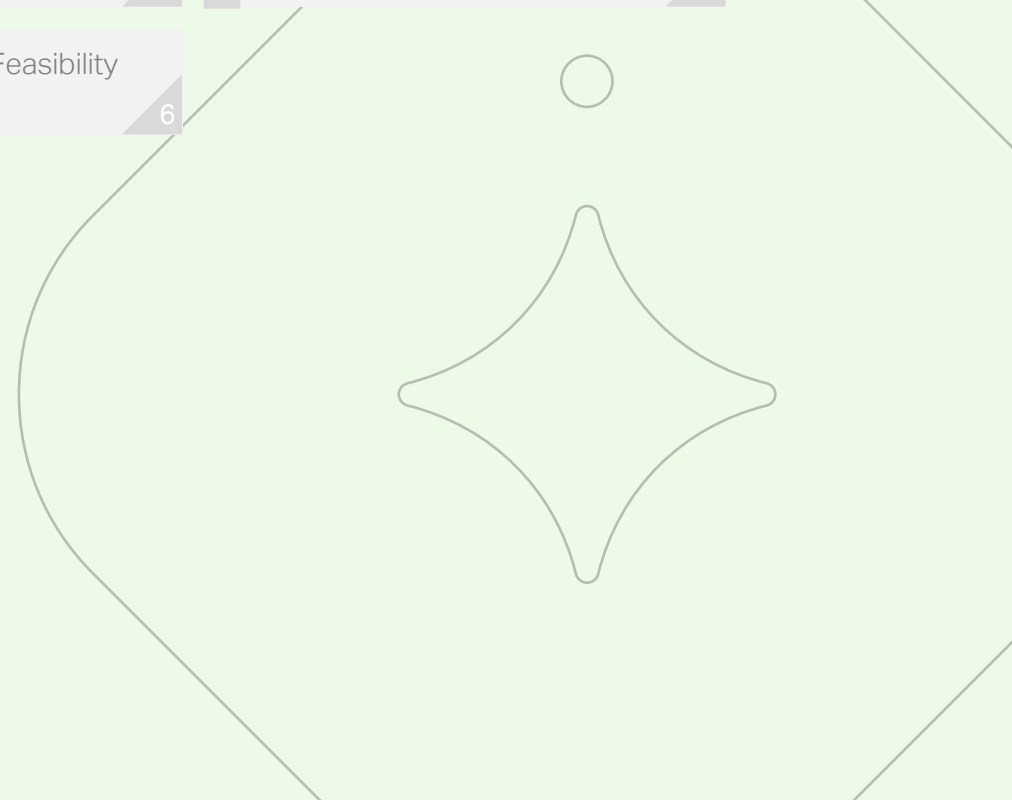
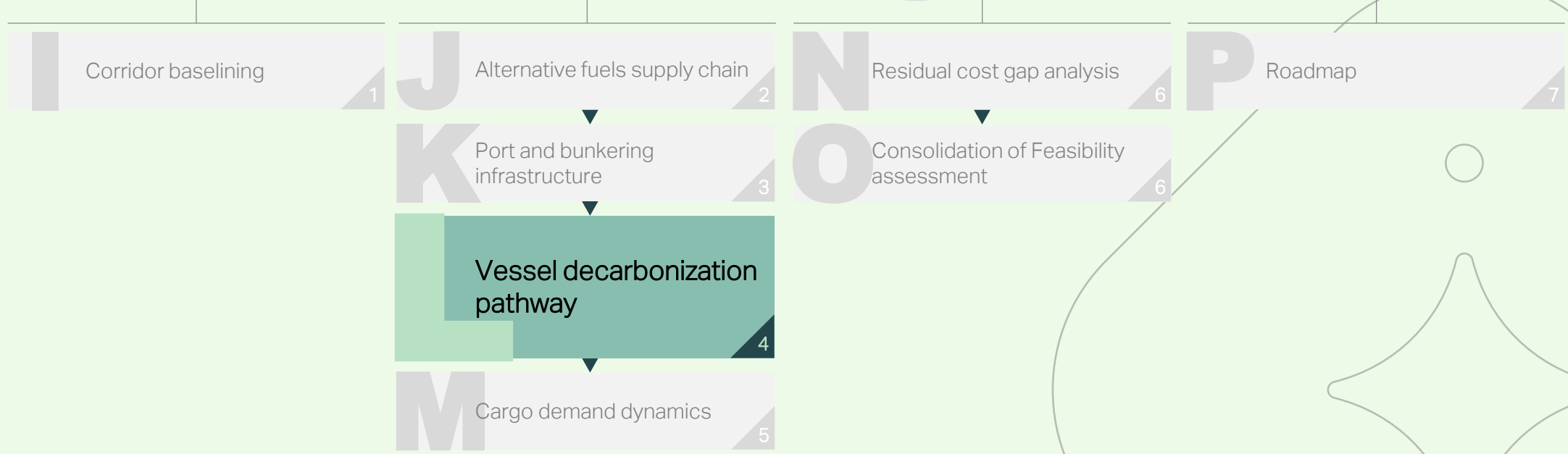
Throughout the Feasibility assessment, fill the table with insights on **technical and regulatory feasibility**<sup>4</sup> – specifically, use this table to highlight **gaps and ways to close them**

Legend and definitions



4. Cost assessment is covered under the residual cost gap analysis methodology





# 5L. Vessel decarbonization pathway

## Purpose



- Assess the technical and regulatory feasibility of **delivering the required number of vessels** within the specified timeline.
- Estimate the number and specification of vessels required including type and size.
- Assess if the vessels are to be **newbuilds or retrofitted vessels with modifications (or a mix)**.
- Create the **timeline to deliver the vessels**.
- Identify regulations that impact the handling of **alternative fuel on vessels along the specific green corridor**, and define workstream-related measures to ensure a safe and just operation of the vessels.
- Quantify the **CapEx and lifetime OpEx** (for 25 years of operation) requirements for newbuilds and retrofitted vessels and review financing potential.
- Perform just and equitable assessment for the vessel decarbonization pathway.

## Key questions



- **How many vessels are needed** and what are their required **characteristics** (e.g., vessel type, fuel, cargo, volumes, engine)?
- Can the **shipyards** deliver the required type and number of vessels and what is the **timeline to make the vessels operational**?
- How **many of the required vessels** are expected to be **newbuilds or retrofitted** over time to meet the decarbonization ambition?
- Which **additional modifications** can be applied to the vessels (e.g., energy efficiency, onshore power) to reduce the amount of alternative fuel required?
- What are the **regulatory requirements to be fulfilled** to make the vessels operational according to the specified vessel characteristics/timeline?
- What are the resulting **investment requirements** (CapEx and OpEx) and potential financing opportunities?

## Importance



- Vessels are the **ultimate vectors** to meet the corridor's **CO<sub>2</sub> abatement targets**.
- It is important to **thoroughly analyze the existing and future fleets** operating within the green corridor and understand what **changes** will be **needed** in terms of upgrading, retrofitting and/or newbuilds.
- Analysis from a J&E perspective will provide insights on how **workers, communities and ecosystems might be affected** by the transition to vessel decarbonization pathway.



# 5L. Vessel decarbonization pathway

## Summary of chapter findings and outcomes

---

- 01
- **Current and future vessel availability and timeline** taking into consideration the availability of alternative fuels based on technology maturity
  - **Modifications required for existing vessels and characteristics of new vessels** (i.e., alternative fuels, onboard storage, technologies)
- 

- 02
- Technical feasibility** of vessel newbuild/conversion to use alternative fuels, including:
- Impact of usage of alternative fuels on vessel, voyage range, and cargo payload
  - Fuel and technology availability and maturity over time
  - Vessel renewal/new ordering timelines
- 

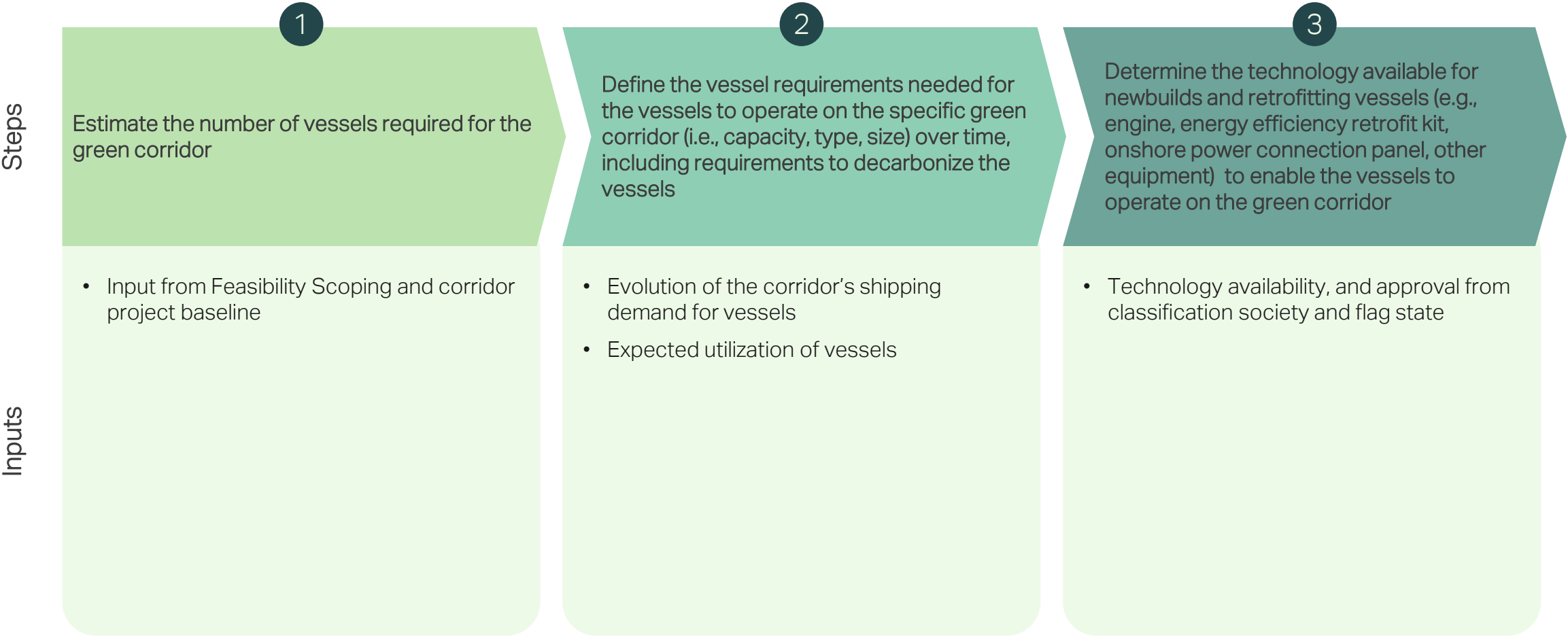
- 03
- Regulatory feasibility** of vessel conversion to use alternative fuels:
- Regulations regarding use and onboard storage of alternative fuels
  - Measures to ensure a just and equitable conversion and operation of the vessels, including relevant ESG ambitions
- 

- 04
- Cost assessment** of vessel conversion to use alternative fuels, including:
- CapEx and OpEx for existing and new vessels' incremental cost of green
  - Resulting financing needs and funding sources
- 

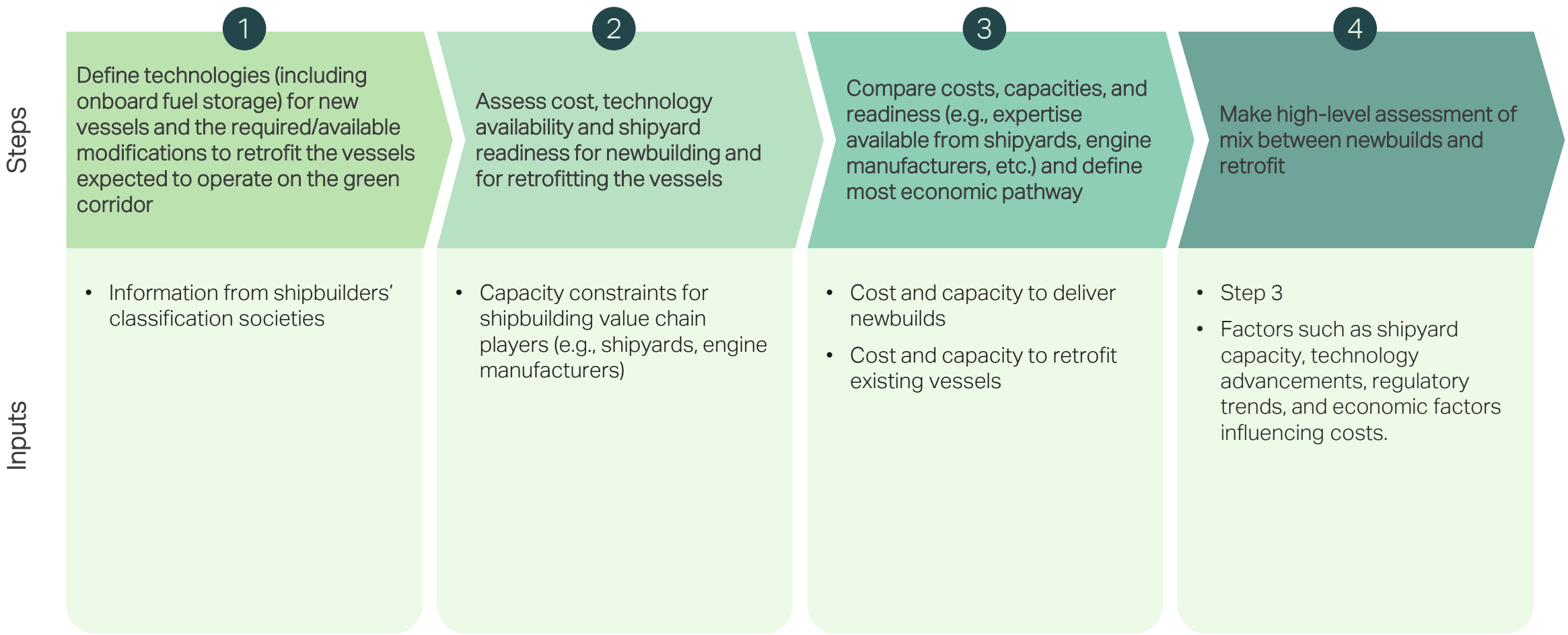
- 05
- Just & Equitable:**
- Analysis from a J&E perspective will provide insights on how workers, communities and ecosystems might be affected by the change/addition of new operating vessels and their related new technologies. There might be socio-economic opportunities and risks. It is important that work is done to maximize the opportunities and minimize the risks.



# Estimate the number of vessels required and define the green corridor's future vessel requirements, including type and size of vessels



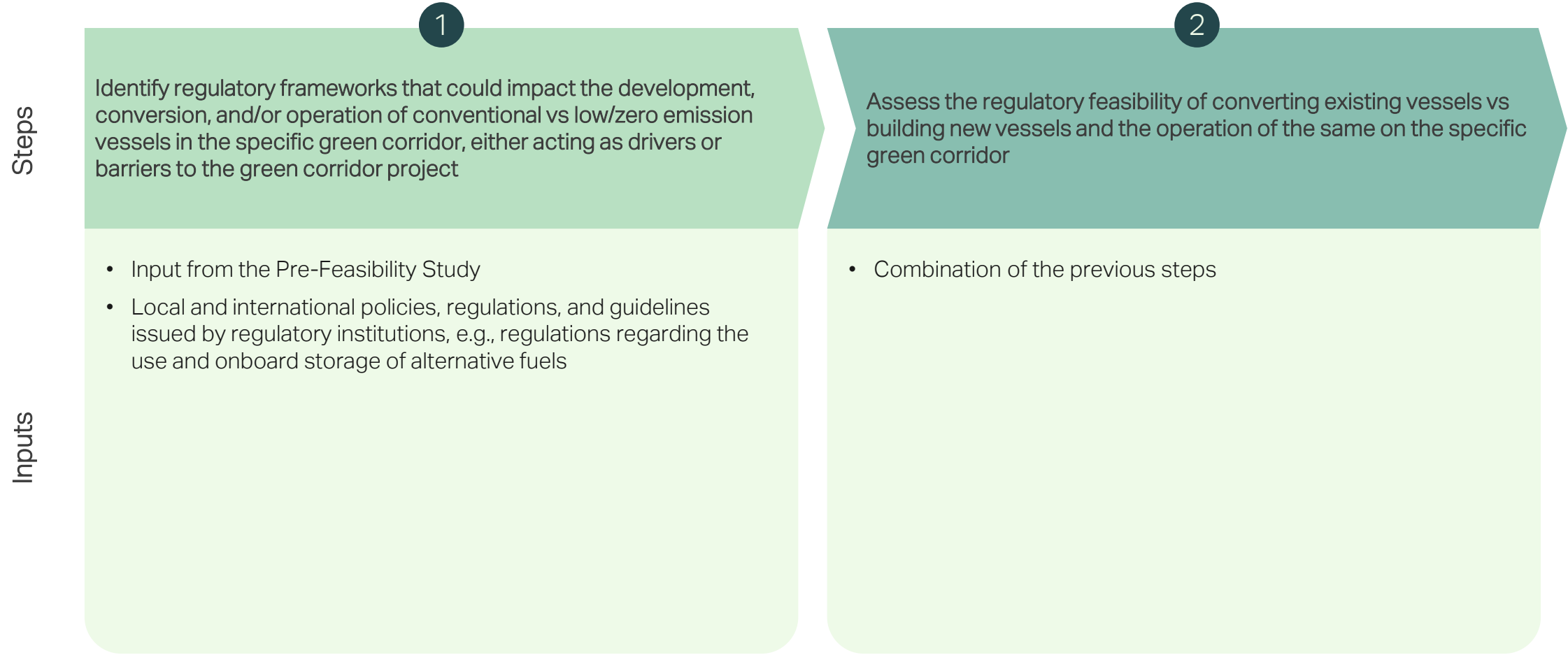
# Define the number of newbuilds and retrofitted vessels that can operate in the specific green corridor over time



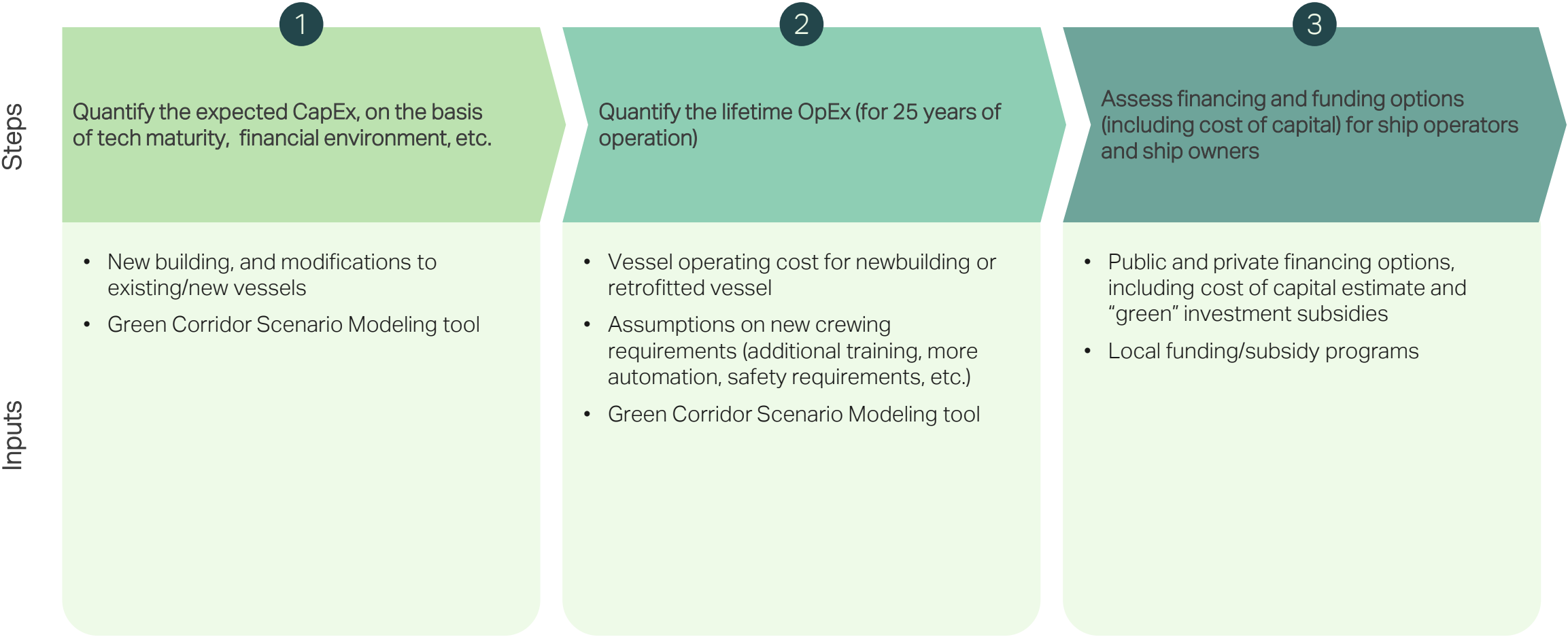
# Create the timeline to decarbonize the selected vessels based on vessel technology and fuel availability, as well as fuel maturity



# Identify regulations that impact the availability of the vessel decarbonization pathway

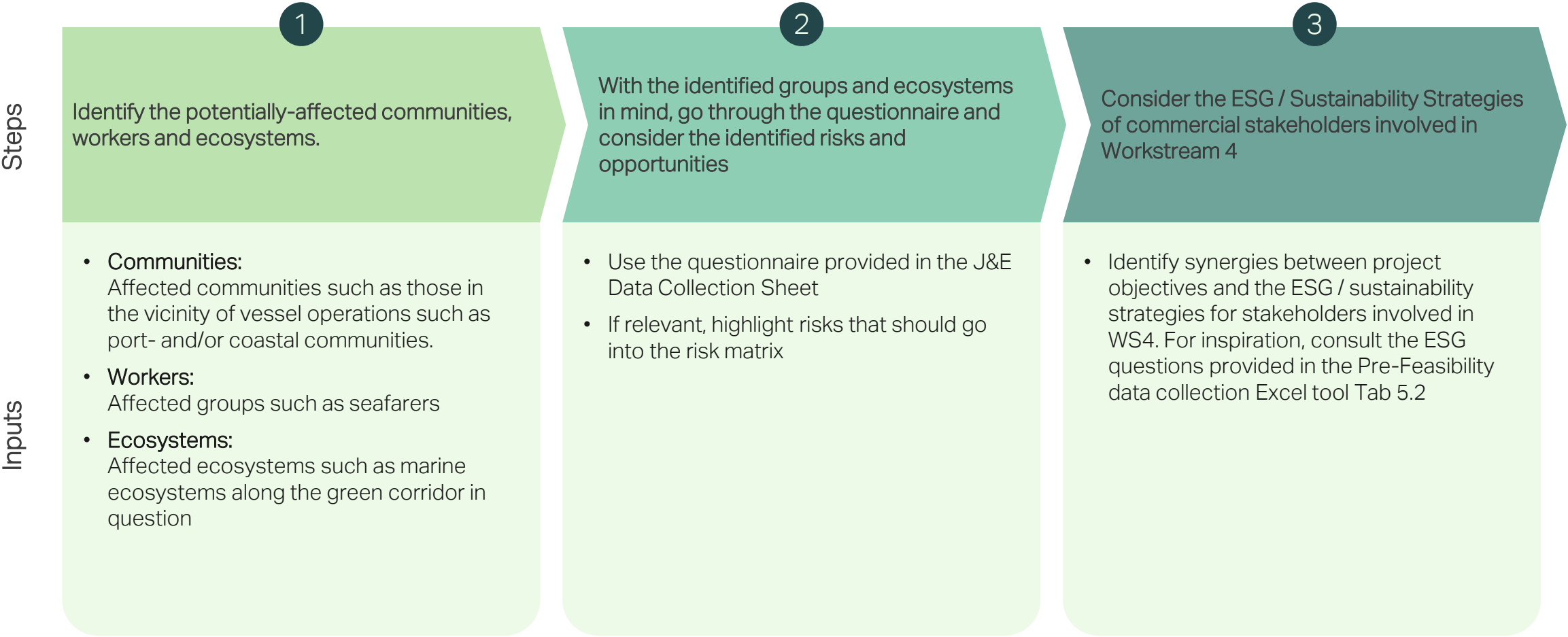


# Quantify the CapEx and lifetime OpEx requirements for newbuilds and retrofitted vessels and review financing potential





# J&E assessment - Vessel decarbonization pathway



# Workstream gap analysis – Vessel decarbonization pathway

Project Vision													Header Definitions										
Workstream Scope / Targets																							
Workstream	Topic	Feasibility Assessment	Elements	Description	Main Gaps	Solution/ Mitigating Actions	Timing	Cost to Close Gap	Investments	Dependencies/ Commitments	Gap Factor	Criticality	Elements	Description	Main Gaps	Solution	Time	Cost to close gap	Investments	Dependencies	Gap factor	Criticality	
		<b>Technical</b> Specify main gaps to target state (scope) and mitigating actions. What are the key technical challenges and mitigating actions? How are they expected to evolve over time? How does this align with the target state time line?											[see workstream-specific spreadsheets for a list of elements]	[describe element]	[describe gap]	[describe solution to close gap, i.e. demonstrators, SOPs, studies, etc.]	[timeframe to close gap]	[demonstrators, pilots, etc.] [\$M]	[Capex/Opex to reach project scope]	[describe pre-requisites and timing/sequence for solution]	[rate the gap based on the means required to close gap] [traffic light]	[to ensure operation] [traffic light]	
		<b>Regulatory</b> Specify main gaps to target state (scope) and mitigating actions. What are the key regulatory challenges and mitigating actions? How are they expected to evolve over time?																					

Traffic Light Table Definition		
Color	Gap Factor/Severity (How large is the gap?)	Criticality/Impact (How high is the impact of this gap?)
Low	Low	Low
Medium	Medium	Medium
High	High	High

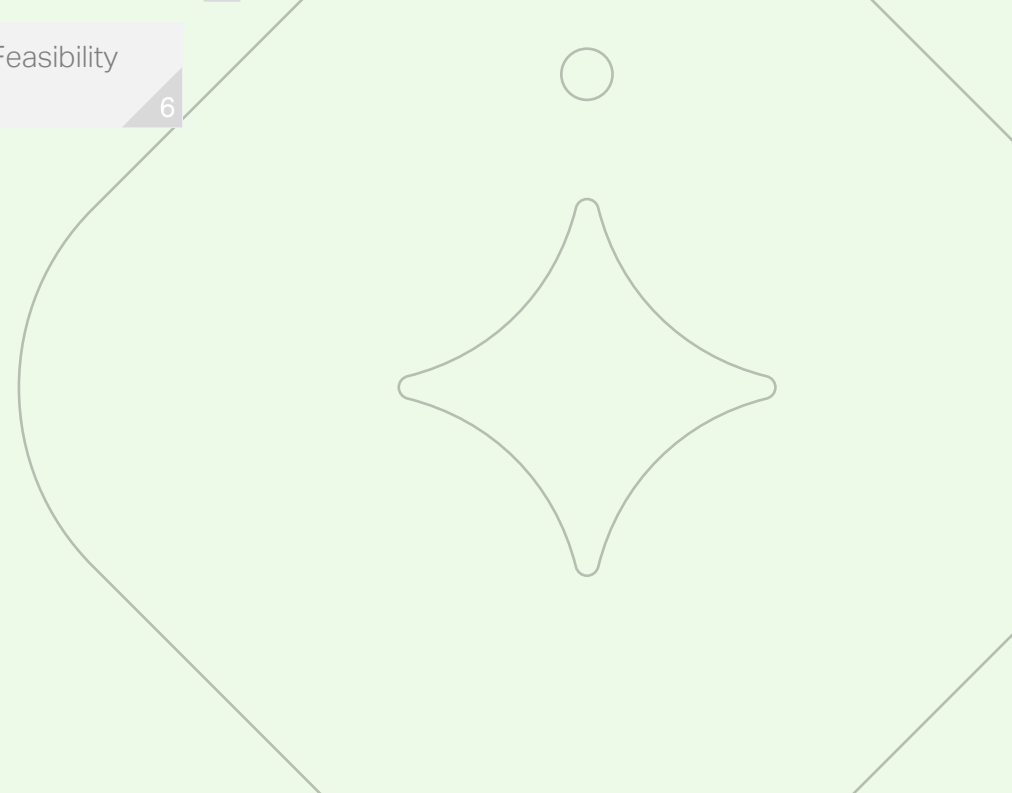
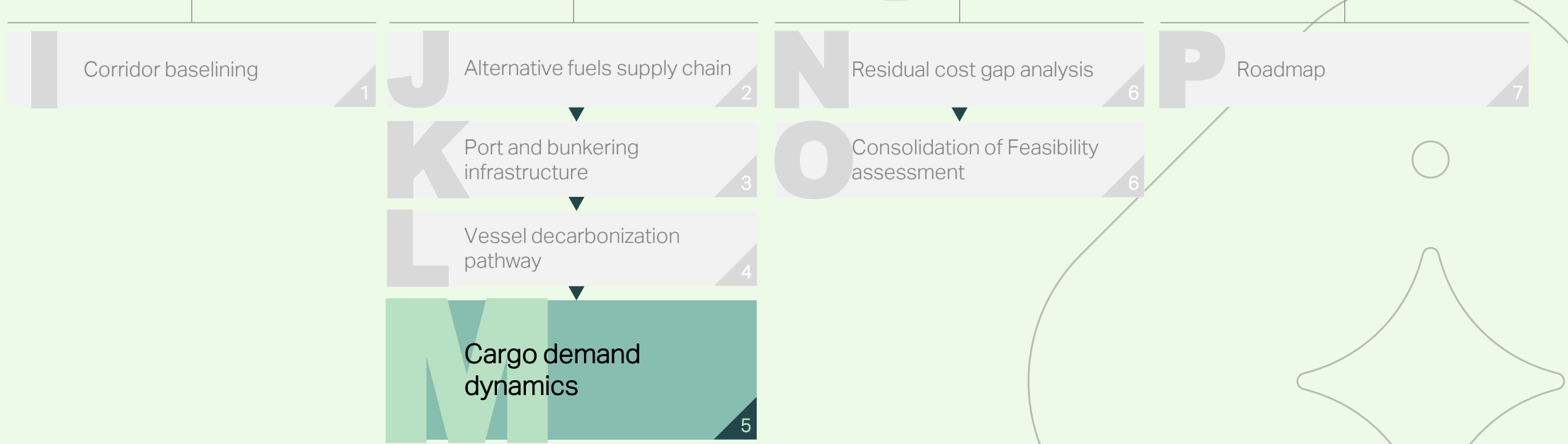
Feasibility Definitions (Gaps related to ...)	
<b>Technical</b>	The technical readiness (development, adaptation, availability) Operational readiness over time
<b>Regulatory</b>	The regulation regarding the use, handling and onboard storage of the alternative i.e., safety and operational risk guidelines, methodologies and procedures for using

Throughout the Feasibility assessment, fill the table with insights on **technical and regulatory feasibility**<sup>5</sup> – specifically, use this table to highlight **gaps** and ways to close them

Legend and definitions



5. Cost assessment is covered under the residual cost gap analysis methodology



# 5M. Cargo demand dynamics

## Purpose



- Examine expected growth and development, trade patterns, and the cargo value chain
- Assess the cargo's **sensitivity to changes in shipping/transportation costs** over time, including share of shipping as part of overall product cost and emissions.
- **List possible alternatives** of transporting the cargo and identify **competing routes and transportation modes**.
- Evaluate the cargo owners' and end-consumers' willingness to pay.
- Identify **mechanisms and regulations** that likely impact the cargo owners' and/or end consumers' **willingness to pay**.
- Perform just and equitable assessment to identify communities, workers and ecosystems potentially affected by the shift in cargo transportation mode and/or demand dynamics.

## Key questions



- What are the **trade patterns** for the cargo types in the specific green corridor? **Who owns the cargo?**
- What is the **value of the cargo** and what is the cost of the green transportation per cargo unit?
- What are the **alternative** routes outside the green corridor or alternative means of transportation?
- How much of the incremental cost can be covered by **cargo owners** and through the **full customer chain?**
- Which **levers** will have an expected positive or negative impact on the cargo owners' and/or end consumers' willingness to pay?
- How might the use of alternative fuels affect the cargo beyond emissions?
- Are there any **socio-economic opportunities and risks**, and how can they be maximized/minimized, respectively?

## Importance



- While work on fuel, ports and vessels aggregates the total cost of the green corridor, the cargo assessment addresses the **options of closing the cost gap with the price on cargo**.
- Within the supply chain, one central dimension is the **willingness of cargo owners and end-customers** to pay for green transportation.



## 5M. Cargo demand dynamics

### Summary of chapter findings and outcomes

---

- 01 Description of the **nature of the cargo** in its current configuration and **future developments** (e.g., growth, trade patterns)

---

- 02 Description of the **cargo value relative to the incremental cost of green transportation** under current and expected developments

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- 03 Identification and description of the **alternatives and competing options** for green transportation of the cargo

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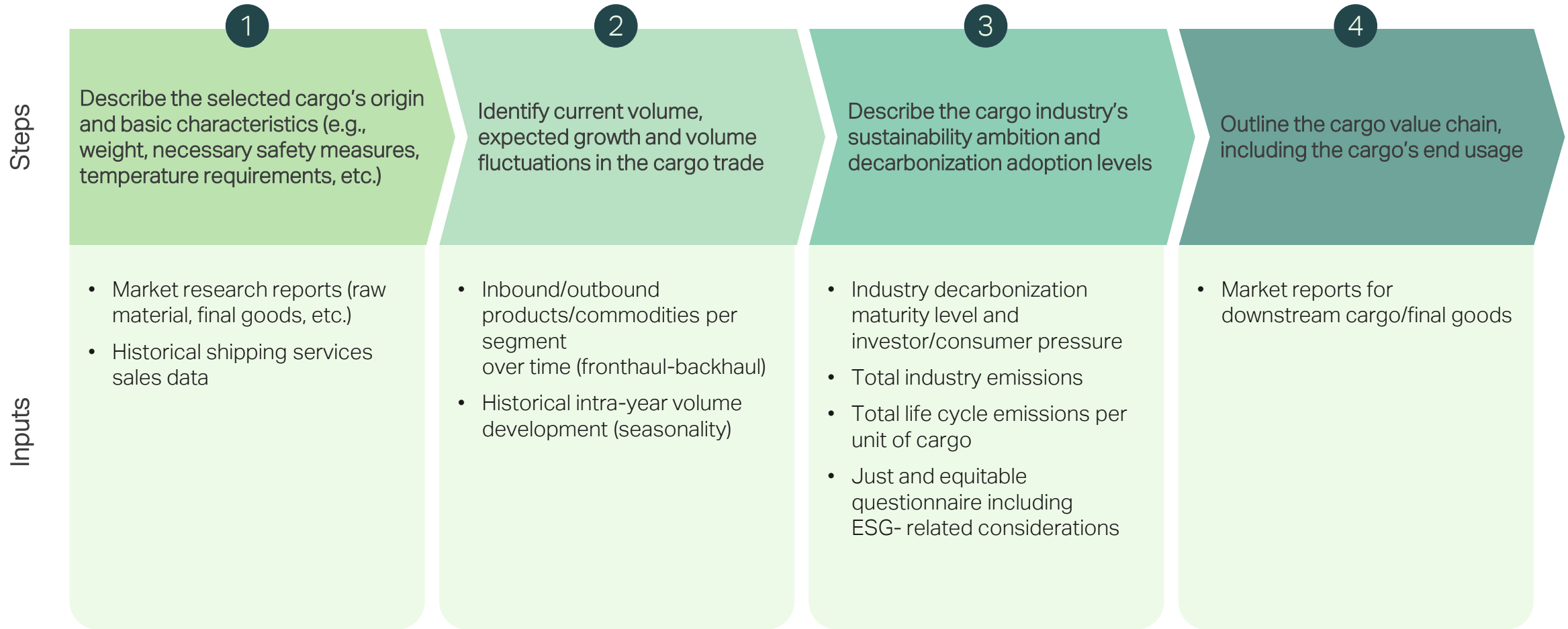
- 04 **Quantitative and qualitative assessment** of the cargo owners' and end consumers' **willingness to pay** for decarbonized shipping, mapped vs volume of cargo transported in the corridor per stakeholder

---

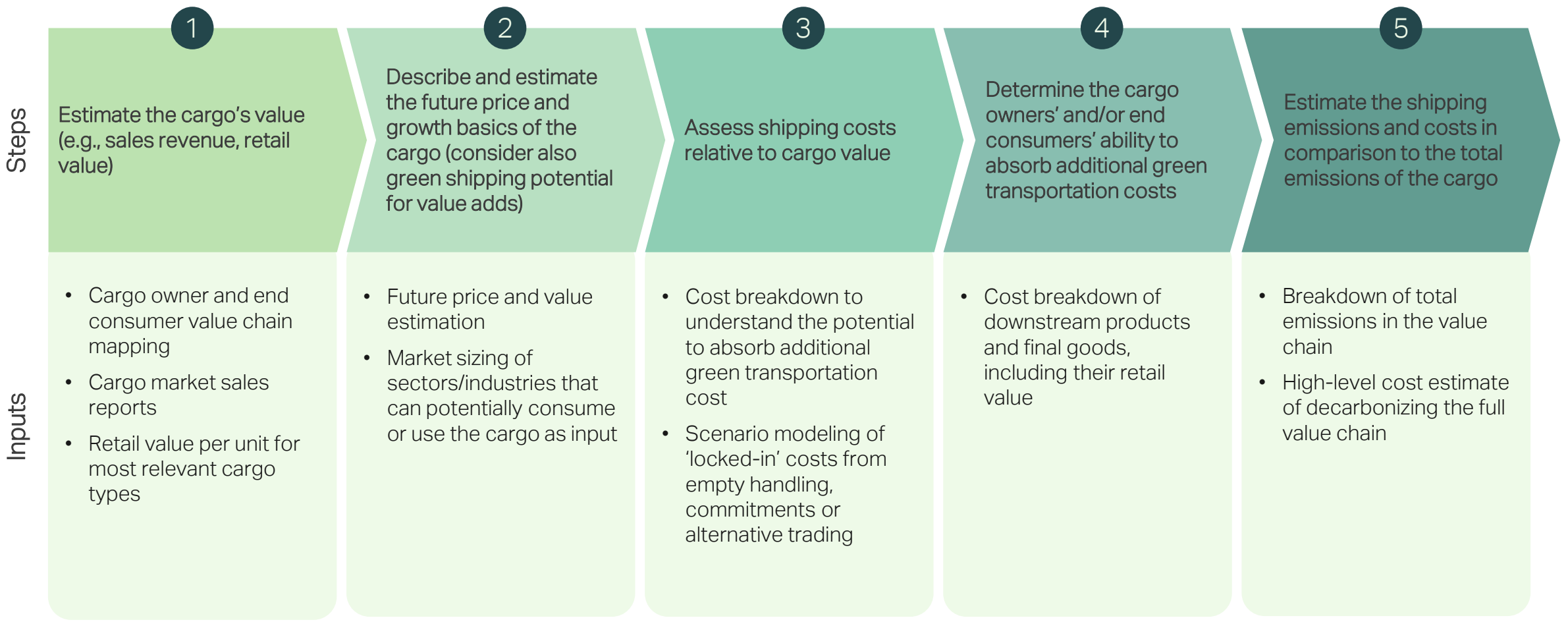
- 05 Overall **drivers**, such as ESG focus areas, which **impact the cargo owners' and end consumers' willingness to pay** (e.g., regulatory mechanisms, industry drivers and constraints) and workstream-related measures to ensure a **just and equitable implementation** of the project



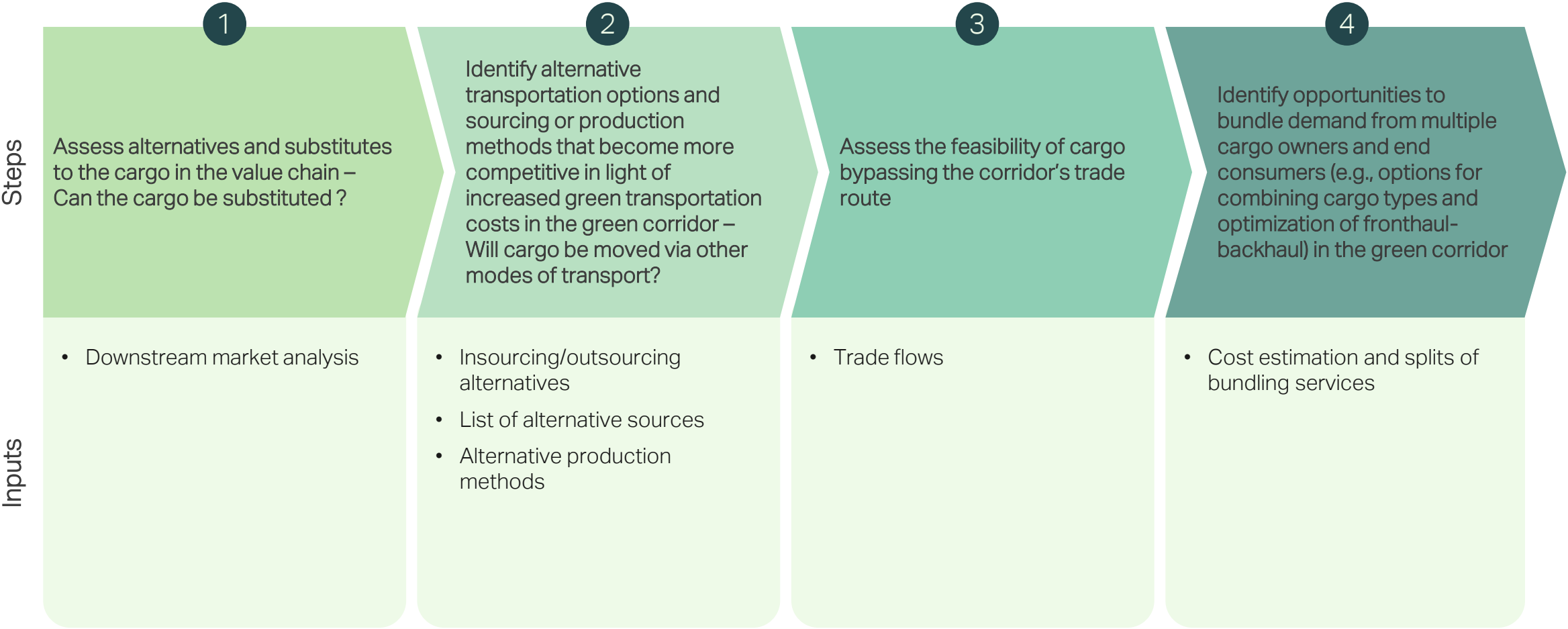
# Examine expected growth and development, trade patterns, and cargo value chain



# Assess the cargo's value

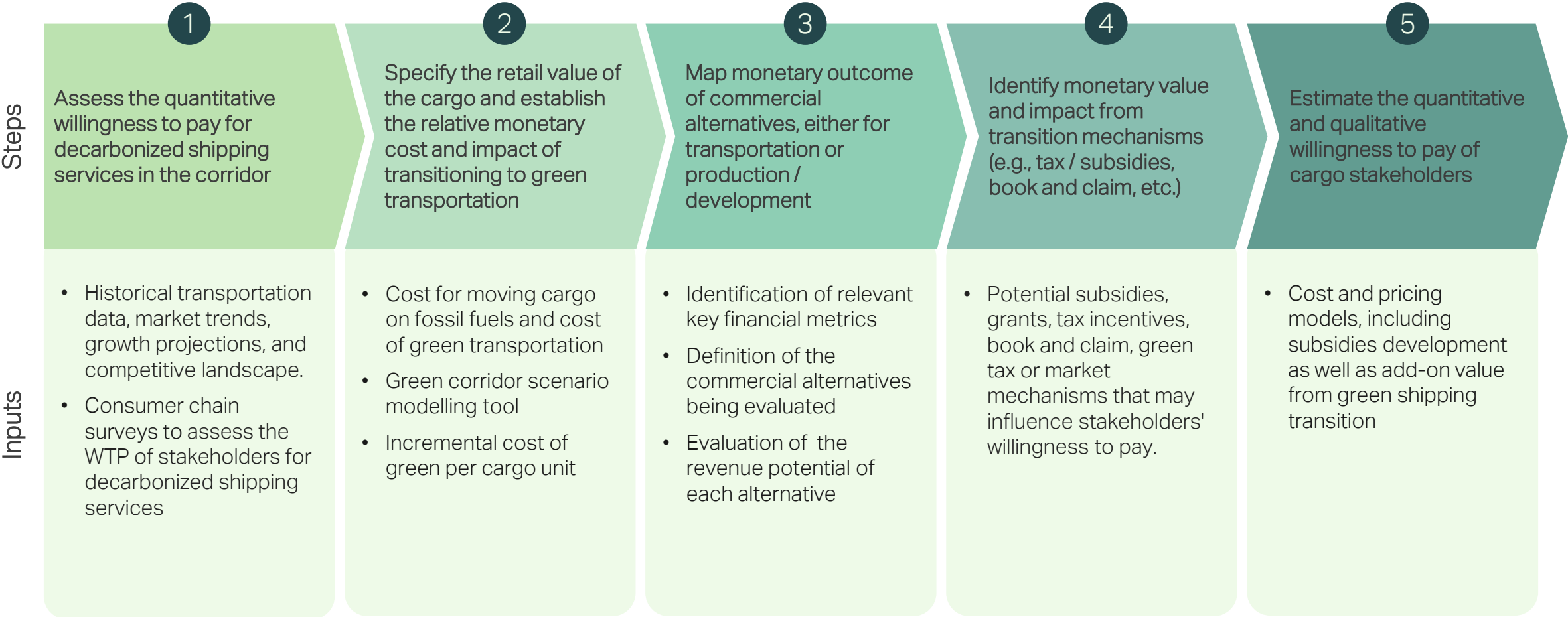


# List potential alternatives for transporting the cargo and identify competing routes and transportation modes

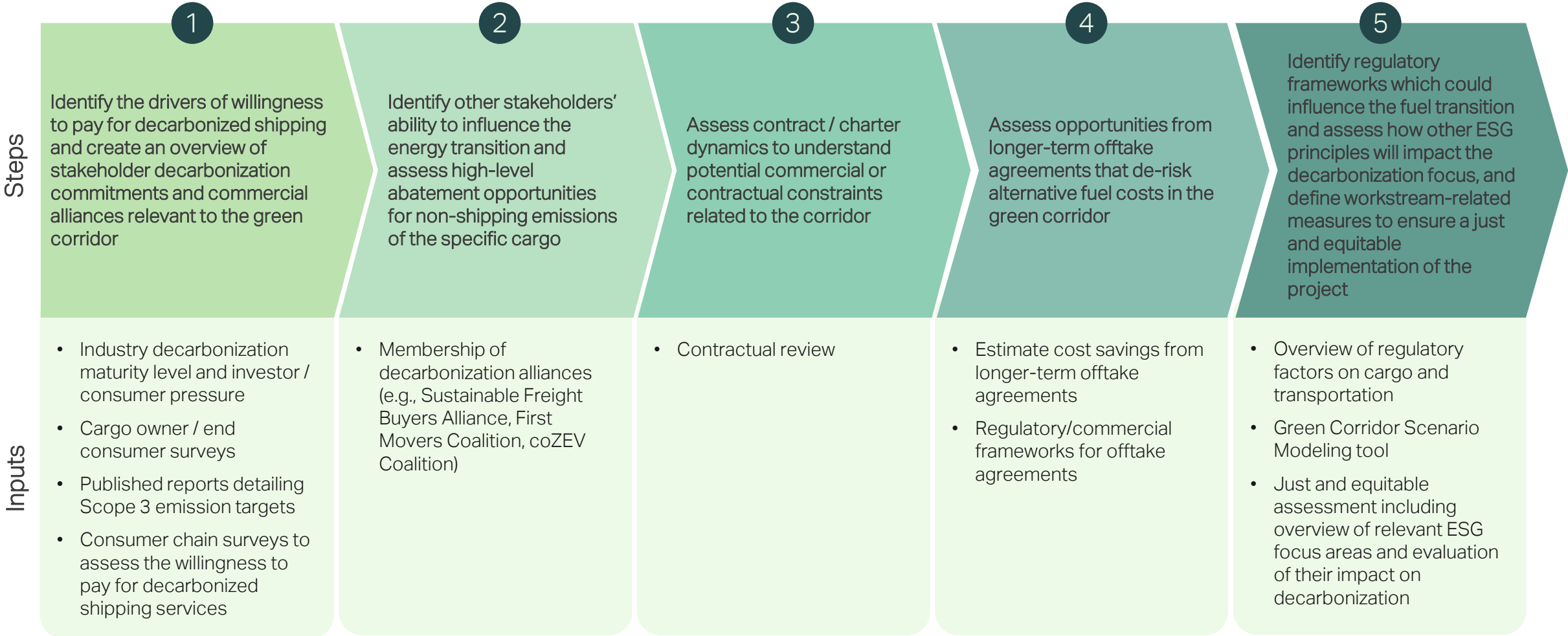




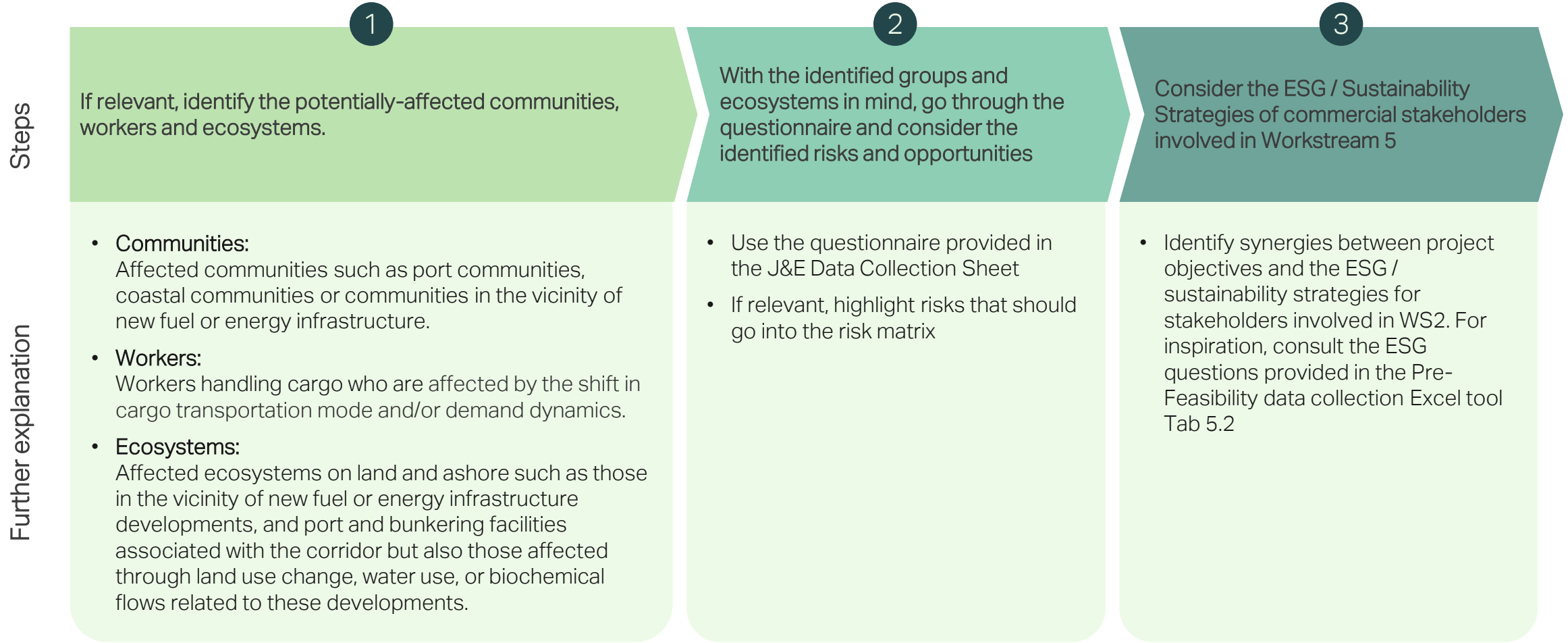
# Make a quantitative and qualitative estimation of the willingness to pay (WTP) for sustainable shipping



# Identify mechanisms and regulations that likely impact the cargo owners' and/or end consumers' willingness to pay



# J&E assessment - Cargo demand dynamics



# Workstream gap analysis – Cargo demand dynamics

Project Vision													Header Definitions										
Workstream Scope / Targets																							
Workstream	Topic	Feasibility Assessment	Elements	Description	Main Gaps	Solution/ Mitigating Actions	Timing	Cost to Close Gap	Investments	Dependencies/ Commitments	Gap Factor	Criticality	Elements	Description	Main Gaps	Solution	Time	Cost to close gap	Investments	Dependencies	Gap factor	Criticality	
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		<b>Regulatory</b> Specify main gaps to target state (scope) and mitigating actions. What are the key regulatory challenges and mitigating actions? How are they expected to evolve over time?																					

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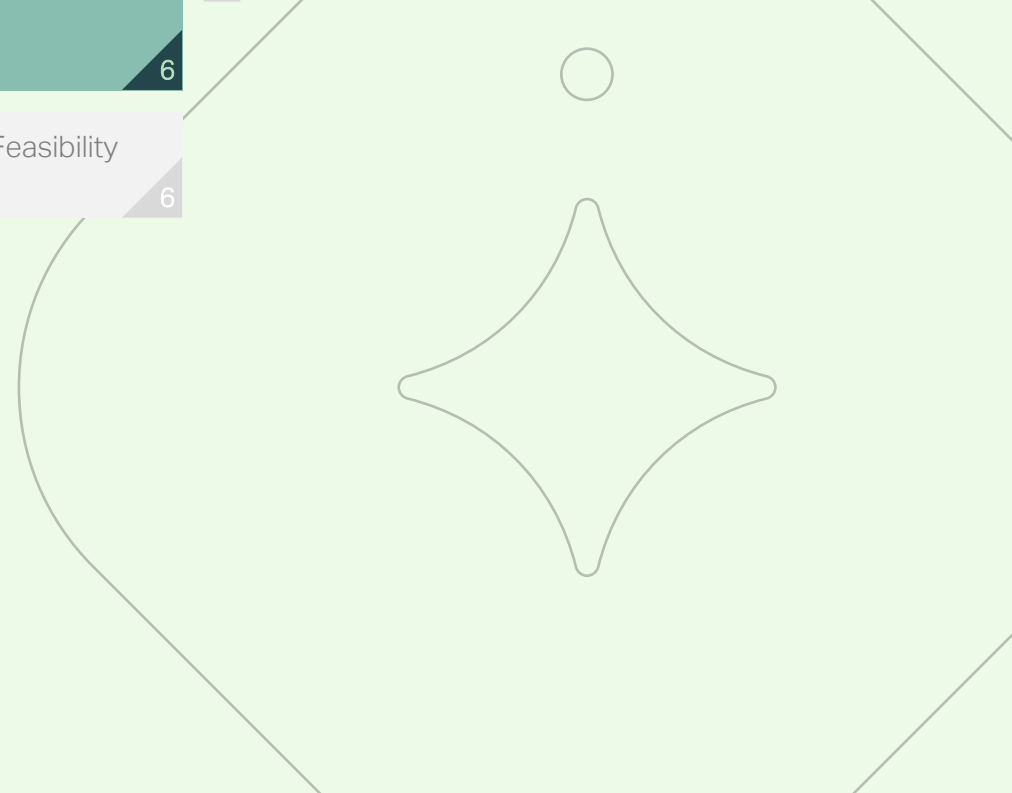
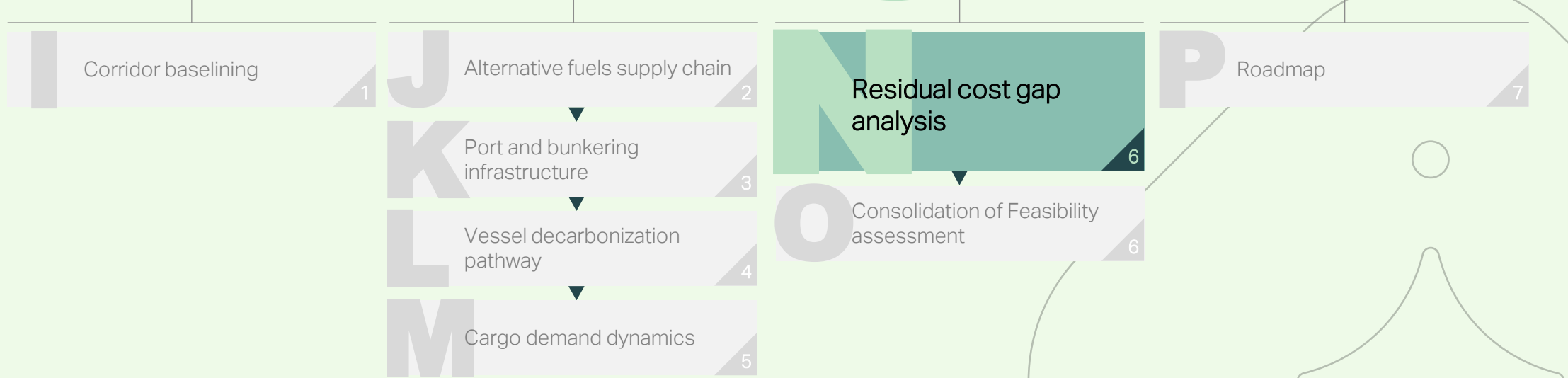
Feasibility Definitions (Gaps related to ...)	
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Throughout the Feasibility assessment, fill the table with insights on **technical and regulatory feasibility**<sup>6</sup> – specifically, use this table to highlight **gaps and ways to close them**

**Legend and definitions**



6. Cost assessment is covered under the residual cost gap analysis methodology



## 6N. Residual cost gap analysis

### Purpose



- **Cost assessment :**  
Estimate the total corridor cost as well as the residual cost gap throughout the value chain of green shipping and outline potential actions/measures to close the cost gap.

### Key questions



- What is the **incremental cost of green**?
- How can the cost gap be closed?
- What are the **financing requirements** and the funding sources to enable the green corridor?
- What are the **potential risks** for the implementation of the green corridor and how can they be **mitigated**?

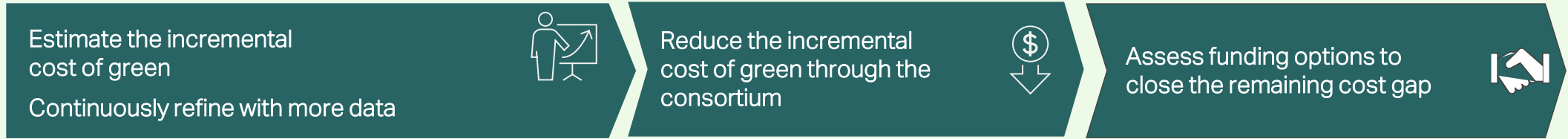
### Importance



- This is a crucial step in **evaluating the trajectory of a green corridor**. It helps determine if the project is receiving **sufficient funding** to move towards execution.
- Based on the **results of the cost gap analysis**, the project team will take the next steps.
- The project team will **engage stakeholders outside the consortium**. The goal is to identify options to **close** the residual cost gap. These options could include subsidies or loans.
- The accuracy of the cost assessment and its relevance depends on the quality of the technical and regulatory assessment. This implies that a **thorough and accurate technical and regulatory assessment is essential** for a valid cost assessment.



# 6N. Residual cost gap analysis



- A. **Estimate costs** of fuel, port and bunkering infrastructure, vessel for **fossil fuel-based** corridor
- B. **Estimate costs** of fuel, port and bunkering infrastructure, vessel for **alternative fuel-based** corridor
- C. **Incremental cost of green.**
  - I. Calculate the **incremental cost** based on (A) and (B). Estimate the high-level cost pass through on cargo and the CO<sub>2</sub> price, to cover the incremental cost of green
  - II. Assess any **pre-investments done** amongst consortium members to update **incremental cost of green**
  - III. Update the **incremental cost of green** based on technical insight during Feasibility Study

- D. **Reduce costs among consortium members** through business development opportunities and synergies
- E. **Assess the willingness to pay** of cargo owners (E1) & customers (E2)

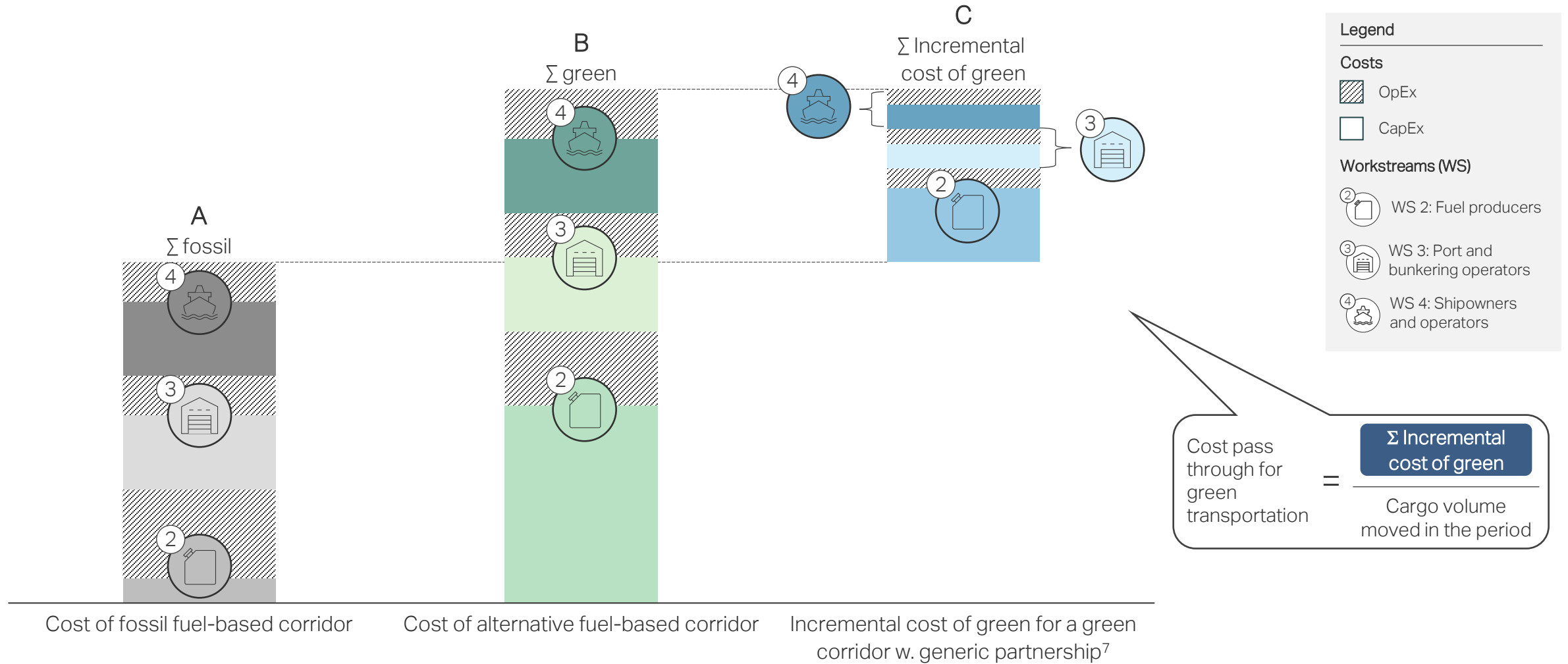
- F. **Identify the remaining cost gap = residual cost gap** to be covered by other stakeholders
  - **Identify sources of funding** to close the remaining cost gap
    - Subsidies
    - Attractive loans
    - Repayment of ETS
    - Philanthropic organizations
    - Guaranteed minimum auctions
    - Other financial instruments



Project Commitment Letter

Feasibility Documented

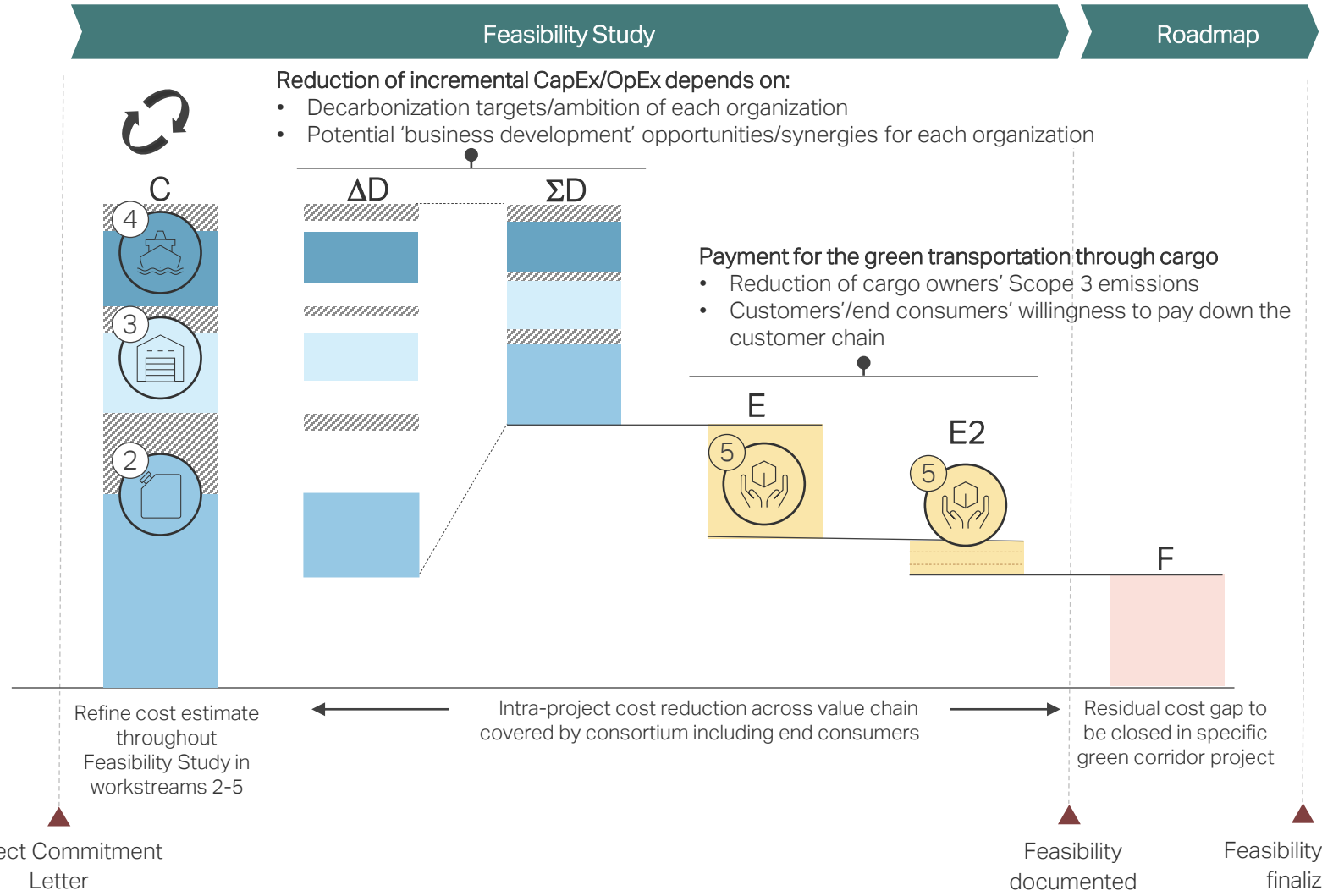
# Initial estimates on the incremental cost of green for a green corridor



7. Estimate to be further refined with cost inputs received from consortium members after the Project Commitment Letter has been signed



# Estimating and addressing the incremental cost of green in Feasibility



**Legend**

**Costs**

- OpEx
- CapEx

**Workstreams (WS)**







- WS 2: Energy & Fuel producers
- WS 3: Port and bunkering operators
- WS 4: Shipowners and operators
- WS 5: Cargo and customers

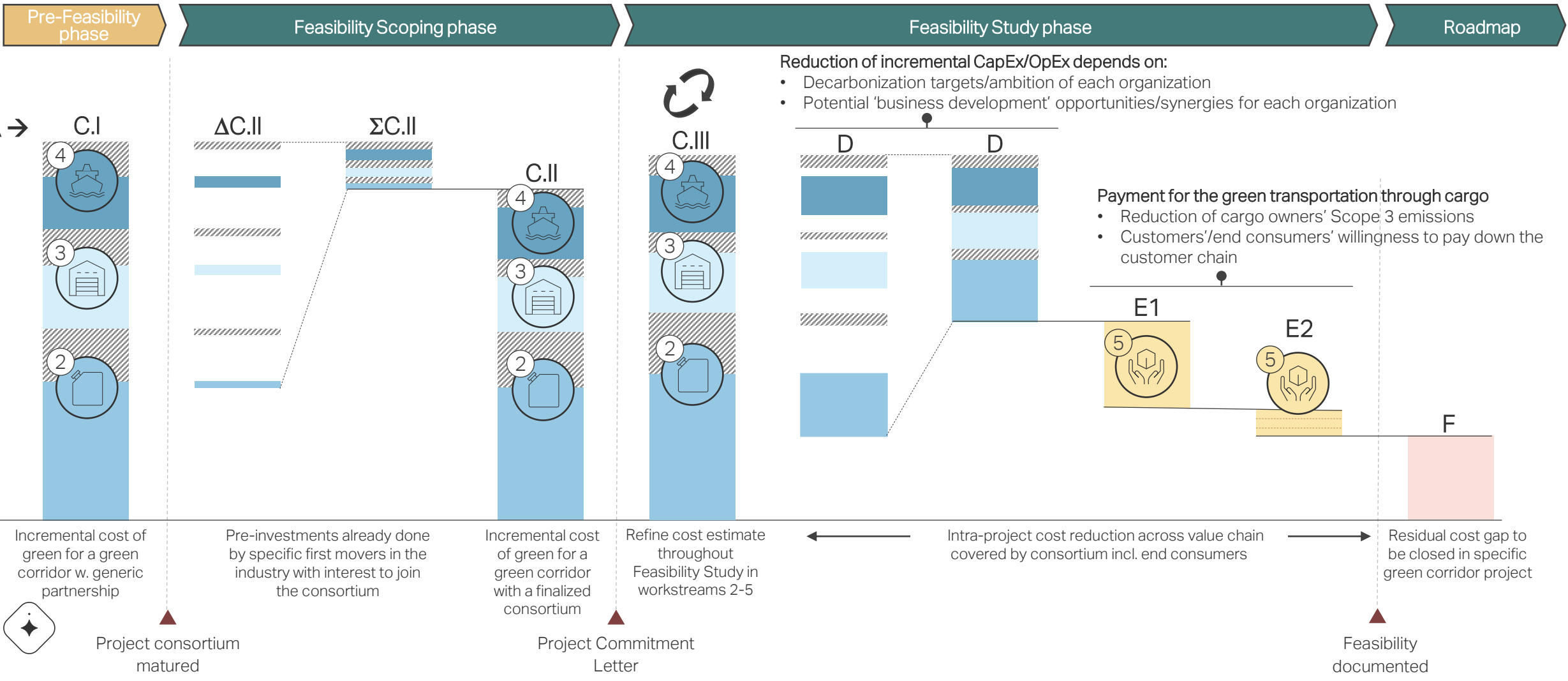
Refinement during Feasibility Study



# The incremental cost of green – full overview

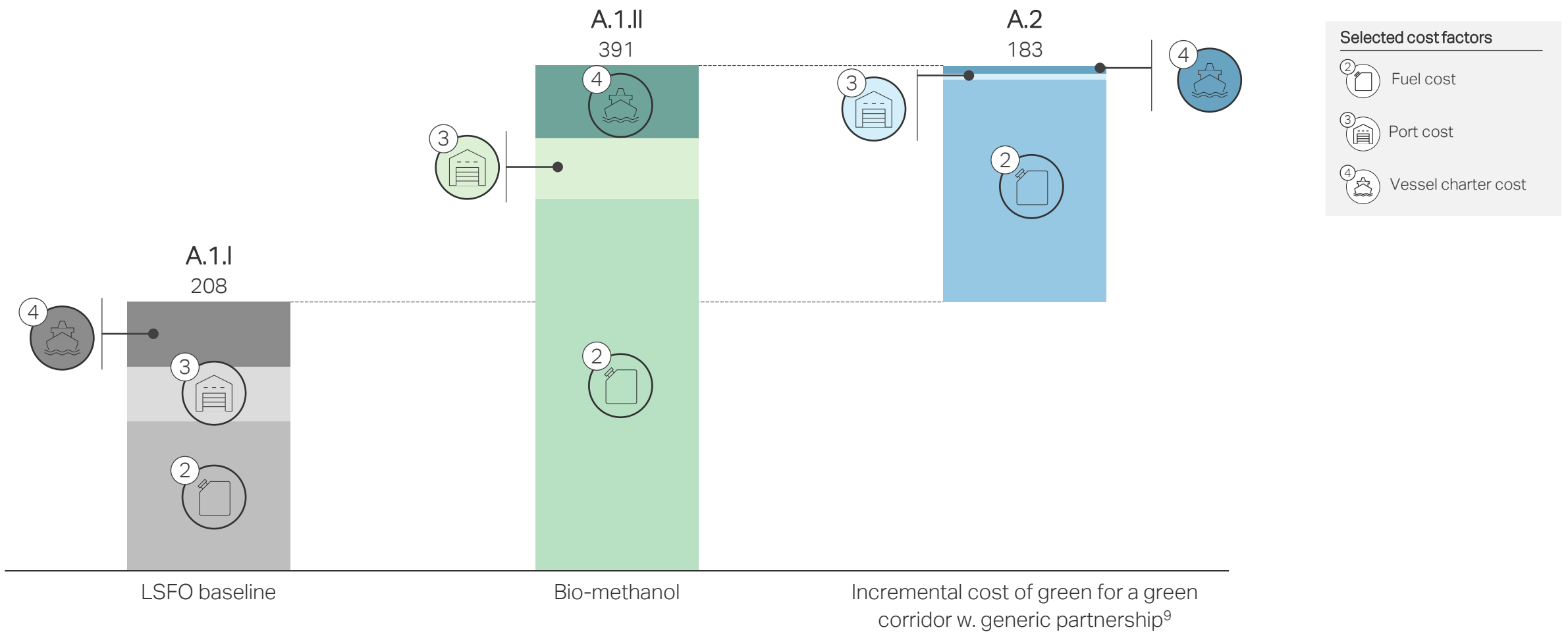
**Legend**

Costs		Workstreams (WS)							
	OpEx		WS 2: Fuel producers		WS 3: Port and bunkering operators		WS 4: Shipowners and operators		WS 5: Cargo and customers
	CapEx								



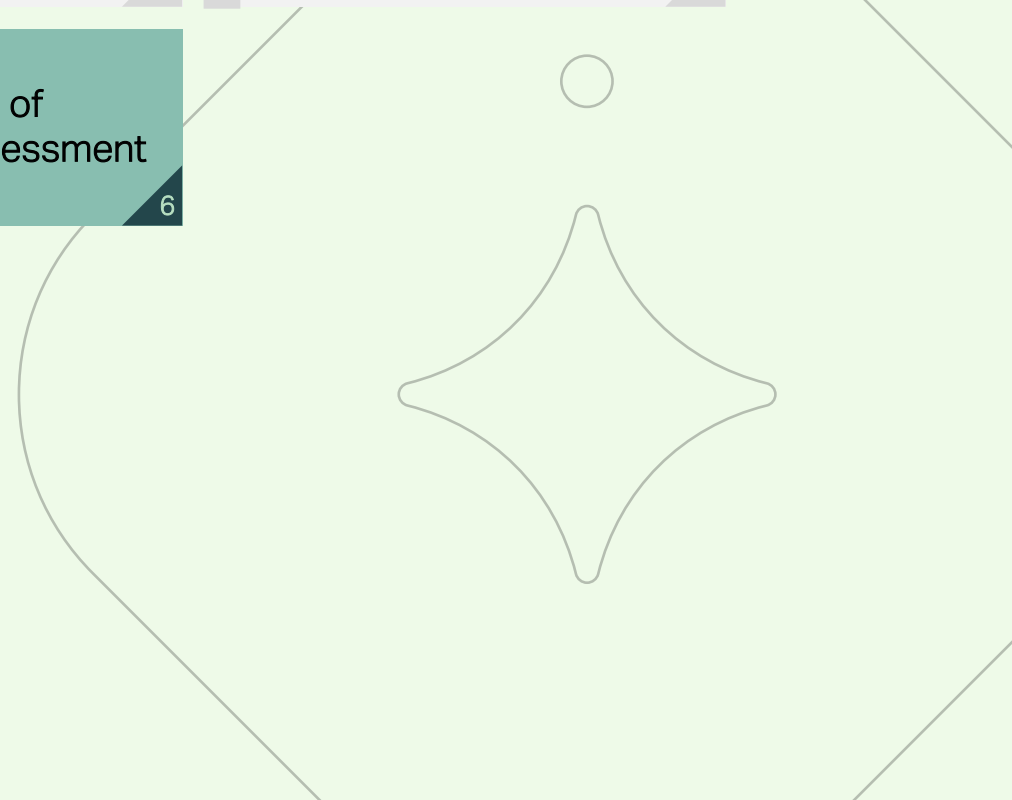
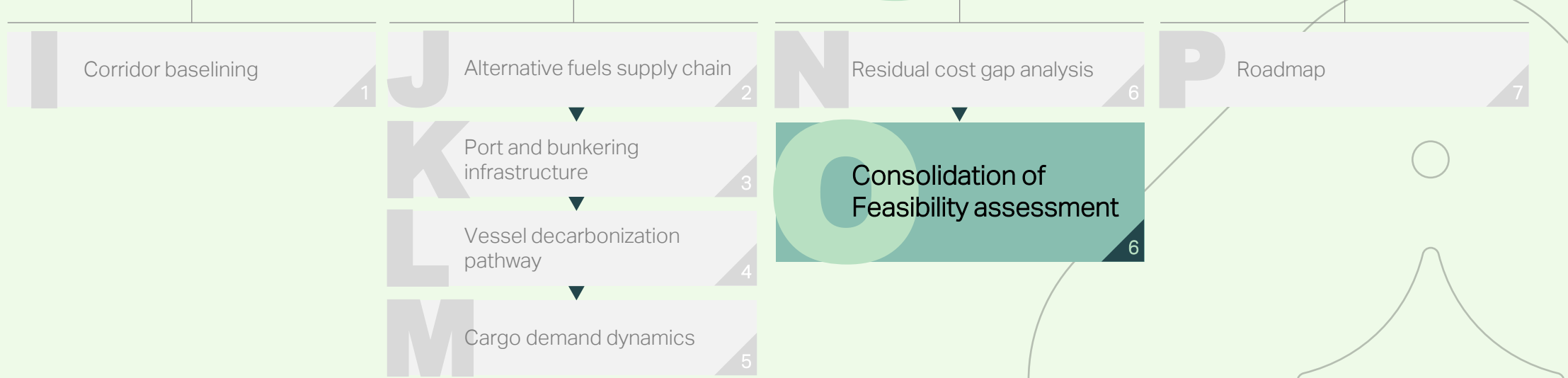
# A. Calculating the incremental cost of green – Example

Incremental decarbonization cost along the value chain compared to LSFO (selected cost factors), USD/TEU<sup>8</sup>



<sup>8</sup> Cost per TEU for a 1,500 TEU ship sailing on different fuel types from Hamburg, Germany to Kotka, Finland. Source: [Maritime Decarbonization Strategy 2022](#)

<sup>9</sup> Estimate to be further refined with cost inputs received from consortium members after the Project Commitment Letter has been signed



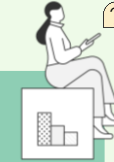
# 60. Consolidation of Feasibility assessment

## Purpose



- Consolidate findings from the Feasibility assessment along the green corridor.
- **Technical feasibility assessment:** Identify technical challenges and define actions to accelerate the implementation of the corridor.
- **Regulatory feasibility assessment:** Regulatory and policy changes for the green corridor to go ahead.
- Estimate the total corridor **incremental cost of green** as well as the **residual cost gap**.
- **Just and equitable assessment:** Consolidate J&E assessments across workstreams 2 to 5 with the general J&E assessment (performed by Project Lead in scoping phase).
- Develop a **risk register** and identify potential **mitigation actions**.
- Summarize insights on **technical, regulatory and J&E feasibility** as well as **costs**.

## Key questions



- What are the **technical challenges** (if any) for the implementation of the green corridor? What **actions are required to reach technical feasibility**?
- What are the **regulatory and policy constraints**? What **actions are required to reach regulatory feasibility**?
- What are the **costs** (CapEx and OpEx) **through the value chain** to deliver the development, construction and operation of the green corridor?
- What are the **options for cost reduction** in the value chain elements?
- Are there **synergies** that can be realized across these steps?
- What needs to be addressed to create a **just and equitable** corridor?

## Importance



- **Quantifying** the residual cost gap is essential to **evaluate the trajectory** of a green corridor in terms of receiving sufficient funding to move towards execution. Based on the outcome of the analysis, the project team will engage stakeholders outside the consortium to identify options to close the residual cost gap (e.g., subsidies or loans).
- The validity of the cost assessment as well as the relevance relies on the **quality of the technical and regulatory feasibility assessments**.
- About **Just and Equitable**, this step enables stakeholders to **make informed decisions and facilitates necessary policy changes** for the green corridor.
- The just and equitable assessment ensures that the **benefits** of the green corridor are **distributed fairly among all stakeholders**, including affected communities and worker groups.



# 60. Consolidation of Feasibility assessment

## Summary of chapter findings and outcomes

---

- 01 **Technical feasibility:**
- Identify the main gaps between baseline status and aligned project scope per chapter (see Feasibility matrix), evaluate and rank them
- 

- 02 **Regulatory feasibility:**
- Identify the main gaps and hurdles to achieve the aligned project scope per chapter (see Feasibility matrix in Appendix 6.5), evaluate and rank them
- 

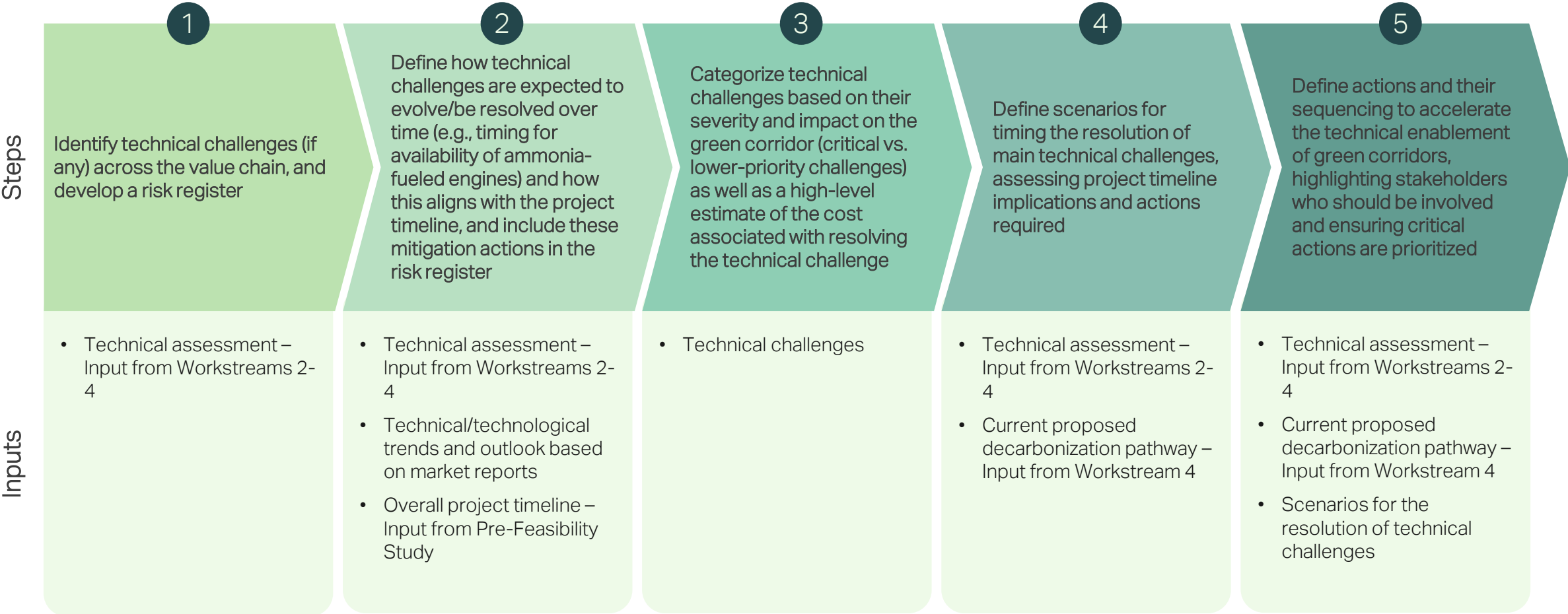
- 03 **Cost assessment:**
- Calculate residual cost gap of green shipping using CapEx and OpEx (for 25 years of operation) results of Workstreams 2-5 (list pre-project investments also)
  - Identify possibilities to eliminate residual cost gap and sequence them (starting with cost reduction measures within the project consortium)
- 

- 04 **Risk register and a list of potential mitigation actions:**
- Develop respective mitigation actions and sequence them
- 

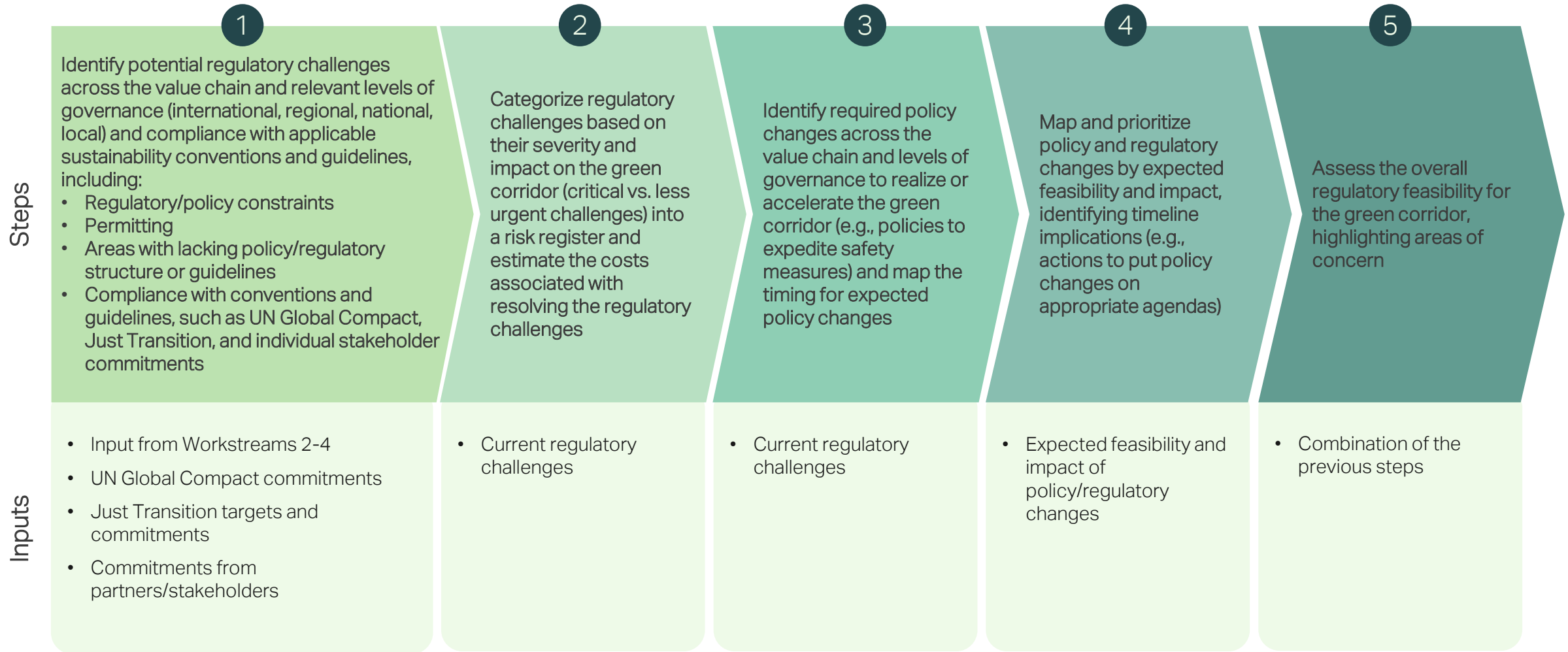
- 05 **Just and equitable assessment:**
- Summarize which communities, workers and ecosystems are most likely to be affected by the green corridor. Consider how to ensure their representation in the project going forward. In addition, ensure transparent project governance systems
  - Develop an overview of the socio-economic risks and opportunities throughout the corridor. Develop mitigation actions for risks that are not included in the risk register and consider how the opportunities can be maximized



# Consolidate technical feasibility results, specifying main gaps between assessments and target state throughout value chain

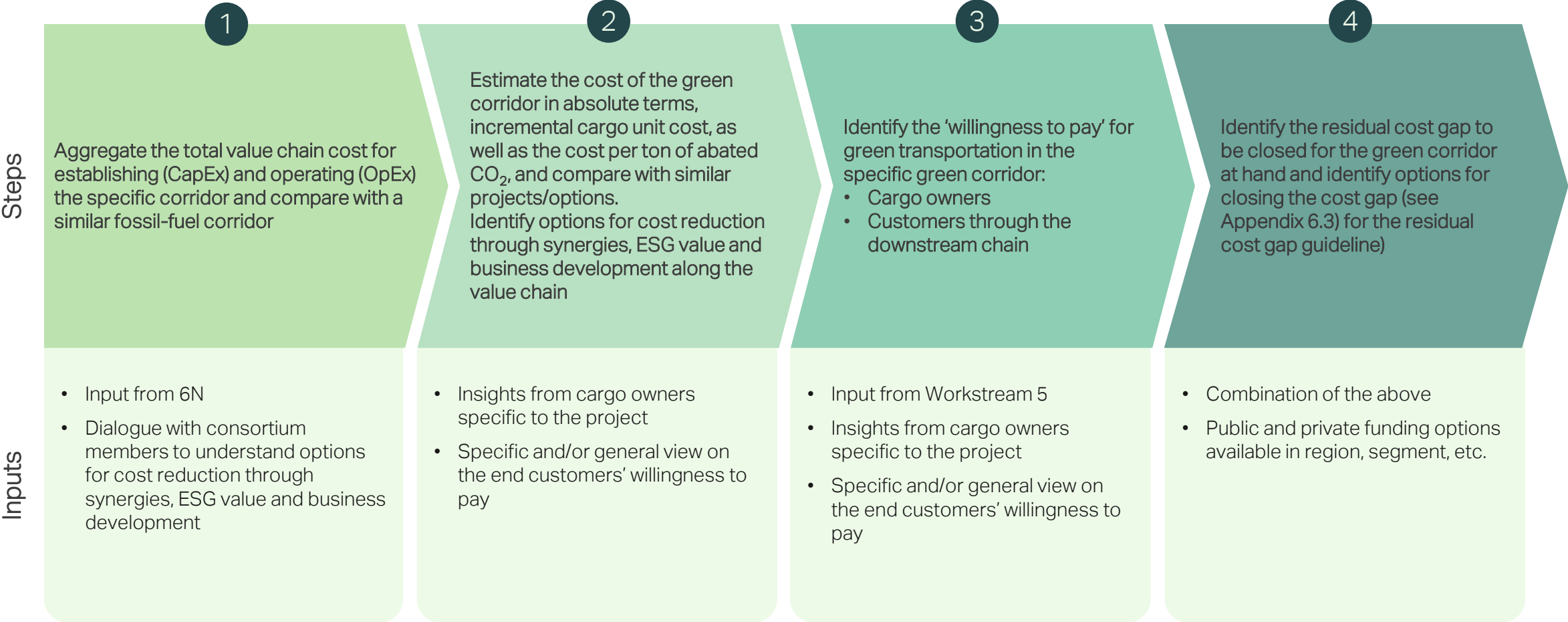


# Consolidate regulatory feasibility of the green corridor

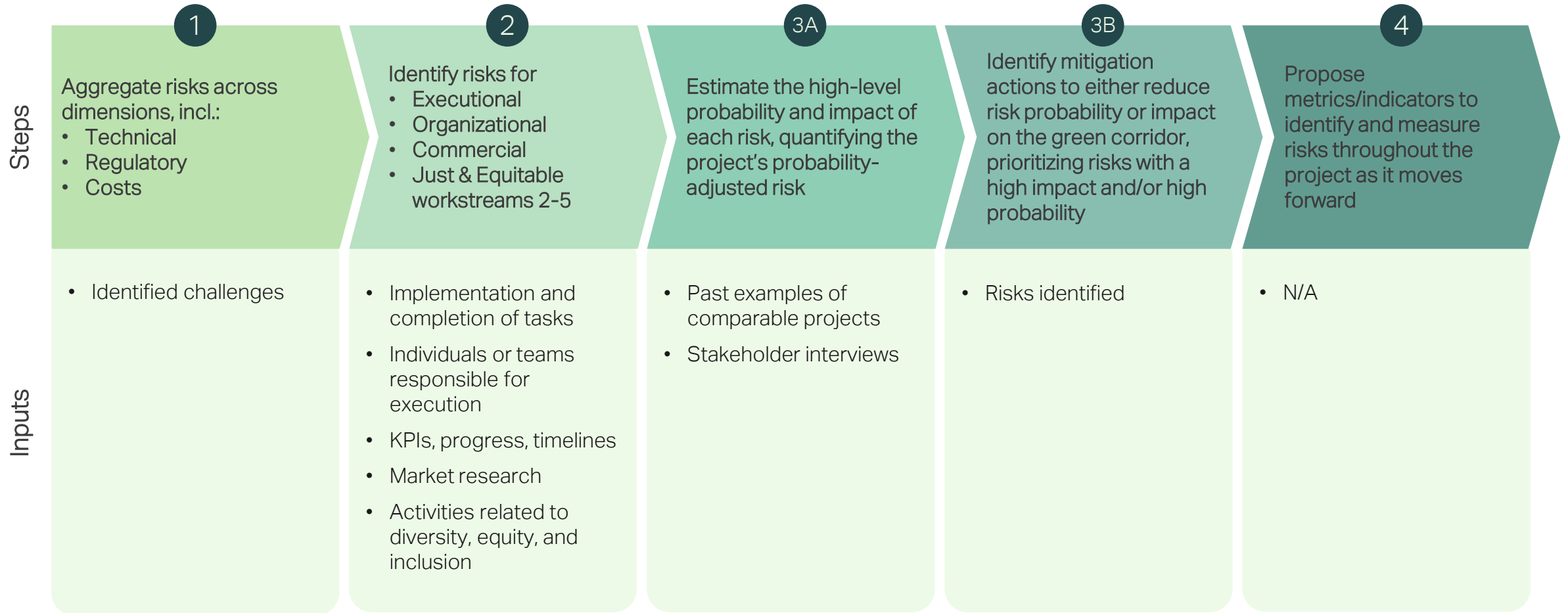




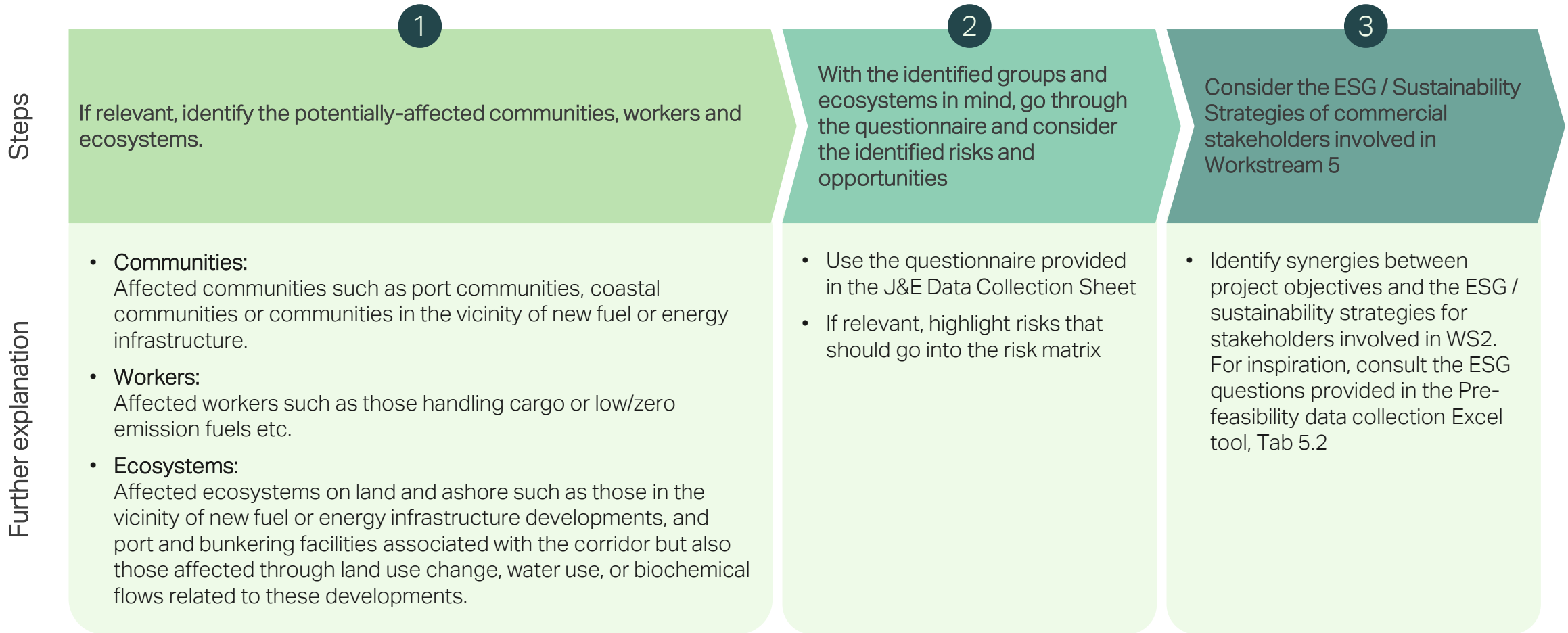
# Consolidate cost assessments throughout value chain, estimate the total corridor incremental cost of green as well as the residual cost gap

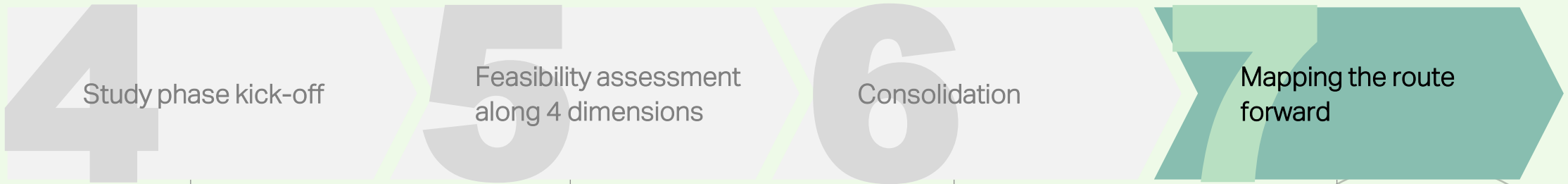


# Develop a risk register and identify potential mitigation actions



# J&E assessment - Consolidation





# 7P. Roadmap

## Purpose



1. Build an **integrated roadmap for each value chain participant**, considering the sequencing and lead time of projects and risk scenarios, and map relevant **milestones**:
  - Select and Define phases:
    - Detailed roadmap
    - **Project governance and resources**
    - **Communications and engagement plan** for internal and external stakeholders
  - Execute and Operate phases:
    - High-level timeline including lead times
2. **Create a comprehensive roadmap** with required investment decisions and outline funding options to close the incremental cost of green.
3. **Outline initial thoughts** regarding commercial arrangements, offtake agreements, etc.
4. **Sign off** on the integrated roadmap

## Key questions



- What are the **short and long-term steps** to **operationalize** the green corridor?
- What are the **steps needed for a final investment decision (FID)** of the project?
- What are the **commitments and investments/projects required** from each stakeholder to close part of the incremental cost of green and enable the integrated business case?
- What is the **overall roadmap toward operationalizing the green corridor** and what **actions does each stakeholder** need to take?
- What is the required **project governance** to deliver the roadmap for the next phases (Select and Define)?
- What are the **resources and capabilities required to complete the next phases** (Select and Define) of the project?
- What is the **internal and external stakeholder communications plan**?

## Importance



- The roadmap is a **key decision tool** for these project participants both for planning to move the project forward, and for discussing public **funding options**.
- **Public funding (along with private funding)** will be **required** to ensure that the first green corridor will move forward.
- For **public funding** to be unlocked, thorough documentation validating the green corridor's decarbonization potential is needed.



# 7P. Roadmap

Summary of chapter findings and outcomes

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01 Summary of feasibility study

---

02 **Statement of feasibility**, a summary of the Feasibility Study output considering technical and regulatory aspects - CO<sub>2</sub> abatement

---

03

- Summary of incremental and residual cost gaps
- Funding options
- \$/t CO<sub>2</sub>

---

04 Proposed **integrated roadmap** and milestones for each stakeholder for each upcoming phase including **investment decisions/CapEx** requirements

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05

- **Immediate next steps and investment** requirements for next phases (Select and Define)
- **Potential commercial arrangements and commitments**

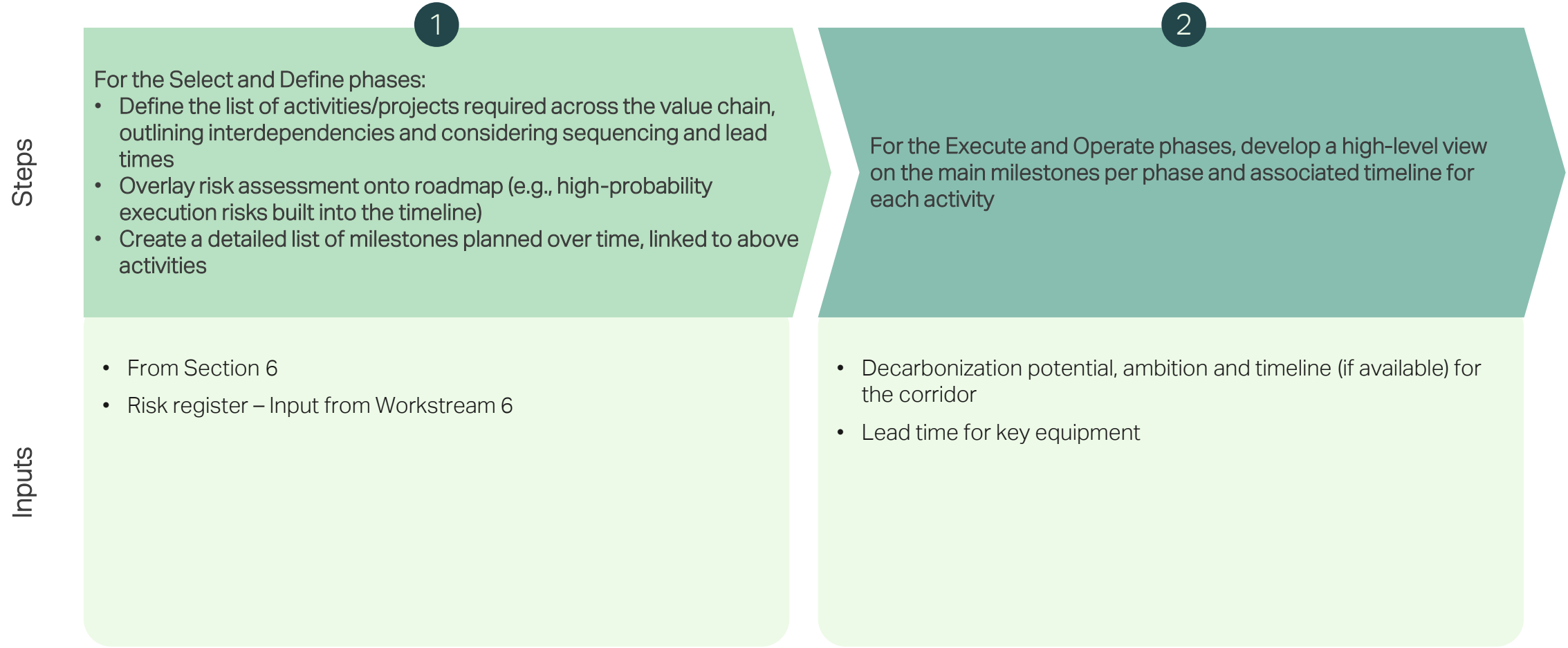
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06 Communication plan

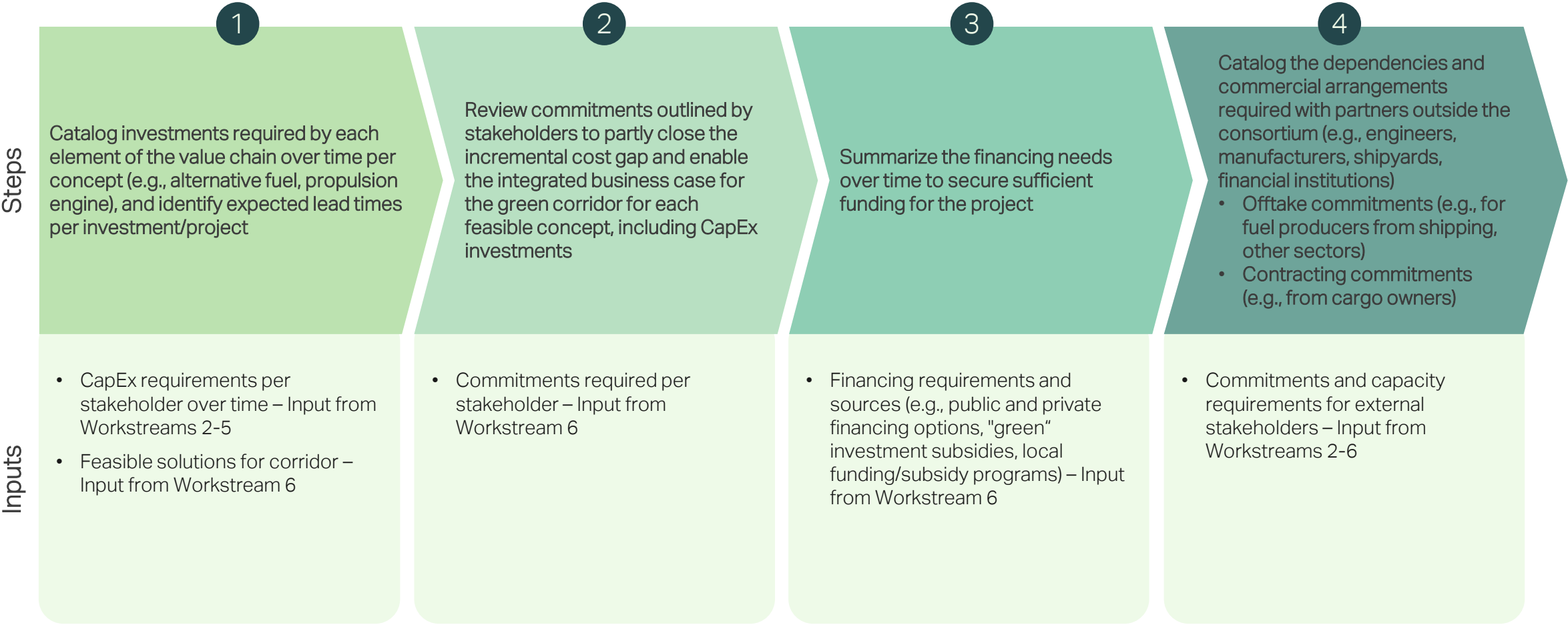
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# Build an integrated roadmap for each value chain participant and map relevant milestones

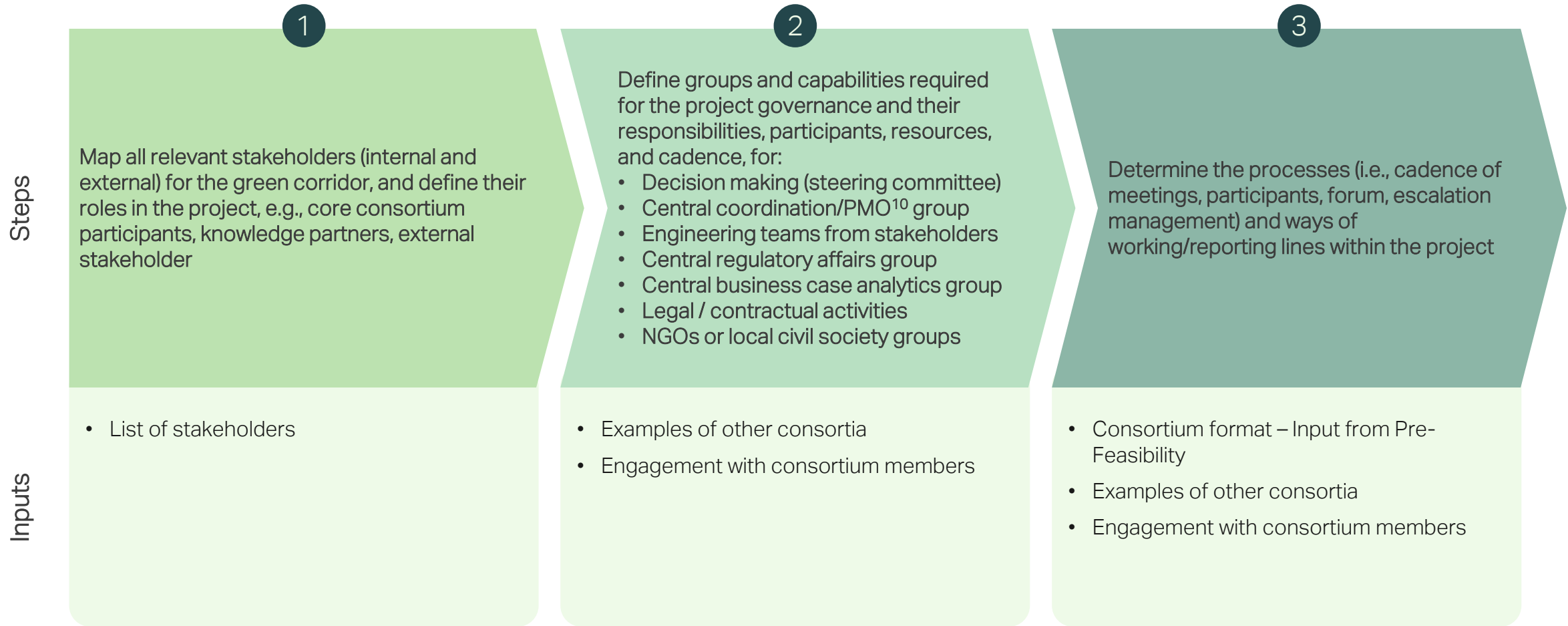


# Catalog investment decisions, expected lead times, and required commercial arrangements planned over time by value chain participant

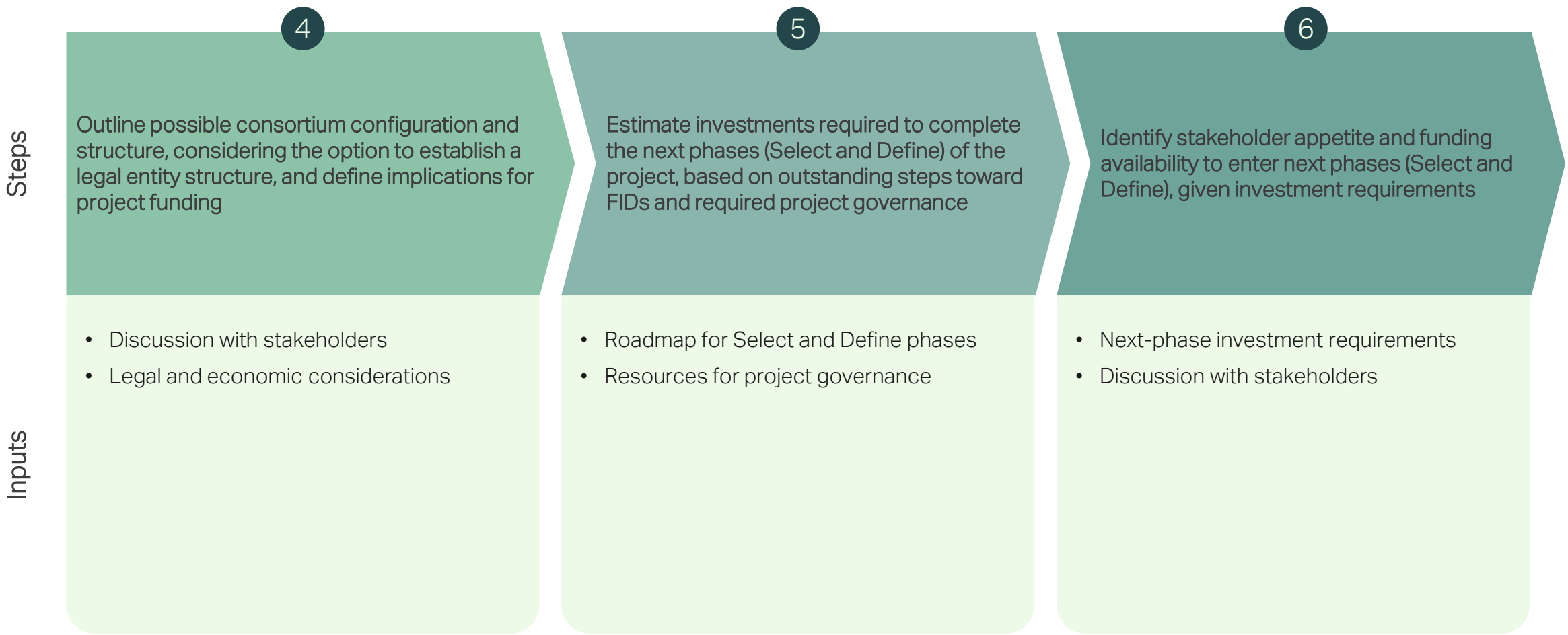




# Define the project governance and resourcing requirements to complete the Select & Define phases (1/2)



# Define the project governance and resourcing requirements to complete the Select & Define phases (2/2)



# Develop a communication and engagement plan for internal and external stakeholders in the Select and Define phases



# Activities to be included in the roadmap for next project phases

NOT EXHAUSTIVE



## Select

- Agree on **criteria to rank project concepts** along value chain (e.g., timing, cost)
- Identify and **gather additional insights** required for ranking
- **Select final concept** based on project concept ranking



## Define

- Create **detailed design plans & schedule** for the technical work required for each step in value chain, **highlighting interdependencies**
- Detail **regulatory and policy changes required** (e.g., ammonia handling)
- Create **implementation plan for required regulatory and policy changes**
- Draft **commercial frameworks** (e.g., offtake agreements)
- Detail **financing frameworks** for FID (e.g., subsidies, local funding)
- Define the **consortium legal structure** for the execution and operation of the green corridor (e.g., asset ownership, project funding)



## Execute

- **Execute project** in a safe and cost-efficient way, with **all testing, validation, training, and frameworks completed** (further details per project needed)
- **Hand over to operators** on corridor



## Operate



## Congratulations on successfully completing the Feasibility Study phase of your green corridor project!

Thanks to the collaborative efforts across various workstreams, the project team has achieved a comprehensive understanding of the key components comprising the green corridor: fuel, ports, vessels, and cargoes, considering their technical, financial, and regulatory aspects.

This culmination is presented in a comprehensive final report, complete with a **risk matrix and mitigation plan**, offering a holistic view of the **global feasibility** of the green corridor project.

## What comes next?

With all essential elements now assembled, stakeholders are poised to determine the project's direction, establish a **roadmap**, define **governance** structures, and allocate **resources** for the next critical phase: the engineering and commercial design of the green corridor.



# Disclaimer

This Methodology is provided "as is" without any warranty of any kind, express or implied, including but not limited to merchantability, accuracy, completeness, or fitness for a particular purpose. Any reliance you place on this Methodology is strictly at your own risk.

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This work is independent, reflects the views of the authors, and has not been influenced by any business, government, or other institution.

