



**Briefing paper**

# Strategic Collaboration Opportunities between the Netherlands–Brazil

Energy Transition & Industry Transformation

## **Authors**

Tijmen Steensma  
Ivan Vera Concha  
Berend Vreugdenhil  
Sjoerd Herlaar

**TNO** innovation  
for life

# Foreword

The transition to a climate-neutral and circular economy is one of the defining challenges of our time. It requires not only national action, but strong international partnerships that connect complementary strengths across regions. In this context, the collaboration between the Netherlands and Brazil offers a promising pathway to accelerate industrial decarbonisation while creating new economic opportunities for both countries.

Brazil and the Netherlands are natural partners in this transition. Brazil's abundant renewable energy resources, strong bioeconomy and growing industrial base position it as a key producer of low-carbon energy carriers and materials. The Netherlands, with its advanced industrial clusters, innovation ecosystem and role as a gateway to the European market,

provides the conditions to integrate, scale and distribute these solutions. Together, we can develop value chains that are not only sustainable, but also competitive and resilient.

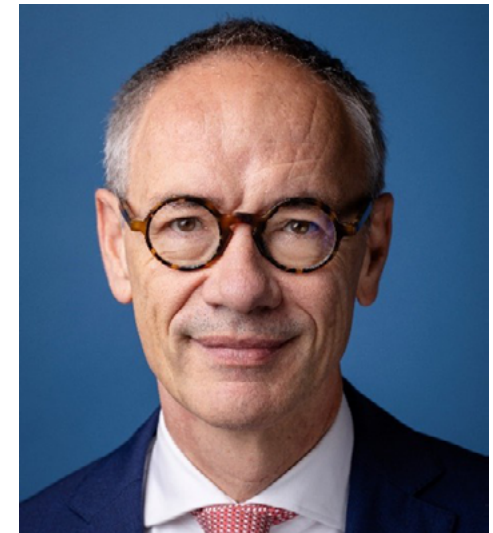
This briefing paper highlights concrete opportunities for collaboration across sectors such as steel, chemicals, fuels and hydrogen. It also makes clear that realising these opportunities requires more than technological capability alone. It calls for alignment on policy frameworks, certification systems and investment conditions, as well as strong partnerships between governments, industry and knowledge institutions.

Importantly, European policy developments and requirements on renewable energy and circularity create

economic opportunities for low-carbon products. This reinforces the strategic relevance of Brazil as a partner and underscores the importance of developing integrated value chains that can meet these requirements.

As Ambassador, I see a strong and growing interest from both Dutch and Brazilian stakeholders to deepen cooperation in this field. The next step is to translate this momentum into concrete projects and long-term partnerships. This will require continued dialogue, mutual understanding and a shared commitment to innovation and sustainability.

I hope that this report will serve as a valuable foundation for advancing this collaboration and inspire stakeholders on both sides to take the next steps together.



**Aldrik Gierveld**  
Ambassador of the Kingdom of the  
Netherlands to Brazil

# Executive Summary

The Netherlands and Brazil show complementary strengths in the transition toward low- and circular carbon industrial systems. In the Netherlands, the transformation of energy-intensive industry is partly constrained by limited availability of domestic renewable energy and circular carbon sources at scale, making access to external low-carbon inputs an important factor. Brazil, in turn, combines a high share of renewable electricity, availability of biomass resources, and established industrial capabilities in numerous sectors, providing a strong basis for the production of renewable energy carriers and biogenic carbon. At the same time, Brazil is further strengthening its position in low-carbon and bio-based industries.

The Netherlands is characterised by advanced industrial clusters, system integration expertise, and access to European end markets, while also facing the challenge of integrating new energy carriers and feedstocks into existing systems. European policy frameworks, including the EU Emissions Trading System (ETS), the Carbon Border Adjustment Mechanism (CBAM), the

Renewable Energy Directive (RED II/III), and sector-specific mandates, are expected to increasingly influence demand for low-carbon products, although the scale and timing remain dependent on policy implementation, market conditions, and competitiveness. CBAM is intended to mitigate carbon leakage and address differences in carbon pricing by applying a carbon cost to selected imports based on their embedded emissions. This may contribute to more competitive conditions and create incentives for lower-carbon production, although its impact will depend on implementation and market responses.

Against this background, there is a potential opportunity to develop integrated value chains linking production, processing, and end-use across both countries. Such value chains could combine production conditions in Brazil with industrial integration and market access in the Netherlands. Realisation of these opportunities will depend on the development of bankable projects, alignment of regulatory and certification frameworks, and sufficient demand visibility in end markets.

## Key messages

Further strengthening the Netherlands-Brazil collaboration presents a strategically relevant opportunity, based on complementary strengths in industrial capabilities, resource endowment, and access to end markets, with potential for joint value creation and co-development across value chains.

1. **Four opportunities are ready for near-term action:**
  - Green pig iron for Low-carbon iron intermediates for steel decarbonisation
  - Gasification of second generation biomass to olefins
  - Mobilisation of second generation biomass
  - Chemical innovation and R&D
2. **The main constraint is not the availability of technological options**, but the limited number of bankable business opportunities, driven by insufficient demand visibility, lack of long-term offtake structures, and exposure to market and regulatory risks.
3. **European policy frameworks** (e.g. CBAM and sector-specific mandates) **are expected to increasingly shape demand for low-carbon products**, but their impact depends on implementation, price developments, and alignment of certification and sustainability frameworks across regions.
4. **Scaling of value chains requires coordinated progress** across market formation, financing, and infrastructure development, as these dimensions are interdependent in enabling investment and deployment.

The development of a limited number of anchor projects can provide proof of concept, reduce risk, and create momentum for broader value chain development and bilateral collaboration.

## Priority Opportunities and key barriers

This briefing paper identifies a set of opportunities with strong potential for bilateral collaboration. These differ in maturity and require a phased approach.

### 1. Green pig iron for Low-carbon iron intermediates for steel decarbonisation

- Relatively high implementation potential and strong stakeholder engagement
- Demand is expected to be influenced by EU decarbonisation policies, including CBAM, although market development remains dependent on implementation and competitiveness
- Potential for near-term supply of lower-carbon intermediates from Brazil to European industrial users, subject to certification and cost conditions

### 2. Gasification of agricultural residues to methanol and olefins

- Strategically aligned pathway for producing chemical intermediates from non-fossil carbon
- Currently at a pre-commercial stage, requiring demonstration at scale and integration across the value chain to validate viability

### 3. Mobilisation of second generation biomass

- Potential enabler for circular carbon value chains, building on biomass availability and existing bio-based industries in Brazil
- Requires development of viable business cases, improved logistics, and alignment with sustainability and certification frameworks

### 4. Chemical innovation and joint R&D collaboration

- Focus on circular carbon, bio-based carbon sources, and low-carbon chemical pathways
- Strong alignment between industrial and research actors in both countries
- Opportunity to develop joint R&D and demonstration projects, linking innovation to industrial deployment

## Key Barriers to Implementation

Stakeholder engagement indicates a consistent set of cross-cutting barriers that constrain progress across the identified value chains.

Core bottlenecks include:

- Limited availability of long-term offtake agreements, leading to insufficient demand visibility and revenue certainty
- Challenges in developing bankable business cases, driven by high capital intensity and exposure to market and regulatory risks
- Uncertainty in certification, monitoring, reporting and verification (MRV), and broader regulatory frameworks, particularly in relation to EU market access

- Infrastructure constraints, including grid capacity, transport logistics, and integration into existing industrial systems
- Diverging perspectives on sustainability and the role of biomass, affecting alignment across stakeholders and jurisdictions

These barriers reflect broader system-level challenges:

- Markets for low-carbon products are developing but remain uneven and dependent on policy implementation
- Investment conditions are not yet sufficiently stable to support large-scale deployment
- Regulatory and certification frameworks are not fully aligned across jurisdictions, increasing complexity and risk for cross-border value chains

### Enabling Conditions for Scaling

Addressing the identified barriers requires coordinated progress across four interdependent dimensions: market formation, financing, infrastructure, and innovation. These dimensions are closely linked. Market formation enables investment, investment supports infrastructure development, infrastructure enables physical flows, and innovation contributes to reducing technological and implementation risks.

First, market formation and policy alignment are critical to translate policy ambition into bankable demand. This includes enabling long-term offtake structures, aligning certification, monitoring, reporting and verification (MRV), and sustainability frameworks, and strengthening bilateral coordination on standards and market access. Without sufficient demand visibility, projects remain difficult to finance.

Second, financing and risk allocation are required to move from concept to implementation. This involves mobilising blended finance to de-risk early-stage

projects, improving the allocation of risk between public and private actors, and developing financing structures that reflect the characteristics and risk profiles of individual value chains.

Third, infrastructure and industrial integration are needed to connect production, processing, and end-use. This includes the development of value chain corridors linking Brazil, the Netherlands, and the wider EU, as well as investments in production, transport, and import infrastructure. Integration into existing industrial clusters and logistics systems is an important condition for achieving scale.

Fourth, innovation collaboration and knowledge exchange act as a cross-cutting enabler across all value chains. Joint R&D, pilot, and demonstration projects can help bridge the gap between technological potential and industrial deployment. By combining complementary capabilities in industrial environments, feedstock availability, process development, and system integration, such collaboration can reduce uncertainty and support the development of more robust project configurations. It can

also contribute to alignment on standards, data, and certification approaches.

Progress across these four dimensions is required to translate identified opportunities into bankable and scalable

value chains, although the pace and sequencing may differ across value chains. In addition, a clear and balanced value proposition for both countries is a critical condition for implementation.

### Priority Actions for Government and Industry

Governments (Netherlands, Brazil and the EU) can support the development of initial projects by strengthening enabling conditions:

- Provide clear and stable policy signals that contribute to demand visibility, including support for early-stage offtake mechanisms
- Promote alignment of regulatory, certification, and monitoring, reporting and verification (MRV) frameworks to facilitate market access
- Mobilise public finance and de-risking instruments, such as blended finance and guarantees
- Facilitate bilateral coordination through platforms that support project development and stakeholder engagement

Industry and ecosystem actors can contribute to implementation and scaling:

- Develop anchor projects in areas such as low-carbon steel, chemicals, and fuels, which can act as entry points for broader value chain development
- Establish long-term offtake arrangements to improve revenue certainty
- Strengthen partnerships across value chains, linking production, processing, and end-use
- Invest in joint innovation, pilot, and demonstration activities to support scale-up and reduce technological and market risks

# Contents

Foreword		
Executive Summary		
<b>1. Introduction: Dutch-Brazilian collaboration in the industrial transformation</b>	<b>3</b>	<b>24</b>
1.1 Reason to collaborate		24
1.2 Existing bilateral collaborations		24
1.3 Scope and objective of this briefing paper		24
<b>2. Strategic context for bilateral collaboration</b>	<b>10</b>	<b>26</b>
2.1 Industrial Transition in the Netherlands	10	26
2.2 Industrial transformation and growth opportunities in Brazil	10	26
2.3 International collaboration in industrial transformation	10	28
2.4 implications of EU and Brazilian regulations	10	28
<b>3. Complementarities between the Netherlands and Brazil</b>	<b>12</b>	<b>29</b>
3.1 Complementary industrial strengths and capabilities	12	29
3.2 Resource, technology and market synergies	12	30
3.3 Joint value creation across integrated value chains	13	30
<b>4. Priority opportunities for joint development</b>	<b>15</b>	<b>29</b>
4.1 Green pig iron for low-carbon steel	15	29
4.2 Gasification of second generation biomass to olefins	15	30
4.3 Mobilisation of second generation biomass	16	30
4.4 Shared R&D in the chemical industry	17	21
4.5 Hydrogen and hydrogen derivatives	18	22
4.6 Biomethane production	19	23
<b>5. Shared perspectives on bilateral collaboration</b>	<b>24</b>	<b>24</b>
5.1 Stakeholder landscape and collaboration momentum	24	24
5.2 Market dynamics and trade considerations	24	24
5.3 Sustainability, certification and feedstock considerations	24	24
5.4 Key barriers and risks	24	24
<b>6. Enabling conditions for advancing bilateral collaboration</b>	<b>26</b>	<b>26</b>
6.1 Market formation and policy alignment	26	26
6.2 Financing and risk allocation	26	28
6.3 Infrastructure and industrial integration	26	28
6.4 Innovation collaboration and knowledge exchange	28	28
<b>7. Outlook for Netherlands-Brazil collaboration</b>	<b>29</b>	<b>29</b>
7.1 Key insights and conclusions	29	29
7.2 Pathways toward project development	29	30
7.3 Areas for further exploration and cooperation	30	30

For this task, a Generative AI tool (Copilot, based on GPT-4, June 2024 version) was used to support searching for and summarizing relevant information. The outputs were manually reviewed by experts and adjusted where necessary. The use of this tool has been documented to ensure reproducibility.

All rights reserved No part of this publication may be reproduced and/or published by print, photoprint, microfilm or any other means without the previous written consent of TNO.

© 2026 TNO

# 1. Introduction: Dutch–Brazilian collaboration in the industrial transformation

## 1.1 Reason to collaborate

The transition toward climate-neutral and circular carbon for industry is accelerating globally, driven by tightening climate targets, evolving regulatory frameworks and increasing pressure on industrial competitiveness. For the Netherlands, this transition presents a structural challenge: the defossilisation of energy-intensive industries requires access to large volumes of renewable energy carriers and circular carbon feedstocks that cannot be produced domestically at the required scale and cost. As a result, international collaboration is essential to ensure both the sustainability and competitiveness of Dutch industrial clusters.

Brazil is emerging as a strategically relevant partner in this context. The country combines abundant biomass resources, a largely renewable electricity mix and an established industrial base in sectors such as biofuels, chemicals and steel. These characteristics position Brazil to play a significant role in the production of renewable molecules and low-carbon materials, both for domestic use and for international markets.

Against this background, collaboration between the Netherlands and Brazil offers opportunities to jointly develop circular carbon value chains that contribute to the industrial transformation in both countries. Rather than being limited to trade flows, such collaboration can support broader industrial transformation by combining Brazilian strengths in feedstocks and scale with Dutch expertise in technology development and system integration. Besides, the Netherlands is positioned as the gateway to the EU market, characterised by a strong regulatory push and a relatively high willingness to pay for decarbonisation.

Building on this shared opportunity, the Ministry of Economic Affairs & Climate Policy (EZK) commissioned TNO to identify and structure potential areas for bilateral collaboration. The work followed a three-phase approach, combining value chain prioritisation with targeted stakeholder engagement to identify and validate collaboration opportunities. In the third phase the findings of this work have provided a basis for the development of concrete project plans for bilateral collaborations.

## 1.2 Existing bilateral collaborations

Collaboration between the Netherlands and Brazil in the field of energy transition and industrial development is already taking shape through a range of initiatives involving governments, industry and knowledge institutions. These include formal agreements, such as memoranda of understanding, as well as project-based cooperation and engagement through innovation networks and diplomatic channels. During COP30, in the Amazon region, Brazil and the Netherlands signed an MoU on energy transition.

A notable example is the collaboration between the ports of Rotterdam and Pecém, which aims, to facilitate the development of international value chains for hydrogen and hydrogen-derived products. Such initiatives illustrate the growing alignment between both countries in exploring opportunities for trade and industrial cooperation in emerging low-carbon markets.

At the same time, interest from Dutch companies in exploring business opportunities in Brazil is increasing, particularly in areas related to renewable

energy, circular carbon and industrial transformation. In the last two years, Dutch government organised two innovation missions to Brazil: one on hydrogen and one on bio-inputs. Stakeholder engagement indicates that actors in both countries are actively seeking partnerships, although many initiatives currently remain at an early stage and require further development to translate into concrete projects.

## 1.3 Scope and objective of this briefing paper

This briefing paper synthesises the outcomes of the first two phases into a concise, evidence-based and action-oriented overview to support stakeholders in both countries. It focuses on value chains and collaboration opportunities that are strategically relevant, informed by stakeholder engagement and expert input, and aligned with broader industrial transformation objectives.

The technological scope of this briefing centres on key pathways for industrial transformation, including green hydrogen, circular (biogenic) carbon and their integration into chemical, fuel and

materials value chains. Opportunities explored include among others biomass conversion routes, gasification and methanol-based pathways and low-carbon industrial processes such as green steel production, reflecting areas with both technological maturity and development potential in the bilateral context.

The scope of the briefing is limited to the priority value chains and themes identified in the first two phases. It reflects current stakeholder perspectives and market developments, further analysis and engagement should translate these opportunities into implementable projects in subsequent phases.

The objective of this briefing paper is to provide an analytical foundation for advancing bilateral collaboration between the Netherlands and Brazil by:

- Synthesising insights from value chain prioritisation and stakeholder engagement into a coherent narrative;
- Identifying priority areas for collaboration based on their strategic relevance and feasibility;
- Highlighting complementarities between both countries across resources, industrial capabilities and innovation ecosystems;
- Clarifying key enabling conditions, barriers and uncertainties affecting the development of joint value chains;
- Supporting policymakers, industry and knowledge institutions in progressing from identified opportunities toward concrete collaboration initiatives.



## 2. Strategic context for bilateral collaboration

### 2.1 Industrial Transition in the Netherlands

The Netherlands faces a structural challenge in transitioning its energy-intensive industrial base toward climate neutrality while maintaining international competitiveness. Key sectors, including chemicals, refining and materials production, are under increasing pressure from high energy prices, tightening climate policies and infrastructure constraints. In particular, grid congestion and limited domestic renewable energy supply constrain the pace of electrification and large-scale deployment of low-carbon technologies.

At the same time, Dutch industry is highly integrated into global value chains and plays a central role in the European processing and distribution of energy carriers and chemical intermediates. This creates both a dependency and an opportunity: while the Netherlands lacks sufficient domestic resources to produce renewable molecules and circular carbon at scale, it is well positioned to act as a hub for their import, upgrading and distribution within Europe.

In this context, access to reliable, cost-competitive sources of low-carbon

feedstocks is a critical enabler for industrial decarbonisation. Strategic international partnerships are therefore not only complementary, but essential to support the transition of Dutch industrial clusters and to safeguard their long-term competitiveness.

### 2.2 Industrial transformation and growth opportunities in Brazil

Brazil is well positioned to play a significant role in the global transition toward low-carbon and circular industrial systems. The country benefits from abundant natural resources, including large-scale biomass availability from agriculture and forestry, as well as favourable conditions for renewable electricity generation. Its electricity mix is already largely renewable, providing a strong foundation for the production of low-carbon energy carriers.

Brazil also has an established industrial base in sectors such as biofuels, chemicals and steel, supported by existing infrastructure, technical expertise and domestic market demand. The country's mature ethanol industry, in particular, provides a scalable platform for the development of broader circular carbon value chains, including the production of

advanced biofuels and biogenic chemical intermediates.

In addition, Brazil is actively positioning itself as a future exporter of green hydrogen and hydrogen-derived products, supported by national policy initiatives and the development of industrial hubs in key regions. This ambition is supported by national policy initiatives, such as the National Hydrogen Program (PNH2), which provides a strategic framework for the development of a domestic hydrogen economy and export potential. At the same time, several industrial hubs are being developed in key regions, including the port of Pecém (Ceará), Suape (Pernambuco), Salvador (Bahia) and Açú (Rio de Janeiro), where infrastructure, renewable energy availability, and industrial partnerships are being aligned to enable large-scale production and export of hydrogen and its derivatives. These developments create a foundation for Brazil to play a significant role in emerging global hydrogen value chains. These developments create opportunities not only for export-oriented growth, but also for domestic industrial upgrading and the development of new value chains aligned with global decarbonisation trends.

### 2.3 International collaboration in industrial transformation

Given the scale and complexity of the industrial transition, international collaboration is a key enabler for achieving decarbonisation objectives. No single country is able to independently provide all the required resources, technologies and infrastructure needed to transition toward climate-neutral industrial systems.

In the case of the Netherlands and Brazil, collaboration offers the opportunity to combine complementary strengths across the value chain. This includes the production of renewable energy carriers and carbon sources, the development and deployment of conversion technologies and the integration of these flows into industrial applications and end markets.

Importantly, such collaboration extends beyond trade relations. It involves joint innovation, co-development of technologies, alignment of regulatory frameworks and the establishment of long-term partnerships between industrial actors. By taking a value chain approach, bilateral cooperation can contribute to both countries' economic development and

climate objectives, while reducing risks and accelerating the deployment of low-carbon solutions at scale.

## 2.4 implications of EU and Brazilian regulations

The development of low-carbon value chains between Brazil and the Netherlands is strongly influenced by policy and regulatory frameworks on both sides. Together, these policies shape market demand in Europe and production conditions in Brazil, creating both opportunities and requirements for collaboration.

On the European side, instruments such as the EU Emissions Trading System (ETS) and the Carbon Border Adjustment Mechanism (CBAM) play a central role. They put a price on carbon emissions and link market access to carbon intensity. As illustrated in the figure on the next page, this increases the cost of carbon-intensive imports, while giving a competitive advantage to low-carbon products. For countries like Brazil, with a largely renewable energy mix, this creates a clear opportunity to supply the EU market with compliant, low-emission products.

Name	Region	Short Explanation	Relevance for Netherlands-Brazil collaboration
EU Emissions Trading System (ETS)	EU	Carbon pricing system for industry and power sectors	The carbon price benchmark, increasing demand for low-carbon fuels
Carbon Border Adjustment Mechanism (CBAM)	EU	Carbon price on imported goods based on embedded emissions	Favors low-carbon production for selective products, requires alignment on MRV and certification for market access
ReFuelEU Aviation	EU	Mandates increasing share of sustainable aviation fuels (SAF)	Creates long-term demand for biofuels and e-fuels, enabling Brazil-Netherlands fuel value chains
FuelEU Maritime	EU	Regulates GHG intensity of maritime fuels	Drives demand for low-carbon fuels and intermediates, supporting export-oriented value chains
Renewable Energy Directive (RED II / III)	EU	Sets renewable energy targets and sustainability criteria	Defines sustainability requirements for biomass and fuels, critical for Brazilian exports to EU
Brazil National Hydrogen Program (PNH2)	Brazil	National strategy to develop hydrogen sector	Supports Brazil's role as domestic user and future exporter of hydrogen and derivatives
RenovaBio	Brazil	Policy promoting low-carbon biofuels via carbon intensity credits (CBIOS)	Provides certification basis for biofuels, relevant for exports and alignment with EU standards
Brazil Industrial Policy (Novia Indústria Brasil)	Brazil	Strategy to modernise and decarbonise industry	Supports development of low-carbon industries and export capabilities
ANEEL Strategic R&D Project Calls	Brazil	Public calls funding collaborative R&D in the electricity sector	Enables co-funded pilot and demonstration projects in areas such as grid integration, renewables and electrification, supporting technology validation and local deployment
1% Oil Revenue ANP R&D Clause	Brazil	Mandatory investment of one percent of oil revenues into R&D	Enables funding for joint innovation (e.g. chemicals, fuels)

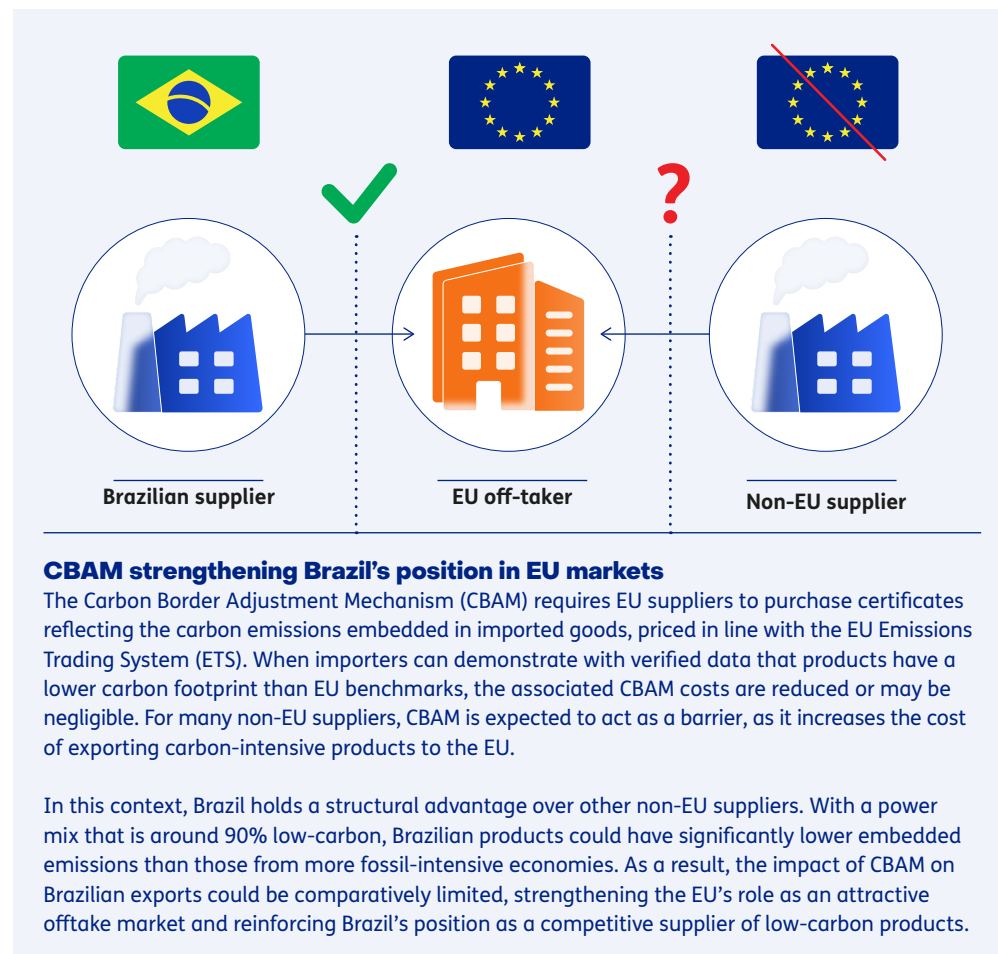
In addition, sector-specific regulations such as ReFuelEU Aviation and FuelEU Maritime are creating long-term demand for sustainable fuels, including biofuels and e-fuels. These policies provide market certainty and support the development of transatlantic value chains. The Renewable Energy Directive (RED II/III) establishes binding sustainability and greenhouse gas (GHG) savings criteria for renewable energy, particularly for biofuels, bioliquids, and biomass fuels. Compliance with these criteria is required for these products to count toward EU renewable energy targets and is therefore a key condition for market access in regulated sectors.

On the Brazilian side, several policies support the development of low-carbon industries and export potential. The National Hydrogen Program (PNH2) and RenovaBio create a framework for scaling hydrogen and biofuel production, while Brazil's broader industrial policy (Nova Indústria Brasil) supports the transition toward more sustainable industrial systems. Importantly, Brazil's electricity framework, characterised by a high share of renewable energy, provides a structural

advantage in producing low-carbon products.

In addition, instruments such as the 1% ANP oil revenue R&D clause support innovation and create opportunities for joint research and development, particularly in areas such as chemicals and advanced fuels.

Taken together, these frameworks highlight that Netherlands–Brazil collaboration is not only driven by technology and resources, but also by policy alignment and market design. European regulation creates demand for low-carbon products, while Brazilian policies enable their supply. Aligning certification systems, sustainability criteria and innovation efforts is therefore essential to unlock the full potential of bilateral value chains.



# 3. Complementarities between the Netherlands and Brazil

## 3.1 Complementary industrial strengths and capabilities

The industrial transition challenges in the Netherlands and the growth opportunities in Brazil align across different stages of the value chain.

The Netherlands combines advanced industrial infrastructure, strong technological capabilities and a central position within European markets. Its industrial clusters are highly integrated, with well-developed logistics networks and a strong focus on high-value processing, system integration and innovation. These characteristics position the Netherlands as a hub for the upgrading, distribution and application of low-carbon energy carriers and intermediates.

Brazil, by contrast, offers favourable conditions for large-scale production of circular carbon products or renewable energy carriers. Its availability of renewable energy and biomass, combined with established industrial bases in specific sectors, could enable the cost-competitive production of low-carbon inputs and intermediates. At the same time, Brazil is increasingly developing capabilities to

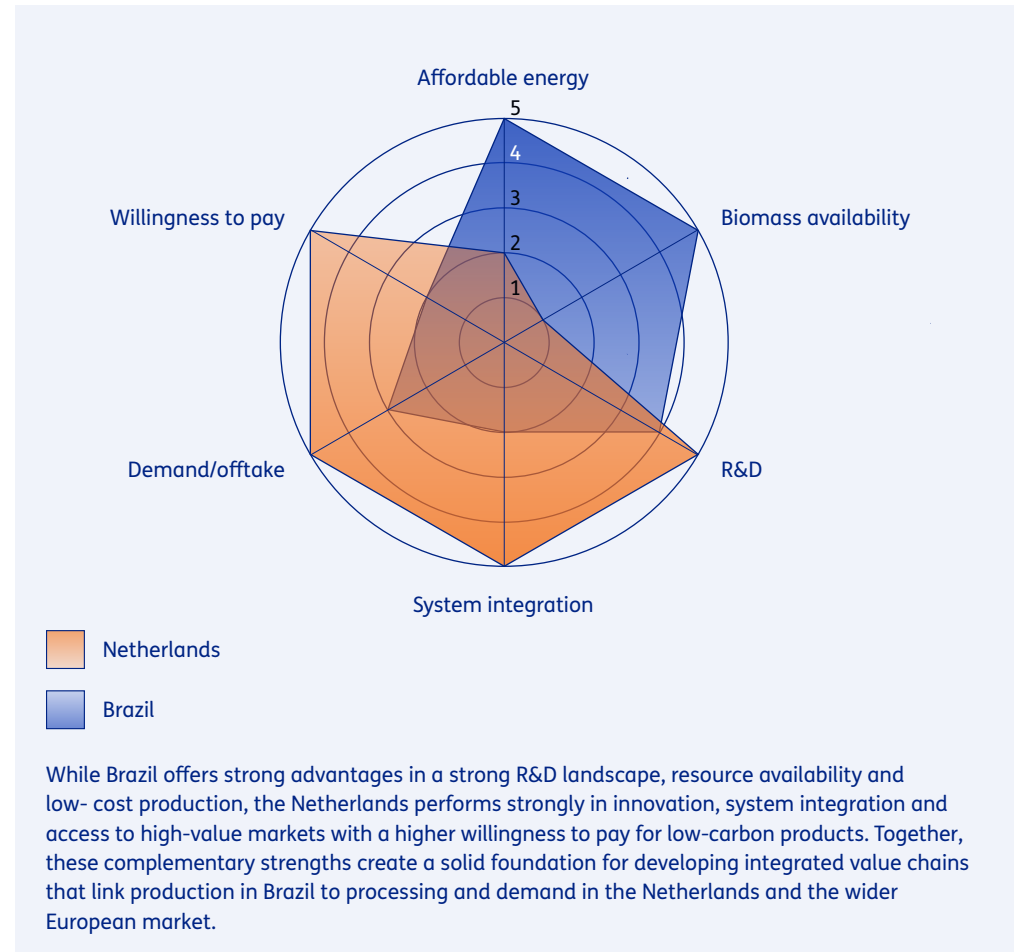
expand its role in higher-value segments of these value chains.

Together, these strengths align across the value chain: Brazil is well positioned to produce circular carbon carriers and intermediates at scale, while the Netherlands provides capabilities for further conversion, integration and access to end markets. This creates a structurally complementary relationship between upstream production and downstream industrial application.

## 3.2 Resource, technology and market synergies

These complementarities can be further understood through the interaction of resources, technology and markets.

From a resource perspective, Brazil's access to low-cost renewable energy and biomass could provide a competitive basis for the production of low-carbon molecules and circular carbon. In contrast, the Netherlands faces structural constraints in domestic resource availability, reinforcing the need for international sourcing of these inputs.



From a technology perspective, the Netherlands has strong capabilities in process development, system integration and optimisation of industrial processes. These capabilities are essential for scaling up emerging value chains and integrating new feedstocks into existing industrial systems. Brazil, while also strengthening its technological base, offers opportunities for large-scale deployment and demonstration of such technologies.

From a market perspective, the Netherlands provides access to EU markets, where regulatory frameworks such as CBAM and sector-specific policies could drive demand for low-carbon products. From a market perspective, the Netherlands provides access to EU markets, where regulatory frameworks such as CBAM and sector-specific policies are expected to increasingly shape demand for low-carbon products. While these policies create important signals for market development, demand remains partly conditional on their implementation, as well as on price developments and competitiveness. In some sectors, there are indications of a higher willingness to pay for decarbonised

products, although this remains uncertain and strongly dependent on policy support and market conditions. Brazil, in turn, is increasingly positioning itself to supply these markets while also developing domestic demand for low-carbon solutions.

The interaction of these three dimensions enables the development of value chains that connect production in Brazil with processing, integration and end-use in European markets, simultaneously supporting industrial development in Brazil.

### **3.3 Joint value creation across integrated value chains**

The combination of complementary strengths and cross-cutting synergies creates opportunities for joint value creation across integrated value chains. Rather than focusing solely on trade in intermediate products, Netherlands–Brazil collaboration can support the co-development of value chains that span production, conversion and end-use applications. This includes linking the production of renewable energy carriers and biogenic intermediates in Brazil with their integration into industrial applications

and markets in the Netherlands and the wider EU. Such collaboration also creates opportunities for joint innovation, co-development of technologies and coordinated investments in infrastructure. In this context, the Netherlands can contribute technological expertise, system integration capabilities and access to markets, while Brazil can provide scale, resource availability and opportunities for industrial deployment.

This approach enables value creation in both countries. For Brazil, it supports the expansion and diversification of its already well-developed industrial base, including strengthening its position in emerging low-carbon value chains and increasing value addition in export-oriented sectors. In several areas, such as bio-based pathways, Brazil already has capabilities that are not yet widely established in Europe. For the Netherlands, it strengthens access to low-carbon feedstocks, supports industrial competitiveness, and reinforces its role as a European hub, while also offering opportunities to learn from Brazil's experience in large-scale deployment of bio-based and low-carbon solutions.

At the same time, the realisation of these opportunities depends on alignment across regulatory frameworks, certification systems and market incentives, as well as the establishment of long-term partnerships between stakeholders. By taking a value chain perspective, bilateral collaboration can reduce risks, improve bankability and accelerate the deployment of low-carbon solutions at scale.

# 4. Priority opportunities for joint development

Building on the strategic context and identified complementarities, this chapter presents the priority opportunities for Netherlands–Brazil collaboration. These opportunities have been assessed through a structured evaluation combining strategic relevance with practical feasibility, informed by stakeholder engagement and value chain analysis.

The assessment is based on five dimensions: stakeholder interest, reflecting the willingness of industry, knowledge institutions and public actors

to engage; strategic alignment with industrial decarbonisation objectives and bilateral interests; regulatory clarity, indicating the degree of certainty in policy and certification frameworks; implementation feasibility, capturing the complexity of realisation; and an overall priority classification based on industry engagement and expert input, synthesising these factors into an assessment of collaboration potential.

The results point to a differentiated portfolio of opportunities. chemical R&D

collaboration and green pig iron emerge as very high-priority opportunities, combining strong strategic alignment with high stakeholder commitment and relatively favourable implementation conditions. These value chains provide clear entry points for near-term collaboration. A second group, including the mobilisation of second-generation biomass and gasification pathways, shows strong potential but requires further development. Key challenges relate to demonstration at scale, the development of viable business cases and integration across

the value chain. Other opportunities, such as hydrogen and biomethane, are strategically relevant but currently constrained by uncertainties related to stakeholder interaction. These are therefore best positioned as medium- to long-term opportunities, requiring further alignment before large-scale deployment becomes feasible. The following sections provide a more detailed analysis of the most relevant value chains, focusing on their collaboration logic and the conditions required to move from opportunity to implementation.

Opportunity	Stakeholder interest	Strategic alignment	Regulatory clarity	Implementation feasibility	Priority
Chemical innovation and joint R&D collaboration	High	High	Medium	Medium	Very high
Mobilisation of second generation biomass	Medium	Medium	Medium	Medium	High
Gasification of second generation biomass to olefins	High	High	Medium	Low	High
Low-carbon iron intermediates for steel decarbonisation	High	High	Low	High	Very high
Biomethane production from agricultural and organic residues	Low	High	Medium	Medium	Potential
Bio-coke technology collaboration and knowledge exchange	Medium	Low	Low	Low	Low
Hydrogen and hydrogen-derived products	Low	High	Medium	Medium	Potential
Pyrolysis oil production from biomass residues	Medium	Low	Low	Low	Low

#### 4.1 Green pig iron for low-carbon steel

Low-carbon steel represents one of the most tangible near-term opportunities for Netherlands–Brazil collaboration. It combines strong strategic alignment with relatively high implementation potential. Stakeholders on both sides express clear interest, particularly in the production and trade of low-carbon intermediates such as green pig iron, hot briquetted iron (HBI) or the use of biogenic carbon.

The collaboration builds on clear complementarities. Brazil has capabilities in biomass-based iron reduction, offering a pathway to lower-carbon production compared to conventional coal-based routes. At the same time, the Netherlands faces increasing pressure to decarbonise its steel sector, driven by high energy costs and EU regulation, including CBAM, which could strengthen demand for low-carbon inputs.

A key opportunity lies in supplying green pig iron from Brazil to the Netherlands during the transition of European steel production or the mobilization of bio-

anthracite. This can deliver near-term emissions reductions while reducing exposure to domestic energy constraints. However, stakeholders emphasise that realisation depends on resolving key uncertainties related to certification, cost competitiveness and logistics.

This value chain stands out as a promising entry point for early collaboration, provided that these enabling conditions are addressed.

##### Key conditions for success:

- Development of robust and recognised carbon accounting and certification systems (CBAM compliance)
- Establishment of long-term supply agreements to support investment decisions
- Clear assessment of techno-economic competitiveness, including logistics and comparison with EU production routes



## 4.2 Gasification of second generation biomass to olefins

Gasification of agricultural residues forms a strategically aligned but early-stage opportunity for Netherlands–Brazil collaboration. It contributes to long-term objectives on circular carbon and low-carbon chemical production, but remains at a pre-commercial stage, with limited large-scale deployment to date. Stakeholders consistently identify demonstration at industrial scale as a prerequisite for further development.

The opportunity is based on complementary capabilities. Brazil provides availability of agricultural residues, industrial-scale biomass handling, and suitable conditions for deployment, while the Netherlands contributes advanced gasification technologies, process integration expertise, and access to downstream chemical markets in Europe. Both countries also have relevant experience in biomass conversion, though at different stages of technological maturity and application.

The critical bottleneck is not resource availability, but the lack of proven, bankable project configurations. Large-

scale demonstration plants are required to validate technical performance, system integration, and economic viability under real operating conditions. Such projects would combine Brazilian feedstocks and industrial context with Dutch technology and engineering capabilities.

This value chain therefore represents a technology validation and scaling challenge, rather than an immediate trade opportunity. Its relevance lies in bridging

the gap between pilot-scale innovation and commercial deployment, enabling future production of methanol, olefins, and other chemical intermediates from non-fossil carbon sources.

If successfully demonstrated, this pathway can contribute to the development of integrated circular carbon value chains, linking biomass-rich regions in Brazil to industrial demand in the Netherlands and wider European markets.

### Key conditions for success:

- Development of demonstration projects with public–private funding
- Securing downstream offtake agreements (e.g. methanol, olefins)
- Alignment of carbon accounting and certification frameworks
- De-risking of capital-intensive investments



### 4.3 Mobilisation of second generation biomass

The mobilisation of second-generation biomass (agricultural and forestry residues) represents a potential but currently constrained opportunity for Netherlands–Brazil collaboration. While it aligns with Dutch policy objectives on circular carbon and high-value biomass use, stakeholder engagement indicates limited strategic priority and unclear business cases in the Brazilian context.

In the Netherlands, biomass is increasingly treated as a scarce feedstock and is therefore prioritised for applications where few alternatives exist, such as chemicals, materials, and sustainable fuels for aviation and maritime sectors. In Brazil, by contrast, the bioeconomy is already highly developed and largely based on first-generation biomass, supported by mature supply chains and favourable production conditions. As a result, second-generation biomass is currently underutilised, not due to lack of availability, but due to economic and logistical constraints, including high collection costs, low bulk density, and long transport distances.

The core opportunity lies in enabling the economic mobilisation of residues, rather than in resource availability. This requires the development of integrated supply chains and viable end-use pathways. Technologies for densification and preprocessing at source, such as palletisation, briquetting, or torrefaction, can improve transport economics and convert residues into tradable intermediates. Dutch companies already have technologies at proof-of-concept stage that could be piloted in Brazilian agricultural regions.

However, stakeholders emphasise that deployment is only relevant if linked to clearly defined downstream applications (e.g. methanol, advanced biofuels, or chemical intermediates). Without such linkage, residue mobilisation remains economically unattractive. In addition, differences in sustainability frameworks and regulatory requirements, particularly for EU market access, introduce further uncertainty. An additional opportunity relates to the integration of carbon removal and storage pathways within biomass value chains. Processing biomass residues in combination with carbon capture could generate negative

emissions, which may become economically relevant in the EU context as carbon removal frameworks and markets develop.

Overall, this value chain should be seen as a conditional enabler for broader circular carbon systems, rather than a standalone opportunity. Its development depends on demonstrating economic viability, aligning value chains end-to-end, and bridging differences in biomass strategies between both countries.

#### Key conditions for success:

- Development of efficient biomass collection and logistics systems
- Alignment on sustainability criteria and certification frameworks (e.g. RED II/III)
- Creation of viable business cases for second-generation biomass
- Integration with downstream value chains (fuels, chemicals, materials)



#### 4.4 Shared R&D in the chemical industry

Collaboration in chemical innovation emerges as one of the most mature and actionable opportunities. Stakeholders in both countries show strong willingness to engage, supported by existing industrial and research capabilities and available funding mechanisms. In addition, increasing demand for circular and low-carbon chemicals and fuels in Europe reinforces the strategic relevance of this collaboration.

It contributes directly to the industrial transition pathways of both countries' chemical sectors. In the Netherlands, this includes the shift toward circular carbon and low-carbon feedstocks within existing chemical clusters. In Brazil, it aligns with the further advancement and scaling of its already well-developed bio-based and chemical industry, building on established capabilities in biomass conversion and large-scale industrial deployment.

The collaboration logic is centred on joint R&D and demonstration, rather than

immediate trade flows. Both countries bring complementary technological expertise: Brazil contributes extensive experience in bio-based processes, feedstock valorisation, and industrial-scale application, supported by dedicated R&D funding mechanisms such as the ANP 1% oil revenue allocation, while the Netherlands contributes expertise in process optimisation, system integration, and technology scale-up.

A key opportunity lies in establishing joint research programmes and demonstration projects embedded in Brazilian industrial clusters. This enables validation under real operating conditions and accelerates the transition from innovation to industrial deployment—identified by stakeholders as a critical bottleneck. Potential formats include Dutch participation in Brazilian-funded R&D initiatives or the establishment of joint research centres.

This value chain can act as an entry point for broader collaboration, linking early-stage innovation to future industrial value chains in chemicals, fuels and circular carbon.

##### Key conditions for success:

- Alignment of funding mechanisms and research agendas
- Clear agreements on intellectual property and knowledge sharing
- Strong focus on pilot and demonstration at industrial sites
- Translation of R&D outcomes into industrial-scale applications



#### 4.5 Hydrogen and hydrogen derivatives

Hydrogen and hydrogen-derived products represent a potentially important area for Netherlands–Brazil collaboration, particularly in the context of long-term industrial transformation. While stakeholder interest is emerging, further development of this value chain will depend on clear commitment from industry and the establishment of viable project pipelines. At the same time, uncertainties related to market development, regulation, and infrastructure indicate that large-scale deployment could potentially materialise over a longer timeframe.

Key barriers include limited offtake certainty, evolving regulatory frameworks, and infrastructure constraints, particularly in Brazil. In addition, the cost competitiveness of green hydrogen and its derivatives remains uncertain, especially in relation to alternative decarbonisation pathways.

The collaboration logic is based on complementary system roles. Brazil has favourable conditions for the production of renewable hydrogen and derivatives—



including a high share of renewable electricity and the development of industrial hubs such as Pecém, Suape, and Açú. The Netherlands is positioning itself as a European import, processing, and distribution hub, with access to industrial demand and integration into EU-regulated markets.

However, the main challenges are system-level rather than technological. The absence of mature markets, unclear

regulatory frameworks, and limited infrastructure for production, transport, and storage currently constrain project development. As a result, this value chain is best understood as a market formation and system integration challenge, rather than a near-term trade opportunity.

In the short to medium term, collaboration is therefore likely to be most effective at the system level, focusing on regulatory

alignment, infrastructure planning, and market development. Initiatives such as hydrogen hubs and international innovation platforms, for example in Pecém, can support coordination between stakeholders and enable early-stage learning.

Overall, hydrogen should be positioned as a strategic option for long-term collaboration, requiring sustained policy support, investment, and coordination to enable future large-scale deployment.

#### Key conditions for success:

- Securing long-term offtake agreements in European markets
- Clarifying regulatory frameworks, particularly in Brazil
- Addressing infrastructure constraints (e.g. grid access, transport, safety)
- Aligning certification systems for hydrogen and derivatives

#### 4.6 Biomethane production

Biomethane production represents a potential area for Netherlands–Brazil collaboration, particularly in the context of renewable gases and circular carbon systems. While the strategic rationale is clear, further development of this value chain will depend on increased industry interest and the emergence of viable project concepts. Current stakeholder engagement indicates limited readiness and relatively low prioritisation compared to other value chains.

The collaboration logic is based on Brazil's potential to produce biomethane from agricultural residues and organic waste streams, combined with the Netherlands' demand for renewable gases to decarbonise industry and the energy system. In principle, this creates opportunities for both domestic utilisation in Brazil and potential integration into European markets.

However, stakeholders highlight several challenges that limit near-term development. These include uncertainty around business case viability, regulatory

frameworks and infrastructure requirements, as well as competition with alternative uses of biomass. In addition, the role of biomethane within broader energy systems remains subject to ongoing policy development in both regions.

As such, this value chain should be seen as a conditional opportunity, requiring stronger stakeholder commitment, clearer market signals, and further validation through pilot and demonstration initiatives before large-scale deployment can be considered.

##### Key conditions for success:

- Strengthening stakeholder commitment and project development
- Clarifying regulatory frameworks and market incentives
- Developing viable business cases for production and use
- Assessing the role of biomethane within broader energy and industrial systems



# 5. Shared perspectives on bilateral collaboration

Stakeholder engagement confirms a strong and growing interest in strengthening collaboration between the Netherlands and Brazil in support of industrial decarbonisation. At the same time, perspectives differ across value chains and stakeholder groups, particularly regarding market readiness, sustainability criteria and risk allocation.

This chapter synthesises key stakeholder insights, highlighting areas of alignment as well as critical bottlenecks that shape the feasibility of bilateral collaboration.

## 5.1 Stakeholder landscape and collaboration momentum

A diverse stakeholder landscape is actively shaping Netherlands–Brazil collaboration, including industrial actors, knowledge institutions, financial organisations and public authorities. Industrial players in sectors such as energy, chemicals and steel are the primary drivers of project development, supported by research organisations that contribute to technology development and system integration. Public actors facilitate policy alignment and international cooperation, while financial institutions are increasingly

involved in enabling project development.

Existing initiatives, including bilateral agreements, innovation partnerships and project-based cooperation, provide a foundation for engagement. However, most collaborations remain at an early stage, with limited progression toward large-scale implementation. Stakeholders emphasise the need to move from exploratory engagement toward more structured partnerships and concrete projects.

## 5.2 Market dynamics and trade considerations

Market dynamics are a key determinant of the feasibility of bilateral value chains. European demand for low-carbon products is increasingly shaped by regulatory frameworks such as CBAM and sector-specific mandates, which provide long-term signals for investment.

However, market development remains uneven. In several value chains - particularly hydrogen and advanced fuels - demand is still emerging and strongly dependent on policy support. The absence of firm and bankable offtake agreements is

consistently identified as a major barrier to project development.

The Netherlands is well positioned as a gateway to European markets, leveraging its logistics infrastructure and industrial clusters. Brazil is increasingly positioning itself as a competitive producer of low-carbon products, particularly where it benefits from favourable resource conditions. Competitiveness depends not only on production costs, but also on compliance with EU regulatory requirements and the ability to demonstrate low carbon intensity.

## 5.3 Sustainability, certification and feedstock considerations

Sustainability and certification frameworks are critical for enabling bilateral value chains, particularly in relation to EU market access. Stakeholders highlight the importance of robust monitoring, reporting and verification (MRV) systems to ensure compliance with EU requirements.

At the same time, differences in perspectives are evident, particularly regarding biomass. Dutch stakeholders tend to opt for second-generation biomass

to avoid the food versus fuel debate, while Brazilian stakeholders emphasise the role of first-generation biomass and established production systems.

Alignment on sustainability criteria and acceptable feedstocks is therefore essential to enable collaboration and avoid regulatory risks. Stakeholders also stress the need for harmonised certification frameworks that are recognised across both jurisdictions. In addition, the sustainability of biomass supply chains (including land use, logistics and competition between applications) remains a key consideration for scaling up.

## 5.4 Key barriers and risks

Across value chains, stakeholders identify recurring barriers that constrain project development. A central challenge is the lack of project bankability, driven by high capital intensity, uncertain demand and the absence of offtake agreements. This is particularly evident in emerging value chains such as hydrogen and advanced fuels.

Regulatory uncertainty further complicates investment decisions. While EU policies

provide important demand signals, uncertainties remain regarding future regulation, certification requirements and implementation. In Brazil, evolving policy frameworks and infrastructure constraints, such as grid access, add additional complexity.

Technical and operational risks persist in less mature value chains, particularly where large-scale demonstration is still required. In addition, coordination challenges across stakeholders and geographies can delay progress.

Overall, stakeholders emphasise that reducing uncertainty and improving predictability, through clearer market signals, aligned regulatory frameworks and structured partnerships, is essential to move from identified opportunities toward implementation.



## 6. Enabling conditions for advancing bilateral collaboration

Realising the opportunities identified in the priority value chains requires a set of enabling conditions that address the key barriers highlighted by stakeholders. These conditions are interdependent: market formation drives investment, investment enables infrastructure and infrastructure supports the scaling of integrated value chains. Coordinated action across these dimensions is therefore essential to move from early-stage collaboration toward industrial deployment.

### 6.1 Market formation and policy alignment

The development of viable Netherlands–Brazil value chains depends fundamentally on the creation of stable and predictable markets for low-carbon products. In the European context, demand is largely shaped by policy frameworks, including carbon pricing, CBAM and sector-specific mandates such as those for sustainable fuels. These instruments play a central role in establishing price signals and creating incentives for low-carbon production.

However, stakeholders emphasise that policy signals alone are insufficient

to enable project development. The availability of offtake agreements is a critical condition for securing investment, particularly for capital-intensive projects. This requires alignment between producers, industrial users and intermediaries, as well as aggregation of demand where individual markets remain limited in scale.

In parallel, alignment of regulatory frameworks between the Netherlands, Brazil and the European Union is essential. This includes harmonisation of monitoring, reporting and verification (MRV) systems, certification schemes and sustainability criteria. Such alignment reduces regulatory uncertainty, facilitates market access and enables the recognition of low-carbon products across jurisdictions.

Bilateral coordination mechanisms can play an important role in this context, supporting dialogue on standards, certification and policy alignment. Taken together, these elements contribute to the formation of markets that are sufficiently robust to support long-term investment and scaling.

### 6.2 Financing and risk allocation

The development of low-carbon value chains is characterised by high capital intensity, long development timelines and exposure to market and regulatory uncertainty. As a result, project bankability remains a central challenge, particularly in early-stage value chains.

Mobilising sufficient capital requires a combination of private investment and public support. Public financial institutions, including development finance institutions and export credit agencies, can play a key role in de-risking projects through instruments such as guarantees, concessional financing and blended finance structures. These mechanisms help to address risks that cannot be generated by private actors alone, particularly in the early phases of project development.

Effective risk allocation across stakeholders is equally important. This includes balancing risks between producers, end-users, technology providers and public actors. Long-term contracts can reduce revenue uncertainty, while public support can mitigate technology and market risks.

The ability to structure bankable projects will depend on the alignment of these financial and contractual elements. In practice, this requires close coordination between industrial stakeholders, financial institutions and public actors to ensure that risks are appropriately distributed and investment conditions are sufficiently attractive.

<b>Funding source / instrument</b>	<b>Type</b>	<b>Short explanation</b>	<b>Role in bilateral collaboration / value chains</b>
Invest International	Public investment vehicle	Finances international projects involving Dutch companies	Supports scaling of Dutch technologies and project development in Brazil
Atradius Dutch State Business	Export credit agency (ECA)	Provides export credit insurance and guarantees	Reduces commercial and political risk for Dutch exporters and investors
FMO	Development finance institution (DFI)	Provides long-term financing for sustainable projects in emerging markets	De-risks investments in Brazil and enables Dutch private sector participation
European Investment Bank	Multilateral public bank	Provides loans and guarantees for large-scale projects	Supports infrastructure and industrial projects and mobilises private capital
World Bank	Multilateral development finance	Provides loans, equity, guarantees, and advisory services	Improves project bankability and supports large-scale energy and infrastructure investments
Inter-American Development Bank	Regional development bank	Provides financing and technical support in Latin America	Supports project development and industrial decarbonisation in Brazil
BNDES	National development finance	Provides loans for industrial and infrastructure projects	Supports domestic scaling of low-carbon industries and infrastructure
Brazilian R&D funding (1% oil revenue clause)	National innovation funding	Mandatory allocation of oil revenues to R&D	Enables joint research and demonstration projects (e.g. chemicals, fuels)
EU Innovation & Demonstration Instruments (e.g. Horizon Europe, EU Innovation Fund)	EU funding programmes	Support R&D, pilot, and first-of-a-kind demonstration projects	Enable early-stage development, reduce technology risk, and accelerate innovation in value chains (e.g. chemicals, biomass conversion)
EU Market Creation Instruments (e.g. European Hydrogen Bank, Carbon Contracts for Difference, ReFuelEU)	Demand-side support	Provide price support and create demand for low-carbon products	Improve bankability through demand certainty and support long-term offtake structures
EU Infrastructure & Investment Instruments (e.g. Connecting Europe Facility, Global Gateway)	Infrastructure funding	Support development of energy, transport, and industrial infrastructure	Enable physical integration of value chains (e.g. ports, hydrogen corridors, logistics networks)
EU External Cooperation Instruments (e.g. NDICI Global Europe, Team Europe Initiatives)	External financing	Support partnerships with non-EU countries	Facilitate Netherlands-Brazil cooperation, support project pipelines, and align investments

### 6.3 Infrastructure and industrial integration

The development of bilateral value chains depends on the availability of infrastructure that connects production, processing and end-use across geographies. This includes both physical infrastructure, such as ports, transportation systems and energy networks and industrial infrastructure, including clusters and processing facilities.

In Brazil, infrastructure development is required to support large-scale production and export of low-carbon products, including access to renewable energy, grid capacity and port facilities. In the Netherlands, integration into existing industrial clusters and logistics systems is essential to enable further processing and distribution within European markets.

The development of international value chain corridors, for example linking production hubs in Brazil with import and processing hubs in the Netherlands, represents a key opportunity. Such corridors can facilitate scale, reduce transaction costs and improve coordination across the value chain.

At the same time, infrastructure constraints, such as grid congestion, transport limitations and permitting processes, can delay project development. Addressing these constraints requires coordinated planning and investment, as well as alignment between public and private stakeholders.

Ultimately, the integration of infrastructure and industrial systems is a prerequisite for scaling. It enables the physical flow of energy carriers and materials, supports industrial symbiosis and allows value chains to develop beyond pilot projects toward full industrial deployment.

### 6.4 Innovation collaboration and knowledge exchange

In addition to market, financial and infrastructure conditions, innovation collaboration plays a critical enabling role in advancing Dutch-Brazilian value chains. Several of the identified opportunities, like in chemicals R&D, biomass conversion and hydrogen, are not yet fully mature and require further development before large-scale deployment becomes viable.

Stakeholder engagement highlights that collaboration in R&D, pilot and demonstration projects can help bridge the gap between technological potential and industrial application. Joint innovation efforts enable partners to combine complementary strengths, reduce technological uncertainty and accelerate learning across the value chain. They also provide a platform to address cross-cutting challenges, such as process optimisation, feedstock integration and system design.

Embedding innovation activities within industrial environments, particularly in Brazil, allows technologies to be tested under real operating conditions. At the same time, participation from Dutch actors supports the transfer of expertise in process development, system integration and scale-up.

Beyond technological development, innovation collaboration can contribute to alignment on standards, data and certification approaches, which are critical for market access and regulatory compliance. It also helps build long-term partnerships between industry, knowledge institutions and public actors.

As such, structured innovation collaboration should be seen not as a separate activity, but as a foundational enabler that supports the development, de-risking and scaling of bilateral value chains over time.

# 7. Outlook for Netherlands-Brazil collaboration

## 7.1 Key insights and conclusions

This briefing confirms a strong strategic case for intensified collaboration between the Netherlands and Brazil in support of industrial transformation. Both countries bring advanced and complementary industrial capabilities: Brazil combines large-scale production, established bio-based pathways, and growing expertise in low-carbon industries, while the Netherlands contributes strengths in system integration, technology development, and access to European markets. Together, this provides a strong foundation for the development of integrated low-carbon value chains.

A focused set of priority value chains, ranging from chemical innovation and biomass-based pathways to low-carbon steel and hydrogen, illustrates where this complementarity can be translated into concrete collaboration. These value chains differ in maturity and timing, but together form a coherent portfolio spanning near-term opportunities and longer-term strategic positioning.

At the same time, the analysis highlights that the primary constraint is not the



availability of opportunities, but the conditions required for implementation. Across value chains, stakeholders consistently point to the lack of bankable business cases, limited demand certainty, and the need for alignment on sustainability and certification frameworks as key barriers.

The overall conclusion is therefore twofold. First, Netherlands–Brazil collaboration offers a credible pathway to jointly develop competitive low-carbon value chains. Second, realising this potential depends on addressing systemic challenges related to markets, financing, infrastructure, and regulatory alignment.

## 7.2 Pathways toward project development

Translating identified opportunities into concrete collaboration requires a phased and coordinated approach. Across value chains, a common development pathway can be observed, moving from early-stage collaboration toward industrial-scale deployment.

In the near term, collaboration is expected to focus on joint research, pilot projects,

and demonstration initiatives, particularly in value chains that are not yet fully mature. These activities are essential to validate technologies, reduce uncertainty, and establish partnerships between stakeholders.

In parallel, the development of a limited number of anchor projects is critical. Such projects, often involving a small group of committed industrial partners, can provide proof of concept, establish initial value chains, and create momentum for further scaling.

Over time, successful pilots can evolve into integrated and scalable value chains, supported by offtake agreements, infrastructure development, and integration into industrial clusters. The development of international value chain corridors, linking production in Brazil with processing and end-use in the Netherlands and the wider EU, represents a key pathway for scaling.

Progress along this pathway depends on simultaneous advancement across the enabling conditions identified in

Chapter 6. Without alignment between market demand, financing structures, infrastructure development, and innovation, projects are unlikely to move beyond isolated initiatives.

## 7.3 Areas for further exploration and cooperation

While this briefing provides a structured basis for collaboration, several areas require further attention to support implementation and scaling.

First, to quantify the potential cost-competitive circular carbon carrier production, additional techno-economic analysis and market validation are needed to assess the long-term competitiveness of selected value chains, particularly in areas such as hydrogen and advanced fuels. This will help prioritise investments and clarify the role of these value chains in future cooperation.

Second, alignment on sustainability, certification, and feedstock use remains a critical issue. Differences in perspectives, particularly regarding biomass, need to be addressed through continued dialogue and

the development of shared frameworks. This is essential to ensure market access and reduce regulatory uncertainty. Third, there is a need to strengthen institutional collaboration. Expanding cooperation between industry, knowledge institutions, financial actors, and public authorities can support the development of joint project pipelines, innovation programmes, and financing structures.

Finally, the outcomes of this work provide a clear starting point for the development of concrete project plans. The next phase should focus on translating priority opportunities into implementable initiatives, supported by targeted stakeholder engagement and structured collaboration mechanisms.

### Authors

Tijmen Steensma  
Ivan Vera Concha  
Berend Vreugdenhil  
Sjoerd Herlaar

### Contributors:

Lisanne Brummelhuis – Ministry of Economic Affairs and Climate Policy  
Mark Schmets – Ministry of Economic Affairs and Climate Policy  
Marinde Vos – Ministry of Economic Affairs and Climate Policy  
Aldrik Gierveld – Embassy of the Netherlands to Brazil  
Robert Thijssen – Netherlands Innovation Network Brazil  
Martijn de Graaff – TNO  
Arie Kalkman – TNO  
Fabio Rosas – TNO

**TNO** innovation  
for life



### Contact

Eduardo da Rosa Silva

Business Developer

✉ [eduardo.darosasilva@tno.nl](mailto:eduardo.darosasilva@tno.nl)

☎ +31 6 2977 0069



Berend Vreugdenhil

Senior Scientist Sustainable Fuels and Chemicals



Ivan Vera Concha

Senior Consultant Circularity & Sustainability Impact



Sjoerd Herlaar

Consultant Circular Economy



Tijmen Steensma

Consultant International Strategy