MAY 2025

Fueling the Future: Energising Green Hydrogen Collaboration between India and The Netherlands

TRACK INDIA
The West Wing

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Track India
22 May 2025

Commissioning party: Embassy of the Kingdom of the Netherlands in India

This report has been published 22 May 2025 by The West Wing: the official youth think tank of the Dutch Ministry of Foreign Affairs. This external report does not represent the views of the Ministry of Foreign Affairs.

Executive Summary

How can the Netherlands, through its Embassy in India, strengthen its ties and collaborate with India to help both countries reach their energy transition ambitions at such a pivotal time for climate action. This is the question this workstream of the West Wing, the official think tank for the Ministry of Foreign Affairs of the Kingdom of the Netherlands and the Advisory Council on International Affairs, set out to answer.

This report outlines a vision (**To Be**), assesses current challenges (**As Is**), and proposes actionable steps (**Transition**) to strengthen bilateral cooperation in the green hydrogen sector.

Because of its potential to decarbonise hard-to-abate industries, green hydrogen has become this report's main subject. However, it is not just green hydrogen's pivotal role in the energy transition that steered the focus of this report. **We believe India's ambition to become a global supplier of green hydrogen and the Netherlands' desire to become a major importer of green hydrogen and a key European distribution hub offer plenty of opportunity for fruitful collaboration that significantly impacts the energy transition in both countries**. However, as an Indo-Dutch collaboration on hydrogen is still in its infancy, we have developed the following recommendations for the Dutch Embassy to solidify this partnership:

Develop a portal to align business needs and stimulate collaboration

To encourage private sector partnerships, provide the most up-to-date information and clear guidelines on effective collaboration on green hydrogen. Interviews identified that it is difficult for companies to locate like-minded businesses, even though both seek partnerships. A popular and proven format to improve information access is through online channels such as a web portal, where organisations can find all the necessary info to collaborate with Indian and Dutch companies.

Create a 'Young Talent Exchange Programme'

An exchange program can promote early intercultural exchange between India and the Netherlands among young and talented people. This will raise awareness and understanding and will make future collaboration more straightforward. Our research revealed that India, although a global player, is often overlooked by the Netherlands. Offering students an esteemed exchange project will strengthen Indo-Dutch relations from the ground up.

Enhance the transfer of knowledge and technology

Long-term cooperation in sharing knowledge and technology is essential, with Indian and Dutch companies and research institutes working together on innovations in the green hydrogen sector.

The Indo-Dutch partnership on green hydrogen will face both opportunities and challenges. To remain relevant and impactful, the Dutch Embassy should continue to act as a facilitator, connecting not only governments and industries, but also knowledge systems, social initiatives and younger generations. By embedding justice, transparency and partnership into each step of this transition, India and the Netherlands can meet their climate targets and lead by example in building a greener, fairer global economy.

Preface

It has been a pleasure and an honour to guide twelve sharp, curious and committed students and young professionals in writing this policy report. Coming from diverse fields, the track members brought a wide range of knowledge and perspectives to the table. What united them was a shared interest in Dutch foreign policy and an ambition to make it future-proof.

Responding to a policy question from the Dutch Embassy in New Delhi, India, this track explored the underutilised and emerging opportunities for collaboration between the Netherlands and India in the context of the energy transition. We chose to focus on green hydrogen—a field in which India has set ambitious goals and is progressing rapidly, and where we see real potential for the Netherlands to contribute to Europe's sustainable energy transition, recognising that green hydrogen will be key to achieving it.

The topic proved to be as exciting as it was complex. From energy diplomacy and the technicalities of green hydrogen (policy), to the challenges of the global energy transition and the fascinating dynamics of India as a geopolitical actor – there was much to unpack before we could even begin formulating policy advice. It was inspiring to see how quickly the track members engaged with these wide-ranging topics and challenges, supporting one another and drawing strength from their diverse perspectives.

I would like to sincerely thank the Dutch Embassy in New Delhi for raising this relevant and forward-looking question and drawing our attention to this dynamic and strategically important country, especially in light of ongoing geopolitical shifts and the urgent global need for sustainable energy. In particular, I would like to thank Paulina Chromik and her colleagues from the economic department for their support and guidance throughout the year. A special word of thanks also goes to the (over 25) experts who generously made time for interviews or reviewed parts of our work—their insights, feedback, and encouragement helped sharpen and ground our thinking.

Hopefully, this report contributes to a deeper understanding of the potential for Indo-Dutch cooperation on green hydrogen and offers a meaningful step towards a more sustainable and inclusive future.

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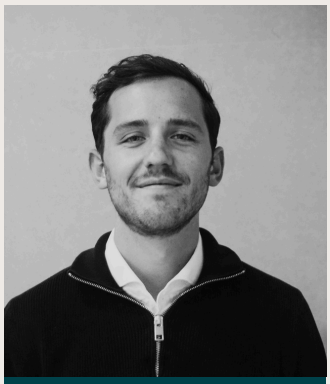

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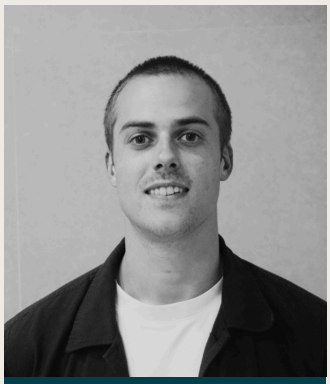

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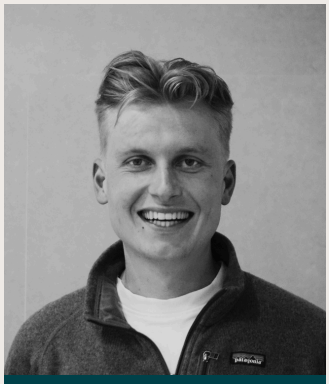

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List of Abbreviations

DEI	Demonstration Energy and Climate Innovation Scheme
EC	European Commission
EU	European Union
IEA	International Energy Agency
MFA	Ministry of Foreign Affairs
NAHSS	Netherlands-Asia Honours Summer School
NGHM	National Green Hydrogen Mission
NZE	Net Zero Emissions
OCW	Ministry of Education, Culture and Science (Onderwijs, Cultuur en Wetenschap)
OECD	Organisation for Economic Co-operation and Development
OWE	Large-Scale Hydrogen Production Using Electrolyser Subsidy (Ondersteuningsregeling Waterstof Electrolyse)
RVO	Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland)
SDG	Sustainable Development Goal
TNO	Netherlands Organisation for Applied Scientific Research (Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek)
UN	United Nations

Introduction

At The West Wing, the official think tank for the Ministry of Foreign Affairs of the Kingdom of the Netherland and the Advisory Council on International Affairs, foreign policy should reflect the world of tomorrow. We envision a world where young people are not just subjects of policy, but active participants in shaping it. Track India places youth perspectives at the heart of our work.

This journey began with our engagement in the West Wing, where we were asked a key question by the Embassy of the Kingdom of the Netherlands in India (hereafter referred to as the Dutch Embassy): *What is the potential for collaboration between India and the Netherlands in the field of green energy?* This question became the foundation of our advice, driven by a desire to contribute meaningfully to a more sustainable, inclusive, and youth-informed future.

Why dive into green energy collaborations between India and the Netherlands?

With a population of over 1.4 billion and a growing economy, India's energy consumption and carbon emissions are expected to rise significantly. While being the third-largest energy consumer and emitter of greenhouse gases,[1] India aims to become Atmanirbhar Bharat (self-reliant India) through clean energy and inspire the global energy transition. Meeting the target to become net-zero emissions (NZE) in 2070 requires critical sectors, such as power, industry, and transport, to transition from conventional production methods to low-carbon technologies. Although India has made advances in renewable energy, it still faces the pressing challenge of rapidly scaling up its capacity to meet these targets.[2] India remains heavily reliant on coal, which accounts for around 55% of its energy supply, mainly sourced from coal-rich states like Jharkhand, Chhattisgarh, and Odisha. These regions are crucial to the national economy and politics, making transitioning from coal to renewable energy challenging due to potential job losses and economic impact.

As the world moves toward reducing carbon emissions to slow down climate change, green hydrogen offers a versatile, clean, and scalable solution for decarbonisation.[a] By replacing fossil fuels or fossil fuel-based hydrogen with green hydrogen in key sectors, carbon emissions can be significantly reduced, helping to meet global climate targets.[3] Demand for green hydrogen is expected to primarily come from energy-intensive industries that require high-temperature heat and use green hydrogen as a feedstock for industrial processes. Moreover, green hydrogen is needed to decarbonise sectors where direct electrification is not an option.[4]

[1] Most hydrogen is produced from natural gas (CH_4) through steam methane reforming, resulting in "grey" hydrogen, which releases substantial CO_2 emissions. To address these emissions, "blue" hydrogen also uses steam methane reforming but incorporates carbon capture and storage (CCS) technology. In contrast, "green" hydrogen is produced via water electrolysis, using electricity from renewable sources like solar or wind. This process only generates water vapour as a byproduct, with no CO_2 emissions and no fossil fuels involved.

Green hydrogen can also drive significant decarbonisation in the Indian economy. India's National Green Hydrogen Mission (NGHM) is a comprehensive national initiative aimed at positioning the country as a global leader in the production, utilisation, and export of green hydrogen.[5] This strategy is integral to India's broader energy transition goals, including achieving NZE by 2070 and enhancing energy security through reduced dependence on imported fossil fuels. As a result, India seeks valuable international partners to foster its domestic production capacity and kickstart green hydrogen export.[6]

While India focuses on exporting green hydrogen, the Netherlands prepares to serve as a gateway for transiting it from international trade to the European market. As a strategic location with international ports, the Netherlands can play a crucial role in importing, distributing, and storing green hydrogen in Europe. Therefore, the Netherlands presents itself as a strategic partner, supported by Dutch companies with a strong reputation for innovation in renewable energy and technology. This makes a collaboration between India and the Netherlands on green hydrogen particularly compelling. Clear opportunities for mutually beneficial partnerships are on the horizon.

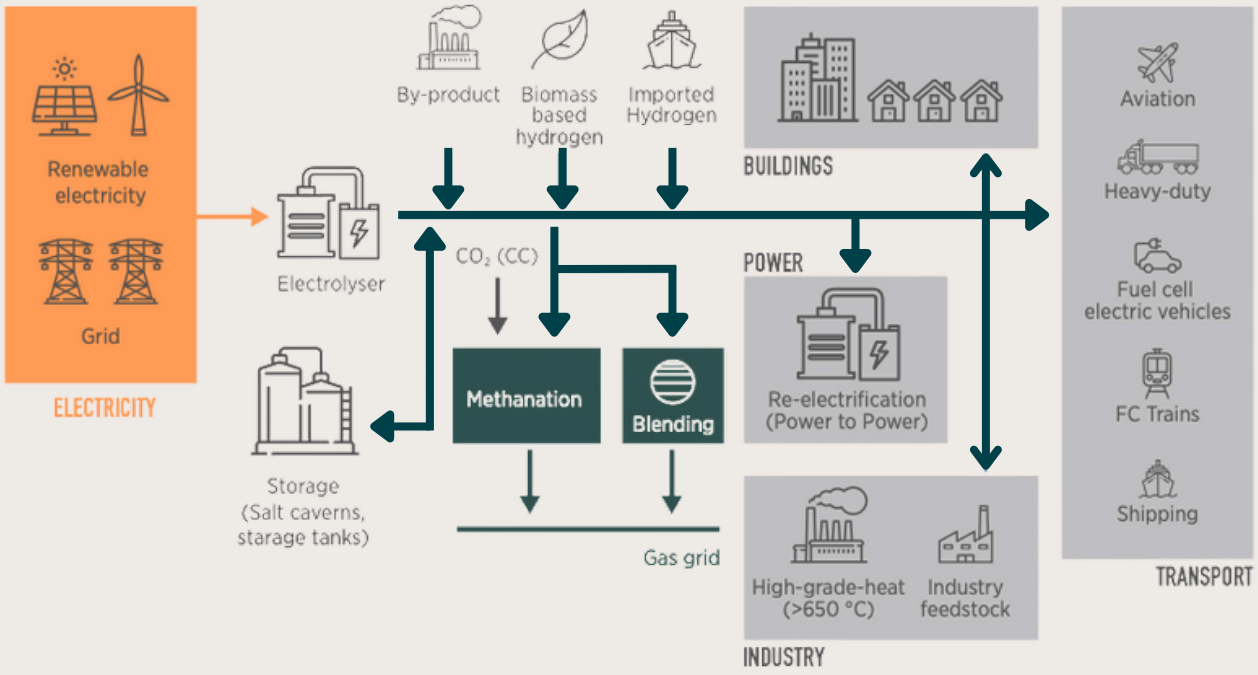

Figure 1: Visual display of the production and different uses of green hydrogen.[1]

Our approach

The content of this report is based on a review of publicly available literature, including policy briefs from renowned research institutes, reports from government organisations, industry reports, and scientific publications.

In addition, twenty interviews with actors in the green hydrogen economy were conducted, albeit from the private sector, the public sector, research institutes, and universities. A list of interviewees can be found in Appendix A. The interviews were conducted in a semi-structured manner. It is important to note that not all arguments presented in this report stem solely from the interviews. As with any active youth think tank, the findings also reflect the authors' individual ideas, expert insights, and values.

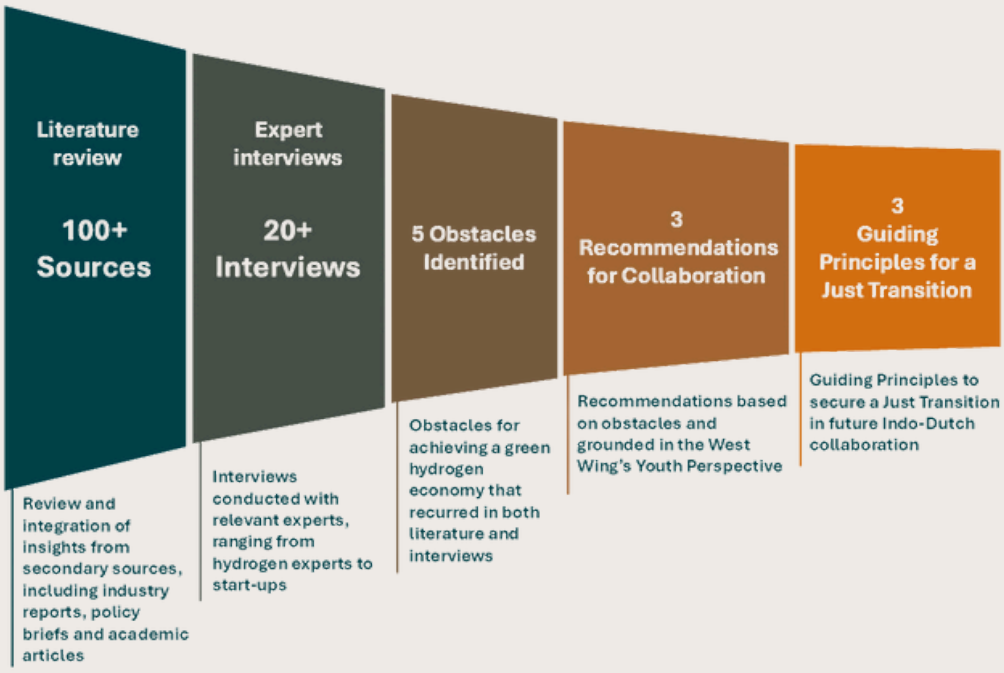

Figure 2: Approach of this report.

How to read this report?

This report is developed around three core chapters.

- The **As Is**-chapter outlines the current state of Indo-Dutch green hydrogen collaboration, highlighting five key obstacles.
- The **To Be**-chapter presents four strategic visions that illustrate what successful collaborations could look like.
- The **Transition**-chapter provides actionable recommendations to move from the current state towards an envisioned future.

These three chapters are supported by guiding principles for the Dutch Embassy, presented in the Guiding Principles-chapter. These principles address potential risks and ensure a resilient, sustainable, and just transition towards a green hydrogen economy. The report is enriched with infoboxes with additional insights that, while not central to the advice, nevertheless offer valuable context on Indo-Dutch green hydrogen collaboration. The report is built on two pillars: youth-led and future-proof. It centres the voices of young people as key stakeholders in shaping a sustainable and inclusive future, while grounding the analysis in long-term global trends.

This dual focus reflects our commitment to empowering youth and underscores our dedication to creating resilient and adaptable solutions in the face of an ever-changing world.

Our strength lies in contributing to the Dutch Embassy's mission to become a green hydrogen powerhouse by thinking out of the box, advocating for sustainability, embracing innovation and fostering dialogue on the subject. We hope that our energy, creativity, and sharp eye will help the Dutch Embassy in its commitment to becoming a green hydrogen powerhouse. If rooted in mutual respect and shared responsibility, Indo-Dutch cooperation on green hydrogen has the potential to become a model for inclusive and future-oriented climate action. This report is our contribution to that vision.

Figure 3: Overview of structure of report.

Infobox / Why Green Hydrogen is more relevant than ever

Amid shifting global power dynamics and a rapidly evolving geopolitical landscape, there is a growing risk that the urgency of the climate crisis will be overshadowed. Issues like national defence, critical resource access, and economic self-sufficiency are understandably moving to the forefront of international policy agendas. However, from the perspective of youth, especially within Track India of the West Wing Think Tank, we stress that these priorities must not make urgent climate action disappear into the background.

Today's geopolitical landscape underscores the urgent need to strengthen energy sovereignty. Europe's continued dependence on external energy sources, whether from Russia, the United States, or elsewhere, exposes it to vulnerabilities and limits its capacity to act independently on the global stage.[7] Green hydrogen presents a partial solution to this problem, offering a path towards a more diversified energy portfolio.

Positioning Europe at the forefront of green hydrogen development is not merely a climate action necessity but a strategic imperative within the broader global energy transition. By investing in this technology, Europe can tackle the climate crisis, enhance industrial competitiveness, and reinforce long-term geopolitical resilience. This is essential to securing a sustainable, sovereign, and bright future.

As Is:
Obstacles to an Indo-Dutch green hydrogen collaboration

It is essential to first understand the current situation to develop meaningful recommendations for the necessary transition toward the visions presented in the To Be-chapter. This As Is-chapter overviews the current green hydrogen landscape in India and the Netherlands. Based on this current state, obstacles have been identified. Together, these insights form the foundation for the recommendations that follow.

Key Takeaways

India's ambitions and needs:

- India aims to become a global leader in producing and exporting green hydrogen.
- India is committed to achieving NZE by 2070, supported by the National Green Hydrogen Mission.
- India seeks to inspire and supply green hydrogen globally, creating jobs and economic growth.

The Netherlands' ambitions and needs:

- The Netherlands aims to become a leading producer, importer, and transit hub for green hydrogen in Europe.
- The Netherlands is committed to achieving NZE by 2050, supported by national and EU hydrogen infrastructure and innovation subsidies.

Five main obstacles for effective Indo-Dutch green hydrogen collaboration have been identified:

- **India faces competition from other countries.**
  - Where India offers favourable conditions for green hydrogen exports, established partnerships between the Netherlands and other countries give competing countries an early lead, making it crucial for India to position itself as a credible and strategic trade partner.

- **India and the Netherlands face infrastructure problems.**
  - While the Netherlands struggles with delayed infrastructure investments, India still waits for the market to mature and fully develop its infrastructure.
- **Green hydrogen is still too expensive to produce.**
  - Uncertain demand, high production costs, and a lack of long-term contracts create a vicious cycle that hinders the investment and scale needed to lower costs.
- **The available subsidies are not sufficient for decarbonisation.**
  - While support schemes exist, their scale is far below what is needed to decarbonise heavy industry, making them insufficient to drive substantial investment in green hydrogen.
- **Dutch companies are reluctant to invest in India.**
  - Dutch companies are cautious about investing in India due to political and logistical uncertainties, market immaturity, and cultural differences, which may hinder effective collaboration and delay profitable green hydrogen ventures.

Green Hydrogen Policy

Green hydrogen policy in India

India has ambitious renewable energy targets. During the Paris Climate Agreement in 2015, India declared its ambitious goal of having 175 GW[b] of renewable energy capacity by 2022 – similar to the electricity demand of 450 million households in India – and 500 GW by 2030. At the COP26 in Glasgow in 2021, Prime Minister Modi announced that India plans to be climate neutral by 2070.[8] With India's National Green Hydrogen Mission, India aims to decarbonise its economy, reduce reliance on fossil fuels, and become a technical expert in green hydrogen.[9] Moreover, India aspires to become a leader in global clean energy, both aspiring to become an international manufacturer of green hydrogen and inspiring other countries to join this mission.[10]

India has allocated roughly 2.4 billion USD to reach its goal from the NGHM.[11] The investments in green hydrogen are already showing results, as private actors increasingly invest in green hydrogen infrastructure projects. Recently, Adani Energy Solutions committed to a 325 million USD project to develop power transmission infrastructure in Gujarat, designed to support large-scale green hydrogen production.[12]

[b] In different contexts, various units are used to discuss green hydrogen. When referring to transport volumes or demand within the energy mix, megatonnes (million tonnes) or petajoules (PJ) are commonly utilized. However, when addressing production capacity, gigawatts (GW) are often the preferred measurement for electrolysis capacity. To clarify, 1 megatonne is equivalent to a lower heating value of 120 PJ. Depending on the specific technology and operating conditions, an electrolyser with a capacity of 1 GW can produce approximately 200 to 400 megatonnes of green hydrogen per year.

These investments illustrate India's commitment to introducing green hydrogen in its energy mix and that India is rapidly transforming its infrastructure capabilities to meet growing amounts of hydrogen. While these policies focus on the future, they exist and must be dealt with in the here and now. That is why they are covered in this current situation sketch.

Green hydrogen policy in the Netherlands

For the Netherlands, it is essential to minimise the use of grey hydrogen to achieve the goal of reducing greenhouse gas emissions to NZE by 2050 and thereafter.[13] The National Plan Energy System (NPE) anticipates a significant demand for green hydrogen by 2050, estimated at approximately 660 petajoules or 5.5 million tonnes (a quarter of the total energy consumption of the Netherlands). To meet this demand, a strong green hydrogen production capacity will be necessary, along with the ability to import hydrogen, estimated at 40% to 60% import for 2035 and 40% to 70% import in 2040 (including transit to other countries in Europe).[14] [15]

In the Netherlands, four port areas aim to import hydrogen in the near future: Port of Amsterdam, Port of Rotterdam, Groningen Seaports, and North Sea Port Vlissingen. The Port of Rotterdam plans to have a green ammonia import terminal (including storage and 'ammonia cracking facilities') running by 2026,[16] Vlissingen by 2028.[17] Groningen aims to be able to handle ammonia imports in the 2030s. The port of Amsterdam, however, is not looking into ammonia imports, but only at non-toxic hydrogen carriers.[19]

The Port of Rotterdam is on a mission to become Europe's leading green hydrogen hub. By developing a large-scale hydrogen network, the port is set to play a key role in green hydrogen production, import, application, and transport across Northwest Europe.[20] Randolf Weterings, programme manager for electrification and hydrogen at the Port of Rotterdam Authority, emphasised: "*In Rotterdam, we already have a significant hydrogen market and infrastructure. We will use that knowledge and asset base to scale it further up to 20 million tonnes of hydrogen by 2050.*"[21]

The demand for hydrogen in Northwestern Europe will be immense, requiring both local production and large-scale imports.[22] To meet this challenge, Rotterdam is spearheading projects such as the Delta Rhine Corridor, a pipeline network connecting the port with key industrial regions in the Netherlands and Germany.[23] In addition to infrastructure development, Rotterdam is championing green corridors, collaborating with ports, shipping companies, and fuel suppliers to establish transport routes powered by sustainable fuels.[24]

To realise its NZE objectives and green hydrogen ambitions, the Netherlands is actively supporting green hydrogen projects through subsidies and policy incentives.[25]

For instance, in 2023, the Dutch government significantly increased financial support mechanisms to stimulate investments in large-scale green hydrogen production and infrastructure. An overview of these subsidies is included in Appendix C. The Dutch subsidies are supported by European subsidies and policies, which are presented in Appendix D and Appendix E, respectively.

Key Obstacles to Indo-Dutch Green Hydrogen Collaboration

While the business case for Indian green hydrogen holds immense potential, several obstacles still hinder its successful realisation. These factors primarily relate to financial viability, market competition, and technological capabilities. The five main obstacles are explained below.

Obstacle 1 – India competes with other countries in the race to become a global green hydrogen manufacturer

India faces intense competition from other global green hydrogen producers, such as Brazil, Morocco, and Saudi Arabia. Some of these countries have already established collaboration agreements with the Netherlands, giving them a first-mover advantage over India.

The current strategy of the Netherlands is to import green hydrogen from multiple countries to mitigate risks. Brazil, Oman, and the United States are being considered. Additionally, close collaboration is taking place within Europe, particularly with the Nordics.[26] India strongly focuses on exports and benefits from favourable conditions for renewable energy production. However, India has only been on the Netherlands' radar for green hydrogen exports for the past two years.[27] A strategic partnership between the Netherlands and India is therefore relatively new and still underdeveloped.[28]

To meet its target of importing 90% of its hydrogen[29], the Port of Rotterdam evaluates countries based on financial stability, infrastructure quality, reliability (anti-corruption and financial trustworthiness), port access, transport costs, and social investments.[30] Therefore, India needs to consider these requirements to enable collaborations with EU-based partners like the Port of Rotterdam.

Infobox / Best Practices from Brazil

Brazil has 10 years of experience in developing a green hydrogen economy. The Netherlands has already closely partnered with Brazil in green hydrogen trade. Brazil's best practices could potentially help India enhance its trade relations with the Netherlands. Learnings India can take from Brazil are the following:

- Brazil has existing infrastructure and expertise in ammonia as a hydrogen carrier, providing an efficient transport option.[32]
- The country has invested in strong networks and has established collaborations with European buyers and investors.[33]
- Brazil considers water consumption and ecological impact, contributing to the sustainability of projects.[34]
- The Port of Pecém has been developed as a strategic hub for hydrogen exports to the Netherlands, with the Port of Rotterdam holding a 30% stake in Pecém.[35]
- Logistics chains and collaboration between Brazilian and Dutch companies have been strengthened, making hydrogen exports to the Netherlands more logistically efficient.
- International financial institutions such as the World Bank and the International Finance Corporation support hydrogen infrastructure in Brazil. This provides a stable foundation for Dutch investments and cooperation in hydrogen projects, reducing investor risks and accelerating growth.[37]
- Regions in Brazil, such as the northeast, already generate over 90% of their energy from renewable sources. This allows for more flexible policies on hydrogen production, such as permitting the use of the existing electricity grid without jeopardising the 'green' hydrogen status. This lowers costs and risks for hydrogen producers.[38]

Obstacle 2 – India and the Netherlands face infrastructure problems

The Netherlands and India lack a fully developed transport and conversion infrastructure for green hydrogen. The development of this infrastructure is costly and lags because of demand uncertainties. This remains a bottleneck for the transition to a green hydrogen economy.

In the Netherlands, the hydrogen infrastructure is still under development and has experienced delays. For instance, while Rotterdam aims to be operational as a hydrogen import hub by 2026, full national connectivity is not expected before 2031.[39]

Necessary extensions, such as the connection to the German Ruhr area, have been postponed to at least 2032.[40] Moreover, large-scale imports of hydrogen carriers like ammonia require dedicated conversion facilities. The country's plant for ammonia cracking, developed by Amplifhy, is not expected to be operational until 2026, limiting short-term import capacity.[41]

Meanwhile, India is already preparing its green hydrogen economy, having designated green hydrogen hubs and committed substantial public investment. The first hub is expected to be completed by 2027, with the second primarily in place by 2032.[42] Infrastructure development is progressing, backed by clear policy direction. However, insufficient domestic and international demand currently hampers full development. This means that the current hydrogen infrastructure, with essential elements like specialised pipelines, storage facilities, and refuelling stations, is still limited.[43] [44] Domestic demand, however, is expected to grow significantly, potentially exceeding 27 million tonnes per year by 2050, driven by sectors such as steel, fertilisers, refining, and heavy-duty transport.[45]

To conclude, the Netherlands faces delays in infrastructure investment. India is preparing to scale up through government support but is waiting for greater market maturity before fully developing its infrastructure. For effective bilateral cooperation on green hydrogen, both countries must better align infrastructure development with future demand.

Obstacle 3 – Green hydrogen remains costlier than alternatives

Green hydrogen remains too expensive to compete with fossil-based alternatives, and this price gap is often cited as the primary barrier to scaling both supply and demand.[46] [47] Green hydrogen remains substantially more expensive than grey or blue hydrogen, primarily due to the high cost of renewable electricity and electrolysis. A moderate scenario estimate by CE Delft and TNO suggests a price for the Netherlands of approximately 2.70 EUR/kg for grey hydrogen (produced in the Netherlands) versus 7.30 EUR/kg for green hydrogen (imported from Morocco, the cheapest option that has been researched) by 2030.[48] While costs are expected to decline, current price gaps discourage private investment and market uptake.

Additionally, for producers, the financial viability of green hydrogen projects is undermined by unclear demand signals. High prices make green hydrogen importers hesitant to commit to long-term contracts, fearing uncertain industrial demand. This leads to a self-reinforcing cycle: low demand keeps prices high, high prices discourage demand, and limited scale delays the cost reductions needed to break the cycle.

In short, without an apparent and sizable demand, production does not scale and without scaled production, prices remain uncompetitive. For international partnerships, such as between India and the Netherlands, joint strategies must go beyond technology and infrastructure.

A joint focus on stimulating demand, such as through regulatory incentives, public procurement, and carbon pricing, is key to unlocking viable business cases across the entire value chain

Obstacle 4 – The available subsidies are not sufficient for decarbonisation

There are plenty of different green hydrogen subsidies available, both in the Netherlands and the EU, as shown in Appendices C and D. However, current funding levels fall well short of what is needed to decarbonise heavy industry.[49] To demonstrate, the OWE (*Opschaling volledig hernieuwbare waterstofproductie via elektrolyse*) subsidy, as carried out by Netherlands Enterprise Agency (*Rijksdienst voor Ondernemend Nederland*) RVO was 250 million EUR for projects with a total capacity of 0.1 GW. In contrast, the estimated capital costs (even without operational costs) to reach the Dutch electrolysis target of 4 GW are 12 billion EUR. This is 50 times the OWE subsidy.[50] Therefore, subsidies are currently insufficient to incentivise green hydrogen.

Obstacle 5 – Dutch companies are reluctant to invest in India

One barrier that could prevent Dutch and Indian companies from working together is their cultural differences. Several interviewed companies noted a clear contrast in professional working styles between the Netherlands and India. For example, Dutch companies have pointed out that they find Indian information provision confusing, with no websites or dated ones and incorrect addresses.[51] At the same time, Indian companies often perceive Dutch counterparts as slow to respond and rigid due to their procedural approach.[52] These cultural and organisational differences could challenge effective communication and complicate bilateral collaboration.

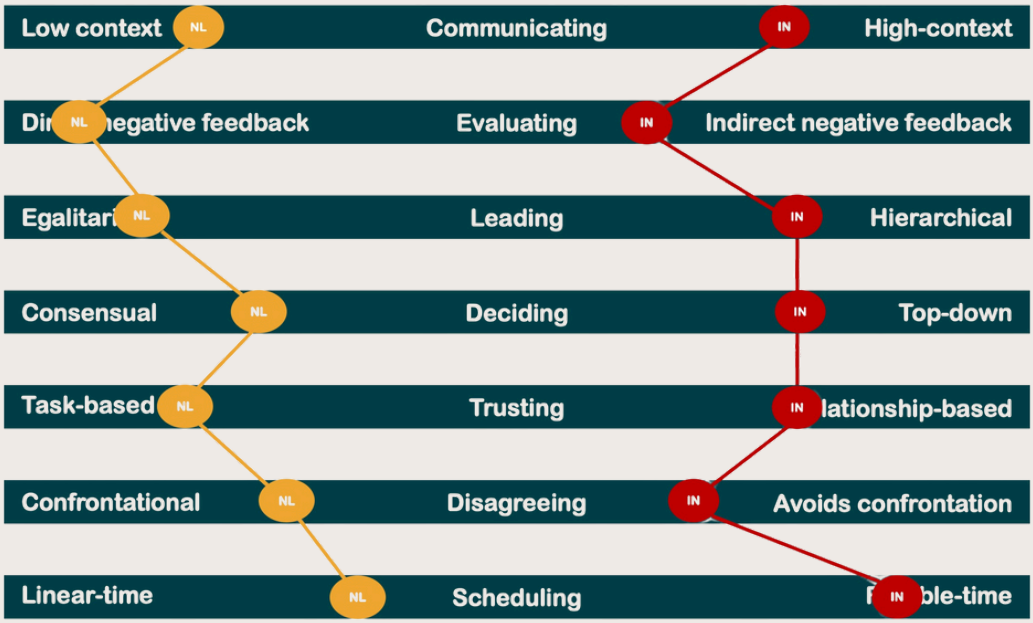

Figure 4: A visual representation of the cultural differences between the Netherlands and India according to the Culture Map by Erin Meyer.

This contrast is highlighted in a Culture Map, based on the theory of Erin Meyer.[53] As highlighted in Figure 4 above, Indian and Dutch professional culture could barely be further apart. Indians generally prefer indirect communication, whereas the Dutch are usually direct in their communication.

The Dutch are also more confrontational, which can come across as impolite for Indians. Additionally, Indian professionals tend to be more flexible in their planning, while the Dutch are generally more structured and rigid – a contrast also highlighted by several interviewees. These differences could hinder collaboration between Dutch and Indian companies, as they may struggle to fully understand each other's approaches to communication, planning, and decision-making.[54]

Infobox / Harnessing Decentralisation, Geopolitics and Sustainablity

India is a dynamic and diverse country, rich in political, social, and economic complexity. As a federal republic consisting of 28 states and eight union territories, each with its own state government and powers,[55] India's political landscape is marked by a wide array of regulations, taxes, and policies that vary from state to state. This decentralisation offers a unique opportunity for the country to accelerate its progress toward NZE by enabling states to design and implement climate policies tailored to their local contexts, particularly in key sectors like energy, agriculture, and land use. States like Tamil Nadu, with its offshore wind projects,[56] and Gujarat, known for its green industrial zones, exemplify the potential for decentralised action to drive sustainable development.[57] However, India's true strength lies not merely in decentralisation, but in the effective coordination between the central and state governments to ensure that national climate goals are achieved.

Strategically located in South Asia, India occupies a central position in regional geopolitics, significantly influencing global trade and security dynamics, particularly through its complex relations with China and Pakistan. The ongoing tensions with Pakistan, especially over the contentious Kashmir region and concerns over cross-border terrorism, present enduring challenges that could destabilise regional growth and security.[58] These tensions are critical factors influencing India's geopolitical strategy and long-term stability.

Despite these challenges, India has consistently strengthened its global presence by engaging actively in multilateral platforms such as the United Nations (UN), QUAD, BRICS, and the Shanghai Cooperation Organisation (SCO).[59] These diplomatic efforts and a rapidly growing economy have enhanced India's resilience and global stature. As one of the world's largest and fastest-growing economies, India attracts substantial foreign investment, particularly in high-growth sectors such as technology, renewable energy, and manufacturing. The country's ambitious push for clean energy – spearheading solar power projects and advancing green hydrogen initiatives – further demonstrates India's commitment to sustainable development and its broader vision for a low-carbon future.

To Be:

How do we envision an Indo-Dutch green hydrogen collaboration?

With green hydrogen as a crucial stepping stone for both India and the Netherlands in achieving their sustainability ambitions, strengthening Indo-Dutch collaboration supports green transitions of both countries, albeit in distinct ways. These national ambitions are situated in a broader energy landscape, where India exports green hydrogen and the Netherlands forms the European hub for green hydrogen imports. Four concrete, strategic visions are presented for green hydrogen collaborations between India and the Netherlands.

Key Takeaways

A future in which India and the Netherlands are partners in the green hydrogen economy is imagined through four visions:

Vision 1 – European demand and Indian supply are aligned
For a reliable green hydrogen trade relationship, European demand and Indian supply must be closely aligned through long-term offtake agreements. Coordinated carrier choices like ammonia and infrastructure compatibility are essential to scale the supply chain efficiently.

Vision 2 – Port of Rotterdam is Europe's green hydrogen hub
The Port of Rotterdam will play a pivotal role in green hydrogen distribution across Europe, with new and repurposed pipeline infrastructure connecting major industrial clusters. Collaboration with India would give Indian producers access to the European market while reinforcing the Netherlands' role as an energy hub.

Vision 3 – The Dutch Embassy in India as key facilitator for Indo-Dutch collaboration
Diplomatic support, primarily through the Dutch Embassy in New Delhi, is vital to aligning regulations and certifications between the EU and India. Strengthened ties at the political and economic level will help navigate challenges such as compliance with REPowerEU standards.

Vision 4 – Indo-Dutch collaborations focus also on knowledge transfer and co-development

Joint R&D initiatives between Indian and Dutch institutions foster co-ownership and accelerate green hydrogen innovation. Knowledge exchange and co-development will ensure both nations benefit from technological advancements and contribute to global energy transitions.

Imagining the future:

Four Indo-Dutch green hydrogen collaboration visions

Vision 1 – European demand and Indian supply are aligned

India's NGHM aims to make India a global hub for producing, using, and exporting green hydrogen and its derivatives.[62] Demand and production must be closely aligned for the green hydrogen economy to thrive, with offtake agreements playing a central role in ensuring stability and predictability.[63] The Netherlands, serving as a demand centre and transit hub for Europe, is establishing clear agreements on demand volumes. Additionally, the choice of carrier for green hydrogen, such as ammonia, is crucial for efficient transport and broader market accessibility, particularly for India's European exports. Ensuring alignment between European demand, supply volumes, and carrier choices is critical to building a reliable and scalable green hydrogen supply chain.

Vision 2 – Port of Rotterdam as Europe's green hydrogen hub

The highest demand for green hydrogen is anticipated in the four coastal industrial clusters: the Ports of Amsterdam, Rotterdam, Groningen Seaports, and North Sea Port Vlissingen. The ultimate goal is to connect all four industrial clusters to a broader network by 2033, not only within the Netherlands but also across neighbouring countries such as Germany and Belgium.[64] This will be partly achieved by repurposing existing gas pipelines that will become available, due to the decline in natural gas usage in the coming years.[65] The potential pipelines from the Port of Rotterdam to industrial clusters in Germany (part of the Delta Rhine Corridor) are a key component of this network, reinforcing the Port of Rotterdam's role as a hub for green hydrogen import, storage, and distribution.[66]

TO BE / PAGE 24

Vision 3 – The Dutch Embassy as key facilitator for Indo-Dutch collaboration

We envision a future in which India and the Netherlands become close allies within the energy transition, trade and diplomacy. First, we envision that Indian green hydrogen exports to Europe fully comply with EU certification standards outlined in the REPowerEU strategy.[68]

The recent visit of Ursula von der Leyen to India, accompanied by 21 of the 27 European Commissioners, signals a significant step toward strengthening diplomatic and economic ties between the EU and India.[69] This creates fertile ground for deeper collaboration between European countries and India, particularly in the realm of sustainable energy. However, the EU maintains stringent regulations, such as the REPowerEU strategy, on the import of green energy, which must be carefully navigated.[70] In this context, by proactively guiding governments and businesses through this process, the Embassy can strengthen its position as a facilitator in the global energy transition.

Vision 4 – Indo-Dutch collaborations focus on knowledge transfer and co-development

Besides studying the possibilities of importing green hydrogen from India, several Dutch institutions, including TNO[71] and the University of Groningen, actively collaborate with Indian institutions. These partnerships are designed to foster knowledge sharing and accelerate the adoption of green hydrogen technologies. By leveraging expertise from both countries, the goal is to innovate and scale up green hydrogen solutions that can contribute to the global energy transition. As the demand for clean energy continues to rise, these institutions should strengthen their collaborations in the future. This enhances the deployment of green hydrogen technologies. Collaboration should go beyond technology transfer or knowledge exchange and toward genuine co-development efforts.[72] This means both countries contribute resources, expertise, and innovation, leading to shared ownership of the resulting technologies. Such an approach ensures that both partners benefit equitably from advancements, fosters long-term partnerships, and builds mutual capacity for sustainable green hydrogen development.

Transition:
How to get there?

Key Takeaways

- Not all obstacles for Indo-Dutch collaboration on green hydrogen listed in As Is can be directly tackled through the embassy. Therefore, the decision was made by Track India in its recommendations to focus on the obstacles that have a high feasibility over the highest impact.
- Obstacle 1 (Competition with other countries) and obstacle 5 (Dutch companies' reluctance to invest in India) are deemed both feasible and impactful to be tackled by the Dutch Embassy.

Three concrete recommendations have been developed:

Recommendation 1: Develop portal to align business needs and stimulate collaboration
The proposed online portal aims to stimulate collaboration between Dutch and Indian companies in green hydrogen by making investment opportunities transparent, facilitating matchmaking, and digitising trade processes, thereby reducing market entry barriers and cultural obstacles.

Recommendation 2: Create a 'Young Talent Exchange Programme'
The proposed "Young Talent Exchange Programme" aims to bridge cultural gaps, enhance awareness of India's market potential, and foster mutual understanding by enabling Dutch students to study, intern, or participate in summer schools at Indian universities, leveraging India's rising education standards and building long-term professional and academic ties.

Recommendation 3: Enhance the transfer of knowledge and technology
The proposed enhancement of knowledge and technology transfer aims to strengthen green hydrogen collaborations between India and the Netherlands by facilitating technology sharing among companies, fostering innovation through joint research at institutions, and developing expertise via academic exchanges, thereby creating a sustainable ecosystem for long-term growth and decarbonisation.

What is needed to get to To Be

The As Is-chapter outlined the current state of Indo-Dutch green hydrogen collaboration and highlighted key obstacles. At the same time, the To Be-chapter presented ambitious visions of what a successful partnership could look like. Many of these challenges stem from a shared uncertainty about how demand, supply, and pricing will develop. In other words, without reliable demand, production cannot scale; without scale, prices stay high. And high prices, in turn, suppress demand. Whereas various solutions have been proposed to improve green hydrogen's business case, this chapter focuses solely on actions that are feasible for the Dutch Embassy and relevant to the scope of this report. First, the most relevant obstacles for the Dutch Embassy are identified. Next, concrete recommendations on how the Dutch Embassy in India can facilitate a transition are presented. Our core pillars guide this approach: a youth-led and future-proof Indo-Dutch green hydrogen partnership.

Impact of solving the obstacle and feasibility for the Dutch Embassy

The challenges in developing a robust green hydrogen economy both influence and are influenced by a wide range of actors, such as EU policymakers and infrastructure developers in India. For the Dutch Embassy, it is crucial to focus on feasible and impactful actions. That is, actions that fall within the Dutch Embassy's capabilities and can make a meaningful difference. Figure 5 explores the five obstacles identified in the As Is-chapter and relates the obstacles to the impact and feasibility of the Dutch Embassy's actions. While this report focuses on relevant actions for the Dutch Embassy, the obstacles not labelled in the high feasibility-quadrants still hold value. The other obstacles can become actionable for different actors in green hydrogen collaborations.

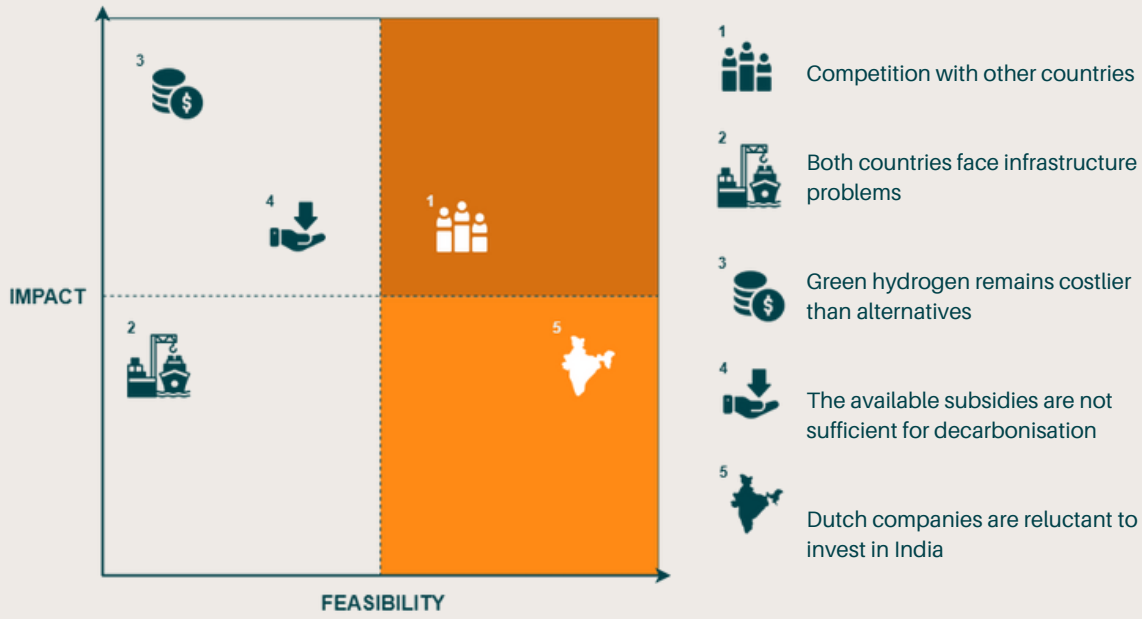

Figure 5: Impact-feasibility matrix based on the findings from the As Is-chapter. The figure showcases both the impact the removal of a barrier would have on achieving the ideal To Be situation and the feasibility of the Dutch Embassy in New Delhi being able to remove the barrier.

The impact-feasibility matrix results from a qualitative analysis performed by the members of Track India. The impact and feasibility range scores are thus based on qualitative assumptions.
Obstacle 1 (*India competes with other countries*) is considered feasible for the Dutch Embassy to address, as the Embassy can serve as a facilitator for Dutch companies seeking to expand abroad. In doing so, it can contribute to enhancing India's appeal as a destination for business.
Obstacle 2 (*Dutch companies are reluctant to invest in India*) s assessed as having a lower overall impact, as major investors are presumably not significantly influenced by this perception. The issue primarily affects smaller commercial actors. Nevertheless, the Embassy can still play a meaningful role in addressing this obstacle by helping to improve India's image among Dutch businesses. Facilitating the entry of smaller companies into the Indian market could also have a positive cumulative effect.

Suggestions for the Dutch Embassy to Bridge the Gaps

After considering the obstacles through organising them in the impact and feasibility matrix above, we identified Obstacle 1 (India faces competition from other countries) and Obstacle 5 (Dutch companies are reluctant to invest in India) as urgent and within reach of the Dutch Embassy's resources and capabilities. We agree that these obstacles directly impact the success of Indo-Dutch green hydrogen cooperation. Addressing these issues allows the Dutch Embassy to strengthen the partnership. Based on these insights, we propose three concrete actions the Embassy can take.

Action 1 - Develop a portal to align business needs an stimulate collaboration

Dutch companies are hesitant to enter long-term partnerships with Indian counterparts for green hydrogen imports. In addition to the economic obstacles outlined in the *As Is*-chapter, this hesitation stems from a limited understanding, on both sides, of available investment opportunities. Both sides are eager to work together, but cooperation often stagnates due to uncertainty and mismatched business cultures.

To tackle this issue, the Dutch Embassy could develop an online portal to align business and trade opportunities between the Netherlands and India. This portal provides Dutch and Indian companies with information on regulations, potential business partners, and developments in the green hydrogen markets of both countries, aiming to facilitate and encourage cross-border investment. This portal is not a replacement for the existing RVO platform *Waterstof International*, but serves as an extension. The portal is different because it promotes Dutch investment in India and vice versa. It offers a more in-depth focus on specific categories of trade, such as green hydrogen, that the Dutch government currently prioritises in its international trade strategy. Moreover, an online portal accelerates the digitalisation of trade processes between the Netherlands and India, making information and matchmaking more accessible and efficient. Therefore, it lowers the barriers Dutch companies face when entering the Indian market.

The portal can be compared to the 'Match & Connect' platform by Gasunie, where large producers, buyers and shippers can connect and look for business opportunities. Similarly, the proposed portal plays a crucial role in matchmaking by connecting Dutch companies with the right Indian partners in the green hydrogen sector or other sectors aligned with Dutch government priorities. It offers curated partner profiles, showcases ongoing and upcoming projects, and enables companies to signal their specific needs and capabilities. This targeted approach helps businesses identify compatible counterparts more efficiently, reducing the time and uncertainty involved in establishing partnerships and overcoming cultural obstacles. By actively facilitating these connections, the portal turns shared climate ambitions into concrete collaboration, accelerating green hydrogen production in India and accelerating Dutch capabilities for the large-scale import of green hydrogen.

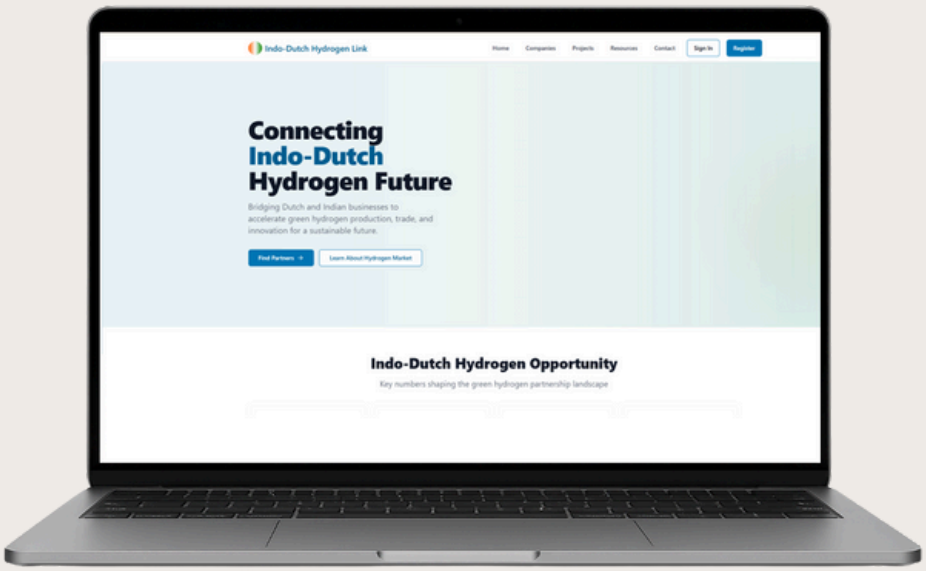

Figure 6: A visual representation of what an online portal for business and trade between and India might look like.

Action 2 - Create a ' Young Talent Exchange Programme'

As outlined in the As Is-chapter, perceived cultural differences, limited awareness of India's market potential, and a lack of understanding of its legal system hinder Dutch companies from collaborating with Indian partners or investing in the country. While the development of a portal supports current professionals, there is untapped potential in preparing and equipping the next generation of professionals through youth exchanges or educational opportunities.

To paint a picture of the missed potential here, Indian higher education and research are rising, especially at technology universities. Indian Institute of Technology Bombay (IITB) ranks 28th in the world on Engineering and Technology in the 2025 QS Top Universities Ranking, a rise of 50 positions from rank 78 in 2017.[75] Indian Institute of Technology Delhi (IITD) has risen with 45 positions between 2017 and 2025, currently ranking at #26 in the QS worldwide ranking for Engineering and Technology.[76]

For reference, Delft University of Technology ranks 14th and TU Eindhoven 95th on Engineering and Technology, meaning these Indian institutions are operating at similar, if not better, academic levels as renowned Dutch Universities. However, while many Indian students travel to the Netherlands yearly for degree programmes or exchanges, the flow is mainly one-way, as relatively few Dutch students study at Indian universities or pursue internships in India. To illustrate, Delft University of Technology has an extensive network of partner universities which support student exchange programmes. However, none of the partner universities are located within India. Despite the high quality of India's education system, opportunities for Dutch students to gain cultural and academic experience in India remain largely untapped, even though they represent the next generation of professionals.

The Dutch Ministry of Education, Culture and Science (OCW) has published its Internationale Kennis- en Talentstrategie (IKT, 'International Knowledge and Talent Strategy') in 2020, which emphasises the need for mutually beneficial and socially relevant international cooperation through, for example, academic exchange. The strategy aims to strengthen the Netherlands' international appeal as a knowledge-driven country.[77] Moreover, the recent appointment of an Education and Science Attaché in India (OWA) offers a concrete, feasible change for diplomatic and institutional cooperation. The IKT and the OWA, which are represented within the Dutch Embassy, create an opportunity for launching initiatives that prepare Dutch students for future engagement with India.

For instance, developing a summer school programme focused on India, the Dutch Embassy could help prepare a new generation of students to engage effectively with India in future business and professional contexts. Inspiration can be drawn from the Netherlands-Asia Honours Summer School (NAHSS), established in 2012 by Utrecht University, Delft University, McKinsey & Company, and AkzoNobel.[78] The NAHSS offers 70 to 100 bachelor students the opportunity to gain knowledge about Southeast Asia and China, equipping them for a future in which these regions play a key role on the global stage.

Figure 7: An AI-generated impression of the logo for the summer school exchange

Therefore, it is recommended that further exploration of the costs and benefits of developing a specialised exchange programme or summer school be conducted to strengthen educational ties between the Netherlands and India.

To initiate a summer school exchange programme, the Dutch Embassy should seek collaboration partners. These could include both Indian and Dutch universities, relevant Indian ministries such as the Ministry of New and Renewable Energy (MNRE), Dutch ministries such as the Ministry of OCW and the Ministry of Foreign Affairs, and corporate organisations like Tata Consultancy Services (TCS) to ensure local embedding and private-sector engagement. Building on the foundations laid by the IKT and the presence of the Education and Science Attaché in India, the Embassy is well-positioned to bring these actors together. A programme of this kind would strengthen bilateral educational ties and contribute to the long-term goals of making Dutch knowledge and talent internationally connected, visible, and future-proof.

Action 3 – Enhance the transfer of knowledge and technology

Transferring knowledge and technology in green hydrogen collaborations strengthens the bilateral relationship between India and the Netherlands and enables both countries to derive long-term mutual benefits from a partnership. The exchange of expertise can take various forms, such as direct technology transfer between businesses and academic and institutional knowledge sharing. These different variations are critical in accelerating the development and deployment of green hydrogen solutions.

First, transferring technology between private companies in the Netherlands and India offers promising opportunities. It also comes with challenges, as companies can be protective of their proprietary information, particularly in emerging and competitive sectors like green hydrogen. Signing international non-disclosure agreements (NDAs) and navigating differences in legal frameworks can be time-consuming and complex. However, joint ventures, licensing agreements, and strategic partnerships are standard mechanisms for enabling technology transfer in the private sector. Despite hurdles around proprietary information, there is growing momentum for collaboration, especially among firms seeking to expand their operations into new markets or to integrate new technologies that support decarbonisation goals. For instance, Dutch companies with advanced electrolyser technology or efficient hydrogen storage systems may find valuable partners in Indian firms with large-scale production capabilities or access to renewable energy infrastructure.[79]

Second, both countries' research and applied knowledge institutes play a significant role in fostering innovation and collaboration. Institutions such as TNO, the Indian Institute of Science (IISc), and the Energy and Resources Institute (TERI) have the technical expertise and knowledge infrastructure to form effective collaborations. These institutes can collaborate on research projects on efficiency improvements in green hydrogen production, safety standards, and regulatory frameworks. Knowledge institutes can accelerate innovation cycles by sharing experimental data, co-publishing studies, and jointly applying for international research funding to ensure that discoveries are rapidly translated into real-world applications.

As a third, universities in India and the Netherlands serve as critical hubs for long-term collaboration through research and training the next generation of green hydrogen experts. Study exchanges, joint degree programmes, and collaborative PhD supervision help build cross-cultural academic communities committed to solving global energy challenges. For example, this type of knowledge exchange can be done with the described "Youth Talent Exchange Programs".

Whether through businesses, research institutes, or universities, knowledge and technology transfer between India and the Netherlands must form a cornerstone in the green hydrogen collaborations. Each channel presents its opportunities and challenges, and together they create an ecosystem for innovation and growth outside the realm of green hydrogen. As trust deepens and expertise grows, the frameworks and relationships built today can expand into other domains of sustainable development.

Infobox 4 / Strengthening India's Image: the Role of Public and Digital Diplomacy

A key request from the Dutch Embassy concerns strategies to improve the Dutch perception of India and India's position within Dutch ministries and the private sector. India has experienced hesitation from Dutch partners and investors when negotiating deals, particularly in the green energy sector. In an interview with Satya Pinisetty, First Secretary of the Economic Department at the Indian Embassy, it was noted that India is often portrayed negatively in Dutch public discourse.[80] Additionally, media coverage of India in the Netherlands is perceived as limited or predominantly negative.

Therefore, improving India's image in the Netherlands could strengthen bilateral cooperation, i.e., green hydrogen collaboration. The aim should be to foster trust, encourage investment, and facilitate long-term project commitments.

Therefore, this section examines how India currently uses Digital Diplomacy (i.e. website, social media channels)–specifically within the broader framework of its public diplomacy efforts in the Netherlands–to shape its image, engage with key audiences, and support its foreign policy objectives.

India's Cultural Diplomacy strategy in EU countries mainly focuses on promoting Indian culture as a form of soft power (i.e. through the Indian Council for Cultural Relations (ICCR)). In other words, it's the cultural outreach efforts of Indian embassies across the world, including Indian classical dance, the teaching of Hindi and Sanskrit, yoga, and Bollywood diplomacy.[81] To enhance the effectiveness of its public diplomacy in Europe, India could emphasise clearly communicating its political objectives and policy decisions to the European public. This approach is likely to resonate more with EU audiences, who tend to value transparency, policy alignment, and shared strategic interests over cultural promotion alone.[82]

Moreover, Indian public diplomacy lacks sufficient focus on environmental issues – an area considered critically crucial by European target audiences, including the general public, opinion leaders, government officials, policymakers, media, students, civil society organisations, and diaspora communities. Given Europe's strong emphasis on environmental sustainability and social equity, India's reputation as a country struggling with severe air pollution and socio-economic inequalities may hamper its diplomatic and economic engagement with Europe. A more transparent approach to public diplomacy, where India actively communicates its political aspirations and domestic challenges, as well as its technological advancements, could lead to greater political recognition in Europe and help strengthen both diplomatic and trade ties between India and the Netherlands.[83]

Guiding Principles: Considerations Towards a Just Indo-Dutch Collaboration

Key Takeaways

To ensure sustainable and equitable Indo-Dutch green hydrogen collaboration, three guiding principles are recommended:

1. Promote social justice in green hydrogen project
Green hydrogen initiatives should prioritise local community involvement, equitable resource use, and transparent decision-making to prevent neocolonial practices and foster inclusive development, particularly in ecologically sensitive and tribal regions.

2. Consider water scarcity in green hydrogen site selection
Given India's water-stressed regions, green hydrogen production should avoid exacerbating local water shortages by implementing sustainable water technologies and transparent site planning. This can be facilitated through clear information on the proposed online portal.

3. Green hydrogen collaborations should support India's energy security
To enhance energy independence and resilience, Dutch investments should focus on large-scale and decentralised green hydrogen projects that contribute to local energy access, aligning with India's energy transition goals while addressing the energy trilemma: security, sustainability, and equity.

The development of a green hydrogen economy comes with several challenges. In addition to the obstacles presented earlier, risks are associated with developing the green hydrogen economy. Several sustainable development goals (SDGs) are set out by the UN[81] and provide a practical framework for sustainable development studies. This section outlines guiding principles for the Dutch Embassy to consider when shaping its strategic partnership with India on green hydrogen. These principles are aligned with the SDGs[d] and are not formal recommendations, but suggestions for guiding an impactful, just, and equitable collaboration. Figure X presents the most relevant SDGs for Indo-Dutch cooperation in the green hydrogen economy are presented in Figure X. We encourage the Dutch Embassy and other actors in the green hydrogen economy to consider these when designing policies, establishing partnerships, and launching initiatives within this bilateral cooperation.

Figure 8: The most relevant SDGs regarding Indo-Dutch green hydrogen collaboration

Principle 1 – Promote social justice in green hydrogen projects

In green transitions, it is essential to consider environmental objectives and the social and ethical implications of these transitions. One key concern is the persistence of unequal power dynamics between the Global North and the Global South. Especially in areas like trade, investment, resource extraction, and development cooperation, these are often described as forms of neocolonialism. Green hydrogen projects are frequently developed without meaningful involvement of local communities, while land, water, and energy resources are primarily used for export. This can deepen inequalities, create social tensions, and cause ecological damage, especially in vulnerable regions. It is crucial to acknowledge these dynamics and promote equitable collaboration, prioritising local needs, community participation, and environmental limits.

Moreover, state-level programmes in India are key in driving the renewable energy transition. Each state is leveraging its unique resources and strengths while addressing specific challenges. Several states in India have become hubs for green hydrogen interest and potential.[82] For instance, Gujarat and Rajasthan are interesting states for green hydrogen developments.

[d] Specifically SDG 6 "Clean water and sanitation", SDG 7 "Affordable and clean energy", SDG 9 "Industry, innovation and infrastructure, SDG 13 "Climate action", and SDG 17 "Partnerships for the goals" are the cornerstones in green hydrogen collaborations.

Gujarat has a strong industrial base, renewable infrastructure, and port connectivity, central to India's green hydrogen ambitions. Rajasthan is rich in solar radiation and focuses on producing green hydrogen via electrolysis. Other states, such as Andhra Pradesh, Tamil Nadu, and Chhattisgarh, are also getting more prominent. Still, these states face more issues related to land displacement, environmental degradation, and community impact (for more information, see Appendix F). These regional differences are significant in understanding India's potential by identifying each Indian state's green hydrogen possibilities. Therefore, when implementing green hydrogen policy, it is essential to keep the differences between Indian states in account. Tailored strategies based on regional strengths ensure effective green hydrogen cooperation.

Keeping the importance of recognising the regional differences and potential in mind, we envision a role for the Dutch Embassy as both a facilitator and a watchdog in ensuring that investments in India's green hydrogen sector do not replicate extractive patterns reminiscent of neocolonial relationships. The Dutch Embassy should obtain free, prior, and informed consent from local communities, be transparent about land and water usage, and prioritise inclusive decision-making. This is especially important in regions inhabited by tribal populations or facing ecological vulnerabilities, of which Tamil Nadu is an example.[e]

Principle 2 – Consider water scarcity in green hydrogen site selection

Hydrogen production requires substantial freshwater for electrolysis, cooling, and other services. Global water usage for hydrogen production under the 1.5 °C warming limit scenario in 2050 (409 MT) will reach 8 – 55 million tonnes.[83] To put things in perspective, this will be more or less around 1% of the water used for agriculture in 2050, which is estimated at 2,679 million tonnes.[84] While, on a global scale, water usage for green hydrogen production appears to be a drop in a vast bucket, the International Renewable Energy Agency (IRENA) estimates that 99% of the planned and operational hydrogen production plants will be in water-stressed areas.[85]

Organisations should be aware of and critical of green hydrogen production projects in water-stressed areas. Unfortunately for the Indian case, most projects are, or will be, in water-stressed regions, as shown in Figure X. The guiding principle should be that local communities should not be negatively influenced in their basic needs for water by green hydrogen production. Therefore, when planning for a green hydrogen production site in India, appropriate measures should be taken to avoid additional water stress. Several technologies already exist for this purpose, such as the desalination of salt and brackish water, air-to-water generation that captures water from the air, and the direct use of saltwater and wastewater in electrolysis (see infobox 5).[86]

[e] Tamil Nadu's strong renewable energy infrastructure and industrial capacity position it as an attractive site for green hydrogen development. If a green hydrogen plant is built in Tamil Nadu, local value creation means giving jobs to local Tamil workers, working with nearby construction companies, and making sure fishing communities are not pushed out, but included and fairly treated. It also means using part of the money earned to improve the local area, instead of sending all the profits to foreign investors or big companies far away.

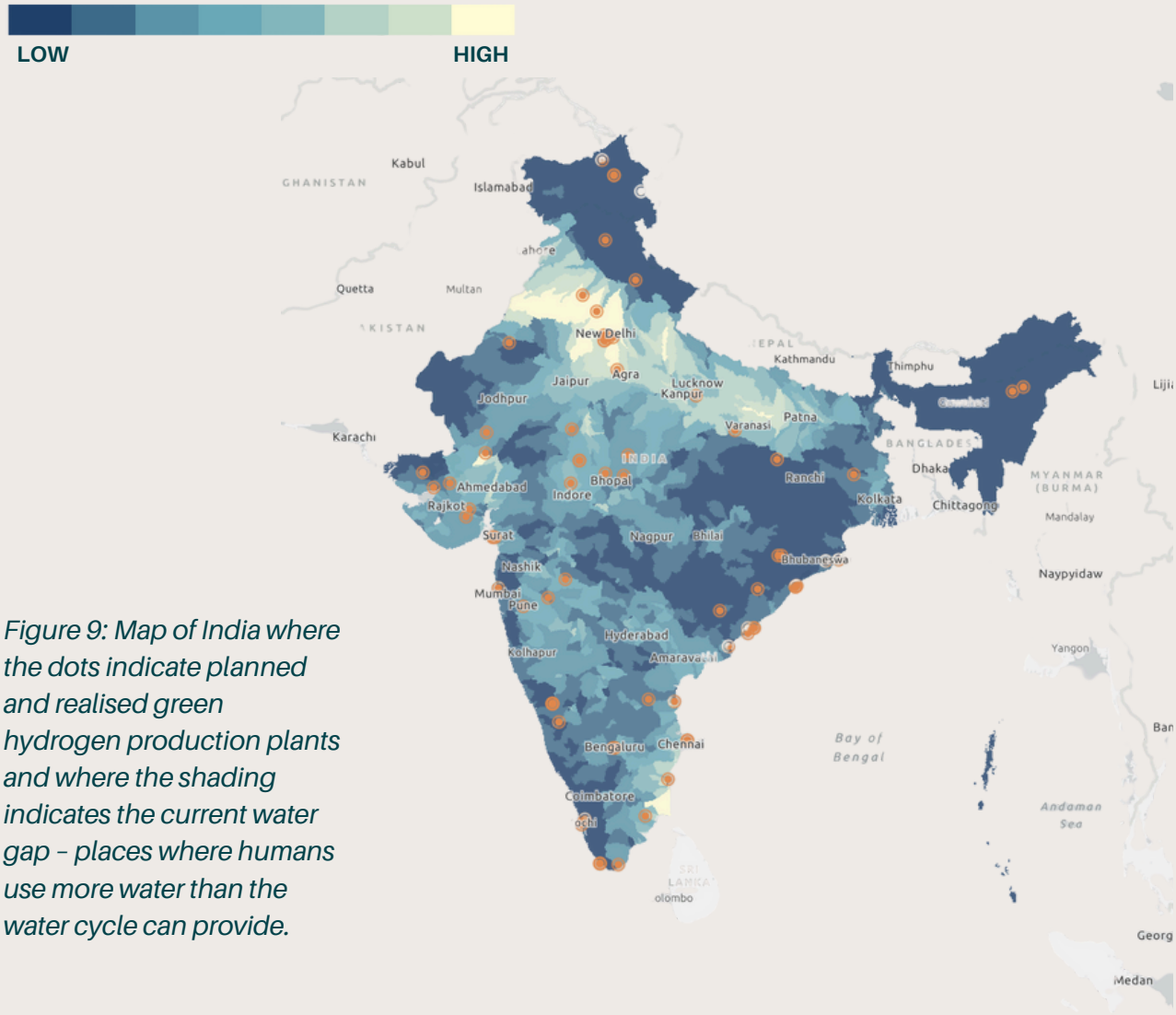

Figure 9: Map of India where the dots indicate planned and realised green hydrogen production plants and where the shading indicates the current water gap – places where humans use more water than the water cycle can provide.

International organisations, in particular, must be made aware of the water stress in India, and it should be incorporated into every stage of green hydrogen planning, from site selection to technology choice, to ensure that green hydrogen production never undermines local communities' essential water supplies. To translate this guiding principle for the Dutch Embassy, we suggest that the water stress levels are clearly shown on the recommended portal, and potential companies are made aware of the issue and the mitigations.

Infobox 5 / Dutch Developments on the Electrolysis of Seawater

The process of electrolysis is essential for the production of green hydrogen.[87] However, most developed electrolysis technologies can only perform this process on processed freshwater.

With water scarcity already a problem in many parts of the world, green hydrogen production can exacerbate the water stress in these regions.[88] One technological solution is at hand: the emerging technology of seawater electrolysers.

With its strong maritime infrastructure and commitment to green energy, Dutch organisations are making significant strides in this field. Leading Dutch institutions such as TU Delft and TNO are at the forefront of advancing seawater electrolysis technology and systems.[89] [90] A key focus of their research has been addressing seawater's salty and corrosive nature, which poses a significant challenge for electrolysis systems. Through innovative materials and system designs, they have developed corrosion-resistant components that enhance the efficiency and longevity of electrolysers used in marine environments.

One of the most ambitious initiatives within this area is the Dutch PosHYdon project,[91] which will be the world's first offshore green hydrogen project. Located on a platform in the North Sea, PosHYdon will integrate offshore wind, gas, and green hydrogen production, demonstrating the feasibility of producing green hydrogen directly at sea and with seawater. These pilot projects and start-ups could present opportunities for technology transfer and co-development in coastal regions in India with vast seawater bodies.

Principle 3 – Green hydrogen collaborations should support India's energy security

India is tied to the energy transition, even though the country is still heavily dependent on oil and gas to keep up with its economic growth.[92] India's reliance on foreign energy sources, such as oil imports from Russia, makes the country vulnerable to geopolitical tensions and is an additional incentive to become energy independent.[93] This affects India's energy security, which is generally understood as the uninterrupted availability of affordable, diverse, and sustainable energy sources. It requires a balance between supply and demand, energy reserves, trade, and a substantial share of renewables, while addressing the energy trilemma: security, sustainability, and equity. For India, this means navigating rapid energy demand growth while ensuring access, environmental responsibility, and resilience through a diversified and inclusive energy transition.[94]

While governments and corporations often lead large-scale energy deals, future-proof energy security in India requires inclusive approaches. Therefore, the Dutch Embassy should encourage investments in small-scale, decentralised green hydrogen projects to enhance local energy access, resilience, and equity.

The Dutch Embassy could play a connecting role between Dutch and Indian small-scale investors and companies through the online portal that has been recommended in the Transition-chapter. This recommendation for an online platform can help strengthen the supply chain from the ground up. Given India's vast size, decentralised governance, and regional diversity–both in population and geography–it is worth exploring how green hydrogen policy can be aligned with local needs to support bottom-up energy governance.

We would like to advise the Dutch Embassy to link Dutch companies and investors to the Council of Entrepreneurship's Cyber Security Council (CSR) support centre.[95] Dutch companies can turn to this support platform for advice on doing business internationally under the OECD guidelines, created by the Dutch Ministry of Foreign Affairs, as well as the UN SDG framework. In addition, the OECD platform can provide entrepreneurs with the right tools to identify and address risks in building the international supply chain for green hydrogen, and offers assistance in, for example, environmental risk complaint procedures.[96]

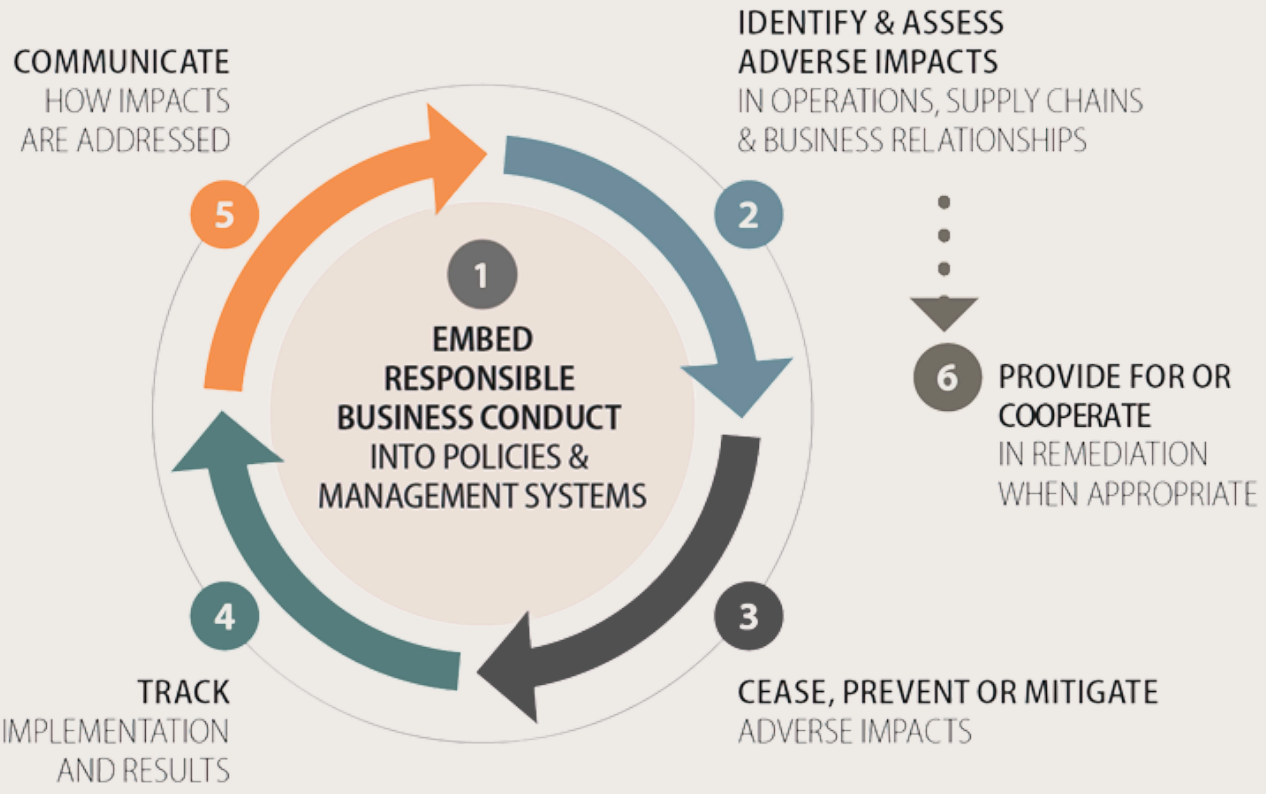

Figure 10: OECD Guidelines on Due Dilligence

Looking at the OECD guidelines above, we have developed our model for the Dutch Embassy. The model is linked to the UN SDGs, and serves as a roadmap to identify and overcome risks such as energy security, neocolonialism and water scarcity.

Our framework combines both relevant SDGs with the Dutch government's OECD guidelines. Firstly, the Dutch Embassy could embed sustainable energy partnership goals while formulating its green hydrogen strategy with India. Secondly, an assessment period is needed to identify risks in local energy security. Subsequently, the risk identification could prevent or mitigate the negative impacts of developing a green hydrogen partnership. As a fourth, the Dutch Embassy could evaluate the progress and local impact of the established collaboration. Communication as a fifth step with affected communities and stakeholders is relevant to, at last, cooperating and facilitating remediation when needed.

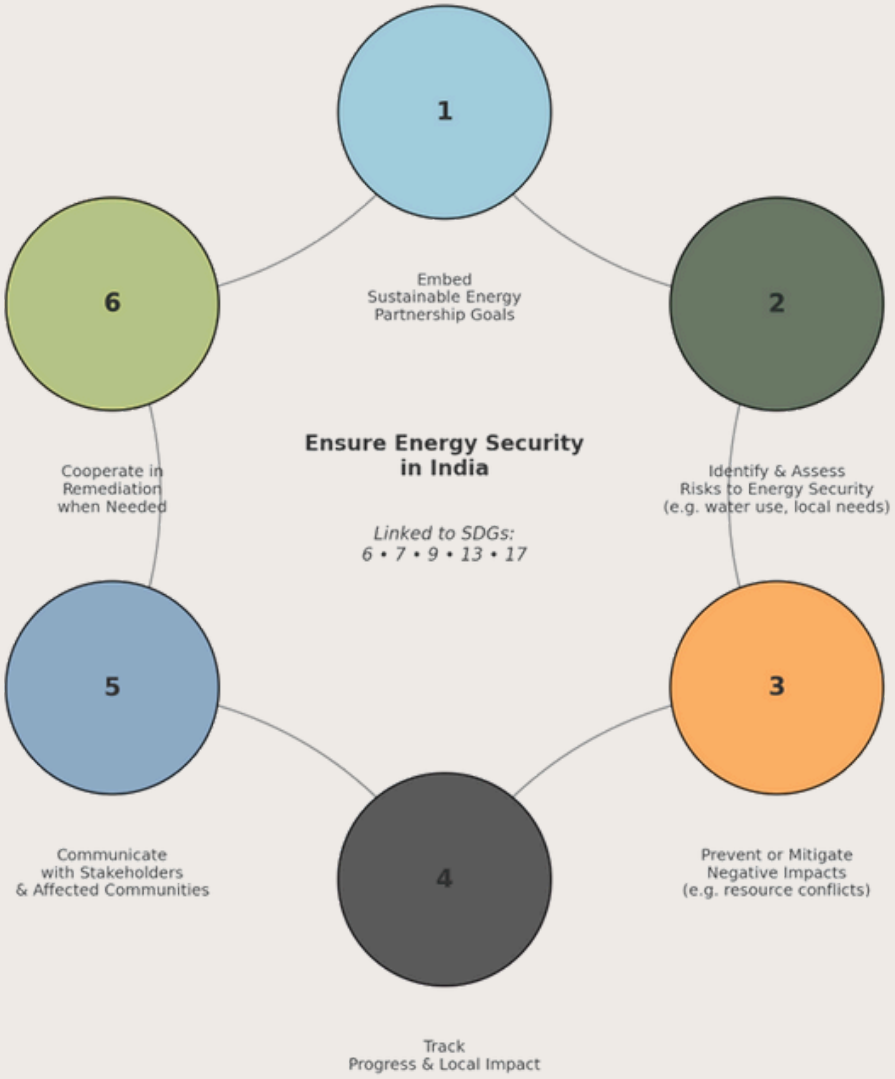

Figure 11: 6-Step Framework for acknowledging the Guiding Principles

Infobox 6 / Bring 'Honest Hydrogen' Certifications to the Green Hydrogen Economy

The FairTrade certification system has long been a trusted way to ensure that products meet high ethical, environmental, and social standards.[97] Bringing a similar certification system, such as the non-existent and imaginable 'HH2 (Honest Hydrogen)' certification, into the green hydrogen economy offers an opportunity to promote transparency, sustainability, and ethical practices in the emerging industry.

Before such certification can be launched, it is essential to establish specific criteria that address the unique needs of the green hydrogen industry. These criteria could include:

1. Social fairness – Ensuring that workers in the green hydrogen supply chain (such as those involved in electrolysis, renewable energy production, or transportation) receive fair wages, have safe working conditions, and can organise and advocate for their rights.

2. Environmental sustainability – Ensuring that the green hydrogen production process is carbon-neutral, using renewable energy sources in all (sub)processes, and that the lifecycle emissions are minimised. This would also include safe disposal of materials and avoidance of practices that lead to environmental degradation.

3. Community benefits – Green hydrogen projects would need to benefit local communities, especially in underdeveloped or energy-poor regions. This can include local economic development through job creation, support for local businesses, and community-driven renewable energy projects.

4. Fair Trade pricing and transparency – The green hydrogen market should ensure that pricing mechanisms reflect production costs and the true environmental and social impacts. This could involve pricing models that equitably compensate communities, workers, and renewable energy producers.

Through partnerships, education, and global collaboration, certified green hydrogen could become a game-changer in driving ethical, transparent, and sustainable growth in the energy sector.

Concluding Remarks

This policy advice, written from a youth perspective, aims to contribute to a **forward-looking, socially responsible, and strategically grounded Indo-Dutch partnership on green hydrogen**. Based on extensive literature, stakeholder interviews, and internal reflection, we argue that realising this cooperation requires more than technical alignment. It asks for investment in synergy, relationships, mutual understanding, and a shared commitment to a just and inclusive energy transition.

India and the Netherlands are ambitious to become key global green hydrogen economy players. India focuses on scaling up **domestic production and exports**, while the Netherlands is positioning Rotterdam as a **European hub for green hydrogen import and distribution**. These goals are complementary, but several barriers still obstruct their realisation: from infrastructural gaps and price volatility to cultural differences and concerns about social impact. Within this context, we identify three areas where the Dutch Embassy can play an impactful and achievable role.

First, the Dutch Embassy can help strengthen Indo-Dutch business collaboration by **developing a portal**. Such a portal would offer practical guidance on India's regulatory framework, highlight credible partners, and map active projects in the green hydrogen sector. Combined with targeted Embassy-led networking events, this would lower entry barriers for Dutch companies and facilitate more transparent, coordinated engagement with Indian counterparts.

Second, long-term cooperation requires **investing in the next generation**. The current flow of academic exchange is mainly one-sided, with few Dutch students engaging with India. The Dutch Embassy could initiate a Young Talent Exchange Programme under the IKT, in partnership with Dutch and Indian universities, focused on green hydrogen and sustainability. Such an initiative would foster mutual understanding, build future-proof networks, and prepare young professionals to work across cultural and sectoral boundaries.

Third, the knowledge and **technology transfer between the Netherlands and India should be enhanced to foster innovation and collaboration**. Businesses, universities, and knowledge institutes can stimulate this. The Netherlands and India can stay at the forefront of relevant developments by investing in and collaborating on the knowledge and technology needed for green hydrogen, such as effective electrolyser technologies. This will help both countries achieve a leadership position in the global green hydrogen economy.

In addition to our advice, we call on the Dutch Embassy **to actively integrate principles of a just transition into its green hydrogen diplomacy**. The Dutch Embassy is well placed to encourage Dutch companies to engage with local Indian stakeholders early, to be transparent about land and water use, and to align with India's regional development priorities. As a facilitator of private-public cooperation, the Dutch Embassy could work with a framework built upon both the SDGs and consult the OECD framework for new and just collaborations. Especially in states like Gujarat, Rajasthan and Tamil Nadu, green hydrogen projects should be designed with attention to water stress, energy access, and local job creation. This also means recognising and addressing the risk of reproducing unequal power dynamics between the Global North and Global South.

The proposals in this report are not exhaustive, but based on what we believe to be realistic and meaningful contributions within the possibilities of the Dutch Embassy. As a youth think tank, we hope that our ideas help the Dutch Embassy build bridges where they matter most: between sectors, generations, and countries. Small steps, thoughtfully taken, can lay the groundwork for long-term partnership and kick off the unfolding of the green hydrogen sector.

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APPENDICES

Appendix A

Interviewees & Affiliations

Person(s)	Current or previous employer	Date of interview
Natalya Rijk	BP, External Affairs Manager (Hydrogen & Biofuels)	March 19, 2025
Peter Brouwer	Bronkhorst, Head of Product Management and Market Development	March 3, 2025
Paula Chromik	Dutch Embassy in New Delhi, Green Hydrogen Lead	April 17, 2025
Priya Joshi	Dutch Embassy in New Delhi, Senior Policy Advisor for Climate and Energy	December 17, 2024
Han Feenstra	Dutch Ministry of Economic Affairs and Climate Policy, Program Manager Hydrogen	January 29, 2025
Joris de Vogel	Dutch MFA, Policy Officer International Enterprise	January 10, 2025
Sataya Pinisetty	Embassy of India in The Hague, First Secretary (Economic & Commerce)	February 21, 2025
prof. dr. Leonie Reins Dana de Leeuw	Erasmus University, Professor of Public Law and Sustainability Erasmus School of Law, PhD candidate	March 18, 2025
Jacqueline Heere Dagmar Goos	Gasunie, Senior Advisor Government & Regulatory Affairs Gasunie, trainee	March 4, 2025
Jacqueline Vaessen	HydrogenNL, Director a.i.	February 25, 2025
Ines Peeters Joost Wijnmaalen Mart Vloet	International Research Projects Delft, Technology & Strategy Consultants	December 12, 2024
Jogchum Bruinsma	Nedstack Fuell Cell Technology, Chief Commercial Officer	March 6, 2025
David Koole	Netherlands Enterprise Agency, Advisor Hydrogen International	March 17, 2025
Tijmen Steensma	Netherlands Enterprise Agency, Rijkstrainee	February 26, 2025
Anonymous	Noordzeekanaalgebied	April 23, 2025
Anonymous	OCI Nitrogen-OCI Global	March 31, 2025
Roman van Riel	Port of Rotterdam, Business Development Manager (Electrification & Hydrogen)	February 27, 2025
Anonymous	Redstack	March 4, 2025

Person(s)	Current or previous employer	Date of interview
Ewoud Huiskamp	SolarDuck, Co-founder & Engineering Director	February 27, 2025
PV Chakrapani	Techsol Energies, Director	March 10, 2025
Rajesh Mehta	TNO, Senior Consultant Energy and Materials Transition	February 28, 2025
prof. Aravind Purushothaman Vellayani	University of Groningen, Professor and Chair of Energy Conversion	March 4, 2025
Anonymous	Vopak	February 28, 2025

Appendix B

A case study on green ammonia from India in Dutch fertiliser production

Green hydrogen is often described as the "Swiss pocket knife" of decarbonisation – a versatile solution with many potential applications. While it is commonly framed as a clean energy carrier, its derivative, green ammonia, plays a vital role as a raw material in industrial value chains. Among these applications, fertiliser production stands out. Today, more than 70% of global ammonia consumption is used in the production of fertilisers[98]. Yet, most of this ammonia is still produced using fossil fuels – specifically natural gas – resulting in 450 million tonnes CO_2 emissions annually, comparable to the total energy-related emissions of an entire country like South Africa[99]. Substituting this grey ammonia with green ammonia presents a substantial emissions reduction opportunity.

However, transitioning to green ammonia is not a straightforward substitution. Industrial processes that rely on ammonia are embedded in complex value chains, and their decarbonisation depends on various technical, economic, and policy factors. This case study explores one potential use case: substituting grey ammonia with green ammonia from India in Dutch fertiliser production. The findings here draw on the PBL report on decarbonisation of the Dutch fertiliser industry, data from CBS and the IEA Ammonia report, and insights from an interview with a major Dutch fertiliser producer (OCI Global).

Green Ammonia and Fertiliser Production – A Low-Hanging Fruit?

Ammonia-based fertilisers are the backbone of modern agriculture. The Netherlands is a net exporter of fertilisers, with key production facilities in Zeeland and Chemelot (Limburg)[100]. In 2017, the two largest Dutch fertiliser producers were responsible for 3.9 million tonnes CO2-eq emissions in ammonia production[101]. Notably, this ammonia is derived from fossil-based natural gas, making the sector an ideal candidate for decarbonisation through green ammonia imports.

Importantly, green ammonia would substitute the grey ammonia already used in fertiliser production, not introduce a new feedstock, offering an immediate emissions reduction opportunity. Integration into existing processes is relatively straightforward: production facilities could shift to storing and using imported green ammonia instead of producing ammonia on-site. Given high natural gas prices and ongoing energy security concerns, this could become an increasingly attractive option, particularly with India emerging as a potential large-scale exporter.

However, as outlined below, the feasibility of this transition is highly dependent on economic and policy-related factors. Findings from the case study are as follows:

Barriers

- **Price gap and lack of willingness to pay (WTP)**. Fertiliser producers are unlikely to switch to green ammonia from India without fertiliser incentives. The cost gap between grey and green ammonia remains significant. End-users – primarily farmers – show limited WTP for more expensive "green" fertilisers.
- **The value-chain dilemma**: a 'stick and carrot' problem. The core issue lies in how sustainability costs are distributed along the value chain. Farmers and fertiliser producers are expected to absorb the cost, while supermarkets and consumers are not. This misalignment discourages adoption and may distort the market. For instance, enforcing "stick" policies that mandate green fertilisers could make EU-produced food more expensive, increasing reliance on cheaper imports and weakening domestic agriculture. Instead, a combined "stick and carrot" approach is needed. The "stick" imposes obligations (e.g., carbon standards), while the "carrot" offers support mechanisms (e.g., subsidies or tax breaks). Value-chain policies should ensure all actors – from food producers to retailers – share the costs and benefits of decarbonisation.
- **Investment uncertainty.** Green ammonia adoption requires new storage and handling infrastructure. For producers, these are long-term capital-intensive investments. Current uncertainty surrounding the future of the European fertiliser market – including the CBAM mechanism and competition from non-EU producers like Russia – fuels hesitation.
- **Safety and regulatory resistance**. Although ammonia has been traded globally for decades, resistance is growing in the Netherlands against its transport near densely populated areas, due to its hazardous nature. Moreover, even green ammonia production can result in emissions of harmful gases such as NOx, which must be appropriately managed.

Opportunities

- **Technical feasibility**. No major technological innovation is required to integrate green ammonia. Production facilities need additional storage, and transport networks must expand – but these are well-understood upgrades.
- **Established infrastructure and expertise**. The global ammonia trade is mature, with proven shipping technology and existing international infrastructure. Green ammonia can leverage much of this, requiring only moderate adaptations.
- **Industry interest and early momentum**. Companies like OCI Nitrogen have publicly expressed interest in green ammonia imports (link: to be added). A key opportunity lies in public-private partnerships such as Contracts for Difference (CfDs), where the government pays the price gap between green and grey ammonia, making green imports economically viable.
- **Strategic industrial policy**. As part of a broader industrial strategy, the Dutch government could choose to subsidise green ammonia imports (e.g., from India) to keep domestic emissions minimised and sustainably diminish emissions while securing a critical sector of the EU food supply and stem dependency on LNG imports from geopolitically sensitive regions.

Appendix C

Hydrogen subsidies in the Netherlands

Subsidy	Description
Subsidy Scheme for Large-scale Hydrogen Production Using an Electrolyser (OWE)	Aims to stimulate large-scale renewable hydrogen production. [102]
Energy Investment Allowance (EIA)	Allows companies to deduct a percentage of their investment costs for energy-saving equipment and sustainable energy from their taxable profit. Investments in green hydrogen production facilities may qualify for this allowance, providing a fiscal incentive to reduce the net investment costs. This scheme benefits companies looking to invest in energy-efficient technologies and renewable energy sources, including green hydrogen. [103]
Demonstration Energy and Climate Innovation scheme (DEI+)	Supports pilot and demonstration projects that focus on energy innovation and CO_2 reduction. Also, projects involving innovative green hydrogen technologies can receive funding to cover part of the investment and operational costs. This scheme aims to accelerate the implementation of new technologies by supporting their demonstration in operational environments. [104]
Topsector Energy (TSE) Industry Studies	Similar goal to DEI+, but specifically aimed at innovation-testing for green hydrogen. [105]
Investeringssubsidie Maakindustrie Klimaatneutrale Economie (IMKE)	Can be deployed for installing electrolysers. [106]
Subsidieregeling Waterstof in Mobiliteit (SWIM)	For the projects in the hydrogen mobility sector. [107]

Appendix D

Hydrogen subsidies in the European Union

Subsidy	Description
Clean Hydrogen Partnership	European public-private collaboration for stimulating research and innovation for hydrogen technology in Europe. It aims to support primarily small and medium-sized companies.
Integrated Projects of Common European Interest (IPCEI)	Aimed at large-scale research, demonstration and implementation projects of European interest, for which the unprofitable overhead cost can be fully compensated.
European Regional Development Fund (ERDF) and INTERREG	It is not aimed explicitly at green hydrogen, but could still be utilised for green hydrogen projects. These subsidies are intended to promote, among others, the low-carbon economy.
Connecting Europe Facility (CEF)	Also, it is not explicitly meant for green hydrogen, but could still be utilised for green hydrogen projects. CEF is aimed at supporting European investments in trans-European transport and energy networks.

Appendix E

Policies and initiatives in the European Union

Policy/Initiative	Description
European Hydrogen Alliance	With this initiative, the EC aims to support deploying green hydrogen technologies across Europe. It is a network that serves as a link between the public, private and science. It focuses on innovation, infrastructure, market creation, and enabling policies to make green hydrogen a key component of the EU's NZE aspirations. [108]
European Hydrogen Strategy	Created in light of the European Green Deal (EGD) of 2020, it was meant to support the large-scale development and use of hydrogen. The strategy concentrates on producing green hydrogen, reducing emissions, and decarbonising industries such as steel and chemicals. It includes creating a hydrogen value chain, investing in infrastructure, and supporting innovation. Furthermore, the Hydrogen Strategy emphasises the importance of hydrogen in the EU's Green Deal and aims to reduce reliance on fossil fuels while boosting economic growth and job creation. [109]
Hydrogen Energy Network	Informal platform facilitated by the EC, which brings together representatives from energy ministries in EU countries. The network is supposed to help national energy authorities share information, exchange best practices, and collaborate on issues related to hydrogen as an energy carrier. HyENet meetings take place twice a year, where participants discuss the latest developments in hydrogen technology. [110]
Renewable Energy Directive III (RED III)	Revision of the Renewable Energy Directive in 2023. This directive requires that renewable fuels of non-biological origin (RFNBO), primarily green hydrogen, be used to reduce emissions. According to RED, in 2030, 42% of hydrogen in industry has to be green. [111]
European Hydrogen Bank	The most essential EU investment mechanism. The European Hydrogen Bank adds to earlier investment mechanisms by providing specific financial mechanisms to promote hydrogen production. The initiative goes beyond earlier EU efforts by introducing market-making activities, enhancing transparency, and focusing on auctioning green hydrogen production contracts. These elements are designed to ensure investment certainty, which was identified as a problem in the report by Berenschot mentioned earlier. Moreover, the Hydrogen Bank is supposed to accelerate the hydrogen economy, complementing broader hydrogen policies like infrastructure development and regulatory frameworks outlined in previous sources. [112]

Appendix F

Zooming in on Indian states and their green hydrogen relevance

Overview information on the growing state of green hydrogen, its challenges and potential.

Rajasthan	With abundant solar radiation, Rajasthan is targeted for green hydrogen via electrolysis. Yet, the region faces acute water scarcity, and projects risk diverting water from local agricultural or community needs if safeguards are not in place. [113] [114]
Andhra Pradesh	As a coastal state with Special Economic Zones and international investor interest, Andhra Pradesh faces the challenge of ensuring that green hydrogen projects benefit local communities and do not result in land displacement or marginalisation of tribal populations. [115] [116]
Chhattisgarh	Chhattisgarh is rich in rare earth minerals and is home to many tribal communities. The increasing interest in green technologies leads to intensified mining for electrolyser components [117]. Without strict regulation and inclusive planning, this could lead to ecological degradation and loss of tribal land and livelihoods, a classic example of neocolonial patterns. [118] [119]
Gujarat	Gujarat is central to India's green hydrogen ambitions as a leading industrial state with strong renewable infrastructure and port connectivity. However, concerns arise over land acquisition in ecologically fragile or densely populated zones, and whether local communities, especially in coastal and agrarian districts, will benefit from green hydrogen export deals dominated by foreign and domestic conglomerates. [120] [121]
Tamil Nadu	The state’s strong renewable energy base and industrial capacity make it an attractive site for green hydrogen development. However, coastal erosion, fishing community displacement, and industrial pollution are ongoing concerns that must be addressed to ensure green hydrogen investments don’t exacerbate existing social and environmental pressures. [122]