Trade in Environmental Goods and Services

Final Report

Client: Ministry of Foreign Affairs

Rotterdam, 3 March 2023

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ECORYS

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List of acronyms and abbreviations

Acronym	Definition
AB	Appellate Body
ACCTS	Agreement on Climate Change, Trade and Sustainability
ACSM	Agreement on Subsidies and Countervailing Measures
AGOA	African Growth and Opportunity Act
AI	Artificial Intelligence
APEC	Asia-Pacific Economic Cooperation
CBS	Centraal Bureau voor de Statistiek
CCS	Carbon Capture and Storage
CfD	Cost-for-Difference
CGE	Computational General Equilibrium
CLEG	Combined List of Environmental Goods
CPC	Central Product Classification
CVD	Countervailing Duties
EDGAR	Emission Database for Global Atmospheric Research
EGA	Environmental Goods Agreement
EGS	Environmental Goods and Services
EPP	Environmental Preferable Product
EU	European Union
EV	Electronical vehicles
FIT	Feed-in Tariff
FTA	Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GHG	Greenhouse Gas
GPA	Government Procurement Agreement
GSP	Generalized System of Preferences
GWO	Global Wind Organization
HS	Harmonized System
IDB	Industrial Development Bureau (Taiwan)
IPCC	Intergovernmental Panel on Climate Change
IRA	Inflation Reduction Act
IRENA	International Renewable Energy Agency
ITA	Information Technology Agreement
ITC	International Trade Centre
LCR	Local Content Requirements
LED	Light-Emitting Diodes
MACC	McKinsey’s marginal Abatement Cost Curve
MENA	Middle East and Northern Africa
MFN	Most-favoured Nation
MLIT	Ministry of Land, Infrastructure, Transportation and Tourism (Japan)
NDC	Nationally determined contributions
NAP	National adaptation plan
NEI	Netherlands Economic Institute
NPR-PPM	Non-product-related processes and production methods
NTB	Non-tariff Barriers
NTM	Non-Tariff Measure
OECD	Organization of Economic Cooperation and Development
OWP	Offshore wind power
O&M	Operation and management
PPM	Processes and Production Method
PTA	Preferential Trade Agreement
R&D	Research and Development
RCA	Revealed Comparative Advantage
RTA	Regional Trade Agreement
SAGEA	Singapore-Australia Green Economy Agreement
SCP	Supply Chain Plan
SDG	Sustainable Development Goals
SME	Small- and medium-sized enterprise

Acronym	Definition
TBT	Technical Barriers to Trade
TESSD	Trade and Environmental Sustainability Structured Discussions
TRIMS	Trade-related Investment Measures
TSD	Trade and Sustainable Development
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
WCO	World Customs Organization
WTIV	Wind turbine installation vessel
WTO	World Trade Organization

1 Executive summary

Facilitating trade in environmental goods and services (EGS) can be a tool for climate action. Trade is a key mechanism for the diffusion of technologies and innovations that we need for **climate change mitigation and adaptation**, **pollution reduction**, **circular economy**, and **biodiversity conservation**. Eliminating trade barriers in the EGS sector could encourage greater trade and investment flows; boost R&D and employment in green sectors thanks to clear market signals, certainty, and predictability; improve access to highly specialised technical expertise; and strengthen export industries that are engaged in global or regional value chains.

This study provides insights into the Netherlands' economic interests in removing barriers to, and facilitating trade in EGS at the WTO level. The Netherlands is the EU's second largest environmental goods exporter, with exports of up to EUR 132 billion in 2021 according to the highest estimate. Dutch exports are concentrated in **climate change mitigation and adaptation,** and **clean energy**. Dutch businesses also provide environmental services worldwide, ranging from **offshore wind generation** to **hydraulic engineering**. Liberalisation in the EGS sector may thus lead to export and productivity growth, diversification, innovation, and upscaling of Dutch businesses.

This study also provides estimates of the potential environmental impacts of trade in EGS, with a focus on GHG emissions. The diffusion and uptake of environmental goods and services is considered critical for the role of the Netherlands and the European Union (EU) in **achieving both the Paris Climate Agreement's objectives and the UN's Sustainable Development Goals (SDGs)**. Boosting trade and exports, however, can also drive up emissions by increasing the scale of industrial production in exporting countries, and by affecting the distribution of economic activities across different sectors.

After multilateral ambitions to liberalize trade in EGS did not materialize, momentum for trade facilitation and liberalisation in EGS is again building. The Trade and Environmental Sustainability Structured Discussions (**TESSD)** informal working group on trade in EGS is exploring opportunities and possible approaches for promoting and facilitating trade in environmental goods and services to meet environmental and climate goals, including through addressing supply chain, and technical and regulatory elements. Increasingly, bilateral trade agreements are also including specific provisions and chapters on EGS, with the recently concluded **UK-New Zealand FTA** and **Australia-Singapore Green Economy Agreement (SAGEA)** being two such examples.

Substantial challenges remain, however. **Trade-related tensions and trade disputes on issues related to renewable energy have increased since 2010** with a focus on industrial policies, subsidies, and local content requirements (LCRs). Discussions around liberalisation in EGS are also made difficult by **challenges in identifying environmental goods** in the World Customs Organization (WCO) Harmonized System (HS). While **"Ex-outs" can serve as one possible solution for describing relevant items**, specific classifications are still needed for innovative and emerging goods.[1] Moreover, questions remain around the certification of products such as "green" hydrogen.

Estimating the potential economic and environmental impacts of tariff liberalisation on environmental goods requires navigating these complexities. Building on a thorough review of existing classification efforts (e.g. OECD, APEC, the Friends' list, UK-New Zealand FTA, and SAGEA)**,** this report

[1] Ex-outs in any HS 6-digit sub-heading mean that only some of the goods classified under a sub-heading are part of a list of environmental goods. Ex-outs are usually products identified at the HS 8-, 9- or 10-digit level.

introduces **three lists of environmental goods that reflect both a different environmental scope and a different level of economic importance for the Netherlands: a core (priority), a short, and a long list.** These three lists guide the modelling and estimation exercises, which are based on a scenario in which tariffs are eliminated on all goods included in each list.

This report finds that export flows from the Netherlands will increase when markets open up more. Using data from UN-COMTRADE in the framework of a partial equilibrium model to simulate the response of international trade to a reduction of tariffs on environmental goods that are on the three distinct lists, we find that:

- **For the core list, exports from the Netherlands would experience an annual increase of 95 million USD** (an increase of 16.5% in exports of "core" environmental goods from the Netherlands to its main export partners);
- **For the short list, exports would increase by approximately USD 160 million annually** (an increase from USD 1.2 to USD 1.4 billion, or 12.3% in export flows towards the rest of the world);
- **For the long list, exports would increase by USD 271 million annually** (equivalent to an increase of 1.5%).

For all EU-27 economies combined, our simulation suggests the following effects from the elimination of tariffs on environmental goods:

- **For the short list, exports from EU economies to the rest of the world would increase annually by approximately USD 4.5 billion** (an increase of 11%)
- **For the long list, EU exports would experience a substantial increase of USD 10.7 billion annually**, bringing the sum of EU exports of environmental goods from USD 136 billion to USD 147 billion (an increase of 7%)

Trade gains expected both for the Netherlands and for the EU would be **distributed roughly equally between goods with a clear environmental end-use application and that are considered dual-use goods.** Moreover, according to our simulation on Dutch export data, **components for wind power generation**, **industrial pumps**, and **machinery to counter water and air pollution** emerge as clear winners from trade liberalisation. The report also provides estimates of Dutch untapped export potential, which is mainly concentrated in **the UK, the USA, China, India, and Taiwan**.

When we link these modelled estimates to data and projections on GHG emissions, we find that the expansion in industrial production linked to trade liberalisation would result in an annual increase of over 41,000 tons of CO2e in the Netherlands**.** This is equivalent to less than 0.01% of the Netherland's annual emissions from industrial activities, suggesting that **the environmentally negative impacts of eliminating tariffs are extremely limited.**

Moreover, an econometric estimation conducted for this report on a dataset of global trade and emissions suggests that the diffusion of environmentally friendly technologies is linked to a **0.36% reduction in CO2 emissions for each 1% of imported environmental goods. For the Netherlands, this is equivalent to a reduction of 85,000 metric tons of CO2e.** The two estimates are derived using distinct methodologies and are not directly comparable, but they do suggest that the environmental effect of tariff liberalisation is, on balance, positive.

This report also provides insights into the impacts of **non-tariff barriers (NTBs) to trade**, which tend to have a larger impact on trade than tariffs. Based on interviews with industry stakeholders, we explore both the degree of prevalence, as well as the degree of restrictiveness of trade barriers, to the Netherlands exports—**with a focus on environmental services**. Our findings suggest that Dutch services exporters face a range of barriers connected to market entry, operations and competitiveness. Procurement processes are another area of concern especially for firms in the wind and water sectors, with exporters facing **local content requirements, bans on provision of certain services and forced joint ventures or caps on foreign ownership.**

Given the changing nature of the EGS sector, **this report suggests moving away from "traditional" environmental services and focusing on services which are indispensable for climate action.** Here, a cluster approach is a promising solution for identifying climate services as it would group services based on their relevance for climate-related activities. The list of climate services that we suggest is organized along three key sectors that could contribute most to reaching net zero emissions—**professional services, including engineering; infrastructure and construction; and digitally-enabled services.**

Looking forward, in the event of future negotiations on EGS liberalisation, this report suggests that **priority should be given to goods in which the Netherlands is internationally competitive**. It would also be opportune to explore where Dutch export interests align with EU policy frameworks such as the European Green Deal. More broadly, a best-in-class outcome would be for the broadest possible number of countries to create a **living list of environmental goods**, to be updated as technology evolves, and develop an open architecture that other countries can join as appropriate.

Discussions of trade facilitation in environmental goods should proceed together with discussions on trade in environmental services. Simultaneous liberalisation of trade in EGS is important because **products, technology and services are often supplied on an integrated basis**. A **climate cluster approach** can be used to liberalise non-core environmental services such as engineering or architecture by specifying these services on the basis of their contributions to a mitigation project or end use, thus avoiding concerns over services with dual uses.

2 Introduction

2.1 Context and vision

2.1.1 Purpose and scope of this study

International trade is an important mechanism for the diffusion and adoption of technology. Technologies which are key to climate change mitigation and adaptation, pollution reduction, circular economy, and biodiversity conservation, are a case in point. The need to build cleaner economies and accelerate the transition to a low-carbon global economy has stimulated renewed discussions around the facilitation of trade in environmental goods and services (EGS) as a tool for climate action, including in the context of the Trade and Environmental Sustainability Structured Discussions (TESSD) at the World Trade Organization (WTO).

The **purpose of the study is to gain insights into the Dutch economic interest in removing barriers to and facilitating trade in EGS at the WTO-level**. Environmental goods and services are an increasingly important business sector. At the global level, the WTO expects the EGS market to grow to about USD 700 billion globally in the next five years.[2] According to a recent CBS analysis, in 2020 the Netherlands exported environmental goods worth between 31 and 132 billion euros—depending on the classification one uses.[3] Liberalisation in the EGS sector may thus offer a wide range of opportunities for export expansion, diversification, innovation, and upscaling of Dutch businesses.

In this report, we provide a critical overview of existing classifications of EGS. Building on this review and our analysis of the Netherlands' current international competitiveness in the EGS sector, we then **propose three up-to-date lists of environmental goods**: (1) a **"long" list** of environmental goods, which is based primarily on environmental considerations; (2) a **"short" and more focused list**, which includes a subset of goods which tend to feature in all existing classifications, indicating a degree of consensus on their environmental purpose; and (3) **a "core" list of goods of clear offensive interest for the Netherlands.**

Building on these three lists, we use a partial equilibrium model to **provide evidence into the potential economic gains** which would result from tariff liberalisation in environmental goods.[4] The purpose of this exercise is to understand the distribution of trade gains across the three lists. Our findings indicate that gains from liberalisation are concentrated among the core and short lists of environmental goods. These findings suggest that, in the event of future negotiations around EGS liberalisation, **priority may be given to goods in which the Netherlands is internationally competitive.**

In addition to economic interests, our research also provides insights into the environmental impacts of trade liberalisation in the EGS sector. In line with existing research, we find that the **environmental impacts of slashing tariffs on environmental goods would be minimal** in the Netherlands—raising GHG emissions by less than 0.1%. Moreover, we find that **trade in environmental goods is linked to a reduction in emissions of 0.36% for each 1% of imported environmental goods.**

[2] WTO, 2022, World Trade Report 2022: Climate change and international trade. *World Trade Organisation*, Geneva. Available at the following link. This estimate is based on a relatively narrow definition of the EGS sector, centred around a number of key technologies (water treatment and management, air pollution, waste management, and clean energy generation).

[3] CBS, 2021. Dutch Trade in Facts and Figures 2021: Exports, Imports, and Investment. *Centraal Bureau voor de Statistiek.* Available at the following link.

[4] It is worth noting that insofar as environmental goods are concerned, this study focuses on tariff liberalisation only. Our modelling exercise does not include the potentially more restrictive issue of non-tariff barriers to trade. These are the focus of our case studies of environmental service exporters.

This suggests that benefits from the diffusion of EGS and climate-friendly goods services outweigh the environmental costs.

Finally, the report provides a **qualitative and quantitative overview of the main non-tariff barriers to trade (NTBs) faced by Dutch environmental service exporters**, with a focus on three service areas of offensive interest for the Netherlands—**offshore wind** generation, **water management** and supporting **business services**. Our findings here reveal that Dutch companies confront a number of barriers relevant to market entry, operations and competitiveness; but that these can vary significantly by country and sector.

In sectors such as renewable energy and water, the significant role of government within the industry often leads to a range of barriers that will be embedded in a country's **procurement process** at the national and sub-national levels. With many foreign governments increasingly seeking to leverage procurements towards domestic economic, political and strategic objectives, Dutch firms may encounter such barriers as **local content requirements, bans on provision of certain services and forced joint ventures or caps on foreign ownership**. These barriers may exist in parallel to issues related to transparency in the procurement process and can equally apply to other sectors of offensive interest to the Netherlands, such as business services.

2.1.2 Why is it important to foster trade in environmental goods and services

Trade facilitation of environment- and climate-related goods and services can support sustainable development within planetary boundaries. For example, eliminating tariffs and NTBs on certain clean energy technologies and energy efficiency products could increase their trade volume by 14% and 60%, respectively, according to one recent study.[5] An increase in trade volume should translate into the greater availability and use of EGS across countries. That, by extension, could help reduce emissions, lower the stress on natural resources and improve social and economic welfare.[6]

Importantly, **trade is also a means of reducing technology costs and diffusing innovation**, as much as for EGS as other products.[7] Addressing trade barriers can accelerate this process, leading to gains for consumers and business shouldering the transitions to a more sustainable economy, while opening new markets for exporters. Working on trade barriers around EGS can also bolster intergovernmental alliances on clean technologies.[8] It could equally encourage greater investment flows thanks to clear market signals, certainty, and predictability, in turn helping to boost research and development (R&D) as well as employment in green sectors.

Facilitating trade in environmental services in particular, can help countries and firms:

1. Reduce the costs of environmental targets by helping to spread the **support systems critical to environmentally-friendly goods**—including training, education, and infrastructure—at lower prices.[9]
2. Access technical expertise as the complexity of many **environmental goods requires specific knowledge and skills for installation and operation**, and these services are not always available or marketed in every country.

[5] Monkelbaan, J., Sugathan, M., and Naranjo, A. 2021. Environmental goods and services: questions and possible ways forward in the TESSD. Working Paper No. 2 in Trade and Environmental Sustainability Series. *Quaker United Nations Office*, Geneva. Available at the following link.
[6] United Nations Environment Programme. 2018. Trade in environmentally sound technologies: Implications for Developing Countries. Available at the following link.
[7] See, for instance, Cai, J., Li, N., and Santacreu, A.M. 2022. Knowledge diffusion, trade, and innovation across countries and sectors. *American Economic Journal: Macroeconomics, 14*(1). Available at the following link.
[8] Monkelbaan, J. 2014. The Benefits of a Sustainable Energy Trade Agreement (SETA). *Law and the Transition to Business Sustainability* 103–124 (D. R. Cahoy & J. E. Colburn eds, New York: Springer. Available at the following link.
[9] Sauvage, J. and Timiliotis, C. 2017. Trade in services related to the environment, No 2017/2, *OECD Trade and Environment Working Papers*, OECD Publishing. Available at the following link.

3. **Strengthen export industries that are engaged in global or regional value chains since goods and services are usually sold and traded in tandem**.[10] For example, solar and wind energy projects involve services such as the assessment of solar and wind resources, site analysis, project development, project financing, engineering and design services, and installation, operation and maintenance of equipment.

Numerous studies have shown how trade in environmental goods is often bundled with services for assembly, installation, technical testing and analysis, education, advice, consultation, management, repairs, computers or R&D.[11] Services such as construction, design and engineering for example are all relevant for the provision of sustainable energy. Any policy restriction placed on the provision of those ancillary services has the potential to deter or slow down the uptake of cleaner technologies.[12] While some technologies that we need for decarbonization are well known, some will only operate at commercial scale in the future.[13] Regardless, it is vital that **the relationship between environmental goods and the related services is understood**, so that that market signals, partnerships and incentives around sustainability transitions are given for both.

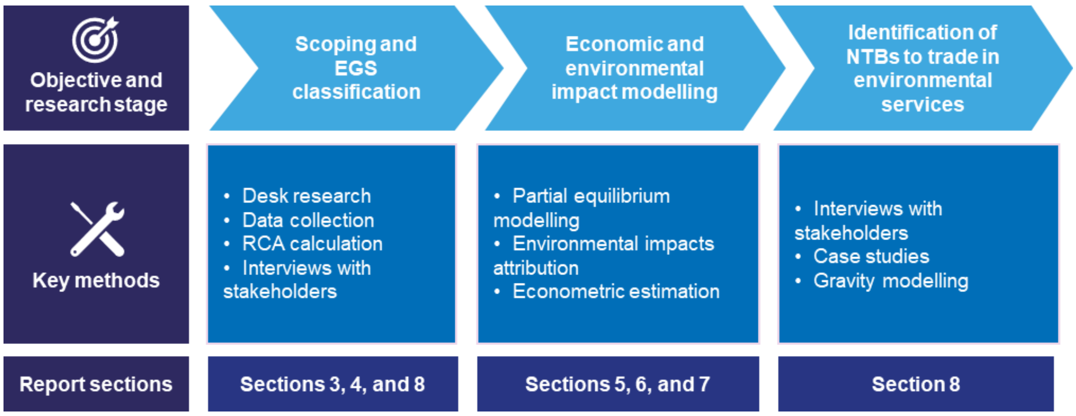
2.2 Approach and methodology

In this report, we combine a set of different methodologies within a mixed methods research framework. Our overall research objectives are the following:

- Provide an **updated EGS classification, focusing on the Netherlands offensive interests**;
- Estimate the **potential economic and environmental impacts of trade liberalisation** in the EGS sector; and
- Identify and map the key non-tariff barriers (**NTBs**) faced by **Dutch exporters of key environmental services.**

Figure 1 below presents the overall methodological framework supporting this study, with an overview of the three objectives and corresponding research stages; the key methods we used, including modelling and semi-structured interviews with stakeholders; and the corresponding sections in the report. Annexes II and III provide greater details on each of the key methods.

Figure 1. Overall methodological framework of the report



[10] National Board of Trade Sweden. 2021. Trade and Climate Change Promoting climate goals with a WTO agreement. Available at the following link. See also Bohn, Notten, Prenen and Wong. 2021. *Diensten in dozen: de rol van indirecte dienstenexport*, in CBS, *Internationaliseringsmonitor Dienstenhandel: Ontwikkelingenen belemmeringen 2022-II.* Available at the following link.
[11] National Board of Trade Sweden. 2014. Making Green Trade Happen. Available at the following link.
[12] Sauvage, J. 2014. The Stringency of Environmental Regulations and Trade in Environmental Goods, No 2014/3, *OECD Trade and Environment Working Papers*, OECD Publishing. Available at the following link.
[13] IEA. 2021. Net Zero by 2050: A Roadmap for the Global Energy Sector. Available at the following link.

The remainder of this report is organised as follows. Section 3 discusses the history of trade liberalisation in the EGS sector, and provides an overview of current liberalisation efforts. Section 4 provides a critical overview of existing classification efforts, with a focus on environmental goods. It puts forward our proposed lists of environmental goods. Section 5 provides a snapshot of the Netherlands' position—in terms of trade flows and overall competitiveness—in the EGS sector. Sections 6 and 7 describe the simulation results, outlining our main findings on the economic and environmental impacts of trade liberalisation. Section 8 focuses on NTBs in environmental services, and concludes with a proposal for a reconceptualization of environmental services. In section 9, we provide policy recommendations arising from the report.

3 Trade liberalisation in the EGS sector

3.1 Past efforts at trade liberalisation

Governments have long recognised the potential of EGS trade. Indeed, a global mandate to facilitate trade in these goods and services was agreed as far back as 2001 but floundered along with the wider Doha Round of WTO negotiations.[14] A few plurilateral and regional efforts have since emerged. Much can still be learned from the discussions, as well as challenges to be navigated.

Starting in 2014, a group of 46 WTO Members began negotiating an Environmental Goods Agreement (EGA), with the aim of slashing (bound) most-favoured nation (MFN) tariffs to zero. The EGA sorted through goods to include categories of environmental action—like air pollution control, renewable energy and energy efficiency—coming up with a list of around 300.[15]

The move was partly inspired by a list of 54 environmental product types that the Asia-Pacific Economic Cooperation (APEC) economies decided to liberalize on a voluntary (applied tariff) MFN-basis in 2012 to 5% or less. That has created a market of well over USD 300 billion within the region.[16] APEC economies continue to pursue their EGS effort, with an aim to explore non-tariff barriers, as well as take into account environment and technological changes.[17]

Despite high-level commitments by G20 trade ministers to reach a deal, EGA negotiations nonetheless collapsed by December 2016. Just like in the Doha talks on EGS, an inherent challenge was **the lack of agreement on the definition of environmental goods**,[18] alongside a change in political will among larger players. Many so-called ‘environmental’ goods have **‘dual’ or multiple uses**, raising questions on classification and nomenclature, but also causing **commercial defensive and offensive trade interests to bleed into consideration of environmental merit.**

Meanwhile, trade-related tensions and trade disputes on issues related to renewable energy have increased since 2010 (see Box 1). These trade tensions are often due to the design and implementation of industrial policies in numerous countries to spur domestic production of renewable energy technologies, ‘green’ job creation, and technological upscaling by using measures such as local content requirements (LCRs) that could be seen as protectionism.[19] One recent example is the Inflation Reduction Act (IRA) in the US, which contains, among other items, local content requirements (LCRs) for tax credits for electric vehicles (EVs).

Recent years have also witnessed governments increasingly resorting to unilateral trade remedies against renewable energy products, particularly among the major renewable energy producer countries. Subsidies that distort trade and competitiveness are often not compliant with WTO rules and can lead to the application of trade defence measures. Although the use of trade remedies (including anti-dumping measures and countervailing duties) by itself does not lead to trade tensions and the WTO offers dispute settlement procedures, the use of trade remedies can indicate potential pressure points and competitiveness concerns. Some experts see the use of trade remedies as a

[14] WTO. The Doha Round. Available at the following link.
[15] Global Affairs Canada. 2022. WTO Environmental Goods Agreement (EGA). Available at the following link.
[16] APEC. 2021. A Review of the APEC List of Environmental Goods. Available at the following link.
[17] APEC. 2021. APEC Advances Environmental Goods Tariffs Cut. Available at the following link.
[18] Lim, A.H. 2017. WTO Work on Trade in Environmental Goods and Services. [Presentation], at United Nations Conference Centre, Bangkok, Thailand. Available at the following link.
[19] Swedish National Board of Trade. 2013. Targeting the Environment: Exploring a New Trend in the EU’s Trade Defence Investigations. Available at the following link.

significant break on renewable energy development and harming associated green services jobs in the process.[20]

Box 1. Recent WTO disputes related to renewable energy and local content requirements (LCRs)

The *Canada – Renewable Energy* case was initiated in 2010 by Japan against the province of Ontario's feed-in tariff (FIT) programme. The Japanese claim was that the programme's LCRs discriminated against foreign renewable energy products, placing Canada in violation of national treatment requirements of the GATT and the TRIMS Agreement, and constituting a prohibited subsidy under the SCM Agreement. The EU had separately challenged the same FIT programme in 2011. The WTO panels for these two cases acknowledged most of the claims by Japan and the EU, including the GATT and TRIMS violations, but were divided on the subsidy issue. Following a Canadian appeal, the Appellate Body (AB) in May 2013 held that Ontario's FIT programme violated the national treatment obligation under the GATT and TRIMs agreement; though it disagreed with the panel's analysis on a few points of law, including the subsidy determination. As a result, Canada had to bring its programmes into compliance, which it did by mid-2014.

A second case on renewable energy, *China – Measures Concerning Wind Power Equipment*, was raised in 2010 by the US against China's Special Fund for Wind Power Equipment Manufacturing. It offered subsidies to Chinese wind turbine manufacturers that agreed to use key parts and components made in China rather than imported parts. This case was chosen out of multiple US investigations on China's renewable energy practices, including a series of anti-dumping and countervailing duties (CVD) investigations. The consultations that followed led China to cancel the subsidy in 2011.

Another WTO dispute involving LCRs, *India – Certain Measures Relating to Solar Cells and Solar Modules*, was initiated by the US in February 2013 against Indian LCR provisions pertaining to solar cells and/or modules. The US complained that the LCRs were in violation of India's obligations under the GATT and the TRIMS and SCM Agreements. In its report released in February 2016, the panel found that the LCRs constituted trade-related investment measures, thus violating the national treatment obligation under the TRIMS Agreement and the GATT.

Another example is *United Kingdom — Measures Relating to the Allocation of Contracts for Difference in Low Carbon Energy Generation*, wherein the European Union requested consultations with the United Kingdom with regard to the inclusion of United Kingdom content in the context of the allocation of Contracts for Difference in low carbon energy generation (mainly offshore wind power generation).

Source: Own elaboration

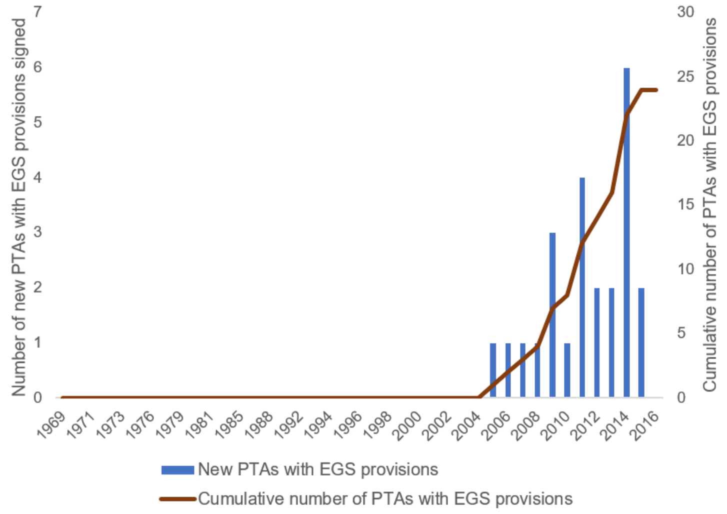
In 2019, Australia, Canada, Mexico, New Zealand, and Switzerland launched an initiative at the WTO that aims to remove barriers to trade in environmental services. An important premise of this initiative is that technological advances have opened significant new opportunities for cross-border trade of services. More recently, a group of six nations are working on an Agreement on Climate Change, Trade and Sustainability (ACCTS), which will include the removal of tariffs on environmental goods and new binding commitments for environmental services.[21] The participating countries have said that, once the ACCTS is concluded, other countries will be welcome to join provided they are able to meet the required commitments. The deal will also cover rules to eliminate harmful fossil fuel subsidies and guidelines to inform the development of voluntary eco-labelling programmes.

[20] If the higher cost of solar panels linked to AD/CVD remedies slows installation, that would curb expansion of associated services (like repair and installation). Some estimates suggest potential new US trade remedies would result in an annual loss of the equivalent of two-thirds of all solar energy installed in 2021. Over the next four years, that would lead to an increase in US carbon emissions of 61 million metric tonnes. Information is retrieved from the following link.
[21] New Zealand, n.d. Foreign Affairs & Trade. Agreement on Climate Change, Trade and Sustainability (ACCTS) negotiations. Available at the following link.

3.2 From multilateral to regional and bilateral efforts

With multilateral liberalisation stalled, efforts have shifted to the bilateral and regional level as Preferential and Regional Trade Agreements (PTAs and RTAs) have become the main tool for countries to liberalise trade—including in the EGS sector.[22] According to our analysis of data on trade agreements notified to the GATT or the WTO between 1969 and 2016, specific **provisions concerning greater trade liberalisation for environmental goods started appearing in trade negotiations around 2005** (see Figure 2 below).

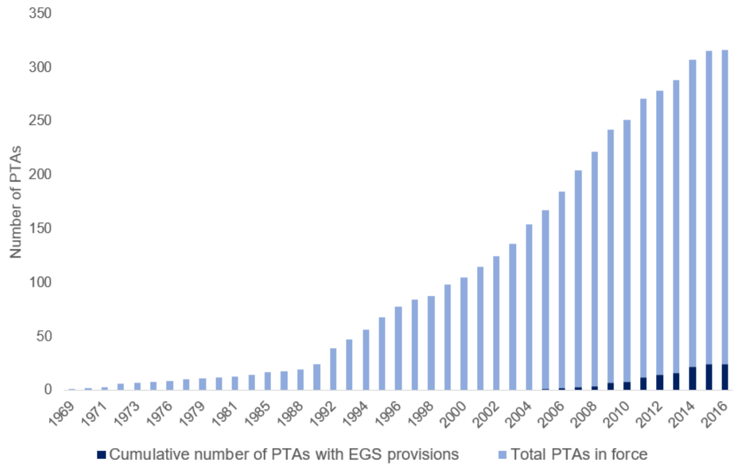
Figure 2. Evolution in trade agreements containing specific EGS liberalisation provisions



Source: Own elaboration, based on World Bank (2021) database on *The Evolution of Deep Trade Agreements*

As of 2016, 24 RTAs and PTAs currently in force globally contain specific provisions aimed at liberalising trade in environmental goods. While the number of these provisions is growing, trade agreements containing liberalisation provisions directed at the EGS sector account for a small share of globally active PTAs—just above 8 percent (see Figure 3 below).

Figure 3. The share of PTAs containing EGS liberalisation provisions remains small



Source: Own elaboration, based on World Bank (2021) database on *The Evolution of Deep Trade Agreements*

[22] See, for instance, Baccini, L. 2019. The Economics and Politics of Preferential Trade Agreements. *Annual Review of Political Science 22*: 75–92. Available at the following link.

3.3 Current liberalisation efforts

Momentum for EGS liberalisation is building. In 2021, a group of 70-plus nations launched the TESSD[23] under WTO auspices, with one informal working group focusing on trade in EGS. In December 2021, ministers from 71 WTO members issued a statement calling to *"explore opportunities and possible approaches for promoting and facilitating trade in environmental goods and services to meet environmental and climate goals, including through addressing supply chain, technical and regulatory elements"*.[24]

Members of the TESSD working group on EGS broadly support a staged approach, where Members would discuss objectives and sectors sequentially to allow more focused discussions. A significant part of the discussions has thus far focused on how trade in EGS could achieve climate and environmental goals. Objectives related to climate change mitigation and adaptation have been mentioned most frequently by Members, including the European Union (EU).

The EU has been a driving force behind the TESSD talks and, in particular, the working group on EGS. The staged approach and the initial focus on climate change in that that group is largely modelled on the EU Taxonomy.[25] The TESSD are not primarily aimed at restarting talks on liberalisation, which have stalled since the breakdown of negotiations on the EGA in December 2016. Rather, they are focused on building consensus around shared priorities, approaches, and best practices to integrate environmental outcomes in the design of trade policies—including through the lens of trade facilitation and regulatory cooperation in EGS.[26] At the same time, however, the "Friends of Environmental Goods" group of countries at the WTO—which includes the EU—would be open to discussing liberalisation together with trade facilitation measures and regulatory cooperation.

Other objectives mentioned in the TESSD working group on EGS, inter alia, have included clean air and clean water (reduction of pollution), protection of biodiversity and ecosystems, transition to a circular economy, sustainable management and protection of water and marine resources.[27] It has also suggested identification of priority sectors, and possibly important goods and services, based on their contribution to internationally agreed environmental objectives.

Members have broadly agreed that discussions on EGS should have a broad scope on policy measures going beyond tariff reductions. Members, *inter alia*, have expressed interest in discussing non-tariff measures, regulatory cooperation, good regulatory practices, technology transfer, and capacity building. In terms of themes, a number of Members have suggested focusing meetings on specific sectors to allow for more structured and deeper discussions. Regarding possible future work and next steps, Members are broadly in agreement to continue with a staged approach focusing on the dual objectives of climate adaptation and mitigation, with renewable energy as the first priority sector.

Another opportunity for opening up trade in EGS lies in bilateral and regional free trade agreements (FTAs). According to the rules in the FTAs recently signed by the EU, the EU and its trade partners must ensure effective implementation of the Paris Agreement on Climate Change and encourage trade that supports tackling climate change. The EU also mainstreams sustainability throughout its trade agreements to prioritise the liberalisation of trade in EGS, promote sustainable

[23] WTO. Trade and environmental sustainability structured discussions news archives. Available at the following link.
[24] TESSD, 2021. Ministerial Statement on Trade and Environmental Sustainability, WT/MIN(21)6. Available at the following link.
[25] The EU's original 'green' and sustainable finance Taxonomy ('the Taxonomy') has been developed to provide investors, governments and many other organisations within the EU with a science-based classification system to use in financial decisions responding to the global climate and environmental emergency. Its aim is to provide robust definitions and transparent reporting to support increased finance for activities that substantially contribute to solving climate and environmental crises.
[26] Bellmann, C. and Sugathan, M. 2022. Promoting and Facilitating Trade in Environmental Goods and Services: Lessons from Regional Trade Agreements. *Technical Paper: Forum on Trade, Environment, and the SDGs (TESS).* Available at the following link
[27] The Kunming-Montreal Global Biodiversity Framework (GBF) agreement, adopted in December 2022, is a case in point.

public procurement, and remove barriers to trade and investment in renewable energy. EU FTAs in force with the following countries include rules on Trade and Sustainable Development (TSD): Canada; Central America; Colombia, Peru, and Ecuador; Georgia; Japan; Moldova; Singapore; South Korea; Ukraine; United Kingdom; and Vietnam.

In terms of non-EU FTAs, the **New Zealand-UK FTA**, signed in February 2022, is the first FTA containing a comprehensive list of HS product codes containing environmental goods. It has been followed up by the **Australia-Singapore Green Economy Agreement**, signed in October 2022, which also puts forward a list of environmental goods.

4 Environmental goods: towards a definition

The World Customs Organization's Harmonized System (HS) serves as the classification system through which tariffs are assigned and international trade statistics are measured. Yet, despite including more than 5,000 commodities at the six-digit level of classification, a number of challenges exist with respect to the measurement and classification of environmental goods within this system.

A first challenge lies in determining whether a good is "single use" or "dual use" in terms of its function and purpose for preserving and improving the environment. In some cases, the classifications are clear: products that are universally accepted as being an "environmental good" (e.g., wind turbines) are assigned specific HS codes at the six-digit level. In a number of instances, however, goods that may have clear environmental applications are assigned an HS code that is shared with products that – while potentially similar – differ in the extent to which they could be considered as having environmental uses. An example of such a good would be pipes or tanks that can be used both for transporting fossil fuels and green hydrogen.

To overcome this challenge, negotiators in trade agreements covering EGs have relied on so-called **"ex-out" product descriptions to describe the relevant item**.[28] The HS is reviewed every five years and the most recent review (HS-2022) which entered into force on 1 January 2022 included several new tariff lines that better capture goods relevant to clean energy – such as LED lights that consume less power.[29, 30]

Beyond the issue of dual-use, additional challenges exist with respect to products that obtain their EG-status as a result of the nature of the production process itself. Products such as "green steel" or "green hydrogen", for example, lack both an accepted standard of classification and an associated HS Code, making measurement of their trade flows and assignment of tariffs impossible at present.

These issues highlight that although advances in HS classifications and ex-outs can be seen as a step forward, a significant increase in specific classifications and certification schemes will be needed in the HS to account for innovative and emerging environmental goods. **The forthcoming review of the HS for the 2027 tariff schedule offers an opportunity to specify further environmental goods**, and this opportunity should be considered by the Netherlands and the EU.[31]

More precise HS codes should improve the quality of trade statistics for environmental goods and would help to align other trade policies, such as those on rules of origin and standards, to be better aligned with climate and environmental policy.[32] One challenge in this area is that a limited number of goods is considered at each HS review for being assigned new tariff lines, and in general only a handful of environmental goods is considered, making prioritization a necessity.

In what follows, we provide a critical overview of different approaches to defining environmental goods, including existing classification efforts. These efforts form the basis of our own proposed classification, which is presented in Section 4.4.

[28] When ex-outs are used, participants at the start of the negotiations may have slightly different descriptions of those technologies in their national tariff schedules and must therefore negotiate a commonly agreed description or add further sub-categorisations at 8-, 9- and 10-digit levels. For more see, Steenblik, 2020; National Board of Trade Sweden, 2021. Available at the following link and link, respectively.

[29] Steenblik, R. 2020. "Code Shift: The Environmental Significance of the 2022 Amendments to the Harmonized System." *International Institute for Sustainable Development*, Geneva. Available at the following link.

[30] World Economic Forum. 2022. Accelerating Decarbonization through Trade in Climate Goods and Services. Available at the following link.

[31] Steenblik, R. 2020. "Code Shift: The Environmental Significance of the 2022 Amendments to the Harmonized System." *International Institute for Sustainable Development*, Geneva. Available at the following link.

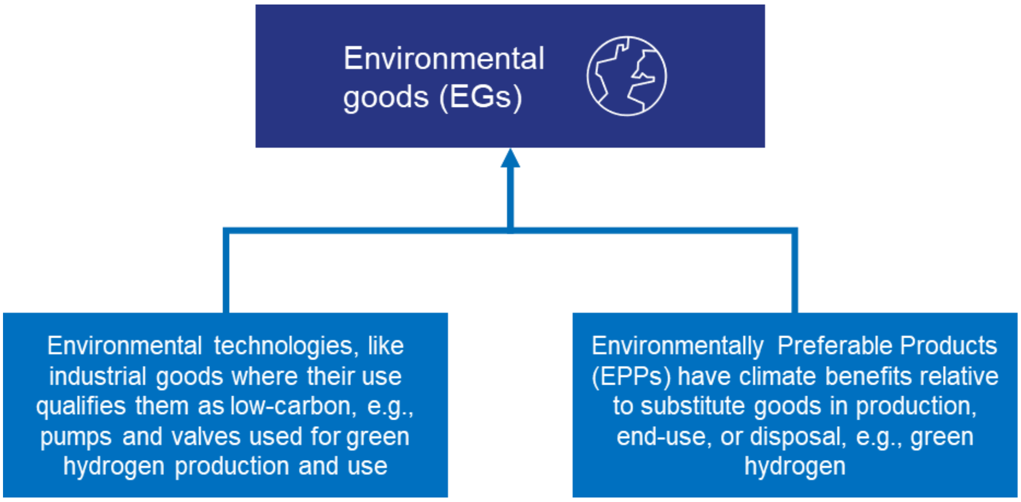
[32] National Board of Trade Sweden. 2021. Trade and Climate Change Promoting climate goals with a WTO agreement. Available at the following link.

4.1 Identifying environmental goods

Environmental goods can be clustered into two broad groups: **environmental technologies** and **environmentally preferable products (EPPs)**. The former usually refer to specific technologies that are used solely for the purpose of solving environmental problems. Examples include, for instance, carbon-scrubbing filters, waste reduction technologies, and water purification machines. EPPs, on the other hand, are "products which cause significantly less 'environmental harm' at some stage of their life cycle than alternative products that serve the same purpose, or products the production and sale of which contribute significantly to preservation of the environment".[33]

Whereas environmental technologies are, in general, easier to distinguish and include within a list of EGs, the classification EPPs is more nuanced and subject to greater debate. Given that EPPs are defined in relation to alternative products, questions arise as to where to draw the line on the scale from the most damaging to the most beneficial goods, with respect to their environmental impact. While decisions can in principle be informed by criteria such as products' carbon footprint or lifecycle approaches, **no consensus exists on how to rank EPPs in terms of their environmental benefits.** Environmental technologies are in that respect less problematic, more easily identifiable, less subject to debate and, therefore, predominantly included in the lists of EGs that we suggest.

Figure 4. The two broad groups of Environmental Goods: Technologies and EPPs



Source: Own elaboration

Voluntary standards and mandatory technical regulations are often connected with EPPs and the private sector or governments may use these to distinguish products according to their environmental impact. However, methodologies for calculating, measuring, reporting, and verifying carbon intensity tend to be inconsistent. For example, **global standards for "green steel", "green cement" and other alternatives for emissions-intensive materials have not yet been developed**—though there are some efforts underway.[34] EPPs have often been considered important for EGS trade negotiations since some developing countries have commercial interests in these. Developing countries are competitive, for example, in producing and processing sustainable natural building

[33] Brenton, P., and Chemutai, V. 2021. The Trade and Climate Change Nexus: The Urgency and Opportunities for Developing Countries. Washington, DC: World Bank. doi:10.1596/978-1-4648-1770-0. Available at the following link.
[34] Forster, H. 2021. Low Emissions Steel Standards Needed to Market Green Steel: ArcelorMittal. *S&P Global*. Available at the link A recent initiative by Responsible Steel and The Climate Group (SteelZero) is looking at defining low-carbon steel. Research is also available on augmenting green steel demand *see e.g.* Energy Transitions Commission, *Steeling Demand: Mobilising Buyers to Bring Net-Zero Steel to Market before 2030* (2021). Available at the following link. Government initiatives are being developed, including the UK's Low Carbon Hydrogen Standards.

materials such as bamboo. Such products are ideal for infrastructure projects and are often locally and affordably produced.

Tariffs are, on average, higher for EPPs than for environmental technologies. The global average was 7.3 percent in 2018. But tariffs in industrialised countries are relatively low—2.8 percent in Japan, 2.9 percent in the United States, and 3.4 percent in the EU.[35] Further, low-income countries can access these markets at lower duties or duty-free under unilateral preference programs, such as the EU's Everything But Arms (EBA), the African Growth and Opportunity Act (AGOA) of the United States, and the Generalized System of Preferences (GSP) applied by many high-income countries. Many of the gains from liberalizing trade in EPPs would thus come from trade between low- and middle-income countries. Therefore, these countries could improve their access to EPPs and contribute to their environmental objectives as well as boost trade with other low- and middle-income countries.[36]

There may be instances where developing countries choose to keep up trade barriers, for example when aiming to protect domestic production of components that can soon be competitively produced locally. One example of this is the production of heavy or bulky components such as towers, for which minimizing transport distances provides a cost advantage. However, imposing tariffs without a realistic chance of achieving competitiveness can be regarded as simply a revenue-raising measure that is likely to increase the cost and slow down the development of renewable energy deployment without creating wider economic benefits and without generating national industries.[37]

There are some hurdles to liberalising trade in EPPs. For example, WTO rules may consider that measures that distinguish between products based only on **processes and production methods (PPMs)**—but are otherwise "like" each other— are discriminatory.[38] Environmental PPMs related to GHG emissions are nonetheless instrumental in defining potential EPPs such as green hydrogen, green ammonia, and green steel. We return to these issues in Section 6 of this report, as discussions around PPMs have some bearing for our modelling results. The issue remains a key point of debate, and also around non-tariff barriers, which will be addressed in more detail below.

However, there are good reasons for including EPPs that can be readily identified in a list of environmental goods, such as "products distinguishable by some observable or measurable difference in their chemical or physical characteristics"[39] and those with an HS code. The 2014-16 EGA negotiations included a category of goods related to EPPs. Countries could also contribute to the development of specific HS codes for EPPs via cooperation in the WCO.[40] We therefore include a number of clearly recognisable EPPs alongside environmental technologies in our own classifications for this report.

4.2 Existing classification efforts

To date, three main lists of environmental goods have been put forward—the **OECD list**, the **APEC list**, and the so-called **Friends' list**. All of these lists include both environmental technologies and EPPs. In 1999, the OECD defined environmental goods as those that *"measure, prevent, limit, minimize, or correct environmental damage to water, air, and soil, as well as problems related to waste, noise, and eco-systems."* The OECD has used this to classify environmental goods under

[35] Brenton and Chemutai, 2021. The Trade and Climate Change Nexus: The Urgency and Opportunities for Developing Countries. World Bank. Available at the following link.
[36] Brenton, P., and Chemutai, V. 2021. The Trade and Climate Change Nexus: The Urgency and Opportunities for Developing Countries. Washington, DC: World Bank. doi:10.1596/978-1-4648-1770-0. Available at the following link.
[37] See, for instance, Bridle and Bellman, 2021. How Can Trade Policy Maximize Benefits From Clean Energy Investment? IISD Report. Available at the following link.
[38] World Economic Forum. 2021. Delivering a Climate Trade Agenda: Industry Insights. Available at the following link.
[39] Steenblik, R. 2005. Liberalising Trade in "Environmental Goods": Some Practical Considerations. OECD Trade and Environment Working Paper No. 2005-05. Available at the following link.
[40] National Board of Trade Sweden. 2021. Trade and Climate Change Promoting climate goals with a WTO agreement. Available at the following link.

three broad headings: pollution management, cleaner technologies, and resource management.[41] The list has been developed for analytical and statistical purposes rather than trade negotiations and identification by customs official, and thus it has been criticized for lacking practical application during negotiations.[42]

The APEC list, first introduced in 2012, represents the first attempt to single out environmental goods as a category for trade liberalization purposes. APEC negotiations started from the OECD attempt to identify relevant categories of goods. The APEC list consists of **54 product categories** and it provides, for the first time, a set of specific goods and tariff lines. **It focuses primarily on industrial goods**, such as steam condensers that minimize air pollution, bamboo flooring, and filtering and purifying machinery. Countries such the United States, Australia, China, and Japan all signed the APEC agreement, and together make up half of the top ten global exporters of environmental goods.[43]

However, the goods that were included in the APEC agreement **covered predominantly the interests of developed countries**. Moreover, the APEC list fails to include EPPs, which cause less environmental damage in production, consumption or disposal than substitute goods. Comparing the OECD and APEC list, there is only 30% overlap – underlining the difficulty in establishing an agreement upon the definition of environmental goods.

Another classification that is relevant to consider is the Friends of Environmental Goods' list.[44] Consisting of 153 product categories from diverse sectors which had been submitted in the context of the Doha negotiations, the Friends' list is a compilation of individual submissions by countries belonging to the Friends group. While the list is considered to be the most comprehensive list to be submitted at Doha, it was criticized on the grounds that it lacks clear environmental and developmental benefits. Additionally, concerns have been raised over the list's lack of products of export interest to developing countries.[45]

Much like the APEC list, the Friends' list focuses on broad product categories. This is an issue which created significant challenges during the negotiations for the EGA. By 2016, negotiators had developed a "landing zone" of products across 304 HS 6-digit tariff lines. Disagreements over specific sub-products persisted, however. Take, for instance, HS code 854140. This covers climate-friendly PV cells and modules for use in solar power, but also photosensitive semiconductor devices and LEDs (light-emitting diodes)—products that can raise environmental concerns over how they are disposed of. Classification issues made it difficult to agree on what products to include, with China adamant about including tariff cuts on solar panels, as well as bicycles.[46, 47]

More recently, two agreements relevant to trade in environmental goods were concluded in 2022: the New Zealand-UK Free Trade Agreement and Singapore-Australia Green Economy Agreement (SAGEA). The New Zealand-UK FTA includes what is perhaps the most comprehensive and updated list of HS subheadings containing environmental goods, as it includes a selection of the latest

[41] CSIS, 2021. Environmental Goods Agreement: A New Frontier or an Old Stalemate? Available at the following link.
[42] Sugathan, M. 2013. Lists of Environmental Goods: An Overview. Information Note. December 2013, International Centre for Trade and Sustainable Development, Geneva, Switzerland.
[43] CSIS, 2021. Environmental Goods Agreement: A New Frontier or an Old Stalemate? Available at the following link.
[44] The "Friends" are Canada, the European Union, Japan, Korea, New-Zealand, Norway, Chinese Taipei, Switzerland and the United States.
[45] Sugathan, M. 2013. Lists of Environmental Goods: An Overview. Information Note. December 2013, International Centre for Trade and Sustainable Development, Geneva, Switzerland. Available at the following link
[46] Monkelbaan, J., Sugathan, M., and Naranjo, A. 2021. Environmental goods and services: questions and possible ways forward in the TESSD. Working Paper No. 2 in Trade and Environmental Sustainability Series. *Quaker United Nations Office*, Geneva. Available at the following link.
[47] The CBS conducted a study on the international trade position of the Netherlands for environmental goods For this study, two lists of environmental goods are proposed and subsequent trade flows presented. One ''narrow'' list combines the aforementioned OECD and APEC lists, while the second includes the environmental goods proposed under the OECD, APEC and Friends' lists. Manifestly, the latter list is described as a list of environmental goods with a broad definition of the term.
See CBS,2022. *Internationaliseringsmonitor: Handel en milieu*. Available at the following link

environmental technologies such as hydrogen and energy storage systems. The list consists of 3 columns. The first column establishes the HS 6-digit subheading, the second the ex-out specifications, and the last provides the opportunity for parties to enter comments on the environmental benefit of the indicated HS subheading or ex-out.[48]In the SAGEA, a list comprised of 372 environmental goods has been developed which are categorized under the HS-standardized system.[49] While this list has been stated to be non-exhaustive and subject to periodic reviews, the current version has a considerable focus on mining and processed mineral goods. Table 1 provides an overview of existing classification efforts.

Table 1. Overview of existing classification efforts

EG list	Strengths	Weaknesses
OECD list	Broad and inclusive list which focuses on the inclusion of environmental goods that measure, prevent, limit minimize or correct environmental damage	Developed for analytical and statistical purposes and not for customs officials
		Limited practical applicability for trade negotiations and lacks ex-outs
		Focuses on the interests of developed countries
APEC list	Provides a set of specific goods and tariffs lines	APEC list primarily focuses on industrial goods, limiting the inclusion of developing countries interests'
	Politically feasible, as it includes fewer controversial goods within the framework of a non-binding agreement which did not fully eliminate tariffs	Included goods predominantly cover the interests of developed countries
		List does not include EPPs
Friends' list	Includes a set of goods under standardized HS-codes	Criticized for the lack of clear environmental and developmental benefits
	The list is comprised of diverse sectors and acts as the most comprehensive list submitted in the context of the Doha negotiations	The list lacks export products that are of interest to developing countries
The New Zealand-UK list	Both lists include recently developed environmental goods and technologies which are not covered in older lists. The New Zealand-UK list is, however, broader and longer in scope.	Concluded by two closely related economies with few areas of trade conflict and high levels of complementarity
Australia-Singapore list		Given Australia's strategic position, the list focuses on products related to mining and mineral processing. These are likely to be less relevant to economies without a strong mining industry.

Source: Own elaboration

4.3 Tariff profiles of environmental goods

Tariffs on environmental goods are on average already relatively low. Average global tariffs on environmental goods based on a definition by the OECD declined from over 3% to below 2% between 2003 and 2016 – suggesting these are not a major barrier to green trade. There is significant variation, however, across countries. **Tariffs are often low in developed countries – on average 0.5% – but are generally higher in developing countries (above 10% in some cases)**.[50] Many climate goods may also already enjoy duty free treatment in the context of FTAs.

[48] TESS. 2022. Promoting and Facilitating Trade in Environmental Goods and Services: Lessons from Regional Trade Agreements – Technical Paper. Available at the following link.
[49] Australian Government Department of Foreign Affairs and Trade, 2022. Singapore-Australia Green Economy Agreement Official Text. Available at the following link.
[50] De Melo, J. and Solleder, J-M. 2017. What's wrong with the WTO's environmental goods agreement. Available at the following link.

A global tariff cutting deal among 50 WTO Members—the Information Technology Agreement (ITA)—also includes some important items like solar cells and modules.[51] Yet, with modern, integrated supply chains in which components and parts cross borders several times until the completion of a product, the cumulative impact of tariffs can add up for even low tariff levels.[52] Countries may also be interested in increasing their competitiveness around environmental goods or green manufacturing. Tariff reduction can contribute to further supply chain integration with this objective in mind. [53]

Among existing classification and liberalisation efforts, the APEC list stands out. In 2012, APEC countries called for a reduction in tariffs on environmental goods to 5% or less by 2020. By 2021, all but two countries had achieved these cuts in tariffs, with some of the APEC economies entirely removing tariffs on these goods.[54] **The simple average tariff applied on the APEC list of 54 environmental goods by the G-17 group of WTO members which negotiated the EGA was 3.21% in 2016**. Within the G-17, the EU simple average tariff of these goods was 2.25%, while the US levied an average 0.85% on the environmental goods included in the APEC list. Outliers, in terms of simple average tariff levied in 2016 were Costa Rica (8.67%), China (7.24%), and South Korea (6.57%).[55]

Among the negotiating countries involved in the broader **Friends' list, the average tariff rate on environmental goods stands at 3.4%**. While it is possible that an agreement on reducing these tariffs could have beneficiary impacts on specific products and countries, it is argued that it would not result in broad macro-economic impacts because of the already relatively low tariff levels.[56]

Across the OECD, APEC and Friends' list of environmental goods, average tariffs are relatively low amongst developed countries which are already engaged in trade agreements or negotiations towards reducing or eliminating these tariffs. Therefore, the economic impacts of complete tariff removal could be limited to some specific goods and industries or predominantly benefit developing countries which continue to have relatively high average tariff rates on environmental goods.[57]

4.4 Tariff liberalisation from a Dutch perspective: proposed lists

In this study, we are interested in estimating the potential economic and environmental impacts of tariff liberalisation on environmental goods. Estimating these impacts requires classifying environmental goods. Definitional boundaries are critical here: existing evidence suggests that the magnitude of economic and environmental impacts depends, to a large extent, on the scope of one's classification of environmental goods.[58] In the context of a discussion around the impacts of trade liberalisation, any classification of environmental goods needs to take into consideration two key selection criteria:

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[51] The Information Technology Agreement (ITA) was originally concluded by 29 participants at the Singapore Ministerial Conference in December 1996. Since then, the number of participants has grown to 82, representing about 97 per cent of world trade in IT products. At the Nairobi Ministerial Conference in December 2015, over 50 members concluded the expansion of the Agreement ('ITA 2'), which now covers an additional 201 products valued at over $1.3 trillion per year.
[52] De Melo, J. & Sollecer, J-M. 2019. The role of an Environmental Goods Agreement in the quest to improve the regime complex for Climate Change, EUI Working Paper RSCAS 2019/55. Available at the following link.
[53] National Board of Trade Sweden. 2021. Trade and Climate Change Promoting climate goals with a WTO agreement. Available at the following link.
[54] APEC Policy Support Unit, 2021. A Review of the APEC List of Environmental Goods. Available at the following link.
[55] European Commission, DG Trade, 2016. Trade Sustainability Impact Assessment on the Environmental Goods Agreement. Available at the following link.
[56] APEC Policy Support Unit, 2021. A Review of the APEC List of Environmental Goods. Available at the following link.
[57] Reinsch, W., Benson, E. and Puga, C., 2021. Environmental Goods Agreement: A New Frontier or an Old Stalemate? Available at the following link.
[58] Monkelbaan, J. et al. 2015. Environmental Goods Agreement (EGA) Trade Sustainability Impact Assessment. European Commission. Available at the following link.

- **Environmental importance:** The environmental implications of trade liberalisation depend on the inclusion of a selection of environmental technologies and environmentally preferable products with clear environmental benefits;
- **Economic importance:** Economic gains are likely to depend on the extent of a country's current and future competitiveness in the EGS sector.

The first criterion can be navigated based on the existing studies and classification efforts reviewed in Section 4.3 above, although the rapidly changing nature of the EGS sector and the complexity of dual-use issues call for some firm choices to be made. The second criterion requires considering the Netherlands' economic interests in the EGS sector, including a consideration of its proximity to some of the country's strategic export industries. Based on these criteria and considerations, **we developed three lists of environmental goods**. Each list reflects a different environmental scope, and a different level of economic importance for the Netherlands.

The purpose of these three lists—discussed in greater detail further below—is to guide the modelling and estimation in Sections 6 and 7. We departed from a **long list** of over 200 environmental goods, which was selected primarily on the basis of environmental importance. This constitutes the baseline for our estimation efforts. It includes a subset of goods included in previous classification efforts[59] and mapping studies.[60,61] It also covers key GHG-emitting sectors (energy supply, transport, and buildings), as identified by the Intergovernmental Panel on Climate Change (IPCC)[62] and goods for carbon capture and storage (CCS) and refrigerant management.[63] In the context of liberalisation negotiations, it could maximise potential environmental gains and, given the inclusion of several EPPs, it could potentially satisfy the interests of developing economies.

The long list, however, is quite broad. Given its variety, its political feasibility in the context of a multilateral trade negotiation is open to question. In addition, it does not take into account the Netherlands' offensive interests in the EGS sector. Examples of such goods include hydraulic turbines and water wheels which are key components used in the production of hydro and tidal power. As such, this environmental good category can be considered to hold considerable environmental purpose in the reduction of GHG emissions and provide a reliable and constant source of electricity. However, with Dutch exports of these particular goods valued at USD 777,000 in 2021 it does not hold any particular significance for the Dutch economy nor competitiveness.

For these reasons, we additionally developed a **short list**. In scope, the short list mirrors the CBS' "narrow list", as it includes nearly 80 products which are well-established in existing lists.[64] The list, however, also includes goods which have a clear environmental relevance for the Dutch economy, and particularly goods related to water management; the circular economy; and biodiversity conservation. As a result, the short list reflects a compromise between economic and environmental considerations. Such environmental goods include, for instance, filtering or purifying machinery for water and liquids. In 2021, the Netherlands exported close to USD 750 million worth of filtering and

[59] Many, although not all, of the goods in these lists were included in previous WTO and APEC negotiation lists; the OECD's Combined List of Environmental Goods (CLEG); the World Bank climate-friendly goods list; and FTAs (notably UK-New Zealand FTA and ANZTEC).
[60] Vossenaar, R. 2014. Identifying Products with Climate and Development Benefits for an Environmental Goods Agreement. ICTSD Issue Paper No. 19, 29. Available at the following link.
[61] Reinsch, W., Benson, E. and Puga, C. 2021. Environmental Goods Agreement: A New Frontier or an Old Stalemate? Available at the following link.
[62] IPCC Sixth Assessment Report (Working Group III). Available at the following link. It is worth noting that we are not able to take into account a number of important IPCC sectors, such as agriculture, forestry, or land use, due to the difficulty in attributing product categories to these sectors. We therefore focus primarily on industry, energy supply, transport, and buildings.
[63] The selection of goods is further supported by McKinsey's global marginal abatement cost curve (MACC) for 2030 to take the cost effectiveness of available technologies into account.
[64] CBS, 2021. Dutch Trade in Facts and Figures 2021: Exports, Imports, and Investment. *Centraal Bureau voor de Statistiek.* Available at the following link.

purifying machinery, making it a product which is relevant for both environmental and economic consideration.

Finally, we also developed a **core list** which reflects Dutch offensive interests only. Featuring 20 environmental goods in which the Netherlands is highly competitive internationally, this list is best understood as a priority list in the context of trade liberalisation negotiations. We proxied competitiveness by computing indices of **revealed comparative advantage (RCA)** at the 6-digit HS level. [65] Product-level RCA indices reflect whether the ratio of exports of a given product over an exporter's total exports exceeds the same ratio for the global economy as a whole. The intuition is that if, relative to the rest of the world, a country exports more of a given product than would be expected, then that country is considered globally competitive in that product line. We selected environmental goods with RCA > 1, indicating a clear comparative advantage; and goods with RCA>0.85 but where Dutch export growth has been above the world average (i.e. above 10% annual growth rate), indicating a clear potential for future competitiveness.

This categorization of goods allows us to gauge the distribution of economic gains from liberalisation across the three lists. There is, however, a sub-category of production inputs that are not explicitly covered by the three lists: indispensable inputs. These inputs have few or no substitutes (in the short-run) and without them an environmental good cannot be produced. For instance, electric vehicles require rare earth metals for battery production, and contain numerous semiconductors. While these inputs have applications across industries (dual-uses), the ongoing semiconductor crisis illustrates the significant impact an indispensable input can have on the production and cost of climate action goods. Table 2 below provides a summary of the three lists we propose.

Table 2. Overview of existing classification efforts

Name	# of products	Selection criteria	Sources and data
Core list	20	Economic importance	• RCA indices calculation; • UN-COMTRADE data
Short list	79	Economic and environmental importance	• OECD CLEG and APEC lists; • CBS' narrow list; • IPCC Sixth Assessment Report (WG III); • McKinsey's global marginal abatement cost curve (MACC) calculations.
Long list	205	Environmental importance	• WTO and APEC negotiation lists; OECD CLEG; World Bank's climate-friendly goods list; • Literature and mapping studies; • FTAs, including the UK-New Zealand FTA and ANZTEC; • IPCC Sixth Assessment Report (WG III); • McKinsey's MACC calculations.

4.5 What is a climate service?

Because climate action requires economy-wide transformation across sectors and involves a set of services that is broader than traditional environmental services categories, it may be useful to identify which services are relevant for climate action. Complicating the matter, however, is the fact that there is currently no clear and agreed upon definition among either international experts or countries as to what constitutes a climate service. It is also important to determine the relevant scope because many different services can be instrumental for addressing climate change. Many such services may also have other uses. For example, engineering services can be relevant for a wind power project but also for an oil refinery. To untangle this complexity, it can be useful to differentiate between "traditional"

[65] We calculated countries' RCA using Balassa indices, which are among the most intuitive and simplest to derive measures of comparative advantage.

or "core" environmental services and services that "enable" or are "indispensable" to trade in climate goods. The World Economic Forum for example distinguishes between:[66]

1. **Traditional environmental services** that qualify as environmental due to their end-use being purely environmental. These service sectors are defined by the WTO in the Services Sectoral Classification List (the W/120 list)[67] and the provisional version of the UN Central Product Classification (CPC prov.) and include services such as **sewage, refuse disposal and sanitation**. These services classifications are thus narrowly focused on traditional environmental services and do not cover most of the more cross-cutting services that are required for, e.g., installing and running renewable energy plants (including engineering, financial, and construction services).

2. **Services that are indispensable for climate action given their role in maintaining climate goods and making them functional.** These services are essential for job creation as 17% of jobs in a wind park for example result from manufacturing the wind turbines while 83% of the jobs involved are in installation and maintenance. However, many of the services that are indispensable for trade in and use of climate goods and decarbonization cannot be easily categorized within the W/120 and CPC provisional lists.[68, 69]

Based on this distinction, and also on feedback from the stakeholders that we consulted, we take a much broader set of services into account that are indispensable for climate action than the classifications of environmental services in the W/120 list and CPC prov.

More specifically, a wide range of climate services that are relevant for decarbonization includes those related to the construction, operation, and maintenance of renewable energy generation and distribution; advisory services on reducing tailpipe emissions from vehicles; application of clean technologies in manufacturing; advisory services on land-use management and agricultural practices; project development advice, design, engineering and consultancy, R&D, financing, operational management, training and education, analytical services, testing and analysis, installation, repair and maintenance services, computer-related services; and telecommunication services[70], and services related to the inspection, certification, and testing of products and services produced with low-carbon technologies.[71]

It is important to note that WTO Members are free to propose any services classification approach as long as the sectors are mutually exclusive and do not overlap. It is important to take technological development into account because it can affect the definition and categorisation of services. Trade deals that cover services need to take this into account and include review clauses that ensure that the scope and coverage of climate services are reviewed and updated again in the future.[72] Section 8.4 of this report will go into the need for such **living agreements and the need to focus on indispensable climate services.**

[66] World Economic Forum. 2022. Accelerating Decarbonization through Trade in Climate Goods and Services. Available at the following link.

[67] WTO. 1991. Services Sectoral Classification List. Available at the following link.

[68] In a joint proposal tabled already in 2007 under Paragraph 31(iii) of the Doha Declaration, the United States and European Union argued that services that enabled Members to fulfil climate-change-related objectives included not only environmental services (such as air pollution control and climate control services) but also technical testing and analysis services (e.g., air composition and purity testing services); energy-related services (e.g., engineering and maintenance services to optimize the environmental performance of energy facilities); and services for the design and construction of energy-efficient buildings and facilities. Proposal for a Result under Paragraph 31(iii) of the Doha Ministerial Declaration, Non-paper by the European Union and the United States (JOB(07)/193/Rev.1, 6 December 2007). Available at the following link.

[69] Committee on Specific Commitments, "Services related to climate change", Informal Note by the WTO Secretariat (JOB/SERV/100, 11 June 2012).

[70] Also see JOB/SERV/100.

[71] Brenton, P. & Chemutai, V.. 2021. The Trade and Climate Change Nexus: The Urgency and Opportunities for Developing Countries. Washington, DC: World Bank. Available at the following link.

[72] World Economic Forum. 2022. Accelerating Decarbonization through Trade in Climate Goods and Services. Available at the following link.

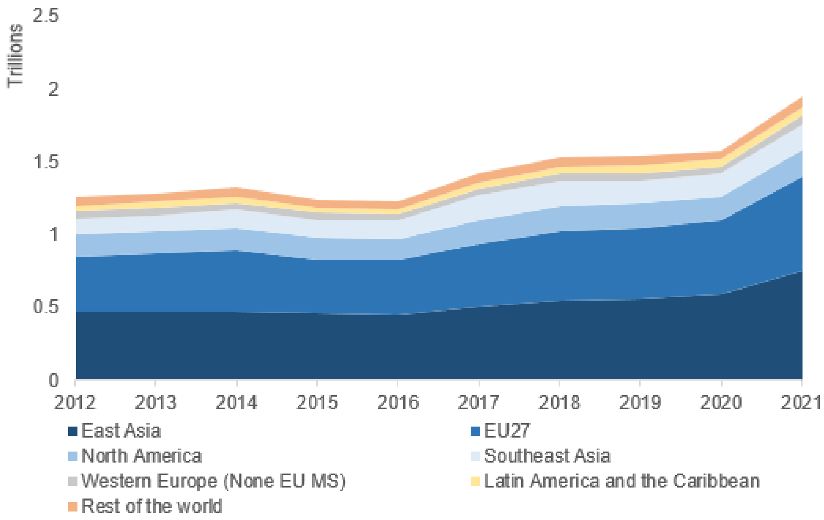
5 The Netherlands in the EGS sector

This section provides a descriptive overview of trends in trade in environmental goods, with an emphasis on the Netherlands' and the EU's role within the EGS sector. Our analysis focuses on the three lists put forward in Section 4.4 above.

5.1 Trade analysis: the long list

Global trade in the over 200 goods contained in our long list have increased by 55% since 2012, **reaching USD 1.9 trillion in 2021**. East Asia accounts for the largest share of worldwide exports of environmental goods, driven by exports from China and Japan. Exports from East Asia reached USD 756 billion in 2021—a 61% increase over 2012 (Figure 5). **The EU exported 639 billion USD in 2021**—a 68% increase over the same period.

Figure 5. Exports of environmental goods contained in the long list, per region (current USD)



Source: Own elaboration, based on UN COMTRADE (2021) data

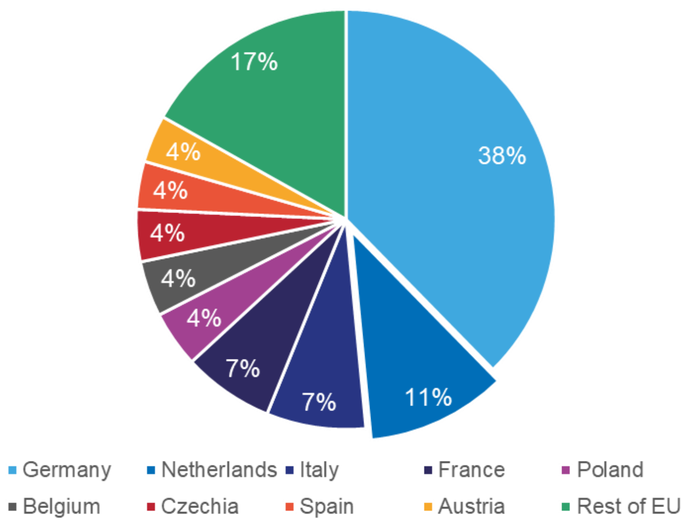
The Netherlands accounts for 11% of all environmental goods exports originating from the EU, making it the **second largest exporter of environmental goods in the EU** after Germany (Figure 6).[73] These statistics include re-exports, as trade data does not allow to distinguish between exports and re-exports.[74] Since 2012, Dutch exports of environmental goods have increased 170%, **reaching USD 60 billion in 2021**. While the EU is the main destination of environmental goods exports from the Netherlands, accounting for 47% of all exports, it is not the highest growth market.[75] Since 2012, Dutch **"long list" exports to North America and East Asia have increased by 310% and 1600%** respectively. As of 2021, East Asian economies account for over 34% of all Dutch exports in the long list (Figure 7).

[73] It is worth stressing that Germany's main exports of environmental goods in 2021 are predominantly dual-use products, A notable example is silicon, Germany's top environmental good export, a key raw material in the production of PV panels, has a variety of industrial applications including steel refining. Germany is also a key exporter of hydrogen. Yet trade data does not distinguish between "green" and "grey" hydrogen.

[74] Re-exports are unlikely to be very prevalent in the EGS sector. According to 2019 CBS data, Dutch re-exports tend to be concentrated in the machinery and transport equipment sectors—which account for 33% of all Dutch re-exports. These two groups are underrepresented across the three lists of environmental goods.

[75] Within the EU, the Netherlands' main export partner is Germany. Electronic integrated circuits, processors and controllers (USD 918 million) and partially or fully electrified road tractors for semi-trailers (USD 878 million) are the top two export categories—both dual-use goods. Important exports Germany which are unmistakably not dual-use include machinery for filtering or purifying water (USD 116 million) and machinery for filtering or purifying gases (USD 101 million).

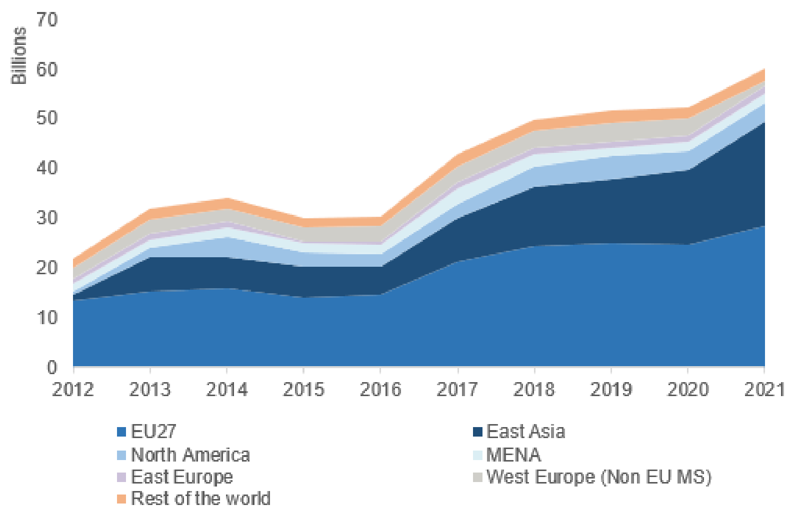
Figure 6. Breakdown of EU27 exports of long-list goods, by EU MS (2021)



Source: Own elaboration, based on UN COMTRADE (2021) data

China and Japan account for a large share of this growth. Dutch "long list" exports have increased by 765% and 290% since 2012 towards China and Japan, reaching, respectively, USD 3.8 billion and USD 700 million in 2021. Yet, it is **Taiwan and South Korea which represent the highest growth market** in the region. While in 2012 the Netherlands exported environmental goods of USD 100 and USD 300 million to the two countries, by 2021 these figures had grown to 7 and 9.1 billion USD in 2021. Dutch environmental goods exports have also grown substantially in North America, where the USA is the Netherlands' largest trading partner (Figure 7).

Figure 7. Dutch environmental goods export (long list), per region (current USD)

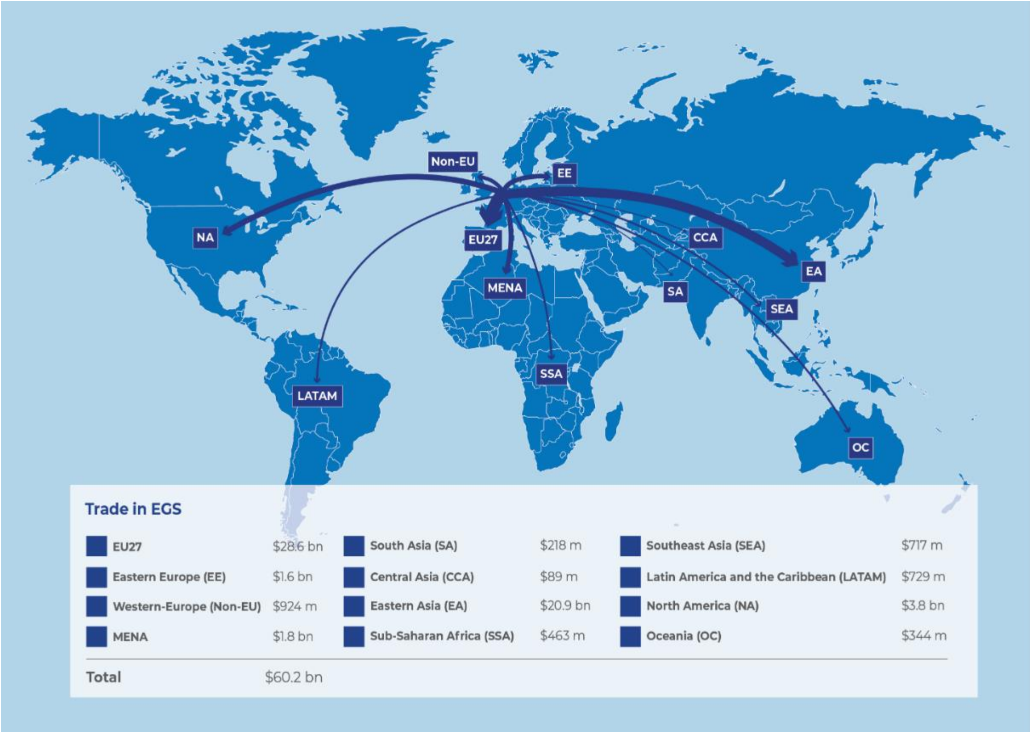


Source: Own elaboration, based on UN COMTRADE (2021) data

Growth in exports towards East Asia and North America is driven by the export of dual-use goods. In 2021 alone, the Netherlands exported over USD 8 billion towards the two regions in machinery and parts for the **manufacture of semiconductor devices and electronic integrated circuits**. While these are essential components for the manufacturing of PV cells, modules and panels, they also have a wide array of non-environmental applications. **Instruments and**

components for laboratory and testing applications—an additional dual-use product category—are another fast-growing export towards the US.

Figure 8. Dutch environmental goods trade flows (long list), in USD for 2021



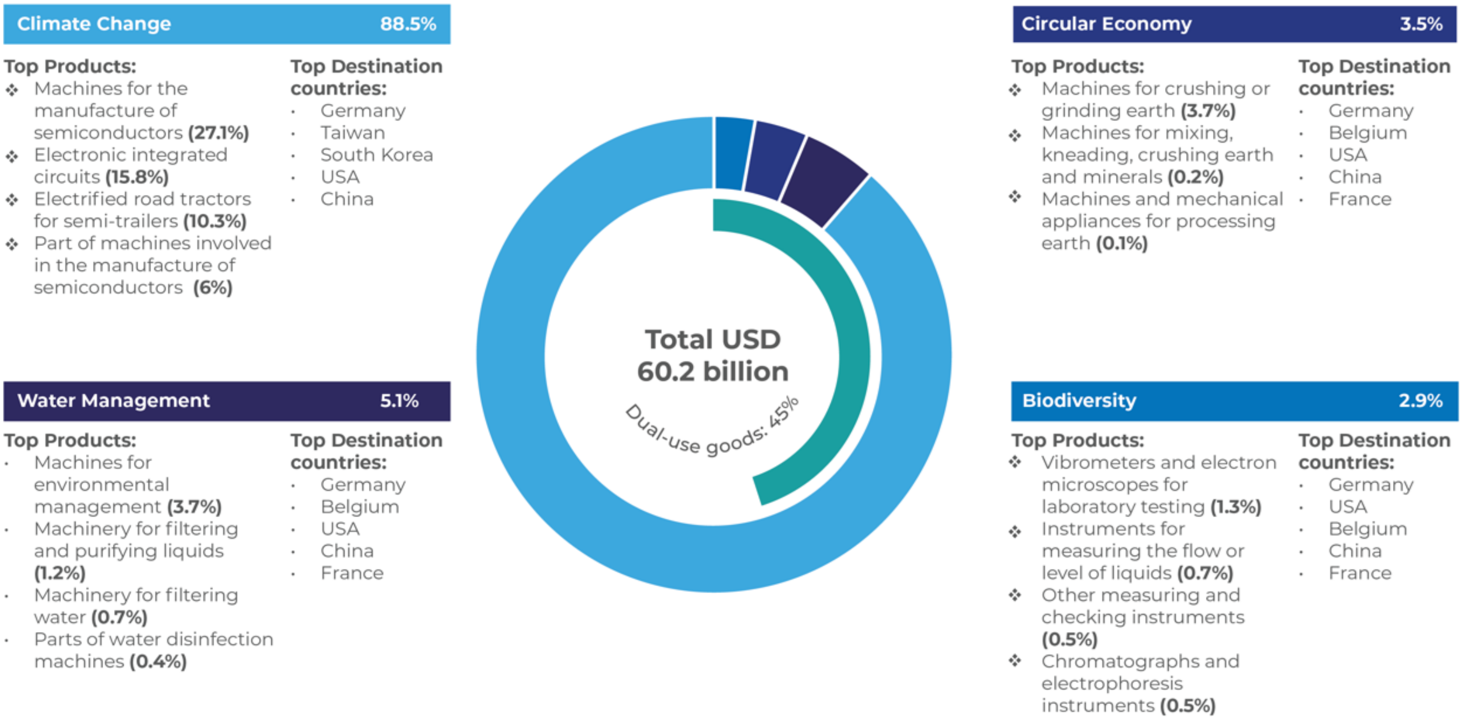
Source: Own elaboration, based on UN COMTRADE (2021) data

Looking at the sectoral distribution of trade flows, the **export of wind turbine components** is a growing area. At the close of 2021, the Netherlands had exported over USD 3.4 billion USD in wind power-related goods—an increase of 110% since 2012.[76] Its major export markets are Germany and Belgium, with significant growth in Canada and Japan.[77] While our consultations with stakeholders suggest that a large part of Dutch turbine component exports are, in fact, re-exports, Dutch firms are active in the production of towers and foundations for offshore wind; as well as in electronic and engineering components.[78]

Figure 9 below provides greater product-level detail on Dutch environmental exports as of 2021. We categorise exports into four key categories—climate change (including wind and solar energy); water management; circular economy; and biodiversity. **Climate change goods account for the lion's share**, and include, among others, machinery for the manufacturing of semiconductors and electronic integrated circuits—key for the operation of both wind and solar technologies—and electrified road tractors for semi-trailers.

[76] Wind turbines, components, structures or parts under HS code heading: 730890, 730820, 761090, 841290, 848210, 848340, 848360, 850231, 850239, 854129.
[77] The Netherlands exported over USD 87 million of wind turbines goods to Canada, an increase of over 245% since 2012. Higher export growth is however observed to Japan, where the Netherlands exported over USD 80 million, an increase of over 1600% relative to 2012 export flows.
[78] See, for instance, RVO, 2022. Dutch Offshore Wind Guide, available at the following link. See also van der Loos et al., 2021. Offshore Renewable Energy: Threats and Opportunities in the post-2030 Netherlands. Available, at the following link.

Figure 9. Environmental goods exports from the Netherlands (long list), broken down into main environmental purpose, top products, and top destination countries, 2021



Notes: Percentages in paratheses indicate the share of each product category of total Dutch environmental goods exports in 2021. Square bullet point symbol for product categories indicate a dual-use product category. Source: Own elaboration, based on UN COMTRADE (2021) data

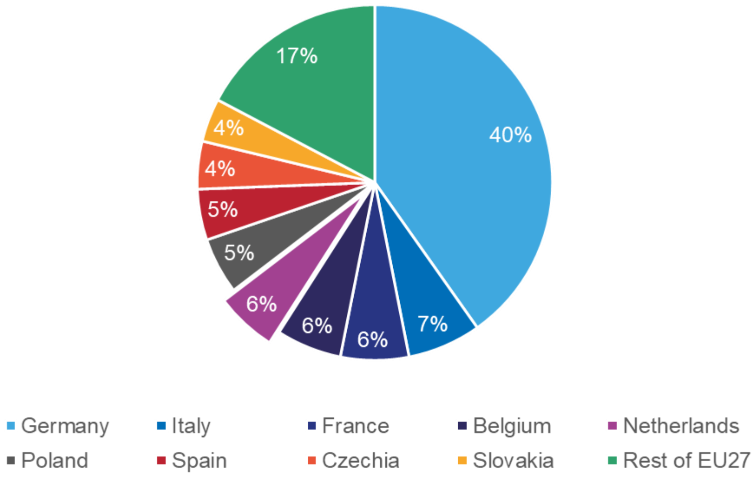
The second largest category of environmental goods are goods related to water management, which accounted for 5.2% of total “long list” exports. This category includes machines and appliances for environmental management relevant to waste, wastewater, drinking water production and soil remediation; and machinery for the filtering and purifying liquids. With a share of 3.5% of exports, the Netherlands also exported USD 2.1 billion worth of environmental linked to the circular economy. Key products under this category include machinery for the processing of minerals and metals, which are essential to move away from the use of virgin materials.

Finally, about 2.9% of all Dutch EG exports are related to biodiversity. Exports here include instruments and apparatus for the measurement of the flow and level of liquids, which are designed to measure potable water consumption to allocate cost, and encourage the conservation of scarce resources. Given the heavy weight of machinery, electronic components, and instruments across these four categories, it is not surprising that **almost half of Dutch “long list” exports belong to product categories which can be categorised as dual-use goods**.

5.2 Trade analysis: the short list

Worldwide exports of the 79 goods included in our “short list” reached USD 908 billion in 2021 – 40% of which originate from the EU. Among EU member states, the Netherlands is the EU’s third largest exporter—after Germany and Italy, alongside France and Belgium (Figure 10 below). The Netherlands exported **nearly USD 20 billion worth of environmental goods included in the short list in 2021**—a 52% increase in exports compared to a decade earlier. The EU, North America, and East Asia are the Netherlands’ top export destination.

Figure 10. Breakdown of EU27 exports of short-list goods, by EU MS (2021)

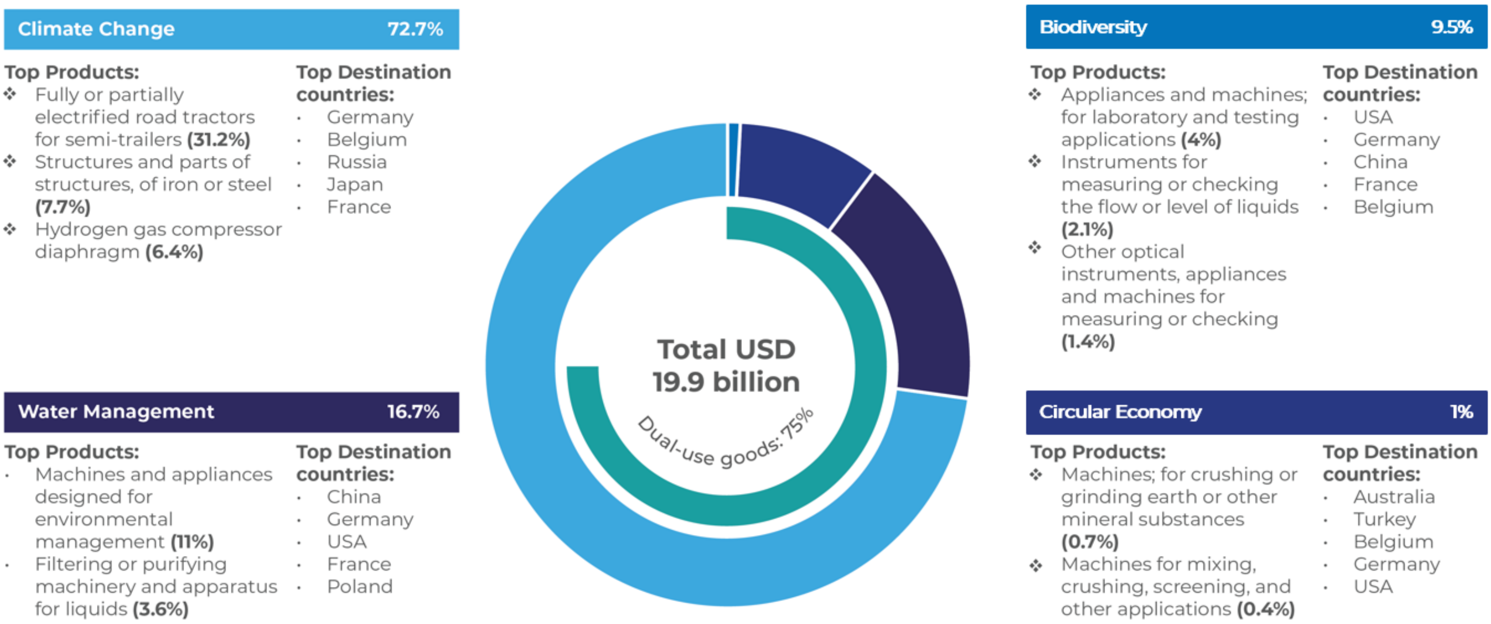


Source: Own elaboration, based on UN COMTRADE (2021) data

Delving deeper into the product level, climate change goods remain the largest export category. **Components for renewable energy generation**, such as structures and parts of structures commonly used in on- and off-shore wind turbines, and hydrogen gas compressor diaphragms, are key items in this group. Relative to the long list, products relevant to water management—including machines and appliances for environmental management, including waste, wastewater and drinking water production and soil remediation—now form a larger share of Dutch exports.

The same observation applies to the export of goods linked to the circular economy and biodiversity, including machinery used for recylcing purposes and instruments (including vibrometers, microscopes, and other optical instruments). In 2021, the Netherlands exported USD 292 million worth of optical instruments relevant for biodveristy applications. **Approximately 75% of Dutch export flows of environmental goods included in the short list can be categorized as dual-use goods.**

Figure 11. Environmental goods exports from the Netherlands (short list), broken down into main environmental purpose, top products, and top destination countries, 2021



Notes: Percentages in paratheses indicate the share of each product category of total Dutch environmental goods exports in 2021. Square bullet point symbol for product categories indicate a dual-use product category. Source: Own elaboration, based on UN COMTRADE (2021) data

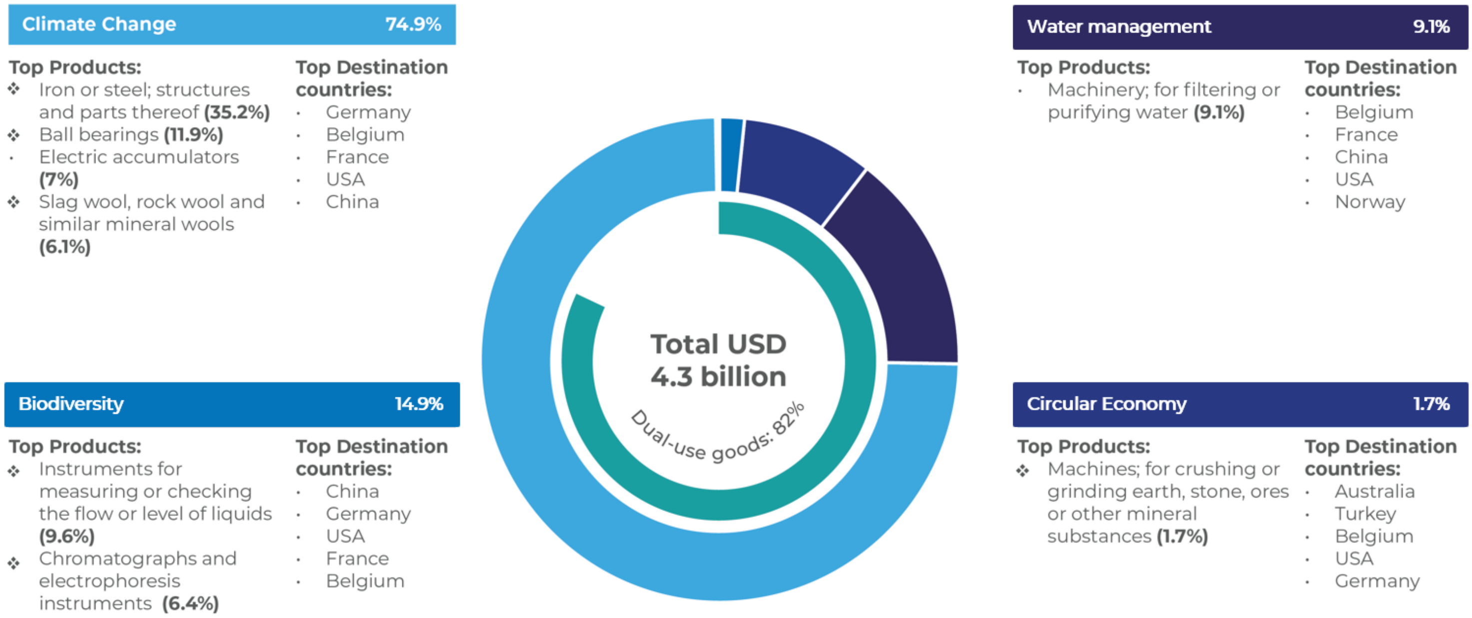
5.3 Trade analysis: the core list

In 2021, Dutch exports of goods included in the core list totalled **USD 4.4 billion —an increase of 69% since 2012.** "Core list" exports are particularly reliant on the EU market, but North America and East Asia have grown in importance in recent years. In terms of product composition, goods related to climate change account for the largest share of exports, followed by the biodiversity (14.9%), water management (9.1%) and circular economy (1.7%). It is worth stressing that goods included in the core list have the **largest share of dual-used goods across all three lists, with 82% of all export flows** arising from dual-use exports.[79]

Within the climate change category, top export products include iron and steel structures and parts of structures for wind turbines (USD 1.5 billion), ball bearings (USD 518 million) and electric accumulators (USD 307 million). Top exported products under the biodiversity category include instruments for measuring or checking the flow or level of liquids (UDS 418 million) and chromatographs and electrophoresis instruments (USD 279 million). For the water management category, the most exported Dutch product in 2021 were machinery for filtering or purifying water (USD 426 million). For the circular economy category, machines for crushing or grinding earth were the most exported (USD 80 million).

[79] Classifying environmental goods as dual-use is challenging, as there is a wide spectrum of possibilities between goods which are clearly only used for environmental purposes and goods which are clearly dual-use. Take, for instance, semi-conductors. While their environmental end-use is currently limited, this is likely to expand very substantially in the near future. Moreover, dual-use definitions can be influenced by political and economic preferences in the context of trade negotiations, making it even more challenging to reach a technical definition. Despite these complexities, we have nonetheless classified goods as being predominantly single- or dual-use in our lists, relying on information contained in "ex-out" provisions in recent trade agreements, specialised literature, and our own team's expertise.

Figure 12. Environmental goods exports from the Netherlands (core list), broken down into main environmental purpose, top products, and top destination countries, 2021



Notes: Percentages in paratheses indicate the share of each product category of total Dutch environmental goods exports in 2021. Square bullet point symbol for product categories indicate a dual-use product category. Source: Own elaboration, based on UN COMTRADE (2021) data

6 Economic impacts of EGS liberalisation

6.1 Economic impacts: a partial equilibrium simulation

Trade liberalisation should increase trade volumes in environmental goods. As new markets open, Dutch exporters in the environmental goods sector could benefit from a reduction in tariffs, leading to increased export flows from the Netherlands. Importing countries would, in turn, gain access to new varieties of environmental goods, generally at cheaper prices. In what follows, we use a partial equilibrium model to simulate the response of international trade to a reduction in tariffs on environmental goods. We are particularly interested in understanding the **magnitude of the increase in trade** resulting from liberalisation, with a **focus on the Netherlands and the EU**.

We run our model on the three distinct lists discussed in Section 4.4 above, focusing on a single liberalisation scenario, i.e. the **elimination of tariffs** on environmental goods. As the **baseline scenario**, we use trade volumes and tariff levels as of 2020.[80] Of particular interest is the difference in the effects of liberalisation when **moving between lists**. Were liberalisation to take place on a broader set of goods, would economic impacts be larger? Alternatively, are economic impacts concentrated around a more focused list of environmental goods? Providing an answer to these questions is arguably crucial in defining negotiation priorities. Should gains be concentrated around a shorter list, the incentive to include more products in a trade agreement would decrease.

6.1.1 Methodology

To simulate the economic impacts of trade liberalisation we use **a partial equilibrium model**. Partial equilibrium models are a flexible tool which enable theoretically-grounded simulations of ex-ante trade policy changes on trade volumes and prices.[81] The model **simulates the effects of a single policy action (tariff elimination)** in the markets that are directly affected, with a focus on one importing market and all its exporting partners. The key output of the model is a simulation of the **trade-creation effect of tariff elimination**, i.e. the estimated increase in trade at the product level following tariff elimination relative to a baseline scenario in which tariffs on environmental goods are at their 2020 levels.

Using data from the UN-COMTADE database for the year 2020, which functions as the baseline scenario, this chapter reports a simulation of the effects of the elimination of tariffs on environmental goods on trade flows **between the Netherlands and EU Member States and the rest of the world**. Focus was placed on a set of markets representing approximately 35% of Dutch exports (see Table A2 in Annex II for a list of these countries) as the remainder of Dutch exports—approximately 65% of total exports—are destined to other EU countries, with whom trade is already liberalised.[82] **Our model was estimated for each product in the three lists**, at the six-digit level of the HS.

We calibrated our partial equilibrium simulation based on a number of assumptions. These are discussed at greater length in Annex II. In essence, however, our key assumptions are as follows:

- The **export supply of exports from the Netherlands is highly elastic** to changes in prices on international markets. This implies that, in our simulation, exporters are very responsive to price reductions following trade liberalisation. This assumption is equivalent to treating the Netherlands, a small and open economy, as a **price taker** in the world economy.

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[80] Our baseline is based on MFN applied tariffs, unless preferential tariffs exist and are applied for a given product-market combination. In that case, the scenario is based on preferential tariffs.

[81] We calibrated our model using the World Integrated Trade Solution-Software for Market Analysis and Restrictions on Trade (WITS-SMART) tool. See Jammes and Olarreaga. 2005. Explaining SMART and GSIM. World Bank. Available at the following link.

[82] CBS, 2021. Dutch Trade in Facts and Figures 2021: Exports, Imports, and Investment. *Centraal Bureau voor de Statistiek.* Available at the following link.

- The **elasticity of substitution** between domestic and imported products is imperfect, and approximately equivalent to 2.9—the mean elasticity reported in a recent meta-analysis of over 3500 studies.[83]

Before turning to a discussion of our simulation results, it is worth highlighting the limitations of our exercise. Partial equilibrium modelling has the significant advantage of allowing simulations to be run at the very disaggregated level (i.e. 6-digit HS product codes) and to yield simple and intuitive results. However, since they focus on single markets, partial equilibrium models do not account for interactions and feedbacks between different markets.[84] They also do not account for the inter- and intra-sectoral structure of international trade. Important input-output linkages between and within industries across different economies are therefore neglected.[85]

Another important limitation concerns issues arising from the dual-use of some environmental goods—particularly in our long list—and from the environmental implications of non-product related processes and production methods (PPMs), as discussed in Section 4. Given that trade data are not available at a more disaggregated level than the 6-digit level, we are not able to distinguish between an environmental good's multiple uses in our modelling; nor between environmental goods which are produced with relatively clean energy and production processes—such as green hydrogen—from those which are produced with fossil fuels, such as grey hydrogen. Finally, our exercise remains silent on the impact of non-tariff barriers (NTBs) to trade, which are notoriously difficult to include in a formal model. We briefly discuss NTBs in Section 6.3 below.

6.1.2 Overall results

Our partial equilibrium results suggest that tariff liberalisation in environmental goods would result in the following effects for the Dutch economy:[86]

- For the **core list,** exports from the Netherlands would experience an annual increase of USD 95 million, reaching a total of USD 670 million. This is equivalent to **an increase of 16.5%** in exports of "core" environmental goods from the Netherlands to its main export partners, relative to current trade levels.

- For the **short list**, exports would increase by approximately USD 160 million annually. Exports are estimated to increase from USD 1.2 billion to USD 1.4 billion, which is equivalent to an **increase of 12.3%** in export flows towards the rest of the world.

- For the **long list**, exports would increase by USD 271 million annually. While this is a sizeable increase, its relative weight is smaller—the increase in export flows following liberalisation would be **equivalent to 1.5%**.

For all EU-27 economies combined, our simulation suggests that the elimination of tariffs on environmental goods would result in the following effects:[87]

- For the **short list**, exports from EU economies to the rest of the world would increase annually by approximately **USD 4.5 billion**. In relative terms, the increase we observe is similar to that experienced by the Dutch economy—approximately **11%**.

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[83] Bajzik, J., Havranek, T., Irsova, Z., and Schwarz, J. 2020. Estimating the Armington Elasticity: The Importance of Study Design and Publication Bias. *Journal of International Economics*, 127. Available at the following link.
[84] The model does not take into account the impact of endogenous changes in consumer preferences following trade liberalisation, which may affect demand curves, and therefore the relative prices of domestic and imported commodities.
[85] This feature implies that our partial equilibrium model does not account for the impacts of a reduction in prices on industries which are either upstream or downstream from an industry which has benefitted from trade liberalisation. It is therefore likely that results reported below are an under-estimate of the "real" effects of trade liberalisation.
[86] We were not able to find data for 2020 for the following HS product codes which we identified as part of the long list: 3920623, 701969, 850171, 850172, 850180, 853951, 853952, 854141, 854142, 854143, 91990, 92091, 940511, 940521, 940531, 940541.
[87] We report EU-27 effects for short and long list only, because the core list is designed around the specific drivers of competitiveness of the Dutch economy.

- For the **long list**, EU exports would experience a substantial increase of **USD 10.7 billion** annually, bringing the sum of EU exports of environmental goods from USD 136 billion to USD 147 billion. In relative terms, this increase is again substantial and it is equivalent to 7%.

The difference between EU and Dutch export gains in the long list is accounted for by the product composition of their export baskets. While Dutch top products predominantly include specific products, parts and components for advanced machinery and technologies (such as wind turbines), top EU products are concentrated in the electric transport equipment sector—where EU export gains are driven by Germany and, to a lesser extent, Austria, Sweden, Poland, and Spain—and in solar power equipment. EU export gains are also concentrated in equipment such as boilers, solar water heaters, and superconducting cables made from nickel.

6.1.3 Gains from trade: the product-level distribution

When looking at results concerning the **long list**, our simulation suggests that dual-use goods tend to account for the majority of trade gains from liberalisation. Moreover, relative to the European average, trade gains for the Netherlands appear to be more concentrated around dual-use goods.[88] More specifically, the distribution is as follows:

- Goods with a clear environmental end-use application account for **41.5% of the trade gains** experienced by the Netherlands, but for approximately **52.2%** of trade gains for EU-27 economies.
- Goods with dual-use applications account for **58.5%** of trade gains experienced by the Netherlands, and for **47.8%** of trade gains for the EU-27 bloc.

Trade gains are also fairly concentrated around a small number of products. Table 3 below provides an overview of the top ten Dutch exports emerging from our partial equilibrium simulation. These account for over 60% of all trade gains experienced by the Netherlands in our trade simulation. **Components for wind turbines**—which, in the form of aluminium, iron, and steel structures and parts of structures, are in the top 5 of products (HS codes 761090 and 730890)—emerge as an area where the Netherlands stands to gain from a trade liberalisation agreement.

[88] We do not find a similarly notable concentration around products, such as hydrogen or ammonia, the production of which would need to be certified for them to qualify as “green”. This is likely due to trade in these emerging products remaining quite limited.

Table 3. Top 10 products by simulated trade gain

#	HS code	Simulated trade effect (million USD)	Additional trade (%)	Description	Environmental application	Dual use
1	761090	41.4	55.8	Aluminium structures and parts of structures	Wind turbine component	Yes
2	841960	28.6	134.2	Machinery for liquefying air or other gases	Used to separate and remove pollutants through condensation	No
3	853710	18.8	8.3	Electrical control and distribution boards	Used as photo-voltaic charge controller	No
4	841391	15.3	10.9	Parts of pumps for liquid	Pump-turbine runner for hydroelectric pumped storage systems.	No
5	730890	13.6	6.9	Structures and parts of Structures, of Iron or steel	Wind turbine component	Yes
6	841480	13.6	14.9	Air pumps and air or other gas compressors	Used as hydrogen gas compressor diaphragm	Yes
7	842139	13.5	7.9	Filtering or purifying machinery and apparatus, for gases	Used in air pollution control	No
8	903289	12.0	12.7	Automatic regulating or controlling instruments and apparatus	Optional ex-outs may include: heliostats and temperature sensors for solar boiler/water heater	Yes
9	392190	9.3	11.0	Film and sheet of plastics	E.g. solar films to improve windows' insulation, reducing emissions by reducing heating and cooling demands of buildings	Yes
10	841490	8.9	10.6	Parts, of vacuum pumps, compressors, fans, blowers, hoods	Used in Carbon capture and storage (CCS), as a component for CO_2 compression and dehydration units	Yes

Source: Own elaboration

The Netherlands also stands to gain from tariff liberalisation when it comes to the export of **industrial pumps** for a variety of environmental applications, ranging from hydroelectric energy generation (HS code 841391), hydrogen production (HS code 841480), and in carbon capture and storage technologies (HS code 841490). Components for air pollution control, solar energy generation, and buildings insulation are three additional areas which would gain substantially from the slashing of tariffs. It is worth noting that, out of these products, at least six can be assumed to have a clear non-environmental end-use.

Table 4 below provides an overview of the key destination markets for the top 10 products emerging from our simulation. Following trade liberalisation, the largest markets for **wind turbine components** are Canada, the United States, China, Brazil, Malaysia and India. Among these, we observe the largest increases in the United States (**+200%** trade in product HS 761090), China (**+67%** and **+12%** trade in products HS 761090 and HS 730890 respectively), and India (**+1000%** trade in product HS 761090, from a very low baseline to up to USD 6 million annually); with the ASEAN countries also emerging as a potentially important new market. The same observation would seem to apply to Russia, but our simulation exercise does not take into account the Russian invasion of Ukraine which has substantially reshaped trade flows to, and from Russia.[89]

[89] For a recent review of trade-related impacts of Russia's invasion, see Ruta, 2022. The Impact of the War in Ukraine on Global Trade and Investment. World Bank. Available at the following link.

In the **industrial pumps** segment, the MENA region, Brazil, South Korea, and India appear to be markets that could generate gains for the Netherlands. Dutch exports to Brazil, in particular, are estimated to see **42%** and **45%** increases in trade under product codes 841480 and 841490, respectively. In the other segments, our simulation suggests that ASEAN countries would also become an important market for Dutch exports—with Thailand importing over USD 4 million worth of instruments (under HS 903289) and the ASEAN group becoming an key market for Dutch exports of PV technologies (HS 853710). Overall, however, China, India, the United States, and Brazil appear frequently as increasingly important export destinations for Dutch exports of environmental goods.

Table 4. Top 10 products and their end-markets

#	HS code	Description	Environmental application	Largest markets	New markets
1	761090	Aluminium structures and parts of structures	Wind turbine component	Canada United States China	United States China India
2	841960	Machinery for liquefying air or gas	Used to separate and remove pollutants through condensation	India Russian Federation China	India China United States
3	853710	Electrical control and distribution boards (less than 1kV)	Used as photo-voltaic charge controller	China United States ASEAN	China ASEAN Saudi Arabia
4	841391	Parts of pumps for liquid, whether or not fitted with a measuring device	Pump-turbine runner for hydroelectric pumped storage systems	Saudi Arabia United States China	Saudi Arabia Brazil United Arab Emirates
5	730890	Structures And Parts Of Structures, of Iron or steel	Wind turbine component	Canada ASEAN United States	Russian Federation ASEAN China
6	841480	Air pumps and air or other gas compressors	Used as hydrogen gas compressor diaphragm	China Korea, Rep. Brazil	China Brazil India
7	842139	Filtering or purifying machinery and apparatus for gases	Used in air pollution control	China United States Korea, Rep.	China Brazil India
8	903289	Automatic regulating or controlling instruments and apparatus	Optional ex-outs may include: heliostats and temperature sensors for solar boiler/water heater	China United States India	China Thailand India
9	392190	Film and sheet of plastic	Includes solar films to improve a window's insulating performance thus reducing GHG emissions by reducing heating and cooling demands of buildings	United States India Russian Federation	United States Canada Russian Federation
10	841490	Parts, of vacuum pumps, compressors, fans, blowers and hoods	Used in Carbon capture and storage (CCS), as a component for CO_2 compression and dehydration units	Kuwait Korea, Rep. United States	Kuwait Brazil India

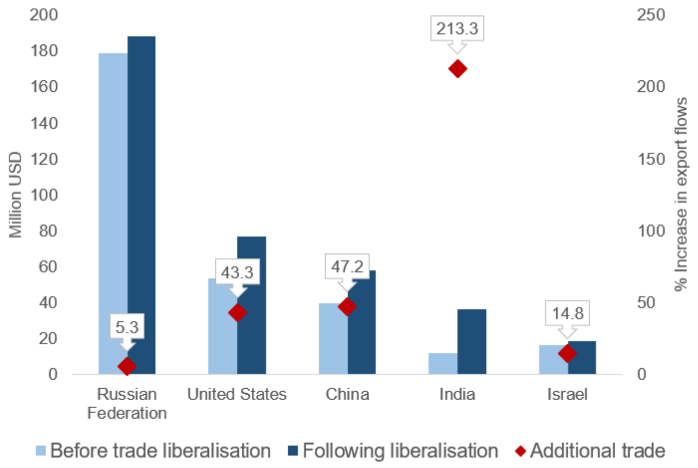
Note: We designate the "largest markets" as those non-EU destination markets which, following trade liberalisation, emerge as the largest recipients of Dutch exports for a given product category. "New markets" are those non-EU destination markets which experience the largest increase in trade, relative to the pre-liberalisation scenario. Source: Own elaboration

6.1.4 *What markets are driving our results?*

Figure 13 provides a breakdown of the five destination markets where Dutch exporters would be able to increase their exports the most. According to our simulations, if liberalisation were to concentrate on the set of products featured in the core list, the biggest increases in exports would be observed towards the **United States, China, India, and Israel** (Figure 13A). Since our simulation does not account for the impact of the 2022 Russia-Ukraine war, trade flows towards Russia appear to be important. This is unlikely to be the case, at least over the short- to medium-term, in any real-world liberalisation scenario.

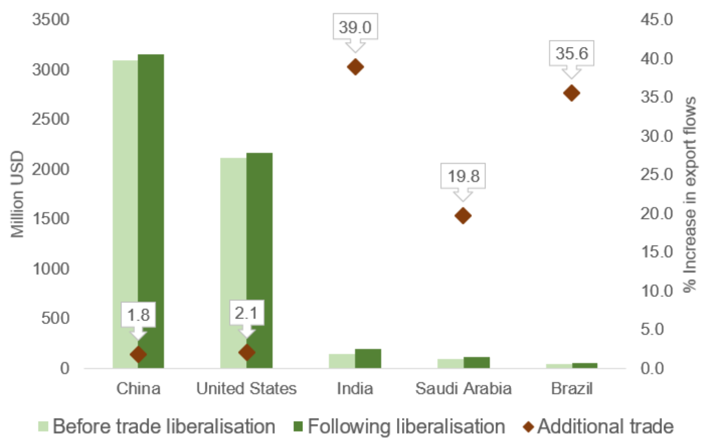
It is worth noting that the United States and China are important destination markets not only in absolute, but also in **relative terms**. Following tariff liberalisation, Dutch exports in the core list would increase by between 40% and 50% towards the two countries—a significant increase. The increase in export flows we observe towards India is even more apparent. According to our simulation, Dutch "core list" exports to India would grow by over 200% following the elimination of tariffs—albeit from a comparatively low basis (Figure 13A).

Figure 13A. The effects of trade liberalisation in the core list: top 5 destination markets by increase in export flows



Source: Own elaboration

Figure 13B. The effects of trade liberalisation in the long list: top 5 destination markets by increase in export flows

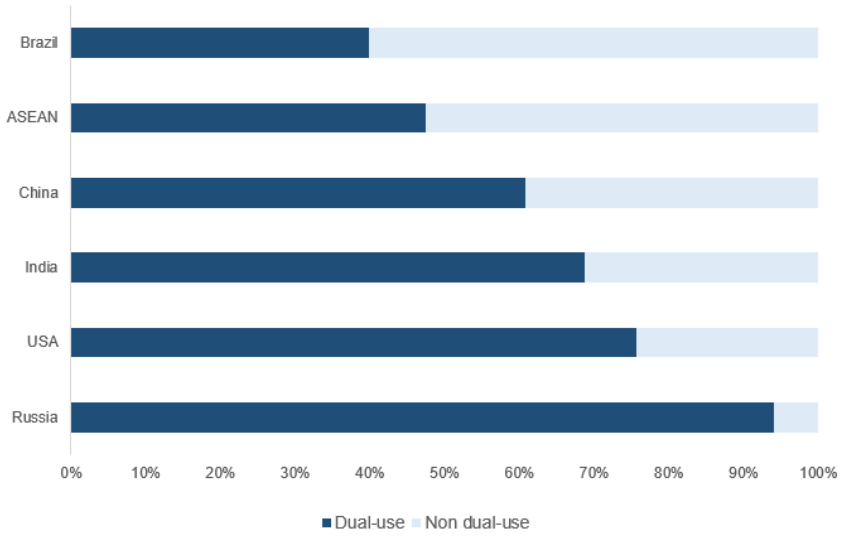


Source: Own elaboration

Focusing on the long list (Figure 13B), **China** and the **United States again emerge as two of the Netherland's largest destination markets**. On the other hand, India, Brazil, and, to a lesser extent Saudi Arabia, would all experience a substantial increase in export flows from the Netherlands—ranging from a 20% to an almost 40% increase annually following the elimination of tariffs on environmental goods.

Not all of these export markets are on the receiving end of the same types of products, however. Trade gains with Russia and, to a lesser extent, the US, are predominantly concentrated in products characterised by dual-use issues. By contrast, the Netherlands' export gains towards Brazil and the ASEAN economies appear to be more concentrated in goods with a clear-cut environmental end-use. Export gains towards China sit in the middle of the distribution (Figure 14).

Figure 14. The distribution of trade gains by market and dual-use



Source: Own elaboration

6.1.5 Product-market combinations: a market potential analysis

Looking ahead, which non-EU markets offer the greatest opportunities for Dutch exporters in the EGS field in the event of a comprehensive process of trade liberalisation? Table 5 (next page) provides a snapshot of the Netherlands' **untapped export potential** for each environmental good featured in the core list.[90] We provide estimates for the top 20 non-EU trade partners, and for the world economy as a whole. Estimates are colour-coded to indicate high (green), average (light green) and exhausted (yellow) export potential. Our findings are as follows:[91]

- Overall, the Netherlands is estimated to have a **total untapped annual export potential in the core list equivalent to USD 1.6 billion globally**.
- The **non-EU markets with the largest potential** are the UK (USD 98 million in untapped export potential), USA (USD 90 million), Taiwan (USD 72 million), and China (USD 54 million).

[90] We calculate untapped export potential using the ITC export potential tool, which builds on a gravity model to estimate the export potential of a particular country or sector at the 6-digit HS level. It evaluates export performance, target market demand, market access conditions and bilateral linkages between the exporting and importing countries. It is available at the following link.

[91] The results reported below are qualitatively similar to the estimation results from the partial equilibrium. Any discrepancy between the two is due to methodological differences. More specifically, the export potential figures presented in Table 5 stem from a gravity model which, by design, favours trade with geographically close countries and countries with relatively similar income levels. Moreover, gravity results reflect the impact NTBs—which the partial equilibrium results do not account for.

- In terms of broader regions, significant potential also lies in East Asia (USD 142 million) and the MENA region (88.5 million USD).
- In terms of the market potential, we find that components for **wind energy have the highest estimated untapped export potential** (USD 645 million). Considering that Dutch exports of these goods in 2021 reached over USD 2 billion, our estimate suggests that the Dutch export market for wind energy could be expanded by 30%.
- **Biodiversity-related goods are an emerging area of offensive interest**: we find over USD 100 million in untapped export potential in this segment, especially towards the US, Taiwan, China, and India.

Table 5. Export potential for Dutch environmental goods outside of the EU27, in current million USD (2021)

Product description	Core environmental purpose	United Kingdom	USA	Taiwan	China	Turkey	India	South Korea	Egypt	UAE	Vietnam	Nigeria	Saudi Arabia	Dem. Rep. Congo	South Africa	Australia	Singapore	Israel	Kuwait	Qatar	Indonesia	Top 20	Total world
Electric generating sets; wind-powered **(components for wind turbines)**	Climate change	59	9.9	40		21			1.1		7.9				3.5	5.4		1.9				149.7	276
Structures and parts of structures, of iron or steel **(components for wind turbines)**	Climate change	13	26	9.6		4.1	5.5		5.3	9.2		7.7	5.4	5.4		1.5			4.3	3.7		100.7	488
Instruments and apparatus; for measuring or checking the flow or level of liquids **(analysis of environmental samples)**	Biodiversity	17	10	8	10	1.5	8	8.2	2.1	0.9	1.5		1.5	2							0.9	71.6	174
Ball bearings **(components for wind turbines)**	Climate change		10	3.1	9.4		3.3	1.8	0.6	1.4	0.7						1.5				0.8	32.6	83
Machinery; for filtering or purifying water **(pollution remediation)**	Water management		9.6	4.9	4.3	0.2	2	3.6	2.1			0.7		0.5								27.9	91
Chromatographs and electrophoresis instruments **(laboratory application)**	Biodiversity			2.4	15		4.1	1.6									3.1					26.2	32
Electric accumulators **(components for renewable energy storage)**	Climate change		8.8		2.6	0.9	1.2		1.5			2			0.5		0.5	1.9			0.4	20.3	52
Slag wool, rock wool and similar mineral wools **(insulation material for buildings)**	Climate change	0.3	2.3	0.8	5.1	3			0.6		1.3	1.7			2.7		0.6					18.4	134
Bridges and bridge-sections, towers and lattice masts **(components for wind turbines)**	Climate change		3.7			1.2	1		2.4		0.7		2.2				0.4	2	1.2	1.1	0.8	16.7	154

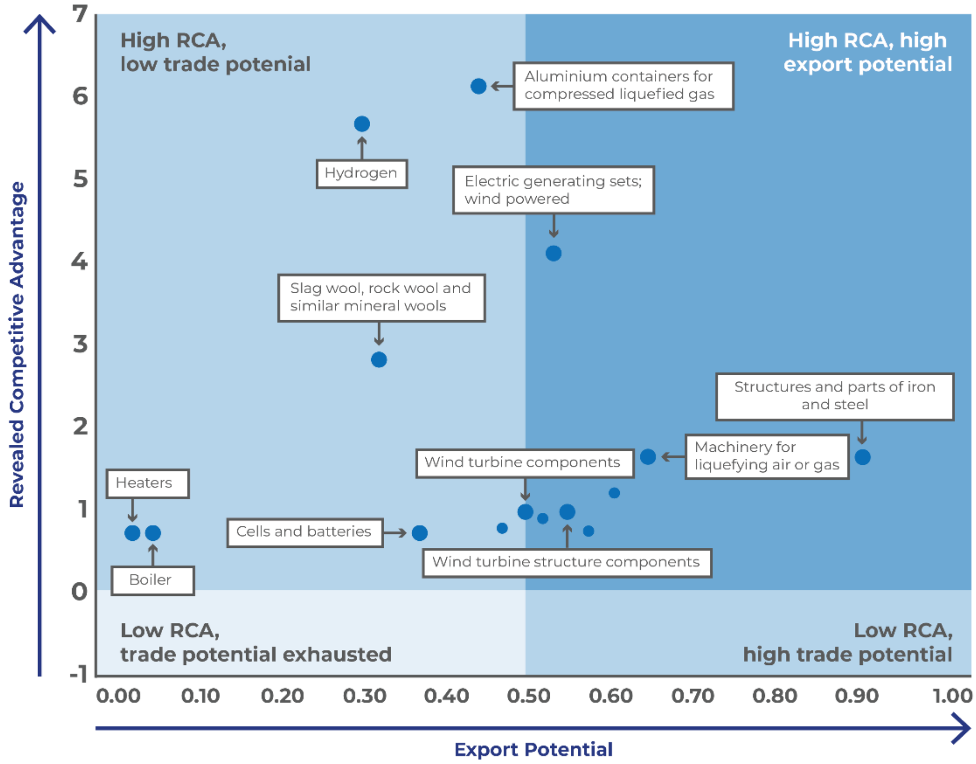
Structures and parts of structures, of iron or steel; plates, rods, angles, shapes, section, and tubes **(components for wind turbines)**	Climate change	6.5	5.6	2.2					0.4					0.5								15.2	43
Machines; for crushing or grinding earth, stone, ores or other mineral substances **(for the recovery and recycling of valuable resources)**	Circular economy	2.1	0.2		1.9		0.6		0.5		0.5	0.4		1	0.5						0.6	8.3	39
Aluminium containers for compressed or liquefied gas **(part of the hydrogen value chain)**	Climate change		2.2	0.8	1	1.5	1	0.6									0.3					7.4	23
Cells and batteries; primary, lithium **(renewable energy storage)**	Climate change		1.9		2												0.5					4.4	14
Machinery; for liquefying air or gas **(pollutant removal)**	Climate change				2.6					0.4			0.3							0.2	0.5	4	6.9
Boilers; auxiliary plant **(components of industrial air pollution control plants)**	Climate change	0.9		0.3	0.4	0.2	0.2	0.8													0.6	3.5	7.4
Hydrogen **(alternative fuel source)**	Climate change		0.2 68				0.3			0.3												0.9	8.6
Heaters; instantaneous or storage water heaters **(solar water heaters)**	Climate change									0.4												0.4	38
Total per country		98.8	90.5	72.1	54.3	33.5	27	16.7	16.6	12.6	12.6	12.5	9.4	9.4	7.2	6.9	6.9	5.8	5.5	5	4.6	508.2	1663.9

Market potential data can be combined with information on the competitiveness of Dutch exports to further identify priority areas for liberalisation. In Figure 15 below, we combine our market potential estimates with product-level RCA indices to highlight environmental goods in which the Netherlands is both world-leading and which are also estimated to have substantial untapped export potential—goods which have particular **offensive interest for the Netherlands**.

Goods in the top-right quadrant are goods which Dutch firms can very competitively produce (RCA>1), and for which we find above-average export potential globally. These are goods of high offensive interest. Examples include **wind turbine components**—including iron structures and parts for wind turbine towers—wind powered electric generators, and **machinery for liquefying air and gas**. The top-left quadrant contains internationally competitive goods such as hydrogen, containers, and isolating material, which have, however, below-average export potential, suggesting that their potential to expand rapidly is more limited.

Results are qualitatively very similar to the estimates obtained from the partial equilibrium model. Notably, components and parts for wind turbines appear to have not only a high relative comparative advantage (RCA>1) but also substantial untapped export potential in key destination markets outside the EU. The wind power sector, as well as machinery which can be used for climate mitigation and adaptation, are thus confirmed as being clear winners from trade liberalisation.

Figure 15. Key export performance indicators of core list goods, 2021



Source: Own elaboration, based on UN COMTRADE and ITC data

6.2 The role of non-tariff barriers in trade in environmental goods

Given the low average tariffs on environmental goods, the greatest impediment to trade in goods can often be non-tariff barriers (NTBs).[92] In almost all sectors NTBs have a bigger impact on trade than tariffs.[93] When combined with tariffs, NTBs to trade in environmental goods could result in average levels of protection ten times greater than tariffs alone.[94] Further, nearly a quarter of specific trade concerns raised by WTO Members relate to NTBs with a stated objective of environmental protection, suggesting that some such measures are a significant source of trade friction even as environmental objectives are pursued.[95] There is a balance to be struck and an important role for regulatory cooperation in certain areas.

6.2.1 NTBs to trade in environmental goods

Table 6 below provides a categorisation of NTBs relevant for the environmental goods sector. This is based on a review of industry surveys by the OECD[96], Monkelbaan[97], and UNCTAD's 2019 International Classification of NTMs.[98,99] We chose these categories based on a comparison of these earlier industry surveys, the categories mentioned most frequently in the literature, and interviews with stakeholders. The top three identified on all fronts include **technical barriers to trade**, **local content requirements** and **challenges around government procurement**. These are discussed below in greater detail.

Table 6. NTBs in the environmental goods sector

NTB	Examples	Prevalence	Impact on trade
Standards, technical regulations, and labelling requirements	Grid-access restrictions Emissions labelling	High	High
Conformity assessment procedures/testing and certification	Conformity assessment for solar panels	High	High
Local content requirements	Requirement to use locally produced wind turbines to be eligible for feed-in tariffs	High	High
Export-related measures (subsidies, licenses, or quotas)	Export licenses for hydrogen to make sure it is not used in arms industry A government subsidy to a particular domestic industry makes those goods that the domestic industry produces cheaper to produce than in foreign markets.	Low	Medium
Restrictions on FDI	Discrimination of foreign versus domestic investors in renewable energy projects	Medium	Medium
Government procurement procedures	Rules that call for special requirements to provide goods or services to state-controlled entities	Medium	High
Customs procedures including licenses and other permits	Difficulty and/or slowness in obtaining import licenses	Medium	High
Infringement of intellectual property	New renewable energy technology is copied in importing country with no license	Medium	Medium

Source: Own elaboration

[92] In trade policy, a distinction is sometimes made between NTBs and a broader set of non-tariff measures (NTMs), although there is no agreed definition. NTMs are generally determined as measures other than ordinary customs tariffs that have an economic effect on the international trade in goods by changing quantities traded or prices or both. NTBs imply a negative impact on trade.
[93] United Nations Conference on Trade and Development & The World Bank. 2018. The unseen impact of non-tariff measures (UNCTAD/DITC/TAB/2018/2). Geneva. Available at the following link.
[94] De Melo, J. & Sollecer, J-M. 2019. The role of an Environmental Goods Agreement in the quest to improve the regime complex for Climate Change, EUI Working Paper RSCAS 2019/55. Available at the following link.
[95] Ibid., p. 16.
[96] OECD, 2007, *Business Perceptions Of Non-Tariff Barriers (NTBs) Facing Trade In Selected Environmental Goods And Associated Services: Survey Results, COM/ENV/TD(2006)48/FINAL* (2007). Available at the following link.
[97] Monkelbaan, J. 2016. Trade Sustainability Impact Assessment on the Environmental Goods Agreement, final report for the European Commission, Directorate-General for Trade. Available at the following link.
[98] United Nations Conference on Trade and Development (UNCTAD). 2019. International Classification of Non-tariff Measures. Available at the following link.
[99] The International Classification of NTMs follows a taxonomy of all measures considered relevant in international trade. It comprises technical measures and other measures traditionally used as instruments of commercial policy, e.g., quotas, price control, exports restrictions, or contingent trade protective measures. Finally, the classification also comprises behind-the-border measures, such as competition, trade-related investment measures, government procurement or distribution restrictions.

6.2.2 Technical barriers to trade

Technical barriers to trade (TBT) refer to both mandatory technical regulations and voluntary standards that define specific characteristics that a product should have, such as its size, shape, design, labelling, functionality or performance. TBTs include standards, technical regulations, conformity assessment procedures (testing and certification), and labelling requirements.

WTO rules create parameters for dealing with various NTBs – including specifically through the WTO's TBT Agreement. The aim of the TBT Agreement is to ensure that technical measures are prepared, adopted and applied according to some basic principles, in order to minimise their negative impact on trade. The five core principles of the TBT Agreement include transparency, non-discrimination and national treatment, proportionality, use of international standards (whenever possible), and equivalence. In addition, FTAs work to address and harmonize various TBT issues.

Box 2. Examples of technical barriers to trade

***Technical regulations and standards*: mandatory technical regulations and voluntary standards that determine a product's size and shape, design, labelling, marking and packaging, and function and performance can obstruct trade and become TBT. Examples are labels that indicate the carbon embodied in a product or energy efficiency performance standards.**

***Conformity assessment procedures* (testing and certification) include product testing, inspection, and certification. Although governments usually introduce such technical requirements in the public interest (for example for health and safety reasons), differing standards and procedures can become barriers to trade. For example, conformity assessment procedures for solar PV equipment may vary between different countries.**

Source: Own elaboration

An important area of trade law related to NTBs is **non-product-related PPMs (NPR-PPMs)**, **i.e. processes or production methods that do not physically manifest themselves in the final product** (see also Section 6.1 above). Examples of PPMs would be standards for the production of green hydrogen (also see Box 3 below) and low-carbon steel. These final products are not distinguishable from regular hydrogen and steel from outside appearance or performance.[100]

Questions will arise on how far is it permitted under trade law to subject green hydrogen and hydrogen produced with fossil fuels—products that are otherwise very much "alike"—to differential treatment based on PPMs.[101] The classification and design of NPR-PPMs can affect the WTO-consistency of measures such as emissions-based labelling requirements, emissions-based taxes or duties, and restrictions on products based on emissions associated with their production.[102] The uncertainty surrounding PPMs may make it challenging for governments to introduce certain types of measures designed to incentivize lower-carbon products. Based on WTO jurisprudence it is likely that compliance with mandatory conditions for emissions-based labelling would be subject to TBT Agreement obligations.[103]

[100] NPR-PPMs leave no trace of the production method in the final product and apply to items where it is impossible to tell whether the product has been produced in a low-carbon manner or not. For example, it is impossible to distinguish steel that has been produced by using green hydrogen from steel that was produced by using coal.
[101] While measures based on NPR-PPMs are not in themselves prohibited by WTO rules, the WTO Appellate Body has generally found that "likeness" is to be determined based on the competitive economic relationship between products in the marketplace. Accordingly, in some circumstances, measures that differentiate between products based on NPR-PPMs may not be consistent with obligations under the TBT Agreement or General Agreement on Tariffs and Trade 1994 (GATT) (or may need to be justified on sometimes narrow public policy exceptions contained in Article XX of the GATT 1994).
[102] Conrad, C. R. 2011. *Processes and production methods (PPMs) in WTO law: interfacing trade and social goals* (Vol. 5). Cambridge University Press. Available at the following link.
[103] WTO, 2011. *US-Tuna II (Mexico)*. Available at the following link.

Box 3. Green Hydrogen Trade

How do we enable cross-border trade of green hydrogen between production points and demand regions across the globe? How will green hydrogen products and services be classified for trade purposes? These are questions to keep in mind as stakeholders strive to accelerate the energy transition in efforts to meet 2050 climate targets.

By 2050, the International Renewable Energy Agency (IRENA) reports that more than 30% of hydrogen produced will be traded internationally. This will require international and multi-stakeholder co-operation to prevent interruptions in the clean hydrogen supply chain; ensuring products can freely move across borders.

The development of standards targeted towards increasing safety and quality of green hydrogen goods and services is one way to build a resilient global green hydrogen economy and reduce the risk of impeding trade in the future. At this early stage, fragmentation from specific arrangements on green hydrogen is a key challenge. Differences around classifications of hydrogen using colour-schemes or levels, for example, exist.

Some actors including industry associations are actively working to develop private sector standards for green hydrogen. For instance, the Green Hydrogen Organization is looking to establish a standard centred around accurate GHG emissions accounting. Existing models could feed into the development of a common standard in order to avoid further fragmentation and encourage healthy competition.

Tariffs today on hydrogen are across the board very low or non-existent for most key producers and consumers of hydrogen. Rather than having a separate tariff line for green hydrogen, it would make sense to have production and process methods (PPMs) in place that can be certified. Industry players and governments could also draw on best practices from trade in other relevant green goods and services in order to create a level playing field, shape an efficient global green hydrogen economy and work towards full industry decarbonization by 2050.

Source: Own elaboration

6.2.3 Local content requirements

Local content requirements (LCRs) are policies imposed by governments that require firms to use domestically manufactured goods or domestically-supplied services in order to operate in an economy. They have emerged as a particularly prevalent form of NTB in the context of some green industries, including solar and wind generation manufacturing[104] and more recently electric vehicles.[105]

LCRs in the renewable energy sector have been the cause of several trade disputes at the WTO.[106] The GATT constrains the use of LCRs, for example, under the National Treatment principle (Article III of GATT), countries are expected not to discriminate between 'like products' from local industries and imports. The Agreement on Subsidies and Countervailing Measures (ASCM) prohibits subsidies granted to investors or industries contingent on the use of domestic products. Certain markets require, for example, that EVs must have domestically produced batteries.

[104] OECD, 2015. *Overcoming Barriers to International Investment in Clean Energy, Green Finance and Investment*. Available at the following link.
[105] World Economic Forum, 2021. *Delivering a Climate Trade Agenda: Industry Insights.* Available at the following link.
[106] See, for example, WTO disputes or requests for consultations in: China – Measures Concerning Wind Power Equipment (DS419), available at the following link; Canada – Measures Relating to the Feed-in Tariff Program (DS426), available at the following link; India – Certain Measures Relating to Solar Cells and Solar Modules (DS456), available at the following link; United States – Certain Measures Relating to the Renewable Energy Sector (DS510), available at the following link.

In a survey, 80 per cent of investors disagreed that LCRs encouraged them to invest in local manufacturing or to source out inputs locally.[107] This suggests that LCRs are ineffective at encouraging domestic industry development.

6.2.4 Government procurement procedures

According to WTO estimates, government procurement accounts for 10-15% of national GDP on average across the world.[108] Directing government procurement spending toward more sustainable projects represents a major opportunity not only to reduce emissions created by governments' own operations, but also to encourage the development of climate mitigation and adaptation technologies.

A subset of 48 WTO members signed up to the plurilateral agreement on Government Procurement (GPA). The fundamental aim of the GPA is to mutually open government procurement markets among its parties. The GPA requires that open, fair and transparent conditions of competition be ensured in government procurement. An outstanding challenge for industry, however, can be that central or sub-central authorities influence procurement processes in ways that give preference to domestic over foreign firms. Among the specific problems are:

- Non-transparent decisions making process or arbitrary enforcement of requirements;
- Timeliness of information about tender requirements;
- Request for informal "additional payments";
- Preferential treatment of domestic producers;
- Frequent change of local contents provisions (use of local labour, inputs, R&D required) that result in unexpected costs for foreign providers;
- Lack of independent appeals procedures or refusal to abide by decisions made by an arbitration authority;
- Definitions of what "sustainable" means can vary greatly in government tenders. This can make it difficult to scale up across markets.

[107] OECD. 2015. Overcoming Barriers to International Investment in Clean Energy, Green Finance and Investment, OECD Publishing, Paris. p.82. Available at the following link.
[108] See here.

7 Environmental impacts of EGS liberalisation

7.1 Trade liberalisation and the environment: a framework

The trade and environment literature identifies three supply-side mechanisms driving changes in environmental effects due to trade liberalisation.[109] These are the **scale** effect, which captures emissions due to increases in output and value added; the **composition** effect, capturing changes in emissions due to reallocation of economic activity across sectors; and the **technology** effect, capturing emissions due to changes in the emission intensity of economic activity.[110]

Empirically, the net impact of tariff liberalisation on the environment depends on the interplay between these three effects. Quantifying these effects *ex ante*, however, is challenging without the aid of a general equilibrium model—which is beyond the scope of this report. In what follows, we therefore focus on providing first estimates of scale and technology effects arising from tariff elimination liberalisation in environmental goods for the Netherlands.

Scale effects arise when industrial production in exporting economies expands as a result of tariff liberalisation. Assuming that production technology remains unchanged, at least over the short-term, scale effects on the environment from a process of trade liberalisation is typically negative. Estimates from recent modelling studies suggests that tariff elimination at the global level would increase global GHG emissions by approximately 1.2%.[111]

The impact of shifts in the distribution of output and value added across sectors on the environment is more ambiguous, as it depends on the extent to which tariff cuts stimulate increased production in polluting versus more environmentally-friendly industries. Recent studies suggest that shifts in composition contribute to small reductions in emissions.[112] The magnitude and direction of composition effects, however, differ markedly across economies and time periods.[113]

Technology effects, on the other hand, are typically found to have a positive effect on the environment. Trade liberalisation in environmental goods is particularly likely to foster positive environmental effects through technology diffusion. The elimination of tariffs on environmental goods is expected to cut the costs of key technologies for climate change mitigation and adaption, thereby increasing their availability and uptake.

Recent estimates suggest that **the maximum possible emissions reduction from tariff cuts in the EGS sector would be between 0.3% and 1% of 2030 emissions levels.**[114] A 2009 research study highlighted that renewable energy technologies—of the type we included in the long list—could have a maximum abatement potential of up to 6.5 gigatons of carbon dioxide (GtCO2) per year by 2030.[115]

[109] These effects are confined to the production side of the economy. Trade liberalisation, however, can also drive up emissions elsewhere in the economy, and most notably in the transport sector.
[110] See, for instance, Cherniwchan, J., Copeland, B. R., & Taylor, M. S.. 2017. Trade and the environment: New methods, measurements, and results. *Annual Review of Economics*, *9*, 59-85.Available, in working paper version, at the following link.
[111] Klotz, R., & Sharma, R. R.. 2023. Trade barriers and CO2. *Journal of International Economics*, 103726. Available at the following link. See also Shapiro, J. S.. 2021. The environmental bias of trade policy. *The Quarterly Journal of Economics*, *136*(2), 831-886. Available, in working paper format, at the following link.
[112] Shapiro (2021), finds that the composition effect is linked to a reduction in global emissions of about 1.3 percentage points.
[113] Cherniwchan, Copeland, and Talyor (2017) provide an up-to-date discussion
[114] The two estimates come from, respectively, Bacchetta, Bekkers, Solleder, and Tresa. 2022. Environmental Goods Trade Liberalization: A Quantitative Modelling Study of Trade and Emission Effects. *Working Paper.* (Available at the following link); and Wooders, P.. 2009. Greenhouse Gas Emission Impacts of Liberalizing Trade in Environmental Goods. *International Institute for Sustainable Development*. (Available at the following link).
[115] Wooders, P.. 2009. Greenhouse Gas Emission Impacts of Liberalizing Trade in Environmental Goods. *International Institute for Sustainable Development*. Available at the following link.

Meanwhile, studies of the EGA suggested that the agreement would have contributed to reduce emissions by the equivalent of 1.6 million homes' annual electricity use by 2030.[116] In other words, while the trade facilitation potential was not insignificant, the environmental impact from tariff cutting needs to be put into the context of improving the overall enabling environment for the scale up of environmental goods, including efforts to address non-tariff barriers and the overall domestic policy environment.[117]

7.2 Environmental impacts estimation

7.2.1 Methodology

To estimate environmental impacts, we used two distinct methodological approaches. While these are outlined in greater detail in Annex II of this report, a few notes are worth stressing here.[118] To quantify scale effects, we linked the partial equilibrium estimates discussed in Section 6 above to data and projections on GHG emissions. The key assumptions here is that modelled estimates capture the increase in the scale of production which follows tariff liberalisation; and that the relationship between export and production expansion is linear.[119]

A second issue concerns aggregation and weighting. Our partial equilibrium simulation was run at the 6-digit HS product level. To capture the impact of the simulation on output, we first aggregated our results at the 2-digit level and matched product and industry classifications at this level of aggregation. Since the match is not exact—environmental goods constitute only a fraction of the output of any given industry—we then calculated the growth of output resulting from trade liberalisation using industry-level shares of environmental goods as weights.

Having obtained modelled estimates of industry-level output growth resulting from trade liberalisation, we then multiplied our growth rates with historical industry-level data from Eurostat on GHG emissions (CO2, N2O, and CH4) to provide an estimate of projected increases in emissions as a result of trade liberalisation. To assess the actual impact of these figures on the Netherlands' emission performance, we also compared our results with GHG emission estimations from the EDGAR (Emissions Database for Global Atmospheric Research) database.

With regard to technology effects, their quantification requires designing and calibrating a computational general equilibrium model (CGE). CGE modelling is beyond the scope of this study. **Econometric estimates, however, can serve as a proxy for modelled estimates of the technology effect.** We propose to proxy the environmental impacts of the diffusion of environmental goods by estimating the impact of environmental goods trade on CO2 emissions in a global panel of emissions and trade.[120]

7.2.2 Scale effects

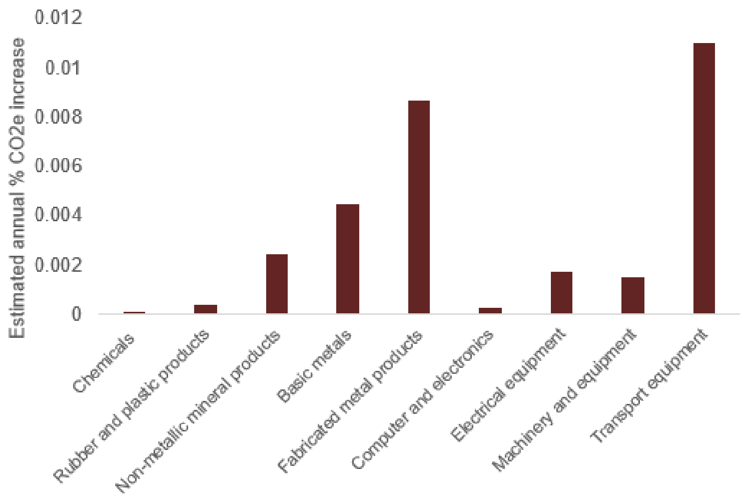
Our estimates suggest that the total environmental impact of eliminating tariffs on all goods included in the long list would result in an **annual increase of over 41,000 tons of CO2e** in the Netherlands. This is equivalent to the emissions from driving 8,000 gasoline-powered cars for a year, or from

[116] The modelling approach used was subject to limitations, for example, not fully capturing effects on GVCs and aggregation issues which make it difficult to capture effects at a product level. In addition, the modelling only partially captures the technique effect, includes dual use products that would not have been included under the agreement due to the use of ex-outs and addresses a different set of goods than those included in the EGA lists (due to confidentiality).
[117] For example, not only the subsidy amount that is available for putting solar panels on a family home, but also the transparency and ease of applying for such subsidies need to be considered.
[118] Our approach follows and adapts the methodology put forward in the Sustainability Impact Assessment in support of the FTA negotiations between the EU and Australia, available at the following link.
[119] While this is a relatively standard assumption, recent modelling results suggest that supply responses to tariff liberalisation might increase non-linearly. See Klotz, R., & Sharma, R. R.. 2023. Trade barriers and CO2. *Journal of International Economics*, 103726. Available at the following link.
[120] Here, we follow Bacchetta, Bekkers, Solleder, and Tresa. 2022. Environmental Goods Trade Liberalization: A Quantitative Modelling Study of Trade and Emission Effects. *Working Paper.* Available at the following link. It is worth noting that Bacchetta and colleagues use these estimates as an input into their CGE model. More specifically, they use them to calibrate the impact of EGS trade on energy efficiency.

powering electricity use in 7,500 homes for a year.[121] It is worth stressing that, in relative terms, this **increase is negligible**—according to EDGAR data, the Netherlands is estimated to have emitted approximately 170 million metric tons CO2 in 2021.

In terms of its drivers, the vast majority of this increase is **accounted for by CO2** (37,000 tons), with methane (CH4) and nitrous oxide (N2O) accounting for the remainder. Moreover, these increases are not equally distributed across industries (see Figure 16 below). At the sectoral level, the largest increases can be observed in the transport equipment, metal products, and electrical machinery and equipment industries.

Figure 16. Sectoral distribution of estimated GHG emission increases



Source: Own elaboration, based on UN-COMTRADE and Eurostat data

To further put these estimates in context, we compared our estimates with the evolution of GHG emission. According to EDGAR data, between 2021 and 2020, total CO2 emissions from all manufacturing industries and construction in the Netherlands are estimated to have increased by 0.35%—from approximately 22 to 22.8 megatons. Had tariff liberalisation been implemented in the same time period, the resulting output growth would have pushed up CO2 emissions from manufacturing and construction to 22.9 megatons—an overall small increase, equivalent to 0.002% of the total.

7.2.3 Technology effects

To provide an estimate of the effects of the diffusion of environmental goods on GHG emissions, we estimated an econometric model on a global panel of trade and emissions data for 150 countries over the 2000-2021 period. Full results are reported in Table A3 in Annex II. **Overall, results indicate a reduction of 0.36% of CO2 emissions for each 1% increase in the import of environmental goods.** For the Netherlands in 2021, this would be equivalent to a reduction in CO2 emissions of **over 85,000 metric tons of CO2e.**

These results suggest that the greater diffusion of environmental goods would **more than compensate for any increase in emissions due to the scale effect**. In addition, the diffusion of environmental goods produced in the Netherlands and exported abroad would also contribute to reducing world-wide emissions. It is worth stressing that our estimates of the technology effect are based on an *ex-post* exercise with current tariff levels remaining unchanged. They therefore likely represent a **conservative scenario**.

[121] These equivalences are derived from the EPA GHG equivalencies calculator.

8 Barriers to trade in environmental services

8.1 Identifying services of offensive interest

The export of services is a key contributor to Dutch growth, employment, and value addition. A relatively small, open, and knowledge-intensive economy, the Netherlands is a large service exporter. In 2021, the country's services exports reached EUR 210 billion, making it the fourth largest service exporter among EU economies in absolute terms.[122] Over half of the Netherlands' services are exported to EU countries, with the remainder going to non-EU economies—particularly the UK, the US, and Switzerland.

Environmental services are therefore likely to be of high offensive interest for the Netherlands. Not all sectors are equally developed, however. While statistics on the export of environmental services specifically are not available, available literature and aggregate-level statistics offer some clues. The Dutch government has identified **offshore wind power** and the **water sector** as two of its key sectors for the promotion of exports and innovation, as part of its *Top Sectoren* strategy.[123]

According to recent PwC estimates, the offshore wind power sector generates approximately EUR 2.2 billion domestically, between direct and indirect turnover; and over 6400 full-time jobs.[124] By 2030, the sector's economic contribution is projected to double—chiefly as a result of the ongoing development of new wind farms in the North Sea. The water sector is another important contributor to the Netherlands' economy. The hydraulic engineering industry[125], for instance, generated approximately EUR 3.3 billion in turnover and over EUR 1 billion in value added in 2020 according to recent estimates.[126]

Wind and water are not the only environmentally-relevant service sectors where Dutch firms appear to excel. Business services tend to account for the largest share of the Netherlands' service exports—for a share of almost 30 percent of total service exports in 2021—followed by transport services.[127] The business service industry includes several activities that are relevant for environmental services, including architectural and engineering services; and research and development (R&D) activities.

8.2 Barriers to trade in environmental services

Based on literature review and interviews with relevant stakeholders, this section highlights the key barriers faced by Dutch providers of environmental services in the offshore wind and business services (with an emphasis on engineering) sectors.[128]

8.2.1 Offshore wind power

Dutch firms operating in the offshore wind power (OWP) sector are active in the provision of services across all stages of an offshore wind farm's lifecycle including in pre-construction (e.g., engineering and design; marine surveying and environmental impact assessments), construction (e.g., subsea foundation installation, wind turbine installation and cable laying) and operation and maintenance

[122] Jaarsma and Rooyakkers (2021). De internationale dienstenhandel van Nederland. *Internationaliseringsmonitor 2022, tweede kwartaal – Dienstenhandel: ontwikkelingen en belemmeringen*. CBS. Available at the following link.
[123] Wind power features under the "Energy" top sector. The water sector is clustered together with the maritime sector.
[124] PwC (2018). De economische bijdrage van windenergie op zee. Rapport voor het Ministerie van Economische Zaken en Klimaat. Available at the following link.
[125] Hydraulic engineering includes dredging, coastal and riverbank works, land reclamation, soil remediation and area development. Dike reinforcements, coastal and bank works, dredging work and construction work are the most important types of work in hydraulic engineering.
[126] Van den Bossche, de Jong, Janse, and Lucas (2021). The Nederlandse Maritieme Cluster – Monitor 2021. *Stichting Nederland Marietiem Land and Ecorys*. Available at the following link.
[127] Jaarsma and Rooyakkers (2021).
[128] Engineering services include those related to offshore wind and water. With respect to the latter, the section on professional services should be viewed as including the main barriers related to Dutch service provision in the water sector.

(O&M). In carrying out these activities in international markets, the key non-tariff barriers confronted by industry include:

- Local content requirements (LCRs);
- Prohibition of certain services by foreign operators;
- Conditional market access provisions in the form of requirements for foreign firms to establish a local presence; equity caps on foreign ownership; and/or forced joint ventures with local partners;
- Discriminatory measures providing preferences to domestic service suppliers in the procurement process.

Among these barriers, stakeholders representing the Dutch OWP sector report that the most problematic and prevalent NTBs pertain to **local content requirements that are typically embedded in a country's rules and regulations related to participation in national and sub-national procurements for the development, construction and O&M of OWP generating facilities**. Consultations and a review of existing literature indicate that these LCRs can be generally characterised as follows:

(i) Requirements that a certain percentage of a procurement contract's value be comprised of locally produced goods and services (including, in some instances, commitments by the service provider to invest in the development of local value chains relevant to the offshore wind sector); and

(ii) Rules that grant preferences – either in the tender evaluation process or awarding of financial credits – to developers that commit to using local content in their bid.

Examples of specific LCRs impacting the Dutch OWP sector are provided in Box 4. These barriers present numerous challenges to Dutch OWP service providers seeking to participate in foreign markets. In emerging OWP markets, for example, local supply chains may be significantly underdeveloped – often requiring decades to fully mature. This can make it difficult for Dutch firms to meet requirements and may require significant investment by companies attempting to qualify for tenders that require commitments toward the development of local supply chains. As the risks involved in such commitments can be substantial, these barriers may reduce the willingness of Dutch firms to enter these markets – particularly among SMEs – and may relegate firms to smaller niche segments of the market.

These LCRs can similarly act as a *de facto* localisation requirement for Dutch companies. Where Dutch firms have not established a legal presence in that country, for example, any services provided would not be considered local content and would place them at a disadvantage vis-à-vis competitors with a local legal presence.

Box 4. Examples of LCRs in the OWP sector

- **Taiwan**

In order to participate in Taiwan's OWP auctions, bidders are required to commit to locally procure all "key development items" specified by the government's Industrial Development Bureau (IDB).[129] During the most recent round of OWP tendering in 2022, the IDB listed 26 such items covering both goods and services which must be entirely sourced from Taiwan for at least 60% of the total proposed capacity. Services designated as "key development items" include all maritime transport services relevant to OWP (e.g., vessels used for surveying, installation, and O&M) as well as relevant engineering design services (wind turbine substructure design, offshore transformer design and cable laying design).[130]

With respect to the former, bidders are required to use Taiwanese vessels unless it can be verified that a vessel is not domestically available.[131] In such instances, developers are allowed to use a foreign-owned vessel provided that it is registered and operated under a joint venture with a local partner. For engineering and design services, the involvement of Taiwanese companies must be at least 50 percent of the total cost of such services contributed to the procurement.

While the 60 percent threshold for all "key development items" must be met in order to participate in the tendering process, additional points may be awarded to bids that exceed this amount. Additionally, the IDB has specified a number of bonus items which, if procured locally, can result in extra points during evaluation. While it is not mandatory for a bidder to commit to local procurement of all of these bonus items, a bidder is required to obtain a score of at least 10 percentage points on the evaluative assessment of these bonus items in order to participate in the tendering process.[132]

- **United States**

Federal and state governments in the United States utilise LCRs within the OWP procurement process in several ways. At the national level, OWP projects are eligible for a preferential Feed-in-Tariff (FiT) under the Infrastructure Investment and Jobs Act if the developer meets specific LCR requirements. This is in addition to various bonuses awarded at the subnational level to developers that meet the specified criteria relevant to the use of content produced within the applicable state. Both federal and state agencies, moreover, incentivise local content by conditioning a developer's access to a range of preferential credits and grants on its commitment to meeting various employment and supply chain development objectives.[133]

Source: Own elaboration

Several countries also restrict access to the provision of OWP-related services by barring the use of foreign-owned, -operated and/or -flagged vessels within their territorial waters. Such barriers are a problem for Dutch OWP developers given the crucial importance of vessels across the entirety of an OWP facility's life cycle – including surveying, installation, post-construction O&M and decommissioning. In particular, wind turbine installation vessels (WTIVs) and cable-laying vessels that are used during the construction phase have become highly specialised as a result of the increasing size of wind turbines. Construction of such vessels requires significant capital expenditures and may only be economically viable for a company provided that the vessel is able to

[129] GWEC. 2022. *Global Offshore Wind Report 2022*. Available at the following link.
[130] InfoLink. 2022. "Taiwan finalizes directions of IRP policy for offshore wind energy zonal development. Available at the following link.
[131] Verification requires certification from the T-Wind Marine Association
[132] Hogan, Megan. 2021. "Local content requirements threaten renewable energy uptake". *Peterson Institute for International Economics*. Available at the following link.
[133] Kaplan, Zachary, Tate Crowards and Michael Warner. 2022. "U.S. Federal and State Local Content Requirements for Offshore Wind Projects". DAI Global. Available at the following link.

move freely between construction sites located in different maritime jurisdictions. Restrictions such as those in place in the United States, Japan (Box 5) and Taiwan (see Box 4 above), however, severely restrict the ability of Dutch firms that require access to these vessels to be competitive in international markets.

Box 5. OWP vessel restrictions in Japan

Under Article 3 of Japan's *Ships Act* (Act No. 46 of 1899, rev. 1991), only Japanese-flagged vessels are permitted to call at closed ports or perform cabotage of goods and passengers.[134] With the country's Ministry of Land, Infrastructure, Transportation and Tourism (MLIT) interpreting an OWP facility operating in Japan's territorial waters as a "closed port", all foreign-flagged vessels are effectively barred from engaging in Japan's offshore wind sector unless opting to go through the process of reflagging.[135]

While reflagging a vessel can be a relatively straightforward procedure in a number of countries, Japan requires that a vessel be Japanese-owned and -registered as well as crewed by Japanese-licensed seafarers.[136] Authorities at the MLIT estimate that this process takes more than a year for specialised vessels such as WTIVs to complete due to the various number of inspections required as well as the Marine Bureau's limited experience with reflagging specialised vessels.[137]

From a Dutch perspective, reflagging in Japan involves considerable risk. This is due to the costs and time involved in changing a ship's flag and registration, the need to relinquish a majority ownership stake in the vessel, as well as the requirements to staff the vessel's crew with Japanese-licensed seafarers. According to industry representatives, this latter issue is particularly problematic. Not only does this increase operating costs, but it also exposes operators to potential staffing shortages since the supply of Japanese seafarers trained to operate and crew WTIVs is considered insufficient.[138] This is exacerbated by the fact that there is currently only one Global Wind Organization (GWO) training centre for OWP in Japan.[139]

Despite the difficulties and risks encountered in the process, it should, however, be noted that reflagging is possible and has been pursued by several foreign OWP operators. Eneti, for example, has already successfully reflagged its WTIV *Seajacks Zaratan*, while Belgium's DEME Group and the Netherlands' Van Oord have each initiated the process to reflag one of their WTIVs to enter the Japanese market.[140] In most cases, these operators have established a partnership with a local company to jointly explore opportunities in the Japanese OWP market and concluded agreements to transfer a 51 percent equity stake while leaving vessel staffing responsibilities and reflagging procedures to the Japanese partner.[141]

Source: Own elaboration

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[134] Ships Act, Article 3. A 'port call' refers to the certified arrival of a vessel at a Japanese maritime port. In Japan, ports may be classified as being either open or closed, with only Japanese-flagged vessels permitted to call at closed ports.

[135] Baker McKenzie. 2019. "Outlook for the Japanese Offshore Wind Market". Presentation for the Asia Wind Energy Association. Available at the following link.

[136] Article 1 of the Ships Act specifies that a Japanese vessel's owner must be (i) a Japanese authority; (ii) a Japanese citizen; (iii) a company incorporated under the law of Japan with all its representatives and at least 2/3 of its executive officers being Japanese nationals; or (iv) an entity other than a company as described in point (iii) all of whose representatives are Japanese nationals.

[137] Stakeholder consultation feedback

[138] RWE Renewables Japan. 2021. "Issues in Offshore Wind Promotion" (in Japanese). Presentation to the Cabinet Office Comprehensive Inspection Task Force for Regulations on Renewable Energy, 21 September 2021. Available at the following link.

[139] RWE Renewables Japan. 2021. "Issues in Offshore Wind Promotion" (in Japanese). Presentation to the Cabinet Office Comprehensive Inspection Task Force for Regulations on Renewable Energy, 21 September 2021. Available at the following link.

[140] DEME has announced that it will reflag its vessel *Sea Challenger* and will undergo a crane upgrade (See: Durakovic, Adnan. 2020. "Sea Challenger to Fly Japanese Flag as DEME and Penta-Ocean Complete Offshore Wind Tie-Up." offshoreWind.biz. Available here). Van Oord has not publicly announced which of its vessels will undergo the reflagging process (See: NYK. 2020. "NYK and Van Oord Partnering to Own and Operate Offshore Wind Installation Vessel in Japan." Available here.).

[141] DEME and Van Oord have respectively partnered with Penta-Ocean and NYK Lines. While unclear, the Monaco-headquartered Eneti appears to have maintained full control over its vessel by transferring ownership to its Japanese subsidiary 'Seajacks 3 Japan LLC' (See: Eneti. 2020. "Enetic Inc.: Prospectus Supplement". For more details, see here.

8.2.2 Business services (with an emphasis on Engineering services)

Dutch providers of environmentally-relevant business services confront a number of non-tariff barriers that either restrict market entry or reduce competitiveness. These include:

- Burdensome accreditation requirements related to company registration and licensing;
- Double taxation;
- Restrictions impacting the use of foreign personnel (work permitting issues, limited recognition of professionals' qualifications from third countries, restrictions on services that can be provided by foreign personnel, and compulsory employment of locals);
- Barriers to establishment (e.g., forced joint ventures, caps on foreign ownership and excessive requirements);
- Transparency in tendering procedures.

When a business services firm wishes to provide specific services in a foreign country, the registration process required in order to receive a license to carry out such services may be subject to unnecessarily burdensome administrative procedures related to accreditation. In such instances, **foreign countries may refuse to recognise similar accreditations undertaken by reputable certifying bodies in the EU or elsewhere**. Moreover, where Dutch firms are required to undergo further accreditation in these countries, the **number of approved certifying bodies may be limited and understaffed, leading to lengthy approval processes**. As a result, Dutch firms engaged in business services can face **notable delays in their ability to enter markets and be, *de facto*, forced into partnering with a local provide**r. This problem becomes particularly acute in instances where service delivery is subject to strict timelines (including in public procurements).

In several countries, market entry may also be restricted by excessive and discriminatory requirements placed on foreign firms as well as conditions such as **mandatory joint ventures with local partners and caps on foreign ownership**. In **Indonesia**, for example, firms wishing to establish a consultancy within the country are required to form a joint venture with a local partner while also meeting mandatory foreign investment requirements that can be prohibitive for SMEs. Additionally, foreign firms must demonstrate that they maintain a specific value of contracts within their portfolio while also generating a specific amount of annual turnover – both overall and within Indonesia. This latter requirement can be particularly problematic for new entrants and may require that a Dutch firm cede additional equity to its Indonesian partner.

Work permits may be subject to significant delays and excessive costs in a number of countries. This can, in turn, lead to delays in the delivery of services and may, in some instances, force companies to forgo opportunities in foreign markets. Additional constraints on the use of foreign professionals may include limits on the scope of work that can be undertaken by non-nationals or burdensome accreditation requirements due to a lack of mutual recognition of professional qualifications. In such instances, Dutch firms may be forced to form partnerships with local service providers, leading to potential lost revenue and reductions in competitiveness.

In addition to measures that restrict the use of foreign personnel, Dutch providers of professional services may face requirements to employ a specific number of locals – either as a percentage of total employment or within specific job titles – in order to establish a presence within a country. In seeking to comply with these requirements, Dutch firms may be forced to either reduce the number of foreign professionals employed or increase the total number of employees – resulting in potentially significant increases in operating costs.

According to Dutch industry representatives, one of the main issues impacting international competitiveness is that of **double taxation in countries with which the Netherlands has not concluded a tax treaty**. In such instances, Dutch service providers will often have applicable taxes (usually ranging from 5-20 percent of the contract value) withheld by the client while also being subject to taxes in the Netherlands. Where the Dutch provider does not maintain a representative office in that foreign country, it is usually unable to recuperate any of the amount withheld, making the taxes an additional cost that must be included in the prices offered to foreign clients. This creates a competitive disadvantage for Dutch companies competing with local service providers or with third-country service providers that benefit from a tax treaty.

8.3 Quantifying barriers to trade in environmental services

To provide a first quantitative estimate of the impact of non-tariff barriers on Dutch services exports, we developed a gravity model. Gravity models enable us to explain cross-sectional variation in trade flows between trade partners, assuming that the volume of bilateral trade is positively correlated with the size of each partner's economy and negatively related to the distance separating them. The basic premise underlying these two assertions rests in notion that trade between two countries will increase as they become wealthier and as the distance that goods need to travel is reduced. Annex II provides a more comprehensive overview of the gravity model methodology employed in this report.

Restrictions or barriers for trade in services can come in various forms and types and are typically the result of various degrees of regulatory cooperation or divergence between two countries. **High regulatory divergence between a country pair can result in considerable compliance costs**, such as, for instance, requirements on the citizenship of board members or criteria for obtaining licences to operate in one market that favours local firms, and consequently, inhibit trade in services.

To account for these regulatory restrictions, we used data from the **OECD services trade restrictiveness index (STRI).** The STRI index captures the degree of restrictiveness to services trade. We combined information from the STRI database with sectoral level data on services trade flows, also from the OECD. Armed with these data, we estimated our gravity model to quantify the impacts of non-tariff barriers to trade in services. Full results are reported in Table A4 in Annex II.

Overall, our results suggest that:

- Trade in all services sectors is sensitive to the degree of trade restrictiveness; despite some variation in statistical significance, **regulatory heterogeneity negatively affects Dutch services exports**. This is in line with the existing literature which suggest that, increased regulatory cooperation or homogenous regulation will positively influence services trade flows between trading partners;

- The export of "professional" services (legal, consulting, and accounting services) from the Netherlands to the rest of the world is the most sensitive to trade barriers, with increases in NTBs being linked to a 40% decrease in exports;

- The export of engineering and architectural services—which are both critical enabling services in the EGS sector—is also sensitive to NTBs, although to a lower extent. Increases in NTBs as measured by the STRI index are linked to **a decrease in the exports of architectural and engineering services of 8.4% and 9.9%, respectively.**

8.4 Reconceptualising environmental services: the example of climate services

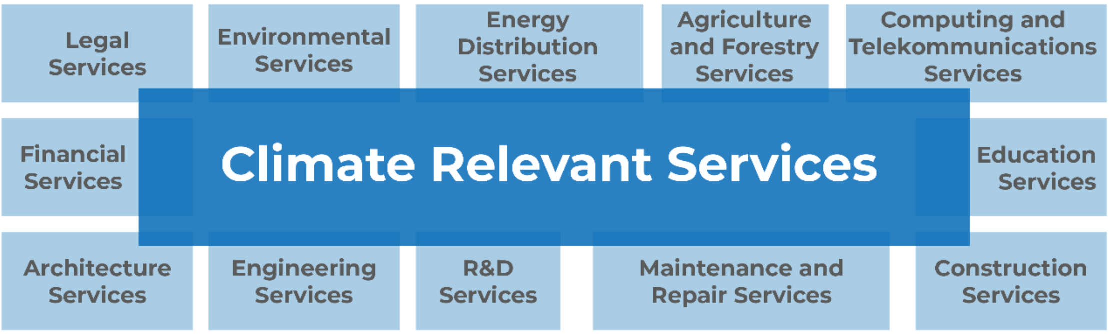
As noted in Section 4.6, traditional lists of environmental services are quite limited, **especially when taking commercial interests of the Netherlands and the EU into account.** Therefore, this section suggests expanding the concept of environmental services and also taking services that are indispensable for improving environmental sustainability into account. This section will use climate-related services as an example as this is by far the biggest type of environmental service and because of its relevance in the TESSD discussion in the WTO and in ongoing FTA negotiations.

This section provides both an approach for identifying broader sets of climate services (sections 8.4.1 and 8.4.2) and three examples of priority areas of indispensable climate services (section 8.4.3). The listed services are based on industry consultations on immediate priorities for decarbonisation, and on our team's own expertise. The list can serve as a benchmark for any ongoing trade liberalisation efforts on climate services or environmental services for that matter.

8.4.1 The cluster approach for identifying climate services

A promising solution for identifying climate services is a cluster approach (Figure 17 below).[142] **A cluster approach would group services based on their relevance for climate-related activities.** This means services can be identified for liberalisation without having to restructure extant classification systems for services.[143]

Figure 17. Indicative cluster of climate relevant services.



Source: National Board of Trade Sweden (2021)

One concern regarding the liberalisation of dual-use services at the CPC code level is that it could lead to much broader liberalisation than just for climate purposes.[144] For example, **engineering services can be used both for wind power projects and for coal extraction.** A wider than intended definition could also deter countries that are wary of broad liberalisation from joining the initiative. A specific clarification of a climate end-use in GATS schedule commitments could address such issues.[145] This would work in much the same way as ex-outs[146] that are used to specify climate goods.[147] Thus, services would be specified in a more comprehensive way than the CPC code to make the climate relevance clear. For instance, 'General construction of power plants' (CPC 2.1 code

[142] Steenblik, R. and Geloso Grosso, M.. 2011. Trade in Services Related to Climate Change: An Exploratory Analysis. *OECD, Paris.* Available at the following link.
[143] National Board of Trade Sweden. 2021. Trade and Climate Change Promoting climate goals with a WTO agreement. Available at the following link.
[144] APEC. 2020. "Trade in Environmental Services: A WTO Perspective." Presentation at the workshop "Manufacturing-Related Services and Environmental Services—Contribution to the Final Review of Manufacturing-Related Services Action Plan and Environmental Services Action Plan, August 19, 2020." Agenda: 11ii 2020/GOS/WKSP3/010, APEC Malaysia, August 19. Available at the following link.
[145] Kim, J. A.. 2011. Facilitating Trade in Services Complementary to Climate-friendly Technologies. *ICTSD Programme on Trade and Environment, Environmental Goods and Services Series, Issue Paper*, (15). Available at the following link.
[146] An ex-out is a code used in WTO databases to reflect the fact that a narrowly-defined product (tariff line) is further subdivided because it has two or more duties (see Harmonized System, tariff suffix). The import statistics will be for the product (tariff line) as a whole, not for each subdivision
[147] APEC. 2021. APEC Ministers Responsible for Trade Meeting Joint Statement. Available at the following link.

54262) could be specified as an ex-out so that it only covers 'Plants powered by renewable energy'.[148] In the resulting services schedules it would be important to avoid overlap between sectors and to define the scope of the commitments in as much detail as possible.[149]

Considering non-core (environmental) services, such as engineering or architecture, as climate-relevant would then depend on the end use of the service and whether that relates to a climate purpose. A recent study by Sauvage and Timiliotis considers the environmental purpose of a service as a matter of degree.[150] The degree to which a service is environmental can be determined by two factors:

1. How important that service is to the core functioning of a good or service (market operation), as well as;
2. How important it is relative to other services for enabling an environmental technology (relativity).

Telephony services, for example, are cited as essential to the functioning of a renewable energy plant (meeting the market operation criteria) but are relatively unimportant in relation to other services such as maintenance of the plant (so would score low on the relativity criteria). This would suggest the import of telephony services might not be critical to the operation of the plant in the same way that the import of maintenance services could be.

8.4.2 Identifying climate services based on key mitigation sectors

The suggested list of climate services below is organized along three key sectors that could contribute most to reaching net zero greenhouse gas (GHG) emissions according to the IPCC Sixth Assessment Report (Working Group III) – energy supply, transport, and buildings. Mitigation technologies from IPCC assessment reports could provide a basis for identifying climate services as they are neutral, evidence-based and identify mitigation options with the potential to be applied in most countries.[151]

In addition to the three key sectors, some goods for CCS and refrigerant management are included because these sectors could have direct and significant impacts on climate change mitigation. In Table 9 below, we reported a list recently developed by the World Economic Forum, which describes examples of specific environmental services, classified according to United Nations CPC Version 2.1, using ex-outs where necessary.[152]

[148] APEC. 2021. APEC Ministers Responsible for Trade Meeting Joint Statement. Available at the following link.
[149] Also see World Economic Forum, 2022.
[150] Sauvage, J. and Timiliotis, C. 2017. Trade in services related to the environment, No 2017/2, *OECD Trade and Environment Working Papers*, OECD Publishing. Available at the following link.
[151] National Board of Trade Sweden. 2021. Trade and Climate Change Promoting climate goals with a WTO agreement. Available at the following link.
[152] World Economic Forum. 2022. Accelerating Decarbonization through Trade in Climate Goods and Services. Available at the following link.

Table 9. Suggested list of climate services (non-exhaustive)

Key mitigation sector	Example mitigation option	Example Service (CPC code listed if identified in source material CPC v2.1)	Source
Renewable energy, Energy efficiency, and grid	Renewable energy	Engineering services for power projects (power projects based on renewable energy) [83324 ex]	APEC 2021; Monkelbaan, 2013; Steenblik and Nordås, 2021
		General construction services of power plants [54262]	
		Financial services, expert investment banking, insurance services and pension services [711]	
		Management consulting and management services; information technology services [831]	
		Data transmission services [8415]	
		General construction services of dams [Hydro-electric dams] [54233 ex]	
		Maintenance and repair services of electrical machinery and apparatus n.e.c. [Maintenance and repair of generators powered by renewable energy and smart grids] [87152]	
	Grid/network	General construction services of long-distance pipelines [Pipelines for carrying water or hydrogen gas] [54241]	Steenblik and Nordås, 2021
		General construction services of long-distance communication and power lines [54242]	
		General construction services of local pipelines [Pipelines for carrying water, sewage, or hydrogen gas] [54241 ex]	
		General construction services of local cables and related works [54252]	
		Structural steel erection services [of prefabricated structural steel components for overhead cranes or electricity transmission towers] [54550 ex]	
	Energy efficiency	Engineering services for industrial and manufacturing projects [83322]	Kim, 2011
		Heating equipment installation services [54613]	
Buildings	Design, urban form, and standards	Architectural services and advisory services [8321]/ Environmental consulting services [83931 v2.1]	Kim, 2011 / APEC, 2020
	Exemplary new buildings	General construction services of residential buildings [541] / Installation services [546]	Kim, 2011; APEC 2021
	Insulation/retrofit existing buildings	Insulation services [54650]	National Board of Trade Sweden, 2021; Steenblik and Nordås, 2021
	Energy efficient windows	Joinery and carpentry services [for prefabricated, insulated doors and double- or triple-paned windows] [54760 ex]	Steenblik and Nordås, 2021
Transport	Infrastructure for modal shifts	Engineering services – transportation [83323] – General construction services of railways [54212]	Kim, 2011
	Urban transport planning	Urban planning services [83221]	APEC, 2020
	Water transport services	Other coastal and transoceanic water transport services of other freight [coastal and transoceanic water transportation of components of off-shore renewable energy plants and equipment for installing, repairing, or maintaining them] [65219 ex]	Steenblik and Nordås, 2021
CO_2 capture and storage	CO_2 capture and storage from industrial site or power plant	Site preparation services [543], other technical testing and analysis services [83449]. Other examples: identification of a suitable geological formation or carbon dioxide (CO_2) capture at the point of emission, transport to the reservoir, and storage on a long-term basis.	Kim, 2011; Monkelbaan, 2013
Refrigerant management	Refrigeration performance improvement	Engineering design services for mechanical and electrical installations for buildings [86723]	

Source: World Economic Forum (2021)

There are three categories of services (at the CPC group level) that appear most often across the five key sectors: 'other professional technical and business services' [83], 'construction services' [54], and 'Telecommunication, broadcasting and information supply services' [84] (in the following called "digital services"). These three categories will be further discussed in the following section based on key literature[153], combined with insights gathered from the interviews conducted for this report.

8.4.3 Three priority areas of indispensable climate services

Other Professional, Technical, and Business Services. In the category of 'other professional, technical, and business services', **engineering services are critical** for electricity generation and distribution. Electrification is set to play a key role in lowering emissions. Whereas currently 20 percent of our final energy consumption is fulfilled by electricity, there is a consensus that this needs to increase to 50% by 2050.[154] Another vector of decarbonization that is currently underdeveloped and that requires professional and technical services is hydrogen, with 12-20% of final energy consumption expected to come from hydrogen and derivatives by 2050.[155]

Often, packages of engineering combined with construction services are sold and traded together. Most of the major exporting and importing countries have scheduled commitments in all four modes, for this category of services, except for Brazil and India, which have both not committed to granting market access for Modes 1 and 2. The importance of cross-border supply in this area is growing, however, as **information communications and technology systems** (ICT and digital services, also see further below) **are increasingly being used for:**

- the transmission of architectural and engineering specifications;
- design plans for environmental projects;
- reports of specialist environmental consultants, environmental quality testing and analysis results; and
- computer modelling simulations.

Trade opportunities for engineering firms depend on a variety of laws, regulations, and administrative rules. For instance, national or sub-federal rules that limit engineering firms' legal entity or joint venture structure, e.g., arbitrary equity limitations, can create trade barriers for engineering firms by reducing their financing options. Their trade performance in the global market also depends on the quality of services, including professional, process, and product standards.

Other rules that can influence trade in services in this area are related to nationality and residency requirements for service providers, as well as their qualification and recognition procedures. While professional qualification requirements aim to provide trust and ensure quality in the service industry, laborious qualification requirements and licensing procedures can hinder the delivery of services.[156]

Construction and Infrastructure Services. Construction services are involved with implementing various **mitigation options across numerous sectors**, including energy supply, transport, buildings, industry, and waste. The construction services sector is one of the major service sectors in most economies in terms of employment and value added.

The most important driver for the development of services in this sector, especially in the developed world, is bigger spending on infrastructure and non-residential development. The public sector is clearly the largest client segment for the construction sector. **Government procurement practices thus are crucial to trade in construction services, given that the sector's largest client segment is the public sector.** Preferential treatment for domestic companies or minimum

[153] For example, Monkelbaan, J. 2013. Trade in Sustainable Energy Services. ICTSD: Geneva. Available at the following link. See also, World Economic Forum. 2021. Delivering a Climate Trade Agenda: Industry Insights.
[154] See for example Energy Transmission Commission at the following link; Wind Europe, at the following link; BNEF at the following link; IEA, at the following link; IRENA, at the following link; and DNV, at the following link.
[155] Ibid.
[156] World Economic Forum, 2022

requirements for financial support that are favourable to domestic companies often hinder market entry for foreign providers, creating trade barriers.

Construction projects are highly localised because they are intensive in both labour and materials inputs. Such local characteristics of the construction business imply that 'commercial presence' (Mode 3) is the preferred mode of supply, which is complemented by 'temporary movement of natural persons' (Mode 4). In general, restrictions on commercial presence are the most common barriers to trade in the construction service sector. Limitations on market access take the form of limitations on foreign investment (e.g., ownership rules); the type of legal entity for a foreign company (e.g., mandatory local incorporation); the number of suppliers; and the value of transactions or assets. Restrictions on national treatment in Mode 3 include registration and authorization requirements; performance and technology transfer requirements; licensing, standards, and qualification; and nationality and residency requirements.[157]

Limitations on the temporary movement of natural persons (mode 4), which are often included in labour market regulations, can impede trade in construction services, given construction's intensive use of labour. In terms of national treatment limitations, foreign nationals frequently have limited eligibility for subsidies, including tax benefits; limited recognition of services providers' qualifications from third countries; and restrictions on foreign nationals' acquisition of land and real estate. Restrictions on land and real estate use or ownership, along with other restrictions, can have a big impact on the provision of construction services, as these restrictions prevent property developers from acquiring real estate under construction until the completion of the project.[158] Complex, expensive, and overly bureaucratic administrative processes around the obtainment of construction permits increase transaction costs and business risks. The outcome can be lower investment in new (and more sustainable) infrastructure and buildings.[159]

Digital services. Finally, access to ICT and digital services plays an important role in the transfer and implementation of new environmental and climate technologies.[160] The World Economic Forum emphasizes[161] the importance of digital services for climate action in supply chains, for example. A broad range of services – from digital and telecommunications services to engineering, cloud storage and artificial intelligence (AI) – will play an integral role in decarbonization. After-sales services and monitoring at a distance (e.g., of a wind park through sensors and big data aggregation) are particularly important when products are imported, and the buyer and seller of the technology are geographically far apart.

Digital services and grid aggregation technology also play a critical role in smart grids – which will need to become more complex and sophisticated as electrification becomes a central decarbonization strategy.[162] Smart grid-related services are important for grid management and enabling the growing flow of clean energy into the grid. The delivery of smart grid-related services often depends on data flows across border (mode 1). Data flow restrictions could hamper these activities. This demonstrates how important it is that trade policies ensure a stable, balanced, and transparent regulatory environment related to digitally-enabled environmental services, which tend to be more knowledge intensive and require more technical expertise than other service activities.[163]

[157] Ibid.
[158] Grosso, M. G., Jankowska, A., & Gonzales, F.. 2008, December. Trade and regulation: the case of construction services. In *OCED Experts Meeting on Construction Services, Paris*. Available at the following link.
[159] Ibid.
[160] UNCTAD. 2021. Trade and Environment Review 2021: Trade Climate Readiness for Developing Countries. *Geneva: United Nations*. Available at the following link.
[161] World Economic Forum (2021). Delivering a Climate Trade Agenda: Industry Insights. Available at the following link.
[162] IEA (2022), *Smart Grids*, IEA, Paris. Available at the following link.
[163] Also see World Economic Forum, 2022.

9 Conclusions and policy recommendations

9.1 What policy options could the Netherlands and the EU consider?

The analysis in this report warrants the question: which policy interventions can be undertaken by the Netherlands and the EU to foster trade in EGS?

First, **focusing on goods and services most relevant to climate action appears to be a good place to start** addressing trade in EGS and could support efforts to reduce emissions under the Paris Agreement. Countries could examine their Nationally Determined Contributions (NDCs) in that process and evaluate where trade flows need to be adapted for climate goods and services. The reality is that different countries will be required to import and export climate goods at various levels depending on their existing capacity, competitiveness and future needs. Our findings, including from our modelling study, suggest that, **in the event of future negotiations around EGS liberalisation, indeed priority should be given to goods in which the Netherlands is internationally competitive**. This does not mean that the export interests of the Netherlands necessarily align with those of the EU. In that sense, it would be opportune to further explore where Dutch export interests align with broader EU policy frameworks such as the Green Deal Industrial Plan.

Second, a best-in-class outcome would be for the broadest number of countries to **create a living list of environmental goods for trade facilitation and develop an open architecture that other countries can join as appropriate**. The scope would have to go beyond tariffs in order to have a meaningful impact, so it would also have to address NTBs and promote regulatory cooperation. In terms of the size of the economies participating in such an initiative, ideally G20 economies would join, as they represent three-quarters of global trade. Ideally, this would be an inclusive initiative in the sense that it would be open to any country interested in committing to the initiative (including through incentives such as technical assistance, capacity building, and financial support). In addition, the initiative could be implemented on an MFN basis. Even if the scope of liberalization is small, it could have a demonstrative effect of signalling to global markets that certain governments are serious about aligning their commercial and economic policies with environmental action. Over the long-term, the impact of the agreement can be increased by adding as many EGs as possible, including dual-use goods and EPPs.

Third, it would be opportune to **get a better overview of (potential) trade flows of EGS and the impact that market opening would have on those flows**. To support these efforts, we have modelled the impact of tariff rate elimination.[164]

Fourth, the WTO could be a suitable platform for the following actions:

1. **Seeking synergies with the implementation of the WTO Trade Facilitation Agreement (TFA).** Implementing the TFA should reduce uncertainty and increase predictability, consistency, and transparency for traders.
2. **Support developing countries** through technical assistance, capacity building, Aid for Trade (AfT), and the Enhanced Integrated Framework (EIF).[165] Developing countries could be supported to align trade policies in their NDCs and National Adaptation Plans (NAPs) and play bigger roles in supply chains for environmental goods.

[164] Complementarities can be explored with work which has already started in this regard. See Bridle, Richard and Christophe Bellmann, 2021. How Can Trade Policy Maximize Benefits from Clean Energy Investment?, IISD. Available at the following link.
[165] The Enhanced Integrated Framework for Trade-Related Assistance for the Least Developed Countries (commonly abbreviated as EIF) is a global development program with the objective of supporting least developed countries (LDCs) to better integrate into the global trading system and to make trade a driver for development. The EIF is being promoted by the WTO and OECD as the preferred way to provide official development assistance to LDC's as part of the global Aid for Trade Initiative.

3. Work with WTO bodies such as the TBT committee on **trade barriers caused by divergent standards and technical regulations.** Such work on regulatory cooperation would be in addition to ongoing discussions on specific trade concerns and could explore collaboration with the International Organization for Standardization (ISO) and other relevant agencies. To this end, the WTO could also draw upon liberalization models and regulatory cooperation initiatives such as **conformity assessment and harmonisation initiatives** (such as mutual recognition agreements) pursued in the context of regional trade agreements (RTAs). Surely, there is a need for a more technical conversation about *how* regulatory barriers pose constraints to trade in EGS and *where* these barriers arise across the value chain and to collectively highlight where standards apply to environmental goods and whether these are mandatory under domestic regulation. Other opportunities for both horizontal and sector-specific forms for regulatory collaboration (including in TESSD) include the following:
    - Early warning system for TBTs;
    - Consistent measurement, accounting, and verification of GHG emissions; and
    - Mapping TBTs for environmental goods.
4. **Liberalizing trade in environmental services that are indispensable** for using environmental goods, including in the Committee on Trade in Services (CTS).

Fifth, there is a need to facilitate **foreign direct investment (FDI)** that can enable the achievement of environmental objectives. Examples of FDI facilitation measures are:

- Aligning IPA strategies, KPIs and investment incentives to climate goals;
- Create a ‘database’ of green suppliers and develop a supplier development program to help domestic firms to become ‘green’;
- Map MNE climate commitments to investment opportunities in host economies and create a pipeline of endorsed and vetted carbon-neutral investment projects that would help MNEs deliver on their commitments;
- Work with stakeholders to potentially include climate FDI facilitation provision in national legal frameworks and develop model clauses for climate FDI provisions in international investment agreements (IIAs).

Sixth, smaller groups of countries that include the Netherlands and the EU can also facilitate trade in EGS, for example in plurilateral, regional or bilateral settings. Some elements that could be kept in mind in such undertakings include indispensable inputs to environmental goods (components and value chain concerns), NTBs and TBTs, Mutual Recognition Agreements (MRAs) on conformity assessment for environmental goods[166], environmental services[167], including products of export interest to developing countries like nature-based and sustainable agriculture-based products, and cooperation in the WCO.

Seventh, on that last point of cooperation in the WCO, the forthcoming review of the HS for the 2027 tariff schedule offers an opportunity to specify further environmental and clean energy goods, and this opportunity should be considered by the Netherlands and the EU, based on the insights from this study. It will be important to prioritise as only a limited number of goods is considered at each HS review for being assigned new tariff lines. There is also a need for developing specific HS codes for EPPs via cooperation in the WCO. The clearly recognisable EPPs that we have presented in this

[166] Sugathan, M. 2016. Mutual Recognition Agreement on Conformity Assessment: A Deliverable on Non-Tariff Measures for the EGA? Issue Paper No. 21; International Centre for Trade and Sustainable Development, Geneva. Available at the following link.
[167] Sauvage, J. and Timiliotis, C. 2017. Trade in services related to the environment, No 2017/2, *OECD Trade and Environment Working Papers*, OECD Publishing. Available at the following link.

report alongside environmental technologies in our own classifications for this report provide a basis for developing HS codes for EPPs.

For any given reform proposal, there are many detailed classification questions which must be addressed to allow classifiers to identify the essential characteristics of the product and explore how these are differentiated from others within a shared subheading. The steps to follow could be: source information relevant to environmental goods, define these goods and decide which of them the WCO should prioritise for reform, or even collectively develop and submit reform proposals as a group of countries – which would then be more likely to be prioritised. The TESSD could be one platform where such proposals could be discussed.

9.2 Maintaining relevance

The appointment of a Dutch or European business advisory body or expert group to consider the credentials of EGS would be a promising way to support negotiators and to ensure the environmental integrity of the overall deliverable on EGS. Such a group could be comprised of experts on energy, environment, industry and technology, trade negotiations, and officials. An expert group could consider prioritisation based on goods judged to have the largest environmental impact, indispensable inputs to these goods, or goods critical to sustainability transitions.

Such an expert group could also ensure that an EGS work programme can evolve in the future to keep pace with technological change including for example through **a ‘living list’ that can be updated as technology evolves with the scope to add further technologies and services in future if required**.[168,169,170] There are several precedents such as the Information Technology Agreement (ITA) which was designed as a ‘living agreement’. Similarly, parties to the Government Procurement Agreement (GPA) revised the text and expanded the coverage. A living agreement should include clauses to ensure that review occurs every four or five years and that such a review is coordinated with HS code revisions so new codes can be added to the lists.[171]

9.3 Services

Further market access openings for environmental services are of vital importance for addressing climate change and other environmental challenges. Services are critical to promoting the dissemination of technologies and knowledge for clean tech. Interviews held for this report reveal that trade in renewable energy technologies for example are often impeded by restrictions to trade in associated services.

A mechanism is needed to bring together discussions of trade in environmental goods and trade in environmental services. **Greater benefits will accrue from a simultaneous liberalisation of trade in EGS because products, technology and services are often supplied on an integrated basis.** For regulatory issues in Mode 3, significant unilateral, bilateral and regional liberalisation already exists, so countries could simply bind the status quo. Mode 4 in general and services standards (e.g., construction codes) would be more difficult to liberalise from the beginning.

The feasibility and size of the gains from environmental services liberalisation will depend to a significant extent on domestic political institutions and reforms, which strengthen the enabling environment for private investment and involvement and support market competition.[172] The stakeholder consultations have made it apparent that the openness and transparency of public

[168] Cosbey, A. 2015. Breathing Life into the List: Practical Suggestions for the Negotiators of the Environmental Goods Agreement. Available at the following link.
[169] De Melo, J. & Sollecer, J-M. 2019. The role of an Environmental Goods Agreement in the quest to improve the regime complex for Climate Change, EUI Working Paper RSCAS 2019/55. Available at the following link.
[170] Monkelbaan, J. 2021. Interactions between trade and climate governance. Exploring the potential of climate clubs. Global Challenges Foundation. Available at the following link.
[171] National Board of Trade Sweden. 2021. Trade and Climate Change Promoting climate goals with a WTO agreement. Available at the following link.
[172] Monkelbaan, J. 2013. Trade in Sustainable Energy Services. ICTSD: Geneva. Available at the following link.

procurement and general business environment are major inhibiting factors for, particularly Dutch SMEs, to engage in international activities outside of the EU. The prevalence of local content requirements in specific industries, such as off-shore wind, are considered particular impediments and discourage international activities in third countries.

There are a large number of climate-relevant services that need to be targeted for liberalisation. **A climate cluster approach can be used to liberalise non-core environmental services such as engineering or architecture by specifying these services on the basis of their contributions to a mitigation project or end use, thus avoiding concerns over services with dual uses.** Such a cluster approach could be pursued in order to identify climate-relevant services for liberalisation. Another point of similarity to EGS is the rapid technological development that affects services. As it is difficult to predict future technological developments and disruptive innovations, we suggest that revision clauses should be included in any agreement for environmental and in particular climate services.

10 Annexes

10.1 Annex I: Environmental goods lists

Table A.1. Core list

HS code	Product description	Sector	Core environmental purpose
761300	Aluminium containers for compressed or liquefied gas	Energy storage	Climate change
280410	Hydrogen	Energy supply	Climate change
850231	Electric generating sets; wind-powered, (excluding those with spark-ignition or compression-ignition internal combustion piston engines)	Energy production	Climate change
870230	Vehicles; public transport type (carries 10 or more persons, including driver), with both compression-ignition internal combustion piston engine (diesel or semi-diesel) and electric motor for propulsion, new or used	Transport	Climate change
680610	Slag wool, rock wool and similar mineral wools (including intermixtures thereof), in bulk, sheets or rolls	Buildings	Climate change
902610	Instruments and apparatus; for measuring or checking the flow or level of liquids	Biodiversity	Biodiversity
841960	Machinery; for liquefying air or gas, not used for domestic purposes	CCS	Climate change
730820	Structures (excluding p refabricated buildings of heading 94.06) and parts of structures, of iron or steel; plates, rods, angles, shapes, section, tubes and the like, prepared for use in structures, of iron or steel: towers and lattice masts.	Energy production	Climate change
902720	Chromatographs and electrophoresis instruments	Biodiversity	Biodiversity
730890	Structures and parts of structures, of iron or steel, n.e.s. (excl. bridges and bridge-sections, towers and lattice masts, doors and windows and their frames, thresholds for doors, props and similar equipment for scaffolding, shuttering, propping or pit-propping)	Energy production	Climate change
850720	Electric accumulators; lead-acid, (other than for starting piston engines), including separators, whether or not rectangular (including square)	Renewable energy storage	Climate change
848210	Ball bearings	Energy production	Climate change
840410	Boilers; auxiliary plant, for use with boilers of heading no. 8402 or 8403 (e.g. economisers, super-heaters, soot removers, gas recoverers)	Energy supply	Climate change
847420	Machines; for crushing or grinding earth, stone, ores or other mineral substances	Circular economy	Circular economy

HS code	Product description	Sector	Core environmental purpose
850650	Cells and batteries; primary, lithium	Electronic devices / sustainable transport	Climate change
761090	Bridges and bridge-sections, towers and lattice masts, of aluminium	Energy production	Climate change
841919	Heaters; instantaneous or storage water heaters, non-electric, other than instantaneous gas water heaters	Energy supply	Climate change
842121	Machinery; for filtering or purifying water	Water management	Water management
732119	Cooking appliances and plate warmers; for solid fuel and fuels other than gas or liquid, of iron or steel	Energy supply	Climate change
732111	Cooking appliances and plate warmers; for gas fuel or for both gas and other fuels, of iron or steel	Energy supply	Climate change

For the sake of brevity, the full versions of the short and long lists are attached via email to the report, in Microsoft Excel format.

10.2 Annex II: Methodology

10.2.1 Economic impacts modelling

In Chapter 6, the partial equilibrium model is introduced to estimate the economic impacts of trade liberalisation in environmental goods. As we are specifically interested in the international trade of such goods, an product-level model is implemented with a number of assumptions.

We first assume that the export supply of environmental goods by the Netherlands is infinitely elastic to changes in the prices they fetch on export markets. A high supply elasticity implies that exporters are highly responsive to price reductions: following a reduction in costs owing to trade liberalisation, exporters will be able to meet the new level of demand with greater quantities of exports at the same price level. This assumption is equivalent to considering the Netherlands as a price-taker in the world economy. Since the Netherlands is a small economy relative to the rest of the world, it seems reasonable to assume that it does not have a substantial impact on international price levels.

For simplicity, we then assume that the supply of all Dutch exports behaves similarly. Products are heterogenous in their technological characteristics, however, suggesting there may be some environmental goods whose export supply is less elastic to changes in prices.[173] This may be the case for highly customised or technologically sophisticated products, where Dutch exporters are more likely to act as price-makers; or where the level of customisation and sophistication is such that supply is more likely to be constrained by long lag times in production. These cases imply that our simulation results are likely to be a slight over-estimate of the “real” effects of trade liberalisation.

A second key assumption concerns the elasticity of substitution between domestic and foreign goods (the Armington elasticity). Armington elasticities capture a consumer’s response to changes in the relative price of domestic and foreign varieties for a given good. They determine the degree to which, in the world of our model, domestic consumers in the importing economy would be willing to substitute a domestic for a foreign variety of environmental good. Assumptions around consumer behaviour are important because the size of the Armington elasticity tends to have a large impact on modelling results. When substitution between goods is assumed to be imperfect—as reflected in a lower elasticity—a simulation will yield a lower impact on trade flows.

There is substantial debate around the appropriate size of the Armington elasticity. To navigate this large and complex literature, we relied on a 2020 meta-analysis performed by Bajzik and colleagues on over 3500 reported elasticities.[174] We also used other recent studies on Armington elasticities.[175] After correcting for publication bias—which tends to disfavour small and statistically non-significant elasticities—and for different types of data, Bajzik and colleagues report a mean elasticity of 2.9 for the entire world, with a 95 percent confidence internal ranging from 1.3 to 4.4. We therefore calibrate our model using this elasticity.

Once the Armington elasticity was adjusted, the core list’s percentage increase in trade flows (derived from decreases in tariffs) nearly halve from 16.5% to 8.9%. Moreover, the products that constitute the short list also experience a decrease in the percentage of trade increase, going from 12.4% to 7.1%. Lastly, long list products undergo a relatively smaller decrease, moving from 1.6% to 1%.

By decreasing the Armington elasticity, the substitution between domestic and imported environmental goods is assumed to be more imperfect. This increased imperfectness signifies that consumers in import markets are less willing to substitute domestic environmental goods for Dutch environmental exports; intuitively, this yields a lower impact on trade flows. Nonetheless, the

[173] See, for instance, Soete, 1987. The Impact of Technological Innovation on International Trade Patterns: The Evidence Reconsidered. *Research Policy*, 16(2). Available at the following link.
[174] Bajzik, J., Havranek, T., Irsova, Z., and Schwarz, J. 2020. Estimating the Armington Elasticity: The Importance of Study Design and Publication Bias. *Journal of International Economics*, 127. Available at the following link.
[175] Imbs, J.M., and Mejean, I. 2015. Elasticity Optimism. *American Economic Journal: Macroeconomics*, 7(3). Available at the following link; and Feenstra R.C, Luck, P., Obstfeld, M. & Russ, K.N. 2018. In Search of the Armington Elasticity. *Review of Economics and Statistics*, 100(1). Available at the following link.

simulation's positive effect of tariff decreases on trade flows persists, and core list products still enjoy the largest percentage trade flow increment. Thus, the study's main findings still hold and are robust to variations to the model's Armington elasticity.

Table A.2. List of countries used in partial equilibrium modelling

Country	Share of Dutch exports in 2020
Algeria	0.46%
Argentina	0.095%
Australia	0.5%
Brazil	0.41%
Canada	0.61%
Chile	0.097%
China	3.05%
Egypt	0.31%
Ghana	0.17%
Hong Kong	0.44%
Iceland	0.12%
India	0.48%
Israel	0.86%
Japan	0.86%
Kuwait	0.1%
Malaysia	0.23%
Mexico	0.45%
New Zealand	0.097%
Nigeria	0.9%
Norway	0.9%
Philippines	0.11%
Qatar	0.12%
Saudi Arabia	0.66%
Serbia	0.13%
Singapore	0.54%
South Korea	1.33%
Switzerland	1.19%
Taiwan	0.19%
Thailand	0.23%
Turkey	1.11%
Ukraine	0.23%
United Arab Emirates	0.49%
United Kingdom	7.89%
United States	4.67%
Vietnam	0.21%

10.2.2 Environmental impacts assessment

Chapter 7 introduces the framework and proposed approach to estimate the environmental impacts of trade in environmental goods. As introduced in this chapter, the existing literature on trade and environment identifies three supply-side mechanisms driving changes in environmental effects due to trade liberalisation, notably, the scale effect, composition effect, and the technology effect.

Quantifying these effects of trade liberalisation on the environment typically requires a CGE model. In the absence of such a model, this reports deploys two distinct methodologies to provide an estimation of scale and technology effects arising from trade liberalisation.

To quantify scale effects, we start from the modelled estimates emerging from partial equilibrium, which we assume capture the increase in the scale of production which follows tariff liberalisation. The key assumption here is that the relationship between export and production expansion is linear. It is worth stressing that while this is a relatively standard assumption, recent modelling results suggest that supply responses to tariff liberalisation might increase non-linearly.[176]

The partial equilibrium simulation was run at the 6-digit HS product level. To capture the impact of the simulation on output, we first aggregated our results at the 2-digit level and matched product and industry classifications at this level of aggregation. Since the match is not exact—environmental goods constitute only a fraction of the output of any given industry—we then calculated the growth of output resulting from trade liberalisation using industry-level shares of environmental goods as weights.

Having obtained modelled estimates of industry-level output growth resulting from trade liberalisation, we then multiplied our growth rates with historical industry-level data from Eurostat on GHG emissions (CO2, N2O, and CH4) to provide an estimate of projected increases in emissions as a result of trade liberalisation. To assess the actual impact of these figures on the Netherlands' emission performance, we also compare our results with GHG emission estimations from the EDGAR (Emissions Database for Global Atmospheric Research) database.

To provide estimates of technology effects, we replicate the econometric estimation put forward in Bacchetta et al. (2022) and use the same set of independent and control variables.[177] We focus on the elasticity of domestic CO2 emissions to the import of environmental goods for a panel of 150 countries over the 2000-2021 period.[178] This elasticity captures the percentage change in emissions linked to an increase in the diffusion of environmental goods. This is because increased use of environmental goods is projected to increase the energy efficiency of industrial production, which will drive down energy consumption and therefore emissions.

In line with Bacchetta et al. (2022), we also control for country's level of income, development, and openness to trade, and include country-level fixed effects to account for time-invariant characteristics which may affect our results. We use, again, data on emissions from the EDGAR database. Data on social and economic characteristics is from the ILO's Competitiveness Indicators and the World Bank's World Development Indicators databases.

Since we have a concern that trade in environmental goods may be caused by the level of emissions (reverse causality), we complement our OLS estimates with an instrumental variable estimation, where we instrument trade in environmental goods with its lagged variable. Our results are both

[176] Klotz, R., & Sharma, R. R.. 2023. Trade barriers and CO2. *Journal of International Economics*, 103726. Available at the following link.

[177] Bacchetta, Bekkers, Solleder, and Tresa. 2022. Environmental Goods Trade Liberalization: A Quantitative Modelling Study of Trade and Emission Effects. *Working Paper.* Available at the following link. The only exception is our use of data on labour productivity, in lieu of capital intensity, to proxy for a country's level of industrial development. Data on labour productivity is more widely available.

[178] Data on environmental goods imports is taken from the newly-released IMF dataset on trade in environmental goods. The dataset aggregates across a list of over 200 HS product codes, which closely resembles, although it does not exactly match, our long list. We chose the IMF database due to its wide coverage of countries. The dataset is available at the following link.

qualitatively and quantitatively very similar to those reported in Bacchetta et al. (2022). Table A3 below reports our full results.

Table A3. Elasticity of CO2 emissions to the import of environmental goods

	OLS	IV (2SLS)
	CO2 (log)	*CO2 (log)*
GDP (log)	0.716***	0.757***
	-0.118	-0.0885
Imports of environmental goods (log)	-0.0366**	-0.112***
	-0.0178	-0.0357
Labour productivity (log)	0.345***	0.375***
	-0.0671	-0.0463
GDP per capita (log)	-0.712***	-0.700***
	-0.104	-0.0695
Trade openness	0.000559	0.000857**
	-0.00055	-0.00036
Observations	1329	1185
Country fixed effects	YES	YES
R^2	0.91	0.98
Robust standard errors are reported in parentheses.		
*, ** and *** indicate a significance level at the 10%, 5% and 1% respectively.		

Results suggest a decrease of 0.36% of CO2 emissions for a 1% increase in the import of environmental goods. For the Netherlands in 2021, this is equivalent to a reduction in CO2 emissions of **over 85,000 metric tons of CO2e.** These results suggest that the diffusion of environmental goods more than compensates for any increase in emissions due to the expected increase in the scale of production which follows liberalisation.

10.2.3 Gravity model for the quantification of barriers to trade in environmental services

A gravitational model is used in order to estimate the effects of barriers to trade in environmental services. The gravity model is a workhorse economic model with a solid theoretical foundation. This model explains cross-sectional variation in trade flows between certain country pairs and allows for the inclusion of various controlling factors which may influence bilateral trade. The general form of the gravity model makes trade flows (*T*) dependent upon the product (GDP) of the income (*Y*) of two countries *o* and *d*, which is then divided by the distance between them (*D)*:

$$T_{odt} = A\frac{Y_{ot}^{\beta_1}Y_{dt}^{\beta_2}}{D_{od}^{\beta_3}}$$

In this model, estimates are produced that provides insights on bilateral trade flows, which is assumed to be positively correlated with the size of trade partner's economy and negatively related by the geographic distance which separates them. This negative relation between distance and trade flows stems from the assumption that the higher the distance goods need to travel, the higher the trade costs will be.

As previously mentioned, the gravity model allows for the inclusion of various factors, or variables, that may add additional explanatory power to the expected bilateral trade flows between a specific country pair. In general, gravity models include a set of time-variant and time-invariant variables to control for specific characteristics of a country pair that might be important to explain their trade relationship, other than their respective income and the distance that separates them. For our modelling purposes, a dummy variable is included equalling one if a country pair have a common language or a prior colonial relationship, and zero otherwise. The former is denoted as *comlanf_off* and *comlang_ethno* while the latter is denoted as *comcol* and *col45*, and control for possible cultural or political ties which might influence bilateral trade. Furthermore, a country pair's GDP and population as well as whether they are in involved in a RTA together are included in the estimation equation as time-variant control variables. These variables are denoted as *GDPod*, *POPod*, and *RTA*.

Services trade restrictions or barriers can come in various forms and types and are typically the result of various degrees of regulatory cooperation or divergence between two countries. High regulatory divergence between a country pair can result in considerable compliance costs, such as requirements on the citizenship of board members or criteria for obtaining licences to operate in one market that favours local firms, and most notably, inhibit the trade in services. Therefore, we propose the inclusion of a regulatory index to quantify regulatory heterogeneity and estimate the gains, in terms of trade in services, from increased regulatory cooperation. The regulatory indices are derived from the OECD STRI database which reflects restrictions in services trade.[179] This database catalogues, scores and weighs such trade restrictions resulting in indices taking values between zero and one where, zero signifies a free and open market while and one a completely closed market.

Taking everything into consideration, we can construct the following estimation equation:

$$\begin{aligned}\ln(X_{odt}) = {} & \beta_1 ln(stri) + \beta_2(rta) + \beta_3 ln(GDP)_o + \beta_4 ln(GDP)_d + \beta_5 ln(POP)_o + \beta_6 ln(POP)_d \\ & + \beta_7 ln(dist)_{od} + \beta_8(contig) + \beta_9(comlang\_off) + \beta_{12} ln(comlam\_ethno)_o \\ & + \beta_{11}(comcol) + \beta_{12}(col45)\end{aligned}$$

Where (X_{odt}) is the logarithm of trade flows between a specific country pair at period *t* and will act as the dependent variable for the estimation efforts. Moreover, the logarithmic form of all time invariant variables are taken for the interpretation of the estimation efforts.

[179] The OECD STRI database includes 22 services sectors for the 34 OECD countries and 8 non-OECD countries. It includes measures organised in five distinct policy headings: restriction of foreign entry, restriction on movement of people, other discriminatory measures, barriers to competition, and regulatory transparency.

In order to estimate the effects of regulatory heterogeneity across specific services sectors, the above estimation model has been run separately several times. The results of the estimation efforts are presented in the following table per sector and model.

Table A4. Gravity model estimation results, per services sector

	Architecture	Culture	Engineering	ICT	Insurance	Logistics	Professional	Transport
$ln(stri)$	-0.084	-0.042	-0.099**	-0.389***	-0.232***	-0.179**	-0.406***	0.073
	(-1.46)	(-0.49)	(-2.00)	(-6.15)	(-3.17)	(-2.41)	(-9.1)	(1.04)
rta	-0.045	-0.194**	0.297***	-0.106*	0.559***	0.514***	0.023	0.059
	(-0.62)	(-2.48)	(3.56)	(-1.89)	(6.94)	(6.4)	(0.37)	(1.11)
N	3644	3915	2739	5678	4154	3388	4822	6140
R^2	0.62	0.61	0.46	0.71	0.6	0.59	0.73	0.68

Dependent variable is the logarithm of annual trade flows between country *i* and country *j*. In parenthesis, the t-statistics are given. *, ** and *** indicate a significance level at the 10%, 5% and 1% respectively.

10.3 Annex III: Interview questionnaire

In order to identify and better comprehend the non-tariff barriers (NTBs) to trade in environmental services, a number of interviews have been conducted with key stakeholders. At first, the interview process started by looking into the sectors wind energy, solar energy, and green hydrogen energy. To identify key stakeholders within these sectors, several members of the industry associations for each sector have been selected based upon whether they traded internationally and whether their main export line focused on environmental services.

For the wind energy sector, we identified members in the industry association *Nederlandse Wind Energie Associatie* (NWEA). A number of 17 companies have been contacted within this sector and a total of 4 interviews have been conducted. For the solar energy sector, we looked into members of the Holland Solar industry association. For this sector, 17 companies have been contacted, which resulted in one interview being conducted. Lastly, for the green hydrogen sector, we selected members within the *Nederlandse Waterstof en Brandstofcel Associatie* (NWBA). A total of 13 companies have been contacted, which resulted in a number 5 interviews being conducted for the green hydrogen energy sector.

Moreover, throughout the interview process, the water sector also emerged as an interesting sector for further research. For this sector, a total of 7 companies have been contacted, which resulted in 2 interviews being conducted. We also reached out to an additional 8 companies involved in a variety of climate-related services, including engineering, out of which we secured 1 interview. Additionally, we also conducted interview with staff at the RVO and the Ministry of Foreign Affairs. We interviewed 3 staff members at these organisations. In summary, we contacted app

To conclude, the interview process has resulted in a total of 17 interviews being planned and conducted.

Invitation letter

The study focuses on identifying trade barriers for Environmental Goods and Services (EGS). Specifically, the study aims to identify non-tariff measures (NTM) that would pose barriers to trade. NTM are in principle all measures other than tariffs that discriminate or restrict market access.

The Netherlands aims to participate in discussions regarding trade in environmental goods and services at the World Trade Organization (WTO). In this study, we would like to highlight sectors and products and services that have high value to the Dutch economy. Furthermore, we aim to get further insight into the Dutch economic and environmental interest in removing barriers to trade in environmental goods and services.

With this interview we aim to learn about your experiences regarding barriers to trade, as well as opportunities for exporting your products or services.

Interview guide

Name of interviewee:	
Organisation:	
Interviewer:	
Date:	

- What are your main export markets for environmental goods and services?
- Which markets do you think will be the main source of export growth over the next 10 years?
- What are the main market access barriers you face and how do these restrict your ability to trade and invest in foreign markets?
  - Has the impact of these barriers changed over time?

- To what extent have these barriers increased costs of exporting/lead to foregone trade and investment?
    - Could you give an estimation of these costs?
    - Can these costs be seen as structural or one-time costs?
- How do these barriers affect your competitive position on the market you export to?
    - Are there firms/countries benefit from this?
- In your view, what is necessary to overcome these export barriers (e.g., innovation, better collaboration with other firms, networking, regulatory cooperation and harmonization of standards etc.)
    - Would you need support from the Dutch government or the EU in pursuing this?
- What (policy) recommendations would you have for the Dutch government to reduce the impact of trade barriers?

About Ecorys

Ecorys is a leading international research and consultancy company, addressing society's key challenges. With world-class research-based consultancy, we help public and private clients make and implement informed decisions leading to positive impact on society. We support our clients with sound analysis and inspiring ideas, practical solutions and delivery of projects for complex market, policy and management issues.

In 1929, businessmen from what is now Erasmus University Rotterdam founded the Netherlands Economic Institute (NEI). Its goal was to bridge the opposing worlds of economic research and business – in 2000, this much respected Institute became Ecorys.

Throughout the years, Ecorys expanded across the globe, with offices in Europe, Africa, the Middle East and Asia. Our staff originates from many different cultural backgrounds and areas of expertise because we believe in the power that different perspectives bring to our organisation and our clients.

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ECORYS

P.O. Box 4175

3006 AD Rotterdam

The Netherlands

Watermanweg 44

3067 GG Rotterdam

The Netherlands

T +31 (0)10 453 88 00

F +31 (0)10 453 07 68

Sound analysis, inspiring ideas

E netherlands@ecorys.com

Registration no. 24316726

W www.ecorys.nl

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