WORLD ECONOMIC FORUM

Accelerating Decarbonization through Trade in Climate Goods and Services

INSIGHT REPORT

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Preface

Trade, investment and international partnerships can deliver the markets and innovations needed to address climate change.

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As the world looks to transition to new, decarbonized production and consumption systems rapidly, a great number of climate-related technologies and services need to be deployed. Trade can be a critical means of reducing costs and spreading these innovations to new markets. Addressing trade barriers can speed up that process, leading to gains for consumers and businesses shouldering the climate transition while opening new markets for exporters. Lowering trade barriers could equally encourage greater foreign direct investment into climate-related projects.

It is vital that climate goods and services trade is understood in order to structure market signals, incentives and partnerships. Many governments increasingly realize the potential in this space. The World Economic Forum is contributing to ongoing discussions at the World Trade Organization (WTO) on trade and the environment. Other trade talks in regional and bilateral settings are also under way.

To encourage timely outcomes, this report highlights top climate technologies and services that help reduce emissions, which trade policy-makers should focus on. The insights are based on the Forum's Climate Trade Zero initiative and community discussions that bring together trade and climate experts from all regions.

We must accelerate our response to climate change. Yet, leaders across the globe know they need to do so in a way that brings opportunities, jobs and prosperity to all parts of society. Trade is an engine of growth, and this engine must be rewired to support the spread of green technologies and services. No country and company can do that alone. Through thoughtful trade collaboration, we stand a better chance of realizing a net-zero economic future.

Executive summary

Boosting trade in specific climate action-related technologies and services could help encourage emissions reductions in industries and homes worldwide.

Trade can support climate action

Trade can help spread climate-friendly technologies around the world. Wind turbines contain around 9,000 components traded in global and regional value chains, electric cars are made from components sourced in many countries, and global heat pump markets are growing. Services trade supports climate technology roll out, like monitoring wind turbine performance to repair faulty parts, or engineering advisory, design, consulting and project management functions that deliver clean energy projects. As well as increasing availability, trade in climate goods and services can reduce costs and increase choice, making industries dependent on emissions savings more competitive.

Government collaboration has been mixed, but action is needed now

Governments have long recognized the importance of a broader push for more environmental goods and services trade. Yet efforts to work together to reduce barriers – from tariffs to regulatory complexity or limitations on foreign suppliers – have been mixed. The urgency of climate action means the time is ripe for a renewed, focused collaboration on boosting trade in climate goods and services.

Trade in 25 climate goods could help emissions reductions

This report presents a list of 25 key climate technologies that trade policy-makers could prioritize in discussions. These were identified based on three sectors that will play an essential role in reaching net-zero emissions, according to the Intergovernmental Panel on Climate Change (IPCC), including energy supply, transport and buildings. Goods for carbon capture and storage (CCS) and refrigerant management are also included as these are promising for decarbonization too. Technologies proposed include wind and solar power, heat pumps, alternative refrigerants, insulation, efficient motors, LED lighting, smart thermostats, electric cars and biogas stoves.

A longer list is also available that indicates inputs to key technologies and relevant tariff codes. That information is specifically designed to help policy-makers explore value chains and areas of most interest to their national context.

Non-tariff barriers matter more than tariffs

A tariff-cutting deal on climate goods would send an important message. It would demonstrate that participating governments are serious about aligning their commercial and economic policies with climate action. Most research to date also notes the importance of addressing non-tariff barriers (NTBs) – like different testing and certification requirements for safely placing a product on a market. The report lists seven types of NTBs and suggests priorities for further work.

Services trade restrictions slow down climate goods distribution

Interviews for this report confirmed that trade barriers to providing climate-related services have resulted in missed business opportunities for the sale of climate goods. The report presents a list of climate services, associated with the five sectors targeted for increased climate goods trade, to encourage trade policy efforts. The list includes “core” environmental services and services that “enable” or are “indispensable” to climate goods trade.

Developing countries must be included, and value chain competitiveness can help

Globally, 759 million people do not have access to electricity, even though it is vital for development and clean energy solutions. Developing countries equally need to secure clean energy supplies to power companies engaged in global value chains as attention grows around supplier emissions. While south-south trade in clean energy technologies is growing, developed country markets could be opened up through regulatory cooperation in areas such as standards and technical requirements for key products.

A climate trade deal can start targeted and grow over time

A trade deal among a broad number of interested countries focused on a tight list of items with significant potential for cutting emissions would be a positive move. The agreement could be broadened in time, especially as policy-makers build up confidence in trade collaboration and undertake effective capacity building.

The Climate Trade Zero community stands ready to support these and other efforts aimed at maximizing the positive contribution that trade can make to addressing climate change.

Introduction

Trade tensions risk reducing the potential of economies of scale to increase the availability of climate-friendly technologies.

“ Fewer trade barriers to critical climate action goods and services will have positive knock-on effects on competitiveness and growth opportunities in a net-zero emissions future.

Trade can support climate action by increasing the availability of climate-friendly technologies. Reducing trade barriers around these items encourages their spread. 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.[1] Many climate goods also depend on a wide range of supporting services. 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, assembly and installation, operation, and maintenance of equipment (see Box 1).[2] Services trade facilitation can help ensure these support systems are widely available. Governments have long recognized the importance of environmental goods and services (EGS) trade (see Table 1). Trade negotiations in this area, however, have had only mixed success for a range of technical and political reasons.

Today, with ever more apparent climate impacts and a need to move quickly on industry decarbonization and innovation, governments could work together on the trade of climate goods and services as a specific sub-category. That would send a postive signal to markets and could support new value chain partnerships. Trade-related tensions and disputes on renewable energy specifically have risen since 2010.[3] These trade tensions are partly due to the design and implementation of industrial policies in numerous countries around clean energy production. Indeed, green job creation is an important target for many policy-makers, but this report suggests localization is not the best way to deliver this, especially in the long-term. Business and academia can help champion an alternative path. Fewer trade barriers to critical climate action goods and services will have positive knock-on effects on competitiveness and growth opportunities in a net-zero emissions future.

This insight report presents reference lists for climate goods and services that trade policy-makers could consider in their discussions. It also identifies non-tariff barriers around climate goods. It concludes with a look at priorities for developing economies as it is vital for all countries to grow green. Tailored policy design for different countries will be the focus of a follow-up initiative from this report (currently in scope). The report’s recommendations are assembled thanks to a 70-plus community of experts working through the Climate Trade Zero initiative. Climate Trade Zero brings trade and climate practitioners together for knowledge exchange and targeted project work. The report also benefited from 30 interviews with industry and academia and peer review.

BOX 1 **Wind farms and trade**

Wind turbines contain around 9,000 components that are traded in global and regional value chains. Design, knowledge and technical know-how are also critical to the manufacture of high-quality wind turbines that can compete with incumbent energy technologies and scale up industry electrification. Tariff barriers around wind energy inputs are relatively low among large emitting economies. However, barriers to trade in services and NTBs, such as local content requirements, impede trade inputs around wind power plants more than tariffs.

Services trade is also an important part of climate goods value chains. Constructing a wind farm requires environmental consultants to identify a suitable location and prepare an environmental impact assessment; financial and consulting services are needed in the project development stage; and specialist delivery firms ensure the delivery of parts. Assembly, construction, testing, IT, monitoring, grid connection and maintenance services are equally essential.

Source: National Board of Trade Sweden, 2021

TABLE 1 | Green goods and services trade talks

Initiative	Date(s)	Notes
World Trade Organization (WTO), Doha Round	2001-	A wide multilateral trade negotiation mandate included objectives on environmental goods and services trade.
Environmental Goods Agreement (EGA) negotiations	2014-2016	46 WTO members worked to cut (bound) most-favoured-nation (MFN) tariffs to zero. The talks focused on environmental action categories – like air pollution and renewable energy – and produced a list of around 300 items. The effort collapsed in December 2016 largely due to a change in political will among large players.
Asia Pacific Economic Cooperation (APEC)	2012	APEC economies committed to cutting applied MFN tariffs to 5% or less. That created a market of well over $300 billion in the region.[4] APEC economies have pledged to continue work on non-tariff barriers to environmental goods and also look at environmental services trade.
Trade in Services Agreement (TiSA) negotiations	2013-2016	20-plus WTO members negotiating a plurilateral deal on services trade were considering a chapter or elements on environmental services.
Agreement on Climate Change, Trade and Sustainability (ACCTS)	2019-ongoing	Six nations (New Zealand, Costa Rica, Fiji, Iceland, Norway and Switzerland) are working on a deal for environmental goods and services trade, phasing out harmful fossil fuel subsidies and alignment on eco-labelling.
Trade and Environmental Sustainability Structured Discussions (TESSD)	2021-ongoing	70-plus WTO members are scoping appetite for green trade collaboration, including in the area of environmental goods and services trade.
Bilateral or regional trade agreements (misc.)	United States Mexico Canada Agreement (2020), Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) (2018), EU-Singapore Free Trade Agreement (FTA) (2019), EU-UK Trade and Cooperation Agreement (TCA) (2020)	Parties cite the importance of environmental goods and services trade and in some cases include liberalization commitments as part of the overall deal.

1 Climate goods trade

Trade discussions should prioritize items with significant emissions reduction potential.

1.1 Categorizing relevant items

In some cases, stakeholders must choose between "greener" products rather than an alternative, a debate currently playing out in many policy settings.

Climate goods can be difficult to pinpoint precisely in the World Customs Organization (WCO) Harmonized System (HS), which classifies over 5,000 commodity groups with six-digit codes. Countries use these as a basis for trade in terms of customs tariffs, international trade statistics and to determine the relevant rules and regulations that must be complied with. Some six-digit subheadings single out an environmental or climate good, while other subheadings cover both environmental and non-environmental goods. Nonetheless, that has not proved an insurmountable obstacle in previous negotiations, with policy-makers using product descriptions known as "ex-outs" to identify the item in question.[5] The recent HS review for the 2022 tariff schedule (HS-2022) entered into force on 1 January 2022 and added several new goods or additional tariff lines that better capture goods relevant to climate action – such as LED lights that consume less power.[6] While this progress is good, specific harmonized codes are still needed for emerging environmental goods. Governments can use the forthcoming review of the HS for the 2027 tariff schedule to further clarify climate goods tariff codes. More precise codes would generate better trade statistics and make it easier to detect where NTBs pose trade barriers.[7]

In some cases, stakeholders must choose between "greener" products rather than an alternative, a debate currently playing out in many policy settings. Some past trade negotiations have talked about "environmentally preferable products" (EPPs) that cause less harm at some stage in their life cycle than alternatives. Tariffs are higher on average for EPPs.[8] Progress on liberalizing trade in EPPs comes with challenges to address. In some circumstances, under World Trade Organization (WTO) rules, measures that distinguish between products based only on processes and production methods (PPMs) – but are otherwise "like" each other – could be considered discriminatory (discussed in more detail below). Some stakeholders also advocate for a life cycle analysis on goods targeted for trade liberalization, where water use, soil, air pollution or labour impacts are considered alongside climate effect, though others suggest this could prove a lengthy process.

The private sector or governments may use voluntary standards or mandatory technical regulations to distinguish products based on carbon content. To date, methodologies for calculating, measuring, reporting and verifying carbon intensity across various products vary, though the Greenhouse Gas Protocol Product Standard is a common starting point. Global standards for "green steel", "green cement" and other alternatives for emissions-intensive materials have not yet been developed – though some efforts are under way.[9] The extent to which carbon accounting can feed into a green trade agenda will depend on consensus around methodologies as much as approach. It may be wise for governments to first focus primarily on climate goods that are more straightforward to define but leave an open agenda to address EPPs in due course.

1.2 Proposed climate goods list

Table 2 outlines a reference list of climate action technologies that trade policy-makers could prioritize. The list is based on industry and expert consultations on immediate priorities for decarbonization. It could inspire trade talks on environmental or climate goods or be used to evaluate outcomes from these. The list offers an impartial view of the technologies and items needed for climate action without prejudice against a particular national interest. A longer list is also available here, noting HS codes (updated for HS-2022), ex-outs where relevant and key inputs to the various technologies – like materials, parts and components, often with dual uses. That includes items like static converters that convert solar energy into electricity and can be used to convert direct current from photovoltaic/solar cells into conventional alternating current electricity. Static converters are also used in other renewable energy generation and, more broadly, in low-voltage devices like computers and power tools.

The list covers three sectors that will play a critical role in reaching net-zero emissions – energy supply, transport and buildings – according to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (Working Group III).[10] Some goods for carbon capture and storage (CCS) and refrigerant management are included because these are also expected to have significant climate mitigation impacts. Examples of some of the most impactful (in terms of emissions cuts) items listed are wind and solar power, heat pumps, alternative refrigerants, insulation, LED lighting, electric cars and biogas stoves. While agriculture is another major source of emissions, the list does not include mitigation technologies like seeds, as these could prove difficult for governments to collaborate on as a first step. Many other general technologies on the list, like those linked to renewable energy and energy efficiency, will be necessary for agriculture mitigation. Technologies for climate adaptation,

in agriculture as well as other sectors, are important but merit a specific discussion that builds on early research due to their complexity and specificity.[11]

Many, but not all, of the goods in Table 2 were included in previous WTO and Asia Pacific Economic Cooperation (APEC) negotiation lists;[12] the Organisation for Economic Co-operation and Development's (OECD) Combined List of Environmental Goods (CLEG); the World Bank climate-friendly goods list; free trade agreements (FTAs) (notably UK-New Zealand FTA and the Agreement between New Zealand and the Separate Customs Territory of Taiwan, Penghu, Kinmen, and Matsu on Economic Cooperation (ANZTEC)); and mapping studies.[13] Positively, that demonstrates that wider government collaboration has the potential to deliver in this area but now needs a focused push.

TABLE 2 **Climate technologies reference list**

	Main category	CO_2 equivalent reduced 2020-2050 (gigatons (Gt))	Sector
1	Alternative refrigerants (refrigerant recovering and reclaiming units). Replacing hydrofluorocarbon (HFC) refrigerants currently includes trade-offs, but is a priority since the 2016 global pledge to phase out HFCs. Practices to better manage fluorinated gases currently widely used as refrigerants would also lead to significant emissions savings.	42.73-48.75	Refrigerants
	Renewable energy and energy efficiency		Energy supply
2	Onshore wind power	46.95-143.56	
3	Offshore wind power	10.22-9.89	
4	Utility scale PV	40.83-111.59	
5	Distributed solar PV	26.65-64.86	
6	Concentrated solar power	18.00-21.51	
7	Biomass	2.62-3.59	
8	Geothermal	6.15-9.17	
9	Small hydropower	1.65-3.21	
10	Tidal systems	1.27-0.8	
11	Biogas stoves	4.65-9.7	
12	High-efficiency heat pumps	4.04-9.05	
13	Waste-to-energy systems (transition solutions)	6.27-5.24	
14	Solar water heaters	3.41-13.73	
15	Efficient motors (rated international efficiency 3 or higher)	Alternative metrics: Widespread upgrading to efficient motors could reduce global electricity consumption by 10%.[14]	
16	LED lighting	14.45-15.69	
17	Solar cookstoves	Alternative metrics: Project Drawdown estimates that clean cooking, which includes fuel-burning stoves that reduce emissions (by increasing thermal efficiency or ventilation) and solar-powered stoves, could reduce emissions between 31.38-76.34 gigatons of CO_2 equivalent ($GtCO_2e$).	

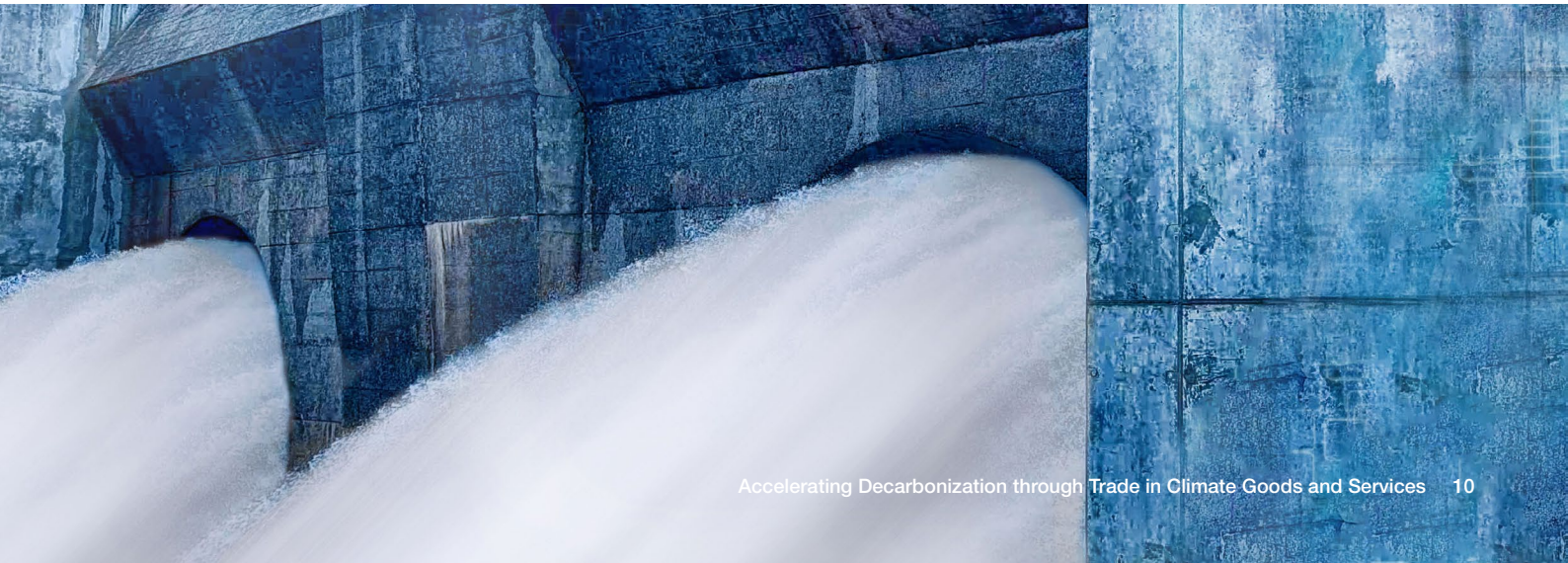
TABLE 2 | **Climate technologies reference list continued**

	Main category	CO_2 equivalent reduced 2020-2050 (gigatons (Gt))	Sector
	Buildings		Buildings
18	High-performance glass	8.82-11.34	
19	Insulation materials	15.38-18.54	
20	Thermostats (smart)	6.1-7.25	
21	Building automation systems	9.55-14.01	
	Fuels		Energy supply
22	Hydrogen	Alternative metrics: According to the IEA, adoption of cleaner technologies for hydrogen production and demand growth for this fuel could avoid up to 60 $GtCO_2e$ in a 2021-2050 net-zero emission scenario, representing 6% of total cumulative emissions reductions.[15]	
	Transport		Transport
23	Electric trains	1.91-3.25	
24	Electric cars[16]	7.66-9.76	
25	**Carbon capture and storage**	Alternative metrics: According to the Intergovernmental Panel on Climate Change (IPCC), there is a broad range of possible deployment levels for CCS with a median average of 665 $GtCO_2e$ captured and stored between now and 2100 for a net-zero pathway.	CCS

Source: World Economic Forum; emissions data and savings estimates from Project Drawdown (data as of 5 August 2022) except where otherwise indicated. The range reflects two scenarios developed by the initiative: scenario 1 in line with a 2-degree Celsius rise by 2100, and scenario 2 in line with a 1.5-degree Celsius rise at the century's end.

1.3 Tariff profiles

Tariffs on many environmental goods are generally already low. The Organisation for Economic Cooperation and Development (OECD) estimates that average tariffs on these declined from over 3% to below 2% between 2003 and 2016 – though they remain high on some items and vary across countries. Tariffs are often low in developed countries – on average 0.5% – but are much higher in developing countries (above 10% in some cases).[17] Some climate goods may already enjoy duty-free treatment in preferential trade agreements (PTAs). Fifty WTO members have already cut tariffs to zero on solar cells and modules as part of an information technology deal. However, with modern, integrated supply chains in which components and parts cross borders several times, the cumulative impact of tariffs can add up even at low levels.

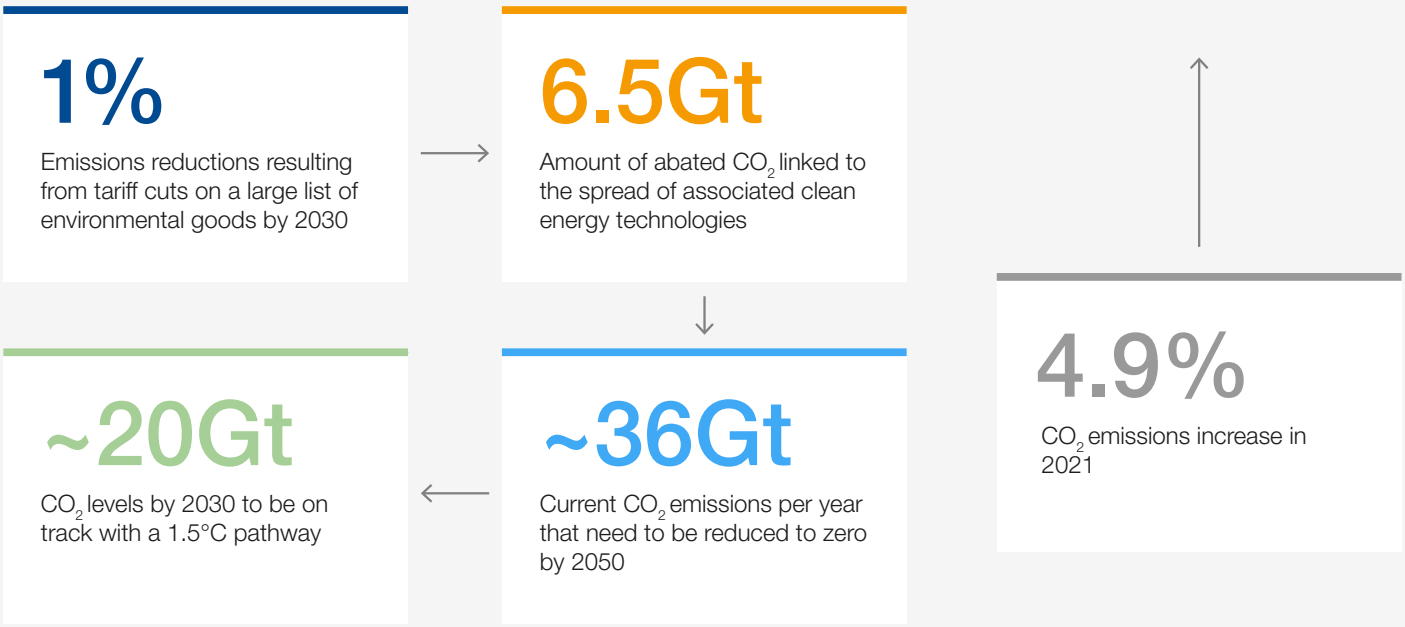


1.4 Potential emissions reductions

Emissions reductions directly attributable to the scale-up of goods from tariffs liberalization are difficult to measure. One estimate in 2009 using an extensive list of goods suggested the maximum possible emissions reductions from tariff cuts would be just under 1% of 2030 emissions levels (if no new policies were enacted after 2008). The same research highlighted that renewable energy technologies included in this larger list could have a maximum abatement potential of up to 6.5 gigatons of carbon dioxide equivalent ($GtCO_2e$) per year by 2030. That figure relates to these technologies' scale-up rather than the specific trade effect.[18]

Other estimates suggested that the 2014-2016 Environmental Goods Agreement (EGA) negotiations would have boosted trade in the covered items by 1.1% and reduced emissions by the equivalent of 1.6 million homes' annual electricity use by 2030.[19] Additional emissions cuts could result from value chain innovation spillovers over time and lower prices thanks to greater competition through trade. In other words, while the trade facilitation potential is not insignificant, the climate action from tariff cutting needs to be put into the context of improving the overall enabling environment for the scale-up of climate goods.

FIGURE 1 **Emissions reduction pathways**



Source: World Economic Forum; Global Carbon Project; McKinsey & Company

> A 2-degree Celsius pathway would require cutting annual CO_2 emissions by half by 2050; noting that carbon dioxide emissions are only part of the story.

In the interviews for this report, stakeholders urged trade policy-makers to focus on goods with most abatement potential as a reference point, not because trade levers alone will address the climate crisis but because every extra push is critical in transforming the economics of decarbonization. For a 1.5-degree Celsius pathway, emissions would need to be reduced from the current ~40 $GtCO_2e$ per year to zero by 2050.[20] A 2-degree Celsius pathway would require cutting annual CO_2 emissions by half by 2050; noting that carbon dioxide emissions are only part of the story. Global emissions targets are guided by the Paris Agreement, struck in 2015, where countries agreed to limit global temperature rise to no more than 2-degrees Celsius above pre-industrial levels and to pursue efforts for a 1.5-degree Celsius threshold. Parties to the deal will do so through national climate action plans, also known as nationally determined contributions (NDCs).

Further, the International Energy Agency (IEA) estimates in its pathway for reaching net-zero emissions by 2050 that most of the global reductions in CO_2 emissions through 2030 could come from technologies that are available today.[21] In 2050, however, almost half the reductions are expected to come from technologies that are currently at the demonstration or prototype phase. Innovation and scale must go together. Trade, investment and international partnerships are one way to achieve that combination.

2 Non-tariff barriers

Climate technology trade can be held up by more than just customs tariffs – "behind-the-border" issues often present a greater challenge for exporters and importers.

2.1 Challenges to consider

Non-tariff barriers (NTBs) present a challenge for global trade and, in almost all sectors, act as a bigger obstacle than tariffs.[22] One study on climate goods trade specifically found that, when combined with tariffs, NTBs could result in average levels of protection ten times greater than tariffs alone.[23] Measures that present as NTBs are not necessarily bad, covering things like product safety or sustainability, but their design can sometimes affect market access. International dialogue is therefore important in this area to ensure key regulatory objectives are maintained while providing opportunities for economies of scale in product distribution. In a recent Forum study on climate and trade, participants called for more evidence around climate goods NTBs, including creating a categorisation of "green NTBs". Policy-makers have also asked the Forum to help them understand and prioritize NTBs that matter most for climate action.

2.2 Climate NTBs

To meet these asks, industry and experts were consulted over a period of six months. The conversations were guided by a climate NTB categorization, developed based on earlier industry surveys by the OECD,[24] Monkelbaan,[25] and UNCTAD's International Classification of NTMs (see Table 3).[26] Interview participants were asked to give a sense of both the degree of prevalence and the degree of restrictiveness of climate NTBs within these various categories. The top three identified on both fronts include technical barriers to trade, local content requirements and challenges around government procurement, which are discussed below in greater detail.

TABLE 3 **Climate non-tariff barriers**

Non-tariff barrier	Examples
Standards, technical regulations and labelling requirements	Grid-access restrictions (e.g. timely connection to the grid, reliable use of the grid under reasonable terms and conditions, enabling market and network arrangements for renewable energy sources – including balancing services, curtailment rules, etc.). Efficiency or energy labelling for LED lighting and other household items. Technical requirements for wind turbines, policies on alternative refrigerants and green hydrogen standards.
Conformity assessment procedures, product testing and certification	Conformity assessment for solar panels, electric vehicles and heat pump test procedures for market access.
Local content requirements	Requirement to use locally produced wind turbines to be eligible for feed-in tariffs.
Export-related measures (subsidies, licenses or quotas)	Dual pricing, export monopolies, export taxes, fiscal taxes on exports, minimum export prices, VAT tax rebate withdrawal, restrictions on customs clearance points, limited licensing of export facilities (e.g. under environmental rules), qualified exporters list etc. Export licenses for hydrogen to make sure it is not used in the arms industry. A government subsidy to a particular domestic industry makes those goods cheaper to produce than in foreign markets.
Government procurement procedures	Rules that call for special requirements to provide goods or services to state-controlled entities, particularly in the renewable energy sector.
Customs procedures, including licenses and other permits	Difficulty or slowness in obtaining import license for solar PV systems.
Infringement of intellectual property	New renewable energy technology is copied in importing country without a license leading a firm to limit sales in that market.

BOX 2 | **Green hydrogen trade**

Many experts expect hydrogen to be a vital source of energy by 2050. The International Renewable Energy Agency (IRENA) expects that more than 30% of hydrogen produced by 2050 will be traded internationally. Standards around the safety and quality of green hydrogen goods and services is one way to build a resilient global green hydrogen economy. At this early stage, fragmentation is a key challenge, with different hydrogen classifications emerging using colour schemes or levels. Some industry associations are actively working to develop private sector standards for green hydrogen that could be scaled up. For instance, the Green Hydrogen Organization is looking to establish a standard for accurate greenhouse gas (GHG) emissions accounting within the sector. Existing models could feed into the development of a common approach.

Currently, MFN tariffs on hydrogen are very low or non-existent. Rather than having a separate tariff line for green hydrogen, policy-makers could instead provide trade preferences via certification systems for this type of trade, assuming compliance with WTO rules. Industry players and governments could also draw on best practices from trade in other relevant green goods and services to create a level playing field.

Technical barriers to trade

One recent analysis found that static converters – worth about $60 billion in global exports per year – faced 523 technical requirements, applied by 61 different countries, globally.

Technical barriers to trade (TBTs) include standards, technical regulations, conformity assessment procedures (testing and certification) and labelling requirements. The topic covers mandatory technical regulations and voluntary standards that define a product's specific characteristics, such as its size, shape, design, functionality or performance. WTO rules provide policy-makers with guidance on NTBs. The Technical Barriers to Trade Agreement requires technical measures to be prepared, adopted and applied according to some basic principles to minimize their negative impact on trade. Principles are also included on how policy-makers might interact with voluntary standards. The five core principles of the TBT Agreement include transparency, non-discrimination and national treatment, proportionality, use of international standards (whenever possible), and equivalence. Countries' FTAs also work to address and harmonize various TBT issues.

Climate goods producers must nonetheless contend with a growing array of requirements for selling across markets – suggesting greater regulatory coherence is needed beyond adherence to TBT principles. Interviewees reported multiple markets imposing similar yet slightly different requirements that must be complied with, ultimately raising the cost of the item. One recent analysis found that static converters – worth about $60 billion in global exports per year – faced 523 technical requirements, applied by 61 different countries, globally. These requirements may be important and do not necessarily need to be eliminated, but governments could work on regulatory cooperation to maintain the outcome and reduce trade friction.[27] Another study in 2019 on heat pump water heaters notes that there are many test methods across regions with major differences between them. Manufacturers must undertake different tests to sell products, which adds to product cost and can create confusion.[28]

Climate-linked standards and regulations are also related to trade law discussion around "non-product-related processes and production methods" (PPMs). PPMs refer to processes or production methods that do not physically manifest themselves in the final product. Relevant PPM examples could be standards for green hydrogen production (also see Box 2) and low-carbon steel. These final products are not distinguishable from regular hydrogen and steel from outside appearance or performance. Measures based on PPMs, like emissions-labelling requirements, emissions-link taxes or duties, will need to consider WTO rules. There is debate on whether WTO rules will allow different treatment for products based only on their carbon intensity. Equally, trade lawyers suggest it is not clear cut which PPMs might fall within the scope of the TBT Agreement. Some FTAs have already started to innovate in this area, like the European Free Trade Association (EFTA)-Indonesia arrangement that gives a greater tariff reduction up to a set quota for palm oil based on compliance with an international private sector-led sustainability standard.[29]

Local content requirements

Local content requirements (LCRs) require firms to use domestically manufactured goods or domestically-supplied services 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 and, more recently, electric vehicles. That has led to several trade disputes at the WTO since the General Agreement on Tariffs and Trade (GATT) and the Trade-Related Investment Measures (TRIMs) Agreement constrain the use of LCRs. For example, under the National Treatment principle (Article III of GATT), countries are expected not to discriminate in policy-making 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.

Yet, even though some forms of LCRs are inconsistent with WTO obligations, they continue to be used by many countries, particularly in government procurement. This is despite many businesses indicating that LCRs are ineffective in encouraging domestic industry development. In a survey as far back as 2015, 80% of investors disagreed that LCRs encouraged them to invest in local manufacturing or to source inputs locally.[30]

Government procurement

Government procurement accounts for 10-15% of national GDP on average across the world. Directing government spending towards more sustainable projects represents a major opportunity to reduce emissions created by governments' operations and support markets for new technologies. For example, the EU has a portal for Green Public Procurement, which is divided up into ten categories, including the circular economy, energy efficiency and green space. The Biden Administration's Green Procurement plan includes carbon capture, utilization and storage (CCUS), hydrogen and other "buy clean" areas.

A subset of 48 WTO members have 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. 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. Definitions of what "sustainable" means may vary greatly across national and sub-national government tenders. This blunts the effectiveness of climate-linked public procurement since climate goods providers must invest a lot of time in compliance and tailoring bids.

Interviewees also suggested that many governments explicitly or tacitly embed LCRs into tenders. For example, an eligibility requirement for government procurement in renewable energy projects might be the use of local inputs. There are several remaining issues in this space, especially regarding public utilities, and whether their purchase of renewable energy falls under government procurement. The problem with governments putting LCRs in place is that they may raise prices, keep the most innovative products out of the market and slow down the scale-up of clean energy in the long term (after giving it an initial boost).

"Definitions of what "sustainable" means may vary greatly across national and sub-national government tenders.

3 Trade in climate services

Limiting climate-related services trade can result in missed opportunities for the sale of climate goods.

3.1 What is a climate service?

There is no clear and agreed-upon definition among either international experts or countries on what constitutes a climate service, making trade talks in this area tricky. Negotiators must also grapple with scope since many different services can be relevant for addressing climate change, but these may also have other uses, like engineering services. To unpack this complexity, it may be helpful to differentiate between "traditional" or "core" environmental services, and those that "enable" or are "indispensable" to climate goods trade as follows:

1. Traditional environmental services are those that can be qualified as environmental in nature, as their end-use is purely environmental. The WTO lists these service sectors in the Services Sectoral Classification List (W/120 list), based on the provisional version of Division 94 of the United Nations Central Product Classification (UN CPC)[31] and includes services such as sewage, refuge disposal and sanitation. Trade negotiators use these lists to categorize, negotiate and schedule WTO General Agreement on Trade in Services (GATS) commitments on environmental services.

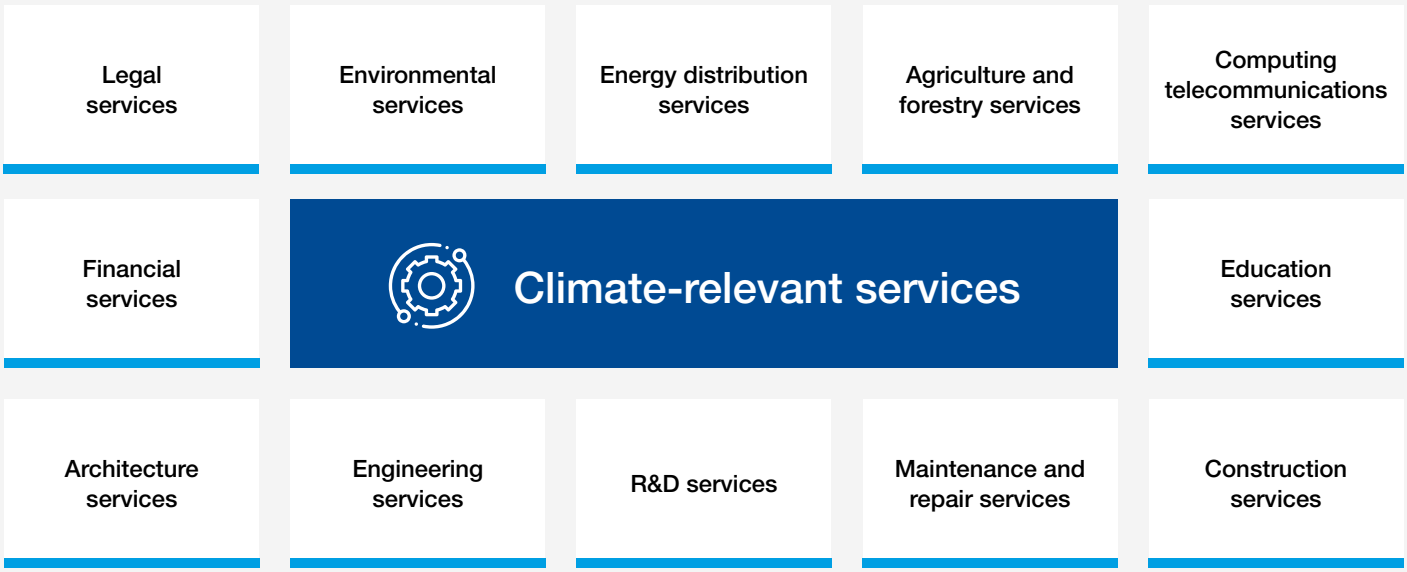
2. Many of the indispensable services for climate goods trade and use cannot be easily categorized in the W/120 and Division 94 lists.[32] The provision of renewable energy, energy efficiency or low emissions technologies, for instance, would likely fit under other services sectors than the ones listed under traditional environmental services.[33] A wide array of services sectors, like engineering, design, construction, legal, IT and digital, and so on, support climate goods.

Like climate-related goods, rapid technological development is also challenging to contend with since it can affect the definition and categorization of services. Trade deals covering climate services would need to consider this and, where possible, include review clauses that ensure scope and coverage are discussed in the future.

3.2 Identifying climate services

One way to identify climate services is to use a cluster approach.[34] This means services are identified based on their importance for climate mitigation activities. Identifying services through the cluster approach would not require reform of the existing services classification system.[35]

FIGURE 2 **Indicative cluster of climate-relevant services**



Source: National Board of Trade Sweden; Steenblik and Geloso Grosso

An often-heard objection to the liberalization of so-called dual-use services at the CPC code level is that it could lead to unintended but wider liberalization than just for climate purposes. For example, engineering services can be used for solar power projects and oil extraction. This could be overcome by specifying the climate end use in GATS schedule commitments, working in a similar way as ex-outs are used to single out climate goods.[36] Services would thus be specified in more detail than the CPC code to clarify the climate application. An example is when "general construction of power plants" (CPC 2.1 code 54262) is specified as an ex-out to cover only "plants powered by renewable energy". In the resulting services schedules, it would be essential to avoid overlap among sectors, and the scope of the commitments should be defined clearly and precisely. In sum, the end use of a service and its relation to a climate purpose would determine whether it would be included in an outcome.

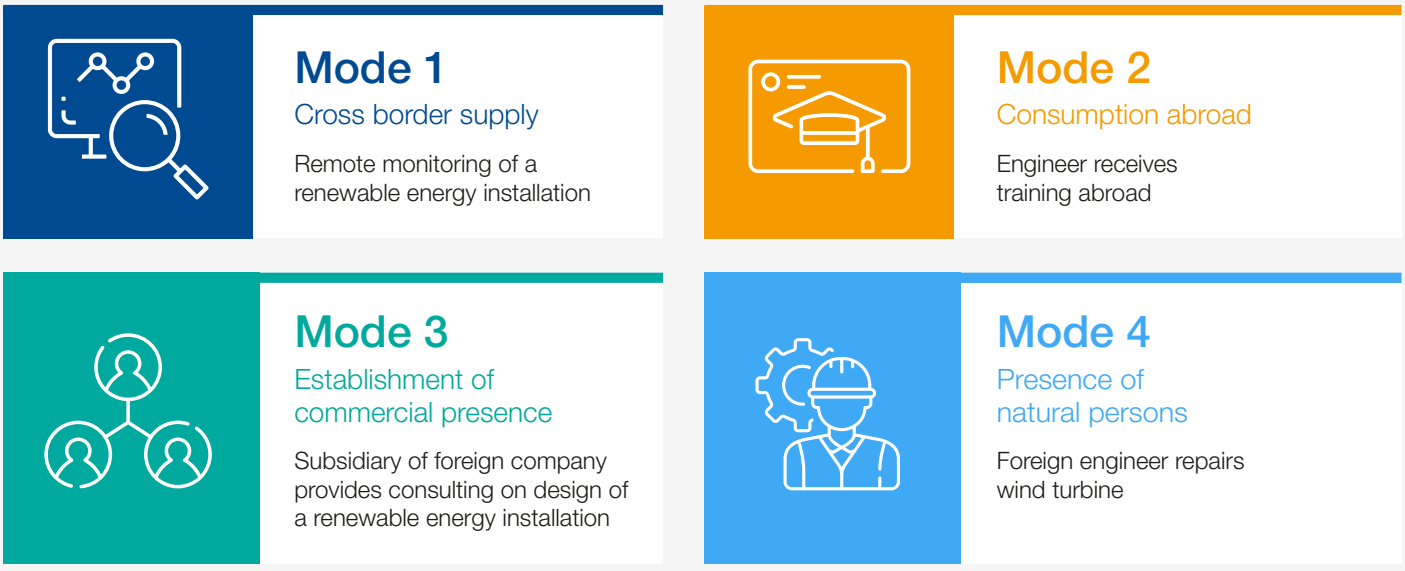
3.3 Services trade challenges

Currently, 59 of 164 WTO members, including the EU, have committed at a global level to liberalizing trade in environmental services (in the traditional sense).

Existing research[37] suggests a host of barriers affect climate services (defined widely). These include but are not limited to barriers to setting up in a country, visa issues, discriminatory tax systems and data transfer limitations. These barriers mainly lie in cross-border commercial presence and investment-related restrictions (mode 3) and the movement of natural persons (mode 4) (see Figure 3). Due to technological developments, however, cross-border supply (mode 1) is gaining importance – such as the digital monitoring of a wind power project from abroad. The OECD's Services Trade Restrictiveness Index (STRI)[38] also shows where services trade barriers exist. Generally, the STRI demonstrates that the services sectors with the highest levels of protection are legal services, accounting services and rail freight transport. These services are often relevant for developing renewable energy and public transport systems.

Trade negotiations can address services barriers through commitments as well as regulatory cooperation. Commitments are organized by "mode of supply", in other words, how the services are delivered. Currently, 59 of 164 WTO members, including the EU, have committed at a global level to liberalizing trade in environmental services (in the traditional sense).[39] In general, though, multilateral environmental services trade liberalization is lower than commitments in other areas, like tourism, financial services and telecommunications. This may be due to many factors, including the role of public entities in providing environmental services or the propensity of environmental services to become natural monopolies (special distribution or collection networks, high capital investments). Some governments go further in FTAs. In 2009, the OECD conducted a survey of the preferential content of services in regional trade agreements, finding that roughly 40% of all market-access commitments for environmental services in these were WTO GATS-plus – meaning that they improved on prior GATS commitments (see Box 3).[40]

FIGURE 3 **Services trade modes of delivery**



Source: World Economic Forum

Community discussions around this report confirmed that barriers to the provision of climate-related services have resulted in missed business opportunities for the sale of climate goods across multiple markets. LCRs and restrictions on the movement of professionals can pose significant barriers to trade. Similar to goods, LCRs for services are often linked to obtaining low-interest loans, tender eligibility and grants, feed-in tariffs, and tax rebates. Professional movement can be particularly important for deploying renewable energy in developing countries that might lack a large pool of skilled technicians to install renewable energy equipment. Increased trade in climate services could subsequently facilitate the transfer of knowledge and improve the skills and employability of individuals in these countries over the long term.

Another climate-related area affected by services trade restrictions is renewable energy supply, transmission, dispatch and distribution. While multilateral trade rules focus on ensuring market access, additional measures may be needed to guarantee the availability of fixed infrastructure and timely access to energy networks and distribution systems.[41] Additional commitments, either in an annex to the GATS on energy services or a reference paper, could be used to address competition issues, third-party access to fixed infrastructure, interconnection with energy networks and grids, transparency, standards and infrastructure development for clean energy. Governments have already done this at the WTO for the telecommunications sector.

BOX 3

The relationship between the GATS and FTAs

The General Agreement on Trade in Services (GATS) is one of the main pillars of the WTO. The GATS applies to all service sectors and types of service supplies. It lays down the general rules and obligations for trade in services, particularly the MFN obligation and principles of proportionality and transparency. WTO members must publish and notify measures affecting trade in services.

Various GATS annexes contain clarifications and specific provisions relating to natural persons supplying services, air transport services, financial services, maritime transport services and telecommunications services. The lists of commitments and exemptions from the MFN obligation of WTO members contain the specific market access rights for foreign service suppliers. Each member inscribes in its list those service sectors in which it grants market access to foreign suppliers and sets out quantitative restrictions (quotas, need clauses, monopolies), limitations on the form of juridical persons and foreign participation in corporate capital as well as reservations on national treatment.

FTAs often contain “negative-listing” of sectors, meaning that countries list the sectors they will not liberalize (thus, “negative” listing) in their schedules. Sectors not included in the schedules are therefore fully liberalized – which is usually more ambitious and the opposite of “positive” listing of sectors under GATS.

3.4 Proposed climate services list

Like the reference list of climate goods, the list of climate services below focuses on sectors where emissions cuts and technologies are vital, including energy supply, transport, buildings, refrigerant management and CCS. Table 4 describes examples of specific climate services, classified according to UN CPC version 2.1, using ex-outs where necessary, and also notes literature references where relevant. In plurilateral trade agreements with fewer and more like-minded participating countries (such as the recent EU-New Zealand FTA), it might be possible to avoid using ex-outs and liberalize a wider set of services.

TABLE 4 **Climate services reference list**

Key mitigation sector	Example mitigation option	Example service (CPC code listed if identified in source material CPC v2.1)	Source
RE, EE 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 (54631).	
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 window) (54760 ex).	Steenblik and Nordås, 2021

TABLE 4 | **Climate services reference list continued**

Key mitigation sector	Example mitigation option	Example service (CPC code listed if identified in source material CPC v2.1)	Source
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 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).	Author

Three "non-traditional" environmental services categories (at the CPC group level) that appear most frequently across the five sectors in the proposed climate services list are "other professional technical and business services" (83), "construction services" (54), and "telecommunication, broadcasting and information supply services" (84) (hereafter called "digital services") – more detail on each of these categories is provided below.

Other professional, technical and business services

Engineering services are key among the "other professional, technical and business services" category for effective electricity generation, transmission and distribution. Electrification will help lower emissions. Many experts suggest a shift is needed in final energy consumption from electricity to shift from 20% today to 50% by 2050.

Engineering services, which predominantly entail advisory, design, consulting and project management functions, complement construction services. Many firms provide integrated packages of engineering and construction services together. Trade opportunities for engineering firms hinge largely on various laws, regulations and administrative rules at home and abroad that can substantially impact firms' financial options and operation. That includes national or sub-federal rules that limit engineering firms' legal entity or joint venture structure or arbitrary equity limitations. Rules governing the nationality and residency requirements for service providers and their qualification and recognition procedures can also influence engineering services trade. Further, while professional qualification requirements are fundamental drivers in the service industry, arduous qualification requirements and licensing procedures can hamper the delivery of services across borders.

Most of the major exporting and importing countries have some level of 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 as digital services are increasingly being used to transmit architectural and engineering specifications, design plans for environmental projects, reports of specialist environmental consultants, environmental quality testing and analysis results, and computer modelling simulations.

Construction and infrastructure services

Opaque, expensive and overly bureaucratic administrative processes of construction permits increase transaction costs and business risks resulting in lower investment.

Construction services implement various mitigation options across multiple sectors, including energy supply, transport, buildings, industry and waste. An important driver for the sector, particularly in the developed world, is increased spending on infrastructure and non-residential development. Government procurement practices are crucial, too, given that the sector's most significant client segment is the public sector. Preferential treatment for local companies or minimum requirements for financial support that are favourable to local companies often hinder market entry for foreign providers.

Construction projects require much local activity because they are highly intensive in labour and materials. Commitments around mode 3 and mode 4 are essential here. Yet, restrictions on commercial presence are generally the most common barriers to trade in the construction service sector. Limitations on investment take the form of firm 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, among others. Limitations in mode 4 might include 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 significantly impact the provision of construction services, as these restrictions prevent property developers from acquiring real estate under construction until the completion of the project.[42] Opaque, expensive and overly bureaucratic administrative processes of construction permits increase transaction costs and business risks, resulting in lower investment in new infrastructure and buildings.

Digital services

Digital tools can help consumers make greener choices – such as through eco-routing in digital maps and making emissions from transport and energy use more visible.[43] Cloud-based computing may be more energy efficient than on-premise (and non-traded) services based on local servers.[44] After-sales services powered by ICT are particularly important when products are sold overseas and the customer is distant. Sensors and big data aggregation facilitate better monitoring, parts replacement and so on. Interviewees also highlighted the importance of digital services and grid aggregation technology in managing "smart" electricity networks. These services can play a vital role in ensuring efficient grid management and supporting the integration of a greater proportion of renewable energy into the system. Delivering such services often relies on data flows (mode 1), and governments' data flow restrictions are growing. Equally, the use of new technologies in certain markets or for particular applications may increasingly be regulated.

4 Developing country priorities

Involving developing countries in climate goods and services trade is essential for building an inclusive, global net-zero economy.

4.1 A just transition

For many developing countries, the energy transition is first and foremost about energy access. Worldwide, 759 million people do not have access to electricity, mainly in Sub-Saharan Africa and South Asia. Electrification is critical for both a just and green transition. From an industry perspective, developing countries must also secure access to clean energy for exporting companies since many firms and investors will prioritize emissions reductions in supply chains. Positively, South-South trade in electrification and clean energy technologies such as solar photovoltaic cells and modules, batteries, wind-powered generating sets, hydraulic turbines and biomass generation-related products is growing faster than global trade in the same products.[45]

Most of the growth, however, has been regionally concentrated in East and South-East Asia.[46] More developing countries need to be brought into these value chains. Many low-income countries can access the EU, US, Japan and other advanced economy markets through development-related preferential tariff schemes. That means some gains may come from lowering tariffs between low- and middle-income countries.[47] A lot of developing countries – particularly in Africa, the Pacific and parts of Latin America – have not engaged in EGS-related trade talks in the past. Both public and private sectors in advanced economies should work to change that through targeted outreach and technical assistance. For example, technical assistance can focus on links between countries' decarbonization plans and the types of goods in focus and connections made to low-carbon manufacturing.

Technology transfer discussions will be an important complement – including carefully synergizing between Paris Agreement commitments in this area. In terms of climate services, many have argued that, by improving access to environmental know-how and technology, liberalization will also lead to greater environmental protection and access to sustainable energy within developing countries, thereby providing a 'win-win-win' outcome for socioeconomic development, the environment and trade.[48]

Further, some developing countries may not have export interests in climate goods now, but they may foresee developing such interests in the future. Costa Rica, for example, joined the Information Technology Agreement (ITA) in 1997 when it had no exports of IT-related products. By joining the ITA, Costa Rica attracted investments in IT, and for several years, 20% of Costa Rica's exports consisted of IT products.[49] Non-tariff barriers may pose a bigger challenge for developing to developed economy trade since firms in low-income countries may have more difficulty meeting technical requirements or may not have similar standards. A global value chain approach might also consider intermediate products and components that many developing countries produce.[50]

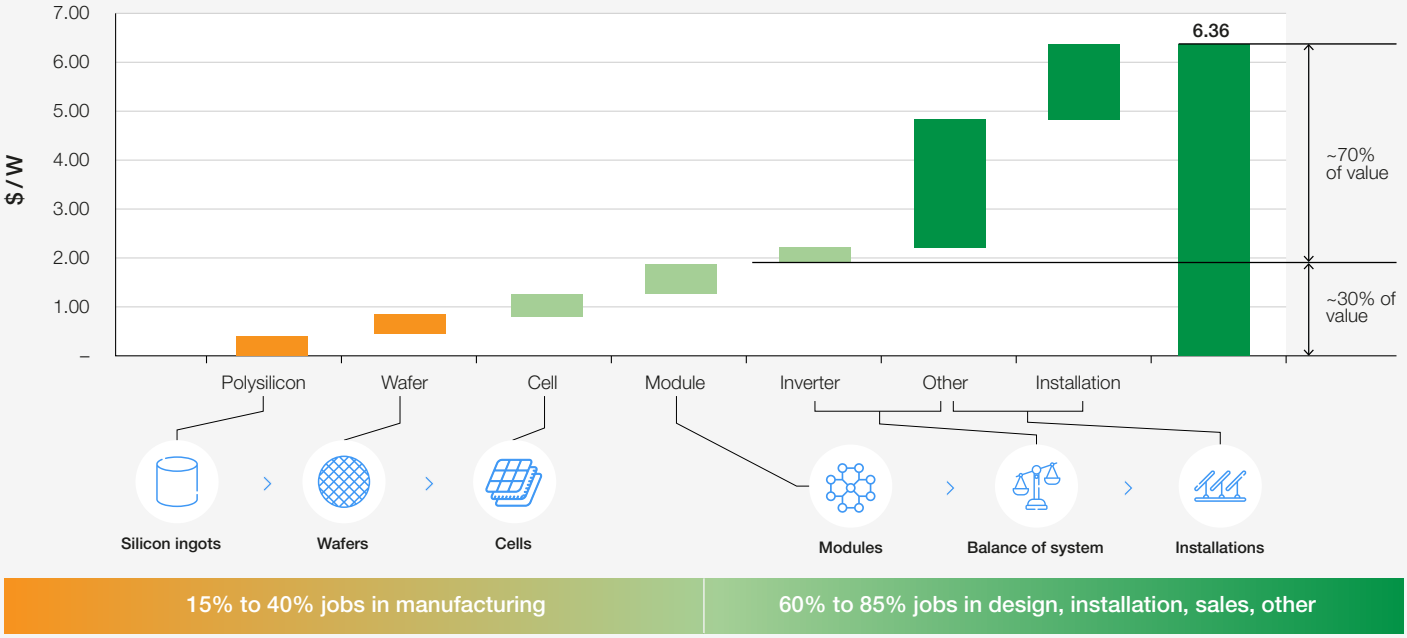
By joining the ITA, Costa Rica attracted investments in IT, and for several years, 20% of Costa Rica's exports consisted of IT products.

4.2 Green jobs

Green jobs are a priority for most countries. Politicians often champion the production and use of climate goods. The International Renewable Energy Agency (IRENA) estimates the renewable energy sector alone employed 11.5 million people in 2020.[51] Facilitating climate goods trade may bring new industries to developing communities. An older study on imported solar technology in India showed that 70% of the value created by solar projects and approximately 60-85% of the jobs were downstream of manufacturing (and related to design, installation, sales and other areas), while only 15-40% of the jobs generated were in upstream manufacturing (see Figure 4).[52] These figures have likely grown with increased climate commitments under the Paris Agreement. Supplier emissions reduction programmes through companies' value chains may also help create demand for climate goods and services within developing economies and associated jobs.

FIGURE 4 | **Value and jobs in silicon PV supply chains**

Silicon PV value distribution



Source: GTM Research; Solar Energy Industries Association

4.3 Regulatory capacity building

Win-win-win outcomes for development, trade and climate action are not pre-given.[53] A range of measures are needed to send a mix of market signals complemented by international cooperation. Development actors must prioritize regulatory capacity building – particularly around energy-related infrastructure critical for climate action. There are a few efforts under way, but these are not sufficient. Regulatory interventions that complement market openings can focus on controlling anti-competitive behaviour, transparent licensing procedures, clear grid access terms and conditions, and other measures that smooth trade and encourage entrepreneurship.

4.4 Other concerns

Trade in climate goods raises some specific issues for developing countries that must be managed. Firstly, many goods concentrating on EPPs require labelling and certification. Developing countries fear that new climate requirements will lead to discrimination against their products even if they do not have the means to comply with them. Some entrepreneurs in developing countries lack the capacity to provide full traceability and visibility that will increasingly be asked for as companies in advanced markets pursue supply chain sustainability.

Secondly, trade talks that only concentrate on tariffs could be seen as unbalanced. That might be the case if the deal increased climate goods imports in some developing countries without addressing non-tariff barriers that hold back trade into advanced nations. Developed countries use three times as many TBT measures as developing countries.[54] Low-income countries are more in need of support to cope with NTBs and regulatory compliance than they are of special treatment for tariffs.

Finally, several trade models predict that a larger home market increases exports more than imports. Due to the low level of tariffs among developed countries and the exclusion hitherto of NTBs from EGS talks, free riding has been the least-risky option for smaller developing countries.[55]

Conclusion

Environmental goods and services trade talks have made limited progress over the years. The urgency of climate action calls for accelerated efforts in all policy areas, and trade is no exception. Ideally, the broadest number of countries would create a list of climate goods for trade facilitation and develop an open architecture that others can join in time. The Climate Trade Zero community recommends starting with a tight, focused and actionable list of items that both hold the greatest potential for cutting emissions and are economically viable in terms of cost savings. Even if the scope is small, such an outcome could demonstrate to global markets that certain governments are serious about aligning their commercial and economic policies with climate action. Over the long term, more goods can be added, including dual-use goods and EPPs, as long as they are carefully specified to target climate uses.

Businesses and experts can identify essential technologies and inputs critical for decarbonization. They can share trade-related challenges and champion greater distribution worldwide. Researchers can provide support by modelling the impact of tariff rate reductions and understanding NTBs. It would be particularly helpful to have NTB information by major product category and at a country level since this level of granularity is necessary for effective regulatory cooperation. Multistakeholder groups could evaluate suggested products and services for environmental credibility in the short term and update policy-makers on technological change in time. It is crucial for trade talks seeking to have a specific impact – like aligning trade flows with decarbonization – to use "living lists".[56] There are precedents such as the WTO Pharmaceuticals Agreement, the GPA and the ITA that were designed as living agreements or agreements that could be updated over time.

If done under the WTO umbrella, other initiatives could be marshalled to support a plurilateral deal, including:

1. Implementing the Trade Facilitation Agreement (TFA) to help border officials deal with evolutions in customs codes.

2. Technical assistance and capacity building – on everything from identifying priority trade flows to support on implementation – through Aid for Trade (AfT) efforts and the Enhanced Integrated Framework designed to support least developed countries (LDC) trade.

3. Coordinating with relevant WTO bodies such as the TBT Committee for guidance on best practices on standards and technical regulations (including information on national implementation of international standards).

4. Facilitating trade in services that are indispensable for using the goods mentioned in this report through work in the Committee on Trade in Services (CTS).

5. Facilitating foreign direct investment to address administrative breaks on capital flows in climate mitigation and adaptation projects.

Political realities being what they are, a climate trade deal can still be championed by a smaller group of nations, as the ACCTS negotiations demonstrate. Countries may wish to explore options regionally or bilaterally. The following additional steps will be vital for a truly comprehensive outcome, which countries could take over time:

– Identify and liberalize indispensable inputs to climate goods and include products of interest to developing countries, like nature-based products.

– Commit to cooperation in the WCO to better align the HS nomenclature to support the climate transition (including through the next WCO HS update in 2027).

– Broaden the scope of talks on climate goods beyond tariffs and include NTBs.

– Broker mutual recognition agreements (MRAs) on conformity assessment for climate goods.[57] Through MRAs, the outcomes from conformity assessments of one party can assess products for import against the requirements of the other party and vice versa.

– Deliver outcomes on climate services trade.

– Complement climate services trade talks with regulatory capacity building, including coordinating with existing development programmes, such as those run by multilateral or regional development banks.

– Scope trade support for key climate adaptation technologies.

Climate trade efforts must not be done in a vacuum but in conjunction with various interventions, including supporting those unable to bear transition costs. Such support could include incentives to boost employment in green sectors, retraining to build new skills and capacities, and financial assistance packages to SMEs – especially in developing countries. Trade liberalization can sometimes cause communities to lose jobs in specific sectors; countries engaging in climate trade talks should evaluate specific items carefully to understand where there are risks and how best to manage those as part of an overall climate action strategy.

To support this movement, the Climate Trade Zero community will continue to host dialogue and explore country-specific analysis. Countries need to be supported in understanding the links between industry decarbonization and trade competitiveness; that means examining both imports and exports in key value chains. Doing so can help countries determine which climate goods and services they may have a competitive advantage in exporting (and what needs to be imported), which export industries will be most affected by climate transition efforts and what viable technological or alternative pathways exist. Global and local industries are best placed to help policy-makers understand the criss-crossing of value chains that drive economic activity in their country and how to align these flows to the climate agenda.

Contributors

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Endnotes

1. Monkelbaan, J., M. Sugathan and A. Naranjo, *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, 2021.
2. National Board of Trade Sweden, *Making Green Trade Happen – Environmental Goods and Indispensable Services,* 2014, https://www.kommerskollegium.se/globalassets/publikationer/rapporter/2016-och-aldre/making-green-trade-happen webb.pdf.
3. Some World Trade Organization (WTO) disputes related to renewable energy and local content requirements (LCRs) include: the Canada renewable energy case launched in 2010 by Japan against the province of Ontario's feed-in tariff (FIT) programme, the China wind power case raised in 2010 by the US, the India solar modules case brought by the US in 2013, and the UK low-carbon energy contracts for a different complaint raised by the EU in 2022.
4. Kuriyama, C., "A Review of the APEC List of Environmental Goods"*, APEC*, 2021, https://www.apec.org/docs/default-source/Publications/2021/10/A-Review-of-the-APEC-List-of-Environmental-Goods/221_PSU_Review-of-APEC-List-of-Environmental-Goods.pdf.
5. 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. The WTO's Information Technology Agreement (ITA), Agreement on Trade in Civil Aircraft, and Agreement on Trade in Pharmaceutical Products all involve ex-outs.
6. Steenblik, R., *Code Shift: The Environmental Significance of the 2022 Amendments to the Harmonized System*, International Institute for Sustainable Development, 2020. For an overview of the timelines for the HS2027 review, also see Grooby G., "Some common questions about the HS, and how to change it to meet needs", *WCO News*, 98, issue 2, 2022, https://mag.wcoomd.org/magazine/98-issue-2-2022/some-common-questions-hs/.
7. National Board of Trade Sweden, *Trade and Climate Change – promoting climate goals with a WTO agreement*, 2021, https://www.kommerskollegium.se/en/publications/reports/2021/trade-and-climate-change/.
8. Brenton, Paul and Vicky Chemutai, *The Trade and Climate Change Nexus: The Urgency and Opportunities for Developing Countries,* World Bank Group, 2021, https://openknowledge.worldbank.org/handle/10986/36294.
9. Forster, Hector, "Low Emissions Steel Standards Needed to Market Green Steel: ArcelorMittal", *S&P Global*, 20 January 2021, https://www.spglobal.com/platts/en/market-insights/latest-news/metals/012021-low-emissions-steel-standards-needed-to-market-green-steel-arcelormittal. 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 Energy Transitions Commission, *Steeling Demand: Mobilising buyers to bring net-zero steel to market before 2030,* 2021, https://www.energy-transitions.org/publications/steeling-demand/.
10. IPCC, *Climate Change 2022: Mitigation of Climate Change*, 2022, https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/.
11. Dekens, J., A. Hammill, D. Hoffmann and C. Bellmann, *Leveraging trade to support climate adaptation in developing countries,* International Institute for Sustainable Development, 2021.
12. APEC, *Scoping Study on New and Emerging Environmental Goods*, 2021, https://www.apec.org/publications/2021/12/scoping-study-on-new-and-emerging-environmental-goods#:~:text=This%20study%20provides%20new%20research,other%20plurilateral%20and%20multilateral%20forums.
13. Vossenaar, Rene, *Identifying Products with Climate and Development Benefits for an Environmental Goods Agreement*, ICTSD, 2014; Reinsch, William, E. Benson and C. Puga, *Environmental Goods Agreement: A New Frontier or an Old Stalemate?* CSIS, 2021, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/211028_Reinsch_Environmental_Goods_0.pdf?QkV7SYIFwwxpGM0DdiDst4CuNPk4.ayl.
14. ABB, *Achieving the Paris Agreement: The vital role of high-efficiency motors and drives in reducing energy consumption*, 2021, https://www.energyefficiencymovement.com/wp-content/uploads/2021/03/ABB_MotionEnergyEfficiency_WhitePaper.pdf.
15. "Hydrogen", *IEA*, https://www.iea.org/fuels-and-technologies/hydrogen.
16. For a detailed overview of cleaner road transport goods and electric vehicles, see National Board of Trade, *Trade Barriers to Goods and Services Important for Climate Action*, 2020, Annex I, https://www.kommerskollegium.se/en/publications/reports/2020/trade-barriers-to-goods-and-services-important-for-climate-action--and-opportunities-for-reform/.
17. De Melo, Jaime and Jean-Marc Solleder, "What's wrong with the WTO's environmental goods agreement", *VoxEU*, 2019, https://voxeu.org/article/what-s-wrong-wto-s-environmental-goods-agreement.
18. Wooders, Peter, *Greenhouse Gas Emission Impacts of Liberalizing Trade in Environmental Goods*, IISD, 2009, https://www.iisd.org/system/files/publications/bali_2_copenhagen_egs.pdf.
19. The modelling approach used was subject to limitations, for example, not fully capturing effects on global value chains 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 environment goods agreement lists (due to confidentiality).

20. McKinsey, *Climate math: What a 1.5-degree pathway would take*, 2020.
21. International Energy Agency (IEA), *Net Zero by 2050: A Roadmap for the Global Energy Sector*, 2021.
22. United Nations Conference on Trade and Development (UNCTAD) and World Bank Group, *The unseen impact of non-tariff measures*, 2018, https://unctad.org/webflyer/unseen-impact-non-tariff-measures-insights-new-database.
23. De Melo, Jaime and Jean-Marc Solleder, "The role of an Environmental Goods Agreement in the quest to improve the regime complex for Climate Change", *EUI Working Paper*, 2019.
24. Organisation for Economic Co-operation and Development (OECD), *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.
25. Monkelbaan, J., *Trade Sustainability Impact Assessment on the Environmental Goods Agreement*, EU publications, 2016.
26. UNCTAD, *International Classification of Non-tariff Measures*, 2019; The International Classification of non-tariff measures (NTMs) follows a taxonomy of all measures considered relevant in today's 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 international classification of NTMs also comprises behind-the-border measures, such as competition, trade-related investment measures, government procurement or distribution restrictions. This classification is determined by a group of eight international organizations, including the International Monetary Fund (IMF), the OECD, the World Bank and the WTO.
27. "How do Technical Barriers to Trade impact trade in environmental goods", *UK Department for International Trade,* 19 July 2022.
28. International Energy Agency, *Test Procedures and Quality Labels for Heat Pump Water Heaters*, 2019, https://heatpumpingtechnologies.org/annex46/wp-content/uploads/sites/53/2020/10/hpt-an46-05-task-1-test-procedures-and-quality-labels-for-heat-pump-water-heaters.pdf.
29. World Economic Forum, *Delivering a Climate Trade Agenda: Industry Insights*, 2021, https://www3.weforum.org/docs/WEF_Delivering_a_Climate_Trade_Agenda_2021.pdf.
30. OECD, *Overcoming Barriers to International Investment in Clean Energy, Green Finance and Investment*, 2015.
31. WTO, *Services Sectoral Classification List*, 1991, https://www.wto.org/english/tratop_e/serv_e/mtn_gns_w_120_e.doc.
32. 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), 2007.
33. See Committee on Specific Commitments, "Services related to climate change", *Informal Note by the WTO Secretariat* (JOB/SERV/100), 2012.
34. Steenblik, R. and M. Geloso Grosso, *Trade in Services Related to Climate Change: An Exploratory Analysis*, OECD, 2011.
35. National Board of Trade Sweden, *Trade and Climate Change Promoting climate goals with a WTO agreement*, 2021.
36. Kim, J. A., *Facilitating Trade in Services Complementary to Climate-friendly Technologies,* ICTSD, 2011.
37. For example, Monkelbaan, J., *Trade Sustainability Impact Assessment on the Environmental Goods Agreement*, EU publications, 2016; Sauvage, J. and C. Timiliotis, *Trade in services related to the environment*, OECD, 2017.
38. OECD.Stat, *Services Trade Restrictiveness Index* [Table], https://stats.oecd.org/Index.aspx?DataSetCode=STRI.
39. WTO, *WTO members engage in exploratory talks on market access for environmental services* [Press release], 30 September 2019.
40. de Melo, Jaime, and Mariana Vijil, "The Critical Mass Approach to Achieve a Deal on Green Goods and Services: What is on the Table? How Much to Expect?" FEEM Working Paper No. 070.2014, http://dx.doi.org/10.2139/ssrn.2486445.
41. International Centre for Trade and Sustainable Development (ICTSD), "Enabling the Energy Transition and Scale-Up of Clean Energy Technologies: Options for the Global Trade System", *E15 Expert Group on Clean Energy Technologies and the Trade System*, Policy Options Paper, 2016.
42. Geloso Grosso, M., *Trade and Regulation: The Case of Construction Services*, OECD, 2008.
43. See for example: "Environmental Insights Explorer", *Google*, n.d. https://insights.sustainability.google/.
44. While the amount of computing done in global data centres increased by about 550% between 2010 and 2018, the amount of energy consumed by data centres grew by only 6% during the same period. See Masanet E., et al., "Recalibrating global data center energy-use estimates", *Science*, vol. 367, no. 6481, 2020.
45. United Nations Environment Programme (UNEP), *South-South Trade in Renewable Energy: A Trade Flow Analysis of Selected Environmental Goods*, 2014.
46. Ibid.
47. Brenton, P. and V. Chemutai, *The Trade and Climate Change Nexus: The Urgency and Opportunities for Developing Countries,* World Bank Group, 2021, https://openknowledge.worldbank.org/handle/10986/36294.

48. Teehankee, M., *Trade and Environment Governance at the World Trade Organization Committee on Trade and Environment*, Kluwer Law International, 2020.

49. Monkelbaan, J., M. Sugathan and A. Naranjo, *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, 2021.

50. For example, building a concentrated solar power system requires materials such as steel, copper, silica and molten salt, as well as components such as collectors, mirrors, reflector film, steam generators, heat collection elements, heat storage and central control systems.

51. International Renewable Energy Agency (IRENA), *Renewable Energy Jobs Continue Growth to 11.5 Million Worldwide* [Press release], 29 September 2020.

52. Council on Energy, Environment and Water (CEEW), Natural Resources Defence Coucil (NRDC), *Laying the Foundation for a Bright Future: Assessing Progress Under Phase 1 of India's National Solar Mission,* 2012.

53. T*rade and Environment*, Kluwer Law International, 2020.

54. UNCTAD and the World Bank, *The unseen impact of non-tariff measures*, 2018, https://unctad.org/webflyer/unseen-impact-non-tariff-measures-insights-new-database.

55. Wu, Mark, "Why Developing Countries Won't Negotiate: The Case of the WTO Environmental Goods Agreement", *Trade, Law, and Development*, vol. 6, no. 1, 2014, pp. 93-176.

56. Cosbey, Aaron, *Breathing Life into the List: Practical Suggestions for the Negotiators of the Environmental Goods Agreement*, FES, 2015.

57. Sugathan, Mahesh, *Mutual Recognition Agreement on Conformity Assessment: A Deliverable on Non-Tariff Measures for the EGA?*, ICTSD, 2016.

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