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Written by Toni Männistö, Juha Hintsa, Cristiano Morini, Susana Wong, Nancy Isarin and Boriana Rukanova

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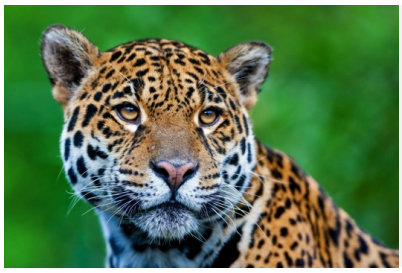

Authors

Toni Männistö, Cross-border Research Association (CBRA)

Juha Hintsa, Cross-border Research Association (CBRA)

Cristiano Morini, Cross-border Research Association (CBRA) / Universidade Estadual de Campinas

Susana Wong, Cross-border Research Association (CBRA)

Nancy Isarin, Cross-border Research Association (CBRA) / Ambiendura

Boriana Rukanova, Delft University of Technology

Credits

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Disclaimer

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1 Introduction

The protection of the environment and the facilitation of circular and sustainable trade are among the greatest challenges facing the global customs community today. In response, customs administrations worldwide have increasingly embraced the Green Customs philosophy to address these critical issues.

1.1 Green Customs initiatives today

Over the past years, customs worldwide have become increasingly environmentally conscious and capable of addressing environmental, circularity, and sustainability issues. The World Customs Organization (WCO) has published a Green Customs Action Plan[1], outlining principles and actions for the global mid- and long-term green transition of customs administrations. WCO has also spearheaded international law enforcement campaigns such as the Operation DEMETER to combat illegal transboundary movement of waste, Thunder operation series to fight wildlife trafficking, and Operation Amazonas to target illegal logging (WCO 2024).

In the EU, the influential Wise Persons Group report on the Reform of the EU Customs Union advocates for a comprehensive package of measures to green EU customs (WPG 2022). Their report emphasizes the importance of customs in contributing to the EU's Green Deal package of policy initiatives[2] by effectively implementing EU sustainability and climate change legislation and by reducing emissions through more streamlined customs procedures, among other ambitions. The Green Deal package includes several consequential environmental, circularity and sustainability policies and legislations that affect EU customs directly or indirectly.

The Carbon Border Adjustment Mechanism (CBAM) is one of the new green regulations introducing additional enforcement responsibilities for EU customs. The mechanism seeks to prevent carbon leakage, which occurs when EU-based industries relocate carbon-intensive production to countries with more lenient climate policies or when EU products are replaced by more carbon-intensive imports[3] (DG TAXUD 2024). Under CBAM rules, importers of carbon-intensive goods must declare the carbon content of their products and pay a levy[4] equivalent to the amount that EU domestic producers pay under the EU Emission Trading System (EU ETS). Customs authorities are responsible for verifying import declarations against the importer registry

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[1] The World Customs Organization's (WCO) defines Green Customs as follows: "Green Customs refers to the measures that Customs administrations can take or develop to reduce their own environmental footprint ("being"), to protect the environment and facilitate green trade ("doing"), and to test transformative ideas towards sustainability excellence ("innovating"), and by doing so drive progress on the related United Nations Sustainable Development Goals" (WCO n.d.).

[2] The European Green Deal outlines a clear plan to achieve the EU's ambitious goal of reducing carbon emissions by 55% by 2030, compared to 1990 levels, and to become the first climate-neutral continent by 2050 (EC 2021a).

[3] Carbon-intensive goods include cement, iron and steel, aluminium, fertilizers, electricity, and hydrogen (DG TAXUD 2024).

[4] Technically, the CBAM is not a customs duty or excise but rather a new levy on goods imported to the EU. Terms like carbon tariff, carbon duty, and carbon tax are commonly used in public debate, but they are misleading, as the CBAM involves a carbon certificate charge, not a duty or tax in a traditional sense (Reedsmith 2021). In short, it is the levying of the cost for the right to emit CO_2.

and blocking non-compliant imports. Customs also ensure that the declared goods meet EU's environmental standards. In some countries, customs act as the designated CBAM authority, maintaining CBAM importer registries and issuing fines for non-compliance (Tulli 2024).

The EU's new Circular Action Plan introduces policy and legislative measures, focusing on seven key product value chains: electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and building materials, as well as food, water and nutrition. For example, the EU's Circular Electronics Initiative promotes eco-friendly design of consumer electronics, by emphasising factors like durability, upgradeability, and repairability, which extend product lifetimes. The European Commission also aims to have mandatory requirements for recycled content and waste reduction measures for products like batteries, packaging, and construction materials. Additionally, it aims to set restrictions on microplastic use and establish guidelines for biodegradable plastics, among other circularity initiatives (EC 2020). New regulations such as the Battery Regulation[5] and the Eco-Design for Sustainable Products regulation[6] introduce new requirements for businesses to disclose data about products they bring on the EU market via the introduction of mandatory Digital Product Passports. For electric vehicle batteries, such product passports will become mandatory as of 2027.

At the national level, many customs have already published sustainability strategies and launched green initiatives. The U.S. Customs and Border Protection's (CBP) 2022 Green Trade Strategy lays down four strategic goals for achieving their Green Trade Vision. First, it aims to incentivise green trade by providing facilitation benefits and other incentives to promote environmentally friendly trade practices and supply chains. Second, it seeks to strengthen environmental enforcement posture by taking action to combat environmental crime at borders. Third, it focuses on accelerating green innovation by promoting and investing in the adoption of innovative, sustainable trade practices by both government and private industry. Lastly, it aims to improve climate resilience and resource efficiency by reducing the greenhouse gas emissions associated with CBP's own operations (CBP 2022).

The Canada Border Services Agency's Green Customs Strategy promotes sustainable development through collaboration with other government agencies and international partners. Key objectives include reducing greenhouse gas emissions, strengthening relationships with Indigenous peoples, protecting the country against invasive species, and promoting sustainable procurement, operative, and disposal practices. This comprehensive approach aims to integrate environmental responsibility into all aspects of border services, ensuring a greener and more sustainable future (CBSA 2023).

1.2 About this study

This study advances the concept of Green Customs by offering more profound insights into how customs administrations can promote sustainability through their activities. By highlighting the

[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1542

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1781&qid=1719580391746

close connection between customs activities and environmental protection, sustainability and circularity, the study showcases the broad range of Green Customs activities and provides examples from around the world. The findings of this study may inspire customs administrations to think innovatively about adopting their own Green Customs strategies and to reflect on how it could impact their present and future operational approaches.

The next chapter introduces a conceptual framework with four key areas of Green Customs activities: border controls, sustainable customs operations, trade facilitation, and the establishment of customs-private partnership referred as ‘Green Lanes for Green Traders’. This framework seeks to deepen our understanding of how customs administrations can effectively respond to the green transition.

The following chapters present five original case studies that discuss ongoing Green Customs initiatives. The first case study outlines the strategies and initiatives undertaken by Irish customs to decarbonize its fleet of cars, vans, and other vehicles. The second case study presents a new border crossing at the Costa Rica-Panama border, constructed with sustainability principles in mind. Besides its green ambitions, this border post is expected to significantly facilitate cross-border trade and travel between the two Central American countries. The third case study showcases best practices for handling seized goods in the Brazilian tri-border city of Foz do Iguaçu, which shares borders with Argentina and Paraguay. The fourth Malaysian case exemplifies a successful collaboration among key national agencies to control the importation of plastic, metal, and paper waste. Lastly, the fifth case discusses the advantages and implementation challenges of the eCITES in South Africa, which is designed to fight illegal trade in endangered species and products made of them.

The final chapter of this study offers insights into how customs can accelerate their transition to sustainability and circularity. It recommends customs to embrace a comprehensive approach to Green Customs that goes beyond border control duties and internal sustainability initiatives. The chapter also advocates for investment in research and development to develop capabilities for addressing environmental, circularity and sustainability challenges. Finally, the chapter concludes with a recommendation to strengthen customs-trade partnerships to promote sustainability throughout global value chains.

2 Four areas of Green Customs activity

How can customs administrations promote sustainability through their activities? As the gatekeepers of international trade, customs are uniquely positioned to make a significant impact on environmental protection. A close examination of the Green Customs theme reveals four key areas where customs can promote sustainability.

By strengthening border controls, customs can combat illicit trade in environmentally sensitive goods and enforce traders' compliance with environmental regulations. Customs can also minimize their own environmental footprint by adopting eco-friendly practices within their operations, such as recycling seized goods and transitioning to electric vehicles. By facilitating trade, customs can help traders optimize logistics for efficiency, speed, and predictability, which ultimately leads to reduced emissions. A more future-oriented approach would see customs leveraging their authority to encourage companies to adopt sustainable practices by offering incentives such as faster customs clearance and other perks, following the 'Green Lane for Green Traders' philosophy.

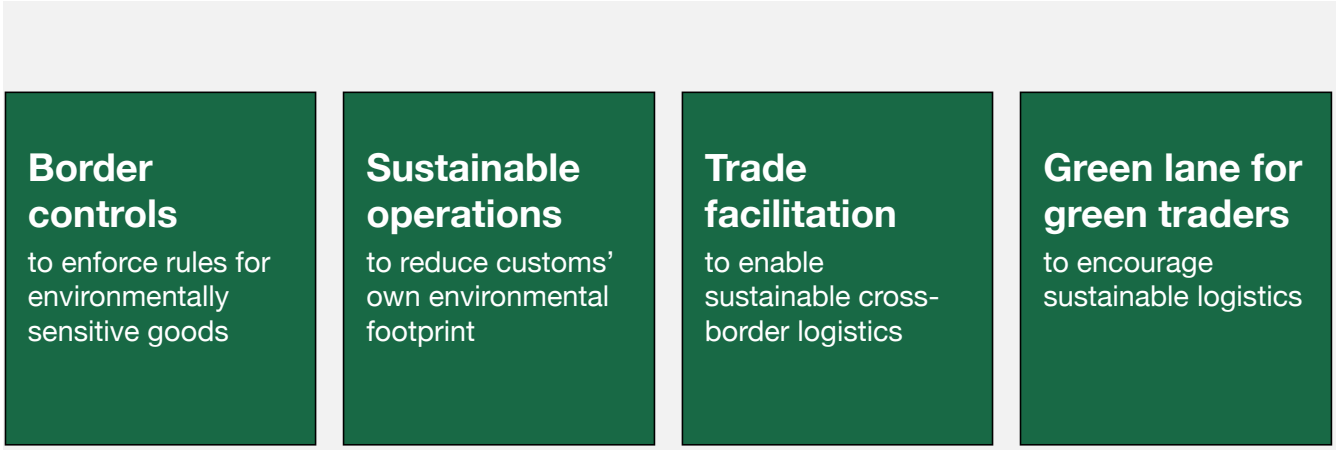


Figure 1 The four areas of Green Customs activity

2.1 Border controls

The first area of Green Customs activity is border control for enforcing rules on the trade in environmentally sensitive goods. As with any legislation, environmental regulations can be violated, and it is the role of customs to ensure the compliance of legitimate trade and combat illegal trade at the border. In many cases, control strategies for both legitimate and illegal trade are similar: cargo inspections, document checks, and risk assessments of cross-border movements using all available data. In principle, customs have four key border control responsibilities specifically focused on environmentally sensitive goods.

The first responsibility, biosecurity control, seeks to protect the population, agriculture, and local ecosystems by stopping pests and diseases at the border. Biosecurity controls commonly target infections such as avian flu, foot-and-mouth disease, and COVID-19, as well as invasive alien species that displace indigenous ones (Smarttraveller 2024) . To prevent the spread of pathogens, customs, under the direction of biosecurity departments, routinely inspect imported goods that may harbor these threats, including food, animal feed, plant materials, animal products, and livestock. Customs officers in countries with unique and isolated ecosystems are particularly vigilant about invasive species — they may even examine the soles of trekking shoes for hiding insects and seeds.

The second control responsibility focuses on preserving biodiversity by combating the trade in endangered animal and plant species and products derived from them. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) establishes the framework for regulating international wildlife trade. CITES categorizes over 40900 species into three Appendices, each specifying the level of protection required (CITES 2024a). Under CITES, customs authorities are mainly concerned with commodities such as leather clothing, shoes, bags, accessories, traditional medicines, wood and timber products, hunting trophies, and live plants and animals.

Another responsibility for customs officers is to enforce regulations concerning the import and export of environmentally hazardous substances. These pollutants are defined by various Multilateral Environmental Agreements (MEAs)[7], such as the Basel Convention for hazardous waste, the Montreal Protocol for ozone-depleting substances, the Stockholm Convention on Persistent Organic Pollutants and the Kyoto Protocol for fluorinated gases (F-gases) and other greenhouse gases. These agreements collectively aim to address a broad spectrum of environmental challenges, emphasizing international cooperation and legally binding commitments to ensure sustainable environmental management and protection. Customs administrations are tasked with ensuring that chemicals, waste, second-hand goods, and other commodities comply with these trading restrictions.

The fourth and newest responsibility of customs officers regarding environmentally sensitive goods involves enforcing trade policies that promote sustainable trade. In the EU, significant efforts are being made to develop the European Green Deal, a roadmap for transitioning the EU economy towards a sustainable future. The new Circular Economy Action Plan further accelerates the shift to a circular economy by introducing regulations for product design and the reuse of materials in cross-border value chains. These green trade policies collectively establish criteria for sustainable products—ranging from biodegradable plastics and biofuels to sustainable steel and eco-friendly textiles—and implement environmental taxes and duties, quotas, and other restrictions on commodities with inferior environmental qualities. The day-to-day responsibilities of collecting

[7] The EU and its Member states are parties to several Multilateral Environmental Agreements (MEA) that have a global reach and regulate cross-border trade in environmentally sensitive goods. The requirements of these agreements are incorporated into corresponding national legislation.

these taxes and duties, enforcing quotas, and monitoring restrictions fall to customs officers at the border.

The table below outlines the four primary responsibilities of customs border control concerning environmentally sensitive goods. It is worth noting that customs authorities oversee a wide range of goods to detect, identify, and seize targets that may cause environmental harm in various ways.

Table 1 Customs' control responsibilities regarding environmentally sensitive goods

CONTROL RESPONSIBILITY	CONTROL TARGETS	GOODS OF CONCERN
Biosecurity to protect population, agriculture and local ecosystems against harmful biological substances	• Animal and plant pests and diseases • Human pathogens • Invasive alien species	• Food • Animal feed • Plant material • Animal products • Livestock
Biodiversity preservation to fight illicit trade in endangered wildlife	• Endangered animal and plant species and products made of them	• Apparel • Traditional medicines • Wood and timber • Trophies
Anti-pollution controls to counter trade in environmentally hazardous substances	• Ozone-depleting substances • F-gases • Hazardous waste	• Chemicals • Waste • Second-hand goods
Green trade controls to enforce regulations concerning circularity, carbon tariffs and other environmental policies	• Goods subject to environmental duties, taxes, quotas, or restrictions	• Plastics • Fuels • Steel • Textiles

Fulfilling control responsibilities can be difficult for customs. A critical challenge is the effective identification and differentiation of various environmentally sensitive goods. For example, biosecurity threats evolve constantly[8], are often microscopic, and can cross borders inside or on living organisms, making detection difficult. In the case of CITES goods, identifying rare and exotic species, determining if prohibited ingredients are part of traditional medicines, and verifying the

[8] Consider, for example, virus variations.

legitimate provenance of products[9] is complex. Controlling environmentally hazardous substances poses equally significant challenges. Harmful chemicals can be integrated into products, as is the case with F-gases in refrigerators and air conditioners. These substances may be stored in pressurized containers that are difficult to inspect and can jeopardize the safety of customs officers due to their hazardous nature.

However, one of the most challenging tasks may be managing the regulations arising from new green trade policies. Historically, the main concern regarding environmentally sensitive products was the potential environmental damage they could cause, with hazardous waste being a prime example. Today, customs officers also need to verify the provenance, production process, and intended end-use of various goods to determine if these goods should be subject to environmental duties, taxes, and trade measures[10]. For this purpose, customs officers need to be able to distinguish between virgin raw materials and recycled materials, sustainable steel and regular steel, biofuels and fossil fuels, biodegradable plastics and conventional plastics, among others.

Customs can adopt several strategies to improve the control of environmentally sensitive goods at the border. Here are some suggestions:

- **Harmonized System (HS) commodity codes for environmentally sensitive goods** would aid customs in monitoring trade compliance with environmental regulations. Commodity codes are critical for accurate identification and differentiation of products. Especially harmonized system classification of end-of-life products — waste, scrap, remanufactured, and second-hand goods — should receive sufficient attention in the next revision of the HS nomenclature[11] (TESS 2021). There can be, for example, unique HS codes for recyclable and biodegradable plastics. There is also a need to harmonize national classifications of hazardous waste, non-hazardous waste, and non-waste goods destined for reuse, repair and refurbishment[12].
- **Techniques for the detection and identification of environmentally sensitive goods** are key capability building areas for customs in environmental enforcement. In fact, the introduction of more accurate HS codes will need to come accompanied with guidance on how the products or materials, that are understood to belong to a new code, may be identified. When inspecting goods, it is often impossible to separate sustainable from non-sustainable products and materials by just looking at the products. New techniques are needed especially for biodegradable plastics and refurbished electronics that are difficult to

[9] For example, the EU permits the international transport of ivory artifacts, including musical instruments, heirlooms, and antiques, under specific conditions (EC 2021b). So, while ivory is generally banned, limited legal markets exist, making it challenging for customs to distinguish between legal and illegal ivory at the border.

[10] Carbon tariffs, for example, mainly involve taxing the carbon emissions associated with imported goods, along with considering other factors such as the energy efficiency of production processes and transportation methods.

[11] The Harmonized System (HS) serves as a globally standardized nomenclature, facilitating the classification of traded commodities based on their names and tariff numbers. Adopted by over 200 countries, it forms the foundation for customs duty calculations and the compilation of trade statistics (WCO 2021a).

[12] There is ongoing debate about whether adding more HS codes will unnecessarily complicate the system. While revising the HS code system is important, it may not be enough to address the growing focus on circularity and sustainability. Given the broad range of products affected, additional mechanisms will be needed to support customs in managing these emerging concerns.

identify with existing technologies without time-consuming laboratory testing. Customs and technology providers should collaborate to develop improved capabilities, for instance expanded reference libraries for Raman spectrometers, IR spectroscopy tools, and X-ray diffraction devices.

- **Strengthening of cooperation with government agencies and non-governmental organizations (NGOs)** is needed to target international environmental crime more effectively. For example, the Environmental Investigation Agency (EIA), an international NGO, has developed a global Environmental Crime Tracker to inform law enforcement about wildlife trafficking hotspots and gateways (EIA 2021). One way to create awareness of cross-border environmental crime is to establish regional or bilateral task forces. South-Korea and the Philippines, for example, have formed a bilateral commission to ensure training and other capacity building activities in the fight against illicit waste trafficking between the countries (Simon 2019). The EU-TWIX platform contains centralized data on seizures of illegal wildlife among police, customs, and other relevant authorities across Europe (EU-TWIX 2024).
- **Upskilling customs officers in environmental crime** would help customs administrations to have in-house expertise on environmentally sensitive goods, for example how they can be identified and how they should be treated if found in customs controls. The World Customs Organization (WCO), for example, provides training courses on environmental crime at their online training platform. Customs administrations could establish national programs to train customs officers to enforce rules about environmental protection and to investigate international environmental crimes. Also hiring officers specialized in the investigation of environmental crime would help customs achieve green customs ambitions.
- **Adopting digital product passports** can support circular economy initiatives by enabling traceability of goods across their value chains and throughout their lifecycles. A Digital Product Passport (DPP) can be seen as “a structured collection of product related data with pre-defined scope and agreed data ownership and access rights conveyed through a unique identifier and that is accessible via electronic means through a data carrier. The intended scope of the DPP is information related to sustainability, circularity, value retention for re-use, remanufacturing, and recycling” (CIRCAPASS 2024). Digital product passports are being now introduced in Europe for specific product groups and they require economic operators placing products on the EU market to provide data about these products. Often this data originates from supply chain partners outside of the EU. Traceability systems that supply chains put in place can be enablers for provide access to information, but for government monitoring purposes it is important to have trustworthy information about the provenance of the goods, their chemical make-up, manufacturing process, and carbon-intensity of their raw materials. One challenge with Digital Product Passports (DPPs) is their lack of automatic integration with traceability systems. In response, the UN is currently developing the UN Transparency Protocol to address this gap (UN/CEFACT 2024).

2.2 Sustainable operations

Customs administrations can also contribute to environmental sustainability by adopting more eco-friendly operational practices. The environmental footprint of a customs administration primarily stems from daily operations and the maintenance of facilities, vehicles, and other physical assets. This footprint can be minimized by implementing sustainable policies and practices across the organization.

For instance, customs can invest in energy-efficient buildings and renewable energy sources to power their facilities. Transitioning to electric or hybrid vehicles for customs patrols and transportation can further reduce emissions. Additionally, adopting digital solutions to replace paper-based processes can not only enhance efficiency but also conserve resources. By integrating waste reduction and recycling programs within their operations, customs administrations can further minimize their environmental impact. Through these measures, customs can lead by example, demonstrating their commitment to sustainability while promoting environmentally responsible practices among the trading community. Here are some of the ideas presented in more detail:

- **Use of renewable energy sources for power** produces no greenhouse gas emissions from fossil fuels and reduces air pollution. Customs can decide to purchase electricity from renewable energy producers or install solar panels and windmills at their sites of operation. Jordan Customs, for example, has installed rooftop solar panels at several facilities around the country. In a sunny country like Jordan, solar panels yield substantial savings in energy bills and carbon emission (Jordan Customs 2018).
- **The purchase of electric, hybrid, or bio-fuel vehicles** can significantly reduce the carbon emissions of a transportation fleet. The EU's Clean Vehicles Directive sets targets for customs and other public bodies for the procurement of low- and zero emission vehicles (EC 2024). Many EU customs already have started the decarbonization of their transport fleet. For example, Irish Customs administration reports being in the middle of electrification of its fleet of light duty vehicles, as illustrated later in this report.
- **Lifecycle management of equipment** from procurement to decommissioning is a way to cut down the total environmental burden of equipment used by customs. Green procurement rules, predictive maintenance, and proper recycling of obsolete equipment are some considerations of sustainable lifecycle management. For example, safe and sustainable decommissioning of X-ray scanners requires expertise and special tools as the equipment may contain radioactive sources and toxic heavy metals (WCO 2021b).
- **Asset sharing among border control agencies** is a way to distribute the cost of expensive tools, equipment, and facilities among multiple users. However, asset sharing can also positively impact the environment: pooling resources reduces the necessity to invest in a larger number of equipment and premises, thus minimizing resource consumption and environmental impact. For instance, in Finland, the Finnish Customs Administration and the Border Guard share common premises and equipment at many

border crossings. Virtually all equipment, including X-ray scanners and lorry brake-testing pads, can be shared and operated by either agency upon request (Poutiainen 2015).

- **Digitalization of customs procedures** comes with many benefits. For customs, digitalization enables faster communication with traders and other government agencies, reduces manual labor and human-caused errors, and unlocks powerful data analytics capabilities, for example. Digital customs procedures also benefit traders in terms of facilitated import and export processes, reduced cost of compliance, and faster clearance times. From the sustainability perspective, digital processes contribute to better resource efficiency and shorter waiting times at border crossings.
- **Eco-friendly disposal of seized goods** presents a substantial opportunity for customs to contribute to environmental protection. Each year, customs administrations confiscate substantial volumes of all kinds of illicit goods — from counterfeit apparel and pharmaceuticals to illicit cigarettes and unsafe children's toys. For example, in 2021, the European Anti-Fraud Office (OLAF) led operations that led to a seizure of 437 million illegal cigarettes and 372 tons of raw tobacco intended for illicit production (OLAF 2022). Today, seized goods are most often destroyed, either incinerated or landfilled. This approach misses a valuable opportunity to recycle materials for use in second-cycle production in various industries.

2.3 Trade facilitation

The third area of Green Customs activity is trade facilitation, a broad concept aimed at reducing red tape at the borders, removing unnecessary non-tariff barriers to international trade, and helping traders to optimize logistics for efficiency, speed, and predictability. The four widely recognized pillars of trade facilitation philosophy are transparency, simplification, harmonization and standardization (UNECE 2012).

Evidence shows that trade facilitation measures at land border crossings can reduce traffic congestion and truck waiting times, thereby lowering CO2 emissions (Lucas 2021). For example, Reyna et al. (2016) concludes that enhancing the efficiency of customs inspection processes can reduce greenhouse gas emissions by 31% to 36% at the Mariposa port of entry on the US-Mexico border. It is reasonable to assume that similar dynamics exist at airports and seaports: the faster cargo is cleared through customs, the less emissions logistics operators produce due to idling times and congestion. Long queues can also result in littering at congested border crossing zones when truck drivers must wait for hours or even days to clear customs.

Another advantage of trade facilitation is that it lowers the cost and complexity of legitimate trade, in this way fostering compliance and diminishing incentives for illegal trading in environmentally sensitive goods. When permit application, clearance, and customs inspection processes work smoothly, traders are more likely to choose the legal path — present their goods to customs and comply with regulations. This way, trade facilitation can potentially redirect a portion of illegal trading volumes in environmentally sensitive goods back into the legal sphere and under customs control.

Facilitating specific goods and industries can also bring environmental benefits. Customs can prioritize the movement of environmentally friendly goods, such as biofuels, solar panels, second-hand goods, and biodegradable plastics. Today, several environmentally conscious trade facilitation agreements are in place, such as the EU-New Zealand Free Trade Agreement, which includes provisions for the encouragement of facilitation of environmental goods ranging from wind turbines to photovoltaic cells (EU 2024) .

Customs can specifically promote circular business models by streamlining the customs processes of reverse supply chains. Regarding cross-boundary waste trade, facilitating legal waste exports and imports can support innovation and industries dedicated to circular economy solutions. Recycling, refurbishing, and repair businesses thrive on economies of scale, with large operations requiring a steady flow of raw materials, which are often sourced internationally. For example, the extraction of metals from electronic and electric waste is highly dependent on a small number of large-scale smelters and refiners, making the process particularly vulnerable to trade barriers (TESS 2021). Streamlined export and import procedures enable efficient material acquisition, providing economic incentives to invest in high-capacity, high-quality infrastructure that are essential for scaling up efficient circular economy businesses. As an example, Indonesia has established regulated bonded processing zones that offer fiscal incentives and simplified import processes for recycling industries (Wahyudi et al. 2023).

Customs can implement several strategies to facilitate trade and advance the green agenda. Here are a few examples:

- **Notifying traders about delays in customs processing** helps companies to optimize border crossings for higher speed and reduced emissions. With an early notification, a truck driver may decide to use a less congested border crossing to minimize waiting time. Similarly, a ship captain may choose to lower cruising speed down to a fuel-efficient slow steaming pace if no berth spot is available at the port until a later date (Boersma et al. 2015).
- **Digitalization of documents and messages** brings both trade facilitation and sustainability benefits for traders and border control agencies. Digital documents reduce needs for paper products and movement of physical document across the supply chain. But more importantly, digital information enables computerized logistics optimization that can lead to higher capacity utilization, low-emission routings, and less idling time (Stephens 2020) — all which contribute to resource-efficiency and sustainability.
- **Prioritization of emission-intensive and perishable cargo** at border crossings can reduce the energy consumption of refrigerated and heated containers, which often carry food, livestock, and other special cargo. For refrigerated containers, about 19% of the energy used during transport is for cooling purposes (Fitzgerald et al. 2011). Providing a

fast lane for time-sensitive cargo can also minimize spoilage and extend the shelf life of perishable products[13].

- **Locating border crossing points along main transport corridors** reduces the need for detours, thereby lowering transport-related emissions. Customs can further minimize the need for unnecessary cargo movements by co-locating bonded warehouses, customs laboratories, and other services at these border crossings.
- **Uniform customs controls across Customs Unions**, such as the EU, can also lead to more streamlined and sustainable logistics. Ideally, companies should select transport routes based on distance, cost, time, and emissions, rather than the leniency of customs controls. In this context, the uniform application of customs rules across a customs union or country would eliminate incentives for customs shopping and the unnecessary transportation of goods.

2.4 Green Lane for Green Traders

The fourth area of green activity involves the 'Green Lane for Green Traders' approach, which is about encouraging companies to adopt sustainable practices in exchange for customs benefits. Once applicable legislation is in place, customs authorities could leverage their unique position as the gatekeepers of international trade by granting preferential treatment to traders who demonstrate dedication to sustainability. Benefits of a green trader status could encompass priority lanes for customs clearance and lower requirements for customs guarantees. This concept shares similarities with established customs-private partnership programs, such as the Authorized Economic Operator (AEO) initiatives, which provide customs simplifications to companies that demonstrate high levels of customs compliance and supply chain security.

The potential benefits of such a 'Green Lane for Green Traders' program are considerable. We know that transportation of goods produces a great deal of global greenhouse gases and that private sector companies play the leading role in international logistics. Recent research argues that global supply chains account for up to 80 percent of the world's total carbon emissions (BCG | HSBC 2021). There is also evidence that global supply chains have plenty of room to reduce emissions and improve to meet sustainability goals (Bové and Swartz 2016). Many companies are already considering sustainable business practices under corporate social responsibility programs. But customs could exert external pressure to further accelerate the green transition in the private sector.

In the US, the US Customs and Border Protection (CBP) identifies "Incentives for Green Trade" as one of the four strategic goals outlined in their Green Trade Vision. This goal aims to provide trade facilitation benefits and other incentives to promote environmentally friendly trade practices and supply chains (CBP 2022). The early concept involves integrating environmental priorities into

[13] Most customs agencies are already committed to the facilitation of perishable goods under the Trade Facilitation Agreement (WTO 2024).

current trade programs and potentially integrating environmental criteria into established trusted trader initiatives, such as the Customs-Trade Partnership Against Terrorism (C-TPAT). The EU could adopt a comparable strategy by incorporating environmental criteria into the existing EU Authorized Economic Operator (EU AEO) program.

On the one hand, customs can incentivize green practices by offering benefits for voluntary sustainability efforts. On the other hand, they can punish traders who overlook the green transition by strategically delaying their international shipments. This approach is similar to the strategic delay described by Bakshi and Gans (2010) in their research, which aimed to accelerate the onboarding of U.S. companies into the C-TPAT program.

Companies have plenty of ways to make their transport and trading eco-friendlier. Customs could make some of these practices requirements for getting the envisioned ‘Green Lane for Green Trader’ status. Here are some ideas for what these requirements could be:

- **Use of low-emissions modes of transport** — for instance rail, short-sea shipping and river barges — is an effective way to cut down consumption of fossil fuel per freight ton. Besides multi-modal logistics, shifting to electric or hybrid vehicles can further reduce emissions of transport operations as well as investments in high-capacity vessels and vehicles.
- **Commitment to circular economy** can also be considered as a criterion for the ‘Green Lane for Green Traders’ status for companies. Embracing circular economy principles involves basing operations on the reuse and regeneration of raw materials and products. This includes prioritizing durability, recyclability and repairability of their products, as well as implementing "take-back" programs for obsolete products.
- **Emission-efficient logistics practices** lay a solid basis for sustainable shipping and could be considered as one eligibility criterion for the ‘Green Lane for Green Trader’ status. Examples of efficient logistics techniques include smart load consolidation, load optimization, backhauling, optimized routing, and slow steaming[14].

[14] The practice of operating cargo ships at low speeds to save fuel and reduce emissions.

3 Case: Decarbonising vehicles of Irish Customs

The first case study outlines the strategies and initiatives undertaken by Irish Customs to decarbonize its fleet of cars, vans, and other vehicles.

3.1 National and EU-level policies drive the decarbonisation project

Irish Customs has embarked on a project to decarbonize its transportation fleet as a part of its broader energy-efficiency strategy. The project is expected to reduce customs' carbon emissions by gradually replacing the existing fleet with electric, hybrid, or biofuel vehicles.

The push for a clean transportation fleet stems from recent national and EU-level policies. Domestically, the Irish Climate Action Plan 2023 seeks to achieve a 51% reduction in greenhouse gas emissions and a 50% improvement in public sector energy efficiency by 2030 (Government of Ireland 2023). That is an obligation for all public sector bodies in Ireland, including the Customs. Today, Irish Customs operates around 300 cars and vans, two cutters, and several mobile scanning units, and this fleet represents a substantial consumption of fossil fuels and the carbon footprint of Irish Customs. Therefore, it makes sense to choose the decarbonisation of the transportation fleet as the spearhead initiative to meet the targets of the Irish Climate Action Plan 2023[15].

At the EU-level, there is the revised Clean Vehicles Directive (EU 2019) that sets binding minimum targets for the procurement of low-and zero-emission vehicles by public bodies. The directive promotes the uptake of clean cars, vans, and trucks that are procured by public bodies through purchase, lease, rent, or other service contracts. The Directive defines national targets for each Member State for the minimum percentage of clean vehicles that the country needs to acquire through its public procurement process. In Ireland, a minimum of 38,5% of the service contract value should be allocated to clean light-duty vehicles like cars and vans (DG MOVE 2024). What is defined as a clean vehicle will change at the end of 2025. Until the then, a vehicle is considered clean if its CO2 emissions are less than 50g/km. From 2026, a more stringent definition will apply as only zero-emission vehicles will be considered clean.

3.2 Irish government services support green procurement

The Office of Government Procurement, a government agency responsible for sourcing goods and services for the public sector bodies, has a procurement framework in place for the purchase of long and medium-range battery electric cars and vans (OGP 2023). Their experts also support other government officials with all aspects related to the public procurement process. The procurement framework and technical support greatly assist Irish Customs to purchase electric cars and vans (Department of Transport 2023).

[15] Irish Customs is also looking to reduce emissions in electricity and thermal energy consumption as part of the Action.

Irish Customs also liaises with the Zero Emission Vehicles Ireland (ZEVI), a dedicated government agency supporting the public and private sectors to make the switch to zero emission vehicles. Customs has been recently selected to participate in one of the ZEVI programs under which Irish customs get one charger installed and one leasing vehicle for three months. With programs like this, Irish Customs can collect information about the car use, for example how often was the car charged or what was the average distance of a trip.

Irish government bodies are also planning to launch centralized procurement schemes for constructing charging infrastructure for electric vehicles. The Office of Public Works (OPW), an agency in charge of construction projects at government properties, is the one-stop-shop contractor for implementing infrastructure plans for Irish Customs and other public bodies. The Office of Public Works has suppliers in its books that can be contracted, for instance, to lay down the groundwork, carry electrical installations, and supply the chargers.

3.3 Electric small vehicles are the priority for the moment

The first phase of the decarbonisation project gives priority to electric cars and vans. This focus is partly chosen because small vehicles represent a majority of the transportation fleet of Irish Customs. Another reason is that there is already an Irish government framework in place for the procurement of electric light duty vehicles. The third main reason is that electric vehicles bring in-use CO2 emissions close to zero[16], this way giving a considerable boost for Irish Customs to meet its energy-reduction targets.

As of today, Irish Customs is conducting an electric vehicle suitability study to find out which vehicles are at the end of their lifecycle. The green procurement ambition does not mean replacing all petrol cars with electric ones at once. After all, scrapping perfectly good petrol and diesel cars would not be a very environmentally friendly thing to do. Instead, as there are recently purchased petrol and diesel vehicles that still have mileage left in them, Irish Customs is rather looking at gradually replacing them over time.

The policy is that an electric vehicle is the first choice when Irish Customs seeks to replace an old vehicle or add a new one. But prior to the purchase decision, Irish Customs must ask a question for each vehicle: can this vehicle be replaced with an electric one? The answer depends on the role of the vehicle. Some cars customs officers drive can travel more than 500km on a typical day, and electronic cars do not typically give that kind of mileage. Moreover, some vehicles are used in rural areas where the access to charging points is limited, which may prevent Irish Customs from converting its entire fleet into electric cars any time soon.

In some cases, there are no electric options available for purchase under the Irish government procurement framework — or on the market at all. For example, Irish Customs sometimes purchase mobile scanners and other heavy equipment that are not available as battery-powered models. The same applies to cutters, fast coastal patrol boats, as there are currently no options

[16] There can be also bonus benefits with electronic vehicles. They typically have additional space at the front and the back, which useful for customs units that carry a lot of equipment. With a new fleet of electric vehicles, there would probably be less need for servicing.

available for fully electric boats that would meet the operational requirements for waterborne surveillance missions[17].

Hybrid cars often have superior fuel efficiency in comparison to petrol and diesel vehicles. Self-charging hybrids excel especially in urban environments where their regenerative braking systems charge batteries while driving. In the same way, plug-in hybrids enable low-emission battery-powered driving when distances are relatively short. On the main roads, on the other hand, where there fewer stops, the benefits of hybrid engines become less significant.

Irish Customs has estimated that hybrid cars would result in around 30% reduction in CO2 emissions against their diesel counterparts. This reduction is significant but insufficient after the zero-emission definition for clean vehicles enters into force in 2026. The new 2026 definition will essentially prevent the procurement of hybrid models under green procurement frameworks. But in the short term, hybrid cars seem like viable options that can be used to lower CO2 emissions.

3.4 Building the infrastructure for electric vehicles

A critical condition for electric vehicles is a nation-wide charging infrastructure with sufficient capacity. Key considerations for charging station installations include universal operability across all makes and models, safety, and usage accessibility. New infrastructure should also be able to accommodate to future innovations of chargers and electric vehicles.

Irish Customs must also consider what kind of chargers they really need. Is it reasonable to invest in fast chargers if cars are going to be laying overnight at parking lots and used only during the day? In such case, cheaper slow-charging infrastructure would be perfectively acceptable. On the other hand, if a car is constantly on the go, which is the case for many surveillance vehicles, there might be need for fast charging stations. To support investment decisions, Irish Customs is collecting information about the usage of cars and their needs for charging speed.

Another key consideration is related to money. Irish Customs has some estimates for the cost of installing charging infrastructure at scale across its 81 sites of operation. The chargers themselves

[17] It has been calculated that around 4% percent of energy consumed by Irish Customs is consumed by two boats they operate, a staggering amount in an organization with around 6500 staff, 81 location, and 300 vehicles. If Irish Customs was able to acquire greener boats, it would make it easier to achieve the green policy targets.

Irish Revenue is currently procuring new Revenue Customs Cutters, fast coastal patrol boats, the next generation of Revenue Customs Cutter main engines shall run on Marine Grade Gas Oil in accordance with marine fuel specification standard ISO 821710. This standard includes additional specifications (DF grades) for distillate marine fuels containing up to Seven decimal Zero (7.0) volume % FAME. The Engine shall be capable of operation with biofuel or biofuel blends.

In addition, the next generation Cutter will have a parallel hybrid system where generators can be used for lower speed propulsion instead of main engines which will also deliver reduced fuel consumption. The emissions of the main engine will meet Tier III emission control standards for Emission Control Areas designated under MARPOL Annex VI. Currently only lower-level Tier II emission standards are required in Ireland. Given the size and operational profile of the Revenue Customs Cutters for 8 day patrols an electric hybrid technology solution was not readily available.

are not overly expensive, around 2000EUR per unit. The groundwork required to install those charging units, however, typically requires larger investments.

More accurate cost estimates can be produced only after thorough site-specific assessments. For example, older buildings might require costly upgrading of electrical-distribution systems and local electric-grid groundworks. Typically, older buildings also have smaller car parks and tight alleyways that may not have sufficient space for newer vehicles and their chargers. The construction works will begin at pilot sites that will be identified using the results of the electric vehicle suitability study

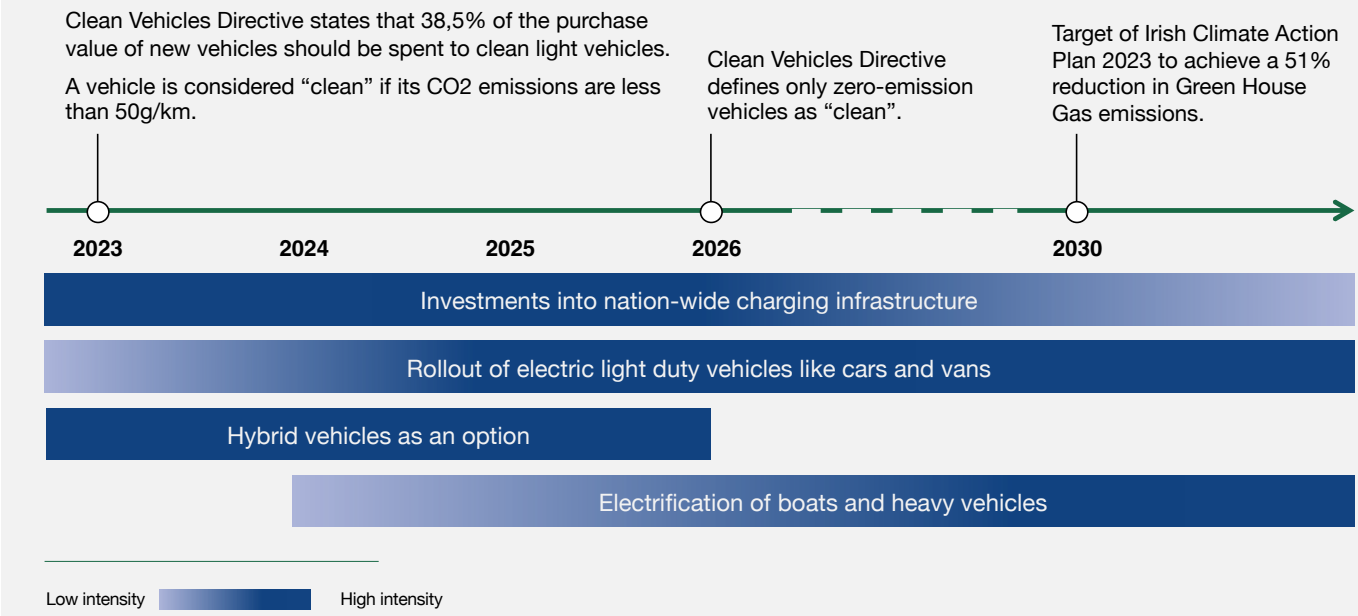
Another possible bottleneck is related to the long delivery time of new electric cars globally over the past years. Also, customization to customs vehicles — for example custom paint jobs or adding compartments for the transportation of sniffer dogs — will take time and may further delay the delivery process.

3.5 Key takeaways

The Irish Customs project to decarbonize its transport fleet marks a decisive switch from fossil fuels to low- and zero-carbon energy sources. There is a strong political backing for the initiative, and the Irish Customs organization is committed to the project throughout the organization. Key milestones for the project are set by the Irish Climate Action Plan 2023 and the EU's Clean Vehicles Directive.

The project requires hefty upfront investments into charging infrastructure before procurement of electric vehicles can begin at scale. In any case, the rollout of electric vehicles will be gradual. The electrification process starts with light vehicles like cars and vans. Existing petrol and diesel cars will be replaced with electric alternative at the end of their lifecycles. Hybrid models can be used as a transitory way to reduce CO2 emissions in the short term, before the new zero-emission definition of the Clean Vehicle Directive kicks in at the beginning of 2026. Larger vehicles and patrol boats will be in the focus later as soon as viable battery-based units become available at the market. The figure below presents the expected timeline of the project.

Figure 2 Timeline of the decarbonisation project of Irish Customs



4 Case: Paso Canoas border crossing in Costa Rica

The second case study presents a new border crossing at the Costa Rica-Panama border, constructed with sustainable principles in mind. Besides its green ambitions, this facility is expected to significantly facilitate cross-border trade and travel between the two Central American countries.

4.1 Modern border crossing boosts sustainability and efficiency

Inaugurated in February 2024, the Integrated Control Center in Paso Canoas, Costa Rica, serves as the primary hub for processing the entry of goods and individuals arriving from Panama into Costa Rica. On an average day, the new border facility oversees the passage of 815 travellers and 227 transportation units. Representing a $33 million investment, the border post complex encompasses several buildings with a total of 14000 square meters roofed area where customs, immigration, police, phytosanitary services, and various other agencies from both Costa Rica and Panama carry out their tasks (TCRN 2024).

The new border crossing aims to streamline current border control processes, and this way facilitate cross-border trade and travel. This will be achieved by modernizing the customs information system, implementing a comprehensive risk management system, and adopting a one-stop-shop concept for border controls. Under the one-stop-shop, officials from both Costa Rica and Panama carry out joint and simultaneous controls at a single, central checkpoint for cargo and people entering Costa Rica from Panama. This arrangement reduces average cargo transit times from hours to minutes, shortens passenger transit times by 50%, lowers logistical costs, and promotes economic integration in the region by addressing a key bottleneck for trade, tourism, and commuting (IDB 2023).

A key design principle of the Paso Canoas Integrated Control Center is the concept of juxtaposed border controls for cargo and passengers[18]. The term juxtaposed refers to the co-location of border controls for exit and entry formalities within the same building. This arrangement allows travelers and cargo to complete immigration, customs, and security checks of two countries in the same place, thereby streamlining the process and reducing congestion at the border crossing. At the Paso Canoas Integrated Control Center on the Costa Rican side of the border, both Costa Rican and Panamanian officials conduct exit controls for Panama and entry controls for Costa Rica.

4.2 Eco-friendly design and construction

The construction of the Paso Canoas border crossing followed an environmentally conscious approach, where architects carefully balanced border control requirements with the preservation of the surrounding ecosystem and the reduction of carbon emissions. Finding the delicate balance

[18] Organized under the "Framework Agreement to Implement Binational Integrated Control Systems at Border Crossings between Costa Rica and Panama."

was challenging. For example, the construction plot featured a natural stream and considerable vegetation, which complicated efforts towards environmental conservation and compensation.

During construction, all bodies of water surrounding the construction plot were left largely untouched and in their natural condition. This decision was made recognizing that altering the normal water flow of nearby streams would cause irreversible disruptions to the local ecosystem. Only minimal water management infrastructure was constructed to handle heavy rainfall during the rainy season, with the aim of mitigating flooding risks.

As part of the building process, trees had to be cleared to make way for the new buildings. Before the tree cutting, it was important to move as many plants and animals as possible to safety to other trees that were spared from the cutting. This rescue effort saved several orchids and bromeliads, as well as one sloth. As part of the conservation and compensation efforts, reforestation was undertaken in various parts of the land, particularly in areas adjacent to the stream, using the same native species that were cleared to make room for the buildings.

Most of the wood obtained from the clearing of the construction site was used directly on the spot for the building project. Any surplus timber was designated for donation to social causes, such as building schools. Leftover woodchips and bark were sold as firewood for local use. Attention was also paid to sorting and recycling of construction waste. For example, empty cement bags, cardboard boxes, paper, gypsum tiles, and other biodegradable materials were stored for later use for landscaping and gardening directly on the site. Some natural waste was composted to make fertilizer for crop cultivation in nearby fields.

4.3 Sustainability certification

At the start of the construction, the Paso Canoas Integrated Control Center obtained a preliminary EDGE (Excellence in Design for Greater Efficiencies) Advanced certification for its design. The EDGE program is a green building certification system focused on promoting resource-efficient and sustainable building practices for reducing energy, water, and other resource consumption of building projects. Seeking the EDGE certification was made a requirement of the loan agreement between Costa Rica and the Inter-American Development Bank (IDB)[19], which was used to finance the building project.

Obtaining EDGE certification follows a formal procedure, requiring buildings to meet specific criteria to qualify as “green” under its standards. To be considered for EDGE basic certification, a building must achieve a minimum 20% reduction in both energy and water consumption compared to a baseline building established by local standards, along with reductions in the energy embodied in building materials[20]. EDGE Advanced certification requires 40% or more on-site energy savings, setting the sustainability ambition even higher. In practical terms, buildings seeking

[19] The Paso Canoas Integrated Control Center was funded by a loan from the Inter-American Development Bank under the Border Integration Program. The loan funds developments at all land border posts of Costa Rica, including three with Panama (Paso Canoas, Sabalito, and Sixaola) and two with Nicaragua (Peñas Blancas and Las Tablillas).

[20] Embodied energy refers to the total amount of energy required to produce, process, transport, and dispose of building materials.

EDGE certifications must integrate energy-efficient features like insulation, efficient windows, and smart lighting. They must also adopt water-saving fixtures, rainwater harvesting, and greywater recycling. Renewable energy like solar panels can be used, and sustainable materials are prioritized, along with waste reduction strategies during construction.

The Paso Canoas Integrated Control Center features 374 solar panels that harness solar energy efficiently throughout the year. To enhance energy efficiency further, the facility employs sophisticated lighting controls equipped with sensors that measure lighting levels, detect occupancy, and adhere to schedules for activating and deactivating lighting systems. Water conservation was another priority in the building design. The project included the construction of a small-scale water treatment plant dedicated to cleaning wastewater for irrigation purposes in nearby gardens and fields. To manage seasonal heavy rainfall, the design incorporated two retention ponds to prevent overflow during long periods of rain during the rainy season from May to November.

4.4 Advantages of the green border crossing

The construction of the Paso Canoas Integrated Control Centre cost $33 million, which was funded by a loan from the Inter-American Development Bank. Despite the relatively high price tag, strong economic and environmental justifications supported the investment. In 2023, land transportation accounted for 77% of the trade between Panama and Costa Rica, totaling $700 million (Latina Republic 2024), Paso Canoas being the main land border crossing between the two countries. The streamlining of border crossing is expected to further strengthen the integration between the two countries, boosting regional markets for goods, services, and labor.

From an environmental standpoint, streamlined border crossing reduces emissions generated by cars and trucks waiting at the border. Especially, expediting cross-border transport of energy-intensive refrigerated goods — such as fruits, vegetables, seafood, dairy products, and meat — lowers emissions. Moreover, faster and more predictable border crossings also facilitate logistics planning and may unlock opportunities for transport companies to optimize routes and loads.

Some benefits of the environmentally friendly design of the Paso Canoas border crossing will become evident over time. Significant cost savings are anticipated to result from lower utility bills and reduced maintenance expenses, thanks to the installation of solar panels and a small-scale water treatment plant. Still, eco-conscious architectural designs that incorporate green spaces offer benefits that extend beyond resource efficiency. No doubt, the fusion of natural beauty and functional facilities enhances the quality of life for officials who work within these buildings, some of whom even reside within the center. Besides, the integration of beautiful, eco-friendly architecture makes the border crossing experience more pleasant for travelers and transporters alike.

4.5 Key takeaways

The Paso Canoas Integrated Control Center represents a project that enhances border control, trade facilitation, and sustainability all at the same time. Cargo and passenger controls are more

effective as multiple border control agencies operate on the same premises, sharing information and coordinating their activities. This one-stop-shop approach streamlines border crossings, making it easier for people to trade and travel across the Costa Rica-Panama border. The environmentally conscious design of the border facility preserves the local nature, provides agreeable space for border officers and travelers, and reduces carbon emission over the lifetime of the facility.

The construction of the Paso Canoas border crossing was financed by a loan from the Inter-American Development Bank, which required meeting environmental standards for sustainable development. To underscore its commitment to sustainability, the construction project obtained an EDGE Advanced certification, signifying the use of highly efficient methods to minimize energy, water, and resource consumption both during construction activities and in building materials. Linking loan decisions to environmental criteria appears to be an effective strategy for promoting green developments worldwide. Customs administrations could implement this strategy by incorporating sustainability requirements into their procurement documents.

5 Case: Innovative recycling of seized goods in Brazil

The third case study showcases best practices for handling seized goods around the Brazilian tri-border city of Foz do Iguaçu, which shares borders with Argentina and Paraguay.

5.1 The busy border crossing of the city of Foz do Iguaçu

Foz do Iguaçu is a Brazilian tri-border city that shares its borders with Argentina and Paraguay. As a major tourist destination in southern Brazil, the city is famous for the iconic Iguaçu Falls and the world's second-largest hydroelectric power plant. The border facing Foz do Iguaçu is the busiest in Latin America in terms of trade volume and the number of border crossings. About half of Brazil's international land border trade flows through the city: around 1500 trucks and 41000 smaller vehicles cross the border on average every day (G1 2022). The city is also home to a busy international airport.

Being the Brazil's main land border crossing, Foz do Iguaçu experiences one of the highest rates of smuggling and seizures nationwide. The prevalence of cigarette smuggling in the tri-border region is not surprising, given that the neighbour Paraguay produces seven times more cigarettes than it consumes (Poder360 2021). Most seized cigarettes in Brazil are of Paraguayan origin, but there are also notable seizures of Chinese and Indonesian cigarettes, along with electronic cigarettes – one of the fastest-growing products in illegal trade (CNN 2022). In 2020, 227 million packs of cigarettes were seized, increasing to 275 million packs in 2021. Despite these large seizure numbers, it is estimated that Brazilian law enforcement can confiscate 8% of smuggled cigarettes that are destined for Brazilian markets (Valente 2020). Altogether, cigarettes and similar products constitute 70% of all seized goods in terms of volume in the Foz do Iguaçu region, followed by lighters (8%), mobile phones, glasses, and watches (6%), and alcoholic beverages (5%)[21]. The range of seized products is presented in the table below.

Table 2 Types of seized goods in terms of volume handled by the Customs in Foz

TYPE OF GOODS	PERCENTAGE OF TOTAL
Cigarettes	70%
Lighters	8%
Mobile phones, glasses, and watches	6%
Alcoholic beverages	5%
Decoders for TVs	4%

[21] It is essential to note that these numbers focus exclusively on legally traded goods, excluding illicit drugs for example.

Agricultural pesticides	2%
Tires	1%
Batteries	1%
Clothing and footwear	1%

5.2 How seized goods are repurposed for second-cycle production

In 2010, Brazil enacted Law No. 12305, establishing the National Policy on Solid Waste. The policy was designed to achieve integrated waste management, promote sustainable production and consumption patterns, and foster collaboration among the public sector, private industry, and the community. Since its introduction, the legislation has influenced sustainability initiatives across the Brazilian society, including the approaches of Federal Reserve to its customs operations.

Specifically, the law had far-reaching implications for the handling of seized goods by customs. Seized goods in Brazil have four possible destinations: auction to the highest bidder, donation for charity, incorporation for the use by public agencies, and destruction (Brazilian Government 2009). For example, in the early 2010s, a common practice was to incinerate all confiscated cigarettes, and there were no established environmentally friendly methods for disposing other types of seized goods either. But today, recycling has emerged as the predominant and environmentally conscious option for handling confiscated goods.

The Customs of Foz do Iguaçu has implemented a successful strategy to recycle a substantial portion of seized goods. A key factor in the success has been partnerships with local industries and universities, which have been forged over the past decade. These collaborations have enabled the design of innovative recycling processes and facilitated the cost-efficient handling of confiscated goods. The cooperation has proven beneficial for all parties involved. Local companies gain access to affordable second-cycle raw materials. Customs avoid spending time and money on handling, storage, and disposal of seized goods. Additionally, society and the environment benefit from reduced CO2 emissions and enhanced sustainability efforts overall.

To recycle seized cigarettes, Customs of Foz do Iguaçu use an innovative cigarette recycling machine that is designed to disassemble cigarettes into their individual components—enabling separate recycling of tobacco, filters, paper, and plastics. The tobacco is pelletized and transported to industrial clients for second cycle use in cement and fertilizer production. Separated filters, papers, and plastics are crushed and pressed into bales, before being sent for general recycling. A private company acquired the machine at a cost exceeding one million Brazilian reais (approximately US$400,000) and donated it to customs in 2016. The current version of the machine can efficiently process 2000 cartons per day, equivalent to 400000 cigarettes.

Seized lighters go through their own recycling process. The gas is isolated and burned without any exploitation. On the other hand, plastics and metals are sorted and sent to their respective municipal recycling processes. Interestingly, plastics from these lighters have found a new life as

bio-composite products, eco-friendly synthetic alternatives for wood, that can be used for various applications from furniture to decking and construction. The repurposing process typically involves melting down the plastics recovered from lighters. Once melted, the material can be melded and shaped into various forms, such as planks or sheets, resembling the appearance and texture of wood.

In the case of seized alcoholic beverages, customs of Foz do Iguaçu cooperates with five local universities to manage the recycling process. In the process, a contracted private sector partner opens the bottles and pours the liquids into containers. The leftover bottles are then sorted into general glass and plastic recycling. The containers, now filled with the beverages, are sent to the partner universities, where the liquids are turned into alcohol-based sanitization gels. The table below summarises commonly seized goods and their end-use applications.

Table 3 End-use applications of seized goods

TYPE OF GOODS	RECYCLABLE MATERIALS → END-USE APPLICATIONS
Cigarettes	Tobacco → Material for cement and fertilizers
	Papers → General recycling
	Filters → General recycling
	Plastics → General recycling
Lighters	Plastics → Synthetic wood products (bio composites)
	Gas → None
Alcoholic beverages	Liquids → Sanitization gel
	Bottles → General recycling

5.3 Key takeaways

This case study represents best practices related to handling of seized goods around Foz do Iguaçu, a tri-border city facing the busiest land border in Brazil both in terms of trade volume and the number of seizures. The customs office of Foz do Iguaçu sets a great example for environmentally friendly customs practices, serving as a potential benchmark for other customs administrations in Brazil and abroad.

The key to the recycling success has been customs' cooperation with local industries and universities. A concrete example of such customs-industry cooperation was the development of a novel cigarette recycling machine capable of separating cigarette components and directing them for sustainable second-cycle use. The cooperation has been a win-win for all parties involved. Companies gain access to cost-effective raw materials while customs enjoy benefits such as lower handling costs and freed-up storage space.

More generally, the recycling process varies from commodity to commodity, and there can be significant variations in how the same commodity is recycled across different regions worldwide. Essentially, each Customs administration confronts distinct landscapes characterized by the types of seized goods, local industry characteristics, local legal requirements, and other factors that determine the most economically viable and environmentally sustainable recycling practices.

6 Case: the Malaysian way of managing waste imports

The Malaysian case study exemplifies a successful collaboration among key national agencies to control the importation of plastic, metal, and paper waste—three waste categories not covered by the Basel Convention.

6.1 International trade in waste

Waste management represents a profitable and diverse global industry, with an estimated value of USD 1052 billion in 2022 (Precedence Research 2023). The industry encompasses the end-to-end process of collection, sorting, shipping, and treatment of waste, all carried out in a way that protects both human health and the environment. A key aspect of the waste management business is the cross-border movement of waste, typically from wealthy countries to less affluent ones. Unfortunately, a significant portion of these waste shipments, instead of being properly handled, often ends up incinerated or illegally dumped due to insufficient waste management systems in the receiving countries.

At the global level, waste management is largely regulated by the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. The Basel Convention establishes principles for preventing the illegal dumping and mishandling of hazardous waste worldwide. It also features a mechanism that mandates prior informed consent for the import, transit, and/or export of waste categories falling within the Convention's scope. However, the Convention targets hazardous waste specifically, thereby excluding many non-hazardous waste types — for example plastics, metal scrap and wastepaper without hazardous characteristics or contaminations — from its scope. To fill this regulatory gap, numerous countries have established national rules to prevent the illicit importation of such waste types into their territories.

Complying with both national and international waste trading rules can be time-consuming, complex, and costly. For this reason, there is often a temptation for traders to seek ways to circumvent these procedures. Dishonest traders often employ a deceptive tactic by misclassifying waste under incorrect commodity codes when they move waste across borders. This strategy allows them to sidestep customs scrutiny and evade the burdensome requirements of regulatory compliance associated with waste shipments.

6.2 Waste management strategy

In January 2018, new restrictions on China's Operation National Sword policy triggered major changes in international waste markets. The policy introduced import bans on various waste types and raised standards for the importation of several other waste categories. Impacted waste streams included plastic waste, metal scrap, and wastepaper. As a result, Malaysia and other South-East Asian countries became new prime destinations to export waste to.

At first, due to the abrupt growth in waste imports, Malaysia lacked the necessary recycling capacity, regulatory procedures, and border controls to manage the inflow of waste. In response, Malaysia quickly implemented a range of measures, including import quotas, restrictions on waste

import permits, and bans on unsorted waste imports. The Ministry of Investment, Trade and Industry (MITI) and the National Solid Waste Management Department (NSWMD) were tasked with designing a system to stop the non-compliant imports of waste and to ensure that legally imported waste met certain quality criteria. This initiative led to the development of new import procedures for plastic, metal, and paper waste.

Royal Malaysian Customs Department (RMCD) plays a central role in the new import procedure. Similar to practices in many other countries, Royal Malaysian Customs Department undertakes inspections at the border on behalf of various government agencies having interest in waste trade. At the operational level, customs officers verify documents, and X-ray containers, and conduct occasional manual examinations together with personnel from relevant environmental government agencies. This joint approach in inspection procedures is designed to streamline processes, preventing unnecessary delays in customs clearance and ensuring the efficient movement of shipments.

To maintain a balance between customs controls and trade facilitation, Royal Malaysian Customs Department assess the risk associated with incoming waste shipments, using all available information. This risk assessment process ensures that Royal Malaysian Customs Department allocates limited inspection resources to examine the shipments with the highest risk of non-compliance. A key input to risk assessment is the records of companies that have previously violated regulations related to waste trading. The process involves customs officers exchanging information regarding potentially suspicious waste shipments with their counterparts in relevant government agencies. Regarding repatriating non-compliant waste shipments to their countries of origin, the Royal Malaysian Customs Department cooperates closely with the Department of Environment (DOE) of Malaysia.

6.3 Plastic waste

Royal Malaysian Customs Department follows national legislation to control imports of plastic waste under the commodity code HS 3915. This code covers a wide range of items, such as single-use plastic bags, bottles for beverages and personal care products, food packaging materials, and straws.

The Malaysian laws require importers to apply for an Approved Permit before they can bring plastic waste shipment into Malaysia. The National Solid Waste Management Department (NSWMD) issues these permits for individual shipments, valid throughout a designated period. To obtain an import permit for waste shipments entering Malaysia, the necessary procedure involves using the online permit system (e-Permit). The application for an import license requires the submission of the following information:

- Name and address of importer
- Name and address of supplier
- Description of goods
- Value and quantity

- Customs tariff code
- Country of origin
- Port of entry

Other supporting documents include:

- Actual photos of imported goods
- Plant/Factory Compliance letter by Department of Environment
- Invoice from the exporter/supplier
- Exporter's approval letter from the National Solid Waste Management Department
- ISO 14001 certification from the exporter/supplier
- Business License issued by the respective local authority
- Confirmation letter from any relevant authority, accredited body, or organization in the exporting countries authorizing plastic waste export activities

Another cornerstone of the Malaysian import procedure is a quota system for plastic importers. These quotas are allotted to licensed companies, based on their verified capacity to treat plastic waste in their facilities. Additionally, national policy on plastic waste specifies quality criteria for imported plastic waste, including a 95% recycling rate, homogeneous structure, freedom from contamination, and a composition of other materials below 5%.

Before the Royal Malaysian Customs Department can grant import clearance, they confirm the existence of a valid Approved Permit. In cases requiring a physical examination, customs collaborate with representatives from the National Solid Waste Management Department in a joint inspection process.

6.4 Metal scrap and wastepaper

Since January 2022, the importation of metal scrap and wastepaper into Malaysia has been under the purview of the Ministry of Investment, Trade and Industry. This responsibility coincides with the implementation of guidelines governing the importation and inspection processes for metal scrap and wastepaper. The formulation of these guidelines involved discussions among various key agencies, including Ministry of Investment, Trade and Industry, Malaysian Investment Development Authority (MIDA), Department of Environment, Ministry of Environment and Water (KASA), National Solid Waste Management Department (JPSPN), Royal Malaysian Customs Department, Port Authorities and Port Operators, and the Standard and Industrial Research Institute of Malaysia (SIRIM).

According to the guidelines, all scrap metal and wastepaper imports into Malaysia undergo an inspection process, leading to the issuance of a Certificate of Approval from Ministry of Investment, Trade and Industry. To clear the inspection process, applicant companies must meet specific prerequisites. They must hold a valid license under the SIRIM Certification/Eco-Label scheme. The applicants are also required to pass annual audits at their waste management

facilities, which involve the verification of quotas, waste handling capacity, and the technology employed for waste processing and material recovery.

The permit system for metal scrap and wastepaper is seamlessly integrated with the Malaysian National Single Window, which has been operational since 2009 (MITI 2018). This integration facilitates the cross-referencing of customs declarations with registered permits, promotes a paperless environment, and establishes a centralized, one-stop gateway for streamlined access to information.

Malaysian regulations set criteria for the acceptable composition of imported waste. For example, scrap metal encompasses various types of metals and alloys in the form old steel appliances, construction debris, aluminium cans, copper wiring and electronics, and brass from plumbing fixtures. Malaysia allows the importation of metal scrap under three commodity codes: ferrous waste and scrap; remelting scrap ingots of iron or steel (HS 7204), copper waste and scrap (HS 7404), and aluminium waste or scrap (HS 7602). The table below outlines the requirements that must be met for importing metal scrap into Malaysia.

Table 4 Quality criteria for imported metal scrap

Commodity (HS heading):	INSPECTION REQUIREMENT (% BY WEIGHT)		
	Ferrous waste and scrap; remelting scrap ingots of iron or steel (HS 7204)	Copper waste and scrap (HS 7404)	Aluminium waste or scrap (HS 7602)
Solid ferrous	Minimum: 94.75%	Maximum: 5.0%	Maximum: 5.0%
Solid non-ferrous	Maximum: 5.0%	Minimum: 94.75%	Minimum: 94.75%
Other recoverable material including plastic	Maximum: 0.25%	Maximum: 0.25%	Maximum: 0.25%
Scheduled waste including electrical and electronic	0%	0%	0%

Comparable criteria apply for paper waste, which often includes materials such as old newspapers, cardboard, magazines, and other types of recovered paper. In Malaysia, the importation is allowed for unbleached kraft paper or paperboard or corrugated paper or paperboard (HS 4707.10), other paper or paperboard made mainly of bleached chemical pulp, not coloured in the mass (HS 4707.20), and paper or paperboard made mainly of mechanical pulp (HS 4707.30). Importation of unsorted paper waste under commodity code HS 4707.90 is prohibited.

6.5 Key takeaways

The Malaysian case study represents a successful collaboration among key national agencies in controlling the importation of plastic, metal, and paper waste — three waste categories not covered by the Basel Convention. The case underscores the importance of transparent and streamlined procedures in promoting a higher level of compliance among waste importers. Malaysian customs have observed a decrease in the volumes of illegally imported waste over the years, indicating the effectiveness of the control system.

The Malaysian control philosophy builds on four key pillars. The first pillar is the online permit application process, offering traders easy access to essential government services. In the case of metal and paper waste, the permit application is seamlessly integrated with the National Single Window. The second pillar encompasses the inspection process, wherein authorities verify the capacity of importing companies to manage waste in their facilities. The third pillar involves company-specific import quotas, which provide authorities with an instrument to regulate the volumes of waste imports into Malaysia. The fourth key pillar consists of explicit quality criteria for imported waste, specifying limits for contaminants and unsorted elements within the waste.

7 Case: eCITES implementation in South Africa

The fifth case study delves into the benefits and implementation challenges of the electronic CITES (eCITES) system in South Africa, which is designed to improve the monitoring and control of trade in endangered species and products made of them.

7.1 The impacts of illegal wildlife trade

The legal trade in wildlife encompasses the regulated commerce of live animals, animal products, plants and plant products under various national and international laws and agreements. It aims to balance the sustainable use of wildlife resources with conservation needs and economic benefits.

Conversely, illegal trade in wildlife and plants results in a loss of biodiversity and is a major global concern with far-reaching ecological, economic, and social impacts. The illegal wildlife trade is a significant black-market activity, estimated to be worth between $7 billion and $23 billion annually (UNEP 2016). While it is a global issue, it is particularly prevalent in regions with rich biodiversity, such as Africa, Southeast Asia, and South America. These regions encompass the source countries, while demand is often highest in countries like China, the United States, and various European nations.

Illegal wildlife trade directly contributes to the decline and potential extinction of species. Rhinos and tigers, for instance, are critically endangered primarily due to poaching. Removing key species from their natural habitats disrupts the ecological balance. Predators and large herbivores, such as tigers and elephants, play crucial roles in maintaining the structure and function of ecosystems. Their removal can lead to overpopulation of certain species and depletion of others, ultimately affecting the entire ecosystem. Moreover, the loss of individual animals from breeding populations reduces genetic diversity, which is essential for species adaptation and survival. This makes species more vulnerable to diseases, climate change, and other environmental stress factors. Countries with rich biodiversity often rely on wildlife tourism as a significant source of revenue. The decline in wildlife populations due to poaching can result in substantial economic losses for local communities and national economies.

7.2 International legal framework for wildlife trade

In 1975, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), an international agreement between countries (also known as Parties), was adopted. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species (CITES 2019).

The CITES Convention works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export, and introduction-from-the-sea[22] activities covered by

[22] Introduction-from-the-sea CITES certificate is a documented required under CITES for importing marine species listed in Appendices I, II, or III, confirming their legal acquisition from the high seas and compliance with international trade regulations (NOAA n.d.)

the Convention must be authorized through a licensing system. Each Party to the Convention must designate one or more Management Authorities to administer this licensing system and one or more Scientific Authorities to advise on the effects of trade on the status of the species.

The CITES permit system is the backbone of the regulation of trade in specimens of species included in the three Appendices of the Convention. Such trade should normally be accompanied by a CITES permit or certificate. The document confirms that the Issuing Authority has verified that the conditions for authorizing the trade are fulfilled; this means that the trade is legal, sustainable, and traceable in accordance with Articles III, IV, and V of the Convention. The national CITES Management Authority or Authorities of each Party issue CITES permits based on advice from the national CITES Scientific Authority. Parties have agreed on a standard format for CITES permits and certificates and on key recommendations regarding the CITES permit system.[23] CITES classifies species into three appendices based on the degree of protection they need:

- Appendix I: Includes species that are threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
- Appendix II: Includes species that are not necessarily threatened with extinction but may become so unless trade is tightly controlled. It also includes species that must be regulated so trade in other species of a similar appearance may be brought under control.
- Appendix III: Contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade.

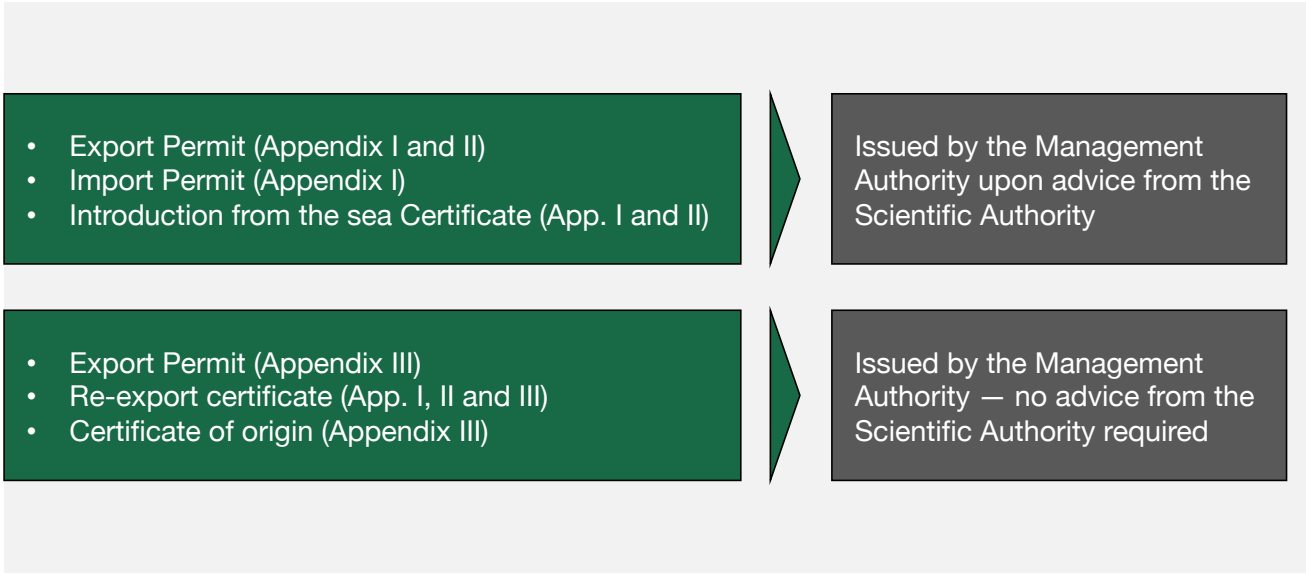


Figure 3 Administration of CITES permits and certificates

[23] As outlined in Resolution Conf. 12.3 (Rev. CoP19) (CITES 2002).

The CITES Convention relies on Parties to enforce its provisions, including monitoring trade and penalizing violations. Parties are required to submit annual reports on their trade in CITES-listed species and biennial reports on legislative, regulatory, and administrative measures taken to enforce the Convention.

7.3 Advantages of eCITES

The Convention at its 19th Conference of the Parties (COP 19), invited Parties to implement the electronic CITES for permit application and issuance. This measure is aimed at controlling and authenticating CITES permits, national reporting as well as electronic exchange of permit information between Parties to improve the implementation of the Convention. The digitization of procedures and electronic information exchange is the objective, rather a tool to simplify the work of Management Authorities and other agencies to implement the Convention.

To enhance the implementation and compliance of the CITES Convention and combat illegal trade, Parties are working to develop and implement electronic permits using modern information and communication technologies. This effort, known as eCITES, includes electronic application and issuance of CITES permits, control and authentication of permits, reporting, and electronic exchange of permit information between countries.

The use of electronic permits, coupled with simplified and automated trade procedures, enables government agencies to enhance their inspection targeting and identify actors who violate the law. The implementation of eCITES promotes collaboration and electronic information exchange with Customs and other border control agencies, facilitating efficient monitoring of CITES trade. Participating countries benefit from increased transparency, prevention of fraudulent permits, expedited and more robust reporting, and improved data for making non-detriment findings. Moreover, simplified and automated procedures could create new business opportunities for compliant traders and rural communities. The eCITES Implementation Framework is based on four pillars:

1. Automation of the CITES permit issuance process in the Management Authorities, including electronic application of CITES permits; transparent and automated controls during inspection, approval and issuance of all permits; electronic payment of fees and electronic repository of all valid permits.
2. Electronic information exchange of CITES permits with customs authorities, automated risk assessment and targeted inspections for export, import and transit and coordinated border controls.
3. Automated generation of reports and statistics to monitor legality and sustainability of trade, including CITES annual trade reports.
4. Electronic exchange of CITES permit information between Government authorities of export, import and transit countries to prevent use of forged documents and establish end-to-end control of trade.

The advantages of eCITES become evident when considering the drawbacks of the paper-based CITES permit system, which include several critical issues that compromise its effectiveness and efficiency in regulating international trade in endangered species. Firstly, the reliance on paper permits makes them vulnerable to forgery. Wildlife traffickers exploit this weakness by using sophisticated techniques to create counterfeit permits. Often, these forgeries are facilitated by corrupt officials who are responsible for issuing or printing the permits.

Secondly, the paper-based system contributes to delays in the clearance of import and export consignments of CITES-listed species. Customs authorities and CITES Management Authorities must manually verify the authenticity of permits, typically by exchanging emails with the issuing authorities. This verification process not only prolongs the clearance time but also increases costs for importers and exporters, as goods may be held up during the verification process.

Furthermore, the manual compilation of data for CITES Annual and Biennial Reports poses another challenge. This process can lead to discrepancies in reported import and export figures due to human error or delays in data exchange between different CITES Management Authorities. Without electronic systems for exchanging permit information, data mismatches are more likely to occur. Moreover, automated clearance processes that bypass customs assessment can exacerbate this issue, as CITES Management Authorities may not be informed of imports if permit copies are not submitted for consignments cleared without inspection.

The eCITES permit system brings many benefits. Firstly, eCITES operates as a cloud-based platform that automates the entire process of applying for, processing, and issuing electronic CITES permits. This automation not only streamlines administrative procedures but also enhances transparency and accountability. Applicants can track the status of their applications online and submit necessary documents promptly, improving efficiency in permit management.

Secondly, eCITES integrates all stakeholders involved in CITES implementation electronically. This includes Management Authorities, Scientific Authorities, Legal Acquisition Certificate issuers, and enforcement agencies. Such integration fosters better coordination and communication, thereby strengthening the enforcement of CITES provisions across jurisdictions. Moreover, the system plays a crucial role in monitoring export quotas for CITES-listed species. By flagging when quotas are nearing exhaustion, eCITES prevents the issuance of excess permits, ensuring sustainable trade practices.

Facilitating secure electronic exchange of permit information is another key feature of eCITES. This capability enhances trade facilitation for legitimate traders while enabling swift and accurate verification of permits by Customs Authorities. It significantly aids in detecting forged permits and combating wildlife trafficking, thereby bolstering enforcement efforts. eCITES also contributes to monitoring international trade trends and patterns. It helps identify potential laundering of smuggled species by flagging discrepancies between reported quantities and known available stocks. Such insights prompt investigations into suspected illegal activities.

Additionally, when equipped with risk analysis tools, eCITES can identify indicators of risk associated with importing and exporting CITES-listed species. Integration of these indicators into Customs Risk Management Systems allows for targeted inspections of high-risk consignments,

enhancing border control effectiveness. The system further improves accuracy in reporting by automating the generation of CITES Annual and Biennial Reports and Illegal Trade Reports. By minimizing errors associated with manual data compilation, eCITES ensures consistency and reliability in reporting across member countries.

7.4 Implementation of eCITES in South Africa

South Africa, as a founding member of CITES, has integrated its provisions into national legislation through the Biodiversity Act. In 2023, the Border Management Authority (BMA) was officially established to manage frontline border law enforcement functions. These include port health, immigration control, biosecurity, food safety, phytosanitary control, and oversight of border infrastructure and risk management. The Authority collaborates closely with the South African Revenue Services (Customs Administration) on regulated goods and in particular wildlife trade (legal and illicit).

The National Department of Forestry, Fisheries & the Environment (DFFE) and Provincial Environment authorities are Management Authorities (MAs) is responsible for issuing of CITES permits, while the Border Management Authority (BMA) oversees compliance monitoring. Cases of non-compliance are escalated to the DFFE Enforcement unit to ensure segregation of duty to foster transparency of investigations and criminal enforcement measures. South Africa has developed the eCITES system known as the Integrated Permitting System (CIPS) in line with the Convention's invitation. This initiative aims to digitize the permit application process, enabling:

- Online application for CITES permits
- Tracking of application progress
- Online payment of permit fees

Despite these advancements, the system currently does not support online processes for steps following payment, such as inspection bookings, necessitating paperwork at the country's Ports of Entry. Additionally, the system is being expanded to track live exports of Appendix I species, with breeding facilities for these species being integrated to provide insights into breeding stocks.

Unlike most Parties, South Africa has decentralized its approach, to give effect to the concurrent mandate by appointing Management Authorities in nine Provinces and the DFFE to issue CITES permits instead of adopting a centralized national system. As a result, the Border Management Agency (BMA) is developing its own system rather than utilizing the off-the-shelf eCITES Asycuda module provided by the United Nations Conference on Trade and Development (UNCTAD) (CITES 2024).

Both the Management Authorities (MAs) and the Border Management Authorities (BMA) will utilize this system, while Customs operates a separate system. Engagements on potential integration/ inter-operability are underway to outline how these systems will interact and facilitate information exchange with partner countries.

Currently, the system does not enable Customs to target suspicious exports because they do not utilize the information within the system, and the BMA lacks an electronic targeting system. Key

stakeholders have indicated that while the system enhances monitoring and control, its effectiveness is hampered by inadequate resources and staff. Smuggling risks persist, especially through non-designated Ports of Entry.

7.5 Key takeaways

Implementing an efficient eCITES system involves several key components and considerations. Firstly, a thorough business process mapping exercise is essential. This exercise defines a clear workflow that encompasses all requirements and involves relevant authorities, ensuring seamless operation and compliance. Comprehensive training is another crucial aspect; it should be provided to all stakeholders, including governmental agencies, traders, and logistics entities. This training ensures that all parties understand their roles and responsibilities within the new system, fostering smooth adoption and operation.

The eCITES system enhances document accessibility by providing online access to all documents involved in the permit application and compliance monitoring processes. This accessibility streamlines processes and reduces administrative burdens associated with paper-based systems. One related benefit of transitioning to an online system is the improvement in data quality and enhancing of risk models for better targeting initiatives. Online verification mechanisms reduce errors and enhance the accuracy of data input and reporting, thereby improving overall data integrity. Moreover, the system offers better insights into import and export activities and destination countries. This enhanced visibility aids in monitoring trade patterns and identifying potential issues or anomalies.

Centralization is another advantage. Instead of fragmented regional data, the eCITES system provides a centralized overview. This consolidation facilitates easier data management, analysis, and reporting, benefiting both operational efficiency and strategic decision-making. Customs agencies also benefit from enhanced information availability through the eCITES system. Timely access to accurate data supports Customs in effectively carrying out their duties related to border control and enforcement.

Furthermore, the system introduces QR-code-enabled permit verification. This feature allows for real-time status checks of permits, mitigating risks associated with fraudulent paper permits observed in the past. It strengthens enforcement efforts by ensuring the legitimacy of trade transactions and preventing illegal activities.

8 Advancing Green Customs for a sustainable future

The urgency and relevance of promoting Green Customs cannot be overstated in today's global context. As climate change, biodiversity loss, and environmental degradation accelerate, it is critical for customs administrations to employ every possible measure to fight these negative trends. This concluding chapter provides insights into how customs can advance their green transition.

8.1 Comprehensive approach to Green Customs

The green transition in customs calls for a fundamental shift in perspective. This shift involves embracing a comprehensive approach to Green Customs initiatives and placing a stronger strategic emphasis on their implementation.

The broad range of Green Customs initiatives

Customs decision-makers should recognize the full spectrum of Green Customs activities. They should also understand how various facets of Green Customs evolve in response to changes in the regulatory and risk landscapes.

Border controls of environmentally sensitive products form the basis of any Green Customs strategy. By controlling environmentally sensitive products and combating environmental crime, customs play a crucial role in addressing global environmental challenges such as climate change, biodiversity loss, and ozone depletion. Importantly, customs should be mindful about the expanding range of environmentally sensitive goods. It is no longer sufficient to stop biological hazards, dangerous waste, harmful chemicals, and endangered wildlife at the border. New regulations are introducing additional categories of environmentally sensitive goods, such as carbon-taxed products and single-use plastics. Controlling these commodities requires enhanced technical, legal, and operational capabilities from customs.

Another cornerstone of the Green Customs philosophy is the internal measures customs can implement to enhance the sustainability of their operations. Customs administrations can adopt eco-friendly practices such as recycling seized goods, investing in solar panels, minimizing paper waste by digitizing customs processes, and transitioning to electric vehicles. By reducing their own environmental footprint, customs can make a meaningful organizational contribution to sustainability at the operational level.

Trade facilitation serves as a powerful tool to reduce the environmental impact of trade. Simplified international trade leads to shorter waiting times at the border, reducing emissions from idling trucks, ships, and other vehicles. Additionally, customs can accelerate the clearance of emission-intensive cargo, such as refrigerated goods, and work to eliminate customs-induced bottlenecks in supply chains in general.

Customs-private partnerships offer substantial potential to motivate traders to adopt environmentally sustainable practices themselves. The concept of a ‘Green Lane for Green Traders’ envisions that environmentally conscious traders would enjoy benefits comparable to those provided to trusted traders under the Authorized Economic Operators (AEO) program.

Embracing the ‘Green Lane for Green Traders’ philosophy will encourage the trading community — including raw material suppliers, manufacturers, and logistics service providers — to transition to greener modes of operation.

Making Green Customs a strategic priority

Fully realising the Green Customs potential demands a profound change in strategic thinking and organizational culture. Sustainability should be integrated into customs decision-making across all levels and functions. Green ambitions should receive the attention they deserve in customs research and development efforts, and procurement activities should incorporate sustainability criteria into tenders. Customs enforcement should place greater emphasis on combating environmental crime[24] and explore innovative approaches to facilitate the trade in environmentally friendly goods that support sustainability. Customs managers should establish metrics to monitor the progress of green initiatives, facilitating the shift towards sustainability and enabling benchmarking with peer customs administrations and other government agencies.

Training programs should integrate green customs elements to provide customs officers with the expertise and technical capabilities needed to effectively control environmentally sensitive goods and to understand the environmental implications of their work. Officers at all levels need to understand the seriousness of environmental offences and their far-reaching negative impacts[25]. This paradigm shift might require restructuring training programs and developing, monitoring, and incentivizing environmental strategies within the customs community.

Overall, Green Customs initiatives deserve strategic recognition, policy support, and operational attention. To advance towards these objectives, it is equally crucial for customs to actively participate in national and international policy-making discussions alongside other government agencies as well as to engage in dialogue with the private sector and society to define green customs agendas (Rukanova et al. 2022).

8.2 Developing control capabilities for environmentally sensitive goods

Environmentally sensitive goods encompass a wide and continuously growing range of commodities that customs must control at the border. Accurately identifying specific environmentally sensitive products can be challenging for customs officers, so they would greatly benefit from new tools and capabilities to simplify product identification.

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[24] Perceived as a low-risk and high-profit crime, transnational environmental crime is estimated at USD 70 to 213 billion annually (Europol 2022). Environmental crimes cover a broad range of activities from waste trafficking to illicit trade in wildlife and polluting chemicals. These crimes damage the sustainability of our planet and lead to loss of biodiversity, deplete natural resources, soil environment, and contribute organized crime and corruption (Hall 2015).

[25] Illegal trade in environmental sensitive products is essentially transboundary and leads to widespread impacts. Sometimes trafficking causes environmental damages in destination countries. For example, the illicit export of toxic waste presents major challenges in receiving countries, as improper disposal often results in environmental contamination and public health hazards. In contrast, wildlife trafficking damages ecosystems and biodiversity mainly in the countries of origin. However, often trafficking activities lead to global damages, like in the case of F-gases and illegally logged timber, which contribute to global warming.

Commodity codes

Commodity codes provide the legal foundation for product identification and the determination of duties, taxes, quotas, prohibitions, restrictions, and other trade measures applied to specific goods. The codes are crucial for monitoring international trade flows, including environmentally sensitive goods. However, a problem with current commodity code systems is their lack of specific codes for environmentally sensitive products that are subject to trade measures. This shortcoming affects not only environmentally harmful products like plastic waste but also environmentally friendly products such as sustainable steel, which may qualify for duty reliefs and other incentives.

At the global level, the Harmonized System (HS) is an internationally standardized nomenclature for classifying traded commodities by name and tariff number. Used in over 200 countries, the HS system forms the basis for calculating customs duties and compiling trade statistics. The first six digits of HS codes are uniform across all countries, while additional digits are specific to individual countries or customs unions (WCO 2021a).

The World Customs Organization manages the maintenance and periodic updates of the Harmonized System (HS), with revisions usually taking place every 5-6 years (ibid.). For instance, the latest HS 2022 revision included a new category for electrical and electronic waste (e-waste), aligning with updates to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (WCO 2022). This commodity code heading is useful for customs officers as it helps them distinguish second-hand electronics from electronic waste by looking at declared commodity codes. The latest revision also highlighted goods with environmental benefits, such as the introduction of a new subheading for solar water heaters, LEDs, waste incinerators, and photovoltaic electric generators (Steenblik 2020).

Importantly, the need for code revisions is continuous, and given the approximately five-year revision cycle, commodity codes often lag the pace of technological and regulatory advancements. The Wise Persons Group on Challenges Facing the Customs Union suggests that the EU take the lead in reforming the HS system to accurately classify environmentally friendly products that upcoming EU policies aim to promote in international trade (WPG 2022). However, while revising the HS system has benefits, it has limitations, and complementary solutions will be essential (Santana 2023).

Product identification technologies

Commodity codes are helpful for product identification as far as customs officers have access to trade documents and can rely on the accuracy of the commodity codes found in them. Nevertheless, officers frequently encounter shipments of goods that raise suspicions of deliberate or accidental misrepresentation of commodity codes. In such instances, customs officers may choose to inspect the goods and accompanying documents — such as invoices and packing lists — to determine the true nature of products goods in question.

The process of product identification relies on a range of technologies, techniques, and external expertise. For instance, to differentiate fossil fuels from biofuels, customs may review exporters' product catalogues to confirm their involvement in the biofuel industry and conduct laboratory testing to analyze the chemical composition of fuel samples. With certain goods, customs typically

consult government agencies with more expert knowledge on the goods under suspicion. Identifying CITES products, for instance, often relies on the specialized expertise of professionals who work for environmental agencies, zoos, or similar organizations.

There is a strong need for new product identification technologies. It is impossible for customs officers to identify many environmentally sensitive goods by mere visual examination at the border. Instead, customs officers often rely on handheld spectrometry devices and test kits — common inspection tools with many EU customs — to obtain detailed information about the material composition of goods. However, these techniques are constrained by their limited ability to reliably identify environmentally sensitive goods. Samples will need to be analyzed in a laboratory employing protein and DNA analyses for identification, which requires both time and money. Consequently, future capability-building efforts should focus not only on increasing the number of spectrometers and test kits at the border. They should also aim to expand the range of environmentally sensitive goods these tools can reliably identify by improving the reference libraries they rely on.

Customs would also greatly benefit from new technologies to support the accurate identification of environmentally sensitive products. Promising technologies include X-ray diffraction, X-ray fluorescence, and nuclear resonance fluorescence induced by photons or neutrons. Moreover, there is a call to further develop laboratory equipment into detection technology that is more compact and rugged, enabling on-the-spot testing of samples at the border. Exploring the full potential of both traditional and non-traditional technologies for identifying environmentally sensitive products should be incorporated into the customs research and innovation agenda.

Access to product lifecycle information

Access to data has been identified as a significant challenge for customs in controlling many environmentally sensitive goods (WCO 2023). Today, it is insufficient for customs to simply identify the physical characteristics of these goods; it is equally important to verify their origins, production processes, and intended end-uses to assess their environmental impacts. For instance, certified timber is identical to non-certified timber, as both are made from similar logs of the same wood species; what distinguishes certified timber is its origin in responsibly managed forests. Similarly, sustainable steel does not differ from regular steel except in its production, which uses environmentally friendly methods and renewable energy.

Detailed data on the production and origin of a product—beyond traditional customs practices—is essential. In the case of circular products, customs must also consider their intended use: will these items serve as second-hand goods, second-cycle raw materials, or be used for refurbishing?

Cross-border shipments of certified timber, sustainable steel, and circular products typically come with documentation that proves their sustainable status. However, customs may sometimes question the authenticity of these documents and initiate verification. Ideally, customs would have access to comprehensive and accurate information about shipped products throughout their entire lifecycle, from production to the point of inspection. This access would allow customs officers to verify the journey of certified timber from the logging site, sustainable steel from the production mill, and circular goods throughout their life cycles, ensuring that products genuinely deserve their

sustainability status. However, due to transparency gaps in the international supply chain, customs often face challenges when verifying the authenticity of environmental certificates.

Fortunately, developments are underway to help customs access information about the origins, production processes, and end-uses of internationally traded goods. Various businesses are developing traceability systems, while service providers are creating platforms to help customs manage and share supply chain data more effectively. Additionally, the introduction of mandatory digital product passports for certain product groups requires the disclosure of product-related information, benefiting consumers, businesses, and authorities alike. Customs authorities could leverage this data to enhance their enforcement activities. For tax collection and security purposes, useful business data that customs can use to cross-validate declarations is found in documents such as digital invoices, packing lists, bills of lading, and shipping instructions. However, for controlling many environmentally sensitive goods, additional details like chemical composition, production and recycling data, and the origin of raw materials are critical (Rukanova et al. 2021). Access to such information would enable customs to verify whether traded goods meet legal requirements.

Another solution involves modern tracking technologies that help customs trace international shipments when there is a risk that goods may not reach their intended destination or may be misused. This is particularly relevant for transboundary waste shipments, where customs aim to ensure that exported waste is not illegally dumped somewhere down the international supply chain. Electronic container seals and immutable records such as blockchains offer significant potential for improved tracking and verification. Additionally, satellite images, spotter planes, and drones can detect waste-related illegal activities, such as illegal dumping sites, burning waste piles, and toxic waste spills.

A straightforward solution to enhance data access involves collaborating with government agencies responsible for granting certificates and permits for the export and import of environmentally sensitive goods. For example, environmental agencies typically grant export permits for CITES products, and it would be beneficial for customs to have online access to valid permits. This way, when CITES products are declared to customs upon export, officers can easily verify the authenticity and validity of the presented export permit. Similar transparency in the permit process would also strengthen control over international waste and chemical trade.

8.3 Working towards sustainability together with the trading community

Customs plays a key role in international trade flows, and in this role, they can promote environmentally friendly business models and sustainable practices within the trading community.

Customs-private partnership programs for sustainability

Customs-private partnership programs for sustainability—such as the 'Green Lane Green Traders' initiative proposed in this study—represent a bold and strategic approach to promoting environmentally responsible practices in the transport and logistics sectors. With the right legislation in place and support from the relevant environmental policy departments, these

programs can leverage customs authority to incentivize businesses to adopt sustainable measures, thereby reducing carbon emissions and enhancing the efficiency of cross-border trade.

As gatekeepers of international trade, customs agencies can contribute to setting verifiable standards and criteria for ‘Green Lane for Green Trader’ status. This designation could be awarded to companies that demonstrate a commitment to sustainability through various practices, such as smart load consolidation, investing in cleaner high-capacity vehicles, and prioritizing rail and inland waterways over road transport, all of which lower emissions and minimize environmental impact.

By helping to establish eligibility criteria for ‘Green Lane for Green Trader’ status, customs agencies can incentivize eco-friendly behavior and investments. Reduced bureaucracy and streamlined procedures under such programs facilitate smoother and faster cross-border movements, benefiting both businesses and the environment. Moreover, customs-private partnership programs foster collaboration between government agencies and the private sector, promoting dialogue and innovation in sustainable logistics solutions. This collaboration can lead to the development of new technologies and practices that further reduce carbon footprints and improve overall efficiency in international trade operations.

Facilitation of flows of environmentally friendly goods

Trade facilitation has been a priority for customs administrations for decades, and today it holds strategic importance comparable to customs law enforcement and revenue collection duties. Now and in the future, trade facilitation—especially for environmentally friendly goods—will support the green shift within the trading community. It will play a critical role in the transition toward more circular and sustainable industries. Customs agencies are the primary authorities at borders, responsible for controlling, monitoring, and facilitating legitimate trade in circular goods, as well as combating waste crime (WCO 2020).

As global economies transition to a circular economy, the trade volume of virgin materials will decrease, while the trade in second-cycle raw materials, recyclable waste, and second-hand goods will increase (Ekins et al., 2019). Recycling, refurbishing, and repair businesses thrive on economies of scale, requiring a steady flow of raw materials often sourced internationally. Streamlined export and import procedures facilitate efficient material acquisition, providing economic incentives to invest in the high-capacity, high-quality infrastructure essential for scaling up efficient circular economy businesses. Supervising circular cargo flows is critical yet challenging, as customs must balance facilitating the movement of circular goods with enforcing laws against serious crimes, such as waste crime (WCO 2023).

Trade facilitation can also assist traders in managing the increased compliance burden associated with higher environmental standards and new green trade regulations. This 'green tape' can have the same detrimental impact on businesses and trade as the 'red tape' linked to excessive bureaucracy and complex cross-border processes. For this reason, customs trade facilitation efforts should aim to simplify compliance with environmental regulations for the trading community. After all, whether it’s red tape or green tape, companies are essentially colorblind to trade barriers in their operations; they perceive these obstacles without regard to their purpose.

References

Bakshi, N., & Gans, N. (2010). Securing the containerized supply chain: analysis of government incentives for private investment. Management Science, 56(2), 219-233.

BCG, Boston Consulting Group and HSBC (2021). Delivering Net Zero Supply Chains.

Boersma, K.F., Vinken, G.C.M. & Jean Tournadre, J. (2015) Ships going slow in reducing their NOx emissions: changes in 2005–2012 ship exhaust inferred from satellite measurements over Europe. Environmental Research Letters.

Bové, A.-T., & Swartz, S. (2016). Starting at the source: Sustainability in supply chains. Available at www.mckinsey.com/capabilities/sustainability/our-insights/starting-at-the-source-sustainability-in-supply-chains.

Brazilian Government (2009). Decreto n. 6,759. A administração das atividades aduaneiras, e a fiscalização, o controle e a tributação das operações de comércio exterior serão exercidos em conformidade com o disposto neste Decreto. Available at www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/decreto/d6759.htm.

CBP, U.S. Customs and Border Protection (2022). Green Trade Strategy.

CBSA, Canada Border Services Agency (2023). 2023-2027 Canada Border Services Agency Departmental Sustainable Development Strategy.

CIRCAPASS (2024). Available at https://cirpassproject.eu/faq.

CITES, Convention on International Trade in Endangered Species of Wild Fauna and Flora (2019). Convention on international trade in endangered species of wild fauna. Available at https://cites.org/sites/default/files/I/Brochure_UNEP_CITES_eng.pdf.

CITES, Convention on International Trade in Endangered Species of Wild Fauna and Flora (2002). Resolution Conf. 12.3 (Rev. CoP19) – 27. Available at https://cites.org/sites/default/files/documents/E-Res-12-03-R19.pdf

CITES, Convention on International Trade in Endangered Species of Wild Fauna and Flora (2024a). The CITES species. Available at https://cites.org/eng/disc/species.php.

CITES, Convention on International Trade in Endangered Species of Wild Fauna and Flora (2024b). eCITES - Introduction. Available at https://cites.org/eng/prog/ecites/introduction.

CNN (2022). Anvisa mantém proibição da venda de cigarros eletrônicos no Brasil. Available at https://www.cnnbrasil.com.br/saude/anvisa-mantem-proibicao-da-venda-de-cigarros-eletronicos-no-brasil/.

Department of Transport (2023). Zero Emission Vehicles Ireland: Information for public sector bodies. Available at www.gov.ie/en/publication/4c6fc-zero-emission-vehicles-ireland-information-for-public-sector-bodies/.

G1 (2022). Ponte da Amizade tem movimento diário de aproximadamente 41,2 mil veículos, aponta estudo. Available at https://g1.globo.com/pr/oeste-sudoeste/noticia/2022/04/06/ponte-da-amizade-tem-movimento-diario-de-aproximadamente-412-mil-veiculos-aponta-estudo.ghtml.

DG MOVE, Directorate-General for Mobility and Transport (2024). Clean Vehicles Directive. Available at https://transport.ec.europa.eu/transport-themes/clean-transport/clean-and-energy-efficient-vehicles/clean-vehicles-directive_en.

DG TAXUD, Directorate-General for Taxation and Customs Union (2024). Carbon Border Adjustment Mechanism. Available at https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en.

EC, European Commission (2020). Circular Economy Action Plan. For a cleaner and more competitive Europe. Available at https://op.europa.eu/en/publication-detail/-/publication/45cc30f6-cd57-11ea-adf7-01aa75ed71a1/language-en/format-PDF/source-170854112.

EC, European Commission (2021a). Carbon Border Adjustment Mechanism: Questions and Answers. Available at https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_3661.

EC, European Commission (2021b). Revised guidance document EU regime governing trade in ivory.

EC, European Commision 2024. Clean Vehicles Directive - European Commission. Available at https://transport.ec.europa.eu/transport-themes/clean-transport/clean-and-energy-efficient-vehicles/clean-vehicles-directive_en.

EIA, Environmental Investigation Agency (2021). EIA launches Global Environmental Crime Tracker. WCO News 96. Available at https://mag.wcoomd.org/magazine/wco-news-96/eia-global-environmental-crime-tracker/.

EU, European Union (2019). Directive (Eu) 2019/1161 of the European Parliament and of the Council of 20 June 2019 amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles.

EU, European Union (2024). Free Trade Agreement between the European Union and New Zealand. 2024/866.

Europol, the European Union Agency for Law Enforcement Cooperation (2022). Environmental Crime. Available at www.europol.europa.eu/crime-areas/environmental-crime.

EU-TWIX, the Europe Trade in Wildlife Information Exchange (2024). The Europe trade in wildlife information exchange (EU-TWIX): a tool to facilitate information exchange on illegal wildlife trade in Europe. Available at www.eu-twix.org.

Fitzgerald, W. B., Howitt, O. J., Smith, I. J., & Hume, A. (2011). Energy use of integral refrigerated containers in maritime transportation. Energy Policy, 39(4), 1885-1896.

Government of Ireland (2023). Climate Action Plan 2023 (CAP2): Changing Ireland for the Better. Available at www.gov.ie/pdf/?file=https://assets.gov.ie/243585/9942d689-2490-4ccf-9dc8-f50166bab0e7.pdf#page=null.

Hall, M. (2015). Exploring green crime: introducing the legal, social and criminological contexts of environmental harm. Palgrave MacMillan; van Uhm, D. P., & Moreto, W. D. (2018). Corruption within the illegal wildlife trade: a symbiotic and antithetical enterprise. The British Journal of Criminology, 58(4), 864–885.

IDB, Inter-American Development Bank (2024). Costa Rica and Panama Inaugurate Innovative Border Crossing Backed by the IDB. Available at www.iadb.org/en/news/costa-rica-and-panama-inaugurate-innovative-border-crossing-backed-idb.

Jordan Customs (2018). Jordan Customs adopts renewable energy solutions. WCO News 85. Available at https://mag.wcoomd.org/magazine/wco-news-85/jordan-customs-renewable-energy/.

Latina Republic (2024). Panama and Costa Rica Inaugurate Integrated Control Center. Available at https://latinarepublic.com/2024/02/21/panama-and-costa-rica-inaugurate-integrated-control-center/.

Lucas, B. (2021). Impacts of trade facilitation on carbon emissions. K4D Helpdesk Report 976. Brighton, UK: Institute of Development Studies. DOI: 10.19088/K4D.2021.039.

MITI, Ministry of Investment, Trade and Industry (2018). National Single Window. Available at www.miti.gov.my/index.php/pages/view/1149.

NOAA, National Oceanic and Atmospheric Administration (n.d.). CITES: Introduction from the Sea. Available at https://media.fisheries.noaa.gov/dam-migration/cites_508.pdf.

OGP, Office of Government Procurement (2023). Electric Cars - EV's (Fleet and Vehicles). Available at www.gov.ie/en/ogp-frameworks/4a10c-electric-cars/.

OLAF, European Anti-Fraud Office (2022). OLAF helps stop over 430 million illicit cigarettes from flooding EU market. Available at https://anti-fraud.ec.europa.eu/media-corner/news/olaf-helps-stop-over-430-million-illicit-cigarettes-flooding-eu-market-2022-02-23_en.

Poder360 (2021). Paraguai produz 7 vezes mais cigarros do que consome e alimenta contrabando. Available at www.poder360.com.br/conteudo-patrocinado/paraguai-produz-7-vezes-mais-cigarros-do-que-consome-e-alimenta-contrabando-em-paises-vizinhos/#:~:text=Uma%20reportagem%20do%20ABC%20Color,apreens%C3%A3o%20de%201%20milh%C3%A3o%20de.

Poutiainen, M. (2015). Managing land borders, the innovative Finnish model. WCO News 76. Available at www.wcoomd.org/-/media/wco/public/global/pdf/topics/wto-atf/dev/managing_land_borders_the_innovative_finnish_model__wco_news_february_2015.pdf?la=en.

Precedence Research (2023). Waste Management Market Size to Reach USD 1985.06 Bn by 2032. Available at https://www.precedenceresearch.com/waste-management-market.

Reedsmith (2021). Five key things about the EU’s Carbon Border Adjustment Mechanism, Available at www.reedsmith.com/en/perspectives/2021/12/five-key-things-about-the-eus-carbon-border-adjustment-mechanism.

Reyna, J., Vadlamani, S., Chester, M., & Lou, Y. (2016). Reducing emissions at land border crossings through queue reduction and expedited security processing. Transportation Research Part D: Transport and Environment, 49, 219–230. https://doi.org/10.1016/j.trd.2016.09.006.

Rukanova, B., Männistö, T., Hintsa, J., Tan, Y., Slegt, M., & Heijmann, F. (2022). A High-Level Framework for Green Customs and Research Agenda. The 23rd Annual International Conference on Digital Government Research. https://doi.org/https://doi.org/10.1145/3543434.3543660.

Rukanova, B., Tan, Y. H., Hamerlinck, R., Heijmann, F., & Ubacht, J. (2021). Digital Infrastructures for Governance of Circular Economy: A Research Agenda. EGOV-CeDEM-ePart-*, 191-198.

Santana, R. (2023). Greening the HS: What are the limits and the alternatives? Presentation at Joint OECD/UNECE Seminar on Implementation of SEEA 13-15 March 2023. Available at https://unece.org/sites/default/files/2023-03/S3_5_Santana-Greening%20the%20HS%20v1.0.pdf.

Simon, J., M. (2019). Illicit trade in waste: it is time to raise the alarm and mobilize. WCO News 89. Available at https://mag.wcoomd.org/magazine/wco-news-89/illicit-trade-in-waste-it-is-time-to-raise-the-alarm-and-mobilize/.

Smarttraveller (2024). Australia's biosecurity and border controls. Available at www.smartraveller.gov.au/while-youre-away/biosecurity-border.

Steenblik, R., P. (2020). Code Shift — The environmental significance of the 2022 amendments to the Harmonized System. International Institute for Sustainable Development (IISD) report.

Stephens, J. (2029). How digitalization combined with artificial intelligence can increase sustainability in global supply chain operations. WCO News 91. Available at https://mag.wcoomd.org/magazine/wco-news-91-february-2020/digitalization-ai-sustainability/.

TCRN, the Costa Rica News (2024). Costa Rica and Panama Will Inaugurate a US$33 Million Border Post. Available at https://thecostaricanews.com/costa-rica-and-panama-will-inaugurate-a-us33-million-border-post/.

TESS, Forum on Trade Environment & the SDGs (2021). The Circular Economy and International Trade: Opportunities for action in the World Trade Organization. Presentation by Christophe Bellmann at the 16th WCO PICARD Conference 9-10 December 2021.

Tulli (2024). The Carbon Border Adjustment Mechanism brings Customs new supervisory duties. Available at https://tulli.fi/en/-/the-carbon-border-adjustment-mechanism-brings-customs-new-supervisory-duties.

UN, United Nations (2022). Green Customs Guide to Multilateral Environmental Agreements.

UNECE, United Nations Economic Commission for Europe (2016). Trade Facilitation Implementation Guide. November 2012.

UNECE, United Nations Economic Commission for Europe (2024) Available at https://uncefact.github.io/spec-untp.

UNEP, United Nations Environment Programme (2016). The rise of environmental crime: A growing threat to natural resources, peace, development and security. Available at

https://wedocs.unep.org/handle/20.500.11822/7662;jsessionid=E2C67B4C603B36B206C7A6B3C7EFC463.

Valente, R. (2020). Receita recorre à doação de empresa de fumo para ter máquina de trituração. Available at https://noticias.uol.com.br/colunas/rubens-valente/2020/12/30/cigarros-equipamentos-doacao-receita-federal.htm.

WCO, World Customs Organization (2021a). What is the Harmonized System (HS)? Viewed 10 February 2021, www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx.

WCO, World Customs Organization (2021b). Handling obsolete NII equipment. WCO News 96. Available at https://mag.wcoomd.org/magazine/wco-news-96/handling-obsolete-nii-equipment/.

WCO, World Customs Organization (2022). Amendments effective from 1 January 2022. Available at https://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/hs-nomenclature-2022-edition/amendments-effective-from-1-january-2022.aspx.

WCO, World Customs Organization (2023). Study Report - Transition to a circular economy and implications for Customs administrations. Available at www.wcoomd.org/-/media/wco/public/global/pdf/topics/research/report/circular-economy-report-en.pdf.

WCO, World Customs Organization (2024). Environment Programme. Available at www.wcoomd.org/en/topics/enforcement-and-compliance/activities-and-programmes/environment-programme.aspx.

WCO, World Customs Organization. Green Customs Action Plan (n.d.). Available at https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/key-issues/green-customs/gcap-public.pdf?la=en.

WPG, Wise Persons Group on Challenges Facing the Customs Union (2022). Putting More Union in the European Customs — Ten proposals to make the EU Customs Union fit for a Geopolitical Europe. Report by the Wise Persons Group on the Reform of the EU Customs Union. Available at https://taxation-customs.ec.europa.eu/document/download/e5326383-2e8d-4d0e-9025-ddf262e9df6e_en.

WTO, World Trade Organization (2024). Trade Facilitation Agreement Database. Measure 7.9 - Perishable goods. Available at https://tfadatabase.org/en/tfa-text/measure/23.

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