World Customs Organization

STUDY REPORT

Transition to a circular economy and implications for Customs administrations

wcoomd.org

Study Report - Transition to a circular economy and implications for Customs administrations

JUNE 2023

World Customs Organization

Foreword by the Secretary General

After the Second World War – in 1950 – Customs representatives from 13 countries met in Brussels to sign the Convention establishing the Customs Co-operation Council, i.e. the World Customs Organization (WCO), in the belief that the harmonization of the Customs-related procedures and rules applied by governments would benefit international trade. Within the WCO, Customs have done their part to make globalization a force for peace and development through trade, setting standards that facilitate the movement of goods along ever longer and more complex value chains, while contributing to State budgets and combating illegal trafficking.

Globalization has developed according to the economic model of "take-make-waste". This model is no longer sustainable and its negative effects on the environment call for major changes in our economic paradigms. Among these, the transition to a circular economy is now being advocated by many governments and environmental actors as the only possible option for containing climate change within acceptable limits for life. This new model aims to recycle and reuse products as much as possible, thus reducing waste and minimizing the use of resources.

The transition to a circular economy is now being advocated by many governments and environmental actors as the only possible option for containing climate change within acceptable limits for life.

What implications will these changes in economic model have for the modalities of international trade and for the role and practices of Customs? The WCO has made environmental concerns one of the priorities of its Strategic Plan 2022-2025. This Study Report provides an overview of the implications of a circular economy for Customs. It would be presumptuous, at this stage, to attempt to predict with precision the economic and regulatory trajectory of the transition to a circular economy. The Report explores the economic and legal dimensions, and attempts to anticipate the adaptations that Customs will face in the near future. As you will see, the challenges are numerous – knowledge being at the forefront of them. Although climate change has become a scientific truth, scientific knowledge about the "how" and the effects of the transition to a circular economy is still under construction. I therefore invite Customs to take up the issues and join forces with each other, and with researchers, to address the issue of how to regulate international trade and taxation in the new context of the circular economy that is emerging.

More than 70 years after the creation of our Organization, the planet itself is under threat. The Members of the Organization are all facing the same uncertainties of the Anthropocene – the most recent period in Earth's history, when human activity has started to have a significant impact on the planet's climate and ecosystems. We therefore have every reason to get to work, but we also have every reason to be optimistic: we are no longer 13, but 185, and the societies for whose benefit we work expect rapid solutions.

Dr. Kunio Mikuriya
WCO Secretary General

Executive Summary

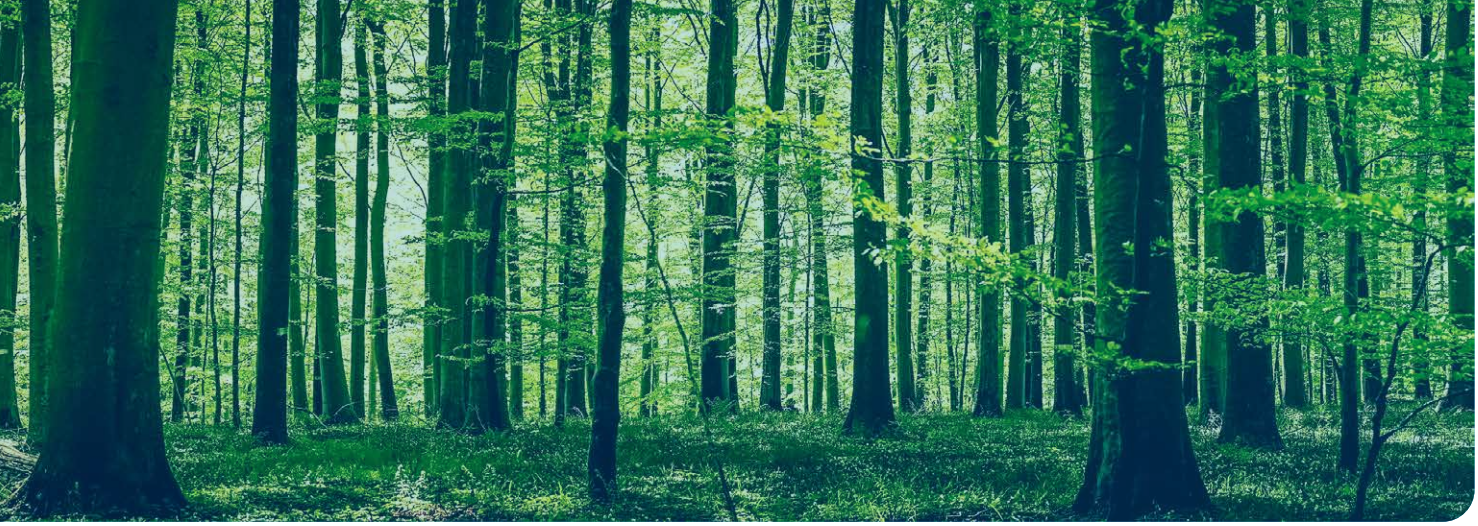
Waste pollution is an important matter for the environment. Part of the environmental problem stems from the high impact of the current world economy, based on a linear "take-make-waste" trend which leads to massive flows of produced and consumed materials and products which do not find their way back into the economy. As a response to the global challenges, the circular economy (CE) approach is often advocated as a suitable tool or means to reverse linear trends of production and consumption. This business approach is intended not only to support environment protection, but also to create new economic value opportunities across industries, involving the redirection of these flows into global supply chains.

The current economy is built mainly on the traditional linear economic model, arising out of an industrial set-up which has its roots in the 17th Century. This model typically assumes that production processes should follow a linear trend ("take-make-waste"), and ignores the adverse effects of materials use and product consumption on the environment. In contrast to the current linear economy, the circular economy approach could be viewed as a more efficient tool for supporting environmental protection. Instead of assuming that wastes are worthless, the circular economic model can enable the transformation of waste or parts of end-of-life products into inputs, to create additional economic value and close certain loops in the production system.

This WCO-led study aims to take stock of all available evidence and of the necessary knowledge in order to highlight the cross-border challenges and opportunities of a transition to a circular economy as currently understood. Increasing knowledge about the circular economy is key to understanding how Customs administrations may respond to the transition.

- Basic knowledge in this new field may typically include the definition of what the term "circular economy" exactly means, as well as existing differences between a linear and circular economy, legal considerations around materials and products in circulation within and outside the border in a circular economy, and the progress status of national and regional transitions.
- In addition, most economies today fall somewhere between a linear and a circular economic model. More and more governments have implemented policies to support the circular economy approach. Currently, there are more than 520 policies and regulations already promoting circular economy goals at the national or regional level. This trend reflects the growing awareness of a number of countries regarding the transition to a circular economy.
- Beyond these policy trends, there are likely to be a multitude of possible responses to the circular economy at the national level, closely related to the balance between the protection of national economic interests and environmental protection.
- Updating changes in the monitoring of the transition to a circular economy is of primary importance for Customs. This highlights the importance of tracking the flows of circular economy goods and developing more exhaustive practical knowledge about the trade-offs between benefits and risks during the transition. While the potential offered by international trade is often viewed as a "tool" or an enabler for globalizing a circular economy, the proliferation of circular economy policies may also have uncertain effects on future trade. The critical point is to understand the potential trade-off between the benefits and risks involved, throughout the transition process.

Given the global trend in circular economy policies, the trade community is also increasingly interested in the role of trade agreements in this transition. In a circular economy, the trading opportunities in reverse supply chains (trading in waste for recycling, refurbishment and remanufacturing, reuse and repair) are considered



to increase. As various Multilateral Environmental Agreements (MEAs) are related to trade in reverse supply chains, Customs administrations – as the gatekeepers responsible for enforcing laws and regulations at borders – must have a deep understanding of some key MEAs to enforce them effectively. In addition to MEAs, an increasing number of Regional Trade Agreements (RTAs) incorporate environmental provisions, some of which affect the operations of Customs administrations.

Data and statistics are often viewed as key enablers in the transition to a circular economy, but there are significant data gaps that can prevent the implementation of a circular economy in practice. This Report takes stock of current knowledge and recent evidence to highlight possible upcoming data challenges in the transition from a national to a global circular economy. The monitoring of a circular economy is something new for many countries in transition, and there are still important data gaps – notably for trade involved in a circular economy. Data concerning the circular economy should be available, accurate and accessible. Digitalization is emerging as an enabler for the transition to a circular economy, and for Customs the growing use of disruptive technologies can represent an opportunity to increase the visibility of circular economy goods across borders. Under this trend, Customs administrations would become big users of the relevant data for their activities regarding the control and facilitation of circular trade. In particular, Customs could respond to the growing data challenges posed by the transition to a circular economy by : (i) increasing the focus on HS codes to drive data harmonization, (ii) embracing Customs digitalization and the use of disruptive technologies, (iii) rethinking data analytics for Customs, and (iv) reflecting on how to accomplish data sharing in a circular economy.

Customs administrations might find themselves in a difficult position in a circular economy, as they will need to facilitate trade in reverse supply chains due to increased trading opportunities, while at the same time effectively detecting and preventing waste crime, the opportunities for which will increase. Regarding facilitation, one of the challenges in transitioning to a circular economy is addressing inefficiencies in the prior informed consent (PIC) process under the Basel Convention. This challenge could be tackled by clarifying the scope and definition of waste and by digitalizing the procedures. Additionally, Customs procedures (such as HS codes, valuation, rules of origin, AEO and treatment of remanufactured goods) offer various challenges and opportunities, as they have not necessarily been developed to address a circular economy. Facilitation and enforcement are interdependent. Waste crime can include actions such as illegal dumping, mislabelling or falsifying documents, and the unlawful export or import of waste. To combat waste crime, the WCO has supported its Members through various programmes, such as Operation DEMETER, and will continue to do so. Cooperation between Customs administrations and environmental agencies at both domestic and international level is essential to combating waste crime.

The last part of this Report examines attempts to address these challenges through case studies, in order to seek possible solutions for Customs administrations. The first case study examines the North American Notice and Consent Electronic Data Exchange (NCEDE), which is the most advanced digitalized system currently in place and serves as a model solution. The second and third case studies are based on interviews with the Customs administrations of Indonesia and Belgium, respectively. These case studies examine the solutions used by those administrations and their attempts to address the challenges identified. The final case study examines the Green Trade Strategy implemented by United States Customs and Border Protection (U.S. CBP); this is the first comprehensive strategy for sustainable trade to be introduced by a Customs administration.

Abbreviations

ACE	Automated Commercial Environment
AEO	Authorised Economic Operator
AES	Automated Export System
AI	Artificial intelligence
APPWP	Asia-Pacific Plastic Waste Project
ASEAN	Association of Southeast Asian Nations
ATAG	Air Transport Action Group
AWGCW	ASEAN Working Group on Chemicals and Waste
BRS	Basel, Rotterdam and Stockholm
C2C	Cradle-to-Cradle
CA	Competent Authority
CBM	Coordinated Border Management
CE	Circular Economy
CECWG	Customs Enforcement and Compliance Working Group
CBP	Customs and Border Protection
CFC	Chlorofluorocarbons
CITES	Convention on International Trade of Endangered Species
CO_2	Carbon dioxide
CTA	Committee on Trade and Environment
CTC	Change of tariff classification
CTPAT	Customs-Trade Partnership Against Terrorism
DPP	Digital Product Passport
EC	European Commission
ECCC	Environment and Climate Change Canada
EDI	Electronic Data Interchange
EFTA	European Free Trade Association
ELV	End-of-Life Vehicle
EPR	Extended Producer Responsibility
ESG	Environmental, Social and Governance
EU	European Union
EV	Electric vehicle
FTA	Free Trade Agreement
G7	Group of Seven
GATT	General Agreement on Tariffs and Trade
GBA	Global Battery Alliance
GCI	Green Customs Initiative
GHG	Greenhouse gases
GPAP	Global Plastic Action Partnership
GTIN	Global Trade Item Number
HCFC	Hydrochlorofluorocarbons
HFC	Hydrofluorocarbons
HS	Harmonized systems
IATA	International Air Transport Association
ICC	International Chamber of Commerce
IMF	International Monetary Fund
IoT	Internet of Things
ISPO	Indonesia Sustainable Palm Oil
ISRI	Institute of Scrap Recycling Industries
LED	Light-emitting diode
LMICs	Low- and middle-income countries
MEA	Multilateral Environmental Agreement
MSME	Micro, Small, and Medium Enterprises
Mt	Metric tonne
NAAEC	North American Agreement on Environmental Cooperation
NAFTA	North American Free Trade Agreement
NCEDE	Notice and Consent Electronic Data Exchange
NGOs	Non-Governmental Organizations
ODS	Ozone-depleting substances
OECD	Organisation for Economic Co-operation and Development
PET	Polyethylene terephthalate
PIC	Prior Informed Consent
POP	Persistent Organic Pollutants
RTA	Regional Trade Agreement
SDG	Sustainable Development Goals
TESSD	Trade and Environmental Sustainability Structured Discussions
TRQ	Tariff Rate Quotas
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNEA	United Nations Environment Assembly
UNECE	United Nations Economic Commission for Europe
UNIDO	United Nations Industrial Development Organization
UNEP	United Nations Environment Program
UNODC	United Nations Office on Drugs and Crime
USD	United States dollar
WBCSD	World Business Council For Sustainable Development
WCO	World Customs Organization
WEF	World Economic Forum
WIETS	Waste Import Export Tracking System
WSR	Waste Shipment Regulation
WTO	World Trade Organization
WWF	World Wide Fund

Table of Contents

Foreword by the Secretary General 5

Executive Summary 6

Abbreviations 8

Chapter 1. Introduction to the circular economy: what Customs should know 10

1. Key concepts surrounding the circular economy 12
2. Policy and economic trends for the transition to a circular economy 17
3. Challenges for Customs in the circular economy 22

Chapter 2. The Multilateral Environmental Agreements and a circular economy: repositioning the role of Customs administrations at the border 30

1. Recent developments in Multilateral Environmental Agreements (MEAs) related to a circular economy 31
2. Regional Trade Agreements (RTAs) and a circular economy 33
3. MEAs and HS codes 36

Chapter 3. Data as a challenge for Customs and policy-making in the circular economy 42

1. Data gaps are a major obstacle to a circular economy 44
2. Five global challenges in the context of trade data 46
3. Where Customs can/need to play a role 48

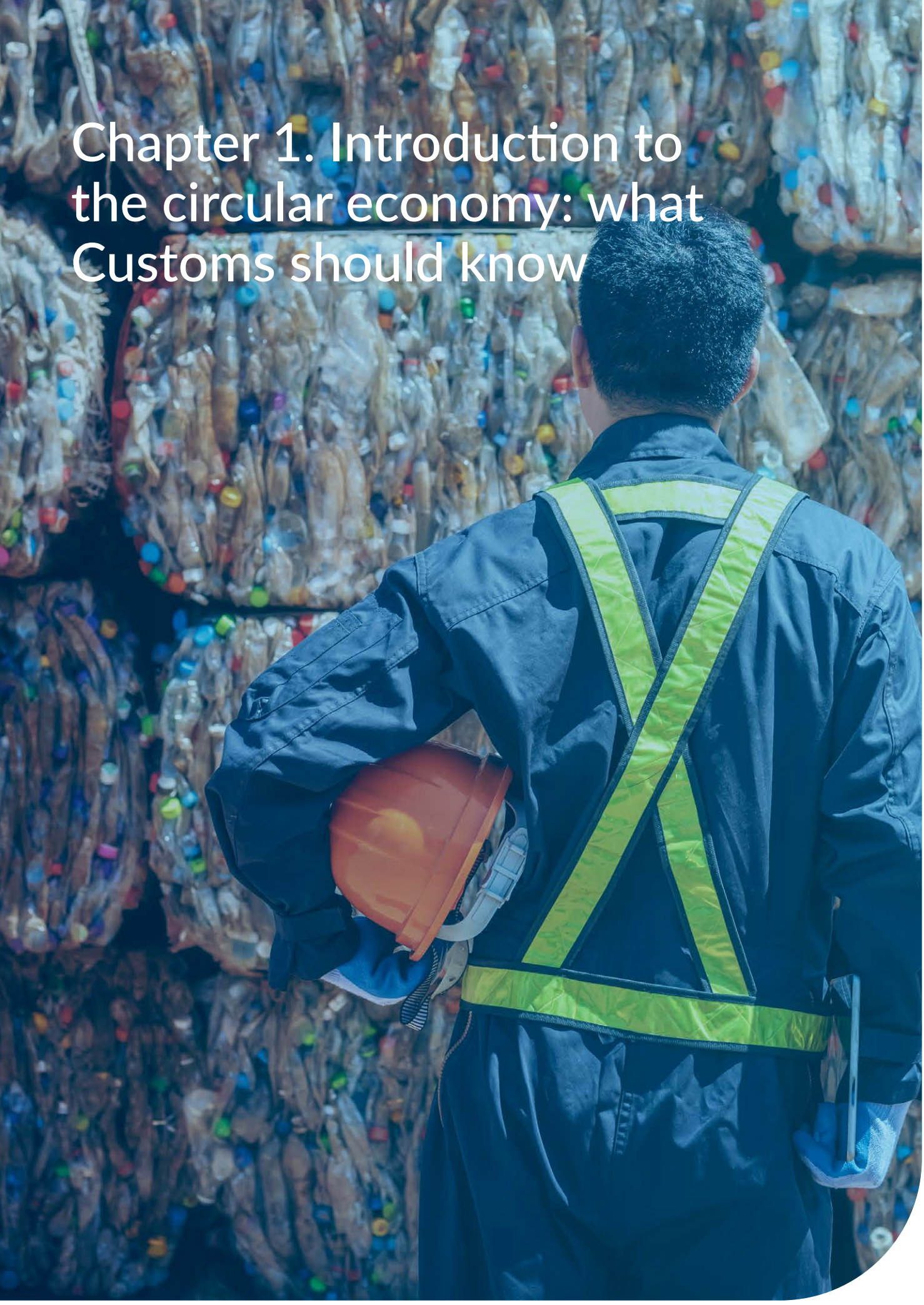
Chapter 4. Complexity of procedures and enforcement relating to waste crime – a second challenge for Customs administrations 68

1. PIC procedure of the Basel Convention and a circular economy 69
2. Customs procedures which need to be considered towards a circular economy 72
3. Circular economy and waste crime 77
4. Cooperation between Customs administrations and environment agencies 80

Chapter 5. Case Studies: Solutions for Customs administrations on the ground ... 86

1. North American Notice and Consent Electronic Data Exchange (NCEDE) 87
2. Indonesia 88
3. Belgium 91
4. United States: Green Trade Strategy 94

Chapter 1. Introduction to the circular economy: what Customs should know



The current world economy is exceeding many global boundaries (Rockström et al., 2009). Since 2017, world consumption of materials has reached an exceptional peak of 100 billion tonnes (Circle Economy, 2021). Recent evidence highlights their global impact on society once they have been used. Around 242 million tonnes of plastics waste are generated each year (Kaza et al., 2018), 79% of which is landfilled (Geyer, Jambeck and Law, 2017). Mining wastes are still growing, standing at over 100 billion tonnes (Charpentier Poncelet et al., 2022). 92 million tonnes of textile wastes from the fashion industry are either incinerated, disposed of or exported to developing countries (Niinimäki et al., 2020). Therefore, waste pollution can entail significant economic and environmental costs, estimated in 2020 to be over USD 21 billion for marine plastics pollution alone (McIlgorm et al., 2022).

Each material extracted and product created has a limited life span before being destined to become waste. Few of them are getting back into the economy, leaving many loops open and leading to "leakages", one cause of waste pollution. Waste leakage can be described as the quantity of wastes leaving the human-controlled environment and entering the natural environment (Kounina et al., 2023) through littering, intentional or illegal dumping, accidental release, or improperly managed landfills.

In response, **circular economy (CE) models have emerged as a concrete alternative to most current wasteful economies. They can enable the creation of considerable economic value by using wastes, not only through consumption, and can also delay the end of life of a product, mitigating the detrimental effect of materials overconsumption.**

A circular economy is typically intended to have a twofold benefit: to decrease waste pollution until its ultimate elimination, and to lower supply chain risks such as supply shortages on imported raw materials . The CE transition could generate substantial economic gains, running into USD 4.1 trillion in the world economy (Accenture, 2015) and USD 965 billion a year in European Union countries alone (Ellen MacArthur Foundation, 2016). Despite the potential, the world economy transition is currently moving in the wrong direction, where few resource flows cycled back into the economy slowing from 9.1% in 2018 to 8.6% in 2020 (Circular Economy, 2022).

National borders are one major strategic issue in a circular economy transition. The threat of waste pollution is a transboundary concern that ignores sovereign borders (WCO, 2023). **Every day, thousands of tonnes of hazardous and non-hazardous wastes are exchanged between countries, with possible environmental and public health risks. Customs are at the forefront to control, monitor and facilitate legitimate waste trade, but also to fight against waste crime** (WCO, 2020).

The CE transition could bring important disruptions to the current global economy, described as "circular disruptions" (Kirchherr et al., 2022). Current supply chains, between 50% and 70% of international trade, are global drivers of waste leakages. Apparel supply chains, for instance, can leak up to 61 million tonnes of plastics to the environment a year (Kounina et al., 2023). The transition could reconfigure the entire supply chain, although it is still critical to clarify possible impacts.

In the transition to a circular economy, implications for Customs is one research area that has been often overlooked. To fill this gap, Chapter 1 outlines insights for the Customs community on what they should know about the circular economy. Section 1.1 clarifies the concept and the different levels of understanding between stakeholders. Section 1.2 helps to identify the possible links between circular economy policy and trade, and how these links translate into practice. The last section sets out why, and to what extent, a transition to a circular economy could get Customs involved.

1. Key concepts surrounding the circular economy

1.1. Definitions of a circular economy

First, a circular economy should be viewed as an evolving concept. **A recent count of circular economy definitions identifies more than one hundred** (Kirchherr et al., 2017). This concept may represent a significant and necessary change in current society (Prieto-Sandoval et al., 2018), along with current waste management and environmental protection.

The meaning of this concept may be described in broad terms (Stahel, 2016) as follows:

"a Circular Economy would turn goods that are at the end of their service life into resources for others, closing loops in industrial ecosystems and minimizing waste. It would change economic logic because it replaces production with sufficiency: reuse what you can, recycle what cannot be reused, repair what is broken, remanufacture what cannot be repaired."

What exactly a circular economy entails may be open to current concept debate. The term can be difficult to define in terms of fields such as science, business or politics (Geissdoerfer et al., 2017). Many examples of definitions among academics, international organizations and NGOs demonstrate how the same concept could be interpreted in various ways (Table 1.1). At the same time, **no clear consensus among scientists, engineers, economic operators and governments has yet emerged on how to implement a circular economy in an efficient way** (Reike et al., 2018; Laurenti et al., 2018).

Besides concept considerations, a circular economy should be understood as having effects on the circulation of goods during their life-cycle. Practically all products and virgin materials used in society could be affected by circular transformations more than once. After their first life, these goods can be redirected towards any sector of the economy (primary/secondary/tertiary), with circularity potential to serve the same or another end use, that is, intermediate goods, capital goods or consumption goods.

A traditional focus of the circular economy is "**Recycle**", "**Reuse**", "**Reduce**", known as the "3 Rs". There is a broad consensus around 3 Rs policy implementation in the field of waste management, such as in China, Japan and Thailand (Boonchit, 2020; Kirchherr et al., 2017). Under the 3 Rs, inputs of virgin materials, and waste losses from the production process, should be diminished as much as possible ("reduce"). Products and their parts could be directly redirected in the production process for similar or different uses ("reuse"). Part of an end-of-life product can serve as materials and should be melted down to create a new product ("recycle").

Beyond the 3 Rs, a number of best practices could also be considered in a more circular economy. These cover "**Recover**", "**Recycle**", "**Repurpose**", "**Remanufacture**", "**Refurbish**", "**Repair**", "**Reuse**", "**Reduce**", "**Redesign**"/ "**Rethink**", and "**Refuse**" (Annex 1.2), known as the "9 Rs" (Potting et al., 2017). In contrast to the 3 Rs, the importance of all these practices has not been officially recognized by any governments (Barrie et al., 2022), but they could be viewed by supply chain actors as tools to expand the scope of circularity potentials (Potting et al., 2017).

The first group of best practices, "recover-recycle-repurpose", focuses on the waste management already being widely practised in certain industries. A recent study shows, for example, that 86% of end-of-life tyres were recovered in 45 countries, representing over 80% of the world's vehicles in use (WBCSD, 2019). The second group, "remanufacture-refurbish-repair", includes more desirable options to extend the lifespan of products and their parts. One study reports that remanufactured alternators and starters can require 14% of the energy and 12% of the material necessary for the production of new ones (Steinhilper, 1998).

Table 1.1. Selected examples of circular economy definitions

Stakeholder	What does circular economy mean?	Source/Year
NGOs/ Foundations	A system that is restorative and regenerative by design, one that builds economic, natural and social capital with the goal of decoupling global economic development from finite resource production through technical and biological cycles.	Ellen MacArthur Foundation (2012)
	An evolution of the way the world produces and consumes both goods and services. The circular model redefines the economy around principles of designing out waste and pollution, keeping products and materials in use for as long as possible. Equally vital is restoring the world's wilderness, building regenerative agricultural systems, using renewable materials, and shifting to renewable energy sources.	Chatham House (2021)
Academics	A regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling.	Geissdoerfer et al. (2017)
	An economic system that is based on business models which replace the "end-of-life" concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks[1]) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations.	Kirchherr et al., 2017
International Organizations	Key features of a circular economy are characterized by increased product repair and remanufacture, increased material recycling, more robust long-lived products through design, increased produce re-use and repair, increased material productivity, improved asset utilization, and modified consumer behaviour.	OECD, McCarthy et al. (2018)
	Markets that give incentives to reusing products, rather than scrapping them and then extracting new resources. In such an economy, all forms of waste, such as clothes, scrap metal and obsolete electronics, are returned to the economy or used more efficiently. This can provide a way to not only protect the environment, but use natural resources more wisely, develop new sectors, create jobs and develop new capabilities.	UNCTAD (N.A.)
Governments	An economy where the value of products, materials and resources is maintained for as long as possible, and the generation of waste minimizes.	European Union (2015)

(Source) Author's compilation

The last group of best practices, "reuse-reduce-redesign/ rethink-refuse", could enable smarter and durable use of products (Reike et al., 2018; Kirchherr et al., 2017). Some recent innovations in the redesign of lighter tyres make it possible to avoid safety problems and save energy (Araujo-Morera et al., 2021). Although all these options are widely preferable to landfill disposal, some of them could generate large value creation and positive environmental outcomes (Reike et al., 2018).

The large-scale implementation of the circular economy approach involves a systematic change from economic operators, industries and countries on the ground. Different layers of society may be subject to changes at the macro level (nations), meso level (e.g. eco-industrial

1 Eco-industrial parks can also include special Customs zones.

parks, including free zones) and micro level (product/company). To scale up a circular economy, these changes should take a holistic approach (Linder et al., 2017; Fang et al., 2007) to ensure that a host of intended benefits could be attained.

Box 1.1. Definitions of concepts lose to a circular economy

The circular economy concept has strong connections with other concepts, such as "Cradle-to-Cradle", "Green Economy" and "Industrial System", that need to be clarified.

Cradle-to-Cradle (C2C) means that a product is designed so that its materials and components can be repurposed or recycled indefinitely (McDonough and Braungart, 2002). A circular economy is particularly built on this concept (Linder et al., 2017) and may be thought to encompass closed supply chains, regenerative design and reverse logistics (Ekins et al., 2019). C2C has been formalized into a product certification standard[2] covering around 391 certified products by 187 manufacturers worldwide (Ünal and Shao, 2019).

Green Economy is defined as "a system of economic activities related to the production, distribution and consumption of goods and services that result in improved human well-being over the long term, while not exposing future generations to significant environmental risks and ecological scarcities" (UNEP, 2012). The main difference could be that the focus of a circular economy is at the product level, to transform resources so that environmental effects can be balanced, while a green economy is explicitly intended to achieve progress towards sustainable development (Santeramo, 2022).

Industrial Ecology refers to the study of material and energy flows through industrial systems to optimize the total materials cycle from virgin material to finished material, to component, to product, to waste product, and to ultimate disposal. The focus of industrial ecology is on creating synergy among the organizations for the reuse of industrial wastes, while a circular economy concentrates on extending the product life-cycle using different strategies.

(Source) Author's compilation of the concept literature

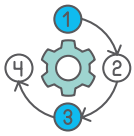
1.2. Differences between a linear economy and a circular economy

A circular economy could differ from today's economy in many ways, some of which are key to gaining a better understanding of possible changes in society. The current economy is mainly built on the traditional linear economic model (Table 1.2), stemming from an industrial process since the 17th century (Tudor, 2021). This model typically assumes that the production process should follow a linear trend ("take-make-waste"), and ignores the adverse effects of material use and product consumption on the environment (Prieto-Sandoval et al., 2018).

The linear economy should be understood as being purely market-oriented, with a major focus on value creation from new products that are more and more complex and increasingly wasteful. The production system operates in open loops, where wastes streams are leaked along the entire process or directed to landfill disposal at the end. This means that materials and products are only considered for a one lifetime use. This trend is exacerbated by planned obsolescence, whereby products such as smartphones and computers have a deliberately short lifespan, rapidly become obsolete and generate increasing waste.

2 More details about the C2C product certification standard can be found at https://c2ccertified.org/certified-products-and-materials.

Table 1.2. Differences between a linear economy and a circular economy

Linear Economic Model		Circular Economic Model
Features of a linear economy: - Take-Make-Waste - Purely market-oriented approach:[3] unlimited consumption growth - Worthless waste - Little or no consideration of limited capacity of the environment		**Features of a circular economy:** - Reduce-Reuse-Recycle (3Rs) → 9 Rs - New market approach: separating growth from material consumption - High-value waste - Emphasis on the fight against waste pollution and on biodiversity protection
Open-loop cycle: - Create value only by producing as many new products as possible - Wastes streams are typically leaked and or directed to landfill disposal (input, output, waste)		**Closed-loop cycle:** - Create value by transforming waste into inputs - Waste streams are redirected into the production process (ultimately to zero waste)
Focus area at the product level: - One lifetime use of materials and products		**Focus area at the product level:** - Multiple lifetime use of materials and products
Practical challenges: - Planned obsolescence:[4] products become obsolete faster, culture of wastefulness, leading to increased e-waste from smartphones and computers with a short lifespan - Import/use of virgin materials: minerals and other natural resources (primary resources) extracted or from an origin country		**Practical challenges:** - Life-cycle approach: to keep products as long as possible, contrary to planned obsolescence - Use of secondary materials: to promote more substitution from virgin materials to secondary materials
Risks: Increased waste leakages along global supply chains, with high CO_2 impacts and high waste generation[5] that could be prevented		**Risks:** Perverse effects of Rs practices: for instance, recyclable clothes waste or second-hand cars could represent larger risks to the environment in a destination country with limited recycling capacities or an ageing vehicle fleet

(Source) Author's compilation based on the literature review

Contrary to the current linear economy, the circular economy approach could be viewed as a more efficient tool to support environmental protection (Millar et al., 2019). **Instead of assuming that wastes are worthless, the circular economic model can enable the transformation of waste or parts of end-of-life products into inputs, to create additional economic value and close certain loops of the production system** (Table 1.2). At the same time, a circular economy should not be viewed as being a perfect economic model. Not all circular transformations necessarily lead to net positive economic and environmental outcomes (for example, there may be waste leakages due to illegal trade), although they can still provide a more suitable alternative than the current linear practices (Korhonen, Honkasalo, and Seppälä, 2018).

1.3. Legal considerations in a circular economy

Most economies today fall somewhere between a linear and a circular economic model. More and more governments have implemented policies to support the

3 The linear business trends were amplified by various factors, among them, demographic growth, and changes in consumer lifestyle attitudes towards fast, cheap and new consumption (Ellen MacArthur Foundation, 2020).

4 Planned obsolescence is one of the undesirable outcomes of the linear economy and directly contradicts the circular economy concept (Malinauskaite et al., 2021).

5 Recent evidence suggests that supply chains are responsible for over 70% of air pollution due to trade. Food supply chains generate 6% of the world's greenhouse gas (GHG) emissions due to food losses (Poore and Nemecek, 2018), representing around three times the air pollution emitted by commercial aviation each year (ATAG, 2020).

circular economy approach, which can be described as a transition process between the two economic models. Therefore, the current industrial economy can be seen as a starting point, while the circular economy is destined to become the finish line as circular transformations progress across industries.

The evolution of legal frameworks from a linear economy to a circular economy is a critical point in this transition. Government support and legislation are widely recognized as key enablers for a circular economy (Moktadir et al., 2020). The lack of broad consensus around the circular economy concept may also have resulted in varying legal interpretations in national laws (Hoernig, 2022; Mikichurova and Vlialko, 2021). In different world regions, some legal definitions have emerged about recognition of the circular economy concept and its close affiliates (such as wastes and non-wastes (Box 1.2)), but are still being updated (Lesniewska and Steenmans, 2023; Barrie et al., 2022).

A practical challenge in this transition could be to clarify the legal status of a good affected by a circular transformation, as well as the possible differences in legal considerations with an alternative new good. involved in a linear economy and those resulting from the circular economic approach. It is critical to address emerging concerns, such as differences between waste and by-products (non-waste), the formal recognition of Rs practices, and competition law issues, in order to avoid the risk of legal uncertainty concerning end-of-waste status (Hoernig, 2022).

Box 1.2. Waste definition as part of the change

The legal definition of waste is central in the context of circular economy transition (WCO, 2023), as wastes can serve as key inputs for various circular transformations (Rs). A concern may be the ambiguity introduced by an intermediary situation, from a linear to a circular economy. New questions about waste definition arise, along with potential changes in waste laws (Backes, 2017). A first legal consideration may be whether waste legislation should be replaced by new legal standards on materials and products (Lesniewska and Steenmans, 2023). This could involve clarifying the difference between a waste and a by-product, and when the qualification as waste ends.

A waste can be defined as material that is disposed of, intended to be disposed of or required to be disposed of, as reflected in the EU's Waste Framework Directive (2008/98/EC) and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. In a circular economy, however, a waste should typically not be disposed of, and there should be no intent to dispose of it. From this perspective, the intent would be to reuse, to recycle, or recover the material or substance (Lesniewska and Steenmans, 2023). The intended use of waste could still be difficult to determine in the context of differentiating waste streams directed to disposal from those redirected into a circular production process.

The case of Germany can provide further insights to answer these questions by formalizing a clear distinction between "unrecoverable waste" and waste as a valuable resource. According to the German Circular Economy Act, waste corresponds to "any object, material, substance, or element resulting from the consumption or use of a good in domestic, industrial, commercial, institutional, or service activities, that is abandoned or rejected, but that is susceptible to the use or transformation of a new good, with economic value or final disposal" (Circular Economy Act, 2012). Otherwise, unrecoverable waste refers to that which cannot become a valuable resource.

In the United States, the Environmental Protection Agency revised in 2018 regulations associated with the definition of solid waste under the Resource Conservation and Recovery Act. As part of these revisions, the "waste" category excludes manufacturing residuals that would return in a closed loop to production (Stanislaus, 2019). At the same time, updated requirements are also applied to recyclers to safely manage against risk of fires, explosions, accidents and release of hazardous materials.

(Source) Author's compilation from the legal literature

2. Policy and economic trends for the transition to a circular economy

2.1. National transition to a circular economy

The transition to a circular economy might have important policy and economic implications at the global level. Today, over 520 policies and regulations already promote circular economy goals at the national or regional level (Barrie et al., 2022), with nearly half of them dedicated to improving waste management and recycling activities. This trend reflects the growing awareness of a number of nations of the transition to a circular economy. Overall, more and more countries are proposing circular economy laws that address how to move away from a traditional industrial economy.

Each country, in practice, may have a different understanding of the circular economy concept, which in turn can be translated in multiple ways into policy implementation areas. The circular economy policy trajectories of China and the European Union are an example (McDowall et al., 2017). Chinese policies are primarily designed to better align industrial growth with environmental and social concerns, while EU policies aim to increase economic competitiveness and innovation, while pursuing environmental goals. Another key feature of various circular economy approaches is the central importance of product design in the EU and eco-industrial parks in China.

The traditional circular economy approach focuses the spotlight on the importance of the 3 Rs (Reduce-Reuse-Recycle) strategies[6]. A handful of nations, such as Germany, Japan and Sweden, have pushed legislation towards waste reduction and recycling programmes (Lee et al., 2015). In 2008, China was one of the first to integrate the circular economy concept into circular economy legislation, using a top-down approach from the central government to provinces, cities and factories, through setting 3Rs targets (Bleischwitz et al., 2022; Feng and Yan, 2007). The European Union, Japan and the United States have adopted a bottom-up approach to design environmental and waste management (Ghisellini et al., 2016), driven by initiatives from NGOs.

More recently, a new focus for business and policy areas has emerged to promote more circular practices for new technologies. A good example is the development of new regulations for recycling electric vehicles (Richter, 2022), led by the EU, Japan,[7] and China (Zeng et al., 2022). The national transition to a circular economy can also be driven by several **regional strategies or initiatives**. Since 2021, ASEAN countries have adopted the Framework for Circular Economy to support their transition.[8] The African Circular Economy Alliance provides support in designing country-specific circular economy roadmaps across African countries.

Policy regulation for the transition to a circular economy can be voluntary or through enforcement mechanisms. **Enforcement regulations** can be seen as one of the main drivers to mainstream circular strategies at the macro level (Lieder and Rashid, 2016), while other approaches to circularity can emanate from industry, such as Cradle-to-Cradle product certification standards (Box 1.1) at the micro or meso level. In the case of Extended Producer Responsibility[9] (EPR) policy, the use of these programmes has emerged as being more mandatory than voluntary through its adoption in the legislation, and allows for the reconfiguration of reverse logistics for specific products, such as computers and televisions (OECD, 2016). Germany is one of the first European countries to implement circular economy practices on solid wastes, under the EPR.

2.2. Potential role of international trade

Given the global trend in circular economy policies, the trade community is increasingly interested in the role of international trade in this transition. **The potential of international trade is often viewed as a "tool" or an enabler on how to globalize a circular economy** (Geng et

6 It is important to note also that the importance of 9Rs practices ("Recover", "Recycle", "Repurpose", "Remanufacture", "Refurbish", "Repair", "Reuse", "Reduce", "Redesign"/"Rethink", and "Refuse") has not been officially recognized by any governments (Barrie et al., 2022)".

7 Japan has e-waste management laws that make manufacturers and retailers responsible for taking back used home appliances, recycling them, and publishing the costs of recycling (World Bank, 2020).

8 The "Framework for Circular Economy" comprises 5 priorities: Standard Harmonization and Mutual Recognition of Circular Products and Services; Trade Openness and Trade Facilitation in Circular Goods and Services; Enhanced Role of Innovation, Digitalization, and Emerging/Green Technologies; Competitive Sustainable Finance and Innovative ESG Investments. ASEAN's transition towards a circular economy hinges on these five Strategic Priorities. https://asean.org/asean-adopts-framework-for-circular-economy/

9 Under EPR policy, the producer's responsibility is organized at sectoral level and the costs for the collection and recycling are shared among the participating companies, based on the amount of products put on the market (Milios, 2017).

al., 2019; Tammimen et al., 2020). It can play a central role in accelerating a circular economy transition, to enable an access to global value chains, where the flows of end-of-life materials/products can be better connected with circular infrastructures (e.g., recycling facility).

In particular, trade in this transition can provide potential opportunities and benefits for a global circular economy, ranging from diversification and industrial growth (e.g. Barrie and Schröder, 2021), to a more circular supply chain (Tamminen et al., 2020; Potting et al., 2017), reduced material use (Dellink, 2020), increased economies of scale (Bellmann and Draper, 2021), and the fight against pollution, climate change and biodiversity loss (Barrie et al., 2022).

The proliferation of circular economy policies may have uncertain effects on future trade implying both potential benefits and risks. An emerging research focus area is to understand the potential role of trade policy in a circular economy (e.g. Barrie and Schröder, 2021), where there is still no consensus on the type of policy response. As a possible response to the potential effects surrounding domestic policies, circular considerations could be integrated into Regional Trade Agreements (RTAs) (Bellman and Sell, 2021) or Facilitation Trade Agreements (FTAs) (de Lange et al., 2022; Kuhlmann et al., 2020). For example, coming into force in 2020, the EU-Vietnam FTA has integrated the concept of remanufactured goods, providing new trade opportunities to extend the scope of best circular practices.

In practice, trade may already be taking an active role in specific circular transformations. A recent WTO analysis identifies 370 trade-related measures in the field of the circular economy, notified by 65 members (Steinfatt, 2020). Half of these measures have a major focus on recycling, comparable to similar domestic policy trends. It also highlights that country partners could benefit from trade by directing waste and materials to destinations where there is a comparative advantage in recycling these materials. Therefore, the national management of waste streams should be understood as operating through a mix of domestic, import and export strategies (Liu et al., 2018).

Box 1.3. Definitions of trade in a circular economy

The global emergence of the circular economy concept could introduce new ways of trading materials and products after their first life. Key concepts such as "circular trade" and "circular supply chain" have been identified to highlight the potentials of trade in a circular economy. The definitions of "circular trade" and "circular supply chain" are mainly based on the identification of goods and services involved in a circular economy.

Circular trade (or circular economy trade[10]) can refer to "any international trade transaction, either material or immaterial, that contributes to circular economy activities at the local, national and global levels. This includes the trade in circularity-enabling goods, services and intellectual property; second-hand goods for reuse, repair, refurbishment, remanufacturing or recycling; refurbished and remanufactured goods; secondary raw materials (biotic and abiotic); and waste, scrap, and residues (biotic and abiotic) that can be safely recovered or valorized" (Barrie et al., 2022).

Circular supply chain (or reverse supply chain) can include all steps creating value for a product or service. The process starts with the design and material sourcing, followed by the manufacturing phase. Next, the product moves into the use phase. Finally, the product is recycled and looped back into the production cycle (Schenkel et al., 2015).

To increase understanding about the changes involved by circular trade and supply chains, more research may be needed to differentiate between linear trade and linear supply chains.

(Source) Author's compilation based on the literature review

10 Another possible definition is "a type of exchange of goods and services across international borders that contributes to building a sustainable global circular economy" (de Lange et al., 2022).

2.3. Is international trade part of the circular solution or part of the linear problem?

Current international trade is primarily operating in a world economy that is more than 90% linear (Circular Economy, 2022). Trade can become part of the solution to address the global problems of waste pollution posed by a linear economy. However, potential outcomes of circular economy transition are not devoid of environmental shortcomings (WCO, 2023). They should be clarified, identified and, in practice, controlled and resolved to better maximize circular benefits. **The critical point is to understand the potential trade-off between the benefits and risks involved throughout the transition process**.

Recent research identifies a range of economic and environmental implications of the circular economy transition, based on the current legislation (mainly the 3 Rs). The focus areas of the trade literature are economic growth and diversification, protection of economic interests, environmental and health risks, and illegal waste trade.

FOCUS AREA 1: *economic growth and diversification*

By way of reminder, a circular economy approach in theory should redirect all waste materials and end-of-life products into the production process and potentially reduce the extraction of virgin materials. However, the context of international trade could possibly have economic benefits and side effects that should be considered across borders.

For example, an economic study shows that economic growth can be compatible with a circular economy transition (Chen and Pao, 2022). It implies at the national or regional level that economic growth can lead to circular economy growth, notably through the trade volume of recyclable raw materials redirected into the economy. It can also mean that the waste imports of a developing country from developed countries may increase to support industrial activity and economic growth (Higashida and Managi, 2014).

A circular economy transition in a large country or a region can have important economic implications for its trading partners. Trade diversion of waste is an example in the context of low- and middle-income countries (LMICs). A recent study shows that EU and other high-income countries are more likely to exchange high-quality waste materials between themselves (World Bank, 2022), with possible adverse effects on waste exports and economic growth in LMICs. At the same time, most trade partners can also gain additional diversification outcomes if most high-income countries help to support LMICs in their transition.

Another study points out that waste trade will be overwhelmingly directed to foreign recycling sites (Kellenberg, 2015) if the origin country has only limited or no circular infrastructure. On the other hand, domestic demand for virgin materials could reduce imports (Ekins et al., 2019), which would mainly affect resource-rich trading partners. If the first effect holds, the second may be contradicted, as a full closed-loop circulation of materials may not be sufficient to meet the growing demand for virgin materials (Van Ewijk, 2018).

Circular economy policies can help reduce waste flows to developing and emerging countries. In the case of valuable waste, such as metal scrap, this reduces income and raw material supply for developing and emerging countries. A reduction in less valuable, low quality waste streams helps reduce negative environmental and social effects (Langsdorf and Duin, 2022).

FOCUS AREA 2: *protection of economic interests*

A trade-oriented transition can also have economic effects on domestic industry. The potential liberalization of circular economy goods may involve ambiguous effects relating to economic competition with newly-produced goods (or new goods). In the case of clothing, the import of used clothing could have driven reduced growth in the apparel industry in African countries (Frazer, 2008). These economic considerations can also depend on the type of product. An economic study found that high-income countries are more likely to import remanufactured tyres, while low-income countries are likely to allow imports of both second-hand and remanufactured tyres (Kojima, 2017).

FOCUS AREA 3: *environmental and health risks*

Waste leakage is a problem of the current world economy. Although a global transition to a circular economy can help in supporting environment protection, some gaps remain. As stricter policies are brought into force in some economies in transition, there is some evidence that leakages of wastes could be transmitted to other economies (e.g. Kellenberg, 2015) through improperly

managed landfills or illegal dumping, especially in poor and vulnerable countries (World Bank, 2022).

Although a more circular world could have manifold benefits, this transition can also transfer risks to environment protection concerning certain goods. Again, the environmental situation/limits of the destination country are key to understanding possible shortcomings of a global transition. Taking the example of second-hand goods, the import of used cars may have ambiguous effects: increasing (Davis and Kahn, 2010) or decreasing (Chen et al., 2022) air pollution. Similarly, the possible expansion of e-commerce of second-hand goods (used goods) may lead to increasing flows of e-commerce air cargos, with larger environmental footprint; around 35% higher than maritime cargos (Quantis, 2018).

Nevertheless, a world transition can unlock additional environmental benefits along the product's supply chain, contributing to SDGs (Annex 1.1). Today, global supply chains comprise 50-70% of international trade, and their transition should create not only significant economic value, but also increasing "societal" value for the environment (Atanasovska, 2022) by decreasing the effects of waste pollution. In the building industry, a more circular supply chain can cut 60% of CO_2 impacts (Nasir et al., 2017) and is one example of potential among many other industries.

FOCUS AREA 4: *illegal waste trade*

Possible effects of the transition on waste crime have not been well documented yet. The economic importance of waste crime is still widespread in the field of trade, estimated at around €10 billion a year for non-hazardous wastes and €1.8 billion for hazardous wastes (European Environmental Bureau, 2020). Stricter inspections on imported waste can contribute to decreasing the import of wastes of low quality, such as during Operation Green Fence in China (Balkevicius et al., 2020), and contribute to supplying more valuable wastes needed to serve a circular transition.

Due to cross-country differences in terms of transition (i.e. legislation and enforcement gaps), criminal organizations could see a considerable lucrative opportunity to undermine circular activities by offering illegal dumping, waste disposal at a lower price – between 200 and 300 times cheaper than legal disposal – or even recycling of wastes with improper technologies (Wingerde and Bisschop, 2021). The fight against waste crime could become more significant in a circular economy transition.

In brief, the overall effects of a circular economy should be understood as evolving with the progress of circular economy legislation. In particular, the possible areas of interest -- economic growth and diversification, protection of economic interests, environmental and health risks, and illegal waste trade -- can be interconnected at the country level to highlight the different potential circular transitions supported by trade. The question arises as to how to balance the benefits and risks associated with a transition, without this being at the expense of other economies. In this light, a "just transition" can be defined as one which aims to "reduce waste and stimulate product innovation, whilst at the same time contributing positively to sustainable human development" (Schröder, 2020).

2.4. How do the WTO and international trade partners address the circular economy?

International organizations and international trade partners have adopted different focus areas on how to promote the transition to a more circular world.

Perspective from the World Trade Organization (WTO)

The WTO-led Aid for Trade work programme for 2020-2021 highlights the opportunities that the circular economy offers for economic and export diversification in developing countries. The focus on the circular economy in the new Aid for Trade work programme reflects the growing attention to environmental sustainability in development cooperation (Steinfatt, 2020). Of the USD 340 billion disbursed under Aid for Trade between 2006 and 2016, around one third (USD 112 billion) has been allocated to projects with an environmental goal (WTO and UNEP, 2018). These developments provide a strong foundation to expand the role of Aid for Trade in the circular economy.

More recently, a plurilateral initiative, the "Trade and Environmental Sustainability Structured Discussions" (TESSD) was launched in November 2020 by a like-minded group of more than 20 members. One of the discussions is focused on the circular economy and how international trade can contribute to the transition to a circular economy.

Following the launch of the TESSD Ministerial Statement (WT/MIN(21)/6/Rev.2) in December 2021, co-sponsors agreed on the TESSD Work Plan in February 2022 (INF/TE/SSD/W/17/Rev.1). In the Work Plan, co-sponsors, inter alia, agreed to advance work intersessionally in four informal working groups on trade-related climate measures, environmental goods and services, circular economy – circularity, and subsidies. See Annex 1.3 for more details of negotiations at the WTO.

At the Committee on Trade and Environment (CTE) of the WTO in June 2022, members highlighted current issues on trade and environment, covering the circular economy, plastics pollution, climate change, biodiversity, transfer of technology and capacity building. The WTO Secretariat provided a report on members' responses to the Aid for Trade monitoring and evaluation (M&E) self-assessment exercise. The results highlighted members' increased efforts to integrate climate and environment objectives in domestic frameworks, and highlighted the circular economy as an emerging area of focus, including cross-border trade in reusable or repairable products, with the aim of identifying best practices.

Perspective from the Ellen MacArthur Foundation

The Ellen MacArthur Foundation – a charity committed to creating a circular economy – has been boosting awareness of the circular economy concept among manufacturers and policy-makers since 2010 (Stahel, 2016), and in 2015 provided one of the most used definitions of a circular economy (Kirchherr et al., 2017). Since 2022, one of the focus areas has been the importance of integrating the principles of the CE into trade and trade-related policies, formalized around 3 priorities: the mapping of the impacts of circular economy trade against multiple policy areas to ensure alignment; investment in the mechanisms that can provide better information about goods, through transparency and traceability; and development beyond trade in durable goods to consider trade in services and agricultural goods.

Since 2023, the Foundation's Plastics Initiative has partnered with the World Economic Forum's Global Plastics Action Partnership (GPAP) and the international climate action NGO WRAP to ensure more effective knowledge-sharing within their combined network. To help accelerate their shared vision for a circular economy for plastics, the organizations are looking to collaborate more closely by sharing learning and best practices across their entire network on a regular basis.

Perspective from the UNCTAD

UNCTAD has developed a classification on ocean-based goods and services. It has also developed various environmental preferable products databases including on ocean-based products & services and biodiversity-based goods. All can be found at UNCTAD Stats. See: https://unctadstat.unctad.org/EN/

In UNCTAD's Sustainable Manufacturing and Environmental Pollution Programme, a new phase is being rolled out to develop national circular economy plans & policies to reduce manufacturing externalities in developing countries in Africa and South Asia.

In 2022-2023, a joint UNCTAD-UNECA project 20 countries in Africa are being assisted in identification of regional green value chains and required actions to ensure their resilience to climate change. UNCTAD is also supporting developing countries in strengthening their supply chains in biodiversity-based (terrestrial and marine) goods and services under a BIoTrade approach.

Perspective from the World Economic Forum (WEF)

The World Economic Forum (WEF), well-known as a host of Davos meetings, is actively involved in promoting and advancing the circular economy agenda. Some of the key activities of the WEF in this area include:

- The Platform for Accelerating the Circular Economy (PACE): The WEF launched the PACE in 2018 as a public-private collaboration platform to accelerate the transition to a circular economy. Among various activities, the PACE carries out collaborative actions in specific industries including foods, electronics, textiles, plastics and capital equipment.
- The Global Plastic Action Partnership (GPAP): The WEF launched the GPAP in collaboration with the United Nations Environment Programme (UNEP) and the World Wide Fund for Nature (WWF). The Partnership aims to tackle the plastic pollution crisis by promoting a circular approach.
- Reports and research: The WEF produces a range of reports and research on the circular economy, including case studies, best practices, and policy recommendations.

Perspective from the United Nations Environment Programme (UNEP)

In 2019, UNEP launched the knowledge-sharing tool "UNEP circularity platform", with the aim of sharing a common understanding of the circularity concept, its scope and how it contributes to promoting sustainable consumption and production patterns. The platform can help stakeholders and countries to better understand and visualize some key focus areas (plastics, textiles and electronics) where CE practices can be implemented, through data visualization and the sharing of case studies.

Perspective from the World Bank

In December 2022, the World Bank released its first report on the circular economy, "Squaring the Circle: Policies from Europe's Circular Economy Transition", stating that the current "take-make-waste" linear model of economic expansion was increasingly unsustainable, not only in environmental terms, but also from an economic security and inclusion dimension. The report concludes that comprehensive policy packages can reduce material consumption while still maintaining growth and welfare creation.

Perspective from the United Nations Industrial Development Organization (UNIDO)

UNIDO have considered various building blocks to integrate the circular economy concept, with a project focus on resource-efficient and cleaner manufacturing of products; development of safe, easy to recycle products with longer lifetimes, and recovery or safe disposal of resources at the end of a product's life, for example:

- Establishing a circular economy framework for the plastics sector (Ghana): the aim is to strengthen the national capacity of Ghana to transition to a circular economy framework that addresses **plastic leakage into the country's oceans and waterways**, facilitates sustainable plastics management through operationalizing the National Plastic Action Partnership (NPAP-GPAP) and the National Plastic Management Policy (NPMP); and ultimately ends marine plastic pollution and reduces unintentional emissions of POPs (u-POPs).
- Switching to circular economy value chains (global): the programme aims to support MSME (micro, small, and medium sized) **suppliers in developing countries in the value chains of large EU manufacturers and buyers** to jointly identify, adopt and excel in circular economy practices.

3. Challenges for Customs in the circular economy

Debate on the circular economy is evolving and has extended to the domains of Customs, as mentioned during the WCO Green Customs Global Conference and the symposia on greening the HS codes in 2022/23 (WCO, 2023). Challenges faced by Customs are due to the early stage of development of the circular economy.

First, the circular economy is characterized by ambiguity that is a common feature of broad concepts (Korhonen et al., 2018). The circular economy is sufficiently broad in scope as to offer the potential for interpretive flexibility, meaning it can be understood or applied differently in various contexts, and accommodate a broad range of policy interests (McDowall et al., 2017). CE's ambiguity allows for several interpretations of definitions that are part of global agreements and conventions, and contributes to diverging assessments and lack of shared direction (Leipold et al., 2023). Circular economy trends are mainly driven by the growing number of laws and amount of legislation (totalling over 520 policies).

Possible ambiguities surrounding the application of the circular economy concept and the interpretation of provisions in environmental and waste management laws could increase uncertainties around the importance, value and diversity of traded goods involved in circular transformations and generate greater uncertainty for Customs on how to deliver effective controls, monitoring, enforcement and facilitation. For example, the lack of a common definition of waste and non-waste could be challenging, with each country having the right to have a different interpretation about the materials and products needed to serve as inputs for a circular economy.

Second, there is unpredictability regarding the evolution of a circular economy. Governments have to combine a constant but multifaceted social demand to address climate change, with the technologies proposed by the private sector as responses, and an economic constraint to make green technology and services profitable in the global value chains and insert the responses to climate

change into the current economic schemes of globalized capitalism.

As a rule of thumb, a global transition to a circular economy could reduce trade in virgin materials, as well as increase trade in secondary raw materials, recyclable waste, second-hand goods and possibly services in circular transformations (Ekins et al., 2019). However, there is some unpredictability regarding the policy innovations of governments, such as carbon border adjustment mechanisms, and the technology innovations of industry.

This lack of predictability complicates the role of Customs in anticipating its adaptation to circular trade, whilst international trade is still viewed as an enabler of a circular economy. For instance, the changing trade pattern in this transition can also raise an important issue of how a circular economy could affect revenue collection through the channel of trade. These effects will depend on several factors, including (but not limited to): the nature of circular economy practices adopted, the types of materials and products being traded, and the regulatory framework in place. Taking the example of the world market in recycled materials:

- **First**, a national transition may lead to increased import and export flows of these commodities, while at the same time, the import of virgin materials may decrease. This can affect revenue, depending on the tariffs and taxes in place in the destination/origin country.
- **Second**, a circular economy may involve the use of more durable and higher-quality goods and materials, which in turn can create a higher value than disposable wastes or low-quality wastes. It could, in the last resort, affect revenue collection.
- **Third**, to drive a circular economy transition, the regulatory framework and legal interpretation of wastes is likely to change, with possible direct implications for how to enforce or facilitate the flow of commodities. Revenue collection could also be affected by this factor.

However, the overall impacts on revenue collection are still unclear. For Customs, particular attention could be given to supporting the potential of a circular economy transition. At the same time, new strategies could be developed by Customs administrations on how the transition may affect the contribution of Customs to economic growth, while maintaining fair and secured revenue collection. For Customs, it could become important to monitor the potential negative impacts of the transition from a linear to a circular economy. The Customs community can also play an important part in this transition at their own level. For example, many more Customs administrations are actively mainstreaming circular economy practices. Dubai Customs, for instance, has recently published the Sustainable Report 2021, highlighting good circular practices around recycling and energy management.

Knowledge is therefore the first challenge for Customs. Customs must be aware of the latest policies related to the circular economy, both at the national and international levels. Customs should be involved in the policy-making discussion in government, and involved in dialogue with the private sector, meaning that Customs has knowledge and expertise in CE concepts and policies. As the circular economy is a relatively new domain, it may be necessary for many administrations to have specialized units at the policy level (headquarters) to follow the legal and economic evolution of the circular economy. In addition, designing training on CE policies and technologies for Customs officials generally may be essential in order to prepare them for their roles and responsibilities related to a circular economy. The purpose of this first introductory chapter has been to raise awareness of Customs of circular economy concepts and complexity. **Chapter 2** will complement it by presenting the legal framework within which Customs are expected to play a role.

The second challenge is data collected by Customs. Due to its position in the logistics and value chains, Customs plays a central role at borders as a data collector in general. In the case of the circular economy, this role will become more critical, as experts, economists and policy-makers are demanding more transaction-level data to consider and elaborate measures incentivizing the circular economy and monitor its economic and environmental impacts. Customs may therefore have to adapt quickly to obtain more data at borders and improve the quality of data collected overall (not just fiscal data or data used specifically for fraud detection). Further insights about the data challenges and Customs' role are presented in **Chapter 3**.

As a circular economy can involve a potential balance between benefits and potential risks, it is therefore important to clarify the possible implications for both facilitation and enforcement. To effectively implement laws and regulations at borders, Customs must establish and maintain a cooperative relationship

with environment agencies and the private sector, and promote and develop the use of Customs regimes that could assist the transition to a circular economy (such as bonded warehouses that facilitate the circular business of exporting products recycled from imported waste). This cooperation and dialogue may be more critical now that the circular economy is nascent and considered as a response to climate change. **Chapter 4** will address the specificities of the usual balance between facilitation and control within the context of the circular economy. **Chapter 5** will provide current Customs experience to address some of these challenges.

References

Accenture (2015). *The Circular Economy Could Unlock $4.5 trillion of Economic Growth, Finds New Book*. Accenture. https://newsroom.accenture.com/news/the-circular-economy-could-unlock-4-5-trillion-of-economic-growth-finds-new-book-by-accenture.htm

Araujo-Morera, J., Verdejo, R., López-Manchado, M. A., & Santana, M. H. (2021). *Sustainable mobility: The route of tires through the circular economy model*. Waste Management, 126, 309-322.

ATAG (2020). *Aviation: Benefits Beyond Borders*. IATA Economics, Airbus, Boeing, ATAG Beginner's Guide to Aviation Efficiency, Intergovernmental Panel on Climate Change (IPCC), BBC News, Qantas.

Atanasovska, I., Choudhary, S., Koh, L., Ketikidis, P. H., & Solomon, A. (2022). *Research gaps and future directions on social value stemming from circular economy practices in agri-food industrial parks: Insights from a systematic literature review*. Journal of Cleaner Production, 131753.

Balkevicius, A., Sanctuary, M., & Zvirblyte, S. (2020). *Fending off waste from the west: The impact of China's Operation Green Fence on the international waste trade*. The World Economy, 43(10), 2742-2761.

Bellmann, C., & Draper, P. (2021). The circular economy and international trade: Options for the World Trade Organization. International Chamber of Commerce.

Bellmann C., & Sell, M. (2021). *Options to Incorporate Circular Economy Provisions in Regional Trade Agreements*. International Institute for Sustainable Development (IISD).

Bleischwitz, R., Yang, M., Huang, B., Xiaozhen, X. U., Zhou, J., McDowall, W., [...] & Yong, G. (2022). *The circular economy in China: Achievements, challenges and potential implications for decarbonisation*. Resources, Conservation and Recycling, 183, 106350.

Boonchit, C. (2020*). 3Rs policy and strategy for municipal waste management in Thailand*. Solid Waste Policies and Strategies: Issues, Challenges and Case Studies, 205-211.

Barrie, J., Schröder, P., Schneider-Petsinger, M., King, R., & Benton, T. (2022). *The role of international trade in realizing an inclusive circular economy*. Chatham House.

Charpentier Poncelet, A., Helbig, C., Loubet, P., Beylot, A., Muller, S., Villeneuve, J., [...] & Sonnemann, G. (2022). *Losses and lifetimes of metals in the economy*. Nature Sustainability, 5(8), 717-726.

Chen, C. C., & Pao, H. T. (2022). *The causal link between circular economy and economic growth in EU-25*. Environmental Science and Pollution Research, 29(50), 76352-76364.

Circle Economy (2021). *Circular Economy Strategies Can Cut Global Emissions by 39%*. https://www.circle-economy.com/news/circular-economy-strategies-can-cut-global-emissions-by-39

Circle Economy (2022). *Circularity Gap Report 2022*. https://www.circularity-gap.world/2022#Download-the-report

Dellink, R. (2020). *The consequences of a more resource efficient and circular economy for international trade patterns: A modelling assessment*. OECD, Paris, ENV/WKP(2020)12.

de Lange, D., Walsh, P., & Paul, S. (2022). *UK-Canada Trade Post-Brexit: Leading with Circular Economy Trade*. Resources, Conservation & Recycling Advances, 14, 200081.

Ellen MacArthur Foundation (2020). *Vision of a circular economy for fashion*. https://www.ellenmacarthurfoundation.org/assets/downloads/Vision-of-a-circular-economy-for-fashion.pdf/

Ellen MacArthur Foundation (2016). *Growth within: A circular economy vision for a competitive Europe*. Ellen MacArthur Foundation and the McKinsey Center for Business and Environment, 1-22.

Ellen MacArthur Foundation (2012). Towards the Circular Economy: Economic and Business Rationale for an Accelerated Transition. https://ellenmacarthurfoundation.org/towards-the-circular-economy-vol-1-an-economic-and-business-rationale-for-an

Ekins, P., Domenech, T., Drummond, P., Bleischwitz, R., Hughes, N. and Lotti, L. (2019). *The Circular Economy: What, Why, How and Where*. Background paper for an OECD/EC Workshop on 5 July 2019 within the workshop series "Managing environmental and energy transitions for regions and cities", Paris. https://discovery.ucl.ac.uk/id/eprint/10093965/1/Ekins-2019-Circular-Economy-What-Why-How-Where.pdf

European Environmental Bureau (2020), Crime and Punishment, accessible at https://eeb.org/?p=101230.

Fang, Y., Côté, R. P., & Qin, R. (2007). *Industrial sustainability in China: Practice and prospects for eco-industrial development*. Journal of environmental management, 83(3), 315-328.

Frazer, G. (2008). *Used-clothing donations and apparel production in Africa*. The Economic Journal, 118(532), 1764-1784.

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757-768.

Geng, Y., Sarkis, J., & Bleischwitz, R. (2019). *How to globalize the circular economy*. Nature, 565(7738), 153-155.

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). *A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems*. Journal of Cleaner Production, 114, 11-32.

Higashida, K., & Managi, S. (2014). *Determinants of trade in recyclable wastes: evidence from commodity-based trade of waste and scrap*. Environment and Development Economics, 19(2), 250-270.

Hoernig, J. (2022). *Towards 'secondary raw material' as a legal category*. Environmental Law Review, 24(2), 111-127.

Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: a global snapshot of solid waste management to 2050*. World Bank Publications.

Kellenberg, D. (2015). *The economics of the international trade of waste*. Annu. Rev. Resour. Econ., 7(1), 109-125.

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, conservation and recycling*, *127*, 221-232.

Kounina, A., Daystar, J., Chalumeau, S., Devine, J., Geyer, R., Pires, S., [...] & Boucher, J. (2023). The global apparel industry: a significant, yet overlooked source of plastic leakage.

Kuhlmann, K., Francis, T., Thomas, I., Le Graet, M., Rahman, M., Madrigal, F., [...] & Nalbantoglu, A. (2020). Reconceptualizing Free Trade Agreements Through a Sustainable Development Lens. Available at SSRN 3723995.

Lee, C. H., Popuri, S. R., Peng, Y. H., Fang, S. S., Lin, K. L., Fan, K. S., & Chang, T. C. (2015). *Overview on industrial recycling technologies and management strategies of end-of-life fluorescent lamps in Taiwan and other developed countries*. Journal of Material Cycles and Waste Management, 17, 312-323.

Lesniewska, F., & Steenmans, K. (2023). *Circular Economy and the Law: Bringing Justice into the Frame*. Taylor & Francis.

Lieder, M., & Rashid, A. (2016). *Towards circular economy implementation: a comprehensive review in context of manufacturing industry*. Journal of Cleaner Production, 115, 36-51.

Linder, M., Sarasini, S., & van Loon, P. (2017). *A metric for quantifying product-level circularity*. Journal of Industrial Ecology, 21(3), 545-558.

Liu, Y., Blome, C., Sanderson, J., & Paulraj, A. (2018). *Supply chain integration capabilities, green design strategy and performance: a comparative study in the auto industry*. Supply Chain Management: An International Journal.

Kojima, M. (2017). *Remanufacturing and trade regulation*. Procedia CiRP, 61, 641-644.

Malinauskaite, J., Anguilano, L., & Rivera, X. S. (2021). *Circular waste management of electric vehicle batteries: Legal and technical perspectives from the EU and the UK post Brexit*. International Journal of Thermofluids, 10, 100078.

McCarthy, A., R. Dellink and R. Bibas (2018), "The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches", OECD Environment Working Papers, No. 130, OECD Publishing, Paris. http://dx.doi.org/10.1787/af983f9a-en

McDonough, W., & Braungart, M. (2002). *Design for the triple top line: new tools for sustainable commerce*. Corporate Environmental Strategy, 9(3), 251-258.

McDowall, W., Geng, Y., Huang, B., Barteková, E., Bleischwitz, R., Türkeli, S., [...] & Doménech, T. (2017). *Circular economy policies in China and Europe*. Journal of Industrial Ecology, 21(3), 651-661.

McIlgorm, A., Raubenheimer, K., McIlgorm, D. E., & Nichols, R. (2022). *The cost of marine litter damage to the global marine economy: Insights from the Asia-Pacific into prevention and the cost of inaction*. Marine Pollution Bulletin, 174, 113167.

Mikichurova, O. V., & Vlialko, I. V. (2021, November). *Circular law as a legal basis for a circular economy*. In IOP Conference Series: Earth and Environmental Science (Vol. 915, No. 1, p. 012022). IOP Publishing.

Milios, L. (2018). *Advancing to a Circular Economy: three essential ingredients for a comprehensive policy mix*. Sustainability Science, 13(3), 861-878.

Nasir, M. H. A., Genovese, A., Acquaye, A. A., Koh, S. C. L., & Yamoah, F. (2017). *Comparing linear and circular supply chains: A case study from the construction industry*. International Journal of Production Economics, 183, 443-457.

Niinimäki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A. (2020). *The environmental price of fast fashion*. Nature Reviews Earth & Environment, 1(4), 189-200.

OECD (2016), Extended Producer Responsibility: Updated Guidance for Efficient Waste Management. OECD Publishing, Paris. https://doi.org/10.1787/9789264256385-en

Poore, J., & Nemecek, T. (2018). *Reducing food's environmental impacts through producers and consumers*. Science, 360(6392), 987-992.

Potting, J., Hekkert, M. P., Worrell, E., & Hanemaaijer, A. (2017). *Circular economy: measuring innovation in the product chain*. Planbureau voor de Leefomgeving, (2544).

Quantis (2018). Measuring fashion: insights from the environmental impact of the global apparel and footwear industries. Full report and methodological considerations. quantis-intl.com. https://quantis-intl.com/measuring-fashion-report

Prieto-Sandoval, V., Jaca, C., & Ormazabal, M. (2018). *Towards a consensus on the circular economy*. Journal of Cleaner Production, 179, 605-615.

Reike, D., Vermeulen, W. J., & Witjes, S. (2018). *The circular economy: new or refurbished as CE 3.0?—exploring controversies in the conceptualization of the circular economy through a focus on history and resource value retention options*. Resources, conservation and recycling, 135, 246-264.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin III, F. S., Lambin, E., [...] & Foley, J. (2009). Planetary boundaries: exploring the safe operating space for humanity. Ecology and society, 14(2).

Santeramo, F. G. (2022). *Circular and green economy: the state-of-the-art*. Heliyon, e09297.

Schröder, P. (2020). *Promoting a just transition to an inclusive circular economy*. Royal Institute of International Affairs.

Stahel, W. R. (2016). *The circular economy*. Nature, 531(7595), 435-438. https://www.nature.com/articles/531435a

Stanislaus, M. (2019). 5 Ways to Unlock the Value of the Circular Economy. World Resource Institute. https://www.wri.org/insights/5-ways-unlock-value-circular-economy

Steinfatt, K. (2020). *Trade policies for a circular economy: What can we learn from WTO experience?* World Trade Organization (WTO), Geneva, WTO Staff Working Paper No. ERSD-2020-10.

Steinhilper, Rolf (1998). *Remanufacturing The Ultimate Form of Recycling*. Remanufacturing Industries Council International Automotive Parts Rebuilders Association (APRA).

Tamminen, S., Sell, M., Forslund, T., Tipping, A., Soprana, M., & Bellmann, C. (2020). *Trading Services for a Circular Economy*. International Institute for Sustainable Development.

Tudor, T., & JC, C. (Eds.). (2021). *The Routledge Handbook of Waste, Resources and the Circular Economy*. Routledge.

Ünal, E., & Shao, J. (2019). *A taxonomy of circular economy implementation strategies for manufacturing firms: Analysis of 391 cradle-to-cradle products*. Journal of Cleaner Production, 212, 754-765.

Bisschop, L., & van Wingerde, K. (2021). *Transnational organized environmental crime*. In The Routledge Handbook of Transnational Organized Crime (pp. 270-284). Routledge.

World Bank (2022). *Squaring the Circle: Policies from Europe's Circular Economy Transition*. World Bank. https://www.worldbank.org/en/region/eca/publication/squaring-circle-europe-circular-economy-transition

World Business Council For Sustainable Development (WBCSD) (2019). Global ELT Management – A Global State of Knowledge on Regulation, Management Systems, Impacts of Recovery and Technologies.

https://www.wbcsd.org/Sector-Projects/Tire-Industry-Project/End-of-Life-Tires-ELTs

WCO (2023). *The Green Customs Global Conference – Summary report*. World Customs Organization, Brussels, Belgium. https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/research/report/wco_green-customs-global-conference_executive-summary_en.pdf

Wichai-Utcha, N., & Chavalparit, O. (2019). *3Rs Policy and plastic waste management in Thailand*. Journal of Material Cycles and Waste Management, 21, 10-22.

Annex 1.1. Links between the circular economy, sustainable development and Customs

A circular economy transition would directly contribute to a number of the Sustainable Development Goals (SDGs), most directly to Goal 12, which aims to ensure "sustainable consumption and production patterns". The circular economy model is also directly aligned with several other economic and environmental goals of the 2030 Agenda for Sustainable Development, including Goal 6 (Clean Water and Sanitation); Goal 9 (Promote Sustainable Industrialization and Foster Innovation); Goal 11 (Sustainable Cities and Communities); Goal 13 (Sustainable Consumption and Production); Goal 14 (Life Below Water); and Goal 15 (Life on Land).

Customs could play a proactive role in facilitating the flows of CE goods (e.g. streamline procedures on CE goods) to further support the smooth transition towards more circular and sustainable supply chains.

Current linear supply chains (accounting for 70% of global trade) are responsible for large waste leakages and pollution emissions. The change from a linear to a circular supply chain is an effective means to cut pollution sources and avoid waste mismanagement.

The emergence of a CE may imply a major threat of illicit trade in end-of-life commodities. For example, some illegal actors could undermine circular activities by proposing illegal dumping, waste disposal at a lower price (between 200 and 300 time cheaper than legal disposal) or even recycling of wastes with improper technologies (Europol, 2022).

In line with SDG 13 (Climate Action), Customs support the effective implementation of various Multilateral Environmental Agreements (MEAs), notably for the control, monitoring and enforcement of hazardous and non-hazardous wastes.

Customs' fight against these waste crimes could help contribute to a more secured transition to a CE, thus making an even greater contribution to addressing cross-border environment and health problems.

Annex 1.2. 9 Rs framework for CE adoption

	Strategies	
Smarter product use and manufacture	**RO Refuse**	Make product redundant by abandoning its function or by offering the same function with a radically different product
	R1 Rethink	Make product use more intensive (e.g. by sharing product)
	R2 Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
Extend lifespan of product and its parts	**R3 Reuse**	Reuse by another consumer of discarded product which is still in good condition and fulfils its original function
	R4 Repair	Repair and maintenance of defective product so it can be used with its original function
	R5 Refurbish	Restore an old product and bring it up to date
	R6 Remanufacture	Use parts of discarded product in a new product with the same function
	R7 Repurpose	Use discarded product or its parts in a new product with a different function
Useful application of materials	**R8 Recycle**	Process materials to obtain the same (high grade) or lower (low grade) quality
	R9 Recover	Incineration of material with energy recovery

(Source) Adapted from Potting et al. (2017, p.5) by Kirchherr et al. (2017)

Annex 1.3. Negotiations at the WTO

Since its inception in 1995, the WTO has considered the environment an important agenda item. The first paragraph of the preamble to the Marrakesh Agreement Establishing the World Trade Organization states that the WTO is "seeking both to protect and preserve the environment and to enhance the means for doing so". In fact, its members have negotiated environmental issues under various formats.

The first round of negotiations under the WTO was launched in November 1999 at Doha, and members agreed to start negotiations on wide-ranging items, including the reduction or elimination of tariff and non-tariff barriers to environmental goods and services.[11] In the beginning, the **Doha round negotiations** progressed slowly but steadily, and members reached an agreement on the Doha Agenda work programme, called the July Package, in August 2004. However, after that, the negotiations lost momentum.

Separately, **APEC**, an economic cooperation forum in Asia and the Pacific, numbering 21 economies, **agreed in September 2012 on the reduction of tariff rates for 54 environmental goods to 5 percent or less** by the end of 2020.[12] This agreement triggered further momentum in Geneva, with like-minded members starting the discussion to move the environmental agenda forward. In July 2014, they announced the launch of the **Environmental Goods Agreement (EGA) negotiations**, as a separate track from the Doha round negotiations.[13] After intensive negotiations, the G20 leaders welcomed the progress achieved in the WTO EGA negotiations in September 2014, but never reached an agreement until now.

Very recently, against a backdrop of increased public awareness of the environment, there has been further momentum at the WTO, and two new initiatives have been announced by a couple of like-minded groups. Firstly, the **Trade and Environmental Sustainability Structured Discussions (TESSD)** were announced in November 2020,[14] with discussion focusing on four areas: trade and climate change; trade in environmental goods and services; the circular economy; and sustainable supply chains. Secondly the **Informal dialogue on plastics pollution and environmentally sustainable plastics trade (IDP)** was announced. This is an open-ended informal dialogue to establish a factual basis to support WTO members' efforts to reduce plastics pollution and to promote sustainable trade in plastics.[15] Both initiatives are currently under discussion, with work ongoing towards the 13th Ministerial Conference that will be held in February 2024.[16] More details will emerge as the Conference approaches.

11 WTO Ministerial declaration, adopted on 14 November 2001 https://www.wto.org/english/thewto_e/minist_e/min01_e/mindecl_e.htm
12 APEC "ANNEX C - APEC List of Environmental Goods" 2020 https://www.apec.org/meeting-papers/leaders-declarations/2012/2012_aelm/2012_aelm_annexc
13 WTO "Environmental Goods Agreement (EGA)" 2014 https://www.wto.org/english/tratop_e/envir_e/ega_e.htm
14 WTO "Communication on Trade and Environmental Sustainability" 2020 https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/WT/CTE/W249.pdf&Open=True
15 WTO "Ministerial Statement on Plastic Pollution and Environmentally Sustainable Plastics Trade" (WT/MIN(21)/8/Rev.2), 2022 https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/WT/MIN21/8R2.pdf&Open=True
16 WTO "WTO members accept UAE, Cameroon offers to host Ministerial Conferences" December 2022 https://www.wto.org/english/news_e/news22_e/gc_19dec22_e.htm

Chapter 2. The Multilateral Environmental Agreements and a circular economy: repositioning the role of Customs administrations at the border

In a circular economy, the trading opportunities in reverse supply chains (trading in waste for recycling, refurbishment and remanufacturing, reuse, and repair) are considered to increase (OECD, 2018). As various Multilateral Environmental Agreements (MEAs) are related to trade in reverse supply chains, Customs administrations, as the gatekeepers for enforcing laws and regulations at borders, must have a deep understanding of some key MEAs to effectively enforce them.

Currently, MEAs are frequently updated in response to heightened awareness of people's environment. In addition to MEAs, more Regional Trade Agreements (RTAs) are equipped with environmental provisions, some of which affect operations of Customs administrations.

Effective implementation of MEAs and RTAs at borders requires close cooperation between Customs administrations and environment agencies.

1. Recent developments in Multilateral Environmental Agreements (MEAs) related to a circular economy

The implications of transitioning to a circular economy on international trade are still under debate (e.g. Dellink, R. 2020; McCarthy, A. et al., 2018) because this transition brings about a wide range of changes in society, making it difficult to predict its impact on international trade. Amidst much analysis, the 2018 OECD report claims that transition entails the emergence of new trading opportunities for trade in waste for recycling, refurbishment, remanufacturing, reuse and repair. These activities, including collecting end-of-life products, recovering values in them through recycling, refurbishment, remanufacturing, reuse and repair, and returning them to the economy, are referred to as **cross-border reverse supply chains** (Yamaguchi, S., 2022, Nuss, C., et al., 2014).

Depending on the characteristics and nature of the waste, **trade in reverse supply chains would be subject to MEAs, such as the Basel Convention, and Customs administrations are the authorities in charge of effectively implementing MEAs at the border**. This chapter reviews the recent development of some key MEAs related to a circular economy.

1.1. Basel Convention

Problems arose in the 1980s, such as environmental pollution caused by waste from advanced countries in Europe being abandoned in developing countries in Africa, and the movement of hazardous waste across borders without prior notification or consultation. There was also growing concern about the increasing amounts of hazardous waste being produced and their impacts on human health and the environment. In response to these issues, discussions were held by the OECD and UNEP. As a result, the Basel Convention was established in March 1989, entering into force in May 1992[17], and it currently has 190 participating parties.[18]

The Basel Convention is **a prime legal tool to deter illegal waste trafficking by putting wastes under a specific procedure, the "Prior Informed Consent" (PIC) procedure** (see Chapter 4 for mechanisms and procedures of the Convention). Since its entry into force, the Basel Convention has been continuously reviewed and updated, and it has recently undergone the major amendments below.

After long debate on the interpretation of Article 17.5 regarding how to determine the necessary number of members for entry into force,[19] **the Ban Amendment of the Basel Convention finally came into force in December 2019**. This amendment prohibits the transboundary movement of hazardous wastes from Annex VII Parties (OECD, EU and Liechtenstein) to non-Annex VII Parties. This reflects the challenges faced by developing countries, which often lack the capacities and infrastructures to effectively control imports and sound management of hazardous waste. The Ban Amendment can be seen as supporting protection of the environment in developing countries by discouraging the export of hazardous waste from developed to developing countries,

17 According to Weiss, E., 2011, there was an international environmental law dating back to the 1900s, but it did not address the issue of pollution. Some laws between the 1950s and 1970s addressed environmental problems, such as marine pollution from oil and damage from civilian use of nuclear energy. The full-blown MEAs appeared after the UN Stockholm Conference on the Human Environment in 1972.

18 Basel Convention (http://www.basel.int/?tabid=4499)

19 Article 17.5 of the Basel Convention states: "Amendments [...] shall enter into force between Parties having accepted them [...] by at least three-fourths of the Parties who accepted them [...]." There were differing views among members regarding this Article, such as whether the determining factor should be the number of members at the time when the amendment was adopted (September 1995) or the number of members at the time when the amendment entered into force.

which can contaminate the environment. It can also be seen as promoting the development of local recycling and waste management infrastructure in developing countries. However, there is a view that complete prohibition is difficult to enforce (Andrews, 2009) and will in the short term make it more burdensome to move waste internationally for recycling purposes (Bellmann, C., 2021).

In January 2021, the plastic waste amendment of the Convention came into force. Plastic waste was previously traded as a low-risk or no-risk commodity (Kahn, S., 2020), but its scope under the Convention has expanded due to the amendment. As a result, substantially all types of plastic waste have come under the scope of the PIC procedure. This amendment aims to address the recent concerns on mounting plastic pollution. It is observed that global trade in plastic waste and scrap declined further in 2021 and the trend continued in the first half of 2022 (Brown, A. et al., 2023).

Further, **the Parties adopted the amendment regarding e-waste in June 2022, and it will come into effect in January 2025**. Alongside plastic pollution, e-waste is another pressing issue in the context of environmental protection. The rapid evolution in technology makes IT equipment outdated in a short time, leaving piles of waste. 53.6 million metric tonnes (Mt) of e-waste were generated worldwide in 2019, and this is estimated to reach 74.7 Mt by 2030.[20] The amendment substantially expands the scope of e-waste, putting it under the PIC procedure. The e-waste Technical Guidelines that address the distinction between waste and non-waste were also adopted on an interim basis,[21] helping Customs and other administrations classify e-waste, and used electrical and electronic equipment.

1.2. Stockholm Convention and Rotterdam Convention

In the 1980s to the early 1990s, scientists and environmental organizations started to raise awareness about the potential risks of Persistent Organic Pollutants (POPs) and certain hazardous chemicals and pesticides, particularly in developing countries. In June 1992, the Rio Declaration was adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil. It included a set of principles for integrating environmental protection and sustainable development, such as the precautionary principle, the polluter pays principle, and the principle of common but differentiated responsibilities.[22] The Stockholm Convention was adopted in May 2001, coming into force in May 2004, and currently has 186 participating parties;[23] the Rotterdam Convention was adopted in September 1998, coming into force in February 2004, and currently has 165 participating parties.[24]

The Stockholm Convention on Persistent Organic Pollutants is an international agreement that aims to eliminate or restrict the production and use of Persistent Organic Pollutants and to regulate the international trade of designated POPs. The Convention restricts the export and import of the chemicals in Annexes A and B, allowing international trade of listed chemicals only for specific purposes specified in the Convention.

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade is designed to regulate the international trade of certain hazardous chemicals and pesticides, and to promote the exchange of information through proper labelling, directions on safe handling, and informed purchases. The Convention requests exporting and importing parties to implement the Prior Informed Consent (PIC) procedure with respect to the chemicals listed in Annex III.

For both Conventions, the list of controlled chemicals has been continuously reviewed and examined since entry into force, and has been amended every other year. The recent additions to the Annexes are summarized in Annex 2.1 of the present report. Examining and analysing the controlled chemicals requires techniques and infrastructure. Customs and relevant authorities must establish which chemicals and substances are subject to the Conventions, and which facilities are available for such examination. To this end, the WCO has been working closely with the secretariat of the conventions to incorporate the controlled chemicals into the HS codes.

20 ITU "Global E-waste Monitor 2020" (https://www.itu.int/en/ITU-D/Environment/Pages/Spotlight/Global-Ewaste-Monitor-2020.aspx)
21 Basel Convention Secretariat (http://www.basel.int/Implementation/PublicAwareness/NewsFeatures/Ewastetechnicalguidelines/tabid/5122/Default.aspx)
22 United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3-14 June 1992 (https://www.un.org/en/conferences/environment/rio1992)
23 Stockholm Convention "Status of ratification" (http://chm.pops.int/Countries/StatusofRatifications/PartiesandSignatoires/tabid/4500/Default.aspx)
24 Rotterdam Convention "Status of ratification" (http://www.pic.int/Countries/Statusofratifications/tabid/1072/language/en-US/Default.aspx)

The two Conventions support the principles of the circular economy by encouraging the use of safer chemicals and the responsible management of waste and resources. Furthermore, both Conventions and the circular economy share a common goal of promoting sustainable development.

1.3. Minamata Convention

The Minamata Convention on Mercury is the newest MEA, coming into force in August 2017, and currently has 139 participating parties.[25] In the mid-20th century, a mercury contamination disaster occurred in the Japanese city of Minamata, leading to the development of Minamata disease, which included symptoms such as numbness, tremors, impaired vision and hearing, and in severe cases, paralysis and death. The Minamata disaster brought global attention to the dangers of mercury pollution. In January 2009, UNEP launched negotiations on a new global treaty on mercury, which was adopted in October 2013.

The Convention that regulates mercury and mercury compounds includes border measures under Article 3. While the Basel Convention already regulates the transboundary movement of waste containing mercury, the two Conventions have different orientations for regulating mercury: the Minamata Convention prohibits the export of mercury, with an exception for the purpose of use in the importing country or environmentally sound interim storage (paragraph 6, Article 3), whereas the Basel Convention puts mercury-contaminated wastes under the Prior Informed Consent (PIC) procedure.

1.4. Convention on Plastic Pollution

The G7 leaders' summit in Schloss Elmau, Germany, in June 2015 highlighted the issue of plastic pollution, one which has since attracted more attention from society. Soon after the leaders' meeting, a report was released at Davos in January 2016, stating that oceans are expected to contain more plastics than fish by 2050.[26] Against this backdrop, the United Nations Environment Assembly, **in March 2022, adopted a resolution to launch negotiations on a plastic pollution treaty.**[27]

Negotiations started in the second half of 2022, with the aim of concluding by the end of 2024. The scope and contents of the treaty will be clarified and developed, including whether or not it will cover provisions on border measures. Without prejudice, some notes mention border measures as one of the components of the treaty (CIEL, 2020; WEF, 2020).

2. Regional Trade Agreements (RTAs) and a circular economy

A regional trade agreement (RTA) is an international agreement between two or more countries to mutually reduce barriers to imports and exports. RTAs are called by a variety of names, depending on the official name in the agreement (e.g. "free trade agreement" (FTA), "economic partnership agreement", "trade promotion agreement", "closer economic relations" and "comprehensive economic cooperation agreement"). Recently, more and more RTAs have been negotiated and ratified. According to the WTO, **as of 1 December 2022, 355 RTAs were in force**,[28] and the number is expected to increase.

2.1. Increasing importance of the environment in RTAs

An essential element of RTAs is the elimination or reduction of import tariffs. However, they also often cover other areas, such as trade in services, investment, competition policy, and intellectual property protection. The environment is also often covered by RTAs, with **most containing some sort of environmental aspect** (Monteiro, J., 2016). In addition, substantive elements (rather than preambular remarks) are now more often embedded (OECD, 2013). The environmental aspects could cover a variety of elements. According to Less, C. & Kim, J., 2008, the major environmental elements of RTAs are as follows: *(i) Key statement on the environment, (ii) Environmental cooperation, (iii) Environmental laws and*

25 Minamata Convention on Mercury "Parties and Signatories" (https://www.mercuryconvention.org/en/parties)
26 The World Economic Forum "The New Plastics Economy: Rethinking the future of plastics", 2017 https://www.weforum.org/reports/the-new-plastics-economy-rethinking-the-future-of-plastics/
27 UNEA website (https://wedocs.unep.org/bitstream/handle/20.500.11822/38522/k2200647_-_unep-ea-5-l-23-rev-1_-_advance.pdf?sequence=1&isAllowed=y)
28 WTO "Regional trade agreements" (https://www.wto.org/english/tratop_e/region_e/region_e.htm)

standards, (iv) Procedural guarantees, enforcement and dispute settlement, (v) Determining levels of environmental protection, exceptions and safeguard clauses, (vi) Institutional arrangements for implementation, (vii) Relationship with other international commitments, (viii) Public participation, and (ix) Performance review of environmental provisions in RTAs.

Most of the above-mentioned elements are not directly related to Customs administrations, and are more closely related to domestic environmental policy, cooperation, or arrangements on environmental policy among contracting parties. However, some of them contain border measures, which are discussed in the following section.

2.2. Provisions related to the circular economy

Preambular clauses and provisions on general exceptions are quite common elements in RTAs. However, **provisions are increasingly being incorporated in the RTAs, such as commitments on environmental cooperation and commitment to MEAs** (e.g. OECD, 2018; George, C., 2014; Monterio, J., 2016). Reaffirming the commitment to the Basel Convention and other MEAs is often seen in the RTAs. For instance, the European Parliament requests that, in its free trade agreements, the European Commission include the minimum standard that corresponds to 12 MEAs.[29,30]

In some RTAs with developed countries, such as the United States or EU countries, **provisions exist to ensure equal treatment of remanufactured goods as new products**. Remanufactured goods are often classified as used goods and face import restrictions such as import bans, licensing, and quality control. These provisions allow remanufactured goods to circumvent such restrictions, facilitating trade in remanufactured goods and enhancing the remanufacturing business. Textual examples are summarized in Annex 2.2.

The EU sees RTAs as a vehicle for promotion of a circular economy (Kettunen, M. at al., 2019). In some EU RTAs, such as the EU-New Zealand Free Trade Agreement and EU-Australia Free Trade Agreement, **"circular economy" is referred to in the text** (see Annex 4.4), but the Agreements only provide a general description of cooperation towards a circular economy, and do not stipulate any specific obligations or rights.

The EU-New Zealand Free Trade Agreement contains a list of 49 **environmental goods,** for example, photovoltaic cells (HS 8541.40) and windmills and turbines (HS 8412.80). Parties to the Agreement recognize the importance of facilitating trade in such goods.[31]

The RTAs have much more potential to promote transition to a circular economy. For example, Bellmann and Van der Ven (2020) advocate the ideas below to facilitate circular trade through RTAs.

(i) Horizontal disciplines on good regulatory practices and international regulatory cooperation

Ensuring that technical regulations and standards are fair and science-based can generate environmental benefits. This provides a common basis for contracting parties to have the same understanding and orientation towards a circular economy.

(ii) Harmonization of circular economy-related standards and test procedures

For instance, different standards exist for metal scrap, such as the ISRI Scrap Specifications Circular in the United States, EU-27 Steel Scrap Specification in the EU, and the State Administration for Material Regulation (SAMR) in China. Harmonizing these standards globally can facilitate circular trade. Additionally, test procedures vary among countries, and results may not be recognized automatically in different countries. Standardizing test procedures and mutually recognizing results among trading partners can greatly facilitate circular trade. Currently, International

29 European Parliament "European Parliament resolution of 25 November 2010 on human rights and social and environmental standards in international trade agreements" (https://www.europarl.europa.eu/doceo/document/TA-7-2010-0434_EN.html)

30 Under EU Regulation No 978/2012, the 12 MEAs are as follows: Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973); Montreal Protocol on Substances that Deplete the Ozone Layer (1987); Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989); Convention on Biological Diversity (1992); The United Nations Framework Convention on Climate Change (1992); Cartagena Protocol on Biosafety (2000); Stockholm Convention on Persistent Organic Pollutants (2001); Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998); United Nations Single Convention on Narcotic Drugs (1961); United Nations Convention on Psychotropic Substances (1971); United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances (1988); and United Nations Convention against Corruption (2004).

31 European Commission "EU-New Zealand: Text of the agreement" (https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/new-zealand/eu-new-zealand-agreement/text-agreement_en)

Standardization Organization (ISO) is working on Standardization in the field of Circular Economy[32].

Harmonizing these standards globally also brings some benefits to Customs administrations. Standards provide product information, such as on contents and quality, which is useful for HS classification and risk analysis to comply with relevant laws and regulations.

(iii) Addressing issues related to classification of waste

For example, a commonly expressed concern is that the 6-digit HS codes do not distinguish between secondary raw materials from waste and scrap, and remanufactured or refurbished products from new products. To address such concerns, contracting parties can agree to create a specific category of products under their national HS codes.

(iv) Labelling schemes that exhibit the product's durability, reparability, upgradability or quality

Labelling schemes indicating a product's durability, reparability, upgradability or quality can assist the transition to a circular economy by informing consumers and recycling operators. Harmonization of such schemes between contracting parties is preferable, and is possible to agree in the RTAs. But labelling should be on a voluntary basis to avoid creating additional trade barriers at borders.

As there is a strong possibility that new attempts related to a circular economy will be made in RTAs in the future, Customs administrations should keep a close eye on this new trend in RTAs.

Box 2.1. Japan - Philippines EPA negotiation and concerns on the surge in imported used goods

The negotiations on the Economic Partnership Agreement (EPA) between Japan and Philippines began in October 2002. One of the thorny issues was the environment. **Philippines was concerned with an increase in import of wastes due to elimination or reduction of import tariffs**. Philippines' concerns focused on used goods that are not hazardous wastes covered by the Basel Convention.

Hazardous wastes can be controlled under the Basel Convention. On the other hand, used goods such as electrical products and electronic appliances cannot be controlled under the Convention or any other laws and regulations, and instead have to be treated equally as new products. **Increased importation of used goods creates concerns in two regards: used goods have a shorter product life and become wastes quickly; used goods are relatively very cheap, and so traders buy and import many used products, picking parts from them to assemble one used product of a high quality, and leaving behind a lot of waste.** At the time, Philippines did not have a well-developed domestic recycling mechanism or waste management system, and so its concerns were legitimate.

The two Governments sought a mutually satisfactory solution, and their Foreign Ministers **exchanged letters pledging to prohibit the exportation of hazardous wastes under domestic laws and regulations alongside the Basel Convention.**[33] As a result of all the efforts made by both sides, the EPA entered into force in December 2008.

Whilst not directly related to the EPA negotiation, those involved in that process may have been aware of the illegal waste trafficking case[34] discovered a few years before the negotiations began. During July to November 1999, a small local trading company, Nisso, exported harmful medical waste (tonnage of as much as 2,100) from Tokyo, Japan, to Manila, Philippines, with a declaration disguising it as used paper for recycling and plastic waste. Philippines Customs inspected the cargos and the fraud was discovered. After the investigation, the Japanese Government took all the waste back from Philippines.

32 ISO "Technical Committees ISO/TC 323 Circular economy" (https://www.iso.org/committee/7203984.html)
33 Ministry of Foreign Affairs, Japan (https://www.mofa.go.jp/mofaj/gaiko/RTAs/j_asean/philippines/pdfs/g_shokan07.pdf)
34 Ministry of Economy and Trade, Japan (https://www.meti.go.jp/policy/recycle/main/3r_policy/policy/pdf/grobal/ref_16.pdf)

Box 2.2. TRQ scheme under FTA between EFTA and Indonesia for sustainable palm oil

Indonesia is the world's largest producer of palm oil and holds more than half of the global market share. However, the expansion of palm oil plantations in the country has resulted in several sustainability issues. These include deforestation, greenhouse gas emissions due to the burning of peatlands, and human rights abuses, such as the displacement of indigenous communities, land grabbing, and exploitation of workers. Therefore, it is important to support sustainable palm oil production.

To promote sustainability in the palm oil industry, the Free Trade Agreement between the European Free Trade Association (EFTA) and Indonesia grants **Switzerland limited Tariff Rate Quotas (TRQs) for palm oil from Indonesia, on the condition that a valid certificate of sustainable and traceable production is submitted.**[35] Indonesia Sustainable Palm Oil (ISPO) issues a national sustainability certificate for palm oil.[36]

This practice can also be extended to circular economy activities. For instance, products made from recycled materials or repaired/remanufactured goods with a certificate issued by a third party can be granted different treatment, such as reduced tariffs, from other regular goods.

3. MEAs and HS codes

As HS codes are the standardized and globally accepted tool for classifying imported or exported goods, they are quite useful for Customs administrations in identifying specific goods. To effectively implement the MEAs, the WCO maintains a correlation table between HS codes and controlled chemicals and products under MEAs.[37] This provides useful guidance for both Customs administrations and traders, because it indicates the possible location of controlled chemicals and products under HS codes.

In addition, the WCO and related international organizations are working closely to further align the HS codes with controlled chemicals and products under MEAs (WCO Secretariat, 2020; Steenblik, R., 2020). It is not an easy task, as HS codes and MEAs have different purposes and objectives. The most recent revision,[38] HS 2022, includes a new heading for electrical and electronic waste or e-waste (HS 8549.99) in line with the e-waste amendment of the Basel Convention. It further includes certain hazardous chemicals controlled under the Rotterdam Convention (such as HS 2931.20, HS 2931.54, HS 2932.96), and certain persistent organic pollutants (POPs) controlled under the Stockholm Convention (e.g. HS 3824.89), as well as a new heading (HS 3827) for gases controlled under the Kigali Amendment of the Montreal Protocol.

Various MEAs are related to trade in reverse supply chains, and Customs administrations must have a deep understanding of them to effectively enforce their regulations. Therefore, it is important for Customs administrations to establish and maintain cooperative relationships with environment agencies.

Nowadays, MEAs are frequently updated, and more RTAs include environmental provisions. To keep up with these changes, Customs administrations should stay informed through diplomatic authorities and environment agencies. Ideally, Customs administrations should be directly involved in the negotiating stage, providing their expertise to other agencies.

The WCO should continue to support its Members, such as through sharing information related to MEAs, keeping up-to-date with the correlation table between HS codes and MEAs, reflecting MEAs in the context of HS codes, and maintaining cooperative relationships with related

35 EFTA "Article 8.10 Sustainable Management of the Vegetable Oils Sector and Associated Trade" (https://www.efta.int/sites/default/files/documents/legal-texts/free-trade-relations/indonesia/efta-indonesia-main-agreement.pdf) and "Annex V: Schedule of Tariff Commitments - Switzerland and Indonesia" (https://www.efta.int/sites/default/files/documents/legal-texts/free-trade-relations/indonesia/efta-Indonesia-annex5-schedule-of-tariff-commitments-switzerland.pdf)

36 ISPO (https://www.indonesiapalmoilfacts.com/ispo/)

37 WCO "Correlations between the HS and international conventions" (https://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/interconnection-table.aspx)

38 WCO "Amendments effective from 1 January 2022" (https://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/hs-nomenclature-2022-edition/amendments-effective-from-1-january-2022.aspx)

international organizations, for example, through the Green Customs Initiative.

References

Andrews, A. (2009). Beyond the Ban - can the Basel Convention adequately Safeguard the Interests of the World's Poor in the International Trade of Hazardous waste? - https://lead-journal.org/content/09167.pdf

Bellmann, C. & van der Ven, C. (2020). Greening regional trade agreements on non-tariff measures through technical barriers to trade and regulatory co-operation. *OECD Trade and Environment Working Papers 2020/04*. https://www.oecd-ilibrary.org/docserver/dfc41618-en.pdf?expires=1671296019&id=id&accname=guest&checksum=418A32BDBDC111DAAF7DB7E844FCC2C5

Bellmann, C. (2021). The Circular Economy and International Trade: Options for the World Trade Organization. https://iccwbo.org/publication/the-circular-economy-and-international-trade-options-for-the-world-trade-organization/

Brown, A., Kaubinger, F. & Borkey, P. (2023) Monitoring trade in plastic waste and scrap. https://www.oecd.org/fr/publications/monitoring-trade-in-plastic-waste-and-scrap-8f3e9c56-en.htm

Center for International Environmental Law (CIEL) (2020). Convention on Plastic Pollution: Toward a New Global Agreement to Address Plastic Pollution. https://www.ciel.org/reports/convention-on-plastic-pollution-toward-a-new-global-agreement-to-address-plastic-pollution/#:~:text=The%20Convention%20on%20Plastic%20Pollution,%2C%20GAIA%2C%20and%20%23breakfreefromplastic.

Dellink, R. (2020) The consequences of a more resource efficient and circular economy for international trade patterns. *OECD Environment Working Papers*. https://www.oecd-ilibrary.org/environment/the-consequences-of-a-more-resource-efficient-and-circular-economy-for-international-trade-patterns_fa01b672-en

George, C. (2014) Environment and Regional Trade Agreements: Emerging Trends and Policy Drivers *OECD Trade and Environment Working Papers 2014/02*. https://www.oecd-ilibrary.org/docserver/5jz0v4q45g6h-en.pdf?expires=1671290761&id=id&accname=guest&checksum=44311DBF05619B2678FA5ED6F74568E9

Kettunen, M., Gionfra, S. & Monteville, M. (2019). EU circular economy and trade: Improving policy coherence for sustainable development. https://ieep.eu/wp-content/uploads/2022/12/EU-trade-CE-and-sustainable-development-IEEP-2019-FINAL.pdf

Khan, S. (2020). Clearly Hazardous, Obscurely Regulated: Lessons from the Basel Convention on Waste Trade. https://www.proquest.com/docview/2424851647

Less, C. & Kim, J. (2008). Checklist for Negotiators of Environmental Provisions in Regional Trade Agreements. *OECD Trade and Environment Working Papers 2008/02*. https://www.oecd-ilibrary.org/docserver/235708858388.pdf?expires=1671286184&id=id&accname=guest&checksum=254E40A27A1A3A3F653F10F49B520D13

McCarthy, A., Dellink, B. & Bibas, R. (2018) The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches. *OECD Environment Working Papers*. https://read.oecd-ilibrary.org/environment/the-macroeconomics-of-the-circular-economy-transition_af983f9a-en#page1

Monteiro, J. (2016). Typology of environment-related provisions in regional trade agreements. *WTO Staff Working Paper, No. ERSD-2016-13*. https://www.econstor.eu/bitstream/10419/145110/1/866032118.pdf

Nuss, C., Sahamie, R. & Stindt, D. (2014).The Reverse Supply Chain Planning Matrix: A Classification Scheme for Planning Problems in Reverse Logistics. *International Journal of Management Reviews*.

OECD (2013). Developments in Regional Trade Agreements and the Environment 2013 Update. https://www.oecd-ilibrary.org/trade/developments-in-regional-trade-agreements-and-the-environment_5jz0v4qcg9zw-en

OECD (2018). Report on the OECD Workshop on Regional Trade Agreements and the Environment in Chile COM/TAD/ENV/JWPTE(2018)1/FINAL.

OECD (2018). International Trade and the Transition to a Circular Economy. https://www.oecd.org/environment/waste/policy-highlights-international-trade-and-the-transition-to-a-circular-economy.pdf

Steenblik, R. (2020). Code Shift: The environmental significance of the 2022 amendments to the Harmonized System. https://www.iisd.org/publications/report/code-shift-environmental-significance-2022-amendments-harmonized-system

WCO Secretariat (2020). Shining a light on dangerous commodities. *WCO News No. 91*. https://mag.wcoomd.org/magazine/wco-news-91-february-2020/shining-a-light-on-dangerous-commodities/

World Economic Forum (WEF) (2020). Plastics, the Circular Economy and Global Trade. https://www.weforum.org/whitepapers/plastics-the-circular-economy-and-global-trade/

Weiss, E. (2011). The Evolution of International Environmental Law. https://scholarship.law.georgetown.edu/facpub/1669/

Yamaguchi, S. (2022). Securing reverse supply chains for a resource efficient and circular economy. *OECD Trade and Environment Working Papers*. https://www.oecd.org/environment/securing-reverse-supply-chains-for-a-resource-efficient-and-circular-economy-6ab6bb39-en.htm

Annex 2.1. Supplementary information on MEAs

1. Stockholm Convention

The recent additions to the Annexes are below.[39]

COP10 (June 2022)	- Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds (Annex A)
COP9 (May 2019)	- Dicofol (Annex A) - Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds (Annex A)
COP8 (May 2017)	- Decabromodiphenyl ether (Annex A) - Short-chain chlorinated paraffins (Annex A) - Hexachlorobutadiene (Annex C)

2. Rotterdam Convention

The recent additions to Annex III of the Rotterdam Convention are below.[40]

COP10 (June 2022)	- decabromodiphenyl ether - perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds
COP9 (May 2019)	- phorate - hexabromocyclododecane
COP8 (May 2017)	- carbofuran - trichlorfon - short-chain chlorinated paraffins - tributyltin compounds

3. Convention on Plastic Pollution

The resolution to launch negotiations on a plastic pollution treaty was adopted in March 2022 and refers to a "circular economy" as follows:

3. (b) To promote sustainable production and consumption of plastics through, among other things, product design and environmentally sound waste management, including through resource efficiency and circular economy approaches […].

It is not clear how this paragraph of the resolution will be translated into the text of the convention. As the Minamata Convention on Mercury regulates the entire life-cycle of mercury, there is a possibility of taking the same approach. However, this all depends on the negotiations.

4. Montreal Protocol

In response to growing concerns about the depletion of the ozone layer, which protects the earth from harmful ultraviolet radiation, negotiations began in May 1981 to protect the ozone layer by phasing out the production and consumption of ozone-depleting substances (ODS). The negotiations continued for several years and resulted in the adoption of the Montreal Protocol in September 1987. It entered into force in January 1989, and currently 198 parties participate.[41] The Montreal Protocol on Substances that Deplete the Ozone Layer is an international agreement to protect the earth's ozone layer by phasing out such chemicals, including chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). This Protocol aims to protect the global environment and work on climate change countermeasures, such as mitigating global warming.

Since its entry into force in January 1989, the Protocol has been amended seven times. The most recent amendment was **the Kigali Amendment to the Montreal Protocol, which came into force in January 2021**. Eighteen types of hydrofluorocarbons (HFCs) were added to a new annex (Annex F). The controlled substances

39 The new POPs under the Stockholm Convention, Stockholm Convention (http://chm.pops.int/TheConvention/ThePOPs/TheNewPOPs/tabid/2511/Default.aspx)
40 Tenth Meeting of the Conference of the Parties to the Rotterdam Convention, Rotterdam Convention (http://www.pic.int/TheConvention/ConferenceoftheParties/Meetings/COP10/tabid/8398/language/en-US/Default.aspx)
41 UNEP, the Montreal Protocol on Substances that Deplete the Ozone Layer (https://ozone.unep.org/all-ratifications)

listed in the annexes of the protocol are subject to regulations, including gradual reductions in consumption and production, cross-border controls such as a licensing system for import and export, or export bans. HFCs are commonly used as refrigerants in air conditioners, refrigerators, and refrigerated display cabinets.

Annex 2.2. Provisions regarding remanufacturing in RTAs

Recently, specific provisions regarding remanufacturing have been found in RTAs among developed countries. These provisions request that trading partners ensure equal treatment between remanufactured goods and new products, and prohibit any prohibitions or restrictions on remanufactured goods.

1. The United States-Mexico-Canada Agreement (USMCA) entered into force in July 2020 and stipulates the following:[42]

Article 2.12: Remanufactured Goods

1. *For greater certainty, Article 2.11.1 (Import and Export Restrictions) applies to prohibitions and restrictions on a* remanufactured good.
2. *Subject to its obligations under this Agreement and the WTO Agreement, a Party may require that a* remanufactured good*:*
   a) be identified as such, including through labelling, for distribution or sale in its territory, and
   b) meet all applicable technical requirements that apply to an equivalent good in new condition.
3. *If a Party adopts or maintains a prohibition or a restriction on a used good, it shall not apply the measure to a remanufactured good.*

2. The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)[43] entered into force in December 2018 among 11 Pacific members.

Article 2.11: Remanufactured Goods

1. *For greater certainty, Article 2. 10.1 (Import and Export Restrictions) shall apply to prohibitions and restrictions on the importation of remanufactured goods.*
2. *If a Party adopts or maintains measures prohibiting or restricting the importation of used goods, it shall not apply those measures to remanufactured goods.*

[FN5] *For greater certainty, subject to its obligations under this Agreement and the WTO Agreement, a Party may require that remanufactured goods:*

(a) be identified as such for distribution or sale in its territory; and

(b) meet all applicable technical requirements that apply to equivalent goods in new condition.

[FN6] *This paragraph shall not apply to the treatment of certain remanufactured goods by Viet Nam as set out in Annex 2-B (Remanufactured Goods).*

3. The EU and Japan's Economic Partnership Agreement entered into force in February 2019.[44]

ARTICLE 2.18 Remanufactured goods

42 USTR "Agreement between the United States of America, the United Mexican States, and Canada 7/1/20 Text" (https://ustr.gov/trade-agreements/free-trade-agreements/united-states-mexico-canada-agreement/agreement-between)

43 New Zealand Foreign Affairs and Trade "Comprehensive and Progressive Agreement for Trans-Pacific Partnership text and resources" (https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-in-force/cptpp/comprehensive-and-progressive-agreement-for-trans-pacific-partnership-text-and-resources/)

44 European Commission "EU-Japan Economic Partnership Agreement" (https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/japan/eu-japan-agreement_en)

1. *Unless otherwise provided for in this Agreement, each Party shall provide that* remanufactured goods *are treated as new goods. Each Party may require that* remanufactured goods *be identified as such for distribution or sale.*
2. *For the purposes of this Article, "*remanufactured goods*" means goods classified under heading 40.12, Chapters 84 to 90 or heading 94.02 of the Harmonized System that:*
   (a) are entirely or partially composed of parts obtained from used goods;
   (b) have a similar life expectancy and performance compared to such goods, when new; and
   (c) have a factory warranty similar to that applicable to such goods, when new.

[FN1] *For greater certainty, the references to the tariff classification number of the Harmonized System in this Chapter are based on the Harmonized System, as amended on 1 January 2017.*

4. EU-Vietnam Free Trade Agreement, signed in June 2019 and awaiting entry into force.[45]

Article 2.6 Remanufactured Goods
The Parties shall accord to remanufactured goods *the same treatment as that accorded to new like goods. A Party may require specific labelling of remanufactured goods in order to prevent deception of consumers. Each Party shall implement this Article within a transitional period of no longer than three years from the date of entry into force of this Agreement.*

Annex 2.3. EU RTAs that refer to a circular economy

Below are excerpts from EU RTAs that refer to a circular economy. They provide a general description of cooperation towards a circular economy, and do not stipulate any specific obligations or rights.

1. **The EU-New Zealand Free Trade Agreement** was concluded in June 2022 and is awaiting entry into force.[46]

5. *The Parties shall work together to strengthen their cooperation on trade-related aspects of environmental policies and measures, bilaterally, regionally and in international fora, as appropriate, including in the United Nations High-level Political Forum for Sustainable Development, UNEP, UNEA, MEAs, OECD, FAO, and the WTO. Such cooperation may cover inter alia:*
   (a) policies and measures promoting mutual supportiveness of trade and environment including:
      (i) sharing information on policies and practices to encourage the shift to a circular economy*; and*
      (ii) promoting, including by removing obstacles to trade and investment, initiatives that contribute to a circular economy *[...].*

2. The negotiations on the **EU-Australia Free Trade Agreement** began in July 2018 and are still under way. [47]

CHAPTER [XX] TRADE AND SUSTAINABLE DEVELOPMENT
ARTICLE X.4 Multilateral Environmental Governance and Agreements
5. *The Parties shall work together to strengthen their cooperation on trade-related aspects of environmental policies and measures, bilaterally, regionally and in international fora, as appropriate, including in the UN High-level Political Forum for Sustainable Development, UN Environment, UNEA, MEAs, or the WTO. Such cooperation may cover inter alia:*
   (a) initiatives on sustainable production and consumption, including those aimed at promoting a circular economy *and green growth and pollution abatement.*

45 European Commission "EU-Vietnam: Texts of the agreements" (https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/vietnam/eu-vietnam-agreement/texts-agreements_en)
46 European Commission "EU-New Zealand: Text of the agreement" (https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/new-zealand/eu-new-zealand-agreement/text-agreement_en)
47 European Commission "EU-Australia agreement: Documents" (file:///C:/Users/mite/Downloads/Sustainable%20development.pdf)

Chapter 3. Data as a challenge for Customs and policy-making in the circular economy

Growing knowledge of the circular economy has paved the way for global awareness of the importance of waste pollution and possible remedies. However, the global economy is trapped by the current dominance of linear economic models (Circular Economy, 2022). Data and statistics are often viewed as key enablers in the transition to a circular economy (UNECE, 2021).

Governments, the private sector, NGOs and academia will need relevant circular economy data for multiple purposes. First, data can highlight possible incentives, targets and outcomes for governments. Some examples are that a circular economy would contribute up to USD 210 billion in Australia (KPMG, 2020) or approximately USD 140 billion in Denmark, Finland, Iceland, Norway and Sweden (Nordic Innovation, 2021). Second, more granular data at the product level may help economic operators to change from a linear to a circular economic model. They could better select critical materials and products with high potential for circularity and economic value (Werning and Spinler, 2020) in order to extend the life of products for multiple end-uses and to reuse waste materials in the production process. Data is also critical **to support Customs and other agencies in improving the process of compliance and reporting requirements at the border**, for example, by recycling (Diversys, 2023). Researchers, chemists and engineers may also need more data to improve the practical implementation of efficient circular models (Kümmerer et al., 2020).

Transaction-level data provides important information for a circular economy. In turn, this can provide relevant insights into how to improve decision-making at the product, operator, industry, and national levels. As a result, the more data is available for decision-making, the higher the performance of the circular economy (Awan et al., 2021) and the more the effects of waste pollution will be reduced.

There are **significant data gaps that can prevent the implementation of a circular economy in practice** (Serna-Guerrero et al., 2022). Today's linear, data-driven world does not require the collection of as much granular data, as waste is generally intended to be disposed of. In contrast, **a data-driven circular economy would require determining exactly where, when, to whom, for what value and in what volume, waste streams could be redirected in a timely manner**. Addressing the data gaps both at the national and global level can help to mitigate the wide range of effects linked to uncertainty surrounding the circular economy transition.

Data volume is therefore the first problem for all stakeholders in the context of a circular economy. Global data volume could reach 175 zettabytes by 2025, up from 33 zettabytes in 2018 (International Data Corporation, 2018). While 80% of industrial data is still untapped, the demand for data[48] could increase exponentially in a global transition to the circular economy, creating a technical challenge to adapt to this change. A second problem is a lack of understanding on how other actors in the value chain could utilize, share and exchange circular economy data (Serna-Guerrero et al., 2022). For example, a compliance issue could emerge as to how, and to what extent, Customs agencies and other actors could share and exchange circular economy data to monitor/detect potential "greenwashing"[49] (Kofos et al., 2022).

This chapter takes stock of current knowledge and recent evidence to highlight possible upcoming data challenges in the transition from a national to a global circular economy, from the perspective of trade and Customs. Section 1 discusses the data issue in the context of national monitoring of a circular economy, illustrating this with some practical examples of companies and countries. It is important, for different reasons, for Customs to be aware of the data challenges faced by the private sector at large: on the one hand, the availability of new transaction-level data creates new opportunities for enforcement, investigation and risk analysis; on the other hand, some of that data may need to be captured at the point of entry for circular economy goods that cross borders. Section 2 deals specifically with data related to international trade and the circular economy, in order for Customs to understand the challenges raised by data circulation in the context of circular trade. The final section discusses the potential role of Customs in response to these challenges, and how Customs could get involved in the use, sharing and exchange of circular economy data. In particular, a number of possible solutions are identified, ranging from the Harmonized System classification of commodities, to the use of disruptive technologies and data analytics, and the development of other digital tools and platforms.

48 In particular, lack of technological know-how and data expertise may hinder small and medium enterprises from adopting circular economy models (Rizos et al., 2016).

49 Greenwashing in this case refers to false claims regarding the circularity of products for business benefits (Kofos et al., 2022).

1. Data gaps are a major obstacle to a circular economy

Despite the growing amount of circular economy legislation, monitoring a national transition can, for most economies, be something new. Data in this emerging field plays a pivotal role, both to provide the relevant information needed to guide economic operators and industries towards a circular economy transition, and to develop a common understanding of possible benefits and risks, including potential impacts on the national economy and the environment.

In practice, circular economy data demonstrates its usefulness in, for example, the creation of performance indicators at the company level (micro layer), measurement of regional recycling rates in specific industries (meso layer) or flow mapping of waste materials and end-of-life products in the national accounts (macro layer). While the use cases can differ between industries and sectors, macro-monitoring tools in relation to material and product flows can reveal advances in a national circular economy transition (European Environment Agency, 2020).

Circular economy data typically differs from linear economy data. First, it needs a broader coverage so as to include material and product flows after the first end-use. Second, circular economy data can be considered an additional resource value for the company (Lowe and Genovese, 2022), as it can facilitate circular transformation and thus generate higher value creation. Relevant circular economy data can be classified mainly into four groups: a) data on the full service life of a product, from materials extraction to post-use life; b) data on flows of materials through various production, consumption, and end-of-life systems; c) data on the operation and performance of systems and value networks – devices, processes, activities, and value chains; d) data on Customers' behaviour, habits and preferences (Kauppila et al., 2022).

However, there are frequently important data gaps for monitoring a national transition between a linear and a circular economy. For consumers, information as to the exact volume of unused textiles and plastics waste is often missing in the national economy (Virtanen et al., 2019). For economic operators, national statistics may over-report some recycling activities, such as when a material is counted as recycled, when it may have been delivered but not processed, or processed but then stockpiled on- or off-site, or exported for recovery without certainty (National Waste Report, 2020). Retired power batteries are another good example, where it may be difficult for national statistics to track the stock of batteries, their quality and their value. In practice, vehicle enterprises usually lack real-time and detailed data, facing confidentiality issues concerning vehicle and battery information and using estimates of the residual value of waste power batteries (Yu et al., 2020). The obstacle created by product data gaps may impede economic operators in transitioning to circular economic models (Kirchherr et al., 2018).

These data gaps still constitute a major obstacle to extensive national monitoring. A body of studies highlights important enablers towards a data-based circular economy, ranging from data availability and data accuracy, to data accessibility. A general case study is provided below to illustrate interlinked enablers for data-based recycling operations.

Enabler 1: data availability

Data availability is a basic requirement for circular activities. Taking the example of recycling operations, data sources on waste materials are often disconnected at different stages of operations, such as collection, transportation, sorting, and processing (Diversys, 2023). To implement recycling operations at the company level, collectors need the availability of real-time information about material types, quantities and locations, to reduce costs and increase efficiency.

Meanwhile, processors will need data about material quality, composition and demand to avoid producing low-value products or incurring unnecessary expenses. In addition, producers will need more detailed information about collection and processing for reporting and auditing. The current limits of data availability underline the practical issue of data silos among the different operators (Pedrazzoli et al., 2022). While recycling legislation often requires more granular information for recycling activities, these data silos hamper data exchanges between different companies and may have important implications for compliance and reporting requirements.

Enabler 2: data accuracy

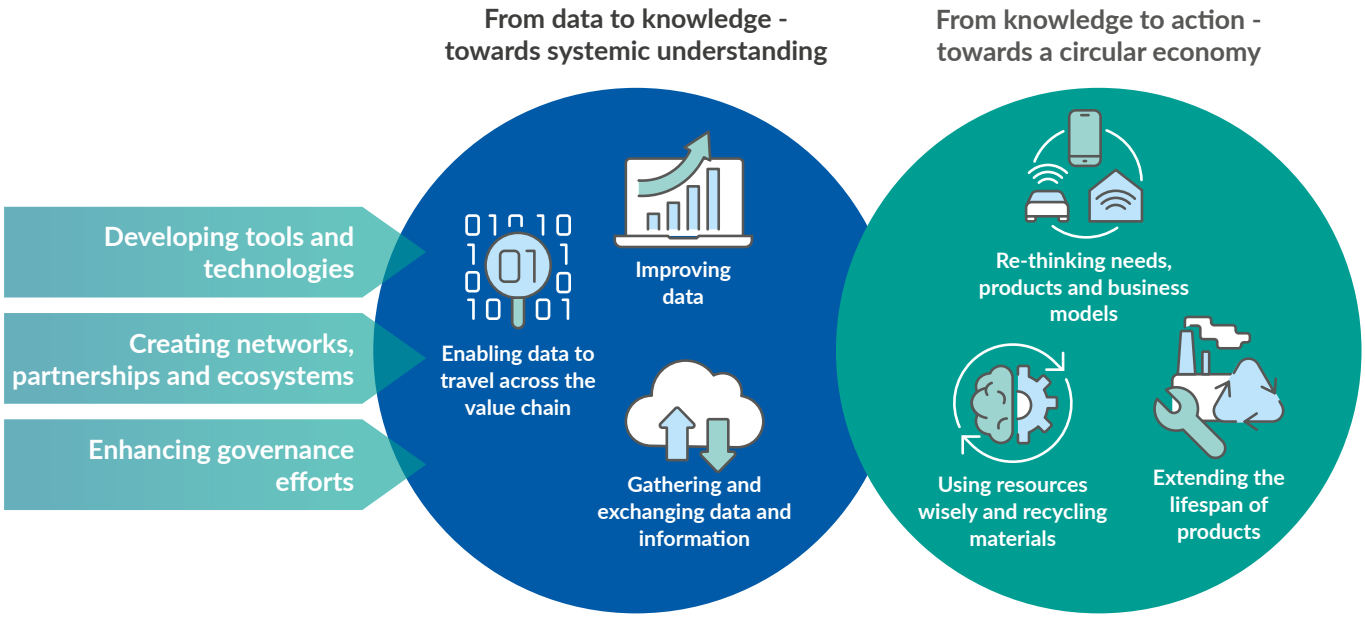
Data accuracy on waste streams is an important enabler for a data-based circular economy. To implement a circular transformation, key information is necessary, such as on the quantity and quality of wastes (Ignatyeva et al., 2021; Stanisavljevic and Brunner, 2019). However, companies may use different datasets, methodologies and measurements, leading to persistent inconsistencies, errors or data quality and accuracy discrepancies (Diversys, 2023).

Operators may lack visibility, not only into their own data, but also that of other partners. For example, collectors of wastes may not know how much material they are delivering to processors or where it ends up. Processors may not know how much material they are receiving from collectors, or where it is from. Remanufacturers may not know how much recycled content they are buying or what environmental benefits they are generating. Producers may not get an accurate picture of the effectiveness of the recycling programme they are funding to meet their Extended Producer Responsibility (EPR) obligations. Governments and regulators may not get the visibility needed to understand legislative effectiveness, make funding decisions, or pursue enforcement.

Enabler 3: data accessibility

Connecting data sources and enhancing high-quality information are important ingredients to support the visibility of circular transformations (Kauppila et al., 2022). In addition, access to information between the different operators is essential for effective decision-making in recycling operations. Limited access to data sources may create important sources of inefficiency in the recycling process, and may cause greater environmental impacts (increased air pollution) and loss of competitiveness for recyclers (Diversys, 2023).

Figure 3.1. Technological and cultural changes towards a circular economy



(Source) Kauppila et al. (2022)

Increased access to circular economy data requires closer collaboration between collectors, processors, remanufacturers, recyclers and producers (Witjes and Lozano, 2016). This type of data can have many owners and different users, while information should be available in real time. The public and private actors potentially involved can have different motives and capacities for collecting, sharing, and opening up their circular economy-related data (Kauppila et al., 2022).

Data gaps are a major challenge for a circular economy transition. It will require a cultural corporate change from economic operators, leading in turn to a systemic change in their data culture (Figure 3.1). To support these changes, data provides the main inputs of knowledge to improve the practical implementation of a national circular economy (Box 3.1).

Box 3.1. Towards a data-driven circular economy in Finland

The Government of Finland adopted a new strategic programme, the "Finnish national circular economy programme", in 2021 to promote a circular economy (Ministry of the Environment, 2021), where multi-stakeholder cooperation and digital solutions will play a critical role. Following the implementation of the Data Governance Act and Data Act in the EU, Finland – under the lead of the Ministry of Finance and the Ministry of Transport and Communications – will establish a single national information point to support the reuse of public sector data and a register of data sources.

The Government currently has a variety of data sources at its disposal, making these publicly available through registers, statistics and databases (Kauppila et al., 2022). Using data from various national sources (including Customs data), the Finnish Environment Institute SYKE has developed a model for estimating the secondary streams of plastic waste.

The overall data is openly available (Table 3.1), but some of the background data cannot be released due to business confidentiality. Estimates will be published as projects proceed. The data is intended for open use by all stakeholders interested in positively contributing to the circular economy of plastics. Although the availability of data on the production of waste is relatively good, the main challenge arises from the lack of circular economy data for a) the amounts of plastic waste exported and imported, b) plastics ending up in the environment and c) the rejects from utilization of secondary materials.

Table 3.1. Data availability on plastics flow at one point of the plastics supply chain

Type of plastics flows	Data source
Plastic waste, mixed MSW, treatment types	MSW statistics, Statistics Finland
Plastic packaging wastes	Producer responsibility statistics, PIRELY
Plastic packaging waste collected in regional collection points and arriving at terminals	RINKI
Waste PET bottles returned to deposit system	Palpa
Storage of plastic waste	YLVA database
Plastics in mixed MSW	Suomen kiertovoima ry KIVO
Plastics sorted and recycled	Environmental permits of individual plants
Plastics exports	UJAS database Customs

(Source) Kauppila et al. (2022)

2. Five global challenges in the context of trade data

Closing the data gaps in a circular economy remains a core challenge at the national level. Close coordination between economic operators, industries and public authorities is essential to fill some of these gaps. **Generally**, flows of materials and products, after the first end-use, do not stop at borders, meaning that other substantial gaps can also occur in trade data and statistics. To advance towards a data-driven transition, global coordination between trade actors would also be a critical step (Geng et al., 2019).

Trade flows of products and materials involved in a circular economy are typically difficult to track. In fact, most trade statistics are often built on the linear economic model, with little consideration of the fate of the waste material and end-of-life products. A good example is trade statistics on used vehicles: only 20% of countries reported used automobiles, and 39% reported used engines (Endo and Fuse, 2017).

Based on recent research, five global challenges can arise from circular economy data in the landscape of international trade:

1. Little consensus about the information needed
2. Lack of cross-sector partnerships and lack of data sources
3. Lack of data harmonization between countries
4. Data transparency and confidentiality
5. Environmental impacts of the technology mobilized by the international trading system

First, there is little consensus in practice on the relevant information which should be exchanged between countries as to material and product transactions. For example, accurate data on waste trade flows is still a challenge (Kellenberg, 2015) in a linear economy, and the possibility of recycling waste materials makes trade data measurement more complicated in a circular economy. Information about the quality of recycling materials is often poorly recorded and exchanged between industrialized countries and developing countries (Brooks et al., 2018). To monitor flows of circular economy goods, the additional information needed could include data used for Customs control (for example, certificates, origin/destination data, and data on chemical composition), data on the production process, and data on recycling, refurbishment and reuse (Rukanova et al., 2021).

A second global challenge for trade data is strengthening cross-border cooperation between governments, economic operators, waste management companies, and other supply chain actors. A recent count of circular economy strategies identifies over 45 practices that are currently implemented at different stages of the supply chain (Kalmykova, Sadagopan and Rosado, 2018) "including eco-design, optimizing packaging, extraction of bio-chemicals to name only a few. In turn, this means that a supply chain would require massive flows of data to be shared between multiple actors (Tseng et al., 2022). Such data may cover, for example, the use of virgin and secondary materials, hotspot sources of waste pollution, the lifespan of the product, and possibilities to reduce, reuse, recycle and recover. In practice, a large amount of this necessary data is often lost along the entire supply chain (Aminoff et al., 2016).

Data harmonization on commodities is also an emerging and critical challenge in a circular economy. Although countries can follow different transition paths, more harmonized circular economy data will be required on international trade transactions. Trade statistics are often aggregated and can provide insufficient visibility on specific goods (Chen et al., 2022), for example, when they integrate circular and environmental considerations (WCO, 2023). Reporters usually have different statistics criteria on what is waste and non-waste, and valuable end-of-life products. These types of concern are likely to be amplified by different definitions or understandings of the legal status of end-of-life products (Hoernig, 2022). For example, the flows and indicators reflecting the performance of ELV management are not directly comparable due to cross-country policy differences (Bhari et al., 2021).

A fourth global challenge for trade data is to address the intertwined issue of data transparency and confidentiality. Circular economy data can include more detailed information about the composition of materials, components and products used during the circular production process (WCO, 2023). In some specific cases, this type of information can raise important confidentiality issues, such as when companies are reluctant to share vehicle and battery information with other actors (Yu et al., 2020). A challenge behind the transparency issue is how to expand data sharing across borders, where feasible implementation depends on the amounts of data made available, the type of data, with whom it is shared and with how many (Nordic Innovation, 2021). For instance, some eco-industrial parks and regions report annually on waste and recycling, while others do not (Geng et al., 2019).

A last possible challenge concerns the intended impacts of data infrastructures in a circular economy transition. Circular economy data flows are expected to grow widely in a global transition, and the question arises of whether core infrastructure to store and process data may also have an important environmental cost (Santarius et al., 2022). The challenge is to ensure that the larger quantities of data needed in a circular economy will not themselves become a significant environmental sustainability challenge. In response, some firms are taking the lead to implement circular strategies at their globally owned and operated data centres. For example, Google has implemented practices, such as repairing components whenever possible, to extend the life of servers, and since 2022, seven of 23 data centres have met the target of zero waste to landfill (Werner and Jaffe, 2023).

3. Where Customs can/need to play a role

Global trends in the circular economy could bring disruptive changes in the conventional way of trading between countries. Data collection, exchange and sharing are essential to monitor the circulation of circular economy goods that could cross borders. While the roles and responsibilities of Customs as a result of ongoing policy developments will still take time to take shape, Customs can already anticipate these changes and take an active role to prepare for the future (Rukanova et al., 2022).

In particular, Customs could respond to the growing data challenges posed by the transition to the circular economy in a number of areas:

- Increasing focus on HS codes to drive data harmonization
- Customs digitalization and use of disruptive technologies
- Rethinking data analytics for Customs
- How to do data sharing in a circular economy

3.1. HS codes and data harmonization in a circular economy

Traditionally, the Harmonized System (HS) classification was primarily intended to be an economic tool to monitor commodities and revenue collection. Over the past few decades, the role of the HS tool has been gradually evolving to integrate some major environmental and social imperatives in a constantly changing Society (WCO, 2023). Following the emerging trend of a circular economy transition, a key question is whether and how HS classification could be compatible with materials and goods that are reused, repaired, remanufactured, refurbished or recycled.

HS classification is typically a harmonization tool[50] for both enforcement and facilitation procedures, and is currently used by more than 200 countries and economies. To track the circulation of commodities, this classification allows Customs officials and economic operators to identify a tangible good, under the same 6-digit code. The latest edition of the HS codes, HS 22, helps capture about 5,600 commodity groups in circulation today, representing overall over 98% of the merchandise in international trade.

Another consideration concerning the HS codes is the collection of daily statistical information about the import and export flows of various commodities. Customs may need this data for internal national monitoring purposes, not only to evaluate revenue collection and the evolution of trade volumes, but also to use historical data on goods valuation to apply Customs controls. Once aggregated, this data provides bilateral trade statistics[51] about different trends at the country, regional or global level and is commonly used by international organizations and academic researchers.

An important data challenge is to understand whether the HS codes could provide sufficient information about the materials and products needed for a circular economy transition. The current version of HS codes integrates some circular considerations for the classification harmonization of certain commodities.

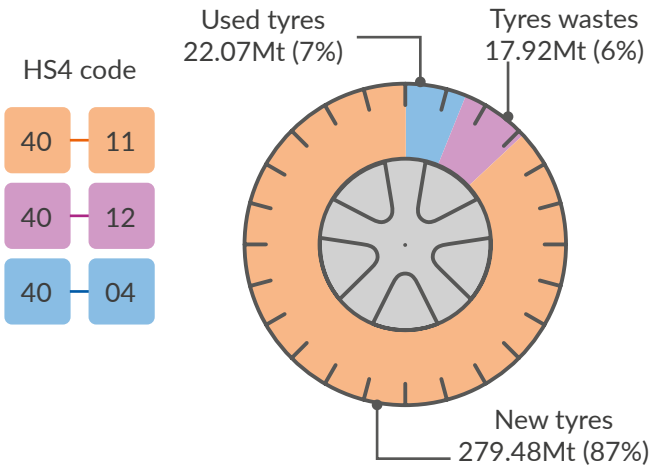
The HS tool makes it possible to identify, under the same 6-digit code, tyres that are reused or retreaded, as well as clothes that are reused (second-hand clothes). For both sets of goods, it is possible to partially identify materials waste with recycling potential. Tyres data can be applied to visualize, for demonstration purposes only, the importance of trade volumes relating to conventional (new) tyres and tyres with circularity potential[52] (Figure 3.2) at the global level. In practice, it can sometimes be difficult to distinguish these goods from their first-life equivalents as new goods (Bellmann, 2021). For other types of waste, there is still no clear consensus on how to treat products made from primary and secondary raw materials in international trade (Yamaguchi, 2021).

50 The HS codes are part of the Convention officially named "The International Convention on the Harmonized Commodity Description and Coding System", managed by the WCO. The first edition of the Convention came into force in January 1988. Since then, it has revised its codes in 1992, 1996, 2002, 2007, 2012, 2017 and 2022 in response to members' needs.

51 Article 3 (b) of the Convention requires **Contracting Parties to produce trade statistics based on the HS codes**: "Each Contracting Party shall also make publicly available its import and export trade statistics in conformity with the six-digit codes of the Harmonized System, or, on the initiative of the Contracting Party, beyond that level, to the extent that publication is not precluded for exceptional reasons such as commercial confidentiality or national security; […]."

52 Another example is textiles (Annex 3.4), where HS codes make it possible to identify the imperative "Reuse" and, to a lesser extent, could identify recyclable textile waste (such as is the case for tyres).

Figure 3.2. Example of data visualization for cumulative trade volumes of tyres, 2003-2019



Note: To simplify data visualization, "Used tyres" in the above Figure includes both reused and refurbished tyres.
(Source) Author's calculation based on BACI data from CEPII (2022)

In addition, the HS tool can help to identify 62 types of waste (Kellenberg, 2012) that can be grouped into broader waste categories (see Annex 3.4 for more details): chemical, metal, paper, plastic, textile and other waste (Yamaguchi, 2018). However, the distinction between waste and non-waste with possible circularity potential (i.e. secondary raw materials) is not currently reflected in the 6-digit codes (WCO, 2023). These categories are not inclusive of all waste traded but, instead, can provide a more complete picture of trade in waste and scrap that may be intended for recycling, reusing, and disposal in the destination country (Kellenberg, 2015).

More recently, the 2022 edition of the HS codes has led to the creation of new headings and subheadings to identify electronic waste (e-waste), one of the fastest-growing categories of waste (WCO, 2020). This major change contributes to increased visibility regarding e-waste trade flows, to support Customs controls on this hazardous commodity across borders and to produce accurate trade data. At the same time, e-waste can also be a key component for circular transformation: it is highly recyclable (Dave et al., 2016; Tesfaye et al., 2017), making it of considerable economic value and allowing the recovery of high-grade precious metals.

In addition, 3D printers, used as machines for additive manufacturing, have been integrated as 6-digit codes in the HS 2022 edition. 3D printing technology can play an essential role in a circular economy, with great potential to shorten the processing cycle, and optimize the use of resources, despite the complexity of materials and products (Han et al., 2021). Research indicates that, in practice, 3D printers can enable the adoption of good circular practices, including "Reduce", "Reuse", "Recycle" or "Repair" (Chen, 2022; Ellen MacArthur Foundation/ Google, 2019), and have great potential in the recycling of complex materials, such as for plastics (Zhu et al., 2021).

The main emphasis of HS 2022 is on which goods require monitoring for environmental risk purposes or may be beneficial to the environment. It is the greenest version of the HS codes (WCO, 2020), recording 351 sets of amendments. As a result, the classification of commodities has evolved. Changes in HS codes include, for example, new subheadings under 29.03 and 38.27 (for goods falling under the Kigali Amendment to the Montreal Protocol); several new subheadings concerning environmentally preferable technologies (such as LEDs for lighting); or products of materials that are capable of being produced more sustainably than those they replace (such as bamboo).

Recent discussions and debates during the Green Customs Global Conference and the series of symposia on greening the HS at the WCO have highlighted the important role that the creation of new headings and subheadings could play in promoting circular economy practices across borders (WCO, 2023). This is a crucial issue, given the increasing shift in national and regional policies towards circular economy objectives. Evidence on the transition to a circular economy shows that the adoption of practices can represent an opportunity for value creation of goods (Lowe and Genovese, 2022), but at the same time, some environmental risks could counterbalance the intended positive environmental effects in this transition (Zink and Geyer, 2017).

The debate remains open as to whether HS codes could help to better integrate circularity issues into the structure of international trade statistics. Current HS codes do not contain the detailed information needed to collect trade data on all goods with circular transformations (e.g. Eyzaguirre and Birkbeck, 2022; Bellmann and Draper, 2021). It is still a practical challenge to link the set of HS codes for a commodity based on its different life-cycle stages (first-life, second-life and after, end-life) and to identify possible circular transformations where necessary. In their transition to a circular economy,

some countries[53] instead use more granular HS codes to capture key materials and products needed on a case-by-case basis.

In response to a circular economy transition, Customs will need more detailed information about materials and products. Additional data on goods in circulation may include the quality level of waste and scrap for use as secondary raw materials, accurate information on the age of reused goods, and the identification of economic operators applying circular measures. Against this backdrop, the proposed new HS codes[54] require the following clarification: a clear rationale of the change, a robust definition of the new category of goods, verifiability by inspection of physical characteristics of the goods at borders, and an indication of where the good is currently classified (Grooby, 2022). The identification of a circular economy good could thus be challenging, due to the absence of an accepted definition and the feasibility of identifying it beyond its physical characteristics at the border (Barrie et al., 2022).

3.2. Digitalizing Customs and use of disruptive technologies

Digitalization is emerging as an enabler for the circular economy transition. "Circular disruptions"[55] typically require the collection of more detailed and varied information about the characteristics of a commodity and its components over the product's entire life-cycle. In response to the changes, a number of stakeholders active in the fields of trade, Customs and the environment should adopt a new mind-set beyond that of traditional data collection in a linear economy.

The smart circular economy provides an opportunity to address important technical challenges linked to the increasing complexity and information needed in this transition. It is described as "an industrial system that uses digital technologies during the product life-cycle phases to implement circular strategies and practices, aiming at value creation through increased environmental, social, and economic performance" (Bressanelli et al., 2022). The use of digital technologies or disruptive technologies, such as the Internet of Things, big data, and artificial intelligence[56] could support this transition (Box 3.2).

Digital technologies can provide a number of benefits in overcoming global challenges for trade data. On the one hand, they can help to improve the reuse, recycling and remanufacturing of goods, to ensure efficient design and manufacturing processes and to reduce waste leakages along the entire supply chain (Hedberg and Sipka, 2021). This then implies the creation and use of massive data flows among the supply chain actors.[57] On the other hand, digital technologies can also provide new opportunities for improving data exchange and sharing between these actors to drive the adoption of suitable circular business models.

53 Two examples in line with the imperative "Reuse" are the introduction of a series of 10-digit codes to differentiate between new and used industrial equipment in the United States, and the creation of 8-digit codes to identify used buses (Barrie et al., 2022). In the case of environmental goods, 31% of Customs administrations have opened tariff codes on these goods at the country level and/or at the regional level (WCO, 2022).

54 The HS codes have a 5-year review cycle, and the WCO has already started negotiations on HS 2027. Working backwards from HS 2027, which enters into force in January 2027, the schedule for the HS 2027 review is as follows: the draft Recommendation will be submitted to the Council in June 2024; HSC will bring together the changes adopted in March 2024.

55 Circular disruptions refer to the rapid and radical reconfiguration of the current linear economy towards a more sustainable model (Kirchherr, 2022).

56 More details about disruptive technologies, their links and relevance for Customs can be found in the "WCO/WTO Study Report on Disruptive Technologies" (2022).

57 The use of disruptive technologies by economic operators can increase understanding of where there is value potential of materials and products, and where that value is being lost.

Box 3.2. Possible use of disruptive technologies in a circular economy

Artificial intelligence (AI) technology is an area of computer science that focuses on the creation of intelligent machines that work and react more like humans, using data collection and analysis. AI is used in trade to manage risks along the entire supply chain. To design a circular economy transition, AI can help to automate and improve e-waste recycling infrastructure by combining image recognition of waste and robotics; and to extend the life time of electronics through predictive maintenance (Ellen MacArthur Foundation/Google, 2019).

Blockchain technology is a type of sophisticated cryptographic decentralized and distributed ledger architecture that enables data to be recorded in a secure digital format by providing real-time information on transactions between supply chain actors. The direct use of the technology can help to enhance supply chain transparency and traceability: by reducing waste, making repair easier through 3D printing of spare parts (Ferreira et al., 2023), and by increasing visibility regarding waste material flows that can be recycled or reused (Nordic Innovation, 2021).

Internet of Things (IoT) technology is the internetworking of physical devices, vehicles, vessels, containers and others, embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data. In a circular economy transition, IoT can be used to reuse, recycle and repair materials and products, but can also reduce waste by improving product quality during the remanufacturing process (Awan et al., 2020).

Big data refers to analytics undertakings that exhibit complexities along four dimensions: volume (scale of data), velocity (analysis of real-time streaming data), variety and veracity (consideration of uncertainty). Big data technology is at the core of this optimization and streamlining of the process of supply chains and it can help to extract relevant information on products and materials at different stages of the product life-cycle (Gupta et al., 2019). Another example is to use web-scraping tools for the valuation of second-hand cars (Nasiboglu and Akdogan, 2020).

- The rise of big data has helped the circular economy by providing insights into the regeneration of resources, preservation of resources, re-use of waste resources, redesign of business models, collaboration for joint ventures, and product forecasting (Snapp and Pound, 2017).
- Big data analytics can be used for supply chain management (Hazen et al., 2014) and product life-cycle management (Li et al., 2015).

Data analytics is the process of examining raw data in order to identify patterns and draw conclusions. It is to obtain, cleanse, review, analyse, and pull insights from raw data for more effective operations and to provide support for better strategic decision-making. Data analytics is an emerging area in the circular economy (Demestichas and Daskalakis, 2020) and could be used, for example, to compare the trade trends between conventional goods and goods with circularity potential, based on HS codes (data analysis and visualization).

(Source) Author's compilation of the research

Although disruptive technologies could play an essential role in disrupting the current linear economy (Hedberg and Sipka, 2021), data needs may vary between stakeholders active in international trade. Compared with economic operators, Customs activities do not directly produce circular economy data, although Customs could be an important user when a material or product crosses a border for circular transformation. In the context of this trend, Customs and other agencies will need as much detailed information as possible to pursue enforcement.

In order for circular economy goods to be tracked, products first need to be identifiable (Kauppila et al., 2022). Depending on the product, the level of identification required may vary – from identifying the material used and the producer, to identifying the product model, the production lot, or even the individual product. In addition, more visibility concerning a product affected by circular transformation would require some type of device, marking or label.

A good example of marking is the identification system by FiberTrace (www.fibertrace.io), developed to track textiles throughout the production chain. Trackers using nano-sized pigment particles of organic rare earth elements embedded in cellulose fibres can help to verify the entire history of the product in the supply chain. In principle, machine learning can also be used to utilize and collect circular economy data that is needed at the different stages of the product's life-cycle (Wang and Yuming, 2020), but is still in the early stages of research.

For Customs, the growing use of disruptive technologies can represent an opportunity to increase the visibility of circular economy goods across borders. In particular, artificial intelligence and blockchains (e.g. TradeLens platform) could help to support decision-making for risk management and targeting of these goods, detect possible fraud, provide more data insights about the effects of this transition on revenue collection, and possibly more. **Further research in these fields should be undertaken to identify their potential, relevance and feasibility in terms of making Customs controls more efficient in a circular economy context, and to identify how Customs could benefit from the use of innovative technologies through private sector involvement in the circular economy to fuel its own control processes.**

3.3. Rethinking data analytics in a time of circular economy transition

Data analytics is evolving as one of the fields that may have the greatest impact on Customs operations, and should be viewed as the next necessary step towards data-driven Customs and border management (WCO/WTO, 2022). The benefits of data analytics range from smarter risk management, to increased revenue, improved fraud detection, and many others. A possible concern for the Customs community is whether advances in data analytics can keep pace with the emerging challenges of a circular economy transition.

Box 3.3. Living Lab and the use of advanced-analytics tools

PROFILE is a multi-stakeholder project aiming to facilitate and accelerate Customs agencies' advanced-analytics capabilities. Under this programme, Customs administrations from five EU countries (the Netherlands, Belgium, Sweden, Norway and Estonia) collaborate with leading technology and data analytics providers (IBM, TNO, FFI, FOI, Inlecom), the European Commission's Joint Research Centre, associations and academic partners.

The five Customs agencies have access to data owned by big data providers, as well as e-commerce websites. The intended benefit of this project is to develop and test innovative data analytics solutions to improve Customs risk assessment processes.

Table 3.2. Overview of Living Lab in Customs

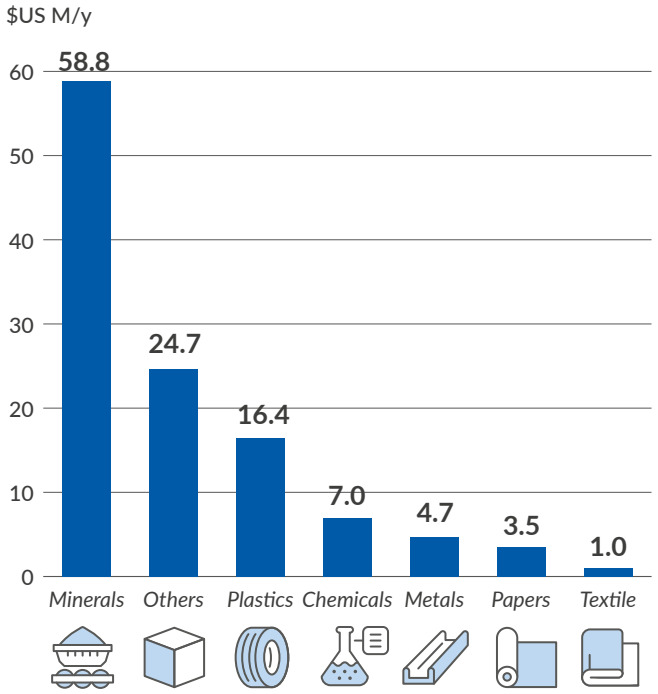
Living Lab	Data analytics focus area	Description
Dutch Living Lab	Customs risks assessment of e-commerce flows	Data analytics is applied to web data retrieval of price information from e-commerce declarations. Use of data analytics in the Customs risk assessment process can help as a support tool for decisions.
Belgian Living Lab	Analysis of the behaviours of operators	Machine learning techniques are applied to historical datasets and external data sources to analyse the behaviours of traders. The use of data analytics can help to enhance risk assessment software.
Sweden-Norway Living Lab	Comparative data analytics between 2 Customs agencies	Data analytics between two neighbouring countries (an EU country and a non-EU country) is performed to compare aggregated results.
EU Living Lab	Sharing data	Advanced analytics aims at developing and piloting a digital infrastructure for sharing data among EU Customs agencies.

(Source) Author's compilation based on PROFILE project (2021); Rukanova et al. (2021)

The current uses of data analytics can help Customs to better target goods fraud and to support the facilitation of compliant flows. In the European Union, the use of advanced-analytics tools is being tested in five European countries to promote best practices in Customs risk management (Box 3.3). Data analytics can also help in obtaining access to additional information about transport management and manufacturing execution systems from traders involved in supply chains (McKinsey & Company, 2022).

In a circular economy transition, the sharing of more detailed datasets about materials and products not only along the supply chain, but also during the entire product life-cycle, could offer Customs important insights. They can act as a reference point for developing new risk management strategies and data analytics tools in line with the importance of possible circular disruptions. From both a facilitation and enforcement perspective, data analytics could help to identify low-, medium- and high-risk actors in the import or export chains (IMF, 2022). One possible consideration may be to clarify the risk assessment criteria of supply chains actors involved in a circular economy.

Figure 3.3. Estimated trade discrepancies by types of waste



Note: Trade discrepancies was estimated as the difference between the sum of exports (national exporter-level data) and the sum of imports (mirrored trading partners' statistics) for each HS code of wastes. Results of possible discrepancies are aggregated by groups of wastes and then averaged across countries and years for confidentiality and statistical purposes.

(Source) Author's calculation based on the WB data (2017) and UN Comtrade (2022)

The growing importance of a circular economy may also require more data analytics to monitor potential revenue leakages and to fight illegal trade. It remains unclear how increased trade in a circular economy could potentially affect domestic revenue mobilization, especially in developing countries where Customs revenue accounts for a substantial portion of domestic tax revenues (Yasui, 2014). In this context, a practical example of data analytics is to compare and identify possible transaction data discrepancies that could be detected between a reporter country and its trade partners, which is known as mirror analysis.[58] The use of mirror analysis is relevant to Customs for selecting cargos on the basis of risk criteria or fraud profiles and establishing risk criteria or fraud profiles from analyses (Cantens et al., 2012).

In the changing context of a circular economy, a mirror analysis tool can help Customs to evaluate the risk of fraud. However, the method may have limits. National import/exports statistics can be compared with mirrored trading partners' statistics, using HS 6-digit codes. Possible trade discrepancies that are observed could be due to the detection of possible fraud cases. Otherwise, sources of any discrepancies could be higher quality of import data rather than export data, possible transit or re-export effects, or cross-country differences concerning the minimum information which economic operators are required to report on their trade flows (Grigoriou, 2019).

For demonstration purposes only, a mirror analysis has been performed using the Exporter Dynamics Database (EDD[59] sample on over 23,000 trade transactions[60] of wastes covering the period 2002-2012 from 11 developing countries (Figure 3.3). The EDD is typically built on exporter-level Customs declaration data and a comparison with external import data from UN Comtrade can enable to provide a quantitative classification of products and their relative flows at risk for a broad range of developing countries. In particular, waste groups with circular potential have been identified using the waste classification of Kellenberg (2009) based on HS codes (Annex 3.4).

Our analysis showcases a set of waste groups at risk with large trade discrepancies observed for minerals (USD 58.8M p.a.), for other waste – including possibly electronic waste (USD 25M p.a.) – and for plastics (USD 16.4M p.a.). For further investigations, evidence on the importance of potential revenue leakages could be obtained from import tariffs. This example illustrates a potential use of mirror analysis to identify high-risks products in a circular economy transition, which could be applied at the country level for other commodities involved (Box 3.4) and the identification of high-risks economic operators in the export or import value chain.

58 More detailed information about the mirror analysis tool, its limits and its different applications can be found in the report "Mirror Trade Statistics: A Tool to Help Identify Customs Fraud" (Cantens et al., 2012).

59 Beyond the scope of this mirror analysis, the EDD could be used for a trade monitoring in a circular economy transition to get more exhaustive information on the firm profile for example about the number of exporters, average exporter size, and concentration.

60 Additional case studies are presented in Annex 3.3 to compare possible trade discrepancies for other types of goods with circular potential.

Box 3.4. Use of mirror data analysis: a comparison between virgin copper and its scrap metal

In 2018, Peru was the second largest world exporter of copper ores and concentrates and the eighth largest exporter of refined copper (Mulder and Albaladejo, 2021). Copper recycling (based on scrap metals) enables the use of 85% less energy than is required by its mining extraction, avoiding about 40 million tonnes of carbon (Copper Alliance). The top three trading partners for extracted copper were China (33.7% of the total volume), Japan (23.8%) and EU (22.1%) over the period 2002-2008.

Table 3.3. Quantity, value and density value of virgin copper and its mirror statistics

Data source	2004	2005	2006	2007	2008
UN Comtrade (world's imports from Peru)	USD 1.068M 1.46M t 0.73 USD/kg	USD 1.408M 1.59M t 0.89 USD/kg	USD 2.746M 1.59M t 1.2 USD/kg	USD 4.826M 2.60M t 1.86 USD/kg	USD 5.103M 2.96M t 1.72 USD/kg
Peru's exports (declared by Peru)	USD 1.082M 1.6 M t 0.69 USD/kg	USD 1.360M 1.5M t 0.89 USD/kg	USD 2.777M 1.7M t 1.60 USD/kg	USD 4.647M 2.6M t 1.76 USD/kg	USD 4.535M 2.8M t 1.63 USD/kg

Note: Virgin copper is identified by the HS code "2603.00".
(Source) Author's calculation based on the WB data (2017) and UN Comtrade (2022)

A mirror data analysis was conducted to highlight possible differences between the sum of exports (national data) and the sum of imports (mirrored trading partners' statistics). This indicated that transactions in virgin copper over the period 2003-2008 reported no or few differences in quantity and value (Table 3.3), despite a high variability in international copper prices (Table 3.4). It suggests that these transactions are of low risk, compared with its substitute, scrap copper. The low unit value is explained by the abundance of copper.

Table 3.4. Quantity, value and density value of scrap copper and its mirror statistics

	2004	2005	2006	2007	2008
UN Comtrade (world's imports from Peru)	USD 27M 28,313.49 t 0.95 USD/kg	USD 22M 27,040.44 t 0.83 USD/kg	USD 16M 8,008.56 t 1.96 USD/kg	USD 18M 4,062.82 t 4.36 USD/kg	USD 12M 2,709.48 t 4.40 USD/kg
Peru's exports (declared by Peru)	USD 3M 2,202.1 t 1.47 USD/kg	USD 3M 1,570.8 t 1.95 USD/kg	USD 25M 5,169.2 t 4.82 USD/kg	USD 33M 7,069.3 t 4.73 USD/kg	USD 28M 5,383.4 t 5.15 USD/kg

Note: Scrap copper is identified by the HS code "7404.00".
(Source) Author's calculation based on the WB data (2017) and UN Comtrade (2022)

In contrast, transactions in scrap copper since 2004 recorded significant value gaps between the two data sources. These discrepancies may be driven by several factors, such as the limits of the mirror analysis, and the possible presence of fraud, but may also be due to different meanings and valuations for copper waste and copper non-waste. In addition, the unit value of scrap copper (USD/kg) is higher than that of the virgin material because it can enable the avoidance of several stages of production costs (Mulder and Albaladejo, 2020).

For Customs, data analytics can be an important tool to improve monitoring of the circular economy beyond borders. Key focus areas of future data analytics may include diversification, protection of economic interests, environmental and health risks, and illegal waste trade. The transition context could lead Customs to rethink the ways of doing data analytics. Current methodologies, commodity identification, data collection

and performance measurements are often inherited from the linear economy system. In that regard, an important consideration may be to determine whether these tools may still be effective in tracking the flows of products and materials involved in a circular economy.

3.4. Examples of sharing data for circularity

Closing the data gaps for a global circular economy will require more data collection, exchange and sharing between traders, recyclers, collectors, processors, transporters, environmental agencies and Customs, as well as other supply chain actors. The major challenge is that more detailed information (and thus massive data streams) needs to circulate in real time so as not to hamper the potential of circular trade. Upcoming data initiatives from governments and the private sector in this new field can provide further insights into how to deliver a data-driven circular economy in practice.

The global efforts to drive a circular economy transition highlight the important issue of critical information gaps: exactly where, when, to whom, for what value and in what volume waste streams could be redirected in a timely manner. A digital product passport or a battery passport are typically intended to address the data gaps in a product's history (e.g. product of interest, location at different points along the supply chain, whether a circular practice has been implemented or not). These innovations make it possible to increase the visibility of goods in circulation involved in a circular economy. Other tools, such as the barcode and Catena-X, have been established for similar purposes. In response to the growing need for data sharing, new platforms (e.g. GAIA-X) have been launched to facilitate the circulation of data laws in line with data governance.

Digital Product Passport

The EU Commission's Green Deal and Circular Action Plan 2020 have paved the way to promote digital tools as key enablers towards a data-driven circular economy. The Digital Product Passport (DPP) is one of the key regulatory tools to enhance the transparency and traceability of products and their components (a common issue in a circular economy). The DPP associates a unique identifier with each product in order to collect more granular information. At this stage, AI technologies may be applied to automate digital passport generation (Çetin et al., 2022). The performance of AI models can be improved by training algorithms when each passport is generated. Through automation, this tool can help supply chain actors, for example, to reduce the cost of trade, provide new business opportunities and decrease the burden of procedures.

In practice, the DPP tool will gradually be deployed in the EU for electronic batteries, as well as for one ore sector (construction, textiles and plastics) at least. A notable advantage of this tool is that it improves decision-making for a variety of stakeholders. For example, the DPP should provide the information needed to producers, recyclers, collectors, remanufacturers or recyclers to implement circular practices. **Access to product-level information may also enable Customs and other agencies to verify compliance with legal obligations in the EU** (Saari et al., 2022).

Global Battery Alliance

The **Global Battery Alliance** (GBA) is a public-private partnership founded in 2017 to help establish a sustainable battery value chain by 2030. The Alliance launched the Battery Passport concept at the World Economic Forum in January 2020, with the aim of gaining full functionality in the fourth quarter of 2022. The Battery Passport is an initiative to align the interests of stakeholders throughout the whole value chain of the batteries of electric vehicles (EVs) and to securely share the life-cycle information on batteries through a digital platform (GBA, 2020). This will make it possible to extend the life of batteries for EV purposes, to enable a safe second life, to reduce the costs of recycling, and to ensure the closed-loop management of batteries. Basically, it will be a sustainability certificate that contains all the applicable information on environmental, social, governance, and life-cycle requirements, involving all actors in the battery value chain (GBA, 2020).

As a tangible step towards its goal, in October 2022, the Alliance released the "Greenhouse Gas Rulebook", a set of detailed rules to realize the concept with definitions, procedures and templates for participating stakeholders. To test the concept on the ground, a pilot project has started in cooperation with a car manufacturer (Everledger, 2022).

In practice, each battery will be identified by a unique printed or engraved identifier (Kauppila et al., 2022). The economic operator that places an industrial battery or an electric vehicle battery on the market **will ensure that the data included in the Battery Passport is**

accurate, complete, and up-to-date. For Customs, such information can be critical **in improving the process of compliance and reporting requirements at the border**. Access to information will be divided into three user groups: "public", "accredited economic operators and the Commission", and "notified bodies, market surveillance authorities and the Commission". The information accessible for each group is presented in the proposal. All information will be stored in an electronic exchange system that the Commission will set up by 2026 (Kauppila et al., 2022).

Barcode and Catena-X

Global Trade Item Number (GTIN) GS1 is an international non-profit organization founded in 1974 in Brussels, Belgium, and is known as having introduced the barcode. GTIN is a set of codes, developed by GS1 to identify products. GTIN has several variations, such as GTIN-8, GTIN-12, GTIN-13 and GTIN-14, and has standardized rules. GTIN carries the information on user companies and product specifications, but also allows additional information, such as production date, serial number, weight, volume and other information in the GS1 barcode.

Since January 2022, China Customs has required traders to submit GTIN information as a mandatory field for the import of certain products, including infant food, wheaten food, biscuits, beer, wines, liquors and cosmetics, in order to facilitate the Customs process. In the same vein as GTIN, there are other initiatives on product codes, such as Amazon's ASIN (Amazon Standard Identification Number), EAN (European Article Number) and UPC (Universal Product Code). These codes also provide related information, including product specifications and manufacturers.

Catena-X is the first open and collaborative data ecosystem for the automotive industry, funded by the German Federal Ministry for Economic Affairs. In March 2021, two car manufacturing giants, BMW and Mercedes-Benz, announced the establishment of Catena-X, with the aim of making the whole automotive value chain more efficient, optimized and competitive in terms of sustainable development and being carbon neutral, by creating consistent means for data sharing and standardization. It is open to all stakeholders in the value chain, including car manufacturers, car parts makers, chemicals and materials suppliers and research institutions. In November 2022, technical specifications and related documents were released,[61] which is a major milestone for implementation.

Catena-X sees itself as a rapidly scalable ecosystem in which all participants in the automotive value chain participate equally. The Catena-X data ecosystem was created with other companies and it networks the entire automotive value chain – achieving even more sustainability. The goal: to provide an environment for the creation, operation and collaborative use of end-to-end data chains along the entire automotive value chain. The Catena-X consortium, which is funded by the German Federal Ministry for Economic Affairs and Energy's "Future Investments in the Vehicle Industry" funding programme,[62] will perform the core development work during the funding period until mid-2024. In contrast to classic funded projects, Catena-X is a transfer and implementation initiative that also envisages concepts of operation. This is being done quickly and agilely, as we expect the first operating companies to emerge in 2023.

Network LCA and Online LCA

The **Network LCA** (https://modellingfactory.org/services#lca) cloud service has been designed to help circular economy operators to improve the use of company-related data without directly sharing it with any of the value network members. Instead, what is shared are the computational results generated from the data of the individual network partners related to their LCAs. As the shared results are aggregate results (e.g. total carbon footprint), no individual contributors can be identified from the publicly available information, which helps all network members to optimize their operations (e.g. material usage, and chemical processes related to manufacturing). The network-level thinking can be generalized to include other types of design, testing, and decision-making processes that use data, without sharing it.

Online LCA is a general tool that can be applied to almost any field of engineering and decision-making at the "factory floor" level. Online LCA relies on the data obtained directly from the measurement sensors at the

61 Catena-X "Milestones on the way to operations: Catena-X publishes Operating Model and first Standards/Reference Implementations" https://catena-x.net/en/news-dates/artikel/on-the-way-to-operations-catena-x-publishes-operating-model

62 www.kopa35c.de

production site, such as the automation system. Real-time measurement data can be used as an input for any simulation and computational models, which gives factory operators a real-time view of the sustainability indicators (e.g. carbon or water footprint, or energy consumption). This extra information can be used by the operators to direct the production process into a more sustainable direction. One must, of course, choose from a set of probably conflicting indicators, with sustainability KPIs forming just one subset of decision variables. Nevertheless, the information will be available for decision-making at a much higher frequency than in the "traditional" life-cycle assessment, which is possibly carried out just once, or once each time legislation changes.

GAIA-X Data Spaces

A data space can be defined as a decentralized infrastructure for trustworthy data sharing and exchange in data ecosystems, based on commonly agreed principles (Nagel & Lycklama, 2021). The aim is to establish data spaces through public-private partnerships, where the European Commission, Member States, private companies, research organizations, and associations contribute with diverse funding programmes and common development initiatives. The data space will provide an architecture and governance for data applications that "enable circular value creations along supply chains", with a special focus on the built environment, packaging, textiles, electronics, ICT and plastics.

The **reasoning behind the data spaces** is described in the following way: "For the development of many products and services, data needs to be widely and easily available, easily accessible, and simple to use and process. Data has become a key factor of production, and the value it creates has to be shared back with the entire society participating in providing the data. This is why we need to build a genuine European single market for data – a European data space based on European rules and values." (European Commission, 2020).

The Data Governance Act (DGA) creates a legal framework for data spaces and their key elements. One of the key elements defined in the DGA is data intermediary services – neutral services that transfer data between different individual platforms. Individual cloud services and even apps and devices can join the data intermediary services and thus link directly with several other systems in the service.

Box 3.5. Finland case for GAIA-X implementation

Implementing major EU initiatives on data and the circular economy is already changing the operational environment for a data-driven circular economy in Finland (Kauppila et al., 2022). At the same time, Finland has adopted a rather ambitious and broad circular economy programme that is accelerating various national circular economy initiatives. Following the development of GAIA-X, action taken by the Government of Finland includes the following:

- The Ministry of Employment and the Economy, Business Finland, and VTT have explored in close cooperation the possibilities for Finnish actors to participate in the Gaia-X initiative.
- The PREGAIA project was carried out as a preparatory project, primarily for participating in the Gaia-X definition work.
- VTT coordinates the Finnish IDSA Hub.
- Motiva plans to build a circular economy-related use case in Gaia-X.

An example of a service that will be integrated in the platform ecosystem is Materiaalitori. Materiaalitori is a data platform intended for the professional exchange of waste and production side streams from companies and organizations (Materiaalitori, 2021; Motiva Oy, 2021). The use of Materiaalitori is required in the Waste Act (Waste Act 646/2011) when a business or organization needs municipal supplementary waste management services with a value of 2,000 euros or more per year.

In such cases, the waste holder is obliged first of all to search for a suitable, market-based service in Materiaalitori. If a suitable service is not found within 14 days, the waste holder may request a municipal supplementary waste management service. The platform brings transparency to this process. It is also used for the management and processing of information on the municipal supplementary waste management service, as well as monitoring the service.

Materiaalitori is open and free of charge for all waste, side stream, and waste service providers and users. Motiva and the Ministry of the Environment will together develop the content and functionality of Materiaalitori (Motiva Oy, 2021). From a data-based circular economy and governance point of view, Materiaalitori provides another key example, as it shows how a legal Act can enhance openness and the availability of data.

For Customs, the data space makes it possible to extend the data pipeline. Some questions still need to be addressed. For example, digital economies are not yet globalized, so this type of data space can create important challenges for low-digitalized economies.

Data Sharing in Eco-Industrial Parks

In developed and developing countries alike, many Customs territories go greener within a more circular economy. Eco-industrial parks, including special Customs zones, bring to light the high potential for reducing the use of virgin materials and keeping the carbon footprint under control, towards more sustainable supply chains. According to a recent survey by the World Bank (2021), more than half of 438 eco-industrial parks started their transition to a circular economy, notably, by recovering waste and material flows, but also by optimizing water use and recuperation. Only about 10% of these eco-industrial parks are initiated and maintained through public-private partnerships (PPPs), with most of them (67%) owned by public operators.

Eco-industrial parks can be one of the key enablers for data sharing. A range of disruptive tools and platforms are being developed to support park operators and firms in identifying industrial symbiosis and circularity opportunities and assessing their technical and economic feasibility (World Bank, 2022).

- In Korea, a digital platform called the "Smart Closed-Loop Grid System" is under development to facilitate industrial symbiosis opportunities. **Using big-data and artificial intelligence** (AI) technologies, this platform will consolidate data available from more than 200,000 companies, identify essential types of industrial symbiosis technologies, and provide information on the successful business models implemented in Korea. The system helps achieve optimal resource management by building networks between supply and demand companies – companies that supply waste and by-products and those that demand such materials. It also helps monitor the performance of 235 operational industrial symbiosis networks in real time.
- Ports, for example in France, are expanding their **digital platforms to exchange information with their partners in the port area**, in order to make processing of goods more efficient in the future. With the help of common standards, it should be possible to transfer ship movements in order to accelerate processing in the next port. In addition, a platform with blockchain technology will establish/develop further transport routes. This would enable the flow of goods to be recorded and transport to be optimized. However, data is not only fed into platforms manually, but increasingly also automatically. In addition, truck and rail traffic are to be integrated. Tracking boxes, which are linked to a sensor, can be used to confirm the integrity of the containers and thus speed up Customs clearance.

For Customs, special Customs zones can be a place for more smuggling, and concerns can arise that fraudulent flows of goods are located for disposal instead of circular transformation. Information sharing is an important enabler to address this critical point between authorities and operators within the Customs zones.

References

Aminoff, A., & Kettunen, O. (2016). Sustainable supply chain management in a circular economy –towards supply circles. In "Sustainable Design and Manufacturing 2016" (pp. 61-72). Springer International Publishing.

Atanasovska, I., Choudhary, S., Koh, L., Ketikidis, P. H., & Solomon, A. (2022). Research gaps and future directions on social value stemming from circular economy practices in agri-food industrial parks: Insights from a systematic literature review. Journal of Cleaner Production, 131753.

Awan, U., Shamim, S., Khan, Z., Zia, N. U., Shariq, S. M., & Khan, M. N. (2021). *Big data analytics capability and decision-making: The role of data-driven insight on circular economy performance*. Technological Forecasting and Social Change, 168, 120766.

Barrie, J., Schröder, P., Schneider-Petsinger, M., King, R., & Benton, T. (2022). *The role of international trade in realizing an inclusive circular economy*. Chatham House.

Bellini, A., & Bang, S. (2022). *Barriers for data management as an enabler of circular economy: an exploratory study of the Norwegian AEC-industry*. In "IOP Conference Series: Earth and Environmental Science" (Vol. 1122, No. 1, p. 012047). IOP Publishing. Ellen McArthur Foundation (2021).

Bellmann, C., & Draper, P. (2021). The Circular Economy and International Trade: Options for the World Trade Organization (WTO). International Chamber of Commerce (ICC). https://icc.se/wp-content/uploads/2021/12/20211214_Circular-Economy.pdf

Bressanelli, G., Adrodegari, F., Pigosso, D. C., & Parida, V. (2022). *Towards the Smart Circular Economy Paradigm: A Definition, Conceptualization, and Research Agenda*. Sustainability, 14(9), 4960.

Brooks, A. L., Wang, S., & Jambeck, J. R. (2018). *The Chinese import ban and its impact on global plastic waste trade*. Science advances, 4(6), eaat0131.

Cantens, T., Ireland, R., & Raballand, G. (Eds.). (2012). *Reform by numbers: measurement applied to customs and tax administrations in developing countries*. World Bank Publications.

Chen, Y. (2022). *Advantages of 3D Printing for Circular Economy and Its Influence on Designers*. Proceedings of the Design Society, 2, 991-1000.

Circle Economy (2021). *Circular Economy Strategies Can Cut Global Emissions by 39%*. https://www.circle-economy.com/news/circular-economy-strategies-can-cut-global-emissions-by-39

Dave, S. R., Shah, M. B., & Tipre, D. R. (2016). *E-waste: metal pollution threat or metal resource*. J Adv Res Biotech, 1(2), 14.

Demestichas, K., & Daskalakis, E. (2020). *Information and communication technology solutions for the circular economy*. Sustainability, 12(18), 7272.

Diversys (2023). Top 5 Data Challenges in Recycling Operations. Post release. https://www.diversys.com/top-data-challenges-recycling-operations

Ellen MacArthur Foundation/Google (2019). Artificial intelligence and the circular economy AI as a tool to accelerate the transition. https://ellenmacarthurfoundation.org/artificial-intelligence-and-the-circular-economy

European Environment Agency (2020). *Paving the way for a circular economy: insights on status and potentials*. EEA Report No. 11/2020.https://www.eea.europa.eu/publications/circular-economy-in-europe-insights

Everledger (2022). Everledger Launches Battery Passport Pilot with Ford. https://everledger.io/everledger-launches-battery-passport-pilot-with-ford/

Eyzaguirre, C. & Birkbeck, C. (2022). *Plastic Pollution and Trade Across the Life Cycle of Plastics: Options for Amending the Harmonized System to Improve Transparency*. Policy Brief, Forum on Trade, Environment & the SDGs (TESS), Geneva, Switzerland.

https://tessforum.org/media/2022/05/TESS-Policy-Brief-Plastic-Pollution-and-Trade-Across-the-Life-Cycle-of-Plastics.pdf

Ferreira, I. A., Godina, R., Pinto, A., Pinto, P., & Carvalho, H. (2023). *Boosting additive circular economy ecosystems using blockchain: An exploratory case study*. Computers & Industrial Engineering, 175, 108916.

Flynn, A., & Hacking, N. (2019). *Setting standards for a circular economy: a challenge too far for neoliberal environmental governance?* Journal of Cleaner Production, 212, 1256-1267.

Fosso Wamba, S., Akter, S., Trinchera, L., & De Bourmont, M. (2019). Turning information quality into firm performance in the big data economy. *Management Decision*, *57*(8), 1756-1783.

GBA (2020). The Global Battery Alliance Battery Passport. Giving an identity to the EV's most important component. https://www.globalbattery.org/publications

Gupta, S., Chen, H., Hazen, B. T., Kaur, S., & Gonzalez, E. D. S. (2019). Circular economy and big data analytics: A stakeholder perspective. *Technological Forecasting and Social Change*, *144*, 466-474.https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/activities-and-programmes/ecommerce/wco-framework-of-standards-on-crossborder-ecommerce_en.pdf?db=web

Hedberg, A., & Šipka, S. (2021). *Toward a circular economy: The role of digitalization*. One Earth, 4(6), 783-785.

Hoernig, J. (2022). *Towards 'secondary raw material' as a legal category*. Environmental Law Review, 24(2), 111-127.

Ignatyeva, M., Yurak, V., Dushin, A., Strovsky, V., Zavyalov, S., Malyshev, A., & Karimova, P. (2021). How far away are world economies from circularity: Assessing the capacity of circular economy policy packages in the operation of raw materials and industrial wastes. *Sustainability*, *13*(8), 4394.

IMF (2022). Pérez Azcárraga, Augusto Azael, Tadatsugu Matsudaira, Gilles Montagnat-Rentier, János Nagy, and R. James Clark. Customs Matters: Strengthening Customs Administration in a Changing World. Washington, DC: International Monetary Fund.

Kauppila, T., Berg, A., Dahlbo, H., Eilu, P., Heikkilä, P., Hentunen, A., Hilska-Keinänen, K., Horn, S., Ilvesniemi, H., Jenu, S., Karhu, M., Karppinen, T. K., Kauppi, S., Kivikytö-Reponen, P., Lavikko, S., Lehtonen, E., Luostarinen, S., Majaniemi, S., Malmi, P., [...] Valtanen, K. (2022). *Handbook for a Data-Driven Circular Economy in Finland: Data Sources, Tools, and Governance for Circular Design*. VTT.

Kazancoglu, I., Sagnak, M., Kumar Mangla, S., & Kazancoglu, Y. (2021). *Circular economy and the policy: A framework for improving the corporate environmental management in supply chains*. Business Strategy and the Environment, 30(1), 590-608.

Kellenberg, D. (2015). *The economics of the international trade of waste*. Annu. Rev. Resour. Econ., 7(1), 109-125.

Kellenberg, D. (2012). *Trading wastes*. Journal of Environmental Economics and Management, 64(1), 68-87.

Khan, F., & Ali, Y. (2022). *A facilitating framework for a developing country to adopt smart waste management in the context of circular economy*. Environmental Science and Pollution Research, 29(18), 26336-26351.

Kirchherr, J., Bauwens, T., & Ramos, T. (2022). *Circular disruption: Concepts, enablers and ways ahead.* Business Strategy and the Environment.

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., & Hekkert, M. (2018). *Barriers to the circular economy: Evidence from the European Union (EU)*. Ecological economics, 150, 264-272.

Kofos, A., Ubacht, J., Rukanova, B., Korevaar, G., Kouwenhoven, N., & Tan, Y. H. (2022). *Circular economy visibility evaluation framework*. Journal of Responsible Technology, 10, 100026.

KPMG (2020). *Potential economic pay-off of a circular economy*.

https://assets.kpmg.com/content/dam/kpmg/au/pdf/2020/potential-economic-pay-off-circular-economy-australia-2020.pdf

Kristoffersen, E., Mikalef, P., Blomsma, F., & Li, J. (2021). *Towards a business analytics capability for the circular economy*. Technological Forecasting and Social Change, 171, 120957.

Kümmerer, K., Clark, J. H., & Zuin, V. G. (2020). *Rethinking chemistry for a circular economy*. Science, 367(6476), 369-370.

Lowe, B. H., & Genovese, A. (2022). *What theories of value (could) underpin our circular futures?* Ecological Economics, 195, 107382.

Ministry of the Environment (2021). Government Resolution on the Strategic Programme for Circular Economy. Ministry of the Environment Resolution 8 April 2021.

Mulder, N., & Albaladejo, M. (2020). International Trade and the Circular Economy in Latin America and the Caribbean. UNIDO Inclusive and Sustainable Industrial Development Working Paper Series WP 3.

Nasiboglu, R., & Akdogan, A. (2020). *Estimation of the second hand car prices from data extracted via web scraping techniques*. Journal of Modern Technology and Engineering, 5(2), 157-166.

National Waste Report (2020). Department of Agriculture, Water and the Environment. Blue Environment. https://www.dcceew.gov.au/sites/default/files/env/pages/5a160ae2-d3a9-480e-9344-4eac42ef9001/files/national-waste-report-2020.pdf

Nordic Innovation (2021). *Data sharing for a circular economy in the Nordics*. Saatavilla. https://www.nordicinnovation.org/CEdatasharing

Pedrazzoli, P., Sorlini, M., Rovere, D., Lazaro, O., Malò, P., & Fiorello, M. (2022). *Challenges and founding pillars for a manufacturing platform to support value networks operating in a circular economy framework*. Applied Sciences, 12(6), 2995.

Rathi, R., Sabale, D. B., Antony, J., Kaswan, M. S., & Jayaraman, R. (2022). *An Analysis of Circular Economy Deployment in Developing Nations' Manufacturing Sector: A Systematic State-of-the-Art Review*. Sustainability, 14(18), 11354.

Rizos, V., Behrens, A., Van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., [...] & Topi, C. (2016). *Implementation of circular economy business models by small and medium-sized enterprises (SMEs): Barriers and enablers*. Sustainability, 8(11), 1212.

Rydning, D. R. J. G. J., Reinsel, J., & Gantz, J. (2018). *The digitization of the world from edge to core*. Framingham: International Data Corporation, 16.

Rodrigo-González, A., Grau-Grau, A., & Bel-Oms, I. (2021). *Circular economy and value creation: Sustainable finance with a real options approach*. Sustainability, 13(14), 7973.

Rukanova, B., Tan, Y. H., Hamerlinck, R., Heijmann, F., & Ubacht, J. (2021, June). Extended data pipeline for circular economy monitoring. In *DG. O2021: The 22nd Annual International Conference on Digital Government Research* (pp. 551-553).

Rukanova, B., Tan, Y. H., Slegt, M., Molenhuis, M., van Rijnsoever, B., Migeotte, J., [...] & Post, S. (2021). *Identifying the value of data analytics in the context of government supervision: Insights from the customs domain*. Government Information Quarterly, 38(1), 101496.

Saari, L., Heilala, J., Heikkilä, T., Kääriäinen, J., Pulkkinen, A., & Rantala, T. (2022). Digital product passport promotes sustainable manufacturing: white paper.

Serna-Guerrero, R., Ikonen, S., Kallela, O., & Hakanen, E. (2022). *Overcoming data gaps for an efficient circular economy: A case study on the battery materials ecosystem*. *Journal of Cleaner Production*, *374*, 133984.

Stanisavljevic, N., & Brunner, P. H. (2019). *Quantity AND quality: New priorities for waste management*. Waste Management & Research, 37(7), 665-666.

Tesfaye, F., Lindberg, D., Hamuyuni, J., Taskinen, P., & Hupa, L. (2017). *Improving urban mining practices for optimal recovery of resources from e-waste*. Minerals Engineering, 111, 209-221.

Tseng, M. L., Ha, H. M., Tran, T. P. T., Bui, T. D., Chen, C. C., & Lin, C. W. (2022). *Building a data-driven circular supply chain hierarchical structure: Resource recovery implementation drives circular business strategy*. Business Strategy and the Environment, 31(5), 2082-2106.

UNECE (2021). *UNECE and Canada mobilize experts to tackle challenges of measuring the circular economy*. Press release.

https://unece.org/circular-economy/press/unece-and-canada-mobilize-experts-tackle-challenges-measuring-circular

Virtanen, M., Manskinen, K., Uusitalo, V., Syvänne, J., & Cura, K. (2019). Regional material flow tools to promote circular economy. Journal of Cleaner Production, 235, 1020-1025.

Wang, Y., Yuan, Z., & Tang, Y. (2021). *Enhancing food security and environmental sustainability: A critical review of food loss and waste management*. Resources, Environment and Sustainability, 4, 100023.

Wang, D., & Zhang, Y. (2020). *Implications for sustainability in supply chain management and the circular economy using machine learning model*. Information Systems and E-Business Management, 1-13.

WCO (2023). *The Green Customs Global Conference – Summary report*. World Customs Organization, Brussels, Belgium. https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/research/report/wco_green-customs-global-conference_executive-summary_en.pdf

WCO (2019). *Illicit Financial Flows via Trade Mis-invoicing Study Report 2018*. World Customs Organization, Brussels, Belgium. https://www.wcoomd.org/-/media/wco/public/global/pdf/media/newsroom/reports/2018/wco-study-report-on-iffs_tm.pdf?la=fr

WCO (2020). *Practical Guidance on Free Zones*. World Customs Organization, Brussels, Belgium. https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/activities-and-programmes/free-zone/wco-fz-guidance_en.pdf?la=en

WCO (2020). Shining a light on dangerous commodities. World Customs Organization, *WCO News No. 91*, Brussels, Belgium.

https://mag.wcoomd.org/magazine/wco-news-91-february-2020/shining-a-light-on-dangerous-commodities/

WCO (2022). *Annual Report 2021–2022*. World Customs Organization, Brussels, Belgium. https://www.wcoomd.org/-/media/wco/public/global/pdf/about-us/annual-reports/annual-report-2021_2022.pdf

WCO (2022). *Framework of Standards on Cross-Border E-Commerce*. World Customs Organization, Brussels, Belgium

WCO/WTO (2022). *Study Report on Disruptive Technologies*. World Customs Organization, Brussels, Belgium. https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/instruments-and-tools/tools/wco-wto-joint-report/wco-wto-study-report-on-disruptive-technologies-en.pdf?db=web

Werning, J. P., & Spinler, S. (2020). *Transition to circular economy on firm level: Barrier identification and prioritization along the value chain*. Journal of Cleaner Production, 245, 118609.

Witjes, S., & Lozano, R. (2016). Towards a more Circular Economy: Proposing a framework linking sustainable public procurement and sustainable business models. Resources, Conservation and Recycling, 112, 37-44.

World Bank (2021). *Circular Economy in Industrial Parks: Technologies for Competitiveness*. World Bank.

Yasui, T. (2015). Background Paper for the WCO Revenue Conference. WCO Research Paper No. 33, World Customs Organization, Brussels, Belgium.

Yu, H., Dai, H., Tian, G., Xie, Y., Wu, B., Zhu, Y., [...] & Wu, H. (2020). Big-data-based power battery recycling for new energy vehicles: information sharing platform and intelligent transportation optimization. IEEE Access, 8, 99605-99623.

Zhu, C., Li, T., Mohideen, M. M., Hu, P., Gupta, R., Ramakrishna, S., & Liu, Y. (2021). *Realization of circular economy of 3D printed plastics: A review*. Polymers, 13(5), 744.

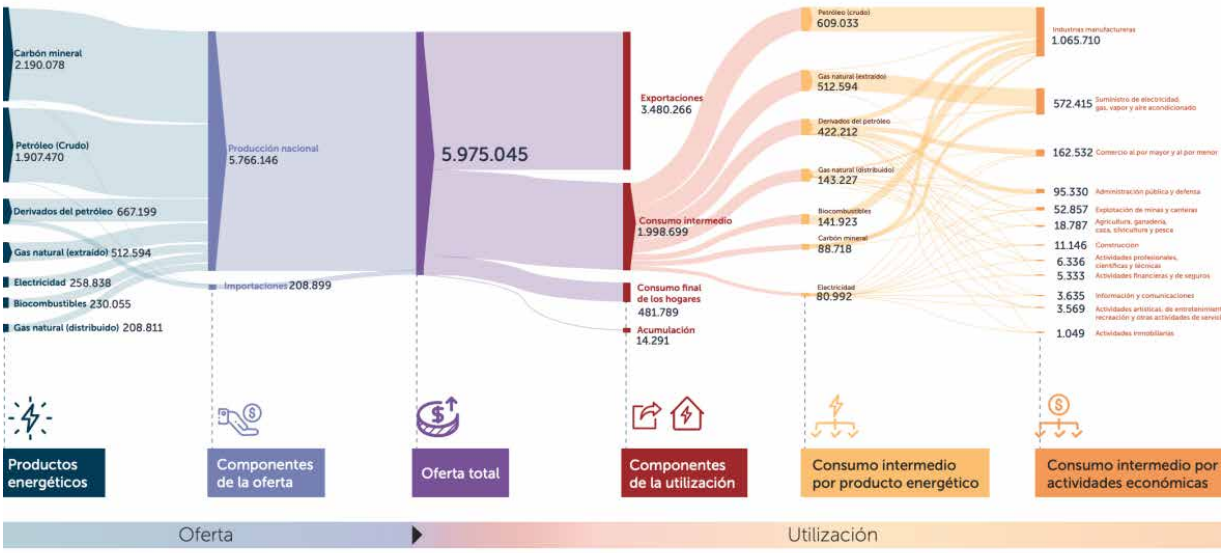
Annex 3.1. An example of circular economy monitoring in Colombia

The **Circular Economy Information System** is an articulated set of elements to compile, consolidate and disseminate statistical information related to the circular economy; to facilitate decision-making in public policy; and to evidence the country's transition towards this model of circular production and consumption.

Colombia is developing circular economy indicators, which are classified at the national level as compliance with the following components: demand for environmental assets and ecosystem services, preservation or loss of value of materials in the production system, pressure on ecosystems due to waste disposal, and factors that facilitate the circular economy.

The second report presents 23 indicators of available statistical information, categorized into four components of the circular economy (e.g. demand for environmental assets and ecosystem services). In addition, this version publishes for the first time **six Sankey diagrams based on data from the Environmental Satellite Account** (Figure 3.4).

Figure 3.4. National example of Sankey diagram towards a data-based circular economy



(Source) UNECE (2022)

Annex 3.2. Example of data visualization for trade of clothes, based on HS codes

Figure 3.5. Cumulated trade volume of clothes, 2003-2019

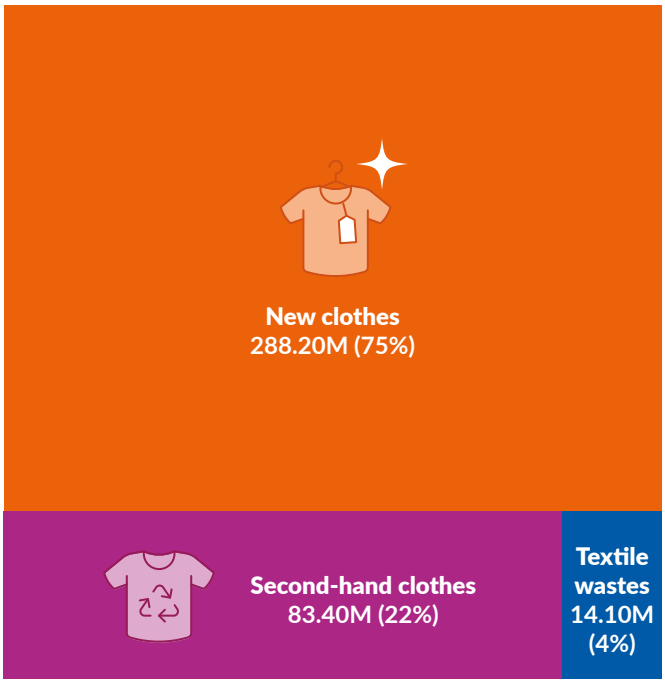


Table 3.5. **An overview of clothes trade at the end of first life**

	New clothes	Second-hand clothes	Textile wastes
Value in 2003	244.3 billion USD	1.7 billion USD	0.6 billion USD
Value in 2019	458.2 billion USD	5.0 billion USD	0.7 billion USD
Trade value growth	**+88%**	**+194%**	**+17%**
Volume in 2003	10.6 million tonnes	2.5 million tonnes	0.9 million tonnes
Volume in 2019	27.9 million tonnes	6.7 million tonnes	0.7 million tonnes
Trade volume growth	**+163%**	**+168%**	**-22%**
Origin (%)			
- Developed countries	14%	**70%**	45%
- Developing countries	**86%**	30%	**55%**
Destination (%)			
- Developed countries	**55%**	29%	**62%**
- Developing countries	45%	**71%**	38%
Top 3 exporters	China, Bangladesh, Vietnam	United States, United Kingdom, Germany	Türkiye, India, United States
Top 3 importers	United States, Germany, Japan	India, Pakistan, Kenya	Germany, Italy, China

(Source) Author's calculation based on BACI data from CEPII (2022)

Annex 3.3. Other examples of possible use of mirror analysis tool

Case 1: new tyres and used tyres given a major trade partner

Before joining the EU in 2007, Bulgaria reported that it exported to the EU about 4.4 thousand tonnes of new tyres, compared to 384 tonnes of used tyres in 2004 (representing more than 80% of the total exports of Bulgaria for both commodities). EU import flows of used tyres from Bulgaria were less taxed than those of new tyres taxed on average. The declared import price is higher than the declared export price, which can be truthful, due to the incorporated cost of transport within the import price.

Table 3.6. Comparison of estimated trade discrepancies between new tyres and used tyres

	Type of good	Value gap (V_M - V_X)	Qty gap (Q_M - Q_X)	Density value gap (V_M /Q_M) - (V_x /Q_X)	Weighted avg tax
Bulgaria 2004	New tyres	-10.3M USD	-4100 T	+0.17 USD/kg	8.3%
Bulgaria 2004	Used tyres	+4.5M USD	+2200 T	+0.29 USD/kg	4.1%

(Source) Author's calculation based on the WB data (2017) and UN Comtrade (2022)

Discrepancies in trade transactions can showcase a risk of misclassification between the two types of tyres. The commodity specified on the invoice could be declared as a used instead of a new good to avoid taxes on imports. At the same time, an overvaluation issue could be prevalent for some transactions in used tyres. In this case, the commodity is closer to a waste than a used good.

Case 2: valuation of goods with circular potential in the textile industry

The unit value of traded textile waste is higher than the value of second-hand textiles, showing that the waste trade can be more lucrative (for example, recycling at a specific destination with recycling technology). Second-hand textiles are identically taxed at 10%, while textile waste is lightly taxed at 1.4% on average. Mirror statistics detected no discrepancies for both the quantity and value of used clothes between the country of interest and its trading partners (table 3.7), while highlighting the suggested presence of a positive gap for the trade value and volume of wastes.

Table 3.7. Comparison of trade discrepancies between second-hand textiles and textile waste

	Type of good	Value gap (V_M - V_X)	Qty gap (Q_M - Q_X)	Density value gap (V_M /Q_M) - (V_x /Q_X)	Weighted avg tax
Uruguay 2010	Second-hand textiles	USD 0	0	0	10
Uruguay 2010	Textile waste	USD 1.2M	456 T	0.9 USD/kg	1.4

(Source) Author's calculation based on the WB data (2017) and UN Comtrade (2022)

Annex 3.4. List of waste and scrap by category and Harmonized System (HS) code (HS 2002)

Category	HS code	Description
Chemical waste	3006.80	Waste pharmaceuticals
Chemical waste	3825.10	Municipal waste
Chemical waste	3825.30	Clinical waste
Chemical waste	3825.41	Halogenated waste organic solvents
Chemical waste	3825.49	Waste organic solvents other than halogenated waste organic solvents
Chemical waste	3825.50	Wastes of metal pickling liquors, hydraulic fluids, brake fluids, etc.
Chemical waste	3825.61	Other wastes from chemical or allied industries, mainly containing organic constituents
Chemical waste	3825.69	Wastes from chemical and allied industries, not elsewhere specified in Chapter 38
Chemical waste	3825.90	Residual products of the chemical and allied industries, not elsewhere specified in Chapter 38
Metal waste	7112.91	Waste and scrap of gold, including metal clad with gold
Metal waste	7112.99	Waste and scrap of precious metal or of metal clad with precious metal
Metal waste	7204.10	Waste and scrap of cast iron
Metal waste	7204.21	Waste and scrap of stainless steel
Metal waste	7204.29	Waste and scrap of alloy steel other than stainless steel
Metal waste	7204.30	Waste and scrap of tinned iron or steel
Metal waste	7204.41	Ferrous turnings, shavings, chips, milling waste, sawdust, filings
Metal waste	7204.49	Ferrous waste and scrap (excluding of subheadings 7204.10 to 7204.41)
Metal waste	7404.00	Copper waste and scrap
Metal waste	7503.00	Nickel waste and scrap
Metal waste	7602.00	Aluminium waste and scrap
Metal waste	7802.00	Lead waste and scrap
Metal waste	7902.00	Zinc waste and scrap
Metal waste	8002.00	Tin waste and scrap
Metal waste	8101.97	Tungsten (wolfram) waste and scrap
Metal waste	8102.97	Molybdenum waste and scrap
Metal waste	8103.30	Tantalum waste and scrap
Metal waste	8104.20	Magnesium waste and scrap
Metal waste	8105.30	Cobalt waste and scrap
Metal waste	8106.00	Bismuth and articles thereof, including waste and scrap
Metal waste	8107.30	Cadmium waste and scrap
Metal waste	8108.30	Titanium waste and scrap

Category	HS code	Description
Metal waste	8109.30	Zirconium waste and scrap
Metal waste	8110.20	Antimony waste and scrap
Metal waste	8112.13	Beryllium waste and scrap
Metal waste	8112.22	Chromium waste and scrap
Mineral waste	2517.20	Macadam of slag, dross or similar industrial waste
Mineral waste	2525.30	Mica waste
Mineral waste	2619.00	Slag, dross (other than granulated slag), scalings and other waste from the manufacture or iron or steel
Mineral waste	2621.10	Ash and residues from the incineration of municipal waste
Mineral waste	2710.91	Waste oils containing polychlorinated biphenyls (PCBs)
Mineral waste	2710.99	Waste oils other than those containing polychlorinated biphenyls (PCBs)
Other waste	4115.20	Parings and other waste of leather or of composition leather, not suitable for the manufacture of leather articles
Other waste	8548.10	Waste and scrap of primary cells and primary batteries
Paper waste	4401.30	Sawdust and wood waste and scrap
Paper waste	4501.90	Waste cork; crushed, granulated or ground cork
Paper waste	4707.10	Recovered (waste and scrap) unbleached kraft paper or paperboard
Paper waste	4707.20	Recovered (waste and scrap) paper and paperboard made mainly of bleached chemicals
Paper waste	4707.30	Recovered (waste and scrap) paper and paperboard made mainly of mechanical pulp
Paper waste	4707.90	Recovered (waste and scrap) paper and paperboard (excluding of subheadings 4707.10 to 4707.30)
Plastic waste	3915.10	Waste, parings and scrap, of polymers of ethylene
Plastic waste	3915.20	Waste, parings and scrap, of polymers of styrene
Plastic waste	3915.30	Waste, parings and scrap, of polymers of vinyl chloride
Plastic waste	3915.90	Waste, parings and scrap, of plastics not elsewhere specified in heading 39.15
Plastic waste	4004.00	Waste, parings and scrap of rubber (other than hard rubber)
Textile waste	5003.10	Silk waste (including cocoons unsuitable for reeling, yarn waste and garnetted stock) - not carded or combed
Textile waste	5003.90	Silk waste (including cocoons unsuitable for reeling, yarn waste and garnetted stock) - other
Textile waste	5103.20	Waste of wool or of fine animal hair, including yarn waste
Textile waste	5103.30	Waste of coarse animal hair
Textile waste	5202.10	Yarn waste (including thread waste), of cotton
Textile waste	5202.99	Cotton waste other than yarn waste
Textile waste	5505.10	Waste (including noils, yarn waste and garnetted stock), of synthetic fibres
Textile waste	5505.20	Waste (including noils, yarn waste and garnetted stock), of artificial fibres

Chapter 4. Complexity of procedures and enforcement relating to waste crime – a second challenge for Customs administrations

This chapter discusses two topics – the facilitation of cross-border reverse supply chains and enforcement against waste crime. Facilitation and enforcement are two sides of the same coin. Customs administrations might be put in a difficult position in a circular economy as they need to facilitate trade in reverse supply chains due to increased trading opportunities, while at the same time effectively detect and prevent waste crime against increased opportunities to commit it.

Regarding facilitation, one of the challenges in transitioning to a circular economy is addressing inefficiencies in the prior informed consent (PIC) procedure the Basel Convention. This challenge could be tackled by clarifying the scope and definition of waste and by digitalizing the procedures. Additionally, Customs procedures pose various challenges and opportunities (such as HS codes, valuation, rules of origin, AEO, and treatment of remanufactured goods) as they have not been necessarily developed to address a circular economy.

Facilitation and enforcement are interdependent. Waste crime refers to illegal activities related to the handling, disposal or trade of waste materials. This can include actions such as illegal dumping, mislabelling or falsifying documents, and the unlawful export or import of waste. It remains a high priority for law enforcement agencies, and the risk of waste crime may increase in a circular economy. To combat waste crime, the WCO has supported its Members through various programmes, such as Operation DEMETER, and will continue to do so. Cooperation between Customs administrations and environmental agencies at both domestic and international level is essential to combat waste crime.

1. PIC procedure of the Basel Convention and a circular economy

1.1. Scope and definition of hazardous wastes and other wastes

The Basel Convention aims to control transboundary movements of hazardous waste by requiring countries to obtain Prior Informed Consent (PIC) before exporting such waste. The PIC procedure is a process in which the Competent Authority (CA), usually the environmental protection agency, of the exporting country notifies the CA of the importing country, and subsequently, the CA of the importing country gives consent to the CA of the exporting country. The procedure ensures the legitimate transboundary movement of hazardous waste by **obtaining mutual consent from both exporting and importing countries before transboundary movement takes place**.

In the cross-border reverse supply chain, it is a very important point whether goods to be traded are classified as wastes or not, as well as whether they are hazardous waste or non-hazardous waste. **The scope and definition of hazardous wastes is not as clear and transparent as traders expect, which creates uncertainty and unpredictability in cross-border supply chain activities.** Ambiguity concerning the rules stemming the Basel Convention can result in barriers to trade (Barrie, J. et al., 2022). Industries have raised concerns over the lengthy process (OECD, 2020) and they are requesting consistent and safe international frameworks to be established for promotion of a circular economy (ICC, 2022). For example, traders consider the goods to be imported or exported as non-hazardous wastes in accordance with the laws and regulations of the importing country, but authorities judge these goods to be hazardous wastes. This may cause a delay in shipping, and additional costs for warehousing until the PIC procedure is completed. In the worst case, shipping needs to be cancelled, and compensatory damages may need to be paid. There are a couple of reasons behind this.

- First, as often happens with international instruments, there is ambiguity in the language of the Basel Convention, and each Contracting Party has the right to its own interpretation.
- Second, Article 3 of the Basel Convention allows for the expansion of the scope of hazardous and other wastes through the domestic laws and regulations of Contracting Parties. As a result, the lists provided in the Annexes of the Convention represent a minimum set, and each Contracting Party may have a different scope of wastes. Traders are able to access notifications about such laws and regulations on the website,[63] but it can be difficult to check the details of notifications every time they engage in import and export activities.

63 Basel Convention Secretariat "National Definitions of Hazardous Wastes" (http://www.basel.int/Countries/NationalDefinitions/tabid/1480/Default.aspx)

- Third, wastes, unlike products, come in a variety of forms with different natures and characteristics. As a result, waste often requires a case-by-case analysis and decision.

To fill the gaps between its members and minimize uncertainty and unpredictability for traders and authorities, the implementation and compliance committee facilitates the resolution of differences in interpretations among its members [64] and the Basel Convention Secretariat releases various guidance including e-waste technical guidelines.[65] These guidelines are useful but not enough to address the concerns of traders. As one solution, practical guidance is issued by individual members (see Box 4.1).

Box 4.1. Examples of practical guidance for used electrical and electronic equipment

To avoid confusion and provide clarity and predictability in the importing process, some countries prepare practical guidelines. For example, the National Environmental Standards and Regulations Enforcement Agency of Nigeria has made available a "Guide for Importers of Used Electrical and Electronic Equipment into Nigeria",[66] which provides practical guidance to traders. It contains related laws and regulations, an enquiry point, requirements for importation, and explanations with pictures.

Another example is the Department of Environment of Malaysia, which publishes "Guidelines for the Classification of Used Electrical and Electronic Equipment in Malaysia".[67] It contains the scope of the product category, required functionalities and features, criteria to be met for importation, descriptions of related laws and regulations, and forms.

Sometimes, exporting countries also prepare guidelines. The "Regulations on the Export of Used Electrical and Electronic Equipment and Guidance to Test Functionality"[68] is prepared by the Danish Environmental Protection Agency. It provides basic information for traders, including the legal framework around waste trade, a checklist and consideration points, and explanations with pictures.

1.2. Digitalization of PIC procedures and Single Window system

The Prior Informed Consent (PIC) procedure may seem like a simple practice, but in reality, **it can take from a couple of months to more than a year to complete, and delays in the procedure can cause a significant burden on businesses** (e.g. Omi, K., 2020; Yamaguchi, S., 2022). Digitalization is key to minimizing communication costs and time, and facilitating trade in cross-border supply chains (Barteková, E. & Börkey, P., 2022).

The Contracting Parties to the Basel Convention already recognize the importance and value of digitalizing the PIC procedure. In 2016 and 2018, surveys were conducted for members and stakeholders by the Basel Secretariat.[69] **Of the 34 Parties which responded, 18 reported that the notification document was electronically available in their countries**. Digitalization is therefore still at an embryonic stage, although the Parties strongly feel the need for an electronic system, and established a small

64 Basel Convention Secretariat "Implementation & Compliance Committee" (http://www.basel.int/TheConvention/ImplementationComplianceCommittee/Overview/tabid/2868/Default.aspx)
65 Basel Convention Secretariat "Adopted Technical Guidelines" (http://www.basel.int/Implementation/TechnicalMatters/DevelopmentofTechnicalGuidelines/TechnicalGuidelines)
66 Info MEAs "Guide for Importers of Used Electrical and Electronic Equipment into Nigeria" (https://www.informea.org/en/guide-importers-used-electrical-and-electronic-equipment-nigeria)
67 Enviro Knowledge Management Center (https://enviro2.doe.gov.my/ekmc/digital-content/87098/)
68 Danish Environmental Protection Agency "Regulations on the export of used electrical and electronic equipment and guidance to test of functionality" (https://www2.mst.dk/Udgiv/publications/2015/02/978-87-93283-44-2.pdf)
69 Basel Secretariat "Responses received from Parties and stakeholders" (http://www.basel.int/Implementation/Controllingtransboundarymovements/eapproachesfornotificationandmovement/Activities/tabid/7377/Default.aspx)

intersessional working group (SIWG) to look further into electronic approaches in 2022[70].

Digitalization of PIC procedures can take a couple of forms with which Customs can be associated:

- Digitalization of the PIC procedure would connect traders and competent authorities, usually the environment agency, allowing for the application of notifications and receipt of results electronically.
- Digitalization of the PIC procedure would connect traders and competent authorities, and integrate with the national Single Window system for sharing relevant information with border agencies, including Customs administrations.
- Digitalization of the PIC procedure would connect traders and competent authorities, share relevant information with Customs administrations through the national Single Window system, and further connect the competent authorities of a trading partner country. Information on notifications and consent issued by the competent authorities of export would be shared online with Customs administrations of import.

Digitalization of PIC procedures alone means little. By integrating it into the Single Window system, its benefits will be maximized, and the WCO's Coordinated Border Management (CBM) Compendium advocates to use information technology enshrined in Standards 6.9[71]. The Single Window system is designed to allow traders to submit information for multiple border agencies through one single point of entry to fulfil import-, export-, or transit-related regulatory requirements.[72] Thus, the system serves as a digital platform to exchange and share relevant information among traders and border agencies.

According to a survey by the Basel Convention Secretariat, the number of countries in which the digitalized PIC procedures are integrated with the Single Window system is unknown. According to a WCO survey,[73] **as of July 2020, 86 Members of the WCO had already implemented some sort of Single Window system**. This means that an environment where the PIC procedures can be connected to the Single Window system is being prepared. In addition, Article 10.4 (Single Window) of the Trade Facilitation Agreement of the WTO, which came into force in February 2017, obliges its members to endeavour to establish or maintain a Single Window system. The notifications and related information on the national Single Window system of WTO members is available on the website.[74]

Digitalizing the PIC procedures, integrating them with the Single Window system, and connecting them to the competent authorities of trading partner countries, is ideal. However, creating a national Single Window system and connecting with trading partner authorities is challenging, requiring coordination and consultation with related agencies (Tsen, J. 2011). If achieved, the benefits would be significant for both traders and authorities. **Chapter 5 provides a case study of successful implementation in North America.**

70 Basel Secretariat "Electronic approaches to the notification and movement documents" (http://www.basel.int/Implementation/Controllingtransboundarymovements/eapproachesfornotificationandmovement/Overview/tabid/7375/Default.aspx)

71 WCO "Coordinated Border Management (CBM) Compendium" (https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/instruments-and-tools/tools/safe-package/cbm-compendium.pdf?la=en)

72 WCO "Building a Single Window Environment" (SWE) resource material (https://www.wcoomd.org/en/Topics/Facilitation/Instrument%20and%20Tools/Tools/Single%20Window%20Guidelines)

73 WCO "WCO annual report 2019 – 2020" (http://www.wcoomd.org/-/media/wco/public/global/pdf/about-us/annual-reports/annual-report-2019_2020.pdf)

74 WTO "Trade Facilitation Agreement Database" (https://tfadatabase.org/en/notifications/categorization-by-member)

Box 4.2. Useful tools for creating a Single Window system and digitalization of PIC procedures

The WCO has long advocated for the Single Window system as part of Customs modernization efforts and has released the **WCO Data Model.**[75] This model is an indispensable tool that serves as a universal language for cross-border data exchange, enabling the implementation of the Single Window system.

The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) also provides useful tools for digitalization, including **data format standards and syntax rules for the transboundary movement of wastes.**[76] These tools facilitate the integration of PIC procedures into the Single Window system and connection of digitalized PIC procedures between competent authorities of exporting and importing countries. Constructing systems governed by international standards is essential, especially when connecting different systems.

2. Customs procedures which need to be considered towards a circular economy

The previous section discussed the challenges of PIC procedures under the Basel Convention. However, the circular economy faces challenges not only with PIC, but also with Customs procedures and elsewhere. According to the WTO, more than 370 measures related to a circular economy were notified in the period from 2009 to 2017 (Steinfatt, K. 2020). To identify these challenges, the author of this report conducted stakeholder interviews,[77] resulting in the following.

Inconsistent treatment and enquiry point for wastes

The private sector frequently expresses concerns that **related laws and regulations are unclear and that guidance from authorities, including Customs administrations, is not always consistent**. For example, a company that had been exporting used electronic equipment as used goods had its export application denied when the authorities determined the goods were hazardous waste and requested that the company apply the PIC procedure. The company received only a brief oral explanation and no detailed guidance, leaving it unsure of the distinction between used goods and hazardous waste.

One possible solution to address this situation is to collect and share decisions and rulings within the authority and partner agencies, refer to them in new cases, and develop and publish practical guidance based on previous cases. In addition, an enquiry point regarding cross-border reverse supply chains should be set up and announced to traders. Regular dialogue with traders can also be useful for exchanging views and opinions.

A lack of HS codes for a circular economy

Many private companies argue that the current HS codes do not effectively address a circular economy. They **propose introducing additional codes to recognize different types of products, such as used and manufactured products of the same kind, as these have distinct features and characteristics in a circular economy**. These additional codes would serve as a useful tool for compliance and enforcement of laws and regulations, as well as for monitoring the detailed trade flow of circular economy goods.

With a few exceptions, the current HS codes do not recognize the various aspects of the product life-cycle (e.g. new, used, recycled), simply because HS codes were not originally designed for such purposes. For example, tyres have detailed categories, including new tyres (HS 4011), retreaded tyres (HS 4012.11-4012.19), and used tyres (HS 4012.20).

75 WCO "WCO Data Model" (https://www.wcoomd.org/DataModel)
76 UNECE "e-Basel Standard: Transboundary Movements of Waste" (https://unece.org/trade/uncefact/e-basel-Standard-TMW)
77 The interviews were conducted separately during August 2022 to February 2023 as follows: a representative of IBM (2 August), a representative of BMW (11 July and 7 September 2022), a representative of Cerpi (4 July 2022), a representative of the European Remanufacturing Council (13 September 2022), representatives of the Confederation of European Paper Industries (15 September 2022), a representative of the Bureau of International Recycling (29 September 2022), representatives of Belgian Customs (24 October 2022), and representatives of Indonesian Customs (6-10 February 2023).

As a procedural point, HS codes are revised every 5 years, and work towards the next revision, HS 2027, is already under way (Grooby, G., 2022). Customs administrations and related international organizations can propose changes to the Review Sub-Committee (RSC), while suggestions from the private sector can be tabled through the Customs administration in their country.

Some research calls for more detailed HS codes for a circular economy (e.g. Barre, J. et al., 2020, Eriksson, E. 2022; Bellman, C. 2021; Eyzaguirre, C. & Birkbeck, C., 2022). However, it is unnecessary and unrealistic to have such detailed categories for all and every product. The absolute necessity should be reviewed based on trade volume, social impacts and other factors. Furthermore, in the case of having a code for the recycled/remanufactured/refurbished/repaired category, there needs to be clarification and agreement on the definition of these activities.

Difficulty accessing inward and outward processing

A company reported that it was **denied access to the inward and outward processing scheme and had to pay Customs duties** when transporting customers' used products to the overseas remanufacturing centre.

Although the details are unknown in the specific case, it can be assumed that the remanufacturing process is not considered to be a form of repair under the importing country's laws and regulations. However, remanufacturing and repair essentially have the same goal of recovering used goods to their original quality. To address this, the laws and regulations should be clarified or amended to include remanufacturing as a form of repair. The Revised Kyoto Convention (Specific Annex F) provides practices for inward processing and outward processing.[78]

Customs valuation in a case of negative value

Used goods or wastes are often traded at significantly low prices, and sometimes even at a negative value, as these goods are considered to be valueless**. A private company has questioned whether the negative value of these goods can be declared to Customs administrations**.

The price declared to Customs administrations should be the transaction value: under the WTO's Customs Valuation Agreement (CVA), the primary basis for Customs value shall be the transaction value. Since the CVA does not assume that the transaction value is negative, it is generally considered inappropriate to declare a negative value to Customs, even if the value stated in the sales contract is negative. If a negative value is declared, Customs administrations may deny it and apply alternative valuation methods (identical goods method, similar goods method, deductive method, computed method, or fallback method).

Customs valuation in the absence of sales contracts

Private companies have questioned **what value to declare to Customs when trading in secondary used materials without a sales contract**. For instance, when a manufacturing company stores secondary materials beyond its own recycling capacity and exports them to an overseas recycling operator for processing fees, the operator processes the materials and ships them back to the manufacturing company. In such cases, property rights over the secondary materials remain with the manufacturing company, and no sales contracts are produced.

As previously stated, the price declared to Customs administrations should be the transaction value. One possible price to be declared is the price at which the manufacturing company bought the materials from outside, plus warehouse costs. If the declared value cannot be determined, Customs administrations can deny it and apply alternative valuation methods, such as the identical goods method, similar goods method, deductive method, computed method, or fallback method.

Tax relief or repayment schemes for multiple-use packages

Some private companies are concerned about **multiple-use packages being subject to Customs duties and taxes every time they cross borders**. In recent times, companies have been avoiding single-use packages to reduce environmental damage and have been using multiple-use packages as much as possible.

Each government has the discretion to impose duties on re-imported goods, but tax relief or repayment schemes for such goods can promote the transition to

78 WCO "Text of the Revised Kyoto Convention" (https://www.wcoomd.org/Topics/Facilitation/Instrument%20and%20Tools/Conventions/pf_revised_kyoto_conv/Kyoto_New)

a circular economy by incentivizing the use of multiple-use packages and reducing waste. The Revised Kyoto Convention (Chapter 4.19) provides a standard practice for duty and tax repayment, which can be useful in implementing such schemes.[79]

For reference, the Customs Convention on Containers 1972 stipulates that containers temporarily imported and re-exported within three months, or a period designated by each Customs administration, shall be exempt from import duties and taxes.[80]

Difficulty obtaining certificate of origin for used goods

It is reported that **obtaining a certificate of origin for used goods can be challenging**, because they become used over time – not through a specific production activity – and ownership may be transferred multiple times. As a result, there is no appropriate person or body to verify the transformation into used goods. Such difficulties arise when applying preferential rates under FTAs for specific used goods.

In relation to specific FTAs, contracting parties can establish their own rules for issuing origin certificates and verification methods. For instance, the model or type of used goods could indicate the number of years since production, which could be useful for certification.

Insufficient attention given to circular activities under CTC rules of origin

It is reported that **circular activities such as remanufacturing and repair are not considered in the tariff classification criterion (CTC) rules** that are widely used in many countries. For instance, capital goods made in the United States, operated in Laos, remanufactured in Singapore, and imported into Thailand are classified based on the origin of goods in the United States, ignoring the remanufacturing activities in Singapore. This is inappropriate as circular activities are not reflected in these rules.

The advantage of CTC rules is that they are easy and simple, but they tend to fail to reflect circular activities such as remanufacturing and repair. One possible solution is to change the rules of origin to value-added rules or specific production rules. Another solution is to create product-specific rules (PSRs) for specific goods.

Incorporating a circular economy in the Authorized Economic Operator (AEO) scheme

Some private companies have **requested a benefit during Customs clearance, for example, a facilitated process and simplified procedures for the AEO operators, in return for the high burden of compliance costs** associated with complying with numerous related laws, regulations and compliance activities.

The Authorized Economic Operator (AEO) programme developed by the WCO aims to improve global supply chain security and promote trade facilitation.[81] A company with AEO status demonstrates compliance with Customs, security standards and other regulations, and is recognized by Customs administrations in many countries. Benefits of AEO status include reduced inspections, streamlined procedures, and priority treatment.

It is widely recognized that compliance costs related to circular economy businesses are a significant burden on the private sector. An idea to facilitate circular trade by AEOs has been advocated (e.g. Yamaguchi, S., 2022; Barre, J. et al., 2022; OECD, 2020).

From a business sector perspective, as the AEO programme is designed by each Customs administration along with the WCO's SAFE Framework of Standards, it is technically possible to further clarify and establish more detailed criteria or designated operators' categories for the circular economy. However, as far as is known, there is no specifically designed programme in place for the circular economy. One pioneering case is that the United States is considering incorporating environmental priorities into its AEO programme, called CTPAT (see Chapter 5).

Specific treatment for remanufactured goods

Some private companies have **requested that remanufactured goods be treated separately from used goods because the quality of remanufactured goods is the same as that of new products. To achieve this, they**

79 WCO "Text of the Revised Kyoto Convention" (https://www.wcoomd.org/Topics/Facilitation/Instrument%20and%20Tools/Conventions/pf_revised_kyoto_conv/Kyoto_New)
80 WCO "Customs Convention on Containers 1972" (https://www.wcoomd.org/en/topics/facilitation/instrument-and-tools/conventions/pf_conv_containers.aspx)
81 WCO "WCO SAFE Package" (https://www.wcoomd.org/en/topics/facilitation/instrument-and-tools/frameworks-of-standards/safe_package.aspx)

have requested the creation of additional HS codes for remanufactured goods such as retreaded tyres (HS 4012.11-4012.19). This makes it easier and clearer for both traders and Customs officials to identify which goods are remanufactured and which are not.

Remanufacturing is generally understood to involve repairing or replacing worn-out or obsolete components and modules, transforming used products into like-new ones.[82] It is commonly used in heavy equipment, medical equipment, and motor vehicles, as well as in sectors such as aerospace, furniture, machinery, construction and mining, railway, and sports equipment.[83] **Remanufacturing has huge business and environmental potentia**l, with estimated markets of €90 billion in Europe by 2030[84] and USD 43.0 billion in the United States production of remanufactured goods in 2011.[85] The market will grow as the economy transitions to a circular model, while also reducing environmental damage by saving natural resources compared to replacing whole products.

Although it is a key driver for a circular economy, **remanufactured goods have suffered from various barriers. They are often treated as used goods and subject to import restrictions**, such as import bans, non-automatic licensing, quality or other technical requirements (limitation of certain ages of goods or residual values, requirement to obtain domestic certification), and conditional import – allowing import for remanufacturing on the condition of subsequent export overseas (e.g. US ITC, 2012; Jansson, K. et al., 2017; AmCham EU, 2016; European Union, 2017; UNEP 2018; ADB Institute, 2023).

While some countries still place the restriction on remanufacturing goods at borders, Singapore opened the door to this new business. In 2011, Caterpillar established a remanufacturing facility in Singapore, which serves as the regional source of remanufactured major components for large off-highway truck and mining equipment (Mining technologies, 2011).

In order to remove trade barriers to remanufacturing, a Ministerial Decision on Trade in Remanufactured Goods was drafted at the WTO in December 2009,[86] but it was not adopted. This issue was taken up in Regional Trade Agreement (RTA) negotiations instead. **Some recent RTAs have incorporated specific provisions addressing remanufactured goods, ensuring equal treatment for them as new products**. These provisions allow remanufactured goods to circumvent import restrictions, facilitating trade and enhancing the remanufacturing business. Textual examples are summarized in Annex 2.1 to Chapter 2. Customs administrations involved in such RTAs should be well aware of the related provisions.

82 There is no universally accepted definition of "remanufacturing", but business associations have tried to arrive at a definition. For example, the Remanufacturing Industries Council based in the United States has released RIC001.2-2021, and the British Standards Institution (BSI) has released the BSI Kitemark.
83 European Remanufacturing Network (ERN) "Case Study Tool" (https://www.remanufacturing.eu/case-study-tool.php)
84 European Remanufacturing Network (ERN) "European Remanufacturing Network" (https://www.remanufacturing.eu/)
85 United States International Trade Commission "Remanufactured Goods: An Overview of the U.S. and Global Industries, Markets, and Trade" 2012 https://www.usitc.gov/publications/industry_econ_analysis_332/2012/remanufactured_goods_overview_us_and_global.htm
86 Ministerial Decision on Trade in Remanufactured Goods (TN/MA/W/124) https://jmcti.org/2000round/com/doha/tn/ma/tn_ma_w_124.pdf

Box 4.3. Dispute settlement case of retreaded tyres

"Retreading" is a remanufacturing process for tyres to replace the tread on worn out tyres. The retreaded tyres are widely seen in airplanes, racing cars, buses, trucks and passenger cars because they are more environment-friendly and more affordable than the regular tyres. Retreaded tyres were invented as early as the 1920s, and major tyre companies entered into the business (Fisher, P., 2005). Since then, innovations and improvements have been continuously made, as the market for retreaded tyres has expanded. The total export value of retreaded tyres (HS 4012) amounted to more than USD 2.6 million in 2021.[87]

In June 2005, the EU requested consultation with **Brazil on its import prohibition on retreaded tyres and other restrictive measures**. Brazil had placed measures on retreaded tyres on the grounds of waste tyres posing a risk to human, animal and plant life due to mosquito breeding and related diseases, and toxic emissions from tyre fires. They did not reach a conclusion at their consultation, and the EU requested the establishment of a panel. The EU claimed that Brazil's measures were inconsistent with WTO laws, including the prohibition of quantitative restrictions (GATT Art. XI), national treatment (GATT Art. III:4) and general exceptions (GATT Art. XX). This case is known as "DS332: Brazil – Measures Affecting Imports of Retreaded Tyres".

As a result of the WTO dispute settlement proceedings, the appellate body report circulated in December 2007 **supported the claim by the EU in material aspects**. The case was closed with Brazil's full implementation of the recommendations by the appellate body.

(Source) WTO website[88] and Steinfatt, K., 2020

Non-Customs regulations on second-hand goods or used goods

Some private companies have **expressed concerns regarding non-Customs regulations on used goods, such as import bans, non-automatic licensing requirements, quality control or other technical requirements**. These regulations hinder the facilitation of trade in second-hand goods or used goods. In most cases, regulations on used goods are created by other administrative bodies, such as the Ministry of Economy or Ministry of Trade, but are enforced at the borders by Customs administrations.

Second-hand goods or used goods are items previously owned and used by someone else, which are still usable or serving intended purposes. They have great potential for reuse in a circular economy (Kojima, M. and Sakata, S., 2022), conserving natural resources and reducing environmental damage. However, there are possible negative impacts on the local environment as second-hand goods or used goods may be of low quality and short-lived compared to new ones, and are considered to cause environmental damage and become waste quickly.

As an example, vehicles are one of the major commodities for modern life, and more than 80 million cars in total were produced globally in 2021. There is huge demand for used vehicles, especially in low-income countries. However, import restrictions have been placed in 80 countries, ranging from age limitations, to quality standards and import bans on vehicles in 2016 (US ITC, 2016). Other research shows that 18 have adopted a complete ban on the import of used vehicles; 66 limit the age of imported vehicles (three to fifteen years); 28 have adopted vehicles emission standards, and 100 countries have no vehicle emission standards at all (UNEP, 2020).

Electrical and electronic equipment, such as mobile phones, PCs, TVs, air conditioners and refrigerators, are also a part of modern life. Denmark's Environmental Protection Agency investigated the import restrictions on 24 countries in Asia and Africa, and discovered 15 countries placed restrictions such as quality control, permissions or complete bans (Danish Environmental Protection Agency, 2015).

87 (Source) UN Comtrade Database
88 WTO "DS332: Brazil – Measures Affecting Imports of Retreaded Tyres" (https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds332_e.htm)

Non-Customs regulations on used goods may seem reasonable in some cases, but they can also be viewed as disguised trade barriers intended to protect domestic industries. As such, these regulations should be transparent, and information regarding their rulings should be made publicly available in a timely manner. In 2017, ISO 20245:2017 established minimum criteria for second-hand goods traded or exchanged between countries, or for other purposes,[89] and it can be a useful reference point for reviewing such regulations.

As Customs administrations are enforcing non-Customs regulations on used goods at borders, **Customs administrations should be familiar with such regulations, and communicate closely with the agencies that are responsible for such regulations**.

3. Circular economy and waste crime

3.1. Overview of waste crime

The situation concerning global waste crime is concerning. **Waste crime refers to illegal or harmful practices involving waste, such as illegal dumping, illegal transport, and illegal trade of hazardous waste**. Impacts of waste crime include air and water pollution, soil contamination, habitat destruction, health problems for humans and wildlife, and economic losses for legitimate waste business and waste management systems.

The illegal trade of hazardous waste can take many forms, and there are various modi operandi used by those involved in these activities. Some common examples include:

- Mislabelling and falsifying documents: Illegal traders of hazardous waste may mislabel waste as non-hazardous, or falsify documents to conceal the true nature of the waste being transported or disposed of.
- Concealing hazardous waste: Illegal traders may disguise and hide hazardous waste by placing non-hazardous waste in the front of the container.
- Bribery and corruption: Illegal traders may bribe government officials to overlook illegal shipments of hazardous waste.

In practice, these modi operandi are often used in combination. Furthermore, the use of false front companies or shell companies and falsified recycling permissions may be involved, as may be collusion by shippers, forwarders, recycling operators and others. In addition, organized crime is often involved in waste crime (Europol, 2022).

3.2. Trend in waste crime

An increase in cross-border reverse supply chains will increase the risk of waste crime, as transboundary movements of waste will provide more opportunities for illicit activities. It is crucial to prevent such criminal activities from occurring, because **if the transition to a circular economy is perceived as leading to the proliferation of illegal waste, achieving the goal will become much more difficult** (UNCTAD, 2021; Kettunen, M. et al., 2019).

As is often the case with other illegal activities, it is difficult to obtain a clear picture of the situation regarding waste crime. While a perfect picture of the situation is never provided, it is evident that the waste crime market is quite significant. Illicit waste trafficking was estimated at USD 10 billion to USD 12 billion annually in 2016 (FATF, 2021; Interpol, 2018). Another estimate is that e-waste which is handled informally or unregistered, including illegally, amounts to USD 12.5 billion to USD 18.8 billion annually (UNEP, 2015). Compared to drugs crime, which is estimated at USD 426 billion to USD 652 billion (Global Financial Integrity, 2017), waste crime may seem small. However, it has unique features, including being a low-risk, high-return, white-collar crime. Often, wrongdoers have a semi-hybrid setup: they have a legal company that does legal work, but on the side, they also engage in illicit work (Politico, 2022).

A lot of effort has been invested in detecting and preventing waste crime both domestically and internationally by various law enforcement agencies, but the crime is still widespread and rampant. According to the results of the WCO's Operation DEMETER, **there were still many seizure cases reported during the Operation period, indicating the need for further tightening of enforcement, despite years of efforts**.

89 ISO "ISO 20245:2017 Cross-border trade of second-hand goods" (https://www.iso.org/standard/68820.html)

Table 4.1. Main outcomes of Operation DEMETER

Edition	Duration	Participating Customs	Seizures
DEMETER I	March - May 2009	65	56 seizures, including: 36,714 tonnes of waste and an additional 1,830 pieces of waste
DEMETER II	February - March 2012	77	64 seizures, including: 2,385 tonnes of waste and an additional 5,416 pieces of waste
DEMETER III	October - November 2013	44	48 seizures, including more than 7,000 tonnes of waste
DEMETER IV	June - July 2018	75	199 seizures, including 326 tonnes of waste and an additional 54,782 pieces of waste
DEMETER V	September 2019	83	201 seizures, including: 4,584 tonnes of waste and an additional 59,983 pieces of waste
DEMETER VI	October 2020	73	119 seizures, including: 99,000 tonnes of waste and an additional 78,000 pieces of waste
DEMETER VII	October 2021	87	112 seizures, including: 4,030 tonnes of waste and an additional 6,108 pieces of waste
DEMETER VIII	October 2022	90	126 seizures, including: 3,647 tonnes of waste and an additional 8,662 pieces of waste

(Source) Author's compilation from WCO data[90]

Other pointers for obtaining a wider picture of the crime are WasteForce Crime Alerts 1 to 7, which reported 138 cases in just one and a half years.[91, 92] Furthermore, there are increasing numbers of cases found on the websites of environment-oriented NGOs, such as the Basel Action Network and EIA.[93]

There are a variety of reasons why waste crime has not been eradicated and attracts wrongdoers. One often-cited reason is that **waste crime can offer high returns and low risks compared to other types of crime**. By engaging in illegal activities such as illegal dumping, illegal waste exports, and the operation of illegal waste treatment facilities, waste crime perpetrators can save on the costs of proper waste disposal and make a profit by charging customers lower prices (euromia, 2017; UNEP, 2015; Smulian, M., 2021; FATF, 2021). In addition, waste is regularly generated and there are constant opportunities for wrongdoers.

Waste crime can lead to serious environmental and health consequences, and as such, the punishment for waste crime has been getting increasingly severe in many countries. However, life sentences or sentences of many years are never heard of in cases of waste crime. As drug smugglers can face life sentences in some cases, waste crime may seem like a low-risk activity.

3.3. WCO efforts on environmental protection

The WCO has been a longstanding supporter of environmental protection and waste management. With the implementation of the Basel Convention and other MEAs since the 1990s, Customs administrations are now responsible for implementing strict controls on harmful wastes and chemicals at borders. This section highlights the major activities of the WCO.

The Probo Koala incident occurred in Côte d'Ivoire in 2002, causing 15 deaths and 69 hospitalizations. It shocked the world and led to calls for tighter controls on waste pollution (see Annex 4.1). In response, the **WCO adopted the Recommendation of the Customs Co-Operation Council concerning Actions Against Cross-Border**

90 WCO "Newsroom" (https://www.wcoomd.org/en/media/newsroom.aspx)
91 WasteForce is the project for deterring and disrupting illegal trade and management, funded by the European Union's Internal Security Fund. The project terminated in May 2021. (https://www.wasteforceproject.eu/about-sweap/)
92 WasteForce "Waste Force Crime Alert" (https://www.wasteforceproject.eu/resources/publications/)
93 Basel Action Network (https://www.ban.org/), Environmental Investigation Agency (https://eia-international.org/)

Environmental Offences in June 2009,[94] demonstrating its commitment to combating environmental crimes. That same year, the WCO declared "Customs and the environment: protecting our natural heritage" as its slogan for 2009 and encouraged its Members to take an active role in environmental protection.[95]

In May 2009, the first edition of **Operation DEMETER** was launched to combat illegal transboundary movement of waste through a joint effort between Customs administrations and relevant international/ regional entities. This global Operation sets specific targets and risk indicators, with participating Customs administrations closely communicating and exchanging feedback. It has proven to be an effective and efficient approach to tackling waste crime, as it is a coordinated clampdown with no escape route. Since its inception, Operation DEMETER has become a series of operations, with the most recent one carried out in October 2022.

In response to its Members' growing need for support on environmental issues, in 2012 the WCO established its **Environment Programme**[96], with the purpose of assisting Members in combating environmental crime. Under the Programme, the WCO provides a variety of types of technical assistance, depending on their needs.

The WCO provides and has continued to update the **correlation table between the HS codes and MEAs**, including the Basel Convention and other related MEAs.[97] The correlations are valuable tools for identifying controlled chemicals and substances in the HS codes and effectively implementing MEAs, as these chemicals and substances are categorized differently from HS codes.

The Green Customs Initiative (GCI) was established in 2004 as a partnership between international entities such as the WCO, UNEP, the BRS Secretariat, CITES, and UNDOC to combat illegal trade in environmentally sensitive goods while facilitating legal trade.[98] As an original member, the WCO has actively participated in the Initiative to enhance the capacity of frontline officers at borders through coordinated efforts with related entities. The GCI provides practical guidance to MEAs and e-learning courses for officials as part of its various activities.

The Asia Pacific Plastic Waste Project (APPW) was launched in April 2020 to tackle the illegal shipment of plastic waste in the region.[99] With many countries imposing stricter controls on plastic waste imports, the Project aims to enhance the capacity of Customs officers and foster Customs-to-Customs cooperation. The participants' experience is compiled and incorporated into Annex III to the **Coordinated Border Management (CBM) Compendium.**[100] Additionally, the **Self-Assessment Tool Basel Convention – Plastic Waste** was developed and published through the project.[101] It is quite useful for Customs administrations to understand where they stand in implementing the Convention.

The first **Green Customs Global Conference** was held in June 2022, aiming to establish the role of Customs in the environmental debate and identify opportunities for Customs to contribute to environmental objectives.[102] The Conference fostered candid dialogue among a broad range of stakeholders, providing opportunities for policy inputs.

The Customs Enforcement Handbook on Circular Economy is to be published in June 2023. The Handbook provides a framework in which trade-related instruments can be analysed, understood and implemented as the basis for an effective Customs enforcement response to environmental challenges.

The WCO has supported its Members through various activities for years, as described above. However, the number of seizure cases and other evidence shows that efforts to detect and prevent waste crime are still

94 WCO "Recommendation of the Customs Co-Operation Council concerning Actions Against Cross-Border Environmental Offences" (http://www.wcoomd.org/~/media/wco/public/global/pdf/about-us/legal-instruments/recommendations/enforcement/cross_border-environmantal-offences.pdf?la=en)
95 WCO (https://www.wcoomd.org/en/media/newsroom/2009/january/international-customs-day-2009-customs-and-the-environment-protecting-our-natural-heritage.aspx)
96 WCO "Environment Programme" (https://www.wcoomd.org/en/topics/enforcement-and-compliance/activities-and-programmes/environment-programme.aspx)
97 WCO "Correlations between the HS and international conventions" (https://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/interconnection-table.aspx)
98 Green Customs Initiative (https://www.greencustoms.org/)
99 WCO "Asia Pacific Plastic Waste Project (APPW)" (https://www.wcoomd.org/en/APPW.aspx)
100 WCO "WCO publishes updated version of the Coordinated Border Management (CBM) Compendium"
101 WCO "Self-Assessment Tool Basel Convention – Plastic Waste" (https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/enforcement-and-compliance/activities-and-programmes/appw/self-assessment-tool-basel-convention_en.pdf?db=web)
102 WCO "Green Customs Global Conference" (https://na.eventscloud.com/website/35881/)

necessary, particularly in transitioning to a circular economy. Additionally, according to the survey by the WCO, implementation of MEAs does not receive the same level of importance from different Customs administrations (Raath, R., 2020). Therefore, the WCO is expected to continue supporting and encouraging its Members by sharing and disseminating related information in a timely manner, leading the global joint operation, and providing technical assistance.

4. Cooperation between Customs administrations and environment agencies

4.1. Importance of cooperation

As mentioned in the previous sub-chapter, despite the extensive efforts of both Members and the WCO, waste crimes continue to be prevalent, and Members face challenges in rigorously implementing related laws and regulations. The overall implementation challenge is the lack of cooperation among relevant entities in the enforcement chain (Secretariat of the Basel Convention, 2020). Cooperation between Customs administrations and environment agencies is essential in a circular economy because it ensures that secondary used materials and used products are properly tracked, managed and traded across borders. This coordination helps prevent the illegal trade of waste, which can have severe consequences for human health and the environment.

Customs administrations are primarily concerned with regulating the flow of goods across borders, collecting tariffs and duties, and ensuring compliance with trade-related regulations. They typically collect information on the importer, exporter, HS codes, value, quantity, origin, and destination of goods being traded. On the other hand, environment agencies are responsible for ensuring compliance with environmental regulations, such as the Basel Convention and other multilateral environmental agreements, waste management, pollution control, and sustainable resource use. They may collect information on recycling operators, recycling facilities, and the environmental impact of products and materials, such as their toxicity and potential for recycling or reuse.

While there may be some overlap in the information collected by Customs administrations and environment agencies, each agency may prioritize different types of information, based on its respective mandate. Therefore, cooperation between the agencies is crucial. **By working together, they can gain a better understanding of the international flow of waste and related recycling activities, which helps them identify and prevent illicit activities**.

4.2. Types of cooperation

There are several ways in which Customs administrations and environment agencies can cooperate to promote a circular economy and ensure that secondary used materials and used products are properly managed and traded across borders. Here are some examples:

- **Information sharing**: Customs and environment agencies can share information on cross-border trade through various methods, such as integrating IT systems, exchanging contact points of officials, and holding regular meetings.
- **Joint inspections**: Customs and environment agencies can conduct joint inspections of suspicious shipments to ensure that they are properly managed under related laws and regulations.
- **Capacity building**: Customs and environment agencies can provide training and capacity building to each other to ensure that both understand each other's mandates and can work together effectively.
- **Joint policy development and coordination**: Customs and environment agencies can collaborate in developing and coordinating policies and regulations for achieving the circular economy.

Effective cooperation between Customs and environment agencies is essential to achieve the goals of a circular economy. **Although there is no one-size-fits-all solution, each Customs administration should seek and establish its own way of cooperating with environment agencies** (see Chapter 5).

4.3. Regional cooperation

In addition to domestic cooperation, **regional cooperation among Customs and environment agencies is crucial for promoting a circular economy**. It facilitates trade by promoting mutual understanding of respective laws, regulations and practices, and strengthens enforcement efforts by enabling information sharing and coordination

to prevent illicit activities. This can help create a level playing field for businesses, reducing costs and delays associated with cross-border trade.

As is the case with domestic cooperation, there is no one-size-fits-all solution for regional cooperation. Each region has its preferred approach. There are already some examples of regional cooperation, mainly led by environment agencies, and three regions – North America, Europe, and Asia – are summarized in Annex 4.2. **Customs administrations should actively participate in such existing regional cooperative frameworks and benefit from them**.

References

American Chamber of Commerce to the European Union (AmCham EU). (2016). The Circular Economy - 10 innovative business solutions and how to go further. https://www.amchameu.eu/publications/circular-economy-10-innovative-business-solutions-and-how-go-further

Asian Development Bank (ADB) Institute (2023). Prospects For Transforming From a Linear To Circular Economy in Developing Asia. https://www.adb.org/sites/default/files/publication/774936/adbi-transitioning-linear-circular-economy-developing-asia-web.pdf

Barteková, E. & Börkey, P. (2022). Digitalisation for the transition to a resource efficient and circular economy. *OECD Environment Working Papers No. 192*. https://www.oecd.org/publications/digitalisation-for-the-transition-to-a-resource-efficient-and-circular-economy-6f6d18e7-en.htm

Barre, J., Schröder, P., Schneider-Petsinger, P., King, R. & Benton, T. (2022). The role of international trade in realizing an inclusive circular economy. https://www.chathamhouse.org/2022/10/role-international-trade-realizing-inclusive-circular-economy

Bellmann, C. (2021). The Circular Economy and International Trade: Options for the World Trade Organization. https://iccwbo.org/publication/the-circular-economy-and-international-trade-options-for-the-world-trade-organization/

Dill, D. and Kopsick, D. (2014). Improving cooperation between customs and environmental agencies to prevent illegal transboundary shipments of hazardous waste. *World Customs Journal*, *Volume 8*, *Number 2*. https://worldcustomsjournal.org/Archives/Volume%208%2C%20Number%202%20(Sep%202014)/07%20Dill%20%26%20Kopsick.pdf

Erik, E. (2022). The crucial role of the WCO in trade liberalization of climate-friendly goods. *WCO News No. 98*. https://mag.wcoomd.org/magazine/98-issue-2-2022/wco-trade-liberalization-climate-friendly-goods/#:~:text=It%20would%20reduce%20the%20cost,flow%20of%20goods%20across%20borders

euromia (2017). Rethinking Waste Crime. https://www.eunomia.co.uk/reports-tools/rethinking-waste-crime/

European Union (2017). Promoting remanufacturing, refurbishment, repair, and direct reuse. https://op.europa.eu/en/publication-detail/-/publication/ac22b439-370c-11e7-a08e-01aa75ed71a1

Europol (2022). "ENVIRONMENTAL CRIME Threat assessment 2022 in the age of climate change". https://www.europol.europa.eu/cms/sites/default/files/documents/Environmental_Crime_in_the_Age_of_Climate_Change_threat_assessment_2022.pdf

FATF (2021). Money Laundering from Environmental Crime. https://www.fatf-gafi.org/publications/methodsandtrends/documents/money-laundering-from-environmental-crime.html

Fisher, P. (2005). A history of retreading. *Tire business*. https://www.tirebusiness.com/article/20050620/NEWS/306209964/a-history-of-retreading-part-1-of-2

Grooby, G. "Some common questions about the HS, and how to change it to meet needs". *WCO News No. 98, 2022*. https://mag.wcoomd.org/magazine/98-issue-2-2022/some-common-questions-hs/

Global Financial Integrity (2017). Transnational Crime and the Developing World. https://www.gfintegrity.org/wp-content/uploads/2017/03/Transnational_Crime-final.pdf

International Chamber of Commerce (ICC) (2022). Moving goods in a circular business model: challenges and way ahead. *WCO News 98*. https://mag.wcoomd.org/magazine/98-issue-2-2022/moving-goods-circular-business-model/

Interpol (2018). World Atlas of Illicit Flows. https://www.interpol.int/ar/content/download/14080/file/World%20Atlas%20of%20Illicit%20Flows-1.pdf

Jansson, K., Vatanen, S., Karvonen, I., Behm, K., Waugh, R., Fitzsimons, D., Sundin, E. & Parker, D. (2017). D6.3 Targeted Recommendations. https://www.remanufacturing.eu/pdf/story/11a98ee6c096c15ce182.pdf

Kettunen, M., Gionfra, S. & Monteville, M. (2019). EU circular economy and trade: Improving policy coherence for sustainable development. https://ieep.eu/uploads/articles/attachments/f560794d-c411-4895-8ae9-910c65548f33/EU%20trade,%20CE%20and%20sustainable%20development%20(IEEP%202019)%20FINAL.pdf?v=63741577228

Kojima, M. and Sakata, S. (2022) Increasing International Trade of Secondhand Goods and its Impacts on Developing Countries. https://www.ide.go.jp/English/ResearchColumns/Columns/2022/kojima_and_sakata.html

Mining technologies (2011). Caterpillar Opens New Remanufacturing Facility in Singapore. https://www.mining-technology.com/uncategorized/news120085-html/

OECD (2020). OCED workshop on international trade and the circular economy: summary report. https://www.oecd.org/env/workshop-trade-circular-economy-summary-report.pdf

Omi, K. (2020). Current situation, analysis and observations on waste control at borders by Customs. *WCO Research Paper No. 50*. https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/research/research-paper-series/50_waste_control_at_borders_by_customs_omi_en.pdf?la=en

Politico (2021). Europe's dirty problem: Environmental crime. https://www.politico.eu/article/europe-sustainability-waste-eu-environmental-crime/

Raath, R. (2020). Environmental sustainability: gaging the level of engagement within the Customs community. *WCO News No. 91*. https://mag.wcoomd.org/magazine/wco-news-91-february-2020/gaging-engagement-customs-community/

Eyzaguirre, C. & Birkbeck, C. (2022). Plastic Pollution and Trade Across the Life Cycle of Plastics: Options for Amending the Harmonized System to Improve Transparency. https://genevatradeplatform.org/articles-research/plastic-pollution-and-trade-across-the-life-cycle-of-plastics-options-for-amending-the-harmonized-system-to-improve-transparency/

Tsen, J. (2011). Ten years of Single Window implementation: Lessons learned for the future. https://unece.org/fileadmin/DAM/trade/Trade_Facilitation_Forum/BkgrdDocs/TenYearsSingleWindow.pdf

Secretariat of the Basel Convention (2020). Focus on the transboundary movements of wastes. *WCO News No. 91*. https://mag.wcoomd.org/magazine/wco-news-91-february-2020/focus-on-the-transboundary-movements-of-wastes/

Steinfatt, K. (2020). Trade Policies for a Circular Economy: What Can We Learn From WTO Experience? *Staff Working Paper Series*. https://www.wto.org/english/res_e/reser_e/ersd202010_e.pdf

Smulian, M. (2021). Staff seeking loopholes 'key driver' of waste crime says EU. https://www.mrw.co.uk/news/staff-seeking-loopholes-key-driver-of-waste-crime-says-eu-13-04-2021/

UNEP (2020). Used Vehicles and the Environment: A Global Overview of Used Light Duty Vehicles - Flow, Scale and Regulation. https://wedocs.unep.org/handle/20.500.11822/34175

U.S. International Trade Commission (US ITC) (2012). Remanufactured Goods: An Overview of the U.S. and Global Industries, Markets, and Trade. https://www.usitc.gov/publications/industry_econ_analysis_332/2012/remanufactured_goods_overview_us_and_global.htm

U.S. International Trade Commission (US ITC) (2016). "Examining Barriers to Trade in Used Vehicles". https://www.usitc.gov/publications/332/used_vehicle_wp_id-44_final_web_0.pdf

UNCATD (2021). Success of circular economy hinges on better governance of 'waste trade'. https://unctad.org/news/success-circular-economy-hinges-better-governance-waste-trade

UNEP (2018). Re-defining Value – The Manufacturing Revolution: Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy, definition of key terms (page 25-26). https://wedocs.unep.org/handle/20.500.11822/31618;jsessionid=1B012D9F2DE6BF4755C1C0403EF59804

UN Human Rights (2009). Toxic waste: UN Expert releases report on 'Probo Koala' incident. https://www.ohchr.org/en/press0releases/2009/10/toxic0waste0un0expert0releases0report0probo0koala0incident

UNEP (2015). Waste Crime - Waste Risks: Gaps in Meeting the Global Waste Challenge - A Rapid Response Assessment. https://wedocs.unep.org/handle/20.500.11822/9648

WCO (2009). OPERATION DEMETER Executive Summary. https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/enforcement-and-compliance/activities-and-programmes/environmental-crime/ex_sum_demeter_en.pdf

Yamaguchi, S. (2022) Securing reverse supply chains for a resource efficient and circular economy. *OECD Trade and Environment Working Papers*. https://www.oecd.org/environment/securing-reverse-supply-chains-for-a-resource-efficient-and-circular-economy-6ab6bb39-en.htm

Annex 4.1. Probo Koala incident

The tanker "Probo Koala" was carrying the toxic residual fuel oil coker naphtha to Côte d'Ivoire in August 2006. It illegally dumped it in the district of Abidjan, causing 15 deaths and the hospitalization of 69 persons. This case attracted international attention and triggered further action on environmental protection.

The Probo Koala was operated by Trafigura, a global logistics company. In March 2006, the Probo Koala loaded coker naphtha in Texas, United States. In July 2006, the Probo Koala anchored in Amsterdam, Netherlands, to process the slops of the coker naphtha. However, the sample showed a higher level of toxicity than the agreement with the port authority allowed. This would have led to additional cost if the slops had been processed there. Consequently, the Probo Koala decided to reload the slops, and left for West Africa.

In August 2006, the Probo Koala berthed in Abidjan, Côte d'Ivoire, and arranged for a local company to unload the slops. Approximately 500 tonnes of toxic slops were unloaded and illegally dumped in various sites in Abidjan in August and the following month. None of the sites had proper management of toxic slops, and no announcement or notice was made to the local residents. It resulted in 15 deaths and seriously damaged the health of local people, resulting in the hospitalization of 69 persons and more than 108,000 medical consultations.

(Source) Trafigura[103]

103 Trafigura "The Probo Koala incident" (https://www.trafigura.com/the-probo-koala-incident/)

Annex 4.2. Regional cooperation in North America, Europe and Asia

Fostering cooperation with trading partners is key to enhancing cross-border reverse supply chains, because mutual understanding and close communication between the authorities of exporting and importing countries is required. Usually, major trading partners exist in the same region, and so regional cooperation is often observed all over the world, taking different forms. Each region is at a different level of integration and has a different orientation, and so there is no single way to enhance regional cooperation. This Annex considers an approach to regional cooperation, using North America, Europe and East Asia as an example.

In North America, regional cooperation between the United States, Canada and Mexico was established on the basis of the North American Agreement on Environmental Cooperation (NAAEC), which is a side agreement of the North American Free Trade Agreement (NAFTA). Subsequently, at the time when the United States-Mexico-Canada Agreement (USMCA) came into force in July 2020, the Agreement on Environmental Cooperation superseded the NAAEC. The Commission for Environmental Cooperation (CEC)[104] takes initiatives to enhance the collaboration and cooperation among the three countries, and has implemented numerous projects, with tangible results. As summarized in Chapter 5, the North American Notice and Consent Electronic Data Exchange (NCEDE) project showcases their efforts. The system connects relevant authorities of the countries online, facilitating legitimate trade in waste, as well as preventing illegal trade flows.

In Europe, the European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL)[105] was established in 1992. It is a non-profit association based in Brussels, Belgium, serving as a forum to enhance cooperation in the region, and to facilitate communication and exchange of information and experience on implementation of related laws and regulations. EU Member States, as well as non-EU members in the region (North Macedonia, Serbia, Türkiye, Iceland, Kosovo, Albania, Switzerland and Norway), participate in the Network, which has a total of 36 members. IMPEL has a solid organizational structure, carries out numerous projects, and provides technical assistance to it members and stakeholders. IMPEL is also seeking inter-regional cooperation, such as with Asia and Africa.

In Asia, the Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Waste was established in 2004 by 12 Asian countries (Japan, Indonesia, Cambodia, Singapore, Thailand, Hong Kong, China, Philippines, Brunei, Vietnam, Malaysia, Myanmar and Laos). In order to foster cooperation in the region, a workshop has been held annually since its inception.[106] The Network provides an opportunity for participants from East Asian countries dealing with the Basel Convention and waste management to communicate directly and to share the latest information and experience.

There is no single way to establish a cooperative relationship between Customs administrations and environmental agencies, or to enhance regional cooperation. There is no "one size fits all" approach (Dill, D. and Kopsick, D., 2014). The three cases indicate that the approach in Asia is based on a soft framework, without any legal instruments, whereas the approach in North America is based on a solid foundation, with an international treaty. The approach in Europe is somewhere in between. The important point is whether the framework is sustainable and has the ability to address regional needs.

104 The Commission for Environmental Cooperation website (http://www.cec.org/)
105 IMPEL website (https://www.impel.eu/en/about-impel)
106 Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Waste website (http://www.env.go.jp/en/recycle/asian_net/Annual_Workshops/Annual_Workshops.html)

Chapter 5. Case Studies: Solutions for Customs administrations on the ground

The transition to a circular economy is a relatively new process and, as previously described, is associated with a number of challenges. This chapter examines attempts to address these challenges through case studies, in order to seek possible solutions for Customs administrations.

In Sub-Chapter 4.1, one of the challenges identified is the lack of digitalization of the Basel Convention Prior Informed Consent (PIC) procedure. The first case study examines the North American Notice and Consent Electronic Data Exchange (NCEDE), which is the most advanced digitalized system currently in place and serves as a model solution.

Chapter 4 identified several challenges in Customs procedures and enforcement. The second and third case studies are based on interviews with Indonesian Customs and Belgian Customs, respectively. These case studies examine the solutions used by those Customs administrations and their attempts to address the challenges identified.

The final case study examines the Green Trade Strategy implemented by United States Customs and Border Protection (U.S. CBP). This is the first comprehensive strategy by a Customs administration to commit to sustainable trade. Having its own strategy has multiple benefits, including prioritizing the environmental agenda in its organizational missions, demonstrating its commitment to the public, and showcasing its proactive role in the transition to a circular economy.

1. North American Notice and Consent Electronic Data Exchange (NCEDE)

The North American Free Trade Agreement (NAFTA) was agreed by the United States, Canada, and Mexico, and entered into force in January 199It intended to create an integrated market in North America comparable to those in the EU and ASEAN. The Agreement covers not only tariff reduction but also the reduction of non-tariff barriers and the enhancement of cooperation. One of the cooperative initiatives is the Commission for Environmental Cooperation (CEC), which was set up to implement the North American Agreement on Environmental Cooperation, as a side agreement of NAFTA. As of 2020, the CEC operates in accordance with the Environmental Cooperation Agreement, which entered into force at the same time as the CUSMA/T-MEC/USMCA (former NAFTA). Numerous projects have been carried out under the CEC, one being the North American Notice and Consent Electronic Data Exchange (NCEDE) project. This trilateral system has resulted in increased protection of the North American environment through improved control of transboundary movements of hazardous waste and hazardous recyclable materials.

The CEC recognized a need to improve the procedures for the transboundary movement of hazardous waste in North America as early as 199After a series of studies and consultations, including the development of common data standards to allow for the exchange of information between countries, NCEDE became operational in 201Since its rollout, the system has been continuously updated and modernized. As changes are made to reflect new domestic and international requirements, NCEDE has been updated to support accurate and efficient data exchanges among the three countries, and to accommodate future upgrades and maintenance needs.

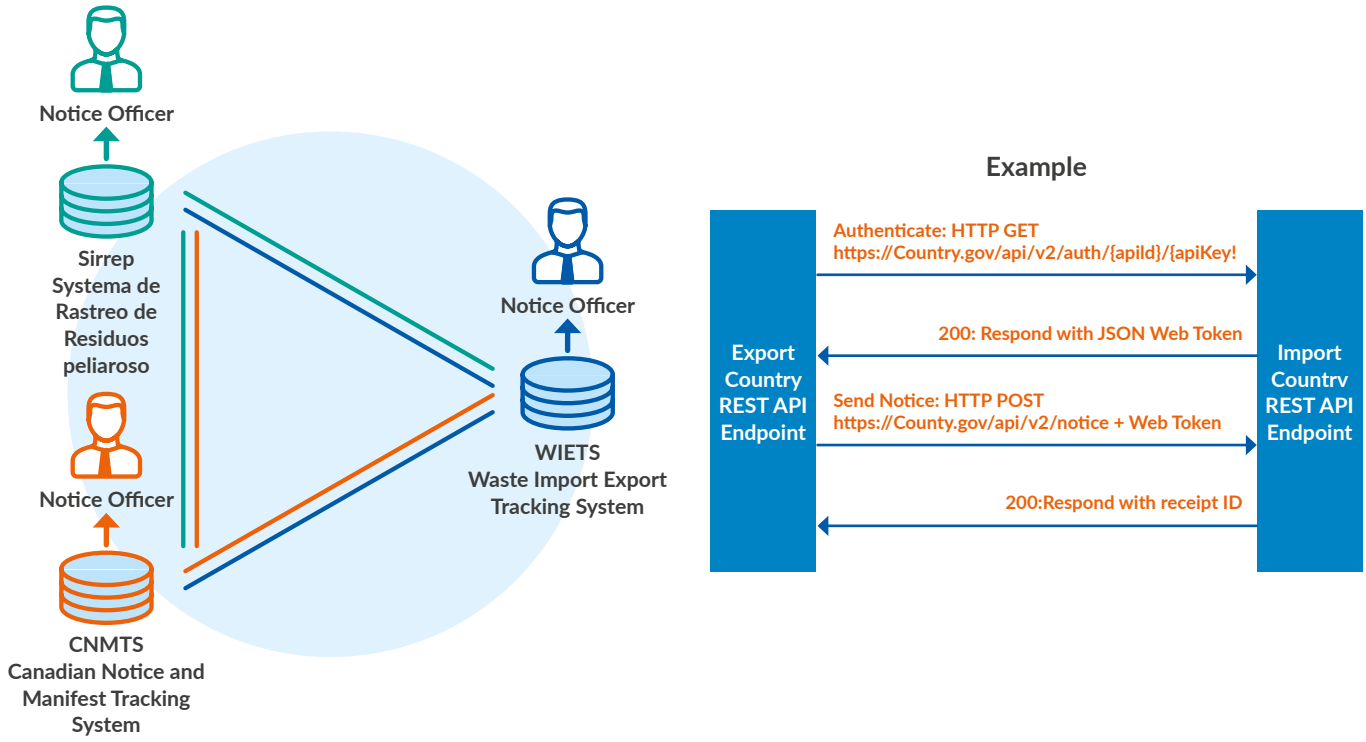
NCEDE connects the respective environmental authorities of the three countries and allows for the sharing and transacting of notifications and consents online (See Figure 5.1.). The system further connects national systems for processing and communication. Taking the United States as an example, NCEDE is connected to the United States Environmental Protection Agency (US EPA) Waste Import Export Tracking System (WIETS) application under US EPA's national RCRAInfo system, and WIETS transfers and shares the notice and consent data to Mexico and Canada through NCEDE. Furthermore, the US EPA's WIETS communicates with the US CBP's electronic system, namely the Automated Export System (AES) for exports under CBP's Automated Commercial Environment (ACE)[107].

NCEDE has significantly improved the efficiency of communication of notices and consents between the three countries, modernizing the data exchange system by allowing a direct exchange of notices through the US-Mexico and the US-Canada API-based exchanges that

107 The relevant systems in Mexico and Canada are: the Semarnat ´s Intercambio Electrónico de Datos de Notificación y Consentimiento known as IEDNC, and the ECCC ´s Canadian Notification and Movement Tracking System known as CNMTS, respectively.

are fully operational. Mexico and Canada successfully continue the data exchange through the existing system. This facilitates legitimate trade of hazardous waste and hazardous recyclable material, and ensuring it is under proper control in North America.

Figure 5.1. NCEDE Version 2.0



(Source) Presentation by Canada and United States at the Consultative workshop on electronic approaches to the notification and movement documents held in January 2021[108]

2. Indonesia[109]

2.1. Circular economy policy in Indonesia

Indonesia, the largest economy in Southeast Asia, consumes a significant amount of natural resources to maintain its economy. Recognizing the importance of the circular economy, and to secure natural resources and support green industries, the Indonesian government plans to develop a National Circular Economy Roadmap guided by the next National Medium Term Development Plan for 2025-2029. Five sectors - wholesale and retail trade, textiles, construction, electronics and electrical equipment, and the food and beverage sector - are potential focus areas for the circular transition. In anticipation of developing the national circular economy plan, the Indonesian government established the **National Taskforce for Non-Hazardous Wastes** in 2009, which comprises the Minister of Environment and Forestry, the Minister of Trade, the Minister of Industry, the Minister of Foreign Affairs, the Chief of Indonesia National Police, and the Minister of Finance.

Indonesian Customs, officially called the Directorate General of Customs and Excise, Ministry of Finance, is part of the Task Force and plays a role in supporting the circular economy through Article 53 of the Customs Law and the Ministerial decree of Finance (141/2020) that requires the **Customs administration to support and encourage recycling businesses by enforcing the related laws and regulations of other ministries and agencies**. Indonesia Customs is expected to facilitate trade in goods for recycling businesses and to detect and prevent illicit trade in unwanted waste.

108 Basel Convention website (http://www.basel.int/Implementation/Controllingtransboundarymovements/eapproachesfornotificationandmovement/Meetings/WorkshopOnlineJan2021/tabid/8741/Default.aspx)

109 Interviews with Indonesian Customs administration on 6-10 February 2023

2.2. Import procedures for waste

Indonesia has a policy to prohibit the import of all categories of hazardous waste. It allows the import of specific categories of non-hazardous waste (such as paper, metals, plastics, rubber, textiles and glass, under certain conditions, for example not mixed with trash or garbage, or contaminated with hazardous materials or waste, in a homogeneous state) and used goods (such as capital goods and other goods, on a case-by-case basis) under strict procedures by Regulations of the Minister of Trade (Permendag) (such as Regulation No. 20/2021) (See Table 5.1.).

The import procedures for waste into Indonesia begin with export registration by the exporting company with the Indonesian Embassy in the exporting country. The registration provides basic information about the exporting company that is useful for risk-profiling.

Before shipping the waste, an affiliated company in the exporting country is required to carry out an inspection for the surveyor report, which is one of the mandatory documents for the import process. The report contains information on aspects including the description of the goods, HS codes, the profile of the exporter, shipment data and container details. **These pre-shipment procedures provide more assurance with regard to the legitimacy of the trade in waste.**

At Indonesia's borders, exporting companies are required to present Ministry of Trade import permits, which are based on recommendations from the Ministry of the Environment and Forestry and the Ministry of Industry, together with the surveyor report. Depending on the goods being imported, additional procedures may also be necessary. Importers use the permits to make a Customs declaration to release the goods. Traders can submit these permits and the Customs declaration online, and receive the result electronically. **All procedures are digitalized through the Single Window system**, which allows proper control of the related information, as well as the facilitation of trade.

2.3. Enforcement

Indonesian Customs controls waste rigorously and continuously strives to detect and prevent illicit trade. As part of their activities, Indonesian Customs actively participates in WCO programmes, such as Operation DEMETER and the Asia-Pacific Plastic Waste Project (APPWP). In the last Operation DEMETER, in October 2022, Indonesian Customs seized 60 tonnes of illicit waste comprising used clothing in a single case. Through the ongoing Asia-Pacific Plastic Waste Project, which has been running from April 2020, Indonesian Customs conducted a diagnostic in an area of trade in waste, and identified recommended actions to improve the effectiveness of operations.

To reinforce their efforts, Indonesian Customs builds cooperative relationships with its trading partners, through the ASEAN Customs Enforcement and Compliance Working Group (CECWG) for example. In its 2019 Meeting, Indonesia submitted a Concept Note on the development of Minimum Standard Requirements for plastic waste importation with a view to combatting plastic waste, strengthening Customs border measures, and protecting the community. This initiative was subsequently designated as one of the activities to be included in the ASEAN Strategic Plan of Customs Development for 2021-2025. Additionally, the CECWG will collaborate with other relevant ASEAN sectoral bodies, such as the ASEAN Working Group on Chemicals and Waste (AWGCW), in the development of minimum standard requirements for other types of waste and harmful goods.

Box 5.1. Investigation into illegal trade in waste in Indonesia

In 2019, NHI Co. imported 1,122 containers from Australia, the United Kingdom, Canada, New Zealand, Puerto Rico and the United States into Indonesia, falsely declared to Customs as non-hazardous plastic waste. However, the containers were contaminated with hazardous waste and blocked from import. Indonesian Customs conducted a risk analysis based on the importer and commodity profiles, detained the targeted containers, and thus discovered the case. A special inter-agency task force led by the Ministry of Environment and Forestry was set up to investigate. It turned out that the verification required by the Basel Convention from the exporting countries had not been carried out. Out of the 1,122 containers that were detained, 540 were duly processed and destroyed in Indonesia in 2021 at the expense of NHI Co., while the remaining 582 containers are still to be processed.

Box 5.2. bonded warehouse for circular business

Indonesian Customs has assigned a bonded warehouse for use by a plastic waste processing company located in the suburbs of Jakarta. The company imports plastic waste from the United States, Japan and Australia, processes it into synthetic fibres in Indonesia, and exports it to the United States, the EU, China, Japan and others. Customs duties and other charges (5% on plastic waste) are exempted under the bonded warehouse scheme, which is a great support for the relatively low-profit-margin business.

Table 5.1. Exports and imports of hazardous wastes and other wastes in Indonesia

Year	2016	2017	2018	2019	2020
Export	652,797	866,228	1,162,721	3,464,180	1,146,109
Import	0	0	0	0	0

(unit: metric tonnes)

(Source) Author's compilation from the UNEP website[110]

3. Belgium[111]

3.1. Circular economy policy in Belgium

Belgium is considered one of the most eco-friendly countries and is promoting the transition to a circular economy throughout the country in line with the EU's policy directions. The first EU Circular Economy Action Plan was adopted by the European Commission in December 2015. It was updated in March 2020 as part of the European Green Deal that sets out an ambitious roadmap for making the EU's economy more sustainable and circular.[112] International trade and Customs are crucial to achieving the objectives of the Action Plan. For example, Customs administrations need to verify that imported materials do not contain hazardous substances, or that they meet specific sustainability, recycling, and other related standards.

Although Belgian Customs does not have its own action plan, it makes **efforts to contribute to a circular economy in its core activities by focusing on securing legitimate trade in waste**. In recent years, the recycling business has become more active in Belgium and the EU, and the volume of trade in secondary materials and wastes is increasing (See Table 5.2.). This implies that the risk of illegal trade in waste or inappropriate trade activities is also on the rise. To prevent illegal trade and facilitate legitimate trade, Belgian Customs is more vigilant with regard to specific goods with high potential risks.

3.2. Import procedures for waste

The import and export of waste in Belgium, as in other EU Member states, are aligned with the above international standards and EU rules. They are regulated under the Basel Convention, the OECD Decision on the Control of Transboundary Movements of Wastes Destined for Recovery Operations, and related EU directives and regulations. Provided all the conditions and requirements are met, both hazardous waste and non-hazardous waste may be imported into Belgium (See Table 5.2.).

In terms of the IT environment in Belgium, **the Customs system and the environmental authority system are not currently interconnected.** Belgium needs to wait for more clarity on EU-wide projects before making any changes. However, the EU Single Window Environment for Customs projects has been moving ahead. It has been running in pilot mode since 2017, and the related EU Regulation was amended in October 2022.[113] The first phase will come into effect by 2025 and focus on enhancing intergovernmental exchanges at EU borders. The second phase is planned to come into effect in 2031.[114]

Another project, the European Data Interchange for Waste Notification (EUDIN), was initiated in the early 2000s by the Netherlands and Belgium, subsequently joined by Germany and Austria, followed by Luxembourg and Switzerland, and then the Nordic countries. Austria and Switzerland are currently the most active countries, conducting the actual interchange of data. A separate Electronic Data Interchange (EDI) for Waste Shipment

110 UNEP website "Reports Dashboard" (http://ers.basel.int/eRSodataReports2/ReportBC_DashBoard.html)
111 Interviews with Belgian Customs administration on 10 November 2022
112 EUR-Lex "An EU action plan for the Circular Economy" (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614)
European Commission "Circular Economy Action Plan" (https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en)
European Commission "European Green Deal" (https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en)
113 European Council "Council adopted EU single window for customs" (https://www.consilium.europa.eu/en/press/press-releases/2022/10/24/council-adopted-eu-single-window-for-customs/)
114 European Commission "The EU Single Window Environment for Customs" (https://taxation-customs.ec.europa.eu/eu-single-window-environment-customs_en)

Regulation (WSR) project is underway in parallel, with a review of the Waste Shipment Regulation.[115] European countries are making efforts to digitalize procedures, similar to NCEDE in North America, but there are still some challenges to overcome.

3.3. Enforcement

Belgium occupies a unique position in Europe, as Antwerp is a gateway port that connects Europe to other continents such as the Americas, Africa, and Asia. Therefore, the responsibility of Belgian Customs extends not only to imports but also to transit and exports.

Belgian Customs has established, and maintains, a robust and collaborative relationship with Belgium's Environmental Inspectorate (NCA), the environmental authority of Belgium. They exchange contact points and communicate on a daily basis. In addition, they have regular meetings to assess and update the situation and exchange information. For Belgian Customs, the information provided by the environmental authority on recycling business operators is very useful for risk analysis and inspections of Customs declarations.

As Belgian Customs regards international cooperation as important, it is a regular participant in the WCO's joint operations, such as DEMETER. In the last Operation DEMETER, in October 2022, Belgian Customs detected 17 cases comprising 76,617 kg and 691 pieces of illicit waste.

Table 5.2. Export and import of Belgium in hazardous wastes and other wastes

Year	2016	2017	2018	2019	2020
Export	533,631	901,213	784,606	750,326	850,482
Import	553,897	620,028	605,757	629,214	657,354

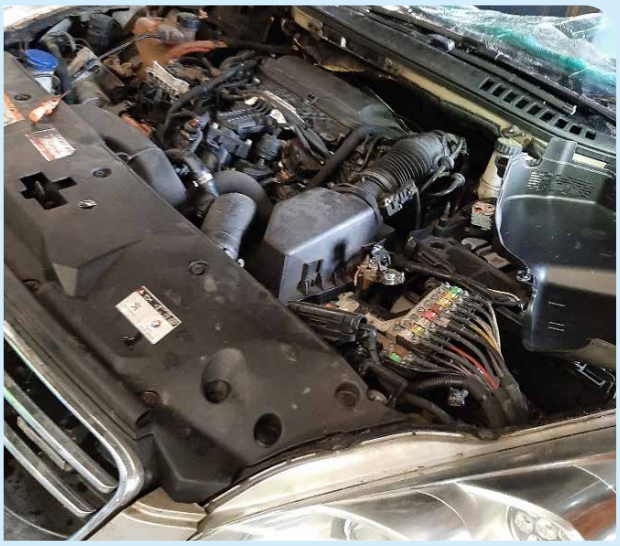
(unit: metric tonnes)

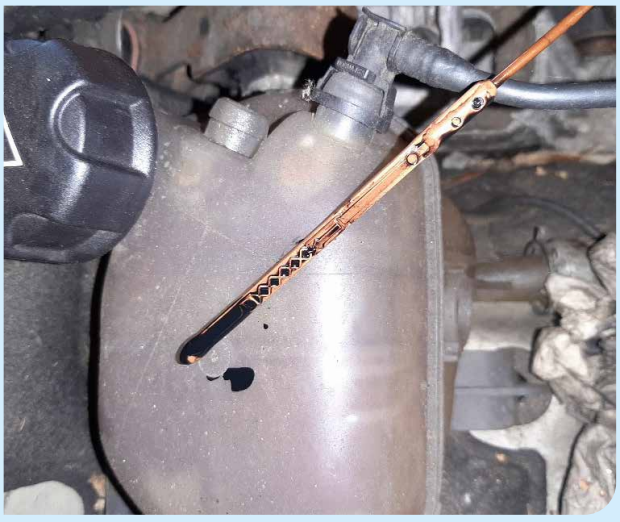
(Source) Author's compilation from the UNEP website

115 Secretariat of the Basel Convention: "Consultative workshop on electronic approaches to the notification and movement documents)" (http://www.basel.int/Implementation/Controllingtransboundarymovements/eapproachesfornotificationandmovement/Meetings/WorkshopOnlineJan2021/tabid/8741/Default.aspx)

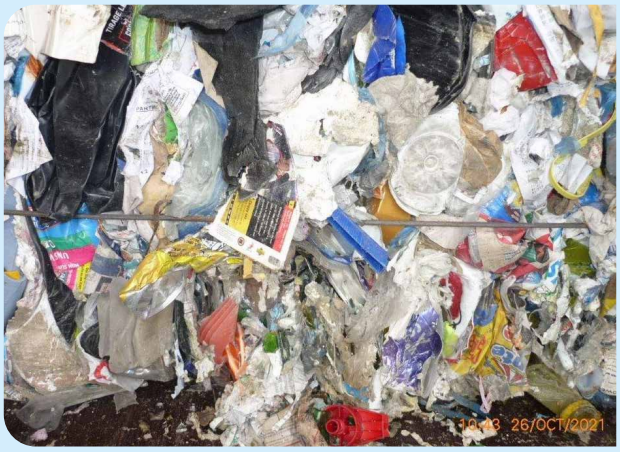
Box 5.3.: Investigation into illegal trade in waste in Belgium

In 2021, a company attempted to export used parts of motor vehicles from Belgium to Madagascar. Exporting used auto parts from EU regions is legal, but exporting hazardous waste from the EU to non-OECD countries, including Madagascar, is prohibited. The export declaration was lodged with Belgian Customs as parts and accessories of motor vehicles (HS 8708.997) with a value of 6,000 euros. Based on risk analysis and intelligence, Customs decided to conduct a physical inspection on the container. The goods were considered hazardous waste, not auto parts, because their quality and condition were not good enough for reuse, and they were contaminated with other waste.





In 2021, the Environmental Inspectorate detected an illegal transhipment of paper waste from Canada to India. After analysing the invoice and manifest information, the Environmental Inspectorate decided to open the containers, and discovered that the paper waste was contaminated with metals, glass, shoes, clothes, and other waste. The goods were not fit for recycling and were considered hazardous waste, which is prohibited from export to India.



4. United States: Green Trade Strategy

United States Customs and Border Protection (U.S. CBP) is one of the most proactive Customs administrations in the environmental area. In June 2022, U.S. CBP released its "**Green Trade Strategy**" to reaffirm its commitment to combatting climate change and to set out a vision for the future of its trade mission.[116] As far as is known, this is the first fully fledged strategy by a Customs administration to commit to sustainable trade.

The strategy primarily focuses on combatting climate change, but also includes elements that contribute to the transition to a circular economy. Firstly, by developing green trade incentive programmes and other facilitation mechanisms, it facilitates legitimate trade and reduces environmental damage. At this time, it is not clear how trade programmes are to be amended, but amendments will aim to influence the behaviour of traders and stakeholders in a certain policy direction. Secondly, the strategy incorporates environmental priorities into existing trade programmes and considers adding environmental criteria into existing trusted trader programmes, such as the Customs-Trade Partnership Against Terrorism (CTPAT), which is an interesting idea as there are currently no specific environmental criteria embedded in existing Authorized Economic Operator (AEO) programmes, although they might be included in general compliance requirements. Thirdly, by prioritizing the enforcement of environmental laws and controls, the strategy prevents illegal trade in waste and provides a level playing field for recycling businesses. This facilitates the trade in reverse supply chains and encourages circular business. Fourthly, by expanding the collection of supply chain data and intelligence to target polluters and parties involved in trading illicit environmental goods, the enforcement position against environmental threats will be strengthened. Fifthly, by promoting interagency collaboration and collaboration with international partners, including foreign Customs agencies and NGOs, to target bad actors, enforcement efforts will be further coordinated and enforcement capabilities will be further strengthened.

Having its own strategy has multiple benefits for U.S. CBP. These include prioritizing the environmental agenda in its organizational missions, demonstrating its commitment to the public, and showcasing its proactive role in the transition to a circular economy. This, in turn, makes it easier to gain support from stakeholders who value sustainability.

116 The U.S. CBP, "Green Trade Strategy" (https://www.cbp.gov/document/publications/cbp-green-trade-strategy)

Contact us:
research@wcoomd.org

Visit our website:
wcoomd.org

Copyright © 2023 World Customs Organization
Photo credits: © Cover, P. 4, 6-7, 10, 30, 41, 42, 68, 85, 86, : © Stock.adobe.com - P.90: © Indonesian Customs - P.93 and 94: © Belgian Customs
Legal deposit: D/2023/0448/7

World Customs Organization

Rue du Marché 30, B-1210
Brussels, Belgium
research@wcoomd.org

#WCOOMD
wcoomd.org