



OPEN ACCESS

EDITED BY

Aleke Stöfen-O'Brien,
World Maritime University, Sweden

REVIEWED BY

Hans Flemming Maltzahn,
Bucerius Law School, Germany
Hanna Dijkstra,
VU Amsterdam, Netherlands
Giacomo Sebis,
Wuppertal Institute for Climate, Environment
and Energy gGmbH, Germany

*CORRESPONDENCE

Barbara Bokor
✉ barbara.bokor@uib.no

RECEIVED 19 April 2024

ACCEPTED 17 October 2024

PUBLISHED 11 November 2024

CITATION

Bokor B (2024) Corporate engagement in
mitigating plastic pollution: examining
voluntary initiatives and EU regulations.
Front. Sustain. 5:1420041.
doi: 10.3389/frsus.2024.1420041

COPYRIGHT

© 2024 Bokor. This is an open-access article
distributed under the terms of the [Creative
Commons Attribution License \(CC BY\)](#). The
use, distribution or reproduction in other
forums is permitted, provided the original
author(s) and the copyright owner(s) are
credited and that the original publication in
this journal is cited, in accordance with
accepted academic practice. No use,
distribution or reproduction is permitted
which does not comply with these terms.

Corporate engagement in mitigating plastic pollution: examining voluntary initiatives and EU regulations

Barbara Bokor*

Faculty of Law, University of Bergen, Bergen, Norway

Plastic pollution has emerged as a critical global environmental challenge, with far-reaching ecological, economic, and social implications. This article addresses the fragmented nature of the current literature on plastic pollution regulations and their impact on the corporate sector and aims to bridge this gap by providing a comprehensive analysis of the current EU regulatory framework and corporate voluntary self-regulatory initiatives relevant to plastic pollution. Examining voluntary initiatives – including corporate social responsibility (CSR) programs and the emerging concept of plastic credits – in terms of their potential to tackle plastic pollution and promote environmental sustainability, the article presents novel insights on how different regulatory mechanisms and voluntary self-regulatory initiatives engage the corporate sector in mitigating plastic pollution. While highlighting the importance of collaborative efforts between regulatory bodies and businesses, the study critically evaluates the challenges and limitations of current approaches. It addresses concerns about the efficacy and transparency of CSR initiatives, with particular attention to the issue of greenwashing and its potential legal implications. By synthesizing diverse sources, this article emphasizes the need to combine stringent regulatory frameworks with responsible business practices to engage the corporate sector in preventing and mitigating plastic pollution, specifically within the context of the European Union's pioneering environmental policy. Ultimately, the study suggests that the most effective long-term solution lies in reducing plastic production altogether while acknowledging the role of transitional measures in the interim.

KEYWORDS

single-use plastics directive, waste management, EPR, plastic credits, CSR, self-regulation, EU law

1 Introduction

Plastic, a versatile and essential material, plays a vital role in global economic development by facilitating daily life and often being lighter and more cost-effective than alternative materials such as stainless steel, glass, wood, or paper (Ilyas et al., 2018). Its unique properties make it highly efficient across various sectors, including packaging, building and construction, automotive and aeronautics, electrical and electronic equipment, agriculture, leisure and sports equipment, and medical and health products (Ilyas et al., 2018). Owing to the multiple functions of plastic, its production has skyrocketed over the past 50 years, from 15 million tons in 1964 to 390.7 million metric tons in 2021, with expectations to double again in the next 20 years (World Economic Forum, 2016). While the growing threat of plastic pollution to the oceans has received notable attention in recent years, the detrimental effects extend beyond the marine environment. Plastics also impact

climate change, terrestrial and freshwater environments, and public health, resulting in far-reaching environmental, economic, and social implications (#BreakFreeFromPlastic, 2017). The corporate sector, here understood as all legal entities engaged in plastic production and consumption,¹ (Ratner, 2001) is integral to addressing plastic pollution in its dual roles as producers of plastic but also as responsible for plastic pollution. Initiatives from the corporate sector could be a response to obligations imposed by regulatory provisions applicable to their activity, purely voluntary undertakings – voluntary self-regulatory measures – or a combination of these different types of regulatory tools.

Current literature on plastic pollution regulation in general, and the role of the corporate sector in particular, could be characterized as fragmented. Reviewing recent publications showcases that most publications fall into distinct categories:

- 1 Studies focusing on businesses and plastic production and/or pollution, but not (only) from a legal research perspective (Dijkstra et al., 2020; El-Jourbagy et al., 2021; Blasiak et al., 2021; Tudor and Williams, 2021; Vandenberg, 2024; Mohammed, 2024)
- 2 Analyses of global or regional plastic regulations without any specific focus on rules applicable to companies (Xanthos and Walker, 2017; Syberg et al., 2021; Beghetto et al., 2023; Nagtzaam et al., 2023; Guggisberg, 2024)
- 3 Research on specific plastic products (such as single-use plastic items) and their regulation or product bans without emphasis on corporate rules (Steenstaad et al., 2017; Xanthos and Walker, 2017; Behuria, 2021; Kasznik and Lapniewska, 2023; Huang et al., 2024)
- 4 Systematic literature reviews on plastic subtopics (Ilyas et al., 2018; Knoblauch and Mederake, 2021; Cowan and Tiller, 2021; Muposhi et al., 2022)

There is a noticeable gap in research specifically examining the EU rules on plastic pollution focusing on provisions applicable to the corporate sector's activity, voluntary initiatives from the corporate sector, and the interactions of these different types of regulatory tools. This gap underscores the need to comprehensively analyze how various regulatory approaches interplay to address plastic pollution from the corporate sector's perspective. The European Union has been chosen as the focus of this study due to its leading role in implementing environmental and plastic pollution regulations and setting standards that often influence international practices in corporate accountability and sustainability (Syberg et al., 2021; Beghetto et al., 2023; Nagtzaam et al., 2023). This article addresses the regulatory challenges associated with plastic pollution originating from both marine and terrestrial sources. By bridging the identified gap in research, this

article aims to investigate how different EU regulatory mechanisms and voluntary initiatives engage the corporate sector in mitigating plastic pollution and to assess the interaction between corporate voluntary self-regulatory measures and mandatory legislation. The emphasis is placed on understanding how a comprehensive regulatory framework can contribute to reducing plastic pollution and encouraging active involvement from the corporate sector.

Following the first, introductory section, the second section outlines essential premises and introduces key terms relevant to the study, encompassing the social character of companies, their inclination toward self-regulatory measures, and the concept of CSR. In the third section, the focus is on examining various EU regulatory instruments regarding plastic pollution applicable to the corporate sector, emphasizing both EU laws and strategies as a means to contextualize how the existing EU regulatory framework influences the corporate sector's approach to addressing plastic pollution. Directives and regulations that do not directly target plastic pollution, but are to enhance corporate accountability, transparency, and sustainability across the European Union could also have potential implications for companies' approaches to plastic-related issues. Those instruments encompassing the *Taxonomy Regulation (2020a)*, the *Corporate Sustainability Reporting Directive (2022) (CSRD)*, the *European Sustainability Reporting Standards (2023b) (ESRS or ESRR)*, and the *Corporate Sustainability Due Diligence Directive (2024) (CSDDD)* will be studied in the third section as well. The fourth section investigates initiatives and international standards on CSR that are voluntarily implemented by companies. Further, studying the example of plastic credits, showcases how the different types of regulatory methods can intersect. This section also analyzes some shortcomings of CSR when dealing with plastic pollution because a comprehensive analysis is key to understanding how these voluntary regulatory approaches could help address the problem of plastic pollution from the corporate sector's side and how these instruments could contribute to the current regulatory framework. The final section explores the potential benefits and challenges of different regulatory approaches applied to and by the corporate sector and how these approaches can effectively interact. It also includes suggestions for further research regarding a deeper analysis of the interactions between CSR and CSDDD, the most effective ways to integrate plastic credits into existing regulatory frameworks, and the environmental, social, and economic impacts of plastic credit programs for future policy development.

2 The surge of corporate self-regulation strategies for social and environmental impacts

2.1 The social character of the corporate sector

Understanding the social character of the corporate sector provides insight into the extent of its responsibility to conduct business with integrity, adhere to ethical and environmental standards, and prioritize sustainable solutions. This understanding is crucial for comprehending the evolving societal expectations toward corporations and their role in sustainable development, ultimately guiding efforts to integrate corporate social responsibility

¹ Various terms, including company(ies), businesses, business entity(ies), enterprise(s), firm(s), or corporation(s), will be utilized interchangeably, irrespective of their ownership (state-owned or privately owned), specific form (private or public limited company), or level of transnationality (national, regional, or multinational), but, this does not imply a theoretically defined differentiation between these entities and other economic actors.

and environmental accountability into business operations. The role and responsibility of corporations in addressing societal and environmental issues have been a significant concern for a long time, especially in light of the increasingly globalized nature of businesses (Herrmann, 2004). Through its global activities, the corporate sector has significantly contributed to environmental issues such as CO₂ emissions, biodiversity loss, and plastic pollution in several noticeable ways (Salzmann et al., 2005). As early as 1973, it was highlighted by Virgil B. Day, former vice president of General Electric, that corporations have not only a legal character but also a social one (Day, 1973). In terms of social responsibility, the corporate sector has a duty to the society in which it operates to conduct business with integrity, adhering to fundamental economic, social, ethical, and environmental standards and principles, while also prioritizing sustainable solutions (Muchlinski, 2021). Societal expectations toward companies and public perceptions regarding the role of the corporate sector have evolved over time (Terziev, 2012). As a result, there is growing awareness of corporate environmental accountability and the contribution of companies to sustainable development (Evans, 2018). With the rising expectations and subsequent political and societal pressure on the corporate sector to adopt sustainable practices and minimize their environmental impact, corporations have intensified their efforts to integrate CSR into their business operations (Wirba, 2023). Therefore, there is an emerging recognition within the corporate sector of the responsibility for the environmental and societal impacts they impose, reflected in their actions and initiatives (Holmes, 1976; Vogel, 2006; Gunningham, 2009; Carroll et al., 2012). In this regard, certain companies have already taken steps to address plastic pollution and promote a more sustainable and circular plastic economy. For example, in order to express their commitment and support for the Global Plastics Treaty,² more than 80 influential companies and financial institutions signed a joint recommendations package in 2022.³ Within the proposed recommendations, they advocated for the establishment of harmonized regulations in three key areas: Reduction, Circulation, and Prevention & Remediation (Treaty, 2023). This indicates an emerging awareness within the business community of the necessity for (harmonized) regulation, coupled with a desire to actively participate in its formation.

Generally, voluntary or self-regulatory initiatives aim to minimize government intervention by encouraging relevant companies or industry associations to tackle potential harms without mandatory requirements (Koski and May, 2005). Through voluntary corporate self-regulation, companies adhere to environmental standards such as

the ISO 14001 Environmental Management Systems standard,⁴ committing to both corporate social responsibility and corporate environmental responsibility initiatives. Within the array of self-regulatory measures, the next subsection will develop CSR and section 4 will introduce its interplay with plastic pollution through plastic-relevant CSR initiatives and the example of plastic credits. That section will also display the shortcomings of CSR.

2.2 What is CSR about?

Private, voluntary standards on environmental and social responsibility, commonly labeled as Corporate Social Responsibility, have arisen in numerous industries such as the plastic industry (Glinski, 2021). Over the years, numerous definitions and interpretations of CSR have emerged from academia, international organizations, the media, and companies, often analyzed in literature reviews (Carroll, 1999; Moir, 2001; Dahlsrud, 2008; Crane et al., 2014; Okoye, 2016).

At the European level, the EU has substantially contributed to shaping the definition of CSR, its rules, and standards. The Commission issued a green paper in 2001 in which a CSR definition was determined as “a concept whereby companies integrate social and environmental concerns in their business operations and their interaction with their stakeholders on a voluntary basis” (European Commission, 2001). In 2011 the definition was reviewed and went through a paradigm shift in the renewed CSR strategy: “the responsibility of enterprises for their impacts on society” (European Commission, 2011). The Commission also issued a staff working document which is built on its 2011 Communication and aims to bring into line European and global approaches to CSR or responsible business conduct (RBC) (European Commission, 2019a)⁵ by stressing the importance of increasing the visibility of CSR or RBC and distributing good practices (European Commission, 2011).

Nevertheless, there is no single, universally accepted meaning of CSR that could be referred to, as many definitions tend to be influenced by specific interests (Marrewijk, 2013). In essence, CSR can be perceived as a business strategy that extends beyond and coexists with the obligations imposed by international, EU, and national laws, serving as an additional layer of development. CSR relates to the importance of conforming business operations with societal and environmental expectations and it guides and governs a company's voluntary commitments to social and environmental concerns (Gjølberg, 2009). The scope of CSR is not rigidly defined; it can vary based on context and organizational priorities; in broad terms, it encompasses a diverse collection of themes, including environmental responsibility, ethical considerations, human rights advocacy, and job creation (Vytopil, 2015; de Colle et al., 2014).

² In March 2022 the UN Environment Assembly adopted its Resolution 5/14 with the title of “End plastic pollution: towards an international legally binding instrument” to tackle the global discharge and mismanagement of plastics, by reducing both plastics leakage into the environment and the impact of plastic production and consumption on resources. The mandate agreed upon at UNEA5.2 consists of the setup of an intergovernmental negotiating committee that will develop an international legally binding treaty on plastic pollution, with a comprehensive approach that addresses the full lifecycle of plastics and with the ambition to complete the negotiations by the end of 2024 (<https://www.unep.org/inc-plastic-pollution>).

³ <https://www.businessforplasticstreaty.org/latest/press-release>

⁴ ISO 14001 is the internationally recognized standard for environmental management systems (EMS) that provides a framework for organizations to design and implement an EMS, and continually improve their environmental performance (<https://www.iso.org/standard/60857.html>).

⁵ The EU applies CSR and RBC interchangeably.

3 EU law relevant to the corporate sector concerning plastic production and pollution

The need for the governance of global environmental resources requires collaboration at multiple levels (local, national, regional, and international) to address the growing ecological challenges, including plastic pollution (Paavola, 2007). Both the upcoming Global Plastics Treaty and various international documents (United Nations Environment Assembly, 2017; UNEA, 2022; European Commission, 2018), alongside the European Union, adopt a comprehensive, holistic approach to addressing plastic pollution. In the European Union, regulatory instruments and initiatives emphasize the need for sustainable business models and advocate for increased environmental awareness among all stakeholders involving consumers, businesses, and public entities. Within this framework, the private sector, particularly business entities, plays a significant role in managing plastic waste and its environmental impacts. Many companies seek solutions through the expansion of recycling infrastructure, the creation of innovative technologies for repurposing waste, and the education of governments and communities to promote action and address existing plastic waste in the environment (Smith and Brisman, 2021). Business entities have a significant role to play, and the overarching goal is to ensure that they operate within legal boundaries while actively contributing to societal well-being (Khan et al., 2021; Rajeev, 2023). In the upcoming sections, the EU regulatory instruments on plastic pollution and reporting requirements will be studied with a specific focus on provisions applicable to the corporate sector.

3.1 Plastic Strategy in the EU

Under its Plastic Strategy (European Commission, 2018), which is part of the EU's Circular Economy Action Plan (European Commission, 2015a), the EU emphasizes environmental protection, sustainable production, and transforming the lifecycle of plastic products from design to disposal.⁶ In March 2020 the European Commission adopted the *New Circular Economy Action Plan* (New Action Plan) (European Commission, 2020a) which is one of the main building blocks and a key component of the *European Green Deal* (EGD) (European Commission, 2019b), the overarching strategy and the Commission's main agenda to make Europe climate-neutral by 2050.⁷ Both the EGD and the New Action Plan promote and stress the importance of transitioning to sustainable business models. The EGD outlines its objective to foster new business models and establish minimum standards to deter the distribution of environmentally harmful products among EU member states (European Commission, 2019b). The EGD also conveys that sustainability should be further embedded into the “*corporate governance framework, as many companies still focus too much on short-term financial performance compared to their long-term development and sustainability aspects*”

(European Commission, 2019b). The New Action Plan articulates expectations toward the corporate sector by highlighting the necessity and significance of designing sustainable products, applying circular economy processes, and preventing waste by keeping the resources in the EU economy for as long as possible.⁸ It also addresses specific measures on compulsory standards for recycled plastic content and measures for reducing plastic waste in key products, such as packaging, construction materials, and vehicles to enhance the adoption of recycled plastics and promote more sustainable plastic usage (European Commission, 2020a). Both the EGD and the New Action Plan have driven significant changes in EU law for instance the adoption of the *Single-Use Plastics Directive* (2019), the *CSRD*, or the amendment of the *Regulation on the Registration, Evaluation, Authorisation, and Restriction of Chemicals* (2006) by measures that restrict microplastics intentionally added to products. Companies operating in the EU must comply with these evolving regulations. By aligning early with the principles of the EGD and the New Action Plan, they can not only ensure compliance but also enhance sustainability and contribute to the EU's broader circular economy objectives. When further discussing plastic, the Plastic Strategy strongly promotes extensive cooperation and participation among the business and industry sectors and civil society because they all “*can contribute to the reduction of litter, recycling, and reuse by developing effective environmental management plans, incorporating problem identification, development of best practices and staff training*” (European Commission, 2018). It stresses the importance of comprehending the requirements of all stakeholders in the plastics value chain and removing regulatory barriers to foster a more conducive environment for innovation and the adoption of circular business models (European Commission, 2018). The three Annexes of the Plastic Strategy emphasize the need and importance of voluntary industry commitments to boost plastic recycling efforts in Europe. Highlighting and integrating voluntary commitments into CSR strategies can benefit companies by showcasing their proactive approach to social responsibility and sustainability. A proactive approach allows companies to shape their CSR strategies and operations in a way that meets future regulatory expectations, thereby reducing compliance risks and improving their brand reputation (Porter and Kramer, 2006).

All the above-introduced instruments propose several concrete rules and initiatives directly impacting companies involved in the production, use, and management of plastics. These documents have also established a policy framework and foundation for the binding rules relevant to plastic pollution and the corporate sector that will be studied in the following sections.

3.2 Regulating plastic pollution in the EU and its connection to the corporate sector

Under the EU plastic regulatory framework, several directives and regulations are highly relevant to companies, particularly

⁶ https://environment.ec.europa.eu/strategy/plastics-strategy_en

⁷ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

⁸ https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

concerning environmental sustainability and corporate obligations.

The *Waste Framework Directive (WFD) (2008)* establishes the legal framework for waste management within the EU and introduces the waste hierarchy in Article 4 that defines an order of preference for managing and disposing of waste by prioritizing prevention, reuse, recycling, and other recovery options over disposal. The WFD also lays down the basic concepts and definitions related to waste management, such as the “polluter pays principle” (OECD, 2008),⁹ defines reuse and recycling targets for waste materials, and introduces the concept of EPR. EPR is a policy approach that holds producers responsible for the environmental impact of their products throughout their life cycle, encouraging them to explore innovative solutions and develop more sustainable products. Numerous companies are bound by EPR rules and must organize and finance the collection, recycling, and proper disposal of their products. According to Article 8 (1) of the WFD “*any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products (producer of the product) has extended producer responsibility,*” namely, producers shall be responsible for the post-consumer stage of a product by collecting end-of-life products, and sorting them before their final treatment, preferably, recycling (OECD, 2016). EPR can be accomplished either through providing the necessary financial resources and/or through assuming control of the operational and organizational aspects of the process from municipalities (OECD, 2016). In line with the polluter pays principle, this policy moves the responsibility, and costs of negative environmental externalities of products after their service life from municipalities and consumers to the respective manufacturers (Beghetto et al., 2023; Tumu et al., 2023). The environmental goal of EPR is twofold: firstly, incentivizing companies to design products that are resource-efficient and have minimal environmental impact, and secondly, ensuring efficient collection at the end of their life cycle, environmentally responsible treatment of collected items, and enhanced rates of reuse and recycling (Beghetto et al., 2023). EPR can establish firmer control over products and make producers interested in creating sustainable plastic products. Both Coca-Cola and Unilever expressed their support for creating government-led EPR schemes and their intention to participate in the design and development phases of these programs (Hjemdahl, 2022). From a legal perspective, these programs can provide a level playing field for the affected companies by subjecting them all to the same regulations and standards. Additionally, engaging in the planning stages enables them to shape the particulars and make a meaningful impact on the outcomes. EPR solutions, while crucial, cannot operate in isolation, they must be complemented by a range of other policy instruments to ensure their effectiveness and address the complexities of plastic waste management comprehensively (WWF, 2019). Various regulatory frameworks, such as bans on harmful materials or

products,¹⁰ product standards, labeling,¹¹ and voluntary agreements, all contribute to the broader policy landscape (European Commission, 2022a) and are linked to EPR (Emma Watkins et al., 2017).

In the EU, plastic packaging and packaging waste are key environmental concerns since packaging is one of the main uses of virgin materials (40% of plastics used in the EU are meant for packaging) and accounts for around 40% of municipal solid waste (European Commission, 2022b). The extensive utilization of packaging along with restricted rates of reuse and recycling, compounded by the relatively short lifespan of packaging compared to other plastic products, leads to littering, challenges in waste management and recycling, and impedes the advancement of a low-carbon circular economy (European Commission, 2022b). The *Packaging and Packaging Waste Directive (PPWD) (1994)* focuses on the management of packaging waste, encouraging reductions in packaging waste production, promoting the reuse of packaging, and ensuring the recycling of packaging materials, involving plastics. The directive aims to reduce the environmental impact of packaging, including plastic packaging, by promoting the reduction, reuse, and recycling of packaging materials.¹² The PPWD imposes obligations on companies, particularly those involved in the production, distribution, and sale of packaging, comprising plastic packaging. Obligations encompass meeting recycling targets, ensuring packaging is designed for recyclability, and participating in EPR schemes. According to Article 7 of the PPWD, return and/or collection systems need to be established for used packaging and packaging waste and systems for the reuse or recovery including recycling of the packaging and/or packaging waste collected to meet the objectives determined in the Directive. EPR can be applied to some types of plastic packaging well because packaging materials often have standardized formats, making them easier to collect, sort, and recycle efficiently within existing waste management infrastructures (Hopewell et al., 2009).

As the PPWD lacks specific guidelines on the way EPR should be implemented by the Member States, responsibilities and costs for packaging waste collection and sorting are allocated differently among stakeholders – such as producers, municipalities, waste management companies, and consumers – and the criteria for obtaining licensing for EPR schemes vary as well (European Commission, 2015b). In certain EU countries, the funds collected through EPR schemes are allotted to private or public waste management entities responsible for

⁹ The polluter pays principle is a fundamental principle of cost allocation and not a principle of compensation for damage caused by pollution. It requires that the costs of pollution prevention and control measures must be borne by the polluter to ensure that the environment is in an acceptable state.

¹⁰ e.g. The amendment of REACH: the restriction of microplastics intentionally added to products, or the ban of certain single-use plastic products in the Single-Use Plastics Directive.

¹¹ For instance, according to Recital 46 and Article 16 of Regulation (EU) 2024/1781 of the European Parliament and of the Council of 13 June 2024 establishing a framework for the setting of ecodesign requirements for sustainable products, amending Directive (EU) 2020/1828 and Regulation (EU) 2023/1542 and repealing Directive 2009/125/EC: “*To drive consumers towards sustainable choices, labels should, when required by the delegated acts adopted pursuant to this Regulation, provide clear and easily understandable information.*” This new Ecodesign for Sustainable Products Regulation entered into force on 18 July 2024 is a step towards achieving the objectives of the New Action Plan.

¹² https://environment.ec.europa.eu/topics/waste-and-recycling/packaging-waste_en

gathering and categorizing post-consumer packaging waste,¹³ while other nations¹⁴ channel these fees to local authorities for independent packaging waste collection or through contracted services (European Commission, 2015b). The Plastic Strategy outlined the intention to develop new standardized regulations to ensure that all plastic packaging introduced to the EU market can be reused or recycled cost-effectively by 2030. This intention has been reinforced by the EGD and the New Action Plan and led to the current revision of the PPWD.¹⁵ The proposal (European Commission, 2022c) also incorporates businesses, recognizing their essential role in achieving the specified targets.

In 2019 the EU adopted the Single-Use Plastics Directive which is designed to address the most commonly found single-use plastic products on beaches, along with fishing-related items. These products account for around 80% of all marine litter in the EU and pose a significant threat to marine ecosystems, biodiversity, and human health.¹⁶ The Directive defines single-use plastic products and aims to prevent and reduce their environmental impact, particularly on marine ecosystems and human health. It also encourages the transition to a circular economy by promoting innovative and sustainable business models, products, and materials.¹⁷ Where sustainable alternatives are easily available and affordable, certain single-use plastic products cannot be placed on the markets of the Member States. This applies to cotton bud sticks, cutlery, plates, straws, stirrers, and sticks for balloons and it should also apply to cups, food and beverage containers made of expanded polystyrene, and all products made of oxo-degradable plastic.¹⁸ Businesses are strongly affected by the provisions of the Directive, as it defines requirements for how products are designed, manufactured, and advertised. For instance, from 3 July 2024, single-use plastic products that have caps and lids made of plastic can be sold only if the caps and lids remain attached to the containers throughout the intended usage time.¹⁹ Furthermore from 2025, beverage bottles manufactured with polyethylene terephthalate (PET) as the major component must contain at least 25% recycled plastic, and from 2030 all plastic beverage bottles shall include at least 30% recycled plastic.²⁰ As per EPR rules, producers shall be responsible for covering expenses related to waste management, litter cleanup, and awareness-raising programs for their products.²¹ This includes items such as food and beverage containers, wet wipes, and balloons starting in 2025, as well as tobacco products starting in 2023.²² Applying EPR as a concrete manifestation of the

polluter pays principle can contribute to sharing the costs of waste management and clean-up between municipalities and corporations. The Directive stands out in the EU for its dual focus on tackling plastic pollution and the extent of engagement with the corporate sector. Still, the lengthy implementation deadlines for various provisions hinder the effectiveness and immediacy of results in the short term.

These regulatory instruments demonstrate a clear focus on addressing the environmental challenges posed by plastics and underline the EU's commitment to reducing plastic pollution, improving plastic waste management, and promoting a circular economy. For companies, these rules create specific obligations that must be met to comply with EU environmental goals and legislation. On the other hand, plastic producers should also develop comprehensive strategies and incentives aimed at reducing the use of virgin plastic²³ and achieving sustainability objectives for plastic production across all the markets they serve (Nameroff, 2023). Enhanced production techniques have the potential to generate cost efficiencies for enterprises, however, it is widely acknowledged that the most effective strategy in combatting plastic pollution and advancing waste management practices lies in reducing the overall production of plastic (Panel – GEF, 2012). While improved production methods may offer short-term economic benefits, the long-term sustainability of our planet necessitates a shift toward minimizing plastic production (Hohn et al., 2020; Bergmann et al., 2022; Walker and Fequet, 2023). The aforementioned instruments still primarily concentrate on addressing or managing the issue of already produced plastic, with less emphasis on reducing its production.

3.3 The EU's initiatives for sustainable corporate governance and sustainable finance

Several EU legislative instruments related to sustainable corporate governance are highly relevant to companies involved in plastic-related activities due to their substantial environmental impact, especially in pollution and waste management. The Taxonomy Regulation (2020b), the CSRD, the ESRR, and the CSDDD are key EU initiatives that aim to enhance corporate transparency, accountability, and environmental responsibility.

The EU Taxonomy Regulation establishes a classification system for environmentally sustainable economic activities and defines the criteria necessary to qualify an economic investment or activity as sustainable. Under Article 3 of the Taxonomy Regulation, an economic activity must make a substantial contribution to one or more of the environmental objectives²⁴ outlined in Article 9 to be classified as

13 For instance in Spain or the Czech Republic.

14 e.g. Austria, Belgium, Sweden.

15 The PPWD has gone through a revision procedure. On 4 March 2024, the Parliament and the Council reached a provisional agreement on the new regulation. This agreement still needs to be formally approved by both institutions ([https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI\(2023\)745707](https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2023)745707)).

16 Recital 5 of 2019. Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment.

17 Article 1 of the Single-Use Plastics Directive.

18 Article 5 and Part B of the Annex of the Single-Use Plastics Directive.

19 Article 6 (1) of the Single-Use Plastics Directive.

20 Article 6 (5) (a–b) of the Single-Use Plastics Directive.

21 Article 8 (2) and (3) of the Single-Use Plastics Directive.

22 Article 17 (1) of the Single-Use Plastics Directive.

23 Virgin plastic is a newly manufactured resin produced from petrochemical or biomass feedstock used as the raw material for the manufacture of plastic products and which has never been used or processed before (https://apps1.unep.org/resolutions/uploads/essential_elements_-_production_and_consumption.pdf).

24 Namely: climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, and the protection and restoration of biodiversity and ecosystems.

environmentally sustainable. While the Taxonomy Regulation sets the overall framework, the Commission has implemented a Delegated Act ([European Sustainability Reporting Standards, 2023a](#)) to establish the technical screening criteria for defining the conditions that determine whether a specific economic activity qualifies as making a substantial contribution to the environmental objectives.²⁵ This Delegated Act encompasses plastic in alignment with the Plastic Strategy, the EGD, and the New Action Plan.²⁶ Both the Taxonomy Regulation and the Delegated Act are of particular significance to companies, including plastic producers, seeking to position their products as environmentally sustainable, fostering a potential shift in corporate strategies and product development within the plastics industry.

The [Non-Financial Reporting Directive \(NFRD\) \(2014\)](#) obliged large companies with more than 500 employees to include in the management report a non-financial statement containing information on environmental, social, and employee matters, respect for human rights, anti-corruption, and bribery matters.²⁷ Nevertheless, in the EGD the Commission identified the need for revising and renewing the NFRD, and the necessity to improve the quality, comparability, and relevance of non-financial information disclosed by companies, which led to the replacement of the NFRD by the CSRD ([EPR Services, 2021](#)). The CSRD introduces new sustainability reporting requirements that oblige large, small, and medium-sized companies, as well as non-EU companies generating over EUR 150 million in the EU market, to publish sustainability information.²⁸ The new rules are designed to grant investors and stakeholders access to necessary information for evaluating companies' societal and environmental impact.²⁹ They also facilitate the assessment of financial risks and opportunities associated with climate change and other sustainability issues.³⁰ Through the CSRD, the EU seeks to enhance the comprehensiveness, comparability, and reliability of sustainability reports within the EU ([Baumüller and Grbenic, 2021](#)). Companies shall report according to ESRS – adopted under CSRD – that directly supports the implementation of the CSRD by providing the specific guidelines and criteria that companies must use to disclose sustainability-related information.³¹ The ESRS aims to guarantee that the information provided by companies is detailed, accurate, and relevant, offering a clear and comprehensive insight into companies' sustainability practices which enables a deeper understanding of sustainability performance, while the unified European standards ensure consistency in the collection and presentation of sustainability information ([Fornasari and Traversi, 2024](#)).

The Taxonomy Regulation, the CSRD, and the ESRS strive to enhance transparency and accountability in reporting on sustainability-related issues, enabling investors and other stakeholders

to assess companies' societal and environmental impact through these reports. Conversely, the CSDDD sets out a risk-based corporate due diligence duty for large companies³² to identify and address adverse human rights and environmental impacts across their operations, subsidiaries, and value chains. This obligation ensures accountability throughout the business's entire scope. A risk-based corporate due diligence shall contain (a) integrating due diligence into policies and risk management, (b) identifying adverse impacts, (c) implementing actions to prevent and mitigate impacts, (d) providing remediation, (e) engaging with stakeholders, (f) establishing a notification mechanism and complaints procedure, (g) monitoring the effectiveness of due diligence, and (h) public communication.³³ Accordingly, corporations concerned with plastic production and consumption need to assess the environmental impacts of their materials, the sustainability of suppliers, and end-of-life product management. Non-compliance could lead to legal liabilities, including penalties and potential lawsuits.³⁴ Nevertheless, the extent of the CSDDD's influence on human rights, the environment, and climate will significantly depend on the implementation by member states, civil society involvement, whether businesses are sufficiently incentivized to engage meaningfully rather than solely focusing on compliance, and, ultimately, on the Commission's review process ([Bueno et al., 2024](#)).

3.4 The transforming effect of EU laws on CSR

The EU's comprehensive regulatory and policy framework has profound implications for the corporate sector, including those dealing with plastics. These policies are driving a shift toward a circular economy, requiring companies to rethink their production processes, supply chains, and reporting practices. Corporations that invest in sustainable innovations, align with green finance principles, and take responsibility for the entire lifecycle of their (plastic) products are more likely to thrive in this evolving regulatory environment ([Jain et al., 2021](#)). Upon reviewing the current EU regulatory framework, it becomes evident that the concept of sustainability is moving from being a

25 Recital 1 and 2 of the Delegated Act.

26 Recital 13 of the Delegated Act.

27 Article 1 of NFRD.

28 https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

29 Recital 3 of the CSRD.

30 Recital 3 of the CSRD.

31 Recital 1 and 2 of Commission Delegated Regulation 2023/2772. According to Article 2 the Regulation shall apply from 1 January 2024 for financial years beginning on or after 1 January 2024.

32 According to Paragraphs 1 and 2 of Article 2 of the CSDDD large company means companies in the EU (a) Employed more than 1,000 people on average and had a net turnover exceeding EUR 450,000,000 in the last financial year, (b) Did not reach the thresholds, but is the ultimate parent company of a group that did, (c) Engaged in franchising or licensing agreements in the EU with royalties exceeding EUR 22,500,000 and had a net worldwide turnover exceeding EUR 80,000,000 in the last financial year. Companies in third countries: (a) It generated a net turnover exceeding EUR 450,000,000 in the Union in the financial year before the last financial year, (b) It did not meet the threshold but is the ultimate parent company of a group that, on a consolidated basis, exceeded that threshold in the financial year before the last financial year, (c) it engaged in franchising or licensing agreements in the Union, involving royalties exceeding EUR 22,500,000, and it generated, or is the ultimate parent company of a group that generated, a net turnover exceeding EUR 80,000,000 in the Union in the financial year before the last financial year.

33 Paragraph 1 of Article 5 of the CSDDD.

34 See Articles 25, 27 and 29 in the CSDDD.

question of regulatory compliance to becoming a strategic imperative, which has the potential to fundamentally transform corporate behavior and encourage substantive changes in organizational strategies, operations, and decision-making processes (Fornasari and Traversi, 2024). These legislative measures promote transparency and comparability in CSR information, emphasizing the integration of stakeholder interests and rights, particularly in the preservation of human rights, to advance long-term sustainable governance and CSR (Čufar et al., 2024). While the EU's regulatory framework on plastics and sustainability is ambitious and necessary to tackle pressing environmental problems, several challenges and deficiencies may arise. Initially, many of these instruments (such as the CSRD, ESRS, and CSDDD) are in their early phases, making it challenging to measure or predict their effectiveness in preventing and mitigating adverse human rights and environmental impacts including plastic pollution. The CSDDD applies exclusively to large companies, thereby excluding a significant number of businesses. Also, while these legislative measures aim to improve transparency and drive corporate sustainability, the sheer volume of required disclosures, combined with often vague or evolving guidelines, can create confusion for companies, which is particularly problematic for businesses new to sustainability reporting (Baumüller and Grbenic, 2021).

4 Initiatives of corporate social responsibility and corporate sustainability on plastic

4.1 CSR in a plastic pollution context within the EU

Governments and non-state actors such as NGOs try to encourage businesses to operate in socially and environmentally responsible ways and collaborate with them to promote sustainable practices (Crane et al., 2013). Under the renewed EU CSR Strategy, mentioned above, CSR primarily relies on non-binding endeavors, including increasing the visibility of CSR and promoting the dissemination of best practices (Kingston et al., 2017). Corporations themselves should take the lead in advancing CSR initiatives but public authorities can support this effort by employing a strategic mix of voluntary policy measures and, when necessary, complementary regulations (European Commission, 2011). This may involve actions to enhance transparency, create market incentives for responsible business conduct, and ensure corporate accountability (European Commission, 2011). The EU's approach to CSR focuses on promoting transparency, environmental sustainability, human rights, and ethical business practices while supporting sustainable development and enhancing competitiveness (European Commission, 2011).

When it comes to plastic pollution as a specific social and environmental concern, leading private sector companies have been increasingly recognizing the proactive roles they can undertake, looking at sustainability in these sectors as an integral aspect within their broader corporate social responsibility framework (Panel – GEF, 2012). The European Topic Center on Circular Economy and Resource

Use³⁵ by having prepared a report on pathways to circular plastics in Europe paved the way for businesses, policymakers, and citizens to discover and implement good practice examples (Ive Vanderreydt et al., 2023). Firms can find inspiration for how to increase their role in making plastics more circular and sustainable by applying smarter use, increased circularity, and renewable material pathways (Ive Vanderreydt et al., 2023). Under CSR strategies, companies might undertake such initiatives as improving the recyclability of plastic packaging, reducing single-use plastics, enhancing circular economic solutions, preventing fishing gear loss at sea, or limiting the use of oxo-degradable plastics. As an illustration, Nestle, in alignment with its sustainability policy, has a dedicated page for waste management on its website.³⁶ This part not only stresses the importance of sustainability and supporting a circular economy but also sets specific targets, such as aiming for 95% of plastic packaging to be recyclable by 2025, with the overarching aim of achieving 100% recyclable or reusable packaging and reducing virgin plastic usage by one third by 2025.³⁷ These goals intend to comply with the objectives of the EU Plastic Strategy and the provisions defined in the current revision of the PPWD. It can be also observed that consumer expectations and negative brand image are increasingly motivating improvements in plastic manufacturing technologies and companies could leverage CSR as a competitive advantage in addressing these challenges.³⁸

4.2 Plastic credits, a manifestation of CSR in plastic pollution

Plastic credit is an economic incentive instrument that attributes economic value to responsible plastic waste management. Plastic credits are typically voluntary initiatives managed by organizations³⁹ or companies and are designed to enhance companies' internal strategies for reducing plastic usage while also contributing to waste collection (Winters, 2023). For instance, Henkel, the German multinational chemical and consumer goods company, has collaborated with Plastic Bank⁴⁰ since 2017 to reduce plastic waste in

35 The European Topic Centre on Circular Economy and Resource Use (ETC CE) is a consortium of European organisations working in partnership with the European Environment Agency and informs decision-makers and the public by presenting reliable and comparable data and information on circular economy and industrial transformation, the implementation of EU waste legislation and material flows and sustainable resource use in Europe.

36 See <https://www.nestle.com/sustainability/waste-reduction>.

37 <https://www.nestle.com/sustainability/waste-reduction/actions-plastic-pollution>

38 See protests against Aldi, Lidl or Tesco because of using single use plastic and plastic packaging (<https://greennews.ie/sick-plastic-campaign-day-of-action-supermarket-packaging/>).

39 For-profit social enterprises such as Plastic Bank (<https://plasticbank.com/>); Empower (<https://www.empower.eco/>) or rePurpose Global (<https://repurpose.global/>).

40 Plastic Bank is a for-profit social enterprise that builds recycling ecosystems in under-developed communities to fight both plastic pollution in oceans and high poverty levels in developing countries (<https://businessabc.net/wiki/plastic-bank>).

the environment, mostly in the oceans.⁴¹ Plastic credits provide companies with an opportunity to compensate for their plastic pollution and cost-effectively adhere to environmental standards (Zhang et al., 2023). Applying plastic credits makes companies financially responsible for dealing with the pollution they cause which indicates that a certain percentage of the plastic they produce and sell is eventually gathered and recycled. Plastic credit also encourages and provides financial support to individuals, businesses, or communities to help reduce, recycle, or properly dispose of plastic waste (EPR Services, 2023). This instrument particularly targets plastic waste reduction and recycling therefore its applicability is limited to the end of a product's lifespan.

In practice, it means that when an organization collects and/or recycles plastic waste (potentially meeting the additionality requirement by handling plastic material that would otherwise remain uncollected or unprocessed) a standardized credit is created and sold to another party based on the collected or recycled plastic (WWF, 2021). The collecting or recycling organization, which must comply with a standard for this activity and undergo auditing as part of the process, receives payment for the credit, while the purchaser can publicly claim ownership over it (WWF, 2021). That crediting initiative then measures the amount of waste collected and displays the appropriate number of credits in a registry, usually one credit per metric ton. Companies can buy those credits, and by doing so they can offset their own plastic usage and support the underlying plastic collection activity. In countries with inadequate waste management systems, local communities can collect plastic waste and trade it for money, goods, or services while the collected material is reintroduced into the plastic value chain, known as Social Plastic (WWF, 2021). These cleanups are predominantly carried out by waste pickers, individuals who are not formally employed and earn their income by collecting waste from dump sites and the natural environment, which they then sell to recyclers. This is due to the cost-effectiveness of paying informal and low-wage workers in developing nations to collect and recycle plastic, compared to the expense of investing in municipal recycling infrastructure in wealthier countries (Brigham, 2023). During the cleanup activity, all the plastic waste collected should be recycled or placed in a controlled landfill in order to manage the plastic waste responsibly.

Companies' interest in applying and engaging in plastic credits has two major dimensions: implementing them into CSR policies and complying with mandatory EPR laws. By integrating plastic credits into CSR initiatives, companies can actively contribute to global endeavors aimed at combating plastic pollution, strengthen their commitment to responsible environmental stewardship, and enhance their public image (United Nations Environment Programme, 2022). This alignment not only improves corporate reputation but also fosters a culture of sustainability that resonates positively with stakeholders and consumers alike. Firms can leverage credits to make green marketing claims and use certain labels on their products such as "100% recycled plastic", "100% social plastic", "circular plastic", or "plastic neutral". "Plastic neutrality" or "plastic circularity" accomplished through businesses purchasing credits could potentially

be the final component needed to fully realize a circular economy (Lee, 2021).

Plastic credits, despite their clear benefits, are not free of associated shortcomings. There are concerns that the concept of neutrality or circularity could be interpreted in a way to rationalize continued plastic production and usage, as these terms suggest the idea that plastic production can be considered impact-free provided that it is neutralized with credits (Winters, 2023). An important observation is that only about 20% of Plastic Bank's partners purchase recycled plastic to include in new products (Brigham, 2023). In contrast, 80% are buying plastic credits, which are intended to offset their new plastic production by financing recycling initiatives in regions where Plastic Bank operates (Brigham, 2023). It sheds light on opponents' opinions that plastic credits might be a means for plastic producers to avert attention from substantial solutions aimed at reducing their plastic impact and may also give rise to the problem of greenwashing⁴² and set the stage for potential future legal challenges (Hicks, 2022). Moreover, due to the voluntary nature and lack of global standardization of plastic credits, managed by private sector entities, they do not have a clear framework and can vary depending on the rules of the overseeing private sector actor, resulting in a lack of transparent communication about their success (United Nations Environment Programme, 2022). They do not require the involvement of all pertinent businesses either and are not incorporated into the public solid waste management system compared to EPR (WWF, 2021). Nevertheless, since EPR rules are still lacking in many parts of the world, plastic credits could serve as a temporary measure to familiarize corporations with the concept of managing and accounting for the plastic value chain, and subsequently as a component to be incorporated into future EPR regulations (Lee, 2021). Plastic credits and EPR have some similarities: they both stem from the polluter pays principle and make producers interested in plastic waste management and recycling, although they differ in various aspects.

In summary, plastic credits present a potential and relevant transitioning solution in those parts of the world that lack (adequate) waste management systems and regulated EPR schemes. However, to realize their full potential and prevent the risk of greenwashing thorough development in transparency, traceability, and credibility is crucial (Association, 2022). According to WWF,⁴³ plastic systems should create restrictions on the claims made using purchased credits and establish transparent guidelines for communicating about plastic recovery activities and the associated credits obtained (WWF, 2021).

4.3 The shortcomings of CSR when dealing with plastic pollution

Even though there is a strong emphasis and call for action by both international organizations and the EU to combat environmental challenges at a more general level and also to engage companies in the

41 <https://www.henkel.com/press-and-media/press-releases-and-kits/2019-11-13-henkel-extends-partnership-with-plastic-bank-997608>

42 Greenwashing is not a legal category but embraces and explains the misleading activities of companies about how environmental-friendly services and products they provide.

43 World Wildlife Fund (<https://www.worldwildlife.org/about>).

prevention and mitigation of plastic pollution,⁴⁴ ultimately the companies themselves are in control of their CSR strategies and voluntary actions (Vince and Hardesty, 2017). Furthermore, the acceptance and assessment of CSR like all other forms of voluntary standards may face criticism on various fronts and exhibit their own limitations. Whereas proponents contend that CSR initiatives positively influence corporate behavior and can be implemented in a more flexible and straightforward way than traditional industry regulations, opponents argue that these solutions are merely PR tools designed to mimic regulatory measures and enhance a business entity's reputation (Haufler, 2013). The effectiveness and efficiency of CSR raise various concerns. The voluntary nature of CSR poses challenges in terms of monitoring and enforcing compliance, often leading to a lack of transparency regarding the fulfillment of CSR commitments (Smits, 2017). There is also a risk that overcommunicating formalistic data in CSR reporting may obscure an organization's actual social performance, making it difficult for stakeholders to accurately assess it (de Colle et al., 2014). This can prevent consumers from making informed purchasing decisions based on reliable and verified information. While CSR standards can boost individual organizational performance, they may not suffice to provoke the systemic change required to tackle societal issues at a national or global level, highlighting the need to elevate the focus from corporate endeavors to public policy (de Colle et al., 2014).

Moreover, greenwashing is the most commonly highlighted drawback concerning CSR, especially when it comes to plastic pollution. According to a Commission study, 53.3% (80 out of 150) of the environmental claims are potentially misleading and vague and around 40% of them have no supporting evidence (European Commission, 2020b). Companies, as part of their CSR policies and marketing campaigns, promote green, circular, and sustainable solutions and accomplishments, frequently employing labels that may mislead consumers regarding the true results and impacts of their products and services. More and more programs have emerged to raise awareness and attention to these misleading commercial claims of businesses about recyclability and being green.⁴⁵ To effectively address the issue of greenwashing and the credibility of corporate climate claims and create a fair playing field, companies should transition from voluntary initiatives to regulated net-zero requirements (United Nations' High-Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities, 2022).

In the US, several lawsuits have already been initiated against petrochemical companies, plastic manufacturers, and beverage companies asserting that their green claims are misleading and unsubstantiated. For instance, Sierra Club – an American environmental organization – filed a lawsuit against Coca-Cola and BlueTriton Brands, Inc. (formerly Nestle Waters North America, Inc.), requesting an injunction to prohibit the sale of plastic bottled water unless their packaging and marketing are changed to remove the “100%

Recyclable” label. Sierra Club argued that this marketing violated California Public Policy, the California Environmental Marketing Claims Act (2021), and the Federal Trade Commission Green Guides because not all components of the bottles were recyclable.⁴⁶ On March 8, 2022, the court administratively closed this case and consolidated it with Swartz v. Coca-Cola (No. 3:21-cv-0463), because the cases raised identical claims, with Swartz becoming the lead case.⁴⁷ The case is still pending. Another lawsuit was filed against BlueTriton Brands by Earth Island, an environmental organization, alleging violations of the D.C. Consumer Protection Procedures Act due to deceptive marketing practices related to sustainability and recycling targets.⁴⁸ The case was initially removed to the U.S. District Court but was later remanded to the Superior Court. Subsequent motions, including one to keep the case open, were granted, and a remote status hearing was scheduled. However, the parties ultimately filed a stipulation of voluntary dismissal on March 27, 2024, leading to the case's closure.⁴⁹

Based on the same premise, the European Consumer Organisation (BEUC) and its affiliates filed a complaint to the European Commission and the network of consumer protection authorities about misleading marketing claims concerning the recyclability of plastic products of major bottled water traders, including Coca-Cola, Danone, and Nestlé Waters/Nestlé in November 2023.⁵⁰ According to the research conducted by BEUC, such claims as “100% recyclable or recycled” or “using circular and green imageries” do not comply with the EU Rules on Unfair Commercial Practices (2005)⁵¹ and are too vague and inaccurate.⁵² Therefore, they called on authorities to investigate the cases, establish a common position to provide a transparent signal and guidance to the entire sector about the misleading nature of these claims, and ensure that sellers stop misleading consumers by using such claims (European Consumer Organisation, 2023). The case is currently ongoing, awaiting the Commission's decision.

These cases related to claims on recycled plastic are founded on noncompliance with the rules stipulated by the Unfair Commercial Practices Directive and consequently based on general rules concerned with consumer protection. The reason for that is that there has been no specific legislation applicable to greenwashing claims yet. However, as greenwashing is gaining more attention, in March 2023 the European

44 See the EU and UNEP documents and resolutions mentioned above in Section 3.

45 See e.g.: <https://www.plasticpollutioncoalition.org/blog/2023/4/19/how-to-recognize-plastic-pollution-greenwashing> or <https://www.euronews.com/green/2023/08/14/what-is-greenwashing-how-to-spot-the-sophisticated-greenwashing-tactics-being-used-in-2023>.

46 2021 – Complaint for unfair business practices and violation of The Environmental Marketing Claims Act. United States District Court – Northern District of California. Sierra Club vs. Coca-Cola Co., et al., No. 4:21-cv-04644 (N.D. Cal. 2021).

47 https://stateimpactcenter.org/files/Sierra-Club-v.-The-Coca-Cola-Company-et-al-Docket-No.-3_21-cv-04644-N.D.-Cal.-Jun-16-2021-Court-Docket.pdf

48 Earth Island Inst. v. BlueTriton Brands, No. 2021-CA-003027 (D.C. Super. Ct. 2022).

49 https://stateimpactcenter.org/files/Stipulation-of-Voluntary-Dismissal-EARTH_ISLAND_INSTITUTE_vs._BLU.pdf

50 <https://www.beuc.eu/press-releases/consumer-groups-launch-eu-wide-complaint-against-major-water-bottle-producers>

51 This Directive has been recently amended by the Directive (EU) 2024/825 of the European Parliament and of the Council of 28 February 2024 amending Directives 2005/29/EC and 2011/83/EU as regards empowering consumers for the green transition through better protection against unfair practices and through better information.

52 <https://www.beuc.eu/unbottling-greenwashing#the-action>

Commission adopted a proposal for a Directive on Green Claims which will oblige companies to substantiate their green claims with credible scientific evidence.⁵³ The key objectives of the proposal on the Green Claims Directive are to increase environmental protection, prevent greenwashing, empower consumers to make informed purchasing decisions, improve legal certainty, level the playing field in the internal market, and support the competitiveness of economic operators prioritizing environmental sustainability (European Commission, 2023).⁵⁴ The proposed changes aim to prevent misleading claims by requiring clear, objective, publicly available, and verifiable commitments and targets from traders, and by mandating third-party verification of environmental claims.⁵⁵ Additionally, the new rules aim to ensure that sustainability labels meet minimum conditions of transparency and credibility, either through certification schemes or public authorities, and to prohibit generic environmental claims without recognized excellent environmental performance.⁵⁶ Furthermore, the proposal seeks to address comparative environmental or social characteristic claims and ensure that consumers are provided with comprehensive information for making better-informed decisions.⁵⁷ It may establish a solid basis for legal action against plastic producers in the future. The Proposal is in front of the co-legislators now.⁵⁸

The new directive, in conjunction with the existing laws, could mark a new phase in how plastic pollution is addressed within the corporate sector and how companies articulate and promote their CSR policies. Overall, CSR presents businesses with an opportunity to take measures to reduce plastic production and pollution, while also providing them with a tool to portray a more environmentally friendly image. Therefore, consumers should be adequately equipped and knowledgeable about these strategies to make informed and effective product choices.

5 Concluding remarks

This article has addressed the fragmented nature of the current literature on how to tackle plastic pollution and promote environmental sustainability by collectively analyzing the combined impact of EU regulations on the corporate sector and voluntary corporate initiatives. As the concept of sustainability evolves from regulatory compliance to a strategic imperative, the EU has adopted a range of regulatory instruments directly applicable to the corporate sector aiming to encourage socially responsible operations in every industrial sector. Concurrently, businesses voluntarily adopt responsible practices to combat plastic pollution and align their interests with environmental well-being. The emergence of laws such as the Single-Use Plastics Directive, the Taxonomy Regulation, CSRD, CSDDD, changes in consumer and greenwashing rules, including the proposed Green

Claims Directive underscore an increasing recognition of the influential role of corporations in addressing environmental and social challenges, as well as the significance of CSR and sustainable business practices. By integrating sustainability requirements into legal frameworks, the EU promotes corporate accountability and encourages businesses to contribute to broader societal and environmental goals. In examining voluntary undertakings, this article specifically explored CSR and plastic credits as a cross-solution considering the characteristics of mandatory EPR rules and CSR policies. The analysis of the literature review implies that neither CSR, plastic credits, nor EPR systems offer a complete solution to the plastic pollution problem. While plastic credits may offer a temporary solution and a stepping stone toward the eventual adoption of EPR systems, a more comprehensive approach is needed that combines stringent regulatory frameworks with responsible business practices. The most effective approach to addressing plastic pollution and improving waste management practices is the reduction of overall plastic production. This may receive less attention in the EU compared to managing the already manufactured plastic using various techniques.

This study has not delved deeply into examining the link between CSR and the newly implemented CSDDD, thus it presents potential new research directions to explore the interactions between CSR and CSDDD in future work. It could also be further investigated how plastic credits can be effectively integrated into the broader landscape of waste management policies to achieve sustainable and resilient solutions for plastic waste management. This research should explore how to integrate plastic credits into existing regulatory frameworks effectively and identify any potential gaps or challenges that need to be addressed. Additionally, studies examining the environmental, social, and economic impacts of plastic credit programs can provide valuable insights into their efficacy and inform future policy development efforts.

Author contributions

BB: Writing – original draft.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

53 Green claims – European Commission ([europa.eu](https://europea.eu)).

54 Section 1.2 of the European Commission (2023). Proposal for a Directive of the European Parliament and of the Council on substantiation and communication of explicit environmental claims (Green Claims Directive). In: COMMISSION, E. (ed.). Brussels.

55 Recital (15) and (42) COM(2023) 166 final.

56 Recital (14) and (39) COM(2023) 166 final.

57 Recital (27) COM(2023) 166 final.

58 European Parliament and Council of the European Union ([https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI\(2023\)753958](https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2023)753958)).

References

- #BreakFreeFromPlastic (2017). Toward an international legally binding agreement on plastics and plastic pollution.
- Baumüller, J., and Grbenic, S. O. (2021). Moving from non-financial to sustainability reporting: Analyzing the Eu Commission's proposal for a corporate sustainability reporting directive (Csrdd). *Vranje: Facta Universitatis*, 369–381.
- Beghetto, V., Gatto, V., Samiolo, R., Scolaro, C., Brahimi, S., Facchin, M., et al. (2023). Plastics today: key challenges and Eu strategies towards carbon neutrality: a review. *Environ. Pollut.* 334:122102. doi: 10.1016/j.envpol.2023.122102
- Behuria, P. (2021). Ban the (plastic) bag? Explaining variation in the implementation of plastic bag bans in Rwanda, Kenya and Uganda. *Environ. Plan. C* 39, 1791–1808. doi: 10.1177/2399654421994836
- Bergmann, M., Almroth, B. C., Brander, S. M., Dey, T., Green, D. S., Gundogdu, S., et al. (2022). A global plastic treaty must cap production. *Science* 376, 469–470. doi: 10.1126/science.abq0082
- Blasiak, R., Leander, E., Jouffray, J.-B., and Virdin, J. (2021). Corporations and plastic pollution: trends in reporting. *Sustain. Futures* 3:100061. doi: 10.1016/j.sfr.2021.100061
- Brigham, K. (2023). These organizations are trying to tackle plastic pollution and poverty at the same time. *CNBC Sustain. Future*.
- Bueno, N., Bernaz, N., Holly, G., and Martin-Ortega, O. (2024). The Eu directive on corporate sustainability due diligence (Csddd): the final political compromise. *Bus. Human Rights J.*, 1–7. doi: 10.1017/bhj.2024.10
- California Environmental Marketing Claims Act. (2021). Complaint for unfair business practices and violation of The Environmental Marketing Claims Act. United States District Court-Northern District of California.
- Carroll, A. B. (1999). Corporate social responsibility: evolution of a definitional construct. *Bus. Soc.* 38, 268–295. doi: 10.1177/000765039903800303
- Carroll, A. B., Lipartito, K. J., Post, J. E., and Werhane, P. H. (2012). Corporate responsibility: The American experience. Cambridge: Cambridge University Press.
- Corporate Sustainability Due Diligence Directive. (2024). Directive (Eu) 2024/1760 of the European Parliament and of the Council of 13 June 2024 on corporate sustainability due diligence and amending Directive (Eu) 2019/1937 and Regulation (Eu) 2023/2859.
- Corporate Sustainability Reporting Directive. (2022). Directive (Eu) 2022/2464 of the European Parliament and of the council of 14 December 2022 amending regulation (Eu) no 537/2014, directive 2004/109/Ec, directive 2006/43/Ec and directive 2013/34/Eu, as regards corporate sustainability reporting.
- Cowan, E., and Tiller, R. (2021). What shall we do with a sea of plastics? A systematic literature review on how to pave the road toward a global comprehensive plastic governance agreement. *Front. Mar. Sci.* 8:798534. doi: 10.3389/fmars.2021.798534
- Crane, A., Matten, D., and Spence, L. J. (2013). "Corporate social responsibility in a global context" in Corporate social responsibility: Readings and cases in a global context. eds. A. Crane, D. Matten and L. J. Spence, vol. 2, 3–26.
- Crane, A., Matten, D., and Spence, L. (2014). Corporate social responsibility: Readings and cases in a global context. London: Routledge.
- Ćufar, M., Belak, J., and Primec, A. (2024). Beyond compliance: Leveraging Nfrd and Csrdd for transformative Csr reporting and stakeholder empowerment in corporate governance. Corporate Governance and CSR Strategies for Sustainability. Hershey, PA: IGI global.
- Dahlsrud, A. (2008). How corporate social responsibility is defined: an analysis of 37 definitions. *Corp. Soc. Responsib. Environ. Manag.* 15, 1–13. doi: 10.1002/csr.132
- Day, V. B. (1973). Business priorities in a changing environment. *J. Gen. Manag.* 1, 45–55. doi: 10.1177/0306307073001100107
- De Colle, S., Henriques, A., and Sarasvathy, S. (2014). The paradox of corporate social responsibility standards. *J. Bus. Ethics* 125, 177–191. doi: 10.1007/s10551-013-1912-y
- Dijkstra, H., Van Beukering, P., and Brouwer, R. (2020). Business models and sustainable plastic management: a systematic review of the literature. *J. Clean. Prod.* 258:120967. doi: 10.1016/j.jclepro.2020.120967
- El-Jourbagy, J. R., Hair, M., and Banks, H. (2021). Creating an industrial regulatory framework to reduce plastics. *Berkeley Bus. L.J.* 18:94.
- Emma Watkins, S. G., Schweitzer, J.-P., Pantzar, M., Janssens, C., and Ten Brink, P. (2017). Epr in the Eu plastics strategy and the circular economy: A focus on plastic packaging. Brussels: Institute for European Environmental Policy.
- EPR Services. (2021). Non-financial reporting directive. Briefing-Implementation Appraisal.
- EPR Services (2023). What is the difference between plastic credit and extended producer responsibility (EPR). *Medium*.
- EU Rules on Unfair Commercial Practices. (2005). Directive 2005/29/Ec of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/Eec, Directives 97/7/Ec, 98/27/Ec and 2002/65/Ec of the European Parliament and of the Council and Regulation (Ec) No 2006/2004 of the European Parliament and of the Council ("Unfair Commercial Practices Directive").
- European Commission (2001). Green paper: Promoting a European framework for corporate social responsibility. Brussels: European Commission.
- European Commission (2011). Communication from the commission to the European Parliament, the council, the European economic and social committee and the Committee of the Regions: A renewed Eu strategy 2011–14 for corporate social responsibility. Brussels: European Commission.
- European Commission. (2015a). Closing the loop - an Eu action plan for the circular economy. Com (2015) 614 final.
- European Commission (2015b). Factsheet on extended producer responsibility (Epr) for used packaging. Brussels: European Commission.
- European Commission (2018). Communication from the commission: A European strategy for plastics in a circular economy-strategy, com/2018/028. Brussels: European Commission.
- European Commission (2019a). Commission staff working document-corporate social responsibility, responsible business conduct, and Business & Human Rights: Overview of Progress. Brussels: European Commission.
- European Commission (2019b). Communication from the commission-the European Green Deal com (2019) 640 final. Com (2019) 640 final. Brussels.
- European Commission (2020a). A new circular economy action plan-for a cleaner and more competitive Europe. Com (2020) 98 final. Brussels: European Commission.
- European Commission (2020b). Environmental claims in the Eu-inventory and reliability assessment draft final report. Brussels: European Commission.
- European Commission (2022a). Communication from the commission to the European Parliament, the council, the European economic and social committee and the Committee of the Regions on making sustainable products the norm. Brussels: European Commission.
- European Commission (2022b). Proposal for a regulation of the European Parliament and of the council on packaging and packaging waste, amending regulation (Eu) 2019/1020 and directive (Eu) 2019/904, and repealing directive 94/62/Ec. Com (2022) 677 final. Brussels: European Commission.
- European Commission (2022c). Proposal for a regulation of the European Parliament and of the council on packaging and packaging waste, amending regulation (Eu) 2019/1020 and directive (Eu) 2019/904, and repealing directive 94/62/Ec. Brussels: European Commission.
- European Commission (2023). Proposal for a directive of the European Parliament and of the council on substantiation and communication of explicit environmental claims (Green claims directive). Brussels: European Commission.
- European Consumer Organisation (2023). Unbottling greenwashing - lifting the lid on plastic bottle recycling claims. Brussels: European Consumer Organisation.
- European Sustainability Reporting Standards. (2023a). Commission delegated regulation (Eu) 2023/2486 of 27 June 2023 supplementing regulation (Eu) 2020/852 of the European Parliament and of the council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending commission delegated regulation (Eu) 2021/2178 as regards specific public disclosures for those economic activities.
- European Sustainability Reporting Standards. (2023b). Commission Delegated Regulation (Eu) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/Eu of the European Parliament and of the Council as regards sustainability reporting standards.
- Evans, M. D. (2018). International law. Oxford: Oxford University Press.
- Fornasari, T., and Traversi, M. (2024). The impact of the Csrdd and the Esrs on non-financial disclosure. *Theatr. Symp.*, 117–133.
- GEF (2012). Impacts of marine debris on biodiversity: Current status and potential solutions. Washington, DC: GEF.
- Gjølberg, M. (2009). The origin of corporate social responsibility: global forces or national legacies? *Soc. Econ. Rev.* 7, 605–637. doi: 10.1093/ser/mwp017
- Glinski, C. (2021). "Corporate social responsibility and corporate liability for environmental damage" in Environmental loss and damage in a comparative law perspective. eds. B. Pozzo and V. Jacometti (Cambridge: Intersentia).
- Guggisberg, S. (2024). Finding equitable solutions to the land-based sources of marine plastic pollution: sovereignty as a double-edged sword. *Mar. Policy* 159:105960. doi: 10.1016/j.marpol.2023.105960
- Gunningham, N. (2009). Environment law, regulation and governance: shifting architectures. *J. Environ. Law* 21, 179–212. doi: 10.1093/jel/eqp011
- Haufler, V. (2013). A public role for the private sector: Industry self-regulation in a global economy. Washington, DC: Carnegie Endowment.

- Herrmann, K. K. (2004). Corporate social responsibility and sustainable development: the European Union initiative as a case study. *Ind. J. Global Legal Stud.* 11:205. doi: 10.2979/gls.2004.11.2.205
- Hicks, R. (2022). Coca-Cola and Unilever: We're not convinced by plastic credits. Singapore: Eco-Business.
- Hjemdahl, P. W. (2022). Why some big brands 'Aren't convinced' by plastic credits. San Francisco, CA: Sustainable Brands.
- Hohn, S., Acevedo-Trejos, E., Abrams, J. F., Fulgencio De Moura, J., Spranz, R., and Merico, A. (2020). The long-term legacy of plastic mass production. *Sci. Total Environ.* 746:141115. doi: 10.1016/j.scitotenv.2020.141115
- Holmes, S. L. (1976). Executive perceptions of corporate social responsibility. *Bus. Horiz.* 19, 34–40. doi: 10.1016/0007-6813(76)90049-5
- Hopewell, J., Dvorak, R., and Kosior, E. (2009). Plastics recycling: challenges and opportunities. *Philos. Trans. Royal Soc. B* 364, 2115–2126. doi: 10.1098/rstb.2008.0311
- Huang, X. N., Xiao, W., Shan, F., and Vedantam, A. (2024). Fighting plastic pollution: Product ban regulation and voluntary compliance.
- Ilyas, M., Ahmad, W., Khan, H., Yousaf, S., Khan, K., and Nazir, S. (2018). Plastic waste as a significant threat to environment – a systematic literature review. *Rev. Environ. Health* 33, 383–406. doi: 10.1515/revh-2017-0035
- Ive Vanderreydt, A. A., Strömberg, E., Tenhunen-Lunkka, A., Arnold, M., Mortensen, L. F., Nielsen, T., et al. (2023). Pathways to circular plastics in Europe: good examples from countries, businesses and citizens. Copenhagen: European Topic Centre on Circular Economy and Resource Use.
- Jain, P., Chou, M. C., Fan, F., and Santoso, M. P. (2021). Embedding sustainability in the consumer goods innovation cycle and enabling tools to measure Progress and capabilities. *Sustain. For.* 13:6662. doi: 10.3390/su13126662
- Kasznik, D., and Łapniewska, Z. (2023). The end of plastic? The EU's directive on single-use plastics and its implementation in Poland. *Environ. Sci. Pol.* 145, 151–163. doi: 10.1016/j.envsci.2023.04.005
- Khan, S. A. R., Yu, Z., Panait, M., Janjua, L. R., and Shah, A. (2021). Global corporate social responsibility initiatives for reluctant businesses. Hershey, PA: IGI Global.
- Kingston, S., Heyvaert, V., and Čavoški, A. (2017). European environmental law. Cambridge: Cambridge University Press.
- Knoblauch, D., and Mederake, L. (2021). Government policies combatting plastic pollution. *Curr. Opin. Toxicol.* 28, 87–96. doi: 10.1016/j.cotox.2021.10.003
- Koski, C., and May, P. J. (2005). Interests and implementation: fostering voluntary regulatory actions. *J. Public Adm. Res. Theory* 16, 329–349. doi: 10.1093/jopart/mui048
- Lee, M. K. K. (2021). Plastic pollution mitigation – net plastic circularity through a standardized credit system in Asia. *Ocean Coastal Manag.* 210:105733. doi: 10.1016/j.ocecoaman.2021.105733
- Marrewijk, M. (2013). Concepts and definitions of CSR and corporate sustainability: Between agency and communion.
- Mohammed, A. Z. (2024). Evaluating corporate marine plastic pollution reduction pledges: Achieving plastic reductions or contributing to greenwashing.
- Moir, L. (2001). What do we mean by corporate social responsibility? *Corporate Govern.* 1, 16–22. doi: 10.1108/EUM0000000005486
- Muchlinski, P. (2021). Multinational enterprises and the law. Oxford: Oxford University Press.
- Muposhi, A., Mpinganjira, M., and Wait, M. (2022). Considerations, benefits and unintended consequences of banning plastic shopping bags for environmental sustainability: a systematic literature review. *Waste Manag. Res.* 40, 248–261. doi: 10.1177/0734242X211003965
- Nagtzaam, G., Van Calster, G., Kourabas, S., Karataeva, E., Nagtzaam, G., Van Calster, G., et al. (2023). "Global plastic pollution and its regulation global plastic pollution and its regulation: history, trends, perspectives" in Chapter 5: Plastic regulation in the European Union (Northampton, MA: Edward Elgar Publishing).
- Nameroff, T. (2023). Preserving the value of voluntary plastic action as packaging regulation increases. *rePurpose*.
- Non-Financial Reporting Directive (NFRD). (2014). Directive 2014/95/Eu of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/Eu as regards disclosure of non-financial and diversity information by certain large undertakings and groups Text with Eea relevance.
- OECD (2008). The polluter pays principle. Paris: OECD.
- OECD (2016). Extended producer responsibility. Paris: OECD.
- Okoye, A. (2016). Legal approaches and corporate social responsibility: Towards a Llewellyn's law-jobs approach. Milton Park: Taylor & Francis.
- Paavola, J. (2007). Institutions and environmental governance: a reconceptualization. *Ecol. Econ.* 63, 93–103. doi: 10.1016/j.ecolecon.2006.09.026
- Packaging and Packaging Waste Directive. (1994). European Parliament and Council Directive 94/62/Ec of 20 December 1994 on packaging and packaging waste.
- Porter, M. E., and Kramer, M. R. (2006). Strategy and society: the link between competitive advantage and corporate social responsibility. *Harv. Bus. Rev.* 84, 78–163
- Rajeev, P. N. (2023). Being an impact Chapion: Enacting corporate social consciousness. Gurgaon: Penguin Random House India Private Limited.
- Ratner, S. R. (2001). Corporations and human rights: a theory of legal responsibility. *Yale Law J.* 111, 443–546. doi: 10.2307/797542
- Registration, Evaluation, Authorisation, and Restriction of Chemicals. (2006). Regulation (Ec) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (Reach), establishing a European Chemicals Agency, amending Directive 1999/45/Ec and repealing Council Regulation (Eec) No 793/93 and Commission Regulation (Ec) No 1488/94 as well as Council Directive 76/769/Eec and Commission Directives 91/155/Eec, 93/67/Eec, 93/105/Ec and 2000/21/Ec (Reach).
- Salzmann, O., Ionescu-Somers, A., and Steger, U. (2005). The business case for corporate sustainability: literature review and research options. *Eur. Manag. J.* 23, 27–36. doi: 10.1016/j.emj.2004.12.007
- Single-Use Plastics Directive. (2019). Directive (Eu) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment.
- Smith, O., and Brisman, A. (2021). Plastic waste and the environmental crisis industry. *Crit. Criminol.* 29, 289–309. doi: 10.1007/s10612-021-09562-4
- Smits, J. M. (2017). Enforcing corporate social responsibility codes under private law: on the disciplining power of legal doctrine. *Indiana J. Global Legal Stud.* 24, 99–114. doi: 10.2979/indjglolegstu.24.1.0099
- Steensgaard, I. M., Syberg, K., Rist, S., Hartmann, N. B., Boldrin, A., and Hansen, S. F. (2017). From macro-to microplastics - analysis of Eu regulation along the life cycle of plastic bags. *Environ. Pollut.* 224, 289–299. doi: 10.1016/j.envpol.2017.02.007
- Syberg, K., Nielsen, M. B., Westergaard Clausen, L. P., Van Calster, G., Van Wezel, A., Rochman, C., et al. (2021). Regulation of plastic from a circular economy perspective. *Curr. Opin. Green Sustain. Chem.* 29:100462. doi: 10.1016/j.cogsc.2021.100462
- Taxonomy Regulation. (2020a). on the establishment of a framework to facilitate sustainable investment, and amending Regulation (Eu) 2019/2088. Regulation (Eu) 2020/852 of the European Parliament and of the Council of 18 June 2020 Eu.
- Taxonomy Regulation. (2020b). Regulation (Eu) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (Eu) 2019/2088.
- Terziev, V. (2012). The role of business in society. *Ново знание* 4, 68–71.
- Treaty. (2023). Policy recommendations of the business Coalition for a Global Plastics Treaty for consideration at Inc2.
- Tudor, D. T., and Williams, A. T. (2021). The effectiveness of legislative and voluntary strategies to prevent ocean plastic pollution: lessons from the UK and South Pacific. *Mar. Pollut. Bull.* 172:112778. doi: 10.1016/j.marpolbul.2021.112778
- Tumu, K., Vorst, K., and Curtzwiler, G. (2023). Global plastic waste recycling and extended producer responsibility laws. *J. Environ. Manag.* 348:119242. doi: 10.1016/j.jenvman.2023.119242
- UNEA (2022). Resolution 5/14 on end plastic pollution: Towards an international legally binding instrument. Unep/Ea.5/res.14. Unep. Nairobi: UNEA.
- United Nations Environment Assembly (2017). Combating marine plastic litter and microplastics: An assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches. Nairobi: United Nations Environment Assembly.
- United Nations Environment Programme. (2022). Assessing the contribution of plastic credit schemes to reducing plastics pollution and improving recycling: Working paper-executive summary.
- United Nations' High-Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities (2022). Integrity matters: Net zero commitments by businesses, Financial Institutions, Cities and Regions.
- Vandenberg, J. (2024). Plastic politics of delay: how political corporate social responsibility discourses produce and reinforce inequality in plastic waste governance. *Global Environ. Politics* 24, 122–145. doi: 10.1162/glep_a_00745
- Vince, J., and Hardesty, B. D. (2017). Plastic pollution challenges in marine and coastal environments: from local to global governance. *Restor. Ecol.* 25, 123–128. doi: 10.1111/rec.12388
- Vogel, D. (2006). Corporate responsibility for the environment. The market for virtue: The potential and limits of corporate social responsibility. Washington, DC: Brookings Institution Press.
- Vytopil, A. L. (2015). Contractual control in the supply chain. On corporate social responsibility, codes of conduct, contracts and (avoiding) liability. The Hague: Eleven International Publishing.
- Walker, T. R., and Fequet, L. (2023). Current trends of unsustainable plastic production and micro (nano) plastic pollution. *TrAC Trends Anal. Chem.* 160:116984. doi: 10.1016/j.trac.2023.116984

- Waste Framework Directive. (2008). Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.
- Winters, J. (2023). Companies are claiming to be 'plastic neutral.' Is it greenwashing? Seattle, WA: Grist.
- Wirba, A. V. (2023). Corporate social responsibility (CSR): the role of government in promoting CSR. *J. Knowl. Econ.*
- World Economic Forum (2016). The new plastics economy — Rethinking the future of plastics. Isle of Wight: World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company.
- WWF (2019). Extended producer responsibility (EPR) for plastic packaging. Gland: Position Paper-WWF Network.
- WWF (2021). WWF position: Plastic crediting and plastic neutrality. Gland: WWF.
- Xanthos, D., and Walker, T. R. (2017). International policies to reduce plastic marine pollution from single-use plastics (plastic bags and microbeads): a review. *Mar. Pollut. Bull.* 118, 17–26. doi: 10.1016/j.marpolbul.2017.02.048
- Zhang, X., Liu, C., and Medda, F. (2023). A smart-contract-aided plastic credit scheme. *IEEE Syst. J.* 17, 1703–1713. doi: 10.1109/JSYST.2022.3205266