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The Legal Transition Towards a More Circular Plastic Packaging Chain *A Case Study of the Netherlands*

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The production and generation of plastic packaging waste in the EU continues to increase, which is accompanied by several negative externalities. At the same time, reuse remains limited and recycling rates of plastic packaging are stagnating, resulting in a significant loss of materials and value to the economy. The transition towards a more circular plastic packaging chain is proposed as a solution: both plastics and packaging are highlighted as key product groups in the EU's Circular Economy Action Plans. However, by looking specifically at the legal framework governing the life cycle of plastic packaging – EU chemicals, product and waste legislation – this research has identified barriers to the transition towards a more circular plastic packaging chain, as well as untapped solutions and incentives to stimulate this transition. It is argued that changes to the legal framework governing the life cycle of plastic packaging are therefore necessary to enable and stimulate the transition towards a more circular plastic packaging chain. Besides improving both the alignment with and the actual contribution of the provisions and instruments of the legislation to the achievement of Circular Economy (CE) objectives, the inherent interlinkages between the different life cycle stages and the legislation governing them need to be better taken into account to not only create a legal framework that is fit for purpose, but also to avoid negative effects and unlock synergies in pursuance of CE objectives.

Keywords: Circular Economy (CE), plastic packaging, EU chemicals legislation, EU product legislation, EU waste legislation

1 Introduction

The European Union (EU) aims at transitioning into a Circular Economy (CE), which can be described as an economy '*where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste is minimized*'.[1] The CE transition forms part of the EU Green Deal, in which the CE is described as a means to contribute to the sustainability goals of the EU.[2] In its CE Action Plans (CEAPs) of 2015 and 2020, the European Commission (EC) identified both plastics and packaging as key product groups.[3] Plastic packaging is the main application of plastic (around 40%) as well as the main source of (post-consumer) plastic waste (around 60%).[4] The application of plastic packaging can be efficient and effective, for example with regard to food protection and reducing food waste.[5] However, plastic packaging also has multiple disadvantages, due to a dependency on (imported) fossil fuels, significant carbon impact and environmental harm caused by inter alia (marine) littering.[6] The application of plastic packaging keeps increasing and so is the generation of plastic packaging waste.[7] Although packaging is

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[1] Closing the loop – An EU action plan for the Circular Economy, COM (2015) 614 final, at 2. This is the definition used by the European Commission. However, there is no undisputed definition for the CE, *see* e.g., J. Kirchherr, D. Reike & M. Hekkert, *Conceptualizing the Circular Economy: An Analysis of 114 Definitions*, 127 Res. Conserv. & Recycling (2017), doi: 10.2139/ssrn.3037579 .

[2] *Ibid.*, at 2; The European Green Deal, COM(2019) 640 final, at 2, 7–9.

[3] A new Circular Economy Action Plan: For a cleaner and more competitive Europe, COM(2020) 98 final, at 8–10.

[4] The Circular Economy for Plastics – A European Overview, Plastics Europe 2022; Commission Staff Working Document, A European Strategy for Plastics in a Circular Economy, SWD (2018) 16 final, at 19–20; Commission Staff Working Document, Measuring progress towards circular economy in the European Union – Key indicators for a monitoring framework, SWD(2018) 17 final, at 24; A European Strategy for Plastics in a Circular Economy, COM(2018) 28 final, at 11–12; E. De Tandt et al., *A Recycler's Perspective on the Implications of REACH and Food Contact Material (FCM) Regulations for the Mechanical Recycling of FCM Plastics*, 119 Waste Mgmt. 316 (2020), doi: 10.1016/j.wasman.2020.10.012 .

[5] W. Leal Filho et al., *An Overview of the Problems Posed by Plastic Products and the Role of Extended Producer Responsibility in Europe*, 214 J. Cleaner Production 551 (2019), doi: 10.1016/j.jclepro.2018.12.256 ; C. Matthews, F. Moran & A. K. Jaiswal, *A Review on European Union's Strategy for Plastics in a Circular Economy and Its Impact on Food Safety*, 282 J. Cleaner Production 4 (2021), doi: 10.1016/j.jclepro.2020.125263; M. Calisto Friant et al., *Transition to a Sustainable Circular Plastics Economy in The Netherlands: Discourse and Policy Analysis*, 14 Sustainability 1–2 (2022), doi: 10.3390/su14010190.

[6] K. J. Groh et al., *Overview of Known Plastic Packaging-Associated Chemicals and Their Hazards*, 651 Sci. Total Env't 3254 (2019), doi: 10.1016/j.scitotenv.2018.10.015.

[7] COM(2020) 98 final, *supra* n. 3, at 8. *See also*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics#Waste_generation_by_packaging_material (accessed 7 Mar. 2023).

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the plastic application with the highest recycling rate,[8] the EU currently recycles only around 45% of it,[9] meaning that over half of all EU's plastic packaging is being incinerated or landfilled.[10] Significant amounts of materials, both non-renewable resources and potentially valuable secondary materials,[11] as well as an estimated 95% of the value of plastic packaging[12] are thus being lost to the economy after a generally short life-cycle.[13]

The EU's vision for a circular plastics economy is elaborated upon in the EU Plastics Strategy. It is the first EU policy framework that adopts a material-specific life cycle approach, integrating all life cycle stages into the plastic value chain, namely circular design, use, reuse and recycling[14] .[15] As such, the strategy not only seems to implement life cycle thinking,[16] but also inter alia aims to improve the economics and quality of plastics recycling by focusing on improving product design, recycled content and separate collection of plastic waste, as well as to curb plastic waste and littering, by tackling single-use plastics, microplastics and compostable and bio-degradable plastics.[17] Specifically with regard to plastic packaging, the aim is to ensure that all plastic packaging is reusable or cost-effectively recyclable by 2030. Part of the EU's actions to achieve these aims relate to reviewing and revising the legislation governing the life cycle of plastics and the products made thereof: EU chemicals, product and waste legislation.[18]

Since the first CEAP, the EU has already taken action to better align its legal framework with the CE transition. Relevant developments with regard to plastic packaging include the introduction of the Plastic Bags Directive in 2015, the amendment of the Packaging and Packaging Waste Directive (PPWD) in 2018 and the introduction of the Single Use Plastics Directive (SUP Directive) in 2019. More recently, a proposal for a new Packaging and Packaging Waste Regulation has been introduced. However, there are still situations in which the legal framework hampers the transition towards a more circular plastic packaging chain or where there are unexploited opportunities to stimulate this transition through legal measures. In other words, it appears that the current legal framework governing the life cycle of plastic packaging currently does not yet fully support the CE transition. Therefore, the objective of this research is to identify and analyse the legal barriers and incentives regarding the EU chemicals, product and waste legislation governing plastic packaging, in order to propose potential changes to the legal framework which could take away these barriers and incentivize the transition towards a more circular plastic packaging chain. Special attention will be paid to the extent to which the material-specific life cycle approach, as announced in the EU Plastics Strategy, resonates in the legislation governing plastic packaging, and what the impact will be of the many future developments at the EU level regarding plastic packaging legislation.

To enable in-depth research into the legal aspects of the transition towards a more circular plastic packaging chain from a theoretical as well as a practical perspective, empirical legal research was used alongside legal doctrinal research. Using the Netherlands as a case study for this research, twenty semi-structured interviews were conducted with twenty-five stakeholders along the plastic packaging value chain in the Netherlands. The Netherlands are currently among the best performing Member States (MSs) with regard to the percentage of plastic packaging waste that is being sent to recycling. In 2021, 49% of all plastic packaging waste was being recycled.[19]

[8] SWD(2018) 16 final, *supra* n. 4, at 19–20.

[9] Under the former calculation methodology of the PPWD, which has changed in 2021 and will lower the recycling rate to approximately 32%, *see further*: s. 3.3.

[10] The Circular Economy for Plastics – A European Overview, Plastics Europe 2022, at 29.

[11] E. Watkins & J. Schweitzer, *Moving Towards a Circular Economy for Plastics in the EU by 2030*, Think 2030, 5 (IEEP 2018).

[12] COM(2018) 28 final, *supra* n. 4, at 6; J. N. Hahladakis & E. Iacovidou, *Closing the Loop on Plastic Packaging Materials: What Is Quality and How Does It Affect Their Circularity?*, 630 Sci. Total Env't 1398 (2018), doi: 10.1016/j.scitotenv.2018.02.330 .

[13] A. Tenhunen-Lunkka et al., *Greenhouse Gas Emission Reduction Potential of European Union's Circularity Related Targets for Plastics*, 3 Circular Economy & Sustainability 475–478 (2023), doi: 10.1007/s43615-022-00192-8. *See also*, https://www.europarl.europa.eu/news/en/headlines/priorities/circular-economy/20181212STO21610/plastic-waste-and-recycling-in-the-eu-facts-and-figures (accessed 28 2023).

[14] Recycling will in this research usually refer to mechanical recycling, which is currently the main way in which plastic (packaging) is being recycled. As opposed to chemical recycling, this form of recycling does not significantly change the chemical structure of the plastic material.

[15] On the implementation of the Circular Economy Action Plan, COM(2019) 190 final, p. 6–7; COM(2018) 28 final, *supra* n. 4.

[16] T. J. De Römph & G. van Calster, *REACH in a Circular Economy: The Obstacles for Plastics Recyclers and Regulators*, 27 RECIEL 277 (2018), doi: 10.1111/reel.12265; T.J. De Römph, *The Legal Transition Towards a Circular Economy,* KU Leuven and UHasselt 36 2018; T.J. De Römph & J. M. Cramer, *How to Improve the EU Legal Framework in View of the Circular Economy*, 38 J. Energy & Nat. Resources L. 247 (2020), doi: 10.1080/02646811.2020.1770961.

[17] Commission Staff Working Document, On the implementation of the Circular Economy Action Plan, SWD(2019) 90 final, at 10.

[18] COM(2018) 28 final, *supra* n. 4, at 9.; COM(2019) 640 final, *supra* n. 2, at 8; COM(2020) 98 final, *supra* n. 3, at 12–13.

[19] Toelichting op het Verslagleggingsformulier Recycling Verpakkingen Resultaten – recycling verpakkingen, 2021. In 2019/2020 these numbers were higher, as according to Eurostat, 57.2% of plastic packaging waste was sent for recycling. It should be noted, however, that this was based on the former methodology, which measured the plastic packaging waste as it entered the recycling plant, whereas the current methodology measures the amount of plastic packaging waste that leaves the recycling plant and therewith also takes into account the amount of waste that is lost during the process. *See also for a comparison with other MSs*, *supra* n. 7, (accessed 13 Dec. 2022).

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Although this means that the current EU recycling targets for plastic packaging (22.5%) are easily met, right now more than 50% of all the Netherlands' (post-consumer) plastic packaging waste is still being incinerated instead of recycled, and parts of its plastic waste still ends up outside the EU or in the environment.[20] This means that changes are necessary to achieve the broader goal to become 100% circular by 2050.[21]

The research is structured as follows. Section 2 examines the relevant EU chemicals, product and waste legislation, both in general as in relation to the CE transition. Section 3 briefly sets out the methodology and subsequently discusses the barriers and (lack of) incentives for a more circular plastic packaging chain, that were identified in the literature study and interview study. The identified legal barriers and incentives are analysed in section 4. Finally, section 5 contains the conclusion.

2 EU Chemicals, Product and Waste Legislation Governing Plastic Packaging in Light of the CE

This section will briefly discuss the legal acts that together govern the life cycle of plastic packaging, after which it will be discussed to what extent the CE transition is reflected in the legislation.

2.1 The legal acts governing the life cycle of plastic packaging – an overview

Plastic packaging is over its whole life cycle governed by both general and sector-specific EU chemicals, product and waste legislation. The main legal instruments within these three areas of law are: the Regulation concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH Regulation), the Regulation on classification, labelling and packaging of substances and mixtures (CLP Regulation), the PPWD, the SUP Directive, the Waste Framework Directive (WFD), and the Waste Shipment Regulation (WSR). There are also several legal acts that focus on specific applications of plastic packaging, such as plastic packaging that is intended to come into contact with food (so-called food contact materials (FCMs)), including the Plastics Regulation and Recycled Plastics Regulation, and plastic packaging that is being used for cosmetic products, namely the Cosmetics Regulation. Table 1 contains a brief overview of the abovementioned legislation.

Annex I – Table 1

Table 1 Overview of EU Chemicals, Product and Waste Legislation Governing Plastic Packaging. The Legal Acts With an Asterisk (*) are Currently Being Revised.

Legal Act	*Focused on: Use of Chemicals (C), and/or Product Stage (P) and/or Waste Stage (W)*	*Objective of the Legislation*	*Description, Including of Key Provisions for (More Circular) Plastic Packaging*
REACH Regulation *	C	Aims to ensure a high level of protection of human health and the environment, including the promotion of alternative methods for assessment of hazards of substances, as well as the free circulation of substances on the internal market while enhancing competitiveness and innovation.[22]	–Regulates chemicals in the EU, by setting up a system for registration, evaluation, authorization and restriction, including. –Chemical substances of plastic (packaging), i.e., polymers, are exempted from registration and evaluation requirements.[23] The components of polymers, monomers, can be subject to those requirements.[24] A registration exemption exists when those have already been registered or when conditions of registration exemption are met.[25] –Recycled polymer re-enters scope of REACH when it ceases to be waste,[26] and the recycler is thus considered a manufacturer under REACH and has to comply with REACH requirements.[27]

[20] Calisto Friant et al., *supra* n. 5, at 2.
[21] Rijksbrede programma '*Nederland circulair in 2050'*, Sep. 2016, at 53–55; '*Transitieagenda Circulaire Economie Kunststoffen*', Transitieteam Kunststoffen, 2018.
[22] Article 1 (1) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 Dec. 2006 concerning the Registration, Evaluation, Authorization 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, OJ 2006 L 396/1 (REACH Regulation).
[23] Article 2 (9) REACH Regulation.
[24] That is, when the requirements of Art. 6 (3) REACH Regulation are met, meaning the polymer consists of 2% weight by weight (w/w) or more of such monomer substance(s) or other substance(s) in the form of monomeric units and chemically bound substance(s), and when the total quantity of such monomer substance(s) or other substance(s) makes up one tonne or more per year. *See also* Guidance for monomers and polymers – Version 3.0, ECHA, 2023, at 8.
[25] Article 6 (3) REACH Regulation; Guidance for monomers and polymers – Version 3.0, ECHA, 2023, at 19. *See* more elaborate: De Römph & Van Calster, *supra* n. 16, at 271–272.
[26] That is when one of the conditions of Art. 3 (1) Directive 2008/98/EC is met. *See also* De Römph & Van Calster, *supra* n. 16, at 270.
[27] De Tandt et al., *supra* n. 4, at 318–319; De Römph & Van Calster, *supra* n. 16, at 270–271; Art. 2 (9) REACH Regulation.

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Legal Act	*Focused on: Use of Chemicals (C), and/or Product Stage (P) and/or Waste Stage (W)*	*Objective of the Legislation*	*Description, Including of Key Provisions for (More Circular) Plastic Packaging*
			–Recyclers have to determine risk and hazard profile of recycled substances.[28]
CLP Regulation *	C	Aims to ensure a high level of protection of human health and the environment as well as the free movement of substances, mixtures and articles.[29]	–Establishes the system of classification, labelling and packaging of chemical substances and mixtures in the EU. –Classification and labelling requirements apply under certain condition to polymers that are classified as hazardous.[30] –Packaging requirements apply to plastic packaging containing hazardous substances or mixtures.[31]
POPs Regulation	C	Aims to protect human health and the environment from POPs[32]	–Prohibits use of POPs in plastic packaging. –Plastic (packaging) waste streams containing POPs above a certain threshold, should be disposed of or recovered as to destroy the POPs.[33]
Regulation on materials and articles to come into contact with food *	P	Aims to ensure the effective functioning of the internal market in relation to the placing on the market in the Community of materials and articles intended to come into contact	–Sets general requirements, including on the safety of materials and articles that are intended to come into contact with food.[35] –Provides basis for setting specific measures for groups of materials.[36]
		directly or indirectly with food, whilst providing the basis for securing a high level of protection of human health and the interests of consumers.[34]	
Plastics Regulation	C P	Aims to establish specific rules for plastic materials and articles to be applied for their safe use.[37]	–Establishes requirements for the manufacture and marketing of plastic materials and articles that are to come into contact with food.[38] –Contains requirements on composition and migration limits of packaging, amongst other things.[39] –Only allows for risk assessed and authorized materials included in the so-called positive list to be intentionally used.[40]
Regulation on recycled plastic food-contact materials	C P W	Aims to ensure the chemical and microbiological safety of recycled plastics intended to come into contact with food.[41]	–Lays down rules for the placing on the market and use of recycled plastic, as well as the development and operation of recycling technologies, processes and installations.[42]

[28] Article 31 REACH Regulation. Also, Art. 32 contains the duty to communicate information down the supply chain when a safety data sheet is not required; and Art. 33 contains a duty to communicate information on substances in articles. *See also* Guidance for monomers and polymers – Version 3.0, ECHA, 2023, at 21; Guidance on waste and recovered substances – Version 2, ECHA, 2010, p. 13–15.

[29] Article 1 (1) Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 Dec. 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006, OJ 2008 L 353/1 (CLP Regulation).

[30] Article 39 CLP Regulation. These requirements also apply when a substance requires registration under REACH, but as polymers are in general exempted from registration, only the second prerequisite is important for polymer manufacturers, *see* Art. 39 (b) CLP Regulation. Article 23(d) CLP Regulation contains an exemption for the labelling requirement for mixtures containing polymers that meet the condition set out in s. 1.3.4.1 of Annex I CLP Regulation.

[31] Article 35 CLP Regulation.

[32] Article 1 Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 Jun. 2019 on persistent organic pollutants (recast), OJ 2019 L 169/45 (POP Regulation).

[33] Article 7 POP Regulation. *See also* Crippa et al., *supra* n. 33, at 43–44.

[34] Article 1 (1) Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 Oct. 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC, OJ 2004 L 338/4.

[35] For example, Art. 3 (1) Regulation 1935/2004 requires that materials and articles do not transfer their constituents to food in quantities that could endanger human health, unacceptably change the food's composition or bring about a deterioration of the food's organoleptic characteristics.

[36] Article 5 jo Annex I Regulation (EC) No 1935/2004.

[37] Recital 2 Commission Regulation (EU) No 10/2011 of 14 Jan. 2011 on plastic materials and articles intended to come into contact with food OJ 2011 L 12/1 (Plastics Regulation).

[38] Article 1 (2) Plastics Regulation.

[39] Article 11 and 12 Plastics Regulation.

[40] Article 5 jo Annex I Plastics Regulation. *See also* Matthews, Moran & Jaiswal, *supra* n. 5, at 3; De Tandt et al., *supra* n. 4, at 322.

[41] https://food.ec.europa.eu/safety/chemical-safety/food-contact-materials/plastic-recycling_en (accessed 13 May 2023).

[42] Article 1 (2) Commission Regulation (EU) 2022/1616 of 15 Sep. 2022 on recycled plastic materials and articles intended to come into contact with foods, and repealing Regulation (EC) No 282/2008, OJ 2022 L 243/3.

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Legal Act	*Focused on: Use of Chemicals (C), and/or Product Stage (P) and/or Waste Stage (W)*	*Objective of the Legislation*	*Description, Including of Key Provisions for (More Circular) Plastic Packaging*
Regulation on cosmetic products *	C P	Aims to ensure the functioning of the internal market and a high level of protection of human health.[43]	–Establishes rules on cosmetic products made available on the EU market. –Migration of prohibited substances from packaging has to be considered to ensure that cosmetic products are safe for human health. The required safety assessment has to take into account characteristics and barrier properties of the packaging material.[44]
PPWD * Incl. Plastic Bags Directive	P W	Aims to prevent any impact of management of packaging and packaging waste on the environment of all MSs as well as of third countries or to reduce such impact, thus providing a high level of environmental protection, and, on the other hand, to ensure the functioning of the internal market and to avoid obstacles to trade and distortion and restriction of competition within the Community. Also aims at preventing the production of packaging waste and, as additional fundamental principles, at reusing packaging, at recycling and other forms of recovering packaging waste and, therefore, at reducing the final disposal of such waste in order to contribute to the transition towards a CE.[45]	–Requires MSs to take measures to ensure that packaging complies with certain essential requirements, which relate to the manufacturing and composition, the reusable nature and recoverable nature of packaging.[46] –Requires MSs to take measures to prevent the generation of packaging waste[47] and to encourage reuse,[48] which have to be included in specific chapter in national waste management plans.[49] –Requires MSs to have systems in place for collection and reuse, recycling and recovery of plastic packaging waste,[50] which includes a requirement to establishment EPR schemes.[51] –Contains increasingly stringent recycling and recovery targets for plastic packaging.[52]
SUP Directive	P W	Aims to prevent and reduce the impact of certain plastic products on the environment, in particular the aquatic environment, and on human health, as well as to promote the transition to a CE with innovative and sustainable business models, products and materials, thus also contributing to the efficient functioning of the internal market.[53]	–Contains product requirements for different SUP packaging, including a ban on packaging made of expanded polystyrene and of oxo-degradable plastics[54]; consumption reduction measures for food containers and beverage cups[55]; design, labelling and marking requirements for beverage cups[56]; and recycled content requirements for PET bottles.[57] –Complements the EPR schemes, by requiring producers to also cover the costs of awareness raising measures, waste collection of the products that are discarded in the public collection systems, and the costs of cleaning up the litter from those products.[58] –Requires MSs to make consumers aware of reusable alternatives and the impact of incorrect disposal, and to encourage them to reduce litter.[59]

[43] Article 1 Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 Nov. 2009 on cosmetic products (recast), OJ 2009 L 342/59.
[44] Article 3 jo. Article 17 Regulation (EC) No 1223/2009.
[45] Article 1 (1) & (2) European Parliament and Council Directive 94/62/EC of 20 Dec. 1994 on packaging and packaging waste, OJ 1994 L 365/10 (PPWD).
[46] Article 9 jo. Annex II PPWD. *See also* SWD(2018) 16 final, *supra* n. 4, at 56–57.
[47] More specifically to reduce the consumption of lightweight plastic bags, *see* Art. 4(1a)-(1c) PPWD, which is the implementation of Directive (EU) 2015/720. *See also* Recitals 2, 4, 5, 10 Directive (EU) 2015/720.
[48] Article 5 PPWD.
[49] Article 14 PPWD jo. Art. 28 Directive 2008/98/EC.
[50] Article 7 (1) PPWD.
[51] Article 7 (2) PPWD jo. Art. 8 & 8a Directive 2008/98/EC. *See also* Recital 20 Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste, OJ 2018 L 150/141.
[52] Article 6 (1) (g) (i) & Art. 6 (1) (i) (i) PPWD. Commission Implementing Decision (EU) 2019/665 of 17 Apr. 2019 amending Decision 2005/270/EC establishing the formats relating to the database system pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste (notified under document C(2019) 2805), OJ 2019 L 112/26 contains the formats on the database system of the PPWD and the calculation of the achievement of the targets.
[53] Article 1 Directive (EU) 2019/904 of the European Parliament and of the Council of 5 Jun. 2019 on the reduction of the impact of certain plastic products on the environment, OJ 2019 L 155/1.
[54] Article 5 Directive (EU) 2019/904 of the European Parliament and of the Council of 5 Jun. 2019 on the reduction of the impact of certain plastic products on the environment, OJ 2019 L 155/1 (SUP Directive). *See also* Recital 15 Directive (EU) 2019/904.
[55] Article 4 SUP Directive.
[56] Article 6 (1) SUP Directive; Art. 7 SUP Directive. This is further set out in Commission Implementing Regulation (EU) 2020/2151 of 17 Dec. 2020 laying down rules on harmonized marking specifications on single-use plastic products listed in Part D of the Annex to the SUP Directive. *See also* Recital 17 SUP Directive.
[57] Article 6 (5) SUP Directive. *See also* Recital 17 Directive (EU) 2019/904.
[58] Article 8(2) jo Annex Part E s. I SUP Directive. These are food containers, beverage bottles and cups, packets and wrappers, and lightweight plastic carrier bags. *See also* Recitals 21 & 22 Directive (EU) 2019/904.
[59] Article 10 SUP Directive.

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			–Sets specific separate collection targets for beverage bottles.[60]
Ecodesign Directive *	P (C) (W)	Aims to ensure the free movement of such products within the internal market, as well as to contribute to sustainable development by increasing energy efficiency and the level of protection of the environment, while at the same time increasing the security of the energy supply.[61]	–Establishes a framework for setting ecodesign requirements for energy-related products, which are implemented through product-specific implementing regulations; –When plastic packaging is considered as part of the lifecycle of the products they contain,[62] it can play a role as an ecodesign parameter for the preparation of implementing measures laying down ecodesign requirements for products.[63] –There are currently no ecodesign regulations containing such requirements.
EU Ecolabel	P	The EU Ecolabel scheme is part of the sustainable consumption and production policy of the Community, which aims to reduce the negative impact of consumption and production on the environment, health, climate and natural resources. The scheme is intended to promote those products which have a high level of environmental performance through the use of the EU Ecolabel. [64]	–Lays down the rules for establishing and applying the voluntary EU Ecolabel scheme.[65] –Some EU Ecolabel criteria contain requirements regarding plastic packaging, including on (recycled) materials or its composition.[66]
WFD *	W (C) (P)	Aims to protect the environment and human health by preventing or reducing the generation of waste, the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use, which are crucial for the transition to a CE and for guaranteeing the Union's long-term competitiveness.[67]	–General framework for waste management in the EU, which includes the waste hierarchy, rules on by-products, end-of-waste criteria, minimum requirements for EPR schemes, and targets for preparation for reuse and recycling.[68] –Specifically with regard to plastic packaging: MSs are required to set measures to encourage reuse of (plastic) packaging[69]; plastic requires national separate collection schemes[70]; separate preparing for reuse and recycling target in place for household waste, which also explicitly covers plastic (packaging).[71]
WSR	W	Aims to ensure the protection of the environment when waste is subject to shipment.[72]	–Establishes procedures and control regimes for shipments of waste between MSs, imported from or exported to third countries.[73]

[60] Article 9 SUP Directive. *See also* Recital 27 Directive (EU) 2019/904.
[61] Article 1 (1) & (2) Directive 2009/125/EC of the European Parliament and of the Council of 21 Oct. 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast), OJ 2009 L 285/10 (Ecodesign Directive).
[62] *See* inter alia: Commission Staff Working Document, Sustainable Products in a Circular Economy – Towards an EU Product Policy Framework contributing to the Circular Economy, SWD(2019) 91 final, *supra* n. 26, at 24–25, where it is stated that (plastic) packaging itself is not a product, but is strongly connected with products.
[63] Annex I Part 1 1.1 (c) jo. Art. 15 (6) Ecodesign Directive.
[64] Recital 5 Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 Nov. 2009 on the EU Ecolabel, OJ 2010 L 27/1.
[65] Article 1 Regulation (EC) No 66/2010.
[66] Commission Decision (EU) 2021/1870 of 22 Oct. 2021 establishing the EU Ecolabel criteria for cosmetic products and animal care products (notified under document C(2021) 7500), OJ 2021 L 379/8, including recitals 7 & 8. *See also* Commission Decision (EU) 2017/1214 of 23 Jun. 2017 establishing the EU Ecolabel criteria for hand dishwashing detergents (notified under document C(2017) 4227), OJ 2017 L 180/1; Commission Decision (EU) 2017/1215 of 23 Jun. 2017 establishing the EU Ecolabel criteria for industrial and institutional dishwasher detergents (notified under document C(2017) 4228), OJ 2017 L 180/16; Commission Decision (EU) 2017/1216 of 23 Jun. 2017 establishing the EU Ecolabel criteria for dishwasher detergents (notified under document C(2017) 4240), OJ 2017 L 180/31;
Commission Decision (EU) 2017/1217 of 23 Jun. 2017 establishing the EU Ecolabel criteria for hard surface cleaning products (notified under document C(2017) 4241), OJ 2017 L 180/45; Commission Decision (EU) 2017/1218 of 23 Jun. 2017 establishing the EU Ecolabel criteria for laundry detergents (notified under document C(2017) 4243), OJ 2017 L 180/63; Commission Decision (EU) 2017/1219 of 23 Jun. 2017 establishing the EU Ecolabel criteria for industrial and institutional laundry detergents (notified under document C(2017) 4245), OJ 2017 L 180/79.
[67] Article 1 Directive 2008/98/EC of the European Parliament and of the Council of 19 Nov. 2008 on waste and repealing certain Directives, OJ 2008 L 312/3.
[68] Articles 4, 5, 6, 8, 8a, & 11 Directive 2008/98/EC of the European Parliament and of the Council of 19 Nov. 2008 on waste and repealing certain Directives, OJ 2008 L 312/3 (WFD).
[69] Article 9 (1) (d) WFD.
[70] Article 11 (1) WFD.
[71] Article 11 (2)(a) WFD. *See also* De Römph & Van Calster, *supra* n. 16, at 269; SWD(2019) 90 final, *supra* n. 17, at 6.
[72] Proposal for a Regulation of the European Parliament and of the Council on Shipments of Waste, COM(2003) 379 final; Recitals 1 & 42 Regulation (EC) No 1013/2006.
[73] Articles 1 (1) & (2) Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 Jun. 2006 on shipments of waste, OJ 2006 L190/1 (WSR).

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Legal Act	*Focused on: Use of Chemicals (C), and/or Product Stage (P) and/or Waste Stage (W)*	*Objective of the Legislation*	*Description, Including of Key Provisions for (More Circular) Plastic Packaging*
			–Contains rules to ban or more strictly control the export and import of plastic (packaging) waste.[74]
Landfill Directive	W	With a view to supporting the EU's transition to a CE and meeting the WFD requirements, it aims to ensure a progressive reduction of landfilling of waste, in particular of waste that is suitable for recycling or other recovery, and to prevent or reduce as far as possible negative effects on the (global) environment, as well as any resulting risk to human health, from landfilling of waste, during the whole life-cycle of the landfill.[75]	–Requires that MSs take measures in order that inter alia waste that has been separately collected for preparing for reuse or recycling, which includes plastic (packaging).[76]

2.2 The legal framework in light of the CE transition

Most of the legislation on plastic packaging predates the CE transition, but since the first CEAP, the EU has taken steps to better align its legal framework with the CE transition. As appears from Table 1, the PPWD, SUP Directive, WFD and Landfill Directive now explicitly aim to contribute to the CE transition according to their objectives. Moreover, they all either focus on, or contain provisions that focus on the application of the waste hierarchy,[77] which provides a priority order in waste prevention and waste management, and thus plays a central role in the CE.[78] Other legal acts do not explicitly refer to the CE in their objectives, but nevertheless intend to contribute to it. This is the case with the Recycled Plastics Regulation, whose recitals states that it contributes to achieving the objective of the EU Plastics Strategy, and thus to increasing plastic recycling in general, which is named an essential prerequisite for the CE transition.[79] Similarly, the various amendments of the WSR also aimed at contributing to the EU Plastics Strategy and CE objectives. The Ecodesign Directive and EU Ecolabel also have the potential to contribute to the CE transition by setting requirements or criteria on plastic packaging.[80] While there are currently no implementing ecodesign regulations that contain such requirements, there are some Ecolabel criteria that do. In summary, the extent to which the legislation explicitly focuses on the CE transition can still be considered limited. In addition, the second column of Table 1 shows that within the legal framework, multiple acts focus on multiple life cycle stages of packaging and thus seem to reflect life cycle thinking, which is considered to be a guiding principle in EU CE policy and legislation.[81] For instance, both the PPWD and the SUP Directive contain provisions relating to the product and waste stages of plastic packaging, whereas the Plastics and Recycled Plastics Regulation can be argued to focus on the product stage as well as contain chemicals requirements. From this seems to follow that within the legal framework governing plastic packaging, the boundaries between EU chemicals, product and waste legislation as separate areas of law seem to be less distinct. Other legal acts also seem to take life cycle thinking into account, such as the Ecodesign Directive and the EU Ecolabel, both of which focus on the environmental impact of products over their entire life cycle, or the REACH Regulation, which underlines the importance of considering the whole life cycle of chemicals with regard to safety assessments.[82] Lastly, provisions or instruments may also be seen as reflecting life cycle thinking, such as Extended Producer Responsibility (EPR) or the Substances of Concern in Products (SCIP) database, as will be discussed below. Altogether, these observations could be seen as indications that life cycle thinking is being reflected in the legal framework. Overall, parts of the legal framework seem to fit the CE transition to varying degrees.[83] The literature and interview study examined whether the explicit focus on contributing to the CE, or the extent to which reflection or the taking into account of life cycle thinking also means that the transition towards a more circular plastic packaging

[74] Commission Delegated Regulation (EU) 2020/2174 of 19 Oct. 2020 amending Annexes IC, III, IIIA, IV, V, VII and VIII to Regulation (EC) No 1013/2006 of the European Parliament and of the Council on shipments of waste, OJ 2020 L 433/11.
[75] Article 1 (1) Council Directive 1999/31/EC of 26 Apr. 1999 on the landfill of waste, OJ 1998 L 182/1 (Landfill Directive).
[76] Article 5 (3) (f) Landfill Directive jo. Article. 11 (1) WFD.
[77] Article 1 (2) PPWD; Recital 27 Directive (EU) 2018/852; Art. 1 SUP Directive; Recitals 2, 29 & 36 Directive (EU) 2019/904; Art. 1 WFD; recitals 5, 15, 20, 41, 57 Directive 2018/851; Art. 15a Landfill Directive; Recitals 2, 8, 9, 10 Directive 2018/850.
[78] Article 4 WFD. *See more extensively*: De Römph, *supra* n. 16, at 50–55; COM(2015) 614 final, *supra* n. 2, at 8.
[79] Recitals 1 & 2 Regulation (EU) 2022/1616.
[80] SWD(2019) 91 final, at 12, 21–23.
[81] T. J. De Römph & J. M. Cramer, *How to Improve the EU Legal Framework in View of the Circular Economy*, 38(3) J. Energy & Nat. Resources L. 247 (2020), doi: 10.1080/02646811.2020.1770961.
[82] *See* e.g.,: Annex I 0.3 REACH Regulation. *See also* e.g.,: Annex XII; Annex I 5.0; Art. 3.37; Annex I 0.7; Art. 18(4)(a); Annex I 5.1.1. and 5.2.2.; Annex II s. 13 REACH Regulation.
[83] *See more extensively also*: I. M. De Waal, The relation between EU chemicals, product and waste legislation governing plastic packaging and the transition towards a more circular plastic packaging chain in the EU, in: EELF Colloquiem 2022 Conference Book, *Rethinking Environmental Law: Connectivity, Intersections and Conflicts in the Global Environmental Crisis*, Intersentia (forthcoming).

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chain is actually enabled or stimulated. This will be discussed in the next section.

3 Legal Barriers and Incentives for the Transition Towards a More Circular Plastic Packaging Chain

This research aims to look at legal barriers and incentives for the CE transition in the plastic packaging chain from both a theoretical and empirical perspective. Therefore, a literature study was combined with conducting semi-structured interviews with plastic packaging stakeholders in the Netherlands. The interview candidates were selected based on purposive sampling.[84] Between 25 November 2022–1 February 2023 twenty-five stakeholders were interviewed in twenty semi-structured interviews (*see* Table 2).[85]

Annex II – Table 2

Table 2 Overview of Interviewed Stakeholders

Category	*Number of Stakeholders*
Plastic packaging industry (incl. industry association)	10
Brand owners	3
Plastic recyclers	8
PRO & knowledge institute	2
Governmental organization	2

In the literature and the interviews, numerous barriers and incentives for the transition towards a more circular plastic packaging chain were identified. Among those were multiple barriers and (lack of) incentives that are linked to the legal framework governing the life cycle of plastic packaging, i.e., the legal acts that are discussed in section 2. It should be kept in mind that the interviewees are all stakeholders from the Netherlands, meaning that the identified legal barriers and incentives might be specifically linked to the situation in this MS. However, the results could still provide insight to other MSs and the subsequent analysis of the legal framework will be relevant to all MSs as well.

3.1 EU chemicals legislation

Plastic packaging, more specifically the monomers and polymers, as well as any other substances of which the plastic is composed, is regulated by EU chemicals legislation.[86] As such, chemicals legislation plays an important role in making sure that not only virgin plastics are safe to be used in packaging, but also that recycled plastics are safe to be used in packaging. Nevertheless, hazardous chemicals can still be found in plastic packaging. According to interviewees and literature, this is less likely for post-consumer plastic packaging streams because of the strict FCM legislation and short life cycle,[87] but hazardous chemicals can still be found in FCM plastic packaging too.[88] The presence of these hazardous chemicals is moreover not only linked to them being used in the plastics themselves, but also to contamination during their use or the recycling process.[89] This stresses the importance of clearly regulating the safety of recycled plastics[90] ; not only to protect human health and the environment, but also to prevent an accumulation of these hazardous chemicals in recycled plastics and to prevent that this negatively affects the value and reputation of safe and qualitative recycled plastics.[91]

[84] L. A. Palinkas et al., *Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research*, 42 Administration & Pol'y Mental Health & Mental Health Servs. Res. 533 (2015), doi: 10.1007/s10488-013-0528-y; M. N. Marshall, *Sampling for Qualitative Research*, 13 Family Practice 522 (1996), doi: 10.1093/fampra/13.6.522; L. Webley, *Qualitative Approaches to Empirical Legal Research*, Oxford University Press 2010.

[85] H. R. Boeije, *Analysis in Qualitative Research*, SAGE 2009.

[86] Plastic consists of a chain of monomers, which together form a polymer. These can be derived from non-renewable fossil feedstock, such as oil, but also from renewable biomass, such as sugarcane or corn. *See* SWD(2018) 16 final, *supra* n. 4, at 5; Leal Filho et al., *supra* n. 5, at 550. *See further* Table 1.

[87] S. Wagner & M. Schlummer, *Legacy Additives in a Circular Economy of Plastics: Current Dilemma, Policy Analysis, and Emerging Countermeasures*, 158 Resources Conserv. & Recycling 8 2020 , doi: 10.1016/j.resconrec.2020.104800; M. P. M. Janssen & F. A. Van Broekhuizen, *Waste Handling and REACH: Recycling of Materials Containing SVHCs: Daily Practice Challenges*, RIVM Letter Report 2016–0159, at 29–30; M. Crippa et al., *A Circular Economy for Plastics – Insights from Research and Innovation to Inform Policy and Funding Decisions* 51 (European Commission, Brussels 2019).

[88] World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, *The New Plastics Economy: Rethinking the Future of Plastics*, Ellen MacArthur Foundation, 2016, at 81; Groh et al., *supra* n. 6, at 3264; Matthews, Moran & Jaiswal, *supra* n. 5, at 4.

[89] World Economic Forum, *supra* n. 34, at 81; I. Kazulyte, *Packaging Recycling and Using of Recycled Raw Materials in the Production of Packages, With an Emphasis on Hazardous Chemical Substances*, 74 Envtl. Res. Eng'g & Mgmt. 22 (2019), doi: 10.5755/j01.erem.74.4.22148; J. N. Hahladakis & E. Iacovidou, *An Overview of the Challenges and Trade-Offs in Closing the Loop of Post-Consumer Plastic Waste (PCPW): Focus on Recycling*, 380 J. Hazardous Materials 5–6 (2019), doi: 10.1016/j.jhazmat.2019.120887; M. Hüttler, J. C. Schmitt & M. Gall, *120 Circular Design Standards for Plastic Packaging – A Comprehensive Analysis*, 20th European Round Table on Sustainable Consumption and Production 4 (2021).

[90] Matthews, Moran & Jaiswal, *supra* n. 5, at 4.

[91] Groh et al., *supra* n. 6, at 3524; Hüttler, Schmitt & Gall, *supra* n. 35, at 4; World Economic Forum, *supra* n. 34, at 81.

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However, it appears that the current legal framework is falling short in effectively addressing and assessing all harmful substances in plastic packaging, more specifically the presence of non-intentionally added substances (for non-FCM packaging), mixture toxicity and accumulative risks of substances.[92] Furthermore, one interviewed recycler stated that because of the importance of recycled plastics being safe, they see the need for EU chemicals legislation being in place, but together with three other interviewed companies he simultaneously stated that complying with all requirements is difficult for recyclers, as the required testing is a lengthy, logistically challenging and above all costly process. As a result, the recycling processes, and therewith the recycled plastics, become more expensive, which negatively affects the competitiveness with virgin plastics and therewith the transition towards a more circular plastic packaging chain. More generally, there is a lack of information at the waste stage on the composition of batches of plastic packaging waste, especially on the presence of hazardous substances.[93] The current legal framework is not sufficient in ensuring that such information is communicated along the life cycle.[94] Because of this, recyclers encounter multiple obstacles with regard to requirements in EU chemicals legislation, such as uncertainty about whether or not authorization is needed or the possibility to invoke the registration exemption for the recovered monomers and other substances.[95] From this appears that even though the legislation itself does not necessarily favour virgin of recycled materials in an explicit way, due to this information void manufacturers of virgin materials are favoured over recyclers.[96] This subsequently shows that the legislation has been designed for 'new' materials and therewith hampers the CE transition, according to both literature and interviewees.[97]

In literature, several suggestions have been made to resolve abovementioned issues and to better align EU chemicals legislation with the objectives of a circular plastic (packaging) economy. In order to improve the addressing and assessments of hazardousness in general, and thus to ensure the safety of the (recycled) plastics, it has been suggested to introduce additional requirements for additives and other chemicals. Examples include setting requirements that are based on both risks for migration and mixture toxicity,[98] and prohibiting the use of hazardous substances at source, preferably by a ban that is generic and broad, according to an interviewee, or based on groups of structurally similar chemicals to prevent 'regrettable substitutions'.[99] While such regulatory requirements are considered to be the main drivers of substitution of hazardous chemicals in plastics,[100] and, according to an interviewed recycler, prevent such chemicals from entering the waste stream and thus the recyclate, the fact that hazardous chemicals can still be found in plastic packaging (*see* above) shows that regulating at the source does not guarantee safe secondary plastics. Although contamination during use or at the waste stage may not be avoided with this, stricter chemicals legislation might still lead to improvements, also with regard to the contamination caused by imported products.[101] Regulatory requirements are also suggested to ensure the gathering and sharing information on chemicals in plastic packaging along all life cycle stages and corresponding stakeholders,[102] in order to contribute to solving the issues stemming from the lack of information that reaches and thereby disadvantages recyclers.[103] Since 2021, the SCIP database already aims to ensure that information on substances of very high concern is available throughout the entire life cycle of materials and products, including at the waste stage.[104] In addition, implementing registration requirements for polymers, just as for regular chemicals is suggested to increase data generation of potential negative effects of plastics as well as put the burden of proof on the producers.[105]

Looking specifically at the objective of increasing the use of post-consumer recycled materials in plastic packaging,[106] it becomes apparent from both literature and interviews that there are no legal barriers, or in some cases not even specific chemicals legislation, that hamper their application in non-

[92] N. Aurisano, R. Weber & P. Fantke, *Enabling a Circular Economy for Chemicals in Plastics*, 31 Current Op. Green & Sustainable Chemistry 2–3 (2021), doi: 10.1016/j.cogsc.2021.100513; Crippa et al., *supra* n. 33, at 45; De Römph & Van Calster, *supra* n. 16, at 275.

[93] *See about this also*: Groh et al., *supra* n. 6, at 3265.

[94] Kazulyte, *supra* n. 35, at 23–27.

[95] De Tandt et al., *supra* n. 4, at 318–327; De Römph & Van Calster, *supra* n. 16, at 270–277; *Chemical Recycling of Polymeric Materials from Waste in the Circular Economy* 65 (ECHA 2021).

[96] De Tandt et al., *supra* n. 4, at 318–319; De Römph & Van Calster, *supra* n. 16, at 270–271.

[97] *Ibid.*, at 277; *For Better Not Worse: Applying Ecodesign Principles to Plastics in the Circular Economy* 31 (C. Fayole ed., ECOS 2019).

[98] Crippa et al., *supra* n. 33, at 11, 48.

[99] Groh et al., *supra* n. 6, at 3265; Crippa et al., *supra* n. 33, at 52.

[100] *Ibid.*, at 50, 52.

[101] De Römph & Van Calster, *supra* n. 16, at 275; ECHA , *supra* n. 41, at 61; Crippa et al., *supra* n. 33, at 47.

[102] Crippa et al., *supra* n. 33, at 52.

[103] G. G. Misko, *Plastic Packaging in a Circular Economy*, Food Safety Magazine 9 (2019).

[104] https://echa.europa.eu/scip (accessed 17 May 2023), and Art. 9 (2) WFD. *See also* Crippa et al., *supra* n. 33, at 43–44; ECHA, *supra* n. 41, at 61; De Tandt et al., *supra* n. 4, at 320, 327.

[105] I. M. Steensgaard et al., *From Macro – to Microplastics – Analysis of EU Regulation Along the Life Cycle of Plastic Bags*, 224 Envtl. Pollution 296 (2017), doi: 10.1016/j.envpol.2017.02.007.

[106] Post-consumer recycled (PCR) plastics is waste generated by end-users, as opposed to post-industrial recycled (PIR) plastics, which is plastic waste generated during the industrial production process.

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FCM packaging.[107] This is also the case for cosmetics plastic packaging, even though producers of these packaging often mistakenly think that they are legally required to comply with FCM requirements.[108] This is different for actual FCM plastic packaging, whilst it is precisely this packaging application that makes up such a large part of plastic packaging in the EU, and therefore could make an important contribution to achieving a more circular plastic packaging chain.[109] According to both literature and several interviewees, FCM legislation currently hampers the use of recycled plastics in FCM packaging and the upscaling of reuse systems for packaging, and thus acts as a barrier for achieving CE objectives.[110] One of the main reasons is that, due to their aim to protect human health, the safety norms for using recycled plastics in FCM applications are perceived as very strict,[111] and even over-conservative by some.[112] Looking at the legislation, it becomes apparent that FCM legislation does contain limited possibilities and strict provisions on using recycled content in FCM packaging, which are difficult to comply with. Under the Recycled Plastics Regulation, 'post-consumer mechanical polyethylene terephthalate (PET) recycling' – which allows for a maximum of 5% non-FCM materials and articles – and 'recycling from product loops which are in a closed and controlled chain' are currently the only two suitable recycling technologies that are deemed capable of producing recycled plastic materials and articles that are safe and allowed to be used in FCM applications.[113] One interviewed producer told that they did establish such a closed and controlled chain for their products on a small-scale, but another interviewee remarked that this is not yet happening industry-wide, except for PET bottle deposit-refund-systems. As became apparent from the interviews, this means that in practice recycled PET is currently the as good as only recycled plastic material that can be used in FCM packaging. Recycled plastic materials and articles obtained by means of recycling processes based on other recycling technologies must since the entry into force of the Recycled Plastics Regulation first be evaluated and approved by the European Food Safety Authority (EFSA). The fact that this also applies to previously used and approved processes, such as using recycled plastic behind a functional barrier,[114] has caused quite a stir in the industry, according to interviewees. Moreover, several interviewees remarked that due to the large number of applications, EFSA is unable to process all applications in a timely manner. The resulting delays not only lead to uncertainty for businesses, but might in turn also decrease the willingness to invest and innovate.[115] As concluded by an interviewed producer, altogether this will slow down the industry and thus negatively affect CE objectives.

Literature and interviews both state that plastic recyclate often does not comply with the norms and thresholds that aim to protect human health by limiting risks for toxicity and contamination.[116] Therefore, in order to facilitate the use of recycled plastic in FCM packaging, and therewith achieve CE targets, several interviewees argued that this would require FCM legislation to be more lenient, without compromising safety. It is argued that the current safety norms are over-conservative and unrealistic as worst-case scenario assumptions are used,[117] and interviewees stated that norms are outdated due to current technologies and knowledge. One interviewed recycler added that they feared that eventually only chemically recycled plastics will be able to comply with FCM legislation. Suggestions for finding a renewed balance between safety and circularity include to update the assumption of input contamination levels, use realistic exposure scenarios, and replace the closed-loop prerequisite with quality and safety requirements for recycled plastics.[118] In short, to adopt more realistic evaluation approaches that will boost the application of recycled plastics in FCM, without compromising safety for human health.[119] However, the strict approach in FCM legislation is dictated by the precautionary principle, which is a guiding principle of EU chemicals legislation. While this may hamper CE objectives,[120] an interviewee remarked that we also want to avoid that in ten years' time

[107] Groh et al., *supra* n. 6, at 3255; K. Kaiser, M. Schmid & M. Schlummer, *Recycling of Polymer-Based Multilayer Packaging: A Review*, 3 Recycling, 3 (2018), doi: 10.3390/recycling3010001.

[108] F. Fleurke et al., *Biobased en gerecyclede grondstoffen in kunststof verpakkingen: belemmerende regelgeving?* 11(Tilburg University 2019).

[109] M. T. Brouwer et al., *Technical Limits in Circularity for Plastic Packages*, 12 Sustainability 10 (2020), doi: 10.3390/su122310021.

[110] R. Franz & F. Welle, *Recycling of Post-Consumer Packaging Materials into New Food Packaging Applications – Critical Review of the European Approach and Future Perspectives*, 14 Sustainability 17 (2022), doi: 10.3390/su14020824; C. Cimpan, E. L. Belle & A. H. Strømman, *Plastic Packaging Flows in Europe: A Hybrid Input-Output Approach*, 25 J. Indus. Ecology 13 (2021), doi: 10.1111/jiec.13175; Fleurke et al., *supra* n. 54, at 5; A. Paletta et al., *Barriers and Challenges to Plastics Valorisation in the Context of a Circular Economy: Case Studies from Italy*, 241 J. Cleaner Production, 12 (2019), doi: 10.1016/j.jclepro.2019.118149; Watkins & Schweitzer, *supra* n. 11, at 12; C. R. Bening, J. T. Pruess & N. U. Blum, *Towards a Circular Plastics Economy: Interacting Barriers and Contested Solutions for Flexible Packaging Recycling*, 302 J. Cleaner Production 6 (2021), doi: 10.1016/j.jclepro.2021.126966; Brouwer et al., *supra* n. 55, at 10–11; S. Bours et al., *Transitie naar een circulaire kunststof verpakkingenketen* 36 (Utrecht University 2022); Transitieteam Kunststoffen, *Actieplan Toepassen Kunststof Recyclaat* 20 (2021).

[111] Kazulyte, *supra* n. 35, at 25; Franz & Welle, *supra* n. 56, at 17; Paletta et al., *supra* 56, at 10; Bours et al., *supra* n. 56, at 31.

[112] Franz & Welle, *supra* n. 56, at 17–23.

[113] Article 3 jo Annex I, Art. 4 Regulation 2022/1616.

[114] Kaiser, Schmid & Schlummer, *supra* n. 53, at 3.

[115] Matthews, Moran & Jaiswal, *supra* n. 5, at 4.

[116] Kazulyte, *supra* n. 33, at 25; Bening, Pruess & Blum, *supra* n. 56, at 6; Watkins & Schweitzer, *supra* n. 11, at 12.

[117] Franz & Welle, *supra* n. 56, at 17–23.

[118] *Ibid.*; *Transition Time! – A Circular Economy for Plastics*, Dutch Sustainable Growth Coalition (DSGC) 15 (2021).

[119] Franz Welle, *supra* n. 56, at 24.

[120] *Ibid.*, at 17–23.

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we come to the conclusion that using these recycled plastics wasn't safe after all. In literature it has been suggested that the Plastics Regulation should also cover and provide guidance on Non-Intentionally Added Substances (NIASs) in packaging,[121] and that we should assume that there are no safe levels for certain hazardous chemicals in FCM-packaging,[122] and even that hazardous chemicals should be eliminated altogether.[123] Moreover, even with slightly more lenient requirements, it can be questioned if this will result in an increased application of recycled content in FCM packaging, as interviewees indicated that there are seldom clean enough batches of other plastic materials than PET available and that the batch-to-batch differences make it practically impossible to test every batch to guarantee the safety and quality of the recycled plastics. Other approaches for enabling more use of recycled plastics in FCM legislation that have been proposed are to increase the cooperation between EFSA and practice with regard to testing procedures and guidelines for waste treatment operators,[124] or to harmonize the use of plastic packaging materials to either FCM or non-FCM application.[125] Two interviewees even questioned whether it should not be agreed upon to make all non-FCM packaging from recycled plastics and all FCM packaging from new materials, biobased if necessary, in order to make sure that safety for human health is not compromised. Although this would ensure a high level of safety, this would hamper the EU's objective of increasing the use of recycled content in plastic packaging as FCM packaging forms such a large proportion of plastic packaging.[126] In short, it becomes clear that the safety objectives of EU chemicals legislation, especially of FCM legislation, can conflict with the objective to increase the use of recycled content in FCM packaging, as well as with CE objectives in general.

From the above, the picture emerges that EU chemicals legislation is not always well aligned with the objectives of a more circular plastic packaging chain.[127] More general, despite the fact that REACH does seem to take life cycle thinking into account,[128] there is a lack of an overarching legal framework for managing chemicals in plastics along their life cycle.[129] EU chemicals legislation forms a fragmented framework, as is evidenced by the fact that both general as well as application-specific chemicals legislation govern plastic packaging. As a consequence, legal requirements for substances can differ per application.[130] That this may lead to inconsistencies, is evidenced by the fact that the CLP Regulation arguably identifies fewer endocrine disrupting chemicals than REACH,[131] as well as by the fact that certain substances that are identified as hazardous under REACH, are still allowed to be used under FCM legislation.[132] Differences between general EU chemicals legislation and FCM legislation further include that requirements for NIASs in finished plastic articles exist for FCMs, but are missing for other plastic packaging.[133] Interviewees added that there seems to be inadequate communication between the Plastics Regulation and Recycled Plastics Regulation, and, as the example of cosmetics packaging already showed, the application-specific acts can also lead to confusion as to which requirements need to be complied with. Harmonizing EU chemicals legislation, for example by using positive and negative lists of chemicals covering all applications of plastics, improving the coordination and coherence between REACH and FCM legislation,[134] and adapting EU chemicals legislation based on a systems thinking approach[135] are all mentioned as possible ways that might achieve a more overarching legal framework.[136]

3.2 EU product legislation

The design stage of plastic packaging also influences its end-of-life (EoL) treatment options, including the recyclability of the plastic packaging as well as the quality of the recycled material. It also may affect the reusability of packaging and establishing of reuse systems.[137] Moreover, product designs that focus on applying recycled content can work as a pull instrument for (high-quality) recycling. In other words, the design stage of plastic packaging affects the achieving of CE objectives for plastic

[121] K. J. Groh et al., *Overview of Known Plastic Packaging-Associated Chemicals and Their Hazards*, 651 Sci. Total Env't 3255 (2019), doi: 10.1016/j.scitotenv.2018.10.015.
[122] https://www.euractiv.com/section/energy-environment/news/commission-likely-to-push-for-recycled-pet-in-food-packaging-despite-concerns/ (accessed 9 Feb. 2023).
[123] Misko, *supra* n. 49, at 10.
[124] De Tandt et al., *supra* n. 4, at 327.
[125] J. F. Lopez-Aguilar, *A Realistic Material Flow Analysis for End-of-Life Plastic Packaging Management in Spain: Data Gaps and Suggestions for Improvements Towards Effective Recyclability*, 31 Sustainable Production & Consumption, 218 (2022), doi: 10.1016/j.spc.2022.02.011.
[126] *See* e.g., *also*: Recital 1 Regulation 2022/1616.
[127] For Better Not Worse, *supra* n. 43, at 31.
[128] *See* e.g.,: Annex I 0.3, Annex XII, Annex I 5.0, Art. 3.37, Annex I 0.7, Art. 18(4)(a), Annex I 5.1.1. and 5.2.2., Annex II s. 13 REACH Regulation.
[129] Aurisano, Weber & Fantke, *supra* n. 38, at 2; Crippa et al., *supra* n. 33, at 46.
[130] *Ibid*.
[131] Groh et al., *supra* n. 67, at 3264.
[132] *Ibid.*, at 3265; E. Watkins et al., *Policy Approaches to Incentivise Sustainable Plastic Design*, OECD Environment Working Papers No. 149 24 (2019); Crippa et al., *supra* n. 33, at 47. The reason for this is that REACH assesses chemicals based on their hazard properties, while FCM legislation assesses chemicals based on toxicity studies and migration abilities. This means that even if a substances contains a hazard property, it is deemed safe by EFSA in certain use levels.
[133] Aurisano, Weber & Fantke, *supra* n. 38, at 2; Crippa et al., *supra* n. 33, at 45.
[134] Watkins et al., *supra* n. 78, at 24.
[135] Crippa et al., *supra* n. 33, at 11, 48.
[136] Watkins et al., *supra* n. 78, at 24; Crippa et al., *supra* n. 33, at 11, 48.
[137] L. Copello, N. Dufour & J. M. Simon, *Creating a Policy Framework to Support the Transition to Reuse: Policy Recommendations'* 9 (Zero Waste Europe 2022).

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packaging.[138] Both literature and interviews show that currently, however, packaging design poses a barrier for the CE. Examples of design choices that hamper recycling which came up most often in the interviews, are the use of inks and printing, the use of labels or stickers, and multi-material packaging.[139] This shows that the EoL of packaging is not always adequately taken into account by producers,[140] and conversely that doing so, i.e., design for recycling or reuse, could contribute to reusing and recycling plastic packaging and thus to achieving CE objectives.[141] Multiple interviewees confirmed this, with one recycler even stating that it would be the only thing that will work to increase recycling of plastic packaging.

Product legislation governs packaging design, meaning that it could play a role in taking away abovementioned barriers and stimulating design for recycling and reuse.[142] Currently, the PPWD and SUP Directive both contain provisions that focus on the product stage of plastic packaging. The essential requirements in the PPWD already focus on design aspects such as limiting weight and volume to a minimum, minimizing hazardous substances and ensuring reusability and recovery.[143] Despite the fact that the PPWD seems to contain the possibility to make sure that plastic packaging is designed for reuse or recycling, the essential requirements are criticized for being irrelevant and ineffective, as they lag behind packaging developments and technologies, and as their vague and imprecise wording makes implementation and enforcement difficult.[144] Moreover, the essential requirements are said to be inconsistent, both internally as requirements can conflict with each other and externally as the requirements do not align with (other) waste legislation, such as the targets in the PPWD, the recycled content requirements in the SUP Directive, or the waste hierarchy.[145] Interviewees added that in practice the essential requirements only focus on weight, about which one interviewee noted that this can conflict with recyclability, while another interviewee argued that requirements for minimizing weight are unnecessary anyway due to the functioning of the market. It was also stated that the essential requirements lack a feedback loop from recyclers to producers and that the enforcement of the essential requirements, and thus their actual impact, has been very limited. Despite being enforced since this year in the Netherlands, many companies are said to lack the necessary administration as they have never actively paid attention to the essential requirements, with one producer even admitting that they were not aware of the existence of essential requirements at all. In short, the essential requirements do not at present seem to support the transition towards a circular plastic packaging chain. The fact that the SUP Directive aims to discourage the use of single-use plastic packaging and contribute to awareness on their use, inter alia by imposing bans and product requirements, is perceived as a positive development by multiple interviewees. Many interviewees stated that, although practical aspects need to be further developed, the SUP Directive contributes to the development of reuse systems for plastic packaging, with one interviewed producer even saying that they are in the process of switching completely from single-use to reusable packaging because of the SUP Directive. However, at the same time it can be argued that there is room for improvement with regard to the extent to which these requirements could contribute to the CE transition. For example, not only the fact that the consumption reduction provision only suggests instead of imposes any measures or targets to MSs could be criticized,[146] but also the suggestions themselves could be questioned. Looking at the Netherlands, the choice has been made to implement inter alia the suggestion to not provide SUP-packaging free of charge at the point of sale, the announcement of which has not only led to questions about its impact, but also to critical remarks on the additional revenue for the points of sale as these do not have to be spent on circularity or sustainability initiatives.[147] Other provisions have a limited scope, such as the marking requirements that only apply to beverage cups,[148] or the product requirements and minimum recycled content that only apply to PET beverage bottles.[149] Moreover, since the SUP Directive

[138] D. Calleja, *Why the 'New Plastics Economy' Must be a Circular Economy*, (19) Field Acts. Sci. Reports 23 (2019) ; SWD (2018) 16 final, *supra* n. 4, at 20–27; Hahladakis & Iacovidou, *supra* n. 35, at 4–6; Calisto Friant et al., *supra* n. 5, at 23.

[139] *See also* SWD(2018) 16 final, *supra* n. 4, at 20, 25–26; Hahladakis & Iacovidou, *supra* n. 35, at 4–6; C. T. M. Soares et al., *Recycling of Multi-Material Multilayer Plastic Packaging: Current Trends and Future Scenarios*, 176 Res. Conserv. & Recycling 2–3 (2022), doi: 10.1016/j.resconrec.2021.105905.

[140] Crippa et al., *supra* n. 33, at 98; Calleja, *supra* n. 84, at 23.

[141] Hahladakis & Iacovidou, *supra* n. 35, at 6; Paletta et al., *supra* n. 56, at 12; W. Hsu, T. Domenech & W. McDowall, *How Circular are Plastics in the EU?: MFA of Plastics in the EU and Pathways to Circularity*, 2 Cleaner Envtl Systems 7 (2021), doi: 10.1016/j.cesys.2020.100004.

[142] Crippa et al., *supra* n. 33, at 132; G. Bergsma et al., *Mandatory Percentage of Recycled or Bio-Based Plastic: In the European Union* 7 (CE Delft 2022); SWD(2018) 16 final, *supra* n. 4, at 20; N. Blanksma et al., *Circulaire kunststofketen in 2050: Scenario's voor een gesloten keten en randvoorwaarden om er te komen* (REBEL 2021).

[143] Article 9 jo. Annex II PPWD. *See also* SWD(2018) 16 final, *supra* n. 4, at 56–57.

[144] *Ibid.*, at 5; E. Karamfilova, *Briefing 'Revision of Directive 94/62/EC on packaging and packaging waste'*, European Parliament Research Service (2022).

[145] This legislation includes the WFD and SUP Directive, as well as internally with the PPWD itself. *See Effectiveness of the Essential Requirements for Packaging and Packaging Waste and Proposals for Reinforcement,* European Commission 2020, para. E.1.0, at 47–49.

[146] This will be part of the evaluation of the SUP Directive, which will be carried out by Jul. 2027, *see* Art. 15 Directive (EU) SUP Directive.

[147] Article 2.2 *Regeling kunststofproducten voor eenmalig gebruik.*

[148] Article 7 SUP Directive.

[149] Article 6 SUP Directive. The limited scope of application of the recycled content requirement is, however, in line with the fact that under the Recycled Plastics Regulation currently only

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only covers plastic single-use packaging, interviewees stated that this has led to substitution for other materials, which is confirmed by the confession of an interviewed brand owner that they also were looking for alternative materials for their single-use packaging. Interviewees warned that these non-plastic materials are not only not necessarily the most sustainable options, but more importantly, that this shows that consumption reduction of single-use *plastic* packaging is not the same as changing the consumption of single-use packaging. Besides the PPWD and SUP Directive, the Ecodesign Directive and Ecolabel also contain (possibilities for setting) product requirements for plastic packaging.[150] But whilst the Ecodesign Directive makes it possible to set product requirements for plastic packaging, there are currently no ecodesign regulations that do so.

The above shows that design requirements for more circular plastic packaging may already be present in the current legal framework, but their impact still appears to be limited. Better utilizing as well as expanding product legislation could be a way to increase its contribution to achieving CE objectives.[151] Multiple interviewees agreed that product requirements could benefit the design of more circular plastic packaging. Although one interviewed producer disagreed with this and contended that design aspects should be left to the market itself, several other interviewees made it clear that product requirements are precisely what is needed, as they observed that producers and brand owners are otherwise not doing enough to enable the transition. In order to improve the extent to which product legislation contributes to the transition towards a more circular plastic packaging chain, several suggestions were made. With regard to the essential requirements in the PPWD,[152] it has been suggested to adjust them to make them reflect the waste hierarchy, such as a focus on reuse and waste prevention, improve the enforcement potential, and add currently missing components, such as requirements on recycled materials, labelling for EoL, clear definitions for recyclability and design for recycling.[153] Interviewees also suggested to extend the scope and provisions of the SUP Directive, either to more single-use plastic packaging products, or even to other single-use packaging beyond those made of plastics, if that would be possible. With regard to the Ecodesign Directive, it has been argued in literature that the Ecodesign Directives should be utilized for design for EoL of plastic packaging,[154] including taking into account REACH compliance for recyclers,[155] or otherwise that it should be used as a framework directive for reference purposes for sector specific standards and circular design guidelines.[156] Independently of these three legal acts, in literature a large number of additional product requirements were suggested, including limiting the number of additives, multi-material packaging or certain inks, as well as standardizing packaging design or implementing reuse symbols to support reuse systems,[157] or to require the use of renewable of recycled plastics.[158] In addition, setting recycled content requirements, potentially combined with quality standards or requirements, was often mentioned as a way to boost demand for secondary plastics and (high-quality) recycling.[159] Also suggested were bans on packaging that cannot be easily recycled,[160] including multi-material packaging,[161] or standardizing or even prohibiting certain plastic types for certain applications, as well as applications or packaging in general[162] , [163] Although such product requirements could contribute to achieving a more circular plastic packaging chain, both literature and interviewees also warned for potential conflicts of interest, for example with regard to a potential higher environmental impact of plastic alternatives,[164] and a difficulty to comply with recycled content requirements and EU chemicals

post-consumer mechanical PET recycling is listed as a suitable recycling technology for FCMs.

[150] *See* inter alia: SWD(2019) 91 final, *supra* n. 26, at 24–25, where it is stated that (plastic) packaging itself is not a product, but is strongly connected with products.

[151] Crippa et al., *supra* n. 33, at 132; Bergsma et al., *supra* n. 88, at 7; Blanksma et al., *supra* n. 88; SWD(2018) 16 final, *supra* n. 4, at 20.

[152] Calleja, *supra* n. 84, at 23.

[153] Kazulyte, *supra* n. 35, at 20; J. Boße et al., *Recommendations for the Revision of the Packaging and Packaging Waste Directive 1994/62/EG: Suggestions for Strenghtening Circular Economy*, Scientific Opinion Paper – Umweltbundesamt 20–23 (2023); SWD(2018) 16 final, *supra* n. 4, at 27; ECHA, *supra* n. 41, at 92; Copello, Dufour & Simon, *supra* n. 83, at; Karamfilova, *supra* n. 90; Misko, *supra* n. 49, at 10–11.

[154] Crippa et al., *supra* n. 33, at 12.

[155] For Better Not Worse, *supra* n. 43, at 31; De Römph & Van Calster, *supra* n. 16, at 277.

[156] Transition Time!, *supra* 64, at 9.

[157] Copello, Dufour & Simon, *supra* n. 83, at 9.

[158] Crippa et al., *supra* n. 33, at 11.

[159] *Ibid.*, at 128; M. Calisto Friant, W. J. V. Vermeulen & R. Salomone, *Analysing European Union Circular Economy Policies: Words Versus Actions*, 27 Sust. Production & Consumption 347 (2021), doi: 10.1016/j.spc.2020.11.001; *Reshaping Plastics: Pathways to a Circular, Climate Neutral Plastics System in Europe*, SYSTEMIQ 84 (2022); F. Laubinger et al., *Modulated Fees for Extended Producer Responsibility Schemes (EPR)*, Environment Working Paper No. 184 33 (2021); Bergsma et al., *supra* n. 88, at 4; Hsu, Domenech & McDowall, *supra* n. 87, at 8; Bening, Pruess & Blum, *supra* n. 56, at 7; T. Elliot, H. Gillie & A. Thomson, *European Union's Plastic Strategy and an Impact Assessment of the Proposed Directive on Tackling Single-Use Plastics Items*, in *Plastic Waste and Recycling* 624 (T. Letcher ed., Elsevier 2020).

[160] A. Verrips et al., *The Circular Economy of Plastics in the Netherlands*, in *Environmental Sustainability and Education for Waste Management* 51 (W. W. M. So et al. eds, Education for Sustainability 2019); R. Gradus, *Postcollection Separation of Plastic Recycling and Design-for-Recycling as Solutions to Low Cost-Effectiveness and Plastic Debris*, 12 Sustainability 10 (2020), doi: 10.3390/su12208415 .

[161] Soares et al., *supra* n. 85, at 3.

[162] *See also* Hüttler, Schmitt & Gall, *supra* n. 35, at 16–17.

[163] *See for a more extensive overview* inter alia: F. Hafsa et al., *A Typology and Assessment of Innovations for Circular Plastic Packaging*, 369 J. Cleaner Production 4 (2022), doi: 10.1016/j.jclepro.2022.133313; Brouwer et al., *supra* n. 55.

[164] *See* e.g., *with regard to the ban on plastic carrier bags*: T. D. Nielsen, K. Holmberg & J. Stripple, *Need a Bag? A Review of Public*

legislation, more specifically FCM legislation (*see* further section 4.1).[165]

3.3 EU waste legislation

Plastic packaging that is (intended to be) discarded becomes plastic packaging waste and therewith falls within the scope of EU waste legislation. The PPWD and SUP Directive both contain, in addition to product related provisions, also multiple provisions related to the waste management of plastic packaging (*see* Table 1). Just as with regard to the product aspects, however, there also seems to be room for improvement with regard to the extent to which these provisions contribute to the CE transition. Concerning the PPWD, this seems to be mainly aimed at the plastic packaging recycling target. It is argued that it should be raised to reach the objectives of the CE.[166] However, merely raising this target does not necessarily include the necessary focus on creating clean recycled plastics nor quality.[167] In line with this, it has been suggested to introduce additional recycling targets that also consider the quality of the recycled material or otherwise EU-wide quality standards for recycled plastics or recycling, as the recycling targets are currently weight-based and therefore do not encourage recycling of lightweight plastic materials, nor ensure maximizing the quality of the recycled plastics.[168] These targets or standards should also take into account the safety of the material and its relevant properties.[169] However, interviewees remarked that this would not only make the targets really complex, but also that due to the contradiction between quality and quantity, this would require lowering quantitative targets. Moreover, just targets were argued to be insufficient, as accompanying requirements for design for recycling would be required as well.[170] As for the SUP Directive, both literature and interviews argued again to extend its scope and provisions, including extending the collection targets to all single-use packaging items and to introduce targets on waste prevention.[171] More generally, to further contribute to achieving a CE for plastic packaging, other suggestions included targets for waste prevention,[172] consumption reduction targets,[173] reuse targets for all plastic packaging,[174] or separate recycling targets for specific packaging types.[175] Whilst such targets in the PPWD and SUP could contribute to the CE transition, it was also argued that to ensure targets' contribution, proper accompanying calculation and measurement methods are required,[176] which is demonstrated by the recent change regarding the measurement of the recycling target in the PPWD, which now measures the output at the recycling plant instead of only the input.[177] They also need to be clear for the coming years, to which interviewees added that gradually increasing targets would stimulate industry to keep improving,[178] as well as that it should be made sure that individual companies feel they should commit to these obligations, despite the fact targets generally address the MSs.

3.3.1 Extended producer responsibility

Furthermore, the PPWD and SUP Directive both require the establishment of EPR schemes for plastic packaging. Judged by the extent to which this is addressed in literature and in the interviews, EPR plays an prominent role in the transition towards a more circular plastic packaging chain and is even named as a key instrument for achieving a CE and improving the sustainability of plastics.[179] For example, EPR is said to have contributed to improving recycling processes and thus to achieving recycling targets,[180] as well as to improving separate collection and sorting, reducing littering and landfilling of plastic

Policies on Plastic Carrier Bags – Where, How and to What Effect?, 87 Waste Mgmt. 434 (2019), doi: 10.1016/j.wasman.2019.02.025.

[165] Elliot, Gillie & Thomson, *supra* n. 105, at 624; Wagner & Schlummer, *supra* n. 33, at 1.

[166] Elliot, Gillie & Thomson, *supra* n. 105, at 626; Calisto Friant et al., *supra* n. 5, at 23.

[167] U. Kral, K. Kellner & P. H. Brunner, Sustainable Resource Use Requires 'Clean Cycles' and Safe 'Final Sinks', 461–462 Sci. Total Env't 819 (2013), doi: 10.1016/j.scitotenv.2012.08.094.

[168] ECHA, *supra* n. 41, at 92; Transition Time!, *supra* n. 64, at 16; E. Van Eygen, D. Laner & J. Fellner, *Circular Economy of Plastic Packaging: Current Practice and perspectives in Austria*, 72 Waste Mgmt. 62 (2018), doi: 10.1016/j.wasman.2017.11.040; Brouwer et al., *supra* n. 55, at 2; Kral, Kellner & Brunner, *supra* 113, at 820; Bergsma et al., *supra* n. 88, at 11; For Better Not Worse, *supra* n. 43, at 31; Crippa et al., *supra* n. 33, at 12; W. Hsu, T. Domenech & W. McDowall, *Closing the Loop on Plastics in Europe: The Role of Data, Information and Knowledge*, 33 Sustainable Production & Consumption, 950 (2022), doi: 10.1016/j.spc.2022.08.019.

[169] Transition Time!, *supra* n. 64, at 16; Actieplan Toepassen Kunststof Recyclaat, *supra* n. 56, at 38; SWD(2018) 16 final, *supra* n. 4, at 34; COM(2018) 28 final, *supra* n. 4, at 11–12.

[170] *See also* Lopez-Aguilar, *supra* n. 71, at 218.

[171] Watkins & Schweitzer, *supra* n. 11, at 6, 16; Elliot, Gillie & Thomson, *supra* n. 105, at 626.

[172] Watkins Schweitzer, *supra* n. 11, at 16.

[173] *Ibid.*, at 16; Calisto Friant et al., *supra* n. 5, at 24.

[174] Copello, Dufour & Simon, *supra* n. 83, at 7.

[175] E.g., for flexibles, *see* Ellen MacArthur Foundation, *Flexible Packaging: Strategy Summary* 3 (2022).

[176] Bening, Pruess & Blum, *supra* n. 56, at 6; Copello, Dufour & Simon, *supra* n. 83, at p. 7. *See for critique on the current recycling target*: C. Somlai, C. Bullock & J. Gallagher, *Plastic Packaging Waste in Europe: Addressing Methodological Challenges in Recording and Report*ing, Waste Mgmt. & Res. 9 (2023); Watkins & Schweitzer, *supra* n. 11, at 12.

[177] *See* De Tandt et al., *supra* n. 4, at 316. *However, see critical*: Van Eygen, Laner & Fellner, *supra* n. 114, at 62.

[178] Boße et al., *supra* n. 99, at 20; Bergsma et al., *supra* n. 88, at 7.

[179] Watkins et al., *supra* n. 78, at 11; Leal Filho et al., *supra* n. 5, at 552.

[180] S. Lorang, *Achievements and Policy Trends of Extended Producer Responsibility for Plastic Packaging Waste in Europe*, 4 Waste Disposal & Sustainable Energy 100 (2022); Leal Filho et al., *supra* n. 5, at 552–553; E. Watkins et al., *EPR in the EU Plastics Strategy and the Circular Economy: A Focus on Plastic Packaging* 9 (2017); E. Joltreau, *Extended Producer Responsibility, Packaging Waste Reduction and Eco-design*, 83 Envtl & Resource Econ. 562 (2022).

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packaging waste.[181] It is furthermore argued that EPR could enable innovations,[182] and promote the dialogue and cooperation between stakeholders along the plastic packaging value chain.[183] EPR also has the potential to create (economic) incentives for producers/manufacturers to design more sustainable or circular plastic packaging as well as encourage design for reuse and (cost-effective) recycling.[184] Some interviewed recyclers and brand owners confirmed that in their opinion EPR has contributed to the high recycling rates in the Netherlands and also might have led to design changes. However, at the same time, it is often argued that the actual impact of EPR is limited. For example, there is a lack of evidence of any positive impact on circular packaging design,[185] and the impact on waste management is considered low as well.[186] One of the reasons is the fact that the current EPR fees are relatively too low and only incentivize making waste management more efficient,[187] instead of making it more sustainable or stimulating more circular product design.[188] Several interviewees agreed with this. More generally, the set-up of EPR is criticized because schemes are solely evaluated based on whether they meet the weight-based collection and recycling targets in the PPWD. This means that they are not stimulated to achieve more than these targets.[189] More important, however, is that because the targets are weight-based, this results in focusing only on increasing recycling volumes which can have an adverse effect on the quality of the recycled materials, as quantity and quality are contradictory objectives in practice.[190] Interviewees confirmed that both are the case for the EPR scheme in the Netherlands. *Stichting Afvalfonds Verpakkingen* – the Dutch producer responsibility organization (PRO) that collectively fulfils the EPR obligation – is claimed to not want to achieve higher volumes than is legally required and sorters are only evaluated and paid based on volume instead of quality.[191] Furthermore, whilst one interviewed recycler stated that the Dutch PRO is very powerful as they have a monopsony, an interviewed brand owner criticized them for lacking decisiveness and vision. According to other interviewees, further alertness with regard to the functioning of the PRO is required, as the responsibilities for and the amounts of money that fall under the responsibility of the PRO will increase, at least in the Netherlands, due to the extension of EPR under the SUP Directive.

Multiple suggestions were identified to improve the contribution of EPR schemes to the transition towards a more circular plastic packaging chain. Simply increasing existing collection and recycling targets might force EPR schemes to aim for achieving these targets,[192] but this does not mean improvements are not necessary to ensure that those are actually met,[193] nor will it automatically have a positive effect on other aspects, such as circular design or quality of the recycled materials.[194] A (key) incentive for utilizing EPR's unused potential with regard to incentivizing circular packaging design, could be the use of fee modulation.[195] Currently, fee modulation already has to be applied where possible in case of collective fulfilment of EPR obligations.[196] In the Netherlands, the PRO already applies a lower fee for easily recyclable plastic packaging,[197] and one interviewee confirmed rumours regarding their extension, which would include modulation based on recycled content, as well as tiered or negative fee modulation. Additional criteria for fee modulation mentioned in literature include, among other things, the presence of hazardous substances, the use of multilayer packaging, and the existence of technology to recycle the packaging in question.[198] It is argued that fee modulation

[181] Crippa et al., *supra* n. 33, at 97–98; COM(2018) 28 final, *supra* n. 4, at 16.
[182] Actieplan Toepassen Kunststof Recyclaat, *supra* n. 56, at 39; Leal Filho et al., *supra* n. 5, p. 552, 556; Crippa et al., *supra* n. 33, at 97–98.
[183] COM(2018) 28 final, *supra* n. 4, at 16; Crippa et al., *supra* n. 33, at 63; L. Milios, *Plastic Recycling in the Nordics: A Value Chain Market Analysis*, 76 Waste Mgmt 184 (2018), doi: 10.1016/j.wasman.2018.03.034.
[184] COM(2018) 28 final, *supra* n. 4, at 16; Lorang, *supra* n. 126, at 100; Watkins et al., *supra* n. 126, at 6; Crippa et al., *supra* n. 33, at 63, 97–98; Calleja, *supra* n. 84, at 23; Leal Filho et al., *supra* n. 5, at 556.
[185] Leal Filho et al., *supra* n. 5, at 554; Milios, *supra* n. 129, at 184; Watkins et al., *supra* n. 126, at 6, 9, 20; Milios, *supra* n. 129, at 184; Laubinger et al., *supra* n. 105, at 9; Copello, Dufour & Simon, *supra* n. 83, at 7; Crippa et al., *supra* n. 33, at 120; Calisto Friant et al., *supra* n. 5, at 23; Lorang, supra n. 126, at 101.
[186] Leal Filho et al., *supra* n. 5, at 555; Joltreau, *supra* n. 126, at 562. This is also related to a lack of data: Watkins et al., *supra* n. 126, at 19.
[187] *Ibid.*, at 24; Leal Filho et al., *supra* n. 5, at 554.
[188] Watkins et al., *supra* n. 126, at 24; Crippa et al., *supra* n. 33, at121; Calisto Friant et al., *supra* n. 5, at 24.
[189] Leal Filho et al., *supra* n. 5, at 554.
[190] Bours et al., *supra* n. 56, at 29.
[191] *See also* Actieplan Toepassen Kunststof Recyclaat, *supra* n. 56, at 35; A. Verrips et al., *supra* n. 106, at 51.
[192] *See* e.g.,: Watkins et al., *supra* n. 126, at 20, 32–33.
[193] Leal Filho et al., *supra* n. 5, at 554.
[194] Watkins et al., *supra* n. 126, at 20.
[195] W. Vermeulen et al., *WHITE PAPER on Pathways for Extended Producer Responsibility on the road to a Circular Economy*, Utrecht University Circular Economy and Society Hub: Utrecht 2021; Crippa et al., *supra* n. 33, at 11; Watkins et al., *supra* n. 126, at 18, 25; Lorang, *supra* n. 126, at 101; Laubinger et al., *supra* n. 105, at 14; C. Picuno et al., *Factors Shaping the Recycling Systems for Plastic Packaging Waste – A Comparison Between Austria, Germany and The Netherlands*, 13 Sustainability 14 (2021), doi: 10.3390/su13126772; Leal Filho et al., *supra* n. 5, at 556; Calleja, *supra* n. 84, at 23; Watkins et al., *supra* n. 78, at 32; Actieplan Toepassen Kunststof Recyclaat, *supra* n. 56, at 35; Watkins et al., *supra* n. 126, at 20; Calisto Friant et al., *supra* n. 5, at 23.
[196] Article 8a (4)(b) WFD. *See also* SWD(2019) 91 final, *supra* n. 26 at 24–25; Vermeulen et al., *supra* n. 141, at 35.
[197] *See more specifically*:, https://www.afvalfondsverpakkingen.nl/nl/tariefdifferentiatie-kunststof (accessed 26 May 2023).
[198] Laubinger et al., *supra* n. 105, at 17–31; Watkins et al., *supra* n. 126, at 2–3, 30; Transition Time!, *supra* n. 64, at 14; Bergsma et al., *supra* n. 88, at 7.

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seems to work, but that its impact is small.[199] Multiple interviewees also agreed that the financial implications of fee modulation could have a positive effect on circular packaging design. However, it was simultaneously stated that it is currently not working as the financial incentive is insufficient,[200] and even that if it would be financially interesting, innovation costs, fear for consumers' rejection of adjusted packaging and disproportionate administrative burdens could also impede its effect.[201] In line with this, together with the fact that fee modulation criteria might not apply EU-wide, it is pointed out that product requirements, such as the essential requirements, might be better suited for improving packaging circularity.[202] Besides stimulating circular design, changes were also suggested for making EPR schemes focus more on the quality of recycling and on higher steps of the waste hierarchy than recycling.[203] In order to solve the issue of the contradiction between quantity and quality, it has been suggested to use different measuring methods, as well as to tighten or supplement current targets,[204] or introduce quality standards in the PPWD.[205] Recycled content requirements could also incentivize PROs to introduce measures to enable high quality recycling, which can in turn be applied for complying with these requirements.[206] Moreover, based on the interviews, the way sorters are paid could also be changed so that it is more profitable for them to sort better,[207] and for promoting refillable and reusable packaging it has been suggested to use part of the fees to create a fund.[208] Lastly, the governance of EPR schemes could be improved by more clearly defining cost coverage and responsibilities for different stakeholders,[209] increasing information and transparency on performance to improve monitoring,[210] as well as to stricter regulate PROs or make sure that societal interests are better represented within EPR.[211]

3.3.2 EU waste legislation in general

Looking at waste legislation more generally, it is argued that waste legislation hampers the CE transition for plastic (packaging).[212] More specifically, it becomes clear that the division between (recycled) plastic packaging as waste and as a resource or product is considered to be unclear.[213] Interviewees argued that the classification of plastic packaging as waste can hamper the CE, this being the case because this demands certain permits and can hamper transboundary transport of plastic packaging (waste). Multiple interviewees further argued that the unclarity surrounding the waste status leads to uncertainty and confusion, inter alia with regard to the question if it is the WFD or EU chemicals legislation that should be complied with.[214] Although the WFD specifies when waste can achieve an end-of-waste (EoW) status, and also provides the possibility to adopt both an EU-wide and national EoW-criteria, there are currently no such EU-wide criteria for plastic waste.[215] In the absence of EoW-criteria, MSs can also decide on the end-of-waste status on a case-by-case basis.[216] However, interpretations on EoW differ among MSs and national EoW-decisions are not valid in other MSs, which thus creates obstacles for export and import of recycled plastic (packaging).[217] Interviewees confirmed this for the situation in the Netherlands and added that the requirements for obtaining a national EoW-status are unclear, which is not helped by the fact that enforcement authorities lack knowledge. Despite being difficult to create because of the wide diversity and complexity of polymers and applications, as well as because of a lack of standards and technical specifications,[218] literature and interviewees both advocate introducing EoW-criteria for plastic waste.[219] This could not only take away the abovementioned uncertainty and lack of harmonization between MSs,[220] but also increase recycling,[221] and stimulate the use of recycled plastics and confidence in its safety and quality, amongst other things.[222] EoW-criteria might even help to better integrate waste and chemicals legislation,[223] which would be in line with the more general call to create a holistic waste management legislation.[224] An additional area of improvement with regard to the WFD is related to the extent to which its provisions are in line with the waste hierarchy, as the WFD is criticized

[199] Joltreau, *supra* n. 126E, at 558; Crippa et al., *supra* n. 33, at 120.
[200] *See also* Watkins et al., *supra* n. 126, at 25–26.
[201] *See also* Laubinger et al., *supra* n. 105, at 15.
[202] *Ibid.*, at 33.
[203] Watkins et al., *supra* n. 126, at 3; Transitieteam Kunststoffen, *supra* n. 22, at 39.
[204] Bours et al., *supra* n. 56, at 4.
[205] Transition Time!, *supra* n. 64, at 16.
[206] Laubinger et al., *supra* n. 105, at 33.
[207] *See also* Actieplan Toepassen Kunststof Recyclaat, *supra* n. 56, at 35.
[208] Copello, Dufour & Simon, *supra* n. 83, at 7.
[209] Watkins et al., *supra* n. 126, at 9; Laubinger et al., *supra* n. 105, at 30.
[210] Watkins et al., *supra* n. 126, at 32–33.
[211] Vermeulen et al., *supra* n. 141; Calisto Friant et al., *supra* n. 5, at 24.
[212] Transition Time!, *supra* n. 64, at 16; Crippa et al., *supra* n. 33, at 127.
[213] Milios, *supra* n. 129, at 187; Paletta et al., *supra* n. 56, at 10.
[214] *See also* De Tandt et al., *supra* n. 4, at 327.
[215] Article 6 WFD. *See also* De Tandt et al., supra n. 4, at 327.
[216] Article 6 (4) WFD.
[217] ECHA, *supra* n. 41, at 62. *See more in general about the legal effect of such decisions*: C. W. Backes, *The Waste Framework Directive and the Circular Economy*, in *Research Handbook on EU Environmental Law* 333 (M. Peeters & M. Eliantonio eds, Edward Elgar Publishing 2020).
[218] SWD(2018) 16 final, *supra* n. 4, at 34.
[219] *See more in general*: Crippa et al., *supra* n. 33, at 12; Transition Time!, *supra* n. 64, at 16.
[220] *See a contrario*: Crippa et al., *supra* n. 33, at 136.
[221] SWD(2018) 16 final, *supra* n. 4, at 34.
[222] ECHA, *supra* n. 41, at 62; Actieplan Toepassen Kunststof Recyclaat, *supra* n. 56, at 34.
[223] De Tandt et al., *supra* n. 4, at 327.
[224] Ellen MacArthur Foundation, *supra* 121, at 3.

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for not paying enough attention to higher steps on the waste hierarchy, like waste prevention,[225] nor does it contain any targets that focus on such higher steps. Specifically with regard to plastic packaging, it has therefore been suggested in literature to update the waste hierarchy according to the latest recycling technologies for plastic (packaging),[226] and to impose higher fees or even a ban for incineration of plastic packaging.-[227] The same has been suggested with regard to landfilling, as is already the case in the Netherlands.[228]

3.3.3 Plastic packaging waste transport

Plastic packaging waste can also be transported for recycling, including both transport within the EU and export to countries outside the EU. Between 2012–2017, around 30% of plastic packaging waste was exported for recycling outside the EU. MSs thus not only seem to be dependent on this for managing their plastic packaging waste, but as these shipments count towards achieving the recycling targets, they also play an important role in achieving recycling targets in the EU.[229] However, looking at the Netherlands, there is uncertainty about the actual recycling of this exported plastic waste, as enforcement on this is insufficient.[230] A ban on plastic waste export outside the EU has been proposed to ensure that plastic waste is recycled within the EU,[231] but three interviewees were reluctant and stated that the EU does not have sufficient recycling capacity to recycle all EU produced and used packaging, which might not only lead to an increase of incineration of plastic packaging,[232] but might also hamper meeting the increasingly stringent recycling targets, which in turn might lead to an increase of waste crimes and illegal shipping.[233] It was furthermore mentioned by two recyclers that the EU also lacks qualitative recycling capacity, which could lead to lower quality recycled plastics than what is currently the case in countries outside the EU. However, at the same time, one of the recyclers said that they have been preparing to make currently exported industrial plastic packaging waste streams suitable for EU recycling facilities, which shows that stricter legislation could also lead to innovation in that respect. Interviewed recyclers who export industrial plastic packaging waste outside the EU themselves furthermore stated that they have very detailed checks on how their exported waste is being treated and moreover that with regard to this plastic packaging waste there is a revenue model in place, which means that the likelihood of it not being recycled is low.

Contrary to exports outside the EU, in light of the CE transition it has been argued that the WSR should enable and facilitate the transport of plastic waste for recycling within the EU to make sure that plastic waste is managed as sustainably as possible, to develop a single market for plastic (waste) in the EU, and to meet the demand for predictable quality of plastic recyclate.[234] Currently, however, multiple interviewees mentioned as barriers the administrative burden caused by WSR requirements, as well as a lack of knowledge among stakeholders about, and differences in interpretation of, legal requirements, including also the Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) certification rules. Interviewees stated that legal requirements, such as pollution standards and the classification of waste, can also differ between MSs and thus hamper intra-EU transport. Therefore, interviewees suggested to impose EU-wide, as well as stricter, pollution standards.

4 Analysis

Section 3 has shown that in almost all cases the legal barriers and incentives identified in literature were supported by the interviewed stakeholders. Only with regard to the export ban for plastic waste export outside the EU interviewees did the result of the interview study differ, but otherwise the interviewees often complemented the identified barriers and incentives by pointing out practical aspects or difficulties that should be taken into account. Furthermore, as was already suggested in section 2.2, it appears that, despite the increased attention to and reflection of CE in the legislation, there appears to be room for improvement in terms of the extent to which and the way in which the legal framework contributes to the CE transition. In line with this, one interviewee stated that he felt that the legal framework had been clearly influenced by the CE transition, and multiple interviewees stated that the legislation had been a trigger for them to become more circular.[235] Overall, however, the legal framework

[225] T.J. De Römph, *Waste in European Waste Law: The Waste Framework Directive Explained*, in *Elgar Encyclopedia of Environmental Law – Volume XII* 549(M Faure ed. 2023).
[226] Crippa et al., *supra* n. 33, at 145; Transition Time!, *supra* n. 64, at 29.
[227] Hahladakis & Iacovidou, *supra* n. 35, at 8; Actieplan Toepassen Kunststof Recyclaat, *supra* n. 56, at 4; Milios, *supra* n. 129, at 188.
[228] Hahladakis & Iacovidou, *supra* n. 35, at 8; Steensgaard et al., *supra* n. 51, at 297–298; Hsu, Domenech & McDowall, *supra* n. 87, at 7. *See also* Art. 5 (3) Landfill Directive.
[229] EU action to tackle the issue of plastic waste – Review no. 4, European Court of Auditors, 2020, p. 37–38.
[230] Calisto Friant et al., *supra* n. 5, at 15; D. Lobelle et al., *Knowns and Unknowns of Plastic Waste Flows in the Netherlands, 2022* SSRN 18 doi: 10.2139/ssrn.4050390.
[231] *Ibid.*, at 24.
[232] *See in this regard also, but in relation to landfilling*: Hsu, Domenech & McDowall, *supra* n. 87, at 7.
[233] EU action to tackle the issue of plastic waste, *supra* n. 175, at 48–49.
[234] Transition Time!, *supra* n. 64, at 20; Actieplan Toepassen Kunststof Recyclaat, *supra* n. 56, at 4; Commission Staff Working Document, Assessment report of the voluntary pledges under Annex III of the European Strategy.
for Plastics in a Circular Economy, SWD(2019) 92 final, at 9–10.
[235] *See also* J. Fellner & P. H. Brunner, *Plastic Waste Management: Is Circular Economy Really the Best Solution?*, 24 J.

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was regularly claimed to be insufficient, outdated, unclear, inconsistent, and complex.[236] Looking more closely at the barriers and (lack of) incentives, several themes could be observed, which are discussed below.

First, several identified barriers and incentives seem to be related to the implementation of the legislation, including challenges linked to measurement methods and units, differences in implementation by the MSs, and enforcement. For example, the recent change in the calculation of the recycling target in the PPWD shows the importance of appropriate measurement methods to achieve the desired results, while the importance of an appropriate choice of units is underlined by the fact that the current *weight*-based targets could negatively affect the quality of the recycled materials. Several barriers were also linked to implementation differences between MSs, which, among others, exist with regard to the SUP Directive, EPR schemes,[237] and EoW-decisions,[238] and which hamper the creation of a level playing field in the EU.[239] The lack of and need for enforcement was also mentioned a few times, including with regard to EU chemicals legislation and the essential requirements.[240]

Second, and following up on section 2.2, it appears that besides the still limited explicit focus on the CE in the legislation, the extent to which the legislation adequately aligns with and contributes to CE objectives could be improved. This is also the case for the legislation that explicitly aims to contribute to the CE transition. Looking at the PPWD, SUP Directive and WFD, the barriers and incentives make clear that the extent to which their provisions reflect the waste hierarchy is regularly criticized. This is the case, for example, with regard to the essential criteria in the PPWD, but also with the fact that the consumption reduction provision in the SUP does not contain any concrete measures or targets.[241] The WFD has additionally been criticized more generally for still focusing mainly on the (preparation for) reuse and recycling of waste rather than on waste prevention.[242]

The calls for targets to focus on higher steps on the waste hierarchy beyond recycling also indicate that there is room for improvement in this respect. Overall, it seems that the focus on the highest step(s) of the waste hierarchy, especially waste prevention, could and should be improved.[243] Furthermore, it appears that the scope of multiple provisions and instruments that could contribute to the CE, could be extended in order to increase their actual impact on the CE transition. Looking at the PPWD, existing targets could be increased, new targets could be introduced, and circular components could be added to the essential requirements. The scope of provisions in the SUP Directive could be extended and the Ecodesign Directive, Ecolabel schemes, and the possibility to introduce EoW-criteria could be better utilized to increase their contribution. The instrument of EPR could also be perfected. In addition, standards, labels and certification could be made better use of for steering into the right direction, as well as for exchanging information throughout the value chain,[244] and thus contribute to the CE objectives.

Third, the interaction between the areas of law, the legal acts and the provisions, seems to play an important role in the identified barriers and incentives. As will be seen, this seems to be related to the fact that the different life cycle stages of plastic packaging and accompanying legislation are inherently linked to and thus interact with each other, which endorses life cycle thinking as a guiding principle in CE policy and legislation (*see* section 2.2.) Already with regard to EU chemicals legislation, it has been argued that there is a lack of an overarching legal framework for managing chemicals in plastics along their life cycle. Other examples of such barriers include the lack of information required by chemicals legislation that reaches the waste stage, which disadvantages recy-

Material Cycles & Waste Mgmt.1 (2022, doi: 10.1007/s10163-021-01340-2).

[236] The unclarity of the legal framework is explicitly mentioned to be related to inter alia the essential requirements, and EPR, as well as to unclear definitions or concepts related to the CE transition, such as (design for) recyclability and recycled content. *See besides* s. 3 *also*: SWD(2018) 16 final, *supra* n. 4, at 56; Leal Filho et al., *supra* n. 5, at 554; Watkins et al., *supra* n. 126, at 9, 32–33; SYSTEMIQ, *supra* n. 105, at 83; Fleurke et al., *supra* n. 54, at 3; Kazulyte, *supra* n. 33, at 22.

[237] *See also* Watkins et al., *supra* n. 126, at 9, 19; Leal Filho et al., *supra* n. 5, at 553–554; Crippa et al., *supra* n. 33, at 118; EU action to tackle the issue of plastic waste, *supra* n. 175, at 24.

[238] *See also* ECHA, *supra* n. 41, at 62.

[239] *See also* S. Kahlert & C. R. Bening, *Why Pledges Alone Will Not Get Plastics Recycled: Comparing Recyclate Production and Anticipated Demand*, 181 Res. Conserv. & Recycling 7 (2022), doi: 10.1016/j.resconrec.2022.106279; Crippa et al., *supra* n. 33, at 92; SYSTEMIQ, *supra* n. 105, at 84; SWD (2019) 92 final, p. 9–10; SWD(2018) 16 final, *supra* n. 4, at 33.

[240] *See also* Crippa et al., *supra* n. 33, at 47; SWD(2018) 16 final, *supra* n. 4, at 56.

[241] This will be part of the evaluation of the SUP Directive, which will be carried out by Jul. 2027, *see* Art. 15 SUP Directive.

[242] B. Puentes Cocina, *An analysis of the Circular Economy Legislative Package: A New Paradigm vs The Old Waste Law*, in *Environmental Law for Transitions to Sustainability* 57 (M. Boeve et al. eds 2021); C. Backes & M. Boeve, *Envisioning the Future of the Circular Economy: A Legal Perspective*, 52 Envtl Pol'y & L. 253–263 (2022), doi: 10.3233/EPL-219034; De Römph, *supra* n. 171, at 459.

[243] *See also* Joltreau, *supra* n. 126, at 562.

[244] *See* inter alia *and* e.g.,: Crippa et al., *supra* n. 33, at11–12; Watkins et al., *supra* n. 78, at 40; L. Äkräs et al., *Towards Sustainable and Circular Practices with Plastics: Exploring the Potential of Law and Governance Tools Based on Holistic and Harmonized Life Cycle Assessment*, 1 Retfærd 15 (2022); Hsu, Domenech & McDowall, *supra* n. 114, at 950; D. Civancik-Uslu et al., *Moving from Linear to Circular Household Plastic Packaging in Belgium: Prospective Life Cycle Assessment of Mechanical and Thermochemical Recycling*, 171 Res. Conserv. & Recycling 10 (2021), doi: 10.1016/j.resconrec.2021.105633.

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clers over producers of virgin plastics, or in the delays at EFSA, which are triggered by the new Recycled Plastics Regulation and which may affect meeting (future) recycled content objectives.[245] In addition, barriers such as these also show how legislation that does not explicitly distinguish between using virgin or recycled materials and therefore can seem neutral or even enabling towards CE objectives,[246] can in reality nevertheless disadvantage recycled over virgin plastics and thus hamper the CE as the legislation is not based on circular and life cycle thinking.

In addition, it is not only shown how improving interaction within the legal framework could contribute to CE objectives, but also that taking this interaction into account may be necessary or play a role in creating synergies. For example, the SCIP database shows how a link between chemicals and waste legislation may take away barriers, such as the information void in this case.[247] Similarly, it has been argued that EoW-criteria could contribute to a better integration between waste and chemicals legislation.[248] Product requirements could also contribute to improve the link with both chemicals and waste legislation as well as lead to synergies, as it is argued how product requirements should be utilized for taking into account REACH compliance aspects for recyclers,[249] as well as for design for EoL, which amongst other things contributes to meeting recycling targets. The latter is also an example of how certain incentives require the positive effects that are to be obtained from interaction with additional adjustments to the legal framework. For example, it is argued that to increase reuse or recycling targets, accompanying design for reuse or recycling requirements would be needed, as well as recycled content requirements to contribute to meeting those targets.-[250] Similarly, the instrument of EPR should be seen as part of a policy mix, which means that to reap all benefits of EPR, suggestions for improving EPR need to be considered in conjunction with, inter alia, the interaction with the targets in the PPWD and labelling or design requirements.[251] It may also be required to look at the interaction between different provisions or adjustments due to the existence of negative trade-offs. For example, (increasing) weight-based recycling targets can have a contradictory effect on achieving high-quality recycled plastics, which is required to comply with EU chemicals legislation and (future) recycled content requirements. Conversely, the introduction of quality-based targets can have a contradictory effect on the quantity of recycled plastics, leading one interviewee to argue that targets cannot therefore be seen in isolation. A similar example relates to the weight-focused essential requirements, which can conflict with recyclability or reusability and vice versa, according to interviewees. The identified barriers and incentives thus also show how the occurrence of negative interactions within the legal framework underlines that legislation cannot be seen in isolation from each other. Furthermore, the identified barriers and incentives not only demonstrate the importance and added value of taking into account the interaction within the legal framework, but also reveal how this interaction can lead to conflicts of interest within the legal framework. This is particularly evident with regard to the barriers related to EU chemicals legislation, where not only the information void disadvantages recycled plastics, but also where the (perceived) stringency of FCM legislation in particular complicates the use of recycled content in plastic packaging. The subsequent discussion in literature and interviews on whether to tighten legislation for safety reasons or to relax legislation in favor of recycling and recycled content, reveals an underlying conflict between pursuing CE objectives on the one hand and safeguarding human health and the environment, here embodied in the precautionary principle, on the other hand.[252] In addition, in the interviews a possible conflict of interest between CE objectives, more specifically the consumption reduction provisions in the SUP Directive and food safety, as well as a tension between circularity and sustainability was mentioned a few times. All in all, the results of the literature and interview study show that several conflicts of interest within the legal framework require that important but also difficult policy decisions will have to be made.

In conclusion, the identified barriers and (lack of) incentives demonstrate how the design of the current legal framework governing plastic packaging, including the interaction between the different areas of law, legal acts and provisions, neither appears to be fit for purpose in pursuance of CE objectives nor appears to stimulate the CE transition. The extent to which the legislation explicitly focuses on contributing to the CE transition could be increased. However, as it appears that regardless of whether a legal act explicitly aims to contribute to the CE transition, it should also be ensured that its provisions actually contribute to fulfilling CE objectives, as well as that instruments and possibilities within the legislation are better utilized to this end. In doing so, it is important to take into account the fact that not only the different life cycle stages of plastic packaging interact, but also the areas of law, the legal acts and the provisions governing these life cycle stages. This could lead to an enabling and stimulating legal framework, unlock synergies and prevent conflicts of interest.[253] In summary, in order to enable or stimulate the transition towards a more circular

[245] Groh et al., *supra* n. 6, at 3265.
[246] Fleurke et al., *supra* n. 54, at 8; Milios, *supra* n. 129, at 187.
[247] De Tandt et al., *supra* n. 4, at 319.
[248] *Ibid.*, at 327.
[249] De Römph & Van Calster, *supra* n. 16, at 277.
[250] *See also* Lopez-Aguilar, *supra* n. 71, at 218; Boße et al., *supra* n. 99, at 15.
[251] Leal Filho et al., *supra* n. 5, at 556; Watkins et al., *supra* n. 126, at 3.
[252] *See about this also*: Crippa et al., *supra* n. 33, at 49; Groh et al., *supra* n. 6, at 3265.
[253] Crippa et al., *supra* n. 33, at 33, 145; EU Thoden van Velzen, MT Brouwer & C. Picuno, Verbeteropties voor de recycling van kunststofverpakkingen, WUR Report 1823 2018, at 3–5. *See about the need to investigate the interrelation between legal barriers along the plastic value chain also*: Hsu, Domenech & McDowall, *supra* n. 114, at 944.

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plastic packaging chain, the extent to which the legal framework is underpinned by circular as well as life cycle thinking could be improved, while not losing sight of the challenges related to the implementation of the legislation.

This analysis gives reason to argue that adjustments to the legal framework governing plastic packaging are needed for the transition towards a more circular plastic packaging chain. The more so because it was stated in both literature and multiple interviews that legislation can or even should be used to trigger action for this circular transition.[254] It also gives reason to reflect on the approach to be taken within the EU chemicals, product and waste legislation governing the life cycle of plastic packaging. With the EU Plastics Strategy, the EU adopted a self-proclaimed material-specific life cycle approach, integrating all life cycle stages of the plastic value chain, as well as a systemic approach with regard to the actions to be taken.[255] The first part of the EU's policy approach shows that the primary focus is thus on plastic as a material, which is considered a priority area and key value chain, rather than on the various applications of plastics. In the legal framework, this seems most clearly reflected in the SUP Directive, which was introduced following the EU Plastics Strategy, while other legal acts, such as the PPWD primarily focus on the application (e.g., packaging).[256] Literature and interviews show different views on the desirability and practical feasibility of such a material-specific approach in legislation. In literature, it was argued that the current diversity of different application-specific legislation complicates the uptake of recycled plastics and that legislation should focus on the entire plastics value chain, instead of only certain single-use products as is currently the case with the SUP Directive.[257] However, as was already discussed with regard to the SUP Directive, a specific focus on *plastic* products can lead to substitution, which can compromise the achievement of underlying objectives such as consumption reduction or waste prevention. Also, it is noted that a material-specific approach in legislation should take into account the fact that plastic is not a homogeneous material but comprises different types.[258] Although it was mentioned as an incentive to harmonize the use of plastic types according to their application, for example only allowing PET to be used for FCM packaging and High Density polyethylene (HDPE) for non-FCM packaging,[259] the different types of plastic make it challenging to create a legal framework for circular plastics.[260] In addition, the barriers and incentives also show that taking into account application-specific requirements will remain necessary, especially when looking at the distinction between FCM and non-FCM packaging.[261] As an alternative to a material-specific approach, some interviewees advocated maintaining or rather expanding the sector-specific approach with regard to plastic packaging. For example, they argued that legislation should focus on single-use packaging in general, rather than only on single-use plastic packaging. Some interviewees also suggested that the focus should be on creating a comprehensive legal framework governing all packaging, comparable to what was above suggested with regard to EU chemicals legislation. This would also be in line with the criticism that the SUP Directive's provisions on packaging are not included in the PPWD. The second part of the EU's approach for plastics concerns integrating all life cycle stages of the plastic value chain, which could be said to relate to the adoption of a life cycle thinking approach in its legal framework. As the analysis already shown, it would indeed be desirable to adopt a life cycle approach within the legal framework. Although it can be said to be already more or less present in some of the legal acts, including the SUP Directive and PPWD, overall it can be concluded that the extent to which the legal framework is underpinned by life cycle thinking could be improved.

4.1 Current and future developments

Many of the legal acts that govern plastic packaging are being revised at the moment. The most noteworthy development will likely be the Proposal for the Packaging and Packaging Waste Regulation (PPWR). The objectives of the PPWR are to reduce the negative environmental impact of packaging and packaging waste, more specifically to reduce packaging waste generation, promote a CE for packaging in a cost-effective way and promote the use of recycled content in packaging. It covers the entire life cycle of packaging and will improve existing regulatory instruments, such as the essential requirements, as well as introduce new measures.[262] Examples include criteria for design for recyclability,[263] mandatory recycled content requirements,[264] bans on certain packaging applications,[265]

[254] Brouwer et al., *supra* n. 55, at 9; Kahlert & Bening, *supra* n. 185, at 7; Paletta et al., *supra* n. 56, at 11; Bening, Pruess & Blum, *supra* n. 56, at 1–2; SYSTEMIQ, *supra* n. 105, at 79; Watkins et al., *supra* n. 78, at 11; Transition Time!, *supra* n. 64, at 30; K. Syberg et al., *Regulation of Plastic from a Circular Economy Perspective*, 29 Current Opinion Green & Sustainable Chemistry 6 (2021), doi: 10.1016/j.cogsc.2021.100462; *A Circular Economy of Plastics: A vision of redesigning plastics value chains, VTT Technical Research Centre of Finland – VTT Discussion paper* 38 (A. Tenhunen & H. Pöhler eds 2020); Calisto Friant et al., *supra* n. 5, at 23.

[255] SWD(2018) 16 final, *supra* n. 4, at 40.

[256] This also seems to be the case when looking at EU chemicals, product and waste legislation more broadly, e.g., when looking at the ELV Directive or WEEE Directive, which primarily focus on the application as well.

[257] Syberg et al., *supra* n. 200, at 6.

[258] Äkräs et al., *supra* n. 190, at 6; Lopez-Aguilar, *supra* n. 71, at 210.

[259] *Ibid.*, at 217.

[260] Äkräs et al., *supra* n. 190, at 6; Lopez-Aguilar, *supra* n. 71, at 210.

[261] *Ibid.*, at 210.

[262] 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 (PPWR Proposal).

[263] Article 6 PPWR Proposal.

[264] Article 7 PPWR Proposal.

[265] Article 22 PPWR Proposal.

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mandatory reuse and refill targets,[266] and targets for packaging waste reduction.[267] These proposed measures correspond with several of the identified incentives. Many interviewees were also positive about the proposal for the PPWR. Amongst other things, they mentioned that it pushes stakeholders into the right direction and that the fact that it is a regulation will help to take away differences between MSs and establish a level playing field, which will benefit trade and cooperation within the EU and thus contribute to scale up the transition.[268] One interviewed producer also specifically mentioned that they were glad that the PPWR focuses on the CE and packaging waste reduction, instead of a focus against plastic packaging specifically. In contrast to the in some regards similar measures in the SUP Directive, these proposed measures will apply to all packaging and will thus complement the SUP measures when single-use plastic is concerned.[269] In the interviews in particular, the proposed recycled content requirement was discussed frequently. Many interviewees were positive towards such requirements and agreed that this will stimulate the use of recycled plastics, and plastics recycling accordingly. One producer, however, stated that he stood negative towards this as the use of recyclate will downgrade the recycled plastics stream. Although the other interviewees were generally positive, some did criticize the current set-up of the requirement. Interviewees argued that the current requirements are not ambitious enough and suggested to further differentiate to packaging applications, in order to better exploit existing potential. A brand owner wondered why renewable materials were not also included,[270] more generally referring towards the role of biobased, biodegradable and compostable plastics in the CE transition, which has been addressed in the communication on an EU policy framework on biobased, biodegradable and compostable plastics, published alongside the PPWR.[271] Moreover, although recycled content requirements could contribute to achieving recycling targets,[272] interviewees stressed that the simultaneous increased focus on reuse could reduce the influx of recyclate, which could have a negative effect on meeting the recycled content requirements. Similarly, and as mentioned before, strict FCM legislation could also hamper meeting the recycled content requirements.[273]

Other proposals and upcoming revisions also show potential to positively affect the transition towards a circular plastic packaging chain. Starting with EU chemicals legislation, it seems that the revision of the REACH Regulation will incorporate several of the identified suggestions and incentives, as a revision of the registration requirements for certain polymers, the introduction of mixture assessment factors, and simplifying the communication in the supply chain are being considered.[274] The revision of REACH is furthermore said to represent a paradigm shift from the current risk-based approach to a hazard-based approach, which would be an important development in light of the perceived conflict of interest between safety and circularity.[275] In addition, the CLP Regulation proposal contains rules for refillable containers for chemicals, which has the potential to reduce packaging waste and facilitate more sustainable sales forms.[276] Also, the revision of Regulation 1935/2004 will aim to support sustainable packaging solutions and contribute to the CE transition, and specifically aims to make plastic packaging reusable and recyclable, to encourage alternatives to plastic packaging and reduce waste.[277] This could also have a positive effect on the Plastics Regulation and Recycled Plastics Regulation, as both are based on Regulation 1935/2004. Looking at EU product legislation, the proposal for an Ecodesign Regulation may complement the PPWD by setting product-based requirements on the packaging of almost all physical goods on the EU market, in order to contribute to minimizing the amount of packaging and thus the generation of packaging waste.[278] For these ecodesign requirements, the weight and volume of packaging as well

[266] Article 26 PPWR Proposal.
[267] Article 38 PPWR Proposal.
[268] *See also* Kahlert & Bening, *supra* n. 185, at 7; SWD(2019) 92 final, p. 9–10; SYSTEMIQ, *supra* n. 105, at 84; SWD(2018) 16 final, *supra* n. 4, at 33; Crippa et al., *supra* n. 33, at 92; Bening, Pruess & Blum, *supra* n. 56, at 6.
[269] *See for the amendments*: Art. 61 & Recital 134 PPWR Proposal.
[270] *See also* G. Bergsma, M. Broeren & M. Uijttewaal, *CO2-reductie met circulaire kunststoffen in Nederland: Scenario-analyse voor 2030 en diverse praktijkcases*, CE Delft 10, 24 (2021). The Netherlands aim to introduce such a requirement, in anticipation of, but also contrary to the recycled content requirement in the PPWR.
[271] *See* inter alia: Art. 7 (4), Art. 8, Arts 11 (3), 47 (8) PPWR Proposal.
[272] Boße et al., *supra* n. 99, at 15.
[273] *See also* Elliot, Gillie & Thomson, *supra* n. 105, at 624; Groh et al., *supra* n. 6, at 3265.
[274] *See also* Art. 138 (2) REACH Regulation, which already gives the EC the possibility to present a legislative proposal for the registration of polymers. *See also* Commission General Report on the operation of REACH and review of certain elements – Conclusions and Actions, COM (2018) 116 final.
[275] Inception Impact Assessment Ref. Ares(2021)2962933–04 May 2021.
[276] Article 35 jo. Annex II s. 3.4 Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures, COM(2022) 748 final (CLP Regulation Proposal); Recital 15 CLP Regulation Proposal.
[277] Inception Impact assessment, Ref. Ares(2020)7731375–18 Dec. 2020.
[278] Commission Staff Working Document, Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC, SWD(2022) 82 final, at 65; Recital 21 Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable

as plastic waste and packaging waste are listed as usable product parameters.[279] Also, following the approach of the Ecodesign Regulation, the Construction Products Regulation proposal also contains sustainability criteria for construction product and their packaging,[280] thus becoming relevant for circular transition for plastic packaging as well.[281] Lastly, the WFD is being revised,[282] and the EC has started the development of EoW-criteria for plastic waste.[283] A proposal for a revised WSR has also been published,[284] amongst other things including an export ban for plastic waste,[285] which is not necessarily seen as a positive development by several interviewees.

All in all, assuming the current proposals are adopted or initiatives are pursued, it seems that several of the identified barriers will be taken away and several identified incentives will be incorporated. There appears to be an increased focus on CE objectives, and the revisions also seem to demonstrate an increased focus on higher steps of the waste hierarchy, as well as on the extent to which the whole life cycle and interaction within the legal framework are taken into account.

5 Conclusion

The EU has the ambition to achieve a circular plastics economy, paying specific attention to plastic packaging as the main application of plastic and the main source of plastic waste. The barriers and incentives identified in this research show that changes to the legal framework governing plastic packaging are needed to enable and stimulate this transition towards a more circular plastic packaging chain, and a number of possible ways of doing this are proposed and assessed in terms of their potential contribution to the circular transition. It appears that EU chemicals, product and waste legislation could be better aligned with the CE objectives for plastic packaging. Provisions and instruments should actually contribute to achieving the objectives of the legal acts, and existing instruments and measures could be better utilized to this end. The identified barriers and incentives also show that it would be desirable if the legal framework would better take into account the fact that the different life cycle stages of plastic packaging, and therefore the legislation governing them, are inherently interlinked. The CE transition emphasizes the need to take into account this interaction between the areas of law, legal acts or legal measures to not only create a legal framework that is fit for purpose in pursuance of CE objectives, but also to unlock synergies. The existence and emergence of conflicts of interest and adverse effects within the legal framework also show that policy decisions will have to be made to prevent these from hampering the CE transition. This needs to remain to be kept in mind in view of the many revisions that are currently taking place at the EU level, which otherwise appear promising in light of the results of this study and thus the transition towards a more circular plastic packaging chain. Further research is needed on this, and the same counts for the interaction with other areas of law and legal acts, and the many practical aspects identified in this research.

[279] Annex I under (i) and (p) Ecodesign Regulation Proposal.

[280] More specifically, the proposed Regulation requires manufactures to also package their products in such a way that their overall environmental and climate sustainability reaches the state of the art level, to give preference to recyclable and recycled materials and to design products in such a way that reuse, remanufacturing or recycling are facilitated, amongst other things. *See* Art. 22 (2) Proposal for a Regulation of the European Parliament and of the Council laying down harmonized conditions for the marketing of construction products, amending Regulation (EU) 2019/1020 and repealing Regulation (EU) 305/2011, COM(2022) 144 final. *See about inherent product environmental requirements also*: Annex I Part C s. 2.

[281] Recital 20 Proposal for a Regulation of the European Parliament and of the Council laying down harmonized conditions for the marketing of construction products, amending Regulation (EU) 2019/1020 and repealing Regulation (EU) 305/2011, at 2, 6.

[282] *Call for Evidence for an Impact Assessment, Environmental Impact of Waste Management – Revision of EU Waste Framework*, Ref. Ares(2022)577247–25 Jan. 2022. *See also*, https://environment.ec.europa.eu/news/waste-framework-directive-revision-2022-02-14_en (accessed 29 Mar. 2023).

[283] *Guidance for Monomers and Polymers – Version 3.0*, ECHA 2023 at 19. *See also*, https://environment.ec.europa.eu/news/commission-starts-develop-end-waste-criteria-plastic-waste-2022-04-05_en (accessed 29 Mar. 2023).

[284] Proposal for a Regulation of the European Parliament and of the Council on shipments of waste and amending Regulations (EU) No 1257/2013 and (EU) No 2020/1056, COM(2021) 709 final, at 2.

[285] https://www.europarl.europa.eu/news/en/press-room/20230113IPR66627/waste-shipments-meps-push-for-tighter-eu-rules (accessed 29 Mar. 2023).