10 Legislation and Regulatory Framework

10.1 EU Packaging Waste Legislation

The EU waste legislation on packaging and packaging waste is presented in Table 10.1.

The Packaging and Packaging Waste Directive 94/62/EC [1] provides for measures aimed at limiting the production of packaging waste and promoting recycling, reuse, and other forms of waste recovery. Their final disposal should be considered as a last resort solution. Article 6(1) of Directive 94/62/EC sets down targets for the recovery and recycling of packaging waste, which, pursuant to Article 6(5), shall be fixed every 5 years based on the practical experience gained in Member States and the findings of scientific research and evaluation techniques such as life-cycle assessments and cost−benefit analysis.

The Waste Framework Directive 2008/98/EC [4] establishes a legal framework for treating waste in the European Union. This is designed to protect the environment and human health by emphasizing the importance of proper waste management, recovery, and recycling techniques to reduce pressure on resources and improve their use. Article 4 of the Directive establishes a five-step waste hierarchy:

- prevention,
- reuse,
- recycling,
- recovery for other purposes such as energy, and
- disposal.

The waste hierarchy generally lays down a priority order of what constitutes the best overall environmental option in waste legislation and policy, while departing from such hierarchy may be necessary for specific waste streams when justified for reasons of, inter alia, technical feasibility, economic viability, and environmental protection.

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Table 10.1 EU Directives and Regulations Related to Packaging and Packaging Waste

Directives/ Regulations	Title	Reference
Directive 94/62/EC of the European Parliament and the Council of 20 December 1994	On packaging and packaging waste	[1]
Directive 2004/12/ EC of the European Parliament and of the Council of 11 February 2004	Amending Directive 94/ 62/EC on packaging and packaging waste (extension of deadlines for the attainment of the recycling and recovery targets for the Member States acceding the EU in 2004	[2]
Directive 2005/20/ EC of the European Parliament and of the Council of 9 March 2005	Amending Directive 94/ 62/EC on packaging and packaging waste	[3]
Directive 2008/98/ EC of the European Parliament and of the Council of 19 November 2008	On waste and repealing certain Directives	[4]
Regulation (EC) No 219/2009/EC of the European Parliament and of the Council of 11 March 2009	Adapting a number of instruments subject to the procedure referred to in Article 251 of the Treaty to Council Decision 1999/468/EC with regard to the regulatory procedure with scrutiny	[5]

Table 10.1 EU Directives and Regulations Related to Packaging and Packaging Waste (*Continued*)

Directives/ Regulations	Title	Reference
Commission Directive 2013/2/EU of 7 February 2013	Amending Annex I to Directive 94/62/EC on packaging and packaging waste	[6]
Directive 2015/720/ EU of the European Parliament and of the Council of 29 April 2015	Amending Directive 94/ 62/EC as regards reducing the consumption of lightweight plastic carry bags; Article 1 and Amending Article 4 of 94/62/EC	[7]
Directive (EU) 2018/ 852/EU of the European Parliament and of the Council of 30 May 2018	Amending Directive 94/ 62/EC on packaging and packaging waste	[8]
Directive (EU) 2019/ 904/EU of the European Parliament and of the Council of 5 June 2019	On the reduction of the impact of certain plastic products on the environment	[9]

The Waste Framework Directive introduces also the concept of "Extended Producer Responsibility" (EPR) as one of the means to support the design and production of goods that take into full account and facilitate the efficient use of resources during their whole life cycle including their repair, reuse, disassembly, and recycling without compromising the free circulation of goods on the internal market. This may include an onus on manufacturers to accept and dispose of products returned after use (see Section 10.4.3).

Directive 2015/720/EU [7] is the latest revision of the Packaging and Packaging Waste Directive 94/62/EC regarding the consumption of lightweight plastic carrier bags. After addressing plastic bags in 2015,

72% of Europeans said they have cut down in their use of plastic bags (Eurobarometer) [10].

Directive (EU) 2018/852 [8] amended Directive 94/62/EC on packaging and packaging waste. This amendment is part of the European Union's framework regarding circular economy (CE) (see Section 10.4.2). In this context, packaging waste management became one of the priorities and additionally a revision regarding packaging waste imposed itself.

Directive (EU) 2019/904[1] [9] aims to reduce the amount of single-plastic products. The Directive introduces new EU-wide rules aiming to reduce the use or even ban certain of 10 identified single-use plastic products most often found on Europe's beaches and seas as well as lost and abandoned fishing gear that together account for 70% of the marine litter in Europe. The Directive introduces also obligations for producers to help cover the costs of waste management and cleanup, as well as awareness raising measures for food containers, packets and wrappers (such as, for example, for crisps and sweets), drinks containers and cups, and lightweight plastic bags. The industry will also be given incentives to develop less polluting alternatives for these products.

Ancillary EU legislation on packaging and packaging waste is presented in Table 10.2.

10.2 EU Regulations on Plastic and Recycled Plastic Materials Intended to Come into Contact with Food

There are strict EU regulations on plastic materials used for food contact. This also applies to recycled plastics (see Table 10.3).

Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food sets out criteria for the composition of new plastic materials. It sets out rules on the composition of plastic food contact materials (FCMs) and establishes a Union List of substances that are permitted for use in the manufacture of plastic FCMs. The Regulation also specifies restrictions on the use of these substances and sets out rules to determine the compliance of plastic materials and articles. Regulation

[1] The Directive has been published on June 12, 2019, entered into force on July 2, 2019, and has to be implemented in national regulation on July 3, 2021 at the latest.

Table 10.2 Ancillary EU Legislation on Packaging and Packaging Waste

Commission Decision	Title	Reference
Commission Decision 97/129/EC of 28 January 1997	On the identification system for packaging materials pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste	[11]
Commission Decision 1999/652/EC of 15 September 1999	Confirming the measures notified by Belgium pursuant to Article 6(6) of Directive 94/62/EC on packaging and packaging waste	[12]
Commission Decision 2003/82/EC of 29 January 2003	Confirming measures notified by Belgium pursuant to Article 6(6) of Directive 94/62/EC on packaging and packaging waste	[13]
Commission Decision 1999/42/EC of 22 December 1998	Confirming the measures notified by Austria pursuant to Article 6(6) of Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste	[14]
Commission Decision 1999/823/EC of 22 November 1999	Confirming the measures notified by the Netherlands pursuant to Article 6(6) of Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste	[15]

(EU) No 2019/37 amended and corrected Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food.

However, after these materials have been used, they do not comply anymore to the plastic Regulation, as they may have been contaminated with other substances. Therefore, a separate Regulation exists to control the recycling processes: Regulation (EU) 2015/1906 on recycled plastic materials and articles intended to come into contact with food. This Regulation amended Regulation (EC) 282/2008. In particular, it amended Article 6 concerning the authorization of recycling processes, for which the Commission shall be assisted by the Standing Committee on Plants, Animals, Food and Feed.

It is noted that plastics depolymerized into monomers or oligomers have to meet the same requirements as virgin plastic materials under Regulation (EU) No 2019/37, while plastics mechanically recycled must also comply with these and other additional requirements. There are three possibilities to use mechanically recycled plastics in contact with food [21]:

The first one is to use offcuts and scraps from the production of plastic FCMs that have not yet been in contact with food. These can be recycled within the manufacturing site where they are generated or, alternatively, at another site where an audited quality assurance system is in place and meets the requirements laid down in Regulation (EU) 2015/1906. Traceability is critical in this case to verify the source of the materials and ensure that they are not affected by any kind of pollution. Offcuts and scraps are postindustrial waste (or preconsumer), which are typically recycled within the same manufacturing site that generates them due to their high quality as waste: they usually have a controlled and homogeneous composition and are clean waste with almost no degradation. Hence, there is very limited availability of this kind of plastics in the market for secondary raw materials, but other alternatives, such as post-consumer recycled (PCR) plastics, are available [21].

The second possibility is to use PCR plastics from processes authorized by the European Food Safety Authority (EFSA) according to Regulation (EU) 2015/1906. In this case, the recycled plastics must be produced from waste coming from FCMs. Traceability is therefore critical to verify the waste source and ensure the avoidance of waste contamination through a controlled closed-loop system. If a closed loop is not possible, a "challenge test" must be performed to demonstrate scientifically that the

Table 10.3 EU Regulations on Plastic and Recycled Plastic Materials Intended to Come Into Contact With Food

Regulation	Title	Reference
Commission Regulation (EC) No 2023/2006 of 22 December 2006	On good manufacturing practice for materials and articles intended to come into contact with food	[16]
Regulation (EC) 282/2008 of 27 March 2008	On recycled plastic materials and articles intended to come into contact with foods	[17]
Commission Regulation (EU) 10/2011 of 14 January 2011	On plastic materials and articles intended to come into contact with food	[18]
Commission Regulation (EU) 2015/1906 of 22 October 2015	Amending Regulation (EC) No 282/2008 on recycled plastic materials and articles intended to come into contact with foods	[19]
Commission Regulation (EU) 2019/37 of 10 January 2019	Amending and correcting Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food	[20]

recycling process is able to reduce any contamination of the plastic waste in a way that food safety risks are totally avoided. EFSA is responsible for the risk assessment of the recycling process, and, taking into account its opinion, the European Commission will adopt a decision granting or refusing the authorization. Authorized recycling processes will be included in a register published on the Commission website. At present, there are several processes with positive scientific opinions from EFSA,

most of them for recycling of poly(ethylene terephthalate) (PET), but the authorizations by the European Commission are delayed. Hence, yet, there is no list of authorized processes published, but recycled plastics from processes with positive opinion from EFSA can be used for food contact applications in the meantime in some EU member states according to their national transitional provisions [21].

The third possibility is to use recycled plastics behind a functional barrier, as specified in Regulation (EU) No 2019/37.

10.3 Regulative Measures in Other Countries

10.3.1 China

In recent decades, vast quantities of plastics and other recyclable waste have been exported to China and surrounding countries for further processing. The cumulative plastic weight imported by China from 1992 to 2016 was calculated to 106 million metric tons (MMT), making up about 45% of all cumulative imports [22]. Through 2017, China was a major importer of recovered paper and plastic. A 2014 report by the International Solid Waste Association stated that China received 56% of the global plastic waste, including 87% of all of Europe's plastic waste exports [23].

In 2013, China introduced a temporary restriction on waste imports that required significantly less contamination. The so-called 'Green Fence Operation' was an enhanced enforcement campaign implemented by Chinese customs from February to November 2013. The goal of the Green Fence campaign was to increase the quality of the plastic waste that China was receiving, while also reducing illegal foreign smuggling and trading [23]. In 2017, China announced a new import policy permanently banning the import of nonindustrial plastic waste [24]. The so-called China's "National Sword" program, which came into effect in February 2018, bans the imports of 24 types of waste material, including eight types of post-consumer plastic scrap, and sets a tougher standard for contamination levels in others [25]. The policy bans various plastics including polyethylene, PET, PVC, and polystyrene. It also sets a stricter quality standard on the limit of contamination in scrap plastic allowed in a shipment—increasing the purity from 90−95% to 99.5%. Already, the amount of scrap plastic imported into China has fallen from 3.5 MMT in 2017 to just 21,300 MT so far in 2018, according to China's Ministry of Environmental Protection and the China Scrap Plastics Association [26].

It is estimated that 111 MMT of plastic waste will be displaced with the new Chinese policy by 2030 [22].

The impact of the National Sword program on the waste management of flexible packaging is expected to be relatively limited, as most flexible packaging is currently not collected for recycling and does not use large amounts of PCR content [27].

The severe restrictions on recovered material imports by China will force exporting countries to better develop internal markets for PCR material, rather than relying on shipments to China. Additionally, it will drive better overall technology development around sortation to increase bale quality. Further, the restrictions will reinforce the motivation to reduce use and redesign plastic packaging and products so that they retain their value and are more recyclable in domestic markets. In addition, the import and export of plastic waste are another justification for a global agreement relating to the use and management of plastic materials [22]. In the short term, countries may look to send their PCR materials to other countries with less developed regulations [27]. A country that is prepared to receive significant quantities of plastic waste could consider an import tax specifically to fund the development of solid waste management infrastructure within the country [22].

10.3.2 India

In 2016, the Ministry of Environment, Forest and Climate Change (MoEFCC) of the Government of India notified the Plastic Waste Management Rules 2016, wherein it was proposed the introduction of legislation banning the production and use of multilayer packaging structures—both flexible and rigid. In particular, the manufacture and use of nonrecyclable multilayer plastic, if any, should be phased out in 2 years' time [28]. In 2018, the MoEFCC notified the new Plastic Waste Management (Amendment) Rules [29]. While the 2016 Rules mandated the usage of only such multilayer plastic that can be recycled, the 2018 Rules have substituted it with "energy recoverable" and those amenable to "alternate use." According to the 2018 Rules, energy recovery means conversion of waste into useable heat, electricity, or fuel through a variety of processes including combustion and gasification.

The amended Plastic Waste Management Rules were received with fierce resistance from environmentalists [30]. Burning of multilayer plastics even through scientific procedures is not advisable as it omits harmful toxins that affects environment and public health. But that

aside, energy conversion in itself would be a difficult task in a country that has still not got the basics of waste management in place: segregation [30].

Further, Rule 15 (explicit pricing of carrying bags) of the 2016 Rules, 2016, which was envisaged to play a key role in discouraging plastic usage, has been omitted in the amendment. The concept of Extended Producers Responsibility (EPR), which was introduced in the Rules of 2016, still remains nowhere close to being implemented [30,31].

10.3.3 Southeast Asia

Several Southeast Asian countries took measures to ban specific plastic packaging. In July 2018, Thailand's Department of Industrial Works forbade imports of plastic waste effective immediately [32]. Thailand is joining neighbors such as Vietnam and Malaysia in cracking down on import and processing licenses and closing its doors to plastic scrap. Thailand's move came after public outcry in the country over recycling plants and importers flouting regulations and bringing contaminated plastic into the country for processing [33].

10.3.4 United States

Although the United States has no all-encompassing federal legislation regulating the packaging industry, the federal government has asserted its authority to regulate food, drug, and cosmetic packaging to preserve consumer safety and confidence. There have also been a number of regulatory programs introduced by States or local jurisdictions to reduce the use and disposal of certain packaging materials and mandate minimum recycling requirements [34].

In the United States, the flexible packaging industry operations are required to comply with many of the environmental regulations established by the Environmental Protection Agency (EPA). Premarket clearance is not required for food contact plastics produced by PCR processes. The recycled food contact plastic materials must meet the same regulatory requirements as virgin plastic materials. In particular, the specific source control is the responsibility of the producer. A producer of recycled plastic materials may ask the US Food and Drug Administration (FDA) to review its recycling process and issue a no objection letter on the suitability of its process for producing recycled plastic for use with food, and, in fact, many have pursued that path, if for no other reason than to gain a market advantage by providing greater

assurance to its customers as to the suitable nature of its product [35]. The FDA's "Points to Consider for the Use of Recycled Plastics in Food Packaging: Chemistry Considerations" guidelines state that the use of recycled polymers is permissible if it is of a type previously permitted for food contact, has been kept free of contaminates during the recycling process, and the recycled material has been tested to establish suitable purity for reuse in food packaging [36].

10.3.5 United Kingdom

In the United Kingdom, companies handling over 50 tons of packaging a year must ensure that a certain proportion is recycled under the Packaging Recovery Note (PRN) scheme. They meet these obligations by buying PRNs from recycling companies in the United Kingdom or from companies that export waste for recycling abroad [37]. The environment department Defra estimates that packaging recycling rates have increased from 31% in 1998 to 64% in 2017. That beats the EU target of 55%. However, the reported packaging recycling rates have been put in question. Since 2002, the quantity of packaging waste exported has increased sixfold, while the quantity recycled in the United Kingdom has remained the same. The National Audit Office (NAO) asserts that over half of the packaging reported as recycled is actually being sent abroad to be processed. According to NAO, there is nothing to prove that packaging sent for recycling actually gets recycled [38]. The UK Government has already acknowledged the need to reform the PRN scheme [37].

10.4 Regulatory Frameworks

The two main frameworks that are applied in the packaging industry for the effective control of waste are the sustainable materials management (SMM) and CE. Both frameworks, CE and SMM, have the goal of utilizing resources more effectively, but they approach it in a different way. In plain terms, CE focuses in recycling, while SMM in carbon footprint impact [27].

The inclusion of PCR content into the film structure is an example of an initiative that hits on both CE and SMM principles. Using PCR content allows the reuse of material that has already been recovered and turned into a new package and supports CE principles. From an SMM standpoint, utilizing PCR often results in a lower overall carbon impact due to fewer fossil fuel/natural gas resources used, which results in lower overall emissions [27].

10.4.1 Sustainable Materials Management

SMM is defined by the Organization for Economic Co-operation and Development (OECD) as an approach to promote sustainable materials use, integrating actions targeted at reducing negative environmental impacts and preserving natural capital throughout the life cycle of materials, taking into account economic efficiency and social equity [39].

According to the US EPA, SMM is a systemic approach to using and reusing materials more productively over their entire life cycles by seeking to minimize the amount of materials involved and the associated environmental impacts. SMM focuses on the efficient use of resources and the reduction of carbon impacts, taking into account economic efficiency and social consideration [40]. EPA supports use of the SMM framework as their primary model focused on sustainable development.

One of the strategic priority areas of EPA's SMM Strategic Plan for fiscal years 2017−2022 is sustainable packaging—increase the quantity and quality of materials recovered from municipal solid waste and develop critically important collection and processing infrastructure [40].

Corporate Social Responsibility (CSR) is another policy frame network that holds accountable the manufacturers of goods that create post-consumer waste. CSR concerns the social, environmental and ethical behavior of manufacturers and it relies largely on voluntary programs created by the manufacturer to prevent or remediate socially and environmentally destructive behaviors. ISO 26000 is recognized by the European Commission as being part of the core set of internationally recognized principles and guidelines regarding CSR [40a]. Major players in flexible plastic packaging, like AEP Industries, Amcor, Mondi and Constantia Flexibles, have their own SCR policies.

10.4.2 Circular Economy

CE is an alternative to traditional linear economy (make, use, dispose) in which resources are kept in use as long as possible—extract the maximum value from them, while in use, then recover and regenerate products and materials at the end of each service life (see Fig. 10.1) [41]. The linear economy model is reaching its physical limits—a fact that highlights the necessity of a more sustainable alternative. Embracing a CE approach is one such attractive option, and many businesses are already exploring this path.

Figure 10.1 Schematic representation of circular economy model versus other models (Waste 360) [42].

CE focuses on keeping material in circulation for reuse/recycling (see Fig. 10.2). The CE framework is based on three main principles:

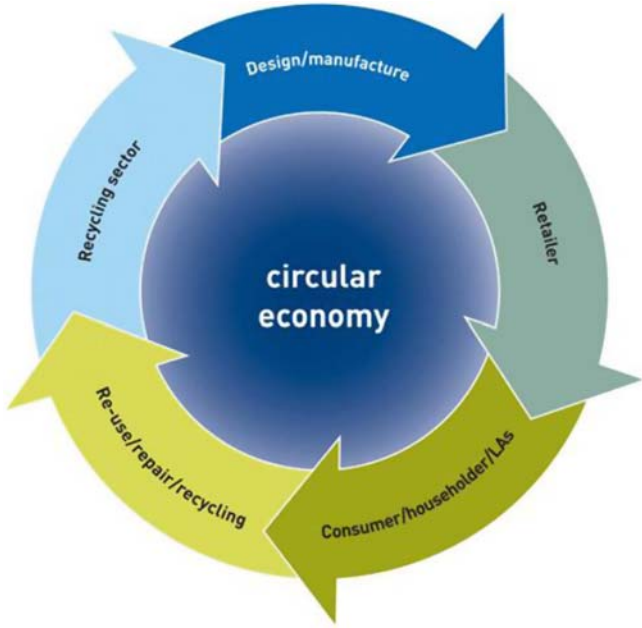

Figure 10.2 Circular economy *Courtesy of The Waste and Resources Action Programme (WRAP). WRAP and the circular economy. http://www.wrap.org.uk/about-us/about/wrap-and-circular-economy; 23-01-2013.*

- maintaining the quality and value of materials;
- optimizing resource yields; and
- fostering system effectiveness [43].

In January 2018, the European Union revealed its strategy for plastics in the CE, which seeks to transform the way plastic products are designed, used, produced, and recycled [44]. The European Strategy for Plastics has as its objective to ensure that by 2030, all plastic packaging placed on the EU market is either reusable or easily recycled in a cost-effective manner. It also addresses the issue of single-use plastic packaging.

The strategy identifies four key actions needed to meet its goals for achieving a CE for plastics:

1. improving the economics and quality of plastics recycling;
2. curbing plastic waste and littering;
3. driving innovation and investment toward circular solutions; and
4. harnessing global action.

CE has been adopted by China simultaneously with European Union as a sustainable development strategy [45].

Flexible packaging adds value in a CE through very efficient use of materials and energy resources. With flexible packaging, customized barrier protection and appropriate portioning reduces the risk of food waste, thus saving many resources. If on top of that it is collected and recycled, this increases its resource efficiency even further.

For the time being, flexible multilayer packaging is not relevant in CE as it is assumed that it is not recyclable. Improvement of recycling technologies for multilayer packaging materials will be needed for flexible packaging to play an important role in a CE, where the focus is on collection and recycling of materials.

Because much of a CE framework is about increasing the amount of material that is collected for recovery, the biggest implication will be increased pressure on the packaging industry to develop flexible structures that can be recovered and recycled. In some markets, including much of Europe, where waste-to-energy is considered a recovery method, this may be the most likely form of recovery for flexible packaging in the short- to midterm, until new technologies that allow for chemical recycling or other forms of flexible recycling are developed [27].

CEFLEX (Circular Economy for Flexible Packaging) is a collaborative initiative of a European consortium of companies and associations representing the entire value chain of flexible packaging. CEFLEX's mission is to further enhance the performance of flexible packaging in the CE by designing and advancing better system solutions [46] (see also Chapter 11, Section 11.4). CEFLEX's vision is as follows:

- By 2020 flexible packaging will have a comprehensive sustainability and circular economy roadmap for flexible packaging, including widely recognized design guidelines and a robust approach to measure, demonstrate and communicate the significant value flexible packaging adds to the CE.

The roadmap will address the following:

- resource efficiency;
- waste preventions benefits;
- sustainably returning recycled flexible packaging materials to supply identified end markets; and
- elimination of leakage.
- By 2025 there will be an established collection, sorting and reprocessing infrastructure for post-consumer flexible packaging across Europe, based on end of life technologies and processes which deliver the best economic, technical and environmental outcome for a CE.

10.4.3 Extended Producer Responsibility

EPR is an environmental policy approach in which a producer's responsibility for a product is extended to the postconsumer stage of a product's life cycle. In practice, EPR implies that producers are responsible for collecting or taking back used goods and for sorting and treating for their eventual recycling. Such a responsibility may be merely financial or organizational as well.

EPR programs shift the costs and responsibilities to the marketplace. EPR makes sure that everyone involved in the life cycle of the product shares in the responsibility for the product's life cycle impact. In Europe, produces and users of packaging pay a form of tax on the packaging they put into the market though EPR [47,48].

In Directive (EU) 2019/904, Article 8: Extended producer responsibility, Section 2 states that producers of the following single-use plastic

products listed in Section I of Part E of the Annex to this Directive will cover the costs pursuant to the EPR provisions in Directives 2008/98/EC and 94/62/EC:

- food containers;
- packets and wrapper made of flexible material containing food that is intended for immediate consumption from the packet or wrapper without any further preparation;
- beverage containers;
- cups for beverages, including their caps and lids; and
- lightweight plastic carrier bags.

The costs to be covered shall not exceed the costs that are necessary to provide those services in a cost-efficient way and shall be established in a transparent way between the actors concerned.

According to Flexible Packaging Association (FPA), there is no clear evidence that EPR is effective in increasing the recycling rates. According to a study, conducted by the consulting firm Science Applications International Corporation for the Grocery Management Association, findings showed that EPR does not necessarily improve overall recycling rates and does not prompt changes in packaging design and selection [49].

CSR is another policy frame network that holds accountable the manufacturers of goods that create post-consumer waste. CSR concerns the social, environmental and ethical behavior of manufacturers and it relies largely on voluntary programs created by the manufacturer to prevent or remediate socially and environmentally destructive behaviors

10.5 Awareness Raising

There is widespread lack of awareness of how to recycle plastic film. Most consumers have not been educated adequately about what film can be recycled or how and where it can and should be collected. As result of lack of awareness, the quality of the film recycling stream and curbside recycling stream suffers as consumers include bags and wrap in their curbside mix [50].

Various programs, initiatives, and campaigns are encouraging consumers to recycle packaging films and plastic bags. Environmental nongovernmental organizations run campaigns to educate consumers on which materials can be recycled and where to place them for recycling. These type of programs, along with increased consumer communication, are crucial for driving increased collection of flexible materials.

Environmental campaigns via TV, Internet, and social media have been putting pressure on the packaging industry. The latest of these campaigns is the pollution of the oceans by plastics. High-profile media coverage, which uses upsetting images and video, has made marine plastic pollution a hot topic [51]. Social media has been used with success for online petitions; for instance, a petition to Walkers Crisps (Pepsico) in the United Kingdom to use recyclable packaging received over 330,000 signatures. Protesters even posted crisp packets back to Walkers. The company have since announced a collaboration with TerraCycle for consumers to send in any crisp packets for recycling. Walkers has also pledged to make all their packaging 100% recyclable or biodegradable by 2025 [52]. Greenpeace runs worldwide petition campaigns asking major producers to stop producing single-use plastic for packaging [53] and supermarkets to ditch throwaway plastic packaging [54].

Borealis, a major plastic producer, has used an art installation at its Innovation Headquarters in Linz, Austria, to generate awareness to the global problem of marine litter. As shown in Fig. 10.3, a larger-than-life installation extending across the building's foyer depicts the skeleton of a huge fish, filled to the gills with plastic waste. Below the sculpture, antlike creatures can be seen carrying single-use plastic items away for recycling [55].

Figure 10.3 Sculpture of the skeleton of a huge fish, filled to the gills with plastic waste; commissioned by Borealis and designed by Saba Tsereteli and Claire Chaulet [55].

Many packaging providers have set up their own schemes to promote recycling. According to Directive (EU) 2019/904, producers will carry the costs of the awareness raising measures referred to in Article 10 of this Directive regarding those products.

The Wrap Recycling Action Program (WRAP), an initiative of the Flexible Film Recycling Group (FFRG) [56], is a US national public awareness and outreach program works with stakeholders including local and state governments, retailers, and material recovery facilities (MRFs) to educate consumers about what types of plastic film are recyclable and how and where to recycle it. Many successful WRAP campaigns across the United States have helped communities keep plastic film out of their MRFs and increase the amount of plastic film collected for recycling at drop-off locations [57]. WRAP seeks to educate and engage more consumers and businesses in effective programs to recycle plastic bags, product overwraps, and other film packaging (see also Chapter 11, Section 11.4).

The website: plasticfilmrecycling.org supported by FFRG provides information to public and businesses on how to recycle plastic bags and wraps and industrial leftover film and also communication resources that can be used to educate communities about plastic film recycling [58]. An online toolkit created by Flexible Packaging Europe has put together and created visual formats to explain about flexible packaging and sustainability. The toolkit comprises downloadable infographics, posters, a fact sheet, and a useful pocket guide [59].

The Dutch supermarket chain EkoPlaza, in cooperation with the British environmental action group A Plastic Planet, launched the first plastic-free aisle. The aisle has a selection of more than 1400 products, ranging from meat and produce to drinks and even snacks, all in plastic-free packages bearing the new Plastic Free Trust Mark. The groceries are packed using "new compostable biomaterials" (in the case of the items that still look like they are wrapped in plastic), as well as more traditional nonplastic materials such as glass, metal, and cardboard [60]. The "Plastic-Free Aisle" initiative will raise awareness among shoppers of the problems of plastic packaging.

Despite its good intentions, the EkoPlaza initiative was met with skepticism. According to the Australian zero waste blogger, Lindsay Miles [61], the language used for plastics, plastic-free, bioplastics, biodegradable, and compostable plastics is confusing. Biodegradable and compostable are not synonym terms. The biodegradable plastic bags EkoPlaza used as a replacement for traditional plastics are not decomposable in a sea environment and still pose a risk to wildlife. To be called

a bioplastic, a material only needs 20% of renewable material; the other 80% could be fossil fuel−based plastic resins and synthetic additives [62]. EkoPlaza's approach does not challenge customers to adopt a radically different and more effective shopping model, for example, by taking refillable containers to the store, something that is already being done at some of the country's new "zero waste" and "bulk shops" [63].

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