

Evaluating Planned Adaptation within the waste management system in Germany and its applicability to the US

ABSTRACT

This essay aims at discussing the concept of Planned Adaptation with respect to the waste management system in Germany, a country whose strategic approach to waste disposal is praised internationally. The first part discusses several key pieces of German legislation, outlining the transition from a framework focusing on waste disposal, to one targeting waste prevention and minimization. The second part analyzes the various drivers which contributed to the regulatory changes on both a national and international level. The last part explores whether the German model should be adapted by the US, by looking at several differences between the two countries in terms of waste management and exploring the merits of a Planned Adaptation approach. The essay concludes that attempting to apply this model to the US is not a straightforward process, but is worth considering, given the results illustrated by objective metrics, such as the very high recycling rates and low landfilling rates reported in Germany.

Introduction

The efficiency which characterizes methods used to manage waste generation and recovery in Germany has made the country a role model on an international level for addressing and regulating this sector. Germany adopts a flexible approach to waste management, whereby policy choices align with newly emerging evidence on the properties and environmental impacts of various forms of waste. Currently, Germany is the country with the highest recycling and compost rate for municipal waste in the European Union, sending to landfills only 1% of its municipal waste (Eurostat, 2016). The waste management sector employs more than 270,000 people in 11,000 companies, generating an annual turnover totaling 70 billion euros (BMU, 2018). In order to understand the factors which enabled Germany to implement such a successful waste management strategy, an analysis of national regulatory trends is imperative. The sequence of adopted regulatory changes illustrates the concept of Planned Adaptation: rules are reviewed and adjusted as better relevant knowledge becomes available (McCray, Oye and Petersen, 2010) and incentives are established to reduce key uncertainties by means of new research. In addition, current regulation accounts for future changes, thus justifying the status of subsequent modifications as planned, and not merely a consequence of previously unsuccessful legislative approaches.

This paper aims at discussing the major regulatory enforcements which have succeeded in Germany in the last decades to address waste management. The documents mentioned here were selected due to their historical impacts on revolutionizing waste management in Germany, and are only a few among a large number of ordinances and acts which have been implemented over the years. The essay also attempts to identify the major drivers of policy change in this sector, and whether the German model is applicable to the waste system in the United States (US). Each of these aspects is targeted in a separate section of the paper. This topic is discussed as an effective example of Planned Adaptation being implemented in a national policy context, with the aim of identifying what made it successful and whether this approach can be expanded on the international scene.

Part I. Developing waste management regulation following Planned Adaptation strategies

In order to understand the context in which waste management policy has been modified in Germany, it is important to consider the institutional actors involved in designing waste management regulation. Germany is divided into 16 partly-sovereign states (*Länder* in German). Both the federal

50 government and the *Länder* have concurrent authority in regulating issues such as air and noise pollution,
51 consumer protection, trade regulations and waste management. Legislation can be imposed at state level
52 only if the federal government has not already passed corresponding laws. Legislation imposed at the
53 federal level is approved by a Federal Council (*Bundesrat*) composed of 69 representatives appointed by
54 the *Länder*. The enforcement of land use and environmental laws is done at a state level, and various
55 organizations have been formed to assist with the development and implementation of environmental
56 legislature (NREL, 1995).

57 Communication between the federal government and the *Länder* is a fundamental aspect of how
58 waste management legislation is approved in Germany and it often involves multiple other actors, such as
59 public and private interest groups and organizations, ministries, *Bundestag* (federal parliament) committees,
60 trade organizations and industrial federations (NREL, 1995). Discussions and debates are held at multiple
61 stages throughout the process.

62 Until the early 1970's, municipalities were the ones responsible for managing waste in Germany.
63 Although the constitution specified the legislative roles which the states were responsible for, waste
64 management was not one of them, and the federal government was imposing legislation only where
65 explicitly provided for (Johnson, n.d.). Around that time, the primary waste disposal method in Germany
66 were the approximately 50,000 refuse dumps located outside all major towns, lacking regulation and
67 control. The government decided to impose regulations when it acknowledged the risks which such sites
68 pose to groundwater quality, with direct impacts on the drinking water provision across the country
69 (Schnurer, 2002).

70

71 *The Waste Disposal Act, 1972 and the AbfG, 1986*

72 The first uniform nationwide waste disposal law was the federal Waste Disposal Act, adopted in
73 1972. A significantly amended form of the act was adopted in 1986 (*The Waste Avoidance and Waste*
74 *Management Act - AbfG*) in response to legislation passed at the then existing European Economic
75 Community (EEC) level. In the 1972 document, waste management is defined as “the recovery or
76 production of materials/ energy from waste (reuse and recycling of waste), depositing of waste as well as
77 the necessary collection, transportation, treatment and storage”. As a direct consequence of regulating waste
78 disposal practices, the refuse dumps were replaced by around 300 landfill sites controlled and supervised
79 by local and regional governments (Schnurer, 2002).

80 The act detailed the various roles which the federal government took on in the context of waste
81 management, such as:

- 82 • Establishing targets for reducing, recovering and reusing non-toxic wastes
- 83 • Making available guidelines as to how waste should be disposed of in an environmentally safe way
- 84 • Regulating labelling and recycling of products which might lead to toxic wastes
- 85 • Regulating procedures associated with applying waste on agricultural land (NREL, 1995).

86 In this first regulatory initiative, the status of reuse and recycle methods is tightly coupled to
87 economic considerations. Under the specifications of the Act, reuse and recycling are preferred over
88 alternative disposal methods only if it is technically feasible to do so, if the additional costs when compared
89 to other options are not unreasonably high, and if the resulting materials or energy can be promoted on a
90 market which already exists or can be conveniently developed (NREL, 1995). These specifications make it
91 possible for a lot of businesses to avoid recycling/reusing as a preferred means of waste disposal over
92 landfilling. Even though the AbfG prioritized waste avoidance as the first step in the national waste
93 hierarchy (McCrea, 2011), the adoption of these acts did not result in the expected reduction of waste
94 generation rates and motivated governmental efforts to impose more stringent laws (Johnson, n.d.).

95 A key part of the Act is Article 14, which expands on one of the previously-mentioned roles that
96 the federal government takes on in this context: specifying objectives to be met regarding avoiding,
97 reducing or reusing waste resulting from certain products. The consequence of this specification was the
98 implementation of The Packaging Ordinance in 1991, a centerpiece of the German strategy in waste
99 management. The government's apparent intention to expand a particular set of terms of the Act into a

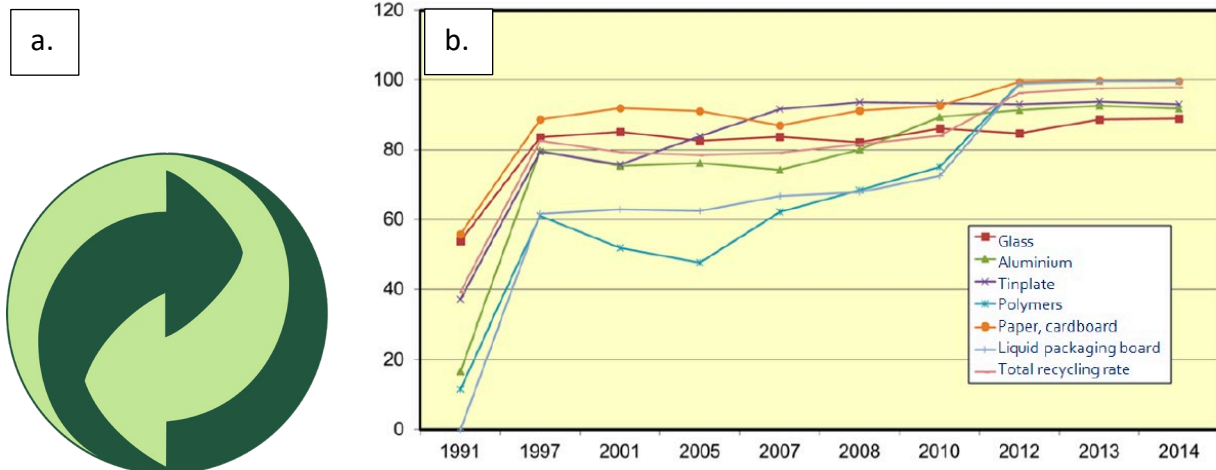
100 subsequent regulatory document can be regarded as an illustration of Planned Adaptation. In the process of
 101 adopting The Packaging Ordinance, Germany took into account the economic aspects discussed in the
 102 previous paragraph and the effect of regulation passed in 1972 and 1986, relying on this experience to
 103 propose an adjusted waste management framework. As we will see, the new framework makes it more
 104 economically convenient for manufacturers to prioritize reuse and recycling, and imposes more stringent
 105 legislative terms across the country.

107 *The Packaging Ordinance, 1991*

108 The adoption of this document (*Verpackungsverordnung*) marks Germany’s transition from
 109 voluntary agreements with the industry, to a more heavily regulated national environment with respect to
 110 waste generation. Its focus is on transport, sales and secondary packaging, thus covering products such as:
 111 materials which protect goods from damage during transport to distribution centers; containers and
 112 coverings used by consumers to transport goods or until these products are used (including disposable
 113 cutlery); additional packaging with advertising, anti-theft or self-serving purposes (NREL, 1995). Under
 114 this ordinance, manufacturers, fillers, wholesalers, distributors and retailers are obliged to recover and reuse
 115 or recycle the materials which make up all types of packaging, essentially requiring that packaging is no
 116 longer treated as municipal solid waste (NREL, 1995). The ordinance did not allow companies to credit
 117 energy generated using recovered packaging materials towards established recycling targets.

118 The Packaging Ordinance led to a substantial shift in responsibility regarding the management of
 119 packaging waste, the ways in which its collection and sorting are funded, and highlighted the concept of
 120 reintroducing part of the material into the economic loop by means of recycling (NREL, 1995). In order to
 121 manage the collection, sorting and transportation of packaging waste, a separate organization called Duales
 122 System Deutschland (DSD) was established. DSD operates separately from the public sector, which runs
 123 the national municipal waste disposal services. The creation of DSD addressed the need for a market for
 124 materials resulting from waste collection, mentioned in The Waste Disposal Act.

125 In order to benefit from services provided by DSD, companies need to pay a license fee for the
 126 disposal of packaging, which initially depended on the annual volumes of produced items. The payers are
 127 then allowed to add the Green Dot logo (Figure 1a) on their packaging, a label which indicates to consumers
 128 that the respective packaging items can be collected into separate bins (yellow bag bins). A crucial incentive
 129 for consumers to cooperate with this waste separation strategy is the absence of charges on the collection
 130 of yellow bags, in contrast with the very high fees associated with municipal waste containers (Žmak and
 131 Hartmann, 2017). The effect which the Packaging Ordinance has had on waste recovery rates in Germany
 132 is illustrated in Figure 1b, with recovery rates for certain materials increasing by as much as 60% by 1997.
 133



134
 135 *Figure 1. a. The Green Dot logo, a trademark identifying products which can be collected and recycled by DSD.*
 136 *Source: https://en.wikipedia.org/wiki/Green_Dot_%28symbol%29. b. Evolution of recovery rates in Germany as a*
 137 *percentage of total waste, from 1991 to 2014. Credits to Žmak and Hartmann, 2017.*

138 The system put in place to address the terms comprised in the Packaging Ordinance had a series of
139 important consequences on the German economy. Firstly, it created job opportunities for employees
140 working under DSD and acted as a financial boost for the country. Secondly, it contributed to the
141 development of new recycling technologies particularly applicable to plastic packaging (Schnurer, 2002).
142 Thirdly, it impacted the secondary materials market on both a national and international level. This was due
143 to the fact that DSD collected much more than what they expected when the system was first implemented,
144 and therefore incurred much higher collection and sorting costs. Instead of 110,000 tons of material
145 estimated to be collected during 1992, more than 400,000 tons were in fact collected (NREL, 1995).
146 Moreover, some administrative details were initially not properly enforced, leading to delays in fee
147 collection from companies using the Green Dot logo. The situation escalated and reached a near-collapse
148 stage in 1993. Some of the changes which were introduced to resolve the crisis included: deferral of
149 payment obligations, modifications of the fee collection process to ensure timely fee payments, and the
150 introduction of new taxation rules based on materials used in collected products. The latter point constituted
151 an economic incentive for manufacturers to upgrade to more sustainable packaging alternatives, as it
152 introduced a payment system in which higher fees were charged for heavier, more difficult to recycle
153 materials (NREL, 1995)

154 Some of the packaging collected in excess was shipped to countries such as France at very low
155 prices, with negative impacts on local efforts to collect and process waste. This situation highlights how
156 policies aimed at addressing a national issue can lead to negative externalities and potential international
157 conflicts. **The Planned Adaptation concept can be applied in this context by considering how a current piece
158 of legislation needs to be amended, in this case due to the fact that the resulting outcome did not fit projected
159 estimates. Accounting for such eventualities is a successful strategy to implement, especially when novel
160 frameworks or procedures with no existing precedents are proposed.**

161 The success of the Green Dot system was extended at a European level in 1995, when the Packaging
162 Recovery Organisation Europe (“PRO EUROPE”) was founded by DSD to avoid trade barriers across the
163 continent (Baughan and Evale, 2004). The organisation distributed the trademark logo to countries within
164 the European Union, whose packaging collection efforts had to align with uniform regulations, following
165 the example adopted in Germany.

166

167 *The Closed Substance Cycle and Waste Management Act, 1996*

168 The next step in consolidating the notions which the Packaging Ordinance is based on – the
169 polluter-pays principle, the precautionary principle, the principle of cooperation – was to expand their
170 application to waste produced by industry and the commercial sector. According to Schnurer, three major
171 factors led to the adoption of this act:

- 172 • The flow of generated waste did not decrease, despite charges imposed on waste volumes;
- 173 • The European Court of Justice accused Germany of not adopting the broad definition of waste
174 established by the European Community. By embedding waste meant for recycling in the new
175 definition, besides waste intended for disposal, Germany was required to regulate a much higher
176 volume of waste;
- 177 • The UN Conference on Environment and Development, which took place in Rio de Janeiro in 1992,
178 emphasized putting the concept of sustainability at the core of the production processes. The term
179 *closed substance cycle* was coined by Prof. Klaus Töpfer, who was Environment Minister in
180 Germany at the time (Schnurer, 2002).

181 The Closed Substance Cycle and Waste Management Act (KrW-/AbfG) was adopted in 1996 and
182 further modified in 2010 in response to the EU Waste Framework Directive (WFD, adopted in 2008). Under
183 its terms, the hierarchy of targets in dealing with waste is avoidance, recycling and disposal. The purpose
184 of the Act is “to promote the closed substance cycle in waste management in order to conserve natural
185 resources”. The appeal of such a policy framework is evident in a country which is vulnerable to potential
186 supply shortages, due to its dependence on imports of raw materials from the world market (Bahn-
187 Walkowiak and Wilts, 2016).

188 All waste generated by households and other agents was collected by national waste institutions,
 189 which were subsidized by fee payments, and preferentially disposed of within Germany (self-sufficiency
 190 principle). The Act encouraged the development of a life-cycle economy by applying the **extended producer**
 191 **responsibility principle: manufacturers were required to increase the service life of products and to generate**
 192 **the minimum possible volume of waste, by employing best available techniques within industrial centers**
 193 (United Nations, n.d.). The entire manufacturing process and service life were taken into consideration
 194 when estimating an end product's impact on the environment. Conditions required from producers and
 195 owners of waste include: high-grade, i.e. resource-conserving, recycling; reasonability of additional costs
 196 incurred compared to waste disposal; existence of a market for resulting substances or energy. **Waste**
 197 **incineration for the purpose of energy generation is now allowed only if waste has a minimum thermal**
 198 **value of 11,000 kJ/kg (household waste is exempt from this requirement) (Schnurer, 2002).**

199 The Act specifies that its provisions may be further detailed in subsequent statutory ordinances
 200 adopted by the Federal Government. This specification is **another illustration of Planned Adaptation, as**
 201 **terms which are applied to waste in general, as part of the KrW-/AbfG, are further expanded on and**
 202 **modified for particular types of waste in future regulatory documents. Examples of ordinances which**
 203 **followed the KrW-/AbfG are: the revised Ordinance on Waste Oils (2002), The Commercial Wastes**
 204 **Ordinance (2003) and The Waste Wood Ordinance (2003).**

205 The influence of the 1992 UN conference on adopting the KrW-/AbfG might be considered proof
 206 of Germany considering a **Planned Adaptation** technique which can be referred to as After-Action Review.
 207 The conference evaluated the effects of global industrial and economic practices on the environment,
 208 highlighting the need to fundamentally change these approaches to ensure wildlife species protection and
 209 to control the global warming effect of greenhouse gases. Proposing the closed substance terminology in
 210 this context illustrates the country's efforts to improve **current practices and to aim for better future**
 211 **outcomes of economic growth on an international scale.** Adopting this concept in Germany's national
 212 regulatory framework demonstrates the country's response to the UN review of the state of the environment.

213

The Waste Management Act, 2012, and the Waste Prevention Programme, 2013

214 Entering into force on 1st June 2012, The Waste Management Act (KrWG) replaced the 1996 KrW-
 215 /AbfG Act, becoming the central piece of waste legislation in the country (Bahn-Walkowiak and Wilts,
 216 2016). It replaced the three-step hierarchy in dealing with waste with a five-step process: waste prevention,
 217 preparation for reuse, recycling, other recovery (for instance, energy recovery) and disposal. The polluter-
 218 pays principle and the principle of shared public and private responsibility for waste management are also
 219 at the core of the Act, having already been invoked in earlier pieces of legislation. The KrWG transposed
 220 the requirements of the WFD related to the selective collection of paper, glass, metal and plastic, with the
 221 addition of a bio-waste stream (Cave, 2017).

222 Article 33 of the KrWG stipulated the creation of a Waste Prevention Programme, which was
 223 adopted in 2013 and focused on outlining waste prevention measures, both existing and potential, with
 224 applicability at national, regional and local levels. Its implementation was hastened by amendments brought
 225 to the WFD, requiring member states to plan waste prevention programs by the end of 2013. These
 226 programs should aim at decoupling the environmental impacts of waste generation from economic growth
 227 (Umweltbundesamt, 2010). In this case, both national Planned Adaptation strategies (similar to the
 228 previously-mentioned Article 14 clause announcing the upcoming Packaging Ordinance) and external
 229 international factors (EU regulation) have contributed to the adoption of the Programme.

230 The major objectives of the Programme are providing information and advice with the aim of
 231 increasing awareness among the general public about the need to reduce waste, alongside supporting
 232 research and development initiatives (BMU, 2018). The Programme also encourages service sharing among
 233 multiple users (for example, carpooling schemes), cutting down on food waste at every stage of the supply
 234 chains, and financial assistance of reuse and multiple use of products (O'Brien, 2018).

235 Despite laying out core theoretical principles which the new economic approach should be based
 236 on to minimize waste generation, neither the Act nor the Programme mentioned concrete targets to be
 237 reached in Germany, arguing that there is a lack of adequate data (O'Brien, 2018). The Programme only
 238

239 refers to a “maximum reduction of waste quantities in relation to economic output” (Umweltbundesamt,
240 2019). This legislative phrasing might explain why, according to the German Association for Waste
241 Management, only around 38% of waste was used as secondary raw materials in the production process in
242 2013, and only 14% of raw materials were obtained from waste at a national level (O’Brien, 2018).

243

244 *The German Resource Efficiency Programme (ProgRess), 2012/2016*

245 As a result, The German Resource Efficiency Programme came into force in 2012 (ProgRess I) and
246 was revisited in 2016 (ProgRess II). The government has to submit a report to the *Bundestag* on the state
247 of resource efficiency in the country every four years, followed by updating the program. This is an example
248 of the “look-back” Planned Adaptation strategy, which is based on regular revision of previous legislation
249 to account for reported results. It has been observed that this strategy is very rarely adopted by policymakers
250 (Lee and McCray, *pers. comm.*). The fact that it is identifiable in this context adds complexity and
251 innovation to Germany’s Planned Adaptation approach towards waste management, corroborating its
252 multifaceted strategy.

253 The new policy terms are meant to promote a circular economy, taking into consideration the entire
254 value chain, and to double resource productivity by 2020 compared to 1994 (O’Brien, 2018). Some of the
255 approaches used to encourage resource efficiency in product development are:

- 256 • Supporting resource efficiency through standard setting;
- 257 • Continuing the Federal Ecodesign Award to incentivize the adoption of environmental performance
258 standards in product design;
- 259 • Establishing ecodesign study modules as part of training product developers and designers;
- 260 • Assessing the adoption of legal instruments enabling longer lived products and sustainable
261 consumption;
- 262 • Informing producers on material efficiency, lifetime and recyclability of products according to the
263 EU Ecodesign Directive and the EU Energy Labelling Directive (O’Brien, 2018).

264 A number of measures are discussed as intended to reduce raw material consumption across the
265 country, including: assisting small and medium enterprises by offering efficiency advisory services;
266 procuring an increased number of resource efficient products and services in the public administration
267 sector; ramping up efforts in improving consumer information; transferring knowledge and technology to
268 developing countries and emerging economies (Bahn-Walkowiak and Wilts, 2016). In addition, ProgRess
269 II also targets increasing the rate of organic waste collection in Germany and improving the rate of metal
270 extraction from scrap and recycled aggregates (O’Brien, 2018).

271

272 **Part II. Major drivers leading to change**

273

274 The succession of policies which have been discussed above is indicative of a significant change
275 in perspective regarding the concept of waste since the adoption of The Waste Disposal Act. The focus has
276 shifted from regulating ways in which waste is disposed of, to highlighting methods in which certain types
277 of waste can be recycled and (partially) fed back into the production stream, to conceptualizing a circular
278 economy in which waste is seen as a resource, and preventing its generation has become the primary aim
279 of regulation. The principles targeting waste prevention are included in the product design phase, with waste
280 minimization as a priority from the onset of production. There are many factors whose interplay contributed
281 to this sequence of changes in legislative approaches. The second part of this essay is focused on trying to
282 untangle their contributions to the current waste management policy landscape in Germany. Understanding
283 their interactions is important when considering Planned Adaptation, as it enables us to explain the
284 flexibility of the German legislative system with respect to waste management. Constantly revisiting the
285 terms of various acts and ordinances implies a lack of rigidity which is a core principle of Planned
286 Adaptation, allowing policy measures to reconsider the way in which processing waste is perceived by the
287 national and international communities.

288 It seems that this revisiting process was both a matter of planning such successive interventions,
 289 and a reaction to previous unsuccessful attempts. Examples of the former scenario are the anticipation of
 290 The Packaging Ordinance when considering Article 14 of the Waste Disposal Act, and the follow-up to the
 291 KrW-/AbfG with a succession of product-specific ordinances. The fact that the *ProgRess* reports were
 292 designed to be evaluated and modified accordingly every four years is another illustration of the
 293 premeditation put into practice by the German government with respect to waste management strategies.
 294 An example of the latter approach (reacting to negative consequences) is the modification of how the DSD
 295 fee collection system was regulated after the 1993 crisis.

296 The four major types of drivers which led to the current state of the German waste management
 297 system are: international legislation, specifically that adopted by the EU; national legislative principles
 298 established in the previously-analyzed documents; administrative approaches referring to the actual
 299 implementation of acts and ordinances; and consumer incentives.

300

301 *EU Legislation*

302 The EU Landfill Directive was adopted in 1999 to regulate waste management in landfills, to
 303 minimize their environmental effects and human health risks, and reduce the amount of landfilled
 304 biodegradable waste. The directive requires the amount of biodegradable municipal waste to be reduced at
 305 35% of 1995 levels by 2016. Such efforts aimed at diverting certain types of untreated municipal waste
 306 away from landfills were already underway in Germany. In 2005 Germany implemented provisions which
 307 went beyond the EU requirements, by banning all untreated residual household and industry waste from
 308 landfills (Cave, 2017), with required pre-treatment taking place in incineration plants or mechanical-
 309 biological treatment plants (Nelles et al., 2016). Despite these regulatory efforts, however, there is no
 310 evidence that the Landfill Directive contributed to preventing waste generation in Germany (EEA, 2009).

311 The WFD was adopted by the EU in 2008 and reviewed in 2018. Its provisions were used to set the
 312 terms of several pieces of German legislation, particularly KrWG and ProgRess II. Articles 10 and 11 of
 313 the WFD require the separate collection of waste with a minimum provision of 4 streams – paper, metal,
 314 plastic and glass – by 2015. These requirements were transposed into German legislation as part of the
 315 KrWG. They replaced the previous 2-stream waste collection system with one in which paper, metal,
 316 plastics and glass are to be collected separately from 1st January 2015 (Article 14). The addition of a
 317 supplemental bio-waste stream (established through a Bio-waste Ordinance adopted in 2015) sets Germany
 318 apart from the other EU member countries in this regard (Cave, 2017). This is an example of German
 319 legislation going beyond EU recommendations in establishing national waste management strategies.

320 WFD established that waste prevention is the most favorable option in the waste hierarchy and
 321 should be adopted before reuse, recycling and recovery (Directive 2008/98/EC, Article 4). Under its terms,
 322 waste prevention had both a quantitative (limiting the amount of waste) and qualitative (related to the
 323 impacts of waste on the environment and human health) dimension, at the same time addressing the
 324 prevention of harmful substances in products (Magrini et al., 2019). The requirements specified in the
 325 directive contributed to Germany's adoption of its national waste management plan in 2010, and of its
 326 national waste prevention program in 2013. The directive allows EU member countries to adopt their own
 327 regulatory frameworks (measures, benchmarks, targets, progress/performance assessment methods) in
 328 implementing its terms, thus providing a legal framework within which individual countries can exercise
 329 independence in establishing national provisions.

330 The effectiveness of putting Planned Adaptation at the core of Germany's waste management
 331 regulatory system makes it possible for the country to respond to changes in EU legislation in a well-
 332 organized and natural manner. At the same time, it ensures that the national response as to how various EU
 333 directives are implemented consistently builds on provisions enacted in earlier acts and ordinances. The
 334 German waste management policy context is already responsive to change and inherently resilient due to
 335 embedding Planned Adaptation in its strategic approach. An external factor such as international regulation
 336 may strengthen this response, but does not make the German legislative framework in this sector completely
 337 dependent on such enforcements.

338

339 *National legislative approaches*

340 A principle which resurfaced multiple times in the previously discussed documents encompasses
341 the producer's responsibility in dealing with waste. It is also referred to as extended producer responsibility
342 (EPR), as it makes manufacturers consider what happens with their products after they are sold, which is
343 not the case for the traditional approach (Short, 2004). Germany introduced this principle for the first time
344 via The Packaging Ordinance in 1991, and it was the first European country to do so (Cave, 2017). It
345 continued to reinforce its implementation via the KrW-/AbfG. This approach made manufacturers
346 reconsider product design so as to minimize the costs associated with the collection and processing of
347 resulting waste.

348 Another fundamental principle in German waste legislation is the polluter pays principle. The
349 German waste management system is entirely financed by fees from manufacturing and producing units,
350 and it lacks governmental subsidies (Nelles et al., 2016). The fee system accounts for different types of
351 materials used in products, as a function of their ability to be recycled, rather than the total volume of
352 resulting waste. This approach was first introduced in German legislation when The Packaging Ordinance
353 came into effect in 1991 and it has been present in the national context ever since.

354
355 *Administrative approaches*

356 The separate collection scheme used by Germany has several characteristics which make it a
357 particularly successful one. The system is consistent throughout the country, involving the usage of bins
358 with different colors for waste separation, with the same type of bins being used in households and
359 businesses alike. Other factors contributing to the success of the initiative include: enforcing supervision at
360 the point of collection, by means of fines for non-compliance and stickers identifying wrong materials; a
361 bin labelling system based on bar codes read at the point of pick-up, for which cost is differentiated based
362 on waste material (very low cost per weight for food waste and recycling, very high for remaining garbage);
363 the use of bio-digesters for food waste (Cave, 2017).

364
365 *Consumer and producer/manufacturer incentives*

366 In 2003, a national deposit-return scheme for refillable drinking packaging was introduced.
367 Customers pay 25 cents for refillable plastic packaging for beverages purchased in stores, and are
368 reimbursed when returning the empty containers. According to Zero Waste Europe, the result of this
369 strategy was a 98.5% return rate of refillable bottles (Cave, 2017). Since 2005, every shop with an area of
370 more than 200 m² needs to have a collecting facility in place for customers to return the plastic containers
371 (Žmak and Hartmann, 2017).

372 Besides this financial incentive, another such initiative was implemented when The Packaging
373 Ordinance was promulgated. As previously discussed, it refers to fee waivers on the collection of yellow
374 bags destined for the DSD packaging return scheme and relatively high fees charged per household for the
375 collection of municipal waste bags.

376 The succession of the legislative documents discussed above highlights the encouragement of a
377 behavioral change among the German population, namely putting waste prevention and resource
378 minimization above ways of dealing with waste once it has been produced. Strategies such as the
379 introduction of ecodesign study modules and more comprehensive customer information campaigns
380 mentioned in the ProgRes reports are targeted at educating customers, with the aim of changing their
381 approach towards waste generation. Such methods should be strongly encouraged in the country which,
382 according to Umweltbundesamt (The Federal Environmental Agency), had the highest per capita packaging
383 consumption in the EU in 2016, with more than 220 kg per individual. The fact that such high figures are
384 recorded after the legislative efforts of 2012 and 2013 (the KrWG and the Waste Prevention Programme)
385 highlights how difficult it is to shift behavioral patterns towards a more minimalistic and efficient lifestyle.
386 Umweltbundesamt has attributed the high levels of packaging consumption to a continued trend for
387 preferring smaller over large size packaging, having products delivered via mail instead of shopping locally,
388 and opting for takeaway food. It is expected that efforts at promoting waste prevention will continue to be
389 a central part of future German legislation in this sector.

390 Planned Adaptation is also materialized in these behavioral approaches, as it enables shifts in social
391 perspectives towards tackling waste in national regulation. In the last decades, there has been a continuous
392 change in how citizens worldwide reconsider product acquisition, as more research has shed light on the
393 negative effects that a consumption-intensive society has on the environment. As a result, behavioral
394 practices have started to change, from avoiding purchasing food wrapped in single-use plastics, to limiting
395 meat consumption in an attempt to protect global resources such as forest cover. The efficiency of the waste
396 management strategy of Germany is partly due to taking into consideration such sociological implications
397 when designing its policy.

398

399 **Part III. Could Germany be used as a model for the US regarding waste management?**

400

401 Germany is considered the country with the strongest packaging legislation in the world and has
402 long been regarded as an international role model for solid waste management (NREL, 1995). At a
403 multinational level, The Packaging Ordinance stimulated the promulgation of the European Packaging
404 Directive in 1994 (Viehöver, 2000), which stipulated that all member states must establish a system for the
405 collection and recovery or recycling of used packaging. As is the case with WFD, the Packaging Directive
406 allowed individual countries to be flexible as to how these terms would be integrated into national
407 regulations (Short, 2004). Complementing the impacts of European legislation, the establishment of PRO
408 EUROPE proved a successful initiative across the European Union, with ten more members implementing
409 the green dot system by 2001, and a current list of 31 members, both within and outside of the Union.

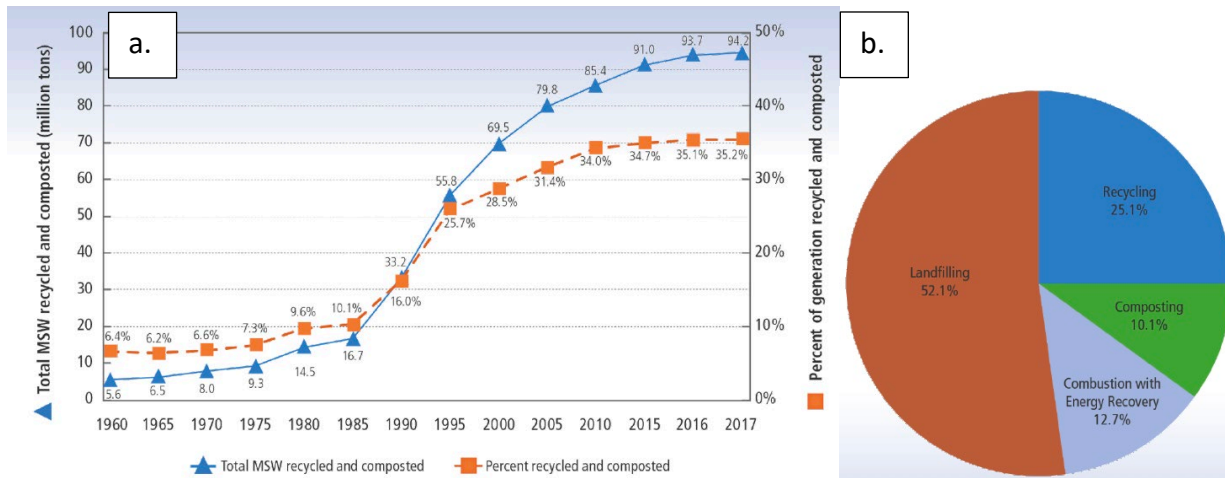
410 Considering the German model on a national level, France passed in 1992 Decree No. 92-377
411 regulating packaging waste, whose Article 4 stipulated that any entity which is responsible for marketing a
412 product must contribute to, or provide for, the disposal of all associated packaging waste (Short, 2004). The
413 equivalent of DSD in France is a firm called Eco-Emballages S.A., which organizes the national collection
414 and recovery system. The major difference between the two firms is the fact that Eco-Emballages does not
415 collect the waste itself, but instead partners with local authorities responsible for collecting packaging,
416 which in turn receive support from the firm. The producers pay for the collection of packaging associated
417 with their products based on a flat-rate amount and an additional charge which depends on weight and
418 material used (Short, 2004). The resulting outcome of this partnership was a jump from a 13% glass
419 recycling rate in 1992 (the only material collected since 1974) to a 67% recycling rate in 2012, applied to
420 all types of packaging.

421 According to Short (2004), a key factor determining the success of the German and French
422 initiatives is the privatization of duties – such as defining what is recyclable packaging and setting charges
423 for producers to be included in the program. The author refers to privatization as an important lesson offered
424 by the German model and one which should be adopted in future attempts at establishing similar initiatives.
425 Another equally important factor is the fact that these initiatives are mandatory (McCrea, 2011). As has
426 been discussed above, before the implementation of The Packaging Ordinance, agreements with industry
427 were voluntary in nature, and no significant trend in waste reduction has been observed. The promulgation
428 of stricter regulation has paved the way towards today's well-established and stable waste management
429 system in Germany.

430 Compared to the US, Germany has been faced with waste-related issues for a longer time, due to a
431 more limited availability of territory for establishing new landfill sites, a higher population density, a longer
432 history of putting into practice alternative waste treatment and disposal methods (NREL, 1995) and a
433 limited supply of natural resources. In contrast, the US comprises large regions which lack extensive
434 industry and are not densely populated, and benefits from vast natural resources which result in lower
435 material costs (Short, 2004; Reynolds, 1995). Establishing a national waste collection system copied after
436 the German one could prove unpractical, given the distances between waste processing facilities and
437 population centers (Short, 2004).

438 Acknowledging these considerations, the last part of this essay aims at evaluating the extent to
439 which Germany's regulatory framework regarding waste management could be applied within the US. To

440 put things into perspective, Figure 2 shows the evolution of municipal solid waste recycling and composting
 441 rates in the US in 2017, and the breakdown of waste disposal methods across the country. The
 442 corresponding statistics for Germany are a 1% landfilling rate in 2016, 67% recycled household waste and
 443 70% recycled commercial and production waste (BMU, 2018).
 444



445
 446 *Figure 2. a. Municipal solid waste recycling and composting rates between 1960 and 2017 in US. b. management of*
 447 *municipal solid waste in the US in 2017. Adapted from EPA, 2019.*

448 Despite its division into *Länder*, Germany has shown a remarkable consistency in implementing
 449 waste management policies at a national level. This is partly due to the continuous dialogue between various
 450 stakeholders involved in the decision-making processes at multiple stages, before adopting a new piece of
 451 legislation. The justification behind this approach is the attempt to address differences of opinion among
 452 stakeholders during the developmental and passage phases of regulations, rather than by means of court
 453 action subsequent to their promulgation (NREL, 1995). Such an approach is referred to as a “top-down”
 454 strategy driven by rationally derived principles, which are then implemented in various legislative
 455 initiatives (Johnson, n.d.). Examples of such principles are the ones mentioned above, referring to the
 456 producer’s responsibility, the self-sufficiency and the polluter pays principle. This “top-down” strategy has
 457 been implemented throughout the EU via documents such as the WFD, the European Packaging Directive
 458 and the Landfill Directive, as they set out the major objectives of adopted regulation, but do not specify
 459 uniform, quantitative targets for the member states. It is each member state’s responsibility to translate these
 460 broad principles into regulation depending on the legislative landscape specific to each nation. A similar
 461 strategy could be implemented in the US, where uniform national goals could be accompanied by a flexible
 462 range of targets which would suit the profiles of individual states.

463 In contrast, the policy framework in the US can be described as a “bottom-up” approach based on
 464 a case-by-case consideration of facts, typical for a decentralized management system which favors the
 465 optimization of existing conditions over the implementation of innovative strategies (Johnson, n.d.).
 466 Compared to Germany, the precautionary principle is not firmly rooted, and even though the polluter pays
 467 principle is accepted, the costs that the industry incurs as a consequence of environmental regulations
 468 weighs heavily in discussions (Schreurs, 2003). The first federal attempt at establishing waste-related policy
 469 was The Solid Waste Disposal Act of 1965, which stipulated technical and financial assistance for state and
 470 local governments to support waste disposal initiatives. However, it did not specify any nation-wide action
 471 towards centralizing waste planning, allowing each state to decide on individual policies (Johnson, n.d.).
 472 Subsequent policies continued to be based on the same approach, and as a result, a federal authority on
 473 waste management never fully developed in the US. This led to litigations on the subject being resolved
 474 through the Supreme Court (Johnson, n.d.; McCrea, 2011), a tendency that makes the US context a more
 475 confrontational one, which is also reflected in the decision-making processes (Schreurs, 2003). There are
 476 no regulations regarding take-back of waste by manufacturers following products utilization, partly due to

477 the lack of authority of the US Environmental Protection Agency (EPA) (Short, 2004). Even though the
478 Resource Conservation and Recovery Act (RCRA) of 1976 gives EPA the authority to establish minimum
479 federal standards for the disposal of non-hazardous solid waste, each state is responsible for developing
480 plans to enforce the standards (McCrea, 2011).

481 The need for changing consumers' and producers' viewpoint on the traditional, linear model of
482 product manufacturing – also called cradle-to-grave approach, in which resources are consumed for product
483 creation, sold and then disposed of – has also been acknowledged in the US (McCrea, 2011). The barrier
484 to employing a circular approach – the one promoted by ProgRes I and II in Germany – is economic in
485 nature: it is more profitable in the short term to simply dispose of the resulting waste, rather than employ
486 long-term methods such as reuse or recycling (Ackerman, 1997). This could explain why, despite EPA's
487 recommended waste hierarchy which places waste avoidance at the top and landfilling at the bottom,
488 regulation in the US is highly focused on disposal (the Clean Air Act applies to emissions from landfills
489 and incinerators) and clean-up (the Comprehensive Environmental Response, Compensation and Liability
490 Act – CERCLA – makes polluters accountable for the clean-up costs associated with historically
491 contaminated disposal sites) (Thomson, 2009). It has, in fact, been argued that CERCLA can be considered
492 a precedent for federal legislation aimed at making manufacturers liable for product packaging, at the same
493 time not infringing upon their individual liberties (McCrea, 2011).

494 Even though the US has been a pioneer of environmental policy in the 1970s, with a powerful
495 environmental NGO community developing around the same time, the country did not maintain its position
496 as a leader in implementation. Contributing to this historic reality are both its federal structure and the
497 increased use of litigation as a way of opposing regulation (Schreurs, 2003). In the 1980s, the industry
498 intensified its anti-regulatory endeavors, arguing that many environmental legislations impeded the success
499 of economic activities. The effort culminated in the attempt of the Reagan administration to weaken EPA's
500 authority and undo many regulations. The most straightforward way in which environmental policy can
501 change in the US is when activists partner with industry representatives in support of a particular legislative
502 action (Schreurs, 2003). Under these circumstances, it is increasingly difficult to prevent bias from entering
503 the policy agenda, potentially leading to the adoption of measures which do not address environmental
504 issues in an efficient way. It is highly unlikely that the industry will ever become voluntarily supportive of
505 such legislation. This explains the need for Germany to make its waste collection and recycling approach
506 mandatory and uniformly adopt the EPR principle.

507 Despite the lack of a uniform EPR strategy across the US, initiatives to collect and process waste
508 have been implemented in a number of states. Maine was the first state to adopt EPR regarding the take-
509 back of electronic waste in 2004, making manufacturers responsible for its recycling or safe disposal. Its
510 labelling system was similar to the Green Dot, and the initiative has been extended to 23 states and New
511 York City by 2011 (McCrea, 2011). But EPR in the US has so far been adopted on a product-by-product
512 basis, a situation which does not solve the issue of hundreds of other types of waste produced in the US.
513 The much needed "framework approach", applicable to multiple products concomitantly, has not, as of
514 2013, been implemented in any state (Nash and Bosso, 2013).

515 There are certain advantages associated with developing waste management legislation at the state,
516 rather than the federal level. States' powers are not limited to constitutional rights, as is the case for
517 Congress, and states' inherent authority to protect the health, safety and welfare of their citizens is translated
518 into a larger potential engagement in environmental policy design; moreover, state-federal partnerships are
519 another possible plan of action (Campbell-Mohn, Breen and Futrell, 1993). As Justice Brandeis proposed,
520 individual states could act as laboratories when it comes to policy matters, applying various approaches and
521 thus enabling inter-state comparisons of the benefits and challenges of each. Such natural experiments could
522 ultimately inform the policy-making process at the federal level. The same perspective has been embraced
523 when suggesting that implementing an EPR approach in the US would be much more successful on a state-
524 by-state basis, to account for local consumption habits (McCrea, 2011). This strategy does not come without
525 its challenges: manufacturers might have a difficult time in trying to comply with a patchwork of multiple
526 state laws rather than a single, uniform provision of terms (Short, 2004). On the other hand, the size of the
527 US makes it difficult for a uniform, federally-managed system to operate across its territory. However, it is

528 worth keeping in mind that an entity created after the French model is based on a partnership with state
529 institutions, which might be a suitable course of action in the US.

530 Trying to explain the differences between Germany and the US with respect to another
531 environmental issue (namely, the fact that the industrial discharges into the Great Lakes were more toxic
532 than those of German factories into the Rhine, despite more stringent American regulation), Marco Verweij
533 proposes several contributing factors, also applicable to the waste management context. He argues that the
534 concept of American exceptionalism promotes liberty and individualism as major ideological concepts,
535 whereas European values emphasize hierarchy, authority and deference (Verweij, 2000). Such discrepancy
536 may be translated into a weaker tendency to abide by legislation in the US, where the industry is more prone
537 to refuse environmental standards.

538 Another difference between the two countries is that non-governmental actors have fewer chances
539 to get involved in such policy making in Germany, whereas their right to sue various companies or state
540 agencies when failing to enforce environmental legislation in the US is not “conducive for a coming
541 together of the minds” (Verweij, 2000). NGOs and environmental research institutes compete with
542 industrial agents to have their interests represented on Capitol Hill, whereas the rise of similar groups in
543 Germany was followed by the creation of a Green Party; once elected to parliament, the Green Party played
544 an important role in facilitating discussions between various stakeholders with respect to environmental
545 regulation (Schreurs, 2003).

546 Moreover, the fact that the US is a presidential system, while Germany is a parliamentary one,
547 comes with another set of discrepancies. The American presidential system is prone to lobbying of
548 Congressional committees by various interest groups which therefore influence policy matters.
549 Furthermore, legislators have less responsibility for implementing the laws they propose, sometimes
550 resulting in the adoption of unrealistic laws. Germany’s parliamentary system, on the other hand, enables a
551 more coherent approach towards law promulgation, due to the close collaboration between different
552 ministries while creating legislation (Verweij, 2000). These observations are confirmed by the previously-
553 mentioned German perspective towards waste regulation, centered on dialogue between multiple
554 stakeholders at various stages in the process.

555 Yet another difference between Germany and the US is the adoption of corporatism over pluralism.
556 Germany, as many other European countries, adopted corporatism as a system in which negotiations
557 between organizations are supervised by the government and aim at reaching a consensus acceptable to all
558 parties. Under pluralism, however, “individual actors fend for themselves” (Verweij, 2000), lacking the
559 motivation to come together and contribute constructively to the creation of environmental regulation.

560 To put these arguments into perspective, we can compare the US and the EU approaches related to
561 the movement of waste between states. The US Supreme Court has maintained the view that limiting
562 interstate waste movement would infringe upon the idea of trade in general, since waste is considered a
563 form of goods. In contrast, the European Court of Justice has prioritized principles such as self-sufficiency
564 and proximity of waste disposal sites to the sources of waste, in an attempt to account for the environmental
565 impacts associated with waste transportation (Johnson, n.d.). The latter line of action is also meant to avoid
566 interstate conflicts, such as the one which resulted from the export of significant quantities of collected
567 packaging in Germany in 1992 (see the Part I discussion on The Packaging Ordinance).

568 This illustrative example supports the statement which McCray, Oye and Petersen (2010) make
569 with respect to the adoption of Planned Adaptation strategies in the American legislature: “the demand for
570 self-corrective mechanisms in American regulation is persistent as a general nonpartisan *good government*
571 principle, but is as yet unpopular in application”. The authors affirm that it is American agencies, rather
572 than governmental administrations, which do not support the concretization of this strategy on a national
573 level. Some of the possible reasons include: the fact that agencies are not eager to install self-correction
574 measures, even when applied to isolated policy contexts; their need to enforce rules which have to be
575 credible, and whose effectiveness therefore diminishes if these rules are softened or removed altogether at
576 a later stage; the consideration that an agency’s public reputation could be threatened if rules are changed
577 often (McCray, Oye and Petersen, 2010).

578 However, the German regulatory approach which was analyzed in this essay serves as an example
579 of a successful application of the Planned Adaptation strategy into a national legislative framework. At an
580 institutional level, there is a certain degree of similarity between Germany and the US, in that both countries
581 are divided into semi-independent legislative bodies (*Länder* and states, respectively) with some autonomy
582 in law implementation. It might therefore be possible for the US to draw inspiration from Germany's
583 methods of establishing a dialogue between different agents involved in law promulgation and build a more
584 centralized decision-making body.

585 Considering Planned Adaptation a fundamental principle as part of law enforcement is particularly
586 efficient in areas where new knowledge is constantly emerging. Environmental regulation is such a domain,
587 with new studies constantly reassessing the effects of anthropogenic actions on the natural world and
588 recommending more stringent standards for pollution levels, waste disposal methods, manufacturing
589 processes etc. In Germany, government policy is increasingly guided by the precautionary principle,
590 favoring the adoption of environmental protection measures when scientific uncertainty is significant
591 (Schreuras, 2003). Embedding such updated knowledge into law does not weaken a particular agency, on
592 the contrary, it offers a country a certain level of resiliency which becomes an advantage in the face of rapid
593 changes, such as the ones posed by the ongoing climate crisis. It also characterizes a mature society which
594 has the ability to readdress prior consensus scenarios and reach new agreements in a timely and efficient
595 manner. The key concept embraced by those who place Planned Adaptation at the core of their legislative
596 efforts is that policymaking in these fields is open-ended. The documents discussed here represent a series
597 of sequential adjustments in which conclusions specified in previous acts feed into the new ones, thus
598 establishing continuity while allowing for a flexible approach. The credibility of Germany's regulatory
599 bodies is by no means diminished by applying such methods. Quite the opposite, Germany's waste
600 management policy framework is appreciated on an international level.

601 A prior analysis of examples from the US indicated that in all cases where Planned Adaptation was
602 observed, this approach "has been imposed from outside the executive agencies themselves" (McCray, Oye
603 and Petersen, 2010). This is certainly not the case in the Germany waste management context, as Part II of
604 this essay indicates. Even though EU legislation has played an important role in revisiting the terms of some
605 of these documents, in some cases Germany went beyond what was stipulated at the union level, and
606 supplemented EU's recommendations with national incentive schemes. According to the terms of ProgRess
607 II, Germany also actively shared its knowledge on waste disposal matters with countries in which such
608 technology is currently under development. The unexpected success of The Packaging Ordinance in such
609 a short time following implementation indicates that the population is on board with governmental
610 initiatives, actively supporting efforts targeted at better waste management. People's predisposition to being
611 a factor in augmenting environmental problems should be kept in mind when attempting to change the US
612 system: Vandenbergh (2001) affirms that many US citizens fail to acknowledge their contribution to such
613 issues and resist attempts to change individual behavior. Therefore, both internal and external factors lead
614 to the successful implementation of Planned Adaptation in the national legislative context and should be
615 considered if this model is to be extended to the US.

616 If attempted in the US, the German approach should initially be adapted to the new context, due to
617 the complexity of factors influencing the outcome of a particular piece of legislation in a specific national
618 setting. The discussion about whether to implement adaptive policies at the state rather than federal level is
619 important to keep in mind in this context. Variations of certain parts of the German waste management
620 system should be carefully considered. Understanding the role of demographics, legal systems, culture,
621 economy, history, geology and resource provisions, among other factors, in shaping the impact of such
622 national legislation is imperative when considering applying it to a new country (NREL, 1995). Taking into
623 account all these variables might prove a lengthy and convoluted process. Nevertheless, we believe that it
624 is worth considering this regulatory shift when aiming for a better waste disposal system. Germany's
625 extended Planned Adaptation strategy regarding waste management offers constructive lessons from the
626 past, as well as examples of effective measures to overcome policy challenges and promote a responsible,
627 sustainable manufacturing approach. It is certain that future regulatory courses of action will continue to
628 adapt to emerging knowledge and the ever-changing status of technology in the field. As the legislative

629 documents analyzed here prove, multiple techniques should be employed when applying Planned
630 Adaptation to policy decisions. They ensure a thorough understanding of the complexities associated with
631 Planned Adaptation and flexibility in the face of eventual externalities which might occur alongside system
632 implementation.

633

634 Conclusion

635

636 This analysis concludes that placing Planned Adaptation at the core of the German waste
637 management system has succeeded in creating a resilient legislative framework, able to tackle waste
638 disposal issues in a very efficient way and serving as an international model for similar initiatives. Multiple
639 Planned Adaptation techniques can be identified when analyzing the adoption of various legislative
640 documents, highlighting the complexity of this approach in German waste management regulations. It is
641 expected that terms set in documents which are currently legally active will be updated in future acts and
642 ordinances, in accordance with a process which has been operating since the beginning of waste regulation
643 in Germany. The success of this method is due to both international factors, such as EU legislation, and
644 national ones, such as a consistent administrative approach towards bin labelling, efforts aimed at educating
645 the population to secure their support, and promoting a sound set of principles throughout promulgated acts.
646 There are numerous differences between the process adopted by Germany and the one active in the US
647 regarding waste disposal. However, we believe that an attempt at applying Germany's strategy to the US is
648 enabled by a certain degree of similarity between the two countries' institutional settings, and should be
649 pursued in the future.

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