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The Circular Economy – Implementation

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ავტორის შეხედულებები არ წარმოადგენს აშშ საერთაშორისო განვითარების სააგენტოსა და აშშ მთავრობის აზრს.

The Circular Economy – Implementation

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Introductory Remarks: *The second part of the textbook focuses on the implementation of a circular economy. However, as the discussions and the examples provided in the first part have shown, this is not straightforward. So far, most environmental policies in this area have more or less severe deficiencies and need a thorough analysis.*

Thereafter, it will be possible to concentrate on the design of incentive compatible, holistic environmental policies – Integrated Environmental Policies, which support the waste hierarchy, an integral part of a circular economy.

In order to understand the material contained in this part, it is recommended to read at least the first three chapters of the first part of the textbook.

1. A Short Repetition

As we know from the first part of this textbook, a circular economy can be considered as a certain solution of the economic allocation problems, taking into account, in particular, the environmental commodities (clean air, soil, water, climate, etc.). It has to be remembered that the allocation of these environmental commodities determines also the degree of environmental pollution. Due to external effects (Tragedy of the Commons, Prisoners' Dilemma, ...), this task, allocating the environmental commodities, cannot be completely trusted to the market mechanism.

It is therefore left to the environmental policies to take care of the allocation of these special commodities. Thereby various quite basic issues have to be considered. There is, first of all, the question, which allocation should be achieved, i.e., the question about the goal of the environmental policies. With the vision of a circular economy, this goal can be defined as sustainability, or as a sustainable development (cf. Chapter 1 in the first part). According to the "Earth Summit" in Rio de Janeiro in 1992, a sustainable development respects an economic agenda, a social agenda and an environmental agenda (cf. UN 1992).

Of course, there still remains the question of a precise concept of sustainability, or of a circular economy, emphasizing more the economic and environmental part of sustainability. This helps to explain the uncertainty regarding the concept of a circular economy. Moreover, and this refers to the second basic issue, which needs clarification, how to achieve a sustainable development, or how to move towards a circular economy?

As answers to these basic questions are obviously interdependent, we can only refer to some general principles, which are expected to be required for sustainability or a circular

economy. The waste hierarchy represents one of these central principles to this regard, although, as indicated in the first part of this textbook, there might be situations for which deviations should be considered.

For all these reasons, a circular economy, focusing on economic and environmental issues of sustainability, is currently often reduced to implementing the waste hierarchy with respect to all kinds of waste: municipal and household waste, packaging waste, hazardous waste, WEEE, end-of-life vehicles, food waste, noxious emissions, greenhouse gas emissions, marine pollution ... Sometimes, practical implementations refer only to recycling, thereby equating prevention of waste with reducing the amount of waste to be landfilled.

Implementing the circular economy is therefore, at this conceptual stage, tantamount to strictly following the waste hierarchy in all the areas indicated above. Measures to achieve these goals can be manifold. As environmental awareness plays a role, there might be efforts to raise environmental awareness through educational programs. This could happen in schools, but also through Corporate Social Responsibility (CSR) modules in various study programs. Of course, with such programs, aspects of sustainability beyond pure economic or environmental issues could also be addressed. Moreover, raising environmental awareness is important for dealing with more global environmental issues, such as climate change, for example.

Coming back to the circular economy, the prominent tools for enforcing the waste hierarchy are appropriate environmental policies. In this second part of the textbook we will therefore first have a closer look at available instruments to be employed in environmental policies. The analysis starts with environmental standards, which play a role in most environmental policies. Also, the question, how to make decisions about raising these standards, will be touched. Experience tells us that standards, which are perceived to be “too high”, can lead to problematic consequences.

Thereafter we briefly review command-and-control policies as well as market-oriented policies. The following chapters are then devoted to “holistic” approaches to environmental policies, including Extended Producer Responsibility (EPR) and Integrated Environmental Policies (IEP). Especially EPR, together with a Design for Environment (DfE) is sometimes referred to as a “business model” for the implementation of a circular economy. In view of the current issues with various practical examples of EPR policies, there will be a careful analysis of possible deficiencies, arriving at relevant “constitutive elements” for the design of such policies.

After addressing some aspects of policies in the context of mitigating climate change, examples of policies will be developed, which support the path towards a circular economy. Again, the differences to current policy approaches will provide further insight regarding the implementation of a circular economy.

2. Tools for Environmental Policies

In this chapter we will briefly present and discuss relevant features of prominent tools of environmental policies, which are of importance for implementing a circular economy. For more detailed information on these and further policies cf., for example, Wiesmeth (2011) or other textbooks in environmental economics.

2.1 Environmental Standards

This section addresses environmental standards, which again arise from our incomplete knowledge about minimum levels (adequate waste collection rates, recycling rates, adequate share of electricity from renewable sources, ...) or maximum levels (tolerable air or water pollution, greenhouse gas emissions, ...) required for an efficient allocation with environmental commodities. They simply replace the generally unknown efficient levels of the environmental commodities. In Georgia, the National Waste Management Action Plan (Georgia 2016), for example, which has to be developed according to Art. 6 of the Waste Management Code (Georgia 2014), refers to various standards in the area of waste management.

Environmental standards are also important for the perception of environmental policy: if the quantities of the regular consumption commodities can be provided at higher environmental standards, i.e., without higher costs but with lower environmental pollution, consumers and producers are likely to prefer this more environmentally friendly situation. However, as soon as stricter environmental standards result in lower quantities of some commodities, competition arises between economic and environment concerns. In Germany, for example, private transport activities might be reduced due to levels of nitrous oxides exceeding the standards. Following this discussion might be interesting.

How to find appropriate values for certain standards? In many cases, standards should take into account or, rather, have to take into account the available techniques and, of course, information on the toxicity of the corresponding pollutants. This refers, for example, to the situation in Germany, explained above.

Many environmental regulations, including the Waste Management Code (Georgia 2014, Art. 4), refer to the “best available technique”, when they point to certain environmental obligations of producers. There is, however, an issue, determining the “best available technique”: such regulations might, at least occasionally, “motivate” engineers and scientists to reduce their efforts to develop innovative environmental technologies. After all, they have the necessary knowledge to improve the environmental qualities of the existing technique, not so much the public authorities. Consequently, appropriate framework conditions are required to enhance this kind of environmental innovation activities, to motivate producers for these activities.

Another possibility to raise environmental standards has gained some importance in recent years: the government simply adjusts the standards automatically according to a plan outlined in the legal documents. This refers also to Georgia, for example, with increasing rates for collecting and recycling waste postulated in the National Waste Management Action Plan (Georgia 2016).

This is, for sure, an interesting way to deal with the information asymmetry affecting the concept of the “best available technique”. However, this procedure can be risky: after all, it might happen that the producers do not keep pace with the steadily increasing standards. Attempts to cheat might then be the consequence, as it happened in Germany with the perhaps too high standards for emissions of nitrous oxides from diesel engines.

Accordingly, the determination of standards could be the task of public academies of sciences or universities: research money from the governments should help to develop guidelines for choosing and adjusting relevant standards. Of course, the research results publicly available and of relevance for everyone.

Given the standards, how to attain them, how to keep them? One policy tool to this regard are command-and-control policies.

2.2 Command-and-Control Policies

The following newspaper report demonstrates the situation. On 08 May, 2018, the Georgian Journal writes: “Tbilisi among dangerous cities in Europe where air pollution is high ... Chemical compound nitrogen dioxide, which is the result of exhaust, reaches critical levels in several districts of the capital. ... The critical environmental issue in the country is not a novelty, as a reminder the volume of harmful substances in the air in cities and towns of Georgia in 2016 was higher than permissible, according to Georgia’s Ministry of Environment. According to the report of the same year of the Ministry of Environment, the major causes of air pollution are transport, energy, industry, agriculture, and waste. ...” (<https://www.georgianjournal.ge/society/34468-tbilisi-among-dangerous-cities-in-europe-where-air-pollution-is-high.html>).

In this context, the question of utmost practical relevance arises – also in view of the path towards a circular economy – how to reduce the air pollution and keep it thereafter within reasonable bounds? We will later come back to this issue, because an adequate response requires some further analysis. At this stage, we are going to investigate the role of a command-and-control policy in somewhat simpler contexts.

Imagine that there are a few companies, which pollute the environment (air, water or soil), and we want to restrict the pollution to a given maximum level, thus, to a certain standard. A straightforward way to achieve the desired result is to “force” the companies through legal regulations: exceeding the standard is not allowed by punishment. Of course, there has to be an effective control to assure compliance with the regulations.

Command-and-control policies constitute by far the largest share of the environmental policies. Reasons might be that they allow an immediate interference with polluting activities, moreover, public authorities can demonstrate that they are active regarding the protection of the environment. Important, not to say famous examples of command-and-control policies are “The Clean Air Act” of the US (US 1971), “The Federal Immission Control Act of Germany (Germany 1990), or the “Closed Substance Cycle Waste Management Act” of Germany (Germany 1994), the latter already pointing towards the requirements of a circular economy.

Although a command-and-control policy sounds simple, there are a few issues, which need closer attendance: beyond the common reference to the “best available technique” already mentioned above, these policies also address the issue of the “economic feasibility” of certain measures. Thus, the Closed Substance Cycle Waste Management Act refers in Art. 5 (4) to the obligation to recover waste, “to the extent this is technically possible and economically reasonable, especially when a market exists, or can be created, for an extracted substance or for extracted energy.” Moreover, “waste recovery is economically reasonable if the costs it entails are not disproportionate in comparison with the costs waste disposal would entail” (Germany 1994, Art. 5(4)). Observe that also the Waste Management Code of Georgia mentions the concept of economic feasibility in the context of landfilling waste (Georgia 2014, Art. 21(6)).

The question of economic feasibility is, of course, of utmost importance for the implementation of a circular economy. For example, when we mentioned that in certain cases a deviation from the waste hierarchy might be reasonable, that’s exactly the issue of economic feasibility. The definition, provided above, seems to be simple. However, a more careful consideration reveals the unclear meaning of “disproportionate”. It is possible, to define the concept of economic feasibility in a theoretical model (cf. Wiesmeth 2011, Section 9.3.1). A practical approach has to be based, however, on a cost-benefit analysis, which cannot be covered here (for a textbook on cost-benefit analysis see, for example, Boardman et al. 2011).

Another issue related to command-and-control policies refers to the question, how many producers and/or consumers you can or want to control. Typically, it is only a comparatively small number. Controlling the actions of a large number of people is usually very costly and, in general, politically not correct. Therefore, a command-and-control policy should – in the context of implementing a circular economy – only be applied, when it refers to a small number of individual producers or consumers. For larger numbers, other policy tools, such as appropriate framework, should be employed.

2.3 Market-oriented Environmental Policies

In contrast to a simple command-and-control policy with the public administration setting the standards and enforcing them with appropriate control measures, market-oriented policies make use of the decentralized knowledge of producers and consumers. Thus, it is left to the consumers and the producers to what extent they want to continue a polluting activity, thereby paying transfers (a “pollution tax”, for example) to other parts of the economy, or whether they prefer to incur economic costs associated with environmentally friendly production technologies. These decisions obviously depend on the individual situation and on the individual information.

Market-oriented environmental policies therefore make use of the scarcity of some environmental commodity, “artificially” generated through an environmental standard or an environmental cap. This standard will then have an effect on various relevant market prices, which will in turn have consequences for the decisions of the individual economic agents, as

indicated above. It is then left to the public administration to make sure that actual emissions or activities are within the bounds of the standard.

There are various examples of market-oriented environmental policies. The most prominent ones are the following:

- **Environmental Cap:** This policy introduces an environmental standard which is interpreted as a “cap”: the supply of a certain environmental commodity is limited by a regulatory measure. Economic agents which want to continue to consume or produce this commodity or employ it as a production factor, will likely be faced with higher market prices. Some agents will therefore prefer to look for and switch to alternatives.
- **Pollution Tax:** A pollution tax raises the prices of a certain commodity and attempts thereby to restrict demand. The resulting “regulated” equilibrium should satisfy the requirements of the environmental standard.
- **Tradeable Certificates:** With a market for tradeable certificates, economic agents trade among themselves. Transfer payments flow from those who can avoid polluting the environment more easily to those who need more certificates, for whatever reason. In contrast to the pollution tax, a market for tradeable certificates can mean expenses for buying certificates, but also allows for revenue from selling certificates.

Market-based environmental policies are used, for example, in the EU Emission Trading System, a cap and trade system (https://ec.europa.eu/clima/policies/ets_en#tab-0-0). Beyond that pollution taxes are applied in various countries to tax certain emissions from production activities. These taxes are usually considered to correspond to the “polluter-pays principle”, which is usually part of ERP policies (cf. Georgia 2014, Art. 5, Art. 9). It should already be mentioned here that it need not always be straightforward to determine the “polluter”. Is it really the manufacturer of a certain product, or is this manufacturer in competitive situation, which necessitates the production of this product, because it is in high demand from the consumers? Information asymmetry, the Prisoners’ Dilemma and the Tragedy of the Commons might generate such a situation.

Market-oriented policies are interesting from an economic point of view: as already indicated, they induce the economic agents to make use of their individual knowledge to make decisions with consequences for the environment. Because of this aspect of decentralizing the decisions, these policies therefore correspond to the market mechanism, which is also a decentralized system of decision-making.

Moreover, it is important to understand another detail how they are working: of course, economic agents try to avoid paying a pollution tax, for example, by looking for alternatives. In the anticipated case, these alternatives are more environmentally friendly production or consumption activities, and the pollution tax works as desired by reducing polluting activities. However, sometimes there are “avoidance possibilities” which are not better for the environment, perhaps even worse. If, for example, a tax on the weight of household waste is meant to reduce waste in the sense of the waste hierarchy, and if household start

to take out all or part of their waste to the environment just to reduce the tax burden, then we arrive in such a situation. In conclusion, applying these market-oriented instruments therefore always requires a careful investigation of the avoidance possibilities.

Although these policies have some advantages over command-and-control policies (cf. Wiesmeth 2011, Ch. 11), in particular due decentralized decisions, they do not play a really significant role in environmental policies. One reason might be the obvious preference of policy makers for command-and-control policies mentioned above. On the other hand, they are, however, attractive in the form of eco-taxes in order to generate additional income for the governments. For more information on this doubtful mixing of a pollution tax (avoidance possibilities are important) and a fiscal tax (there should be no possibilities to avoid paying such a tax), cf., for example Wiesmeth (2011), Section 11.3.

Summary: *With environmental standards, command-and-control policies and market-oriented policies this chapter introduced and discussed the most important basic tools for environmental policies. With respect to practical applications, there is a clear dominance of command-and-control policies, by means of which environmental standards should be attained. This seems also to be the case for Georgia, given the current environmental regulations. However, the control aspect of these policies is problematic in view of social and political costs.*

More sophisticated, holistic approaches to environmental policies, such as EPR policies or IEP, are typically based on these basic tools and combinations thereof. They then provide the corner stones for policies required for the path towards a circular economy.

3. Holistic Approaches to Environmental Policies

Quite a few environmental issues, in particular those, related to a circular economy, touch the interests of both consumers and producers. This refers, for example, quite generally to waste management: efforts to prevent waste in view of the waste hierarchy, have to address consumers and producers simultaneously. Households can hardly reduce packaging waste without the cooperation of the producers packaging and selling the commodities. Thus, producers have to be “motivated” to reduce packaging, for example through corresponding actions of the consumers. Such actions could result from a particular environmental policy linking the decisions of consumers and producers.

This is then the background of “holistic” approaches to environmental policy. In view of the above example, those policies, integration of signals along the product chain, are of utmost relevance for implementing a circular economy. “Extended Producer Responsibility policies” and, as a further development, “Integrated Environmental Policies” constitute the main groups of this holistic approach.

3.1 EPR Policies

According to the literature, an essential characteristic of EPR policies is that it places some responsibility for a product’s end-of-life environmental impacts on the original producer and

seller of that product (cf. Walls 2006, p. 1). This corresponds to the OECD's definition of EPR as an "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle" (cf. OECD 2001 or again Walls 2006, p. 1).

Thus, "an EPR policy is characterized by: (1) the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities; and (2) the provision of incentives to producers to take into account environmental considerations when designing their products. While other policy instruments tend to target a single point in the chain, EPR seeks to integrate signals related to the environmental characteristics of products and production processes throughout the product chain." This fundamental characterization of ERP policies, taken from OECD (2001), raises a few questions, which deserve a closer look in view of the role of EPR policies in many environmental regulations, and also in view of their role regarding the implementation of a circular economy.

- If an EPR policy is meant to provide incentives to producers for a DfE (cf. Walls 2006, p. 1), then this definition seems to blame, in the first place, the producers for some environmental problem. The role of the consumers seems to be neglected in this context, although demand for a particular design of certain commodities may lead to the environmental problem in question.
- If an EPR policy seeks to integrate signals related to a product throughout the product chain, why should 'municipalities' in particular and consumers and other stakeholders in general be excluded from the consideration? Municipalities can play a decisive role in promoting a design for environment by, e.g., organizing waste management in a way, which supports or alleviates recycling activities.

As already mentioned earlier, the missing integration of the consumers played a substantial role regarding the development of the quota of refillable drinks containers in Germany in the years since 1992. The non-existent suitable integration of the customers produced this result. By using individual quota, for example, instead of a combined quota, customers could have been integrated into the policy in an adequate way (cf. Wiesmeth & Häckl 2017, Example 4.3b, for more details on this issue).

Thus, the bottom line regarding EPR policies is: it is in general necessary to not only include producers into the policies, but all "stakeholders" of relevance. Due to competitive forces producers are often dependent on the behavior of their customers and other stakeholders. In consequence, a Prisoners' Dilemma situation might force them to depart from intended course of action.

This result of necessarily integrating relevant stakeholders into a holistic environmental policy will be further discussed in the context of Integrated Environmental Policies.

3.2 Integrated Environmental Policies

The concept of "integrated waste management" evolved in 1975 from the mission statement of the Solid Waste Authority of Palm Beach County, Florida. The idea at that time

was to “integrate” solid waste transportation, processing, recycling, resource recovery and disposal technologies”. Since then the concept has further developed into a holistic approach to waste management comprising now – under the roof of the waste hierarchy – various waste management activities such as avoidance of waste, reuse of discarded components, recovery and environmentally sound recycling. Bilitewski et al. (1994) initiated this development with a comprehensive discussion of all aspects of (integrated) waste management, and Wilson (1996) examined in this context “the development of integrated sets of policy measures by countries around the world...” (cf. p. 389). The next step in this development has been taken by the EU with the already introduced “Circular Economy Package” (EU 2015).

The question that arises in this context, is then the following: assume that we have specific goals for a particular waste policy (reduction of waste, waste recovery and recycling quota, DfE for particular products, restriction of exports of waste commodities, ..., or a combination of those goals) in order to implement a circular economy, what are the constitutive elements of this waste policy, necessary to reach these goals, to work without deficiencies, to be incentive compatible – to develop into an “integrated” environmental policy?

That this question is not only of theoretical relevance, shows the experience with a variety of holistic approaches from EU members (cf. Ch. 5 of Part 1). Consequently, designing a fully functional environmental policy is anything but straightforward and simple. As we have seen, current WEEE policies seem to motivate excessive semi-legal export activities with WEEE often ending up in developing countries, which is certainly not the goal of WEEE policies in the context of sustainability. Babu et al. (2007) survey various global aspects of WEEE recycling, Ongondo et al. (2011) provide a global view of the management of WEEE, and Schnoor (2012) highlights also the situation regarding WEEE in developing countries.

It turns out that such Integrated Environmental Policies can be characterized by the some “constitutive elements”, related to the fact that these policies are meant to supplement the market mechanism in the context of environmental commodities (cf. Wiesmeth & Häckl 2017, Section 4):

CE I: Dependence of the policy on local conditions: Observe that solutions of the allocation problems in a market economy depend on local conditions, too.

This first constitutive element is meanwhile recognized in many holistic policies. It justifies, for example, that waste management policies differ across regions and countries.

Recommendations to just copy environmental policies from other countries including technological equipment, can be therefore misleading: different framework conditions might require a different approach. It is therefore always recommended, to gather information on the most important steps towards a circular economy: waste management, air/water pollution, marine debris, greenhouse gas emissions. This includes ideas about the most important steps to be taken first towards the implementation of a circular economy, this includes also proposals on technical equipment to be employed, etc.

CE II: Integrating affected economic agents into the policy: The background is that any interference with the allocation problems can affect a multitude of economic agents.

As a consequence, all agents, who are affected by the goals of a certain environmental policy, have to be integrated into this policy. “Affected” thereby means that if a group of agents is not adequately integrated into the policy, these agents might significantly change their economic behavior with the risk to undermine some of the goals of the policy. Take, for example, the rebound effect mentioned in Section 5.5 of Part I), which points to behavioral changes not considered initially.

A simple example, already indicated, is provided by the implementation of the waste hierarchy: if waste should be prevented, then the authorities in charge of waste management are dependent on the cooperation of all consumers and producers, who generate waste. In this sense, all these “stakeholders” have to be integrated into the environmental policy. A simple command-and-control policy, such as an Article on the Waste Management Code (Georgia 2014, Art. 4) is usually not sufficient to achieve this goal: control costs would be extraordinarily high and politically not correct.

CE III: Linking the policy tools with the goals of the policy: Here the background is that external effects associated with environmental commodities require additional signals, which need to be connected, also with the goals of the policy.

This last constitutive element is for various reasons the most important one and at the same time the most difficult one to implement. It is not much visible in the actual policies so far.

EPR policies often postulate the requirement of a DfE (cf. again Georgia 2014, Art. 9). Again, this will, in general, not be sufficient to induce a necessary change in behavior of the producers. They can always delay or postpone a DfE, if it is not in their business interests. One must not forget in this context that producers typically have more information on potentials of a DfE than the public authorities.

In view of CE II, the appropriate integration of consumers to “exert some pressure” on producers can help to address this issue. This implies linking the decisions of the consumers with those of the producers in order to reach the goals of the environmental policy.

Summary: *Holistic or Integrated Environmental Policies represent attempts to prepare the path towards a circular economy. They are typically characterized by combinations of policies addressing different features of the environmental issue in consideration.*

A great deal of these policies is usually labelled “EPR policy”, thereby referring to obligations of the producers to reduce environmental pollution associated with their product in one way or the other. Experience, however, shows that only a complete and adequate integration of all stakeholders into an environmental policy helps to successfully address the environmental pollution.

Integrated Environmental Policies take these obvious deficiencies into account and are, therefore, based on “Constituent Elements” related to observable problems with holistic policies. Consequently, the design of these policies should observe these constitutive elements.

The following chapters provide a closer look at existing holistic approaches to environmental policies with a special focus on the question, whether sufficient attention is paid to these constitutive elements of an Integrated Environmental Policy.

4. The German Packaging Act and Incentives for a Circular Economy

In this chapter we reconsider the Packaging Act, the holistic approach towards packaging waste in Germany, analyze its structure and investigate deficiencies regarding the achievement of the goals. The analysis of this and other policies will then later allow to design examples of Integrated Environmental Policies, which support the implementation of a circular economy. The example is taken from Germany, based on the environmental regulations of the EU. After this quite detailed discussion, the other examples in the next chapter can be shorter because of partially similar structures and conclusions.

Various features of the German Packaging Act, which entered into force at the beginning of 2019 (cf. Germany 2019a, 2019b) have already been introduced, with the current situation regarding packaging waste pointing to an unclear development. What are possible reasons for this observation? We investigate this issue with a careful analysis of the effects of the policy on the various parts of the waste hierarchy.

4.1 Prevention of Packaging Waste

What are the incentives provided through the Packaging Act to prevent packaging waste? Of course, in the sense of a command-and-control policy the Packaging Act stipulates the waste hierarchy in § 1 “Waste Management Objectives”. But, of course, we understand that such a “command” is difficult to control, at least regarding waste prevention. So, the question is, whether there are other mechanisms in the Act or in other environmental regulations, which support efforts to reduce or prevent packaging waste? We consider the situation of the consumers, who should be adequately integrated into the policy in order to motivate the producers for preventing packaging waste.

4.2 Voluntary Incentives

Households certainly have an influence on the quantity of packaging waste generated: they can buy drinks, for example, in refillable containers, they can bring their own bags, they can look for commodities, which are packaged more environmentally friendly. However, the Tragedy of the Commons leads many, if not most consumers to forget about these environmental issues. Of course, environmental education and awareness campaigns can help, but, as experience shows, the effects are most often not really convincing, and regionally and temporally limited.

4.3 Transport and Secondary Packaging

There is, however, one regulation in the Act, which is interesting from the point of an EPR policy. The Act allows the return of transport packaging (for protection) and secondary packaging (additional packaging): manufacturers and distributors are obligated to accept returned transport and secondary packaging after use. The households have some interest to leave this packaging in the shops, as they have to take care of it then at home, implying some additional efforts to dispose of it in the prescribed way.

The interesting point is now that the returned packaging has to be reused or recycled insofar this is technically possible and economically reasonable. We already know that the concept of “economically reasonable” recycling activities is not easy to understand. However, due to the fact that chemically or biologically active substances may not be landfilled in Germany, taking back used transport or secondary packaging for sure implies higher costs for the manufacturers and distributors. They therefore have an incentive to reduce unnecessary secondary or transport packaging – the EPR policy is working with this “support” from the consumers.

This example shows, how linking of parts of the regulations of the Packaging Act can improve the performance: the actions of the consumers lead to potentially higher costs for the producers, motivating them for a DfE regarding transport and/or secondary packaging. The strength of this effect depends, however, on the motivation of the consumers to return this packaging. This is, as we shall see later, regulated in a different way for one-way drinks containers.

4.4 Sales Packaging

Are there any significant incentives for the consumers to prevent or reduce regular sales packaging? According to the Packaging Act, consumers have the obligation to return used packaging to a separate collection. As the collection of the used packaging is, again according to the Packaging Act, costless for the consumers, they will in general comply with this regulation. The collection of residuary household waste is, on the other hand, costly for the consumers. In principle, as producers have to pay for the collection and recycling of the packaging waste, there is again an incentive for a DfE, for raising the recyclability of the packaging, and/or reducing the quantity of the packaging material.

4.5 Compliance Schemes

The final outcome of this analysis depends, however, on some further details of the integration of the manufacturers and distributors, who put sales packaging filled with product and typically arising at the final consumer into circulation for the first time, into the policy. In order to ensure that all these producers of packaging fulfill their duties regarding the collection and recycling of packaging waste, they must register with the newly established packaging registry. This mandatory registration also commits producers to participation in a dual system of waste management, a so-called “compliance scheme”, or, often used equivalently, a Producer Responsibility Organization (PRO).

Such a compliance scheme ensures adequate regular free of charge collection of used and emptied sales packaging from or in the vicinity of the private final consumer. The collected

packaging has to be consigned to recovery or recycling. Of course, the manufacturers and distributors have to pay a fee to the compliance scheme depending on the quantity and the material of packaging (cf. Wiesmeth et al. (2018) for more details). Thus, in principle, such a compliance scheme could enforce prevention of packaging waste: a smaller amount of packaging material reduces licensing fees and costs for the producer. However, the structure of these compliance schemes plays an important role to this regard.

4.6 Collective Systems – Competition

The Packaging Act allows different forms of these compliance schemes. The general system seems to be a collective system based on independent compliance schemes in competition. This means that the manufacturers and distributors of packaging have no stakes in these compliance schemes. Moreover, there are various for-profit compliance schemes, which are in competition, ensuring the positive effects of a market economy: competition will help to reduce fees for the participating producers of packaging and guarantee quality of services.

Collective systems have been reviewed in the literature. There are the review reports BIO (2014), OECD (2016) and of Gupt & Sahay (2015) and further reviews of Cahill et al. (2010) and Tencati et al. (2016), which provide more information on various collective systems employed mainly in the member states of the EU.

4.7 Collective Systems – Associations

Besides a system of independent compliance schemes operating in a competitive environment, the Packaging Act allows – under certain conditions – also collective systems based on associations. This means that producers in the same sector can cooperate regarding their duties with regards to collecting and recovering packaging waste and establish an association. Of course, this association may transfer these obligations to a PRO.

The idea to form an association among drinks producers to implement the obligations of the EPR policy collectively seems to be an optimal way to realize the polluter-pays principle. Economies of scale reduce costs of collecting and recycling the waste drinks containers. Gupt & Sahay (2015) and Wang et al. (2017) refer to such systems.

There are, however, some issues with such collective systems: for example, problems might arise with sharing the costs of the system or the profits (Gui et al. 2016), and, due to competition, the association or some members, might have a critical view on new entrants. In addition, why should such an association care much about the quality of its services, about the environment? The public authorities have only incomplete information regarding the operations, and limited possibilities to influence these operations.

Other aspects refer to the difficulties to extend such an association to other areas of waste management, for example to WEEE. Additional associations would have to be established with further challenges (cf. EPR policies in France: OECD 2016, p. 249ff).

The most important issue for the context considered here refers to possible “vested interests” of the members of the association: profitable prices for recycled plastics, for example, provide incentives to increase the share of plastic packaging, whereas non-profitable recycling provides incentives to ship plastic waste to other countries, for example

from the EU to China and other Asian countries. Moreover, these associations control the whole chain from distributing goods in packaging to collecting and recycling used packaging. Especially this latter fact could inspire new business models, in which prevention of packaging waste plays only a minor or no role at all. Similar observations are of relevance for the legislation regarding WEEE and ELV to be considered later.

4.8 Individual Systems

The Packaging Act allows also “individual systems”, again under certain provisions. An individual system transfers the obligations to collect and recover packaging waste to an individual producer with the polluter-pays principle again perfectly incorporated – at least at first glance (OECD 2016, p. 164ff). Occasionally, such systems are associated with “Individual Producer Responsibility” (IPR) (Rotter et al. 2011, Atasu & Subramanian 2012, Wang 2017).

Costs of such an individual system can be high and prohibitive (cf. Huismann 2013), and the question about the “polluter” may have been posed incompletely, because, in a competitive environment, producers also have to observe the demand for their products (Wiesmeth & Häckl 2011)).

What are the incentives for reducing packaging waste and for a DfE in such an individual system? If the recycling of plastic is profitable, then there is no apparent reason for a DfE. To the contrary: perhaps the share of plastic packaging will be increased. Individual systems are, therefore, also characterized by vested interests: the producers have legitimate business interests. However, as in the case of collective systems based on associations, these business interests might be conflicting with environmental issues, with the waste hierarchy, despite of IPR.

Indeed, our earlier observations reveal a certain trend to increase, in particular, the share of one-way plastic bottles in individual systems in Germany. The regulations regarding drinks packaging, thus, deserve a closer look.

4.9 Drinks Packaging

In Germany, the packaging material used for drinks packaging needs not be licensed with a compliance scheme. It is the duty of the distributors of drinks to take care of collection and recycling of the returned one-way packaging. Of course, they can transfer these obligations to a PRO, they can, however, also setup an individual system.

Regarding costs, such an individual collection system might make sense in the following situations: the producer or importer offers beverages in refillable containers in a geographically limited area. Alternatively, chain stores, with shops all over the country, may consider to set up their own system. This is possible in Germany, where various discounters are offering beverages in specially designed one-way containers (Lidl 2016), and also Coca-Cola pursues a similar policy (Coca-Cola 2018).

As already explained earlier, there is a mandatory deposit fee for one-way drinks packaging in Germany (cf. <http://www.dpg-pfandsystem.de/index.php/en/>). This system yields a collection rate of 96-98% (NABU 2017) with a “deposit leakage” of 2-4%. Thus, non-

redeemed deposit fees in Germany are estimated to amount up to 180 million Euro for 2015, an additional source of income for beverage producers and groceries. Again, in particular individual systems can profit from this deposit leakage by raising the share of one-way plastic bottles (NABU 2017, p 5).

The fact that there are no licensing fees for the material of drinks packaging, yields another problematic aspect: there is no further pressure to use different packaging materials or to switch to refillable packaging. This is, in view of the possibility of “modulated” license fees, of particular relevance. Ecologically modulated license fees can help to redirect demand for certain packaging materials, for example, plastics. But this does not apply to drinks packaging in Germany, at least not for the time being – an incomplete link of the policy regulations with the goals of the policy.

In conclusion, individual systems and collective systems based on associations for packaging waste in general and drinks packaging in particular can provide incentives, which are contradictory to the goal of waste prevention due to vested interests of the producers. This includes also aspects of a DfE, for example, in the sense of refillable packaging for drinks. These findings should be kept in mind when we carefully design holistic policies for the path towards a circular economy.

4.10 Reuse of Packaging

The German Packaging Act also wants to promote the reuse of packaging. So far, this is happening with shopping bags, in particular, plastic shopping bags. Thus, in 2012, out of the 6.1 billion plastic bags distributed in Germany 2.9 billion were reused, comprising a total weight of 70,191 t out of a total of 986,139 t (cf. UBA 2015, p. 77).

In addition, reuse refers also to refillable drinks containers. According to UBA (2015), Table 3-11, refillable containers constituted only 0.33 million t of a total of 16.49 million t of packaging waste in Germany in 2012, whereas one-way packaging amounted to 2.25 million t in 2012.

Of course, there is also reuse of transport packaging. Precise numbers are, however, difficult to find.

4.11 Recycling of Packaging Waste

The German Packaging Act raised the standards: the shares of packaging waste consigned for recovery and recycling. For example, from 2019 the compliance schemes have to take care that 80% (in terms of weight) of the licensed glass packaging are prepared for reuse or recycled, up from 75% so far, and for plastic packaging the recovery share is 90%, of which 65% have to constitute material recovery, up from 60% in the last years.

Of course, these standards are rather high, and it remains to be seen, whether they can be achieved and kept. So far, the compliance schemes recycled also non-licensed packaging waste. This helped to achieve the standards, because the recycled non-licensed packaging counted also for the achievement of the standards.

Fig. 1 shows that there is an indication for a “decoupling” of packaging consumption and GDP in Germany. But the development is not really encouraging, in particular, when plastic packaging is taken into account (cf. UBA 2015, p. 52). So far, the prevention of packaging waste, the prominent goal of the various regulations, could not be achieved. This is surprising, given the fact that a lot of packaging was replaced by much lighter plastic packaging.

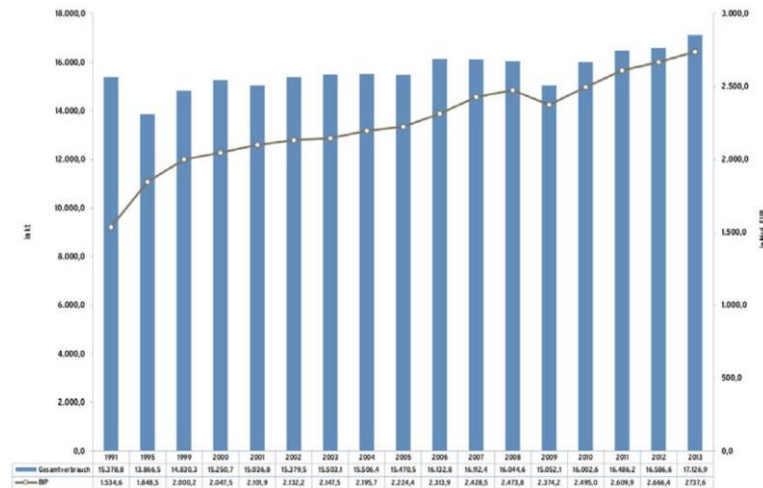


Fig. 1: Consumption of packaging (all materials) and GDP in Germany from 1991- 2012. Source: UBA (2015), p. 47.

Summary: *This detailed analysis of the German Packaging Act demonstrates many relevant issues of a holistic approach to managing packaging waste. The analysis first shows possible ways and means to prevent packaging waste. The main idea is to exert some pressure on the distributors of packaging in the form of higher costs, thus motivating them for a DfE or for reducing packaging. The pressure results from consumers, who can return used transport and secondary packaging, and who have an incentive to segregate packaging waste to be returned for recovery and recycling. This demonstrates the linkage between the policies oriented to the consumers and the policies oriented to the producers. Another pressure arises from the fees to be paid to a compliance scheme for the quantity and the packaging materials licensed. A smaller amount to be licensed resulting from a DfE or reusable packaging reduces costs.*

However, structural properties of the compliance schemes are important: collective schemes based on associations and individual systems, which are possible according to the Packaging Act, are prone to vested interests. Moreover, the fact that the material for drinks packaging need not be licensed, probably weakens the positive effect of the mandatory deposit system regarding collection of empty one-way drinks packaging. The pressure for a DfE is reduced without the additional costs resulting from the licensing fees.

In terms of an Integrated Environmental Policy, whether CE I is fulfilled depends on the standards. CE I is violated, if the standards cannot be attained for objective reasons. Moreover, this approach partially violates CE II, because both consumers and producers are not always adequately integrated into the policy. CE III is violated, as the policy tools are not in each case perfectly linked with the goals of the policy.

Thus, this practical example reveals the complexity of an “incentive compatible” holistic approach of an environmental policy, which is meant to prepare the path to a circular economy.

5. Further Examples of Holistic Policies for a Circular Economy

This chapter presents examples of additional holistic environmental policies in Germany. The goal is again to analyze incentive compatibility of the regulations and to detect some weak points in order to allow a better policy design in the future or for other countries. Observe again that, as a member of the EU, the environmental policies of Germany are derived from the various directives of the EU.

5.1 WEEE Policy

The aims of the German Electrical and Electronic Equipment Act (ElektroG) are to protect the environment and health against harmful substances from electrical and electronic equipment and to reduce the amount of waste through prevention, recovery and recycling. These goals clearly point towards aspects of sustainability and a circular economy. What are the instruments and tools of the policy to reach these goals? How can we explain certain deficiencies of the regulations? What about the incentives for a DfE? To what extent are there incentives for exporting (too) old devices?

- **Consumers:** Owners of WEEE are obligated to collect WEEE separately and discard it free of charge at municipal collection points. Alternatively, consumers can take advantage of take-back systems offered by producers and resellers of electrical and electronic equipment. Moreover, there is a 1:1 take-back obligation of retail stores with at least 400 m² of sales area for small amounts of WEEE.

As we understand already, even a “free of charge return” of WEEE is not really without costs, as owners of WEEE still have to invest some time and perhaps money to go to the collection point. The Tragedy of the Commons may distract consumers from always complying with this obligation.

- **Voluntary Incentives:** Consumers are advised to examine whether an electrical or electronic device can be put to longer or different use.

Again, the Tragedy of the Commons might prevent consumers from acting accordingly, even in countries with a supposedly high environmental awareness. Many buyers of smartphones, for example, still seem to prefer the latest model, inspiring the manufacturers for rapid innovation cycles.

- **Producers and importers** have, in the sense of EPR, an increased responsibility for the entire life of their products, including a DfE. They are obligated to register themselves and their products at a clearinghouse, the WEEE national register (stiftung elektro-altgeräte register, stiftung ear).

This is undoubtedly a typical “command” of a command-and-control policy. It should be sufficient to adequately address the comparatively small number of producers and importers of electrical and electronic equipment and to control their participation in the clearinghouse activities. However, the requirement of a DfE has to be seen more problematic, as the producers have the necessary knowledge, not the public authorities.

- **WEEE National Register:** This register (stiftung ear) was founded by the producers as their clearinghouse (Gemeinsame Stelle). It registers the producers and coordinates the provision of containers and the pick-up of WEEE at the municipal collection sites. The producers have to provide for the containers and the pick-up of WEEE free of charge. Cf. <https://www.stiftung-ear.de/en/home> for more details.

Of course, the role of the WEEE national registry corresponds in some way to the also newly established packaging registry in the context of packaging waste: to collect the necessary information on commodities, which turn into waste commodities. The question is whether this collection of data, besides reducing free-riding, can support the waste hierarchy.

Moreover, the WEEE national registry is founded by the producers, thus, it has features of an association, bringing into the activities the interests of the producers.

- **Take-Back and Treatment:** Producers have to take-back WEEE from the collection sites for treatment. This implies also that they have to check and decide whether WEEE or parts of it can be reused, or reused after an adequate preparation.

These regulations are obviously based on the polluter-pays principle and seem quite natural. However, in view of possible vested interests, one should not forget that the producers will be better off with each piece of WEEE that needs not to be recycled (in Germany) at presumably high costs. Thus, decisions on reusability might be taken in problematic cases, and the old equipment might be exported for reuse in some developing country. Even if this possibility is now much more restricted, there are some doubts whether semi-legal or even illegal exports of WEEE from Germany have completely stopped or can be completely stopped with the new regulations.

- **Recovery Targets:** The target recovery rates for non-reusable devices range from 70-85% depending on the category of the devices. Germany has complied with the somewhat lower rates in the last years.

Summary on the WEEE Policy: *Similar to the German packaging waste legislation, the WEEE legislation underwent some major changes in recent years. The most important new feature is the establishment of the WEEE national register and more possibilities to return WEEE in an orderly way.*

Nevertheless, despite all these attempts to close loopholes regarding insufficient separate collection of WEEE and too many questionable exports to developing countries, there still remain some issues, which deserve a closer look in view of incentive compatible regulations, which are required for an Integrated Environmental Policy preparing the path towards a circular economy.

Regarding the constitutive elements of an IEP, the locality principle, CE I, refers to the economic feasibility of the standards and the expectations on the environmental awareness, respectively on the extent that the effects of Tragedy of the Commons can be reduced in the context of a separate collection of WEEE. This implies at the same time to the adequate integration of the consumers into the policy. As the integration of producers might lead to vested interest, a violation of CE II seems possible. A sufficient pressure on producers for a DfE, in order to address CE III, depends also on a more or less complete collection of WEEE with non-reusable equipment consigned for recycling. In addition, one must not forget that equipment that can longer be used or reused, has consequences for the returns of the producers. Moreover, many consumers want to buy the latest models of a smartphone etc. It remains therefore questionable whether this recommendation for reusability has a chance to overcome the Tragedy of the Commons (consumers) and the Prisoners' Dilemma (producers). And last, but not least, reusability is the vehicle for exporting perhaps non-reusable WEEE to developing countries.

5.2 End-of-Life Vehicles

Approximately half a million cars and light utility vehicles are scrapped in Germany each year. Most scrap cars are recycled with high recovery rates, which, reaching almost 100%, typically exceed the standards. Nevertheless, there are, as we know, some issues with old German vehicles, and the reasons should be understood by analyzing the end-of-life vehicles legislation (Germany 2016).

- **Collection Obligation:** Vehicle manufacturers are required to take back all end-of-life vehicles (ELV) of their brand from the last registered owner. They are also required to establish (jointly or individually) a dense network of authorized collection facilities. Of course, with respect to the waste hierarchy extensive consideration should be given to a DfE.

These requirements address both owners of ELV and car manufacturers, again in terms of a command-and-control policy. They integrate owners of ELV appropriately, as it is not recommended to leave an easily identifiable ELV somewhere in the environment. Moreover, it would make any sense in view of the free-of-charge take-back requirement. The pressure for a DfE depends, as usual, on the return rates of ELVs for recycling. In this context, Gerrard & Kandlikar (2007) show that “legislative factors and market forces have led to innovation in recycling ...” and that “carmakers are also taking steps to design for recycling and for disassembly” (cf. Abstract).

- **Exporting Used and Scrap Cars:** Almost 1.7 million used cars were exported from Germany in 2016. Although probably many of these cars are still in a reasonable condition, some are in bad shape, declared as reusable cars in order to prevent high scrap costs in Germany. Also, owners may prefer to sell their scrap vehicle for a small amount of money to an international dealer instead of returning it without cost to the manufacturer. This situation is aggravated by the fact that the Correspondents'

Guidelines No 9 (EU 2011a), regulating shipment of scrap cars to countries outside the EU, are not legally binding.

In addition to that, improper vehicle maintenance, and improper dismantling and scrapping activities in developing and transformation countries, accompany the export of used cars, and pose a hazard to health and the environment – in addition to the loss of valuable raw material.

These last observations are certainly not in line with a sustainable development on a global level and with a path towards a circular economy. They should therefore be reconsidered in the context of an amended legislation.

Summary on the ELV Regulations: *Whereas the return of ELV is supported by individual interests and a dense network of authorized collection facilities, thus confirming CE I, the export of used vehicles, in particular to developing and transformation countries, requires a closer look. This observation points to an incomplete integration of producers into the policy, thus, a violation of CE II. Moreover, again in view of the large numbers of cars exported to countries outside the EU, and considering the even larger number of used cars, whose destiny remains unclear, the pressure on manufacturers for a DfE is weaker than it could be. In conclusion, the linkages of the policy tools with the goals of the policy, CE III, should be intensified.*

5.3 Promotion of Renewable Energy Sources

As they help to reduce greenhouse gas emissions, renewable energy sources constitute environmental commodities. The promotion of renewable energy sources, supporting sustainable development and the path towards a circular economy, should therefore be guided by the principles of Integrated Environmental Policies. The corresponding regulations, which entered into force in Germany in 2000 and have since then be amended several times, comprise one of these policies (Germany 2017).

- **Integration of Producers:** The approach presented here is relevant for Germany and for various other countries. It is substantially based on priority connections to the grid systems for general electricity supply of plants generating electricity from renewable energy sources and the priority purchase and transmission of, and payment for, such electricity by the grid system operators in the form of guaranteed prices (Germany 2017), Section 8).

Initially these regulations offered comparatively high payments to any producer of electricity from renewable sources. The guaranteed prices were as much as 0.40 € per kWh electricity from photovoltaic modules. Meanwhile, the regulations regarding feed-in tariffs are different. They are much more based on the actual situation of the generation of electricity from renewable sources. There is the possibility of a market premium (Germany 2017, Section 19), and there are auctions on onshore wind energy installations (Germany 2017, Section 328), just to name a few.

However, and that's the most interesting issue in this context, these regulations proved to be a very effective means to motivate private households, for example, to install photovoltaic modules on the roofs of their homes to generate electricity from renewable sources. The grid system operators had to buy the electricity at predetermined fixed prices. The "business case" of these providers was thus quite simple and relatively risk-free. The strongly increasing share of alternative energy sources in Germany illustrates the success of these framework conditions, which helped to establish significant industries for the various branches of renewable energies, at least initially.

- **The German "Energiewende":** This shift towards renewable energy sources has also been among the goals of the German "Energiewende" – besides reducing greenhouse gas emissions and besides gaining a larger degree of independence from imports of fossil fuels (cf. Dehmer (2013) for a careful analysis and assessment of the German Energiewende).

Today, on the one hand some goals of this postulated development towards renewable energy sources are criticized for their economic consequences. On the other hand, especially young people, who see their future in jeopardy in view of the global warming, are demonstrating for more efforts to mitigate climate change.

- **Greenhouse Gas Emissions:** Of course, the Energiewende is closely related to reducing greenhouse gas emissions for a sustainable development. Current emissions in Germany are slightly increasing, perhaps pointing to some side effects of the Energiewende.

The Energiewende focusing on electricity from renewable sources depends on the availability of these sources. This is, however, not always guaranteed in Germany with quite a few days without wind and sunshine. Thus, for an uninterrupted availability of electricity it is necessary to have additional coal and gas power plants, keeping greenhouse gas emissions on a certain level. Also, the economic growth in the recent years contributed to the increased consumption of electrical energy and the rebound effect is likely to raise demand. All these factors might have led to the current situation of a stagnating level of greenhouse gas emissions in Germany.

- **Integration of the German Policy into the Global Network:** Germany is integrated into the EU ETS, the EU Emission Trading System, a cap and trade policy. Consequently, any reduction in greenhouse emissions from German sources allows, in principle, additional emissions from other countries. And each ton of coal or oil, not turned into electricity in Germany, can be used in other countries. The different levels of awareness of climate change might also interfere with these issues.

Thus, the German policy is not really tied into the international arena regarding the reduction of greenhouse gas emissions, and Germany alone is, with its 900 million t of greenhouse gas emissions, simply too small to have any recognizable effect on climate change.

As already indicated above, more and more arguments are currently brought up against further initiatives to reduce greenhouse gas emissions in Germany. Some of these initiatives lead to a complete phasing out of burning lignite (brown coal) in Germany for generation of electricity or heat within the next 10 years or so. The arguments of those opposing this agreement stress the necessity to first convince other countries to follow suit and comply with the regulations of the Paris Agreement.

Summary on Renewable Energy Sources: *The regulations in German regarding renewable energy sources are interesting, because they demonstrated very convincingly, how it is possible to motivate a large number of producers to generate electricity from renewable sources – without making use of a command-and-control policy.*

In fact, the regulations proved too successful, such that in the end the government had to substantially alter the rules for monetary compensations. In addition, the regulations also attracted international companies, mainly from China, Japan and South Korea, which brought cheaper technologies to the German market, thereby driving various German producers of photovoltaic modules into bankruptcy. To some extent, the regulations thus failed to support innovations mainly in Germany.

Regarding the elements of an IEP, the realization of CE I has to be doubted, given these developments: it might have been better to make use of photovoltaic modules in southern countries with more and more reliable sunshine, for example. Regarding CE II, the success regarding the integration of producers of electricity proved negative with respect to the innovativeness of the producers of these technologies. Thus, the linkage of these issues is problematic, thereby pointing to an issue with CE III.

Keeping these analyzes in mind, we now turn to the design of Integrated Environmental Policies, which could be of relevance for Georgia in some important environmental areas. The overall goal of these policies is the implementation of a circular economy.

6. Design of Integrated Environmental Policies for a Circular Economy

This chapter contains three examples of Integrated Environmental Policies: for WEEE, for drinks packaging and for ELV, all with a focus on Georgia. The design of the policies is related to the structural issues analyzed and the constitutive elements discussed in the last chapter in the context of various policies. Given these examples, it should then be possible to develop IEPs for other policy areas of relevance for a circular economy and a sustainable development in Georgia.

The central idea of an Integrated Environmental Policy is the careful integration of the relevant environmental commodities into the economic allocation problems. Given this background, which helps to understand IEPs, it is possible to provide some general guidelines for designing such a policy. These guidelines can then be applied to a particular environmental issue (cf. Wiesmeth & Häckl 2017, Section 6):

- Determine clearly the goals of the environmental policy. In view of a sustainable development associated with a circular economy, these goals may comprise environmental, economic and social goals.
- Consider all local conditions, which are of relevance for the environmental policy. This is also in agreement with a sustainable development (cf. UN 1992, Principle 11).
- Identify all stakeholders in the environmental issue at hand and make sure that all stakeholders are adequately integrated into the environmental policy. These are in most cases producers and consumers, sometimes also located across the border.
- Choose the right instruments to address the stakeholders and affect their behavior. In general, a mix of instruments is required, in particular, if there are multiple goals. For example, command-and-control policies can be used to control and monitor the behavior of a small group of agents. Framework conditions are better suited to address a larger number of agents.
- Critical parts of any integrated environmental policy are the links between appropriate signals required to coordinate the behavior of the agents. The goal thereby is to overcome Tragedy of the Commons and/or the Prisoners' Dilemma situations by means of establishing some "Individual Product Responsibility" (IPR) (cf. Rotter et al. 2011). In most cases systems of fees and refunds supported through compliance schemes are required to motivate economic agents to assume individual responsibility of the (waste) products.

The performance of a particular policy could be measured according to the share of DfE achieved, or, in the case of waste management, also through more sophisticated measurement tools such as the "Zero Waste Index" proposed in Zaman & Lehmann (2013), or the "Strategic Environmental Assessment Procedure" developed by Frederico et al. (2009).

The following sections contain outlines of the three IEPs mentioned above. Emphasis is given to an adequate integration of the stakeholders and the linkage of the various policy tools, thus, to constitutive elements CE II and CE III. Referring to CE I, it might be advisable to adjust some parts of the policies to take better into account the relevant local conditions in Georgia.

6.1 WEEE Management in Georgia towards a Circular Economy

In view of the analysis of the situation with WEEE in Germany and the analysis of the current WEEE legislation based on the corresponding EU Directive (EU 2012), we consider the following approach for an IEP regarding WEEE (cf. Wiesmeth & Häckl 2017 for more details and additional information regarding this proposal):

- **WEEE National Register:** Producers and importers of WEEE have to register their products and the quantity with the WEEE national register. At the same time, they

have to join a compliance scheme, which is in particular in charge of collecting, recovering and recycling WEEE in Georgia.

- **Stimulating Collection:** A mandatory deposit fee on electrical and electronic equipment (EEE) could stimulate separate collection of WEEE – similar to the mandatory deposit fee on non-reusable drinks packaging in Germany.

According to the German Advisory Council on the Environment deposit schemes are an effective tool, in particular for small equipment, such as mobile phones and computers (cf. Wilts and Gries 2016, Ch. 3). There is also some experience with these deposit schemes for EEE in various countries, among them Austria, Italy and the US (cf. again Wilts and Gries 2016, Ch. 3).

Of course, a mandatory deposit fee requires a certain organizational and perhaps technical infrastructure. This could be simplified in the beginning by allowing return of WEEE in Georgia only to the stores, where the new equipment was bought.

Alternatively, one might start with special containers for the return of small WEEE in the vicinity of the apartments, next to the containers for regular household or separate packaging waste. Educational programs in schools could accompany this proposal in order to raise environmental awareness regarding WEEE. This issue is of relevance in view of CE I, and should be carefully considered.

- **Independent Compliance Schemes:** The next element in our approach is a system of independent compliance schemes in competition, which producers or importers have to join and which take back WEEE and consigns it to treatment and recycling. These compliance schemes receive licensing fees from the manufacturers, which depend also on the characteristics of the products mentioned above. These fees are used for paying for collection and recycling of WEEE.

Optimally, the compliance schemes should be private, for-profit institutions, which are in competition (cf. Wiesmeth et al. 2018). Again, referring to CE I, for the beginning Georgia could perhaps do with just one compliance scheme, thereby losing, of course, certain important features of competition, for example, yielding equilibrium licensing fees (cf. next paragraph).

- **Licensing Fees:** How to determine the licensing fees the manufacturers have to pay for their products? Optimally, these fees should depend on the level of DfE. In the proposed framework with various for-profit compliance schemes, these fees should emerge in competition as (approximate) equilibrium fees. The compliance schemes have information on collection and specific recycling costs, which are included in their fees. Competition keeps these fees low and disseminates relevant information between compliance schemes.

In special cases, it might be necessary to make use of “ecologically modulated” fees, as mentioned in the German Packaging Act (cf. Germany 2019b). These modulated fees can help to direct attention to certain (environmentally relevant) specifications that a product

should have for DfE, similar to the energy efficiency specifications that have already been introduced for many household appliances (cf. EU 2010).

Determining the fees in a context without competition is not an easy task, as experiences with the feed-in tariffs for electricity from renewable sources in Germany proved. The too high tariffs for electricity from photovoltaic modules initiated unplanned and unexpected activities.

- **Implementation of the Constitutive Elements:** Referring to CE II, this approach integrates consumers and producers adequately. Consumers have a stronger incentive to return WEEE to official collection points and semi-legal or illegal “leakage” to export markets declines because export decisions are made by the independent compliance schemes and not by the manufacturers with their vested interest. Then, as the licensing fees depend on certain characteristics of the WEEE, prices of the new products will depend on these characteristics as well. In particular, there will be higher prices for products without DfE, affecting demand.

Thus, there are the following consequences for manufacturers and importers: first due to the higher collection rates recycling costs tend to increase. Moreover, higher fees for products with a lower level of DfE can only be sold at higher prices, reducing demand for these products. Therefore, if a higher level of DfE reduces lifetime costs and stimulates demand, producers have a stronger incentive to change the design of their products – without intensive monitoring from the public authorities.

In view of CE III, there is a closed link of signals from product design to taking back and recycling used and waste equipment. IPR enforced through this closed link of signals drives this result, with the compliance schemes neutralizing vested interests of the producers and importers.

- **Open Issues:** As indicated, various aspects of the policy referring to local conditions still have to be clarified. In particular, collection and recycling rates, suitable for Georgia have to be introduced. Moreover, the organization of the collection system and the recycling activities should help to create jobs in Georgia.

6.2 Management of Drinks Packaging for a Circular Economy in Georgia

The following proposal is adapted from Wiesmeth et al. (2018). In view of the earlier remarks, we focus on recommendations for an incentive compatible policy regarding one-way drinks packaging in Georgia.

- **National Packaging Register:** Producers and importers of drinks in one-way packaging have to register their quantity and material of drinks containers. At the same time, they have to join a compliance scheme, which is in particular in charge of collecting, recovering and recycling empty drinks containers in Georgia.
- **Take-Back System with Deposit:** A take-back system with a deposit fee focuses on individual incentives to return empty bottles. Incentive compatibility can be raised,

return rates of packaging increase with a refund-system (cf. Dace et al. 2012 for Latvia; Numata 2016 for Finland and Norway; and Groth 2008 for a review of the German system).

Such a system needs a more sophisticated infrastructure: charging and returning the deposit fee, a clearing house, logistics to collect the returned bottles (cf., for example, <http://www.dpg-pfandsystem.de/index.php/en/> for the German deposit system). Dace et al. (2012) evaluate the deposit-refund system for packaging of beverage containers in Latvia. One of their findings is that collection costs range between 1.5 Euro Cent (manual collection) and 3.6 Euro Cent (automatic collection) per unit of packaging (cf. p. 323, Figure 9). The OECD report refers to a deposit system for beverage producers in the Republic of Korea, with costs of about 40% of the costs of manufacturing a bottle (OECD 2016, p. 279ff).

	2020	2025	2030
Paper	30%	50%	80%
Glass	20%	50%	80%
Metal	70%	80%	90%
Plastic	30%	50%	80%

Table 1: National minimum targets of Georgia for waste to be recycled. Source: Georgia (2016), p. 20.

In view of CE I, if it is too costly to setup the infrastructure for a deposit system within the short period of time that is left – given the national recycling targets of 30% for plastic and paper as indicated in Georgia (2016) for the year 2020 (cf. Table 1), a simpler version should be considered. As waste paper and waste glass containers on the one hand, and waste plastic containers on the other are of different environmental quality due to the environmental risks associated with them (EU 2011b, Metz 2016, Pivnenko et al. 2016), there could initially be a stronger focus on the collection of plastic bottles.

Georgia could then start with a simple separate collection system in the major cities with already established waste collection systems: separate bins especially for plastic bottles, if possible, also for glass and waste paper, at various locations next to the regular waste containers. Later, a take back system with a deposit for single-use plastic bottles could complement the separate collection system.

- **Independent Compliance Schemes:** Similar to the considerations regarding a WEEE policy, Georgia should opt for independent compliance schemes in competition. Such an approach allows a reduction of packaging waste from beverage containers. The licensing fees will assume a competitive level without any interference from the public authorities. However, if need be, the government can “modulate” the fees, raise the fees for plastics licensing, for example, in order to further reduce the quantity of plastics used in drinks packaging.

Regarding the compliance schemes, the same remarks apply as for the case of the WEEE policy. In fact, the compliance schemes, which organize the collection and the recycling of

the waste drinks containers, could be the same as those, which take care of the collection and the recycling of WEEE.

As there is a well-educated labour force in Georgia, it is possible to further develop the existing recycling activities into a functioning recycling sector (CENN 2016; WMTR 2016). Experience shows, that for-profit compliance schemes stimulate innovations regarding packaging and recycling. Welle (2011), Zhang & Wen (2014), Rujnic-Sokele & Pilipovic (2017), and Van Eygen et al. (2018) study and discuss innovations and challenges associated with plastics and plastic waste.

- **Publicity Campaign:** An adequate publicity campaign has to accompany the introduction of this EPR system emphasizing, for example, the overall availability of fresh drinking water, or detailing characteristics of certain plastics or recycled plastics. Orset et al. 2017, show that this kind of information does have an effect on purchasing decisions of the consumers.
- **Implementation of the Constitutive Elements:** The stakeholders have an interest in observing the waste hierarchy. Less material for drinks packaging or refillable containers can reduce the licensing fees. In addition, as experience from Germany shows, consumers have an incentive to return the empty containers, thus exerting an additional pressure on producers and importers for a DfE, showing that the tools of the policy are appropriately linked with the goals. Thus, CE II and CE III are satisfied.
- **Open Issues:** Again, the local conditions should be analysed. Where to start with a particular collection system? Which collection and recycling rates are considered to be feasible? Should there be differences among the regions?

6.3 Used Cars and a Clean Air for a Sustainable Development in Tbilisi

As mentioned earlier, the air pollution in Tbilisi is above generally recommended maximum levels. As cars seem to play a major role for this pollution, the following approach provides the outline for an Integrated Environmental Policy to reduce pollution from cars. The policy will also demonstrate how an appropriate policy in Georgia supports corresponding efforts in Germany for a DfE regarding cars, and to restrict the export of used cars, which are actually scrap vehicles.

- **Inspection:** Georgia asks for an inspection certificate from an authorized institution in the exporting country for any car imported into Georgia. This certificate has to prove that the car is in safe condition and that the emission levels do not exceed the standards adopted in Georgia. This certificate is, in the sense of a command-and-control policy, required for registering the car in Georgia.
- **Follow-up Inspections:** Similar to the regulations in many other countries, the cars have to be maintained, such that they can pass a similar safety inspection every two years. These inspections are to be carried out at authorized facilities in Georgia, perhaps in cooperation with the international car manufacturers.

- **Take-Back Requirement for ELV:** Scrap vehicles have to be taken back by the international manufacturers, or by facilities, authorized by them, without costs to the last owner. ELVs have to be recycled in a reasonable way, the car manufacturers pay for these activities.
- **Implementation of the Constitutive Elements:** The command-and-control policy addresses all importers of cars into Georgia. Due to the registration of the car, an almost perfect control is possible. Moreover, as there is a sticker on the license plate indicating the month and the year of the next inspection, also this requirement can be sufficiently controlled without too much efforts. Due to the free-of-charge take-back requirement, the manufacturers cannot escape their duties regarding recycling the scrap vehicles. Thus, importers, car buyers and car manufacturers are integrated into the policy and addressed appropriately – CE II is satisfied. As the policy will reduce air pollution in Tbilisi and Georgia, the tools are appropriately linked with the policy goal, and CE III is respected.

Interestingly, there are links of this policy to the ELV policy in Germany (and probably other countries, too). The fact that manufacturers have to take back scrap vehicles in Georgia and consign them for recycling, raises the number of cars, which have to be recycled with money from the manufacturers. Thus, there is an additional pressure for a DfE for cars. Moreover, fewer used cars, which are in a bad condition, will or can be exported to Georgia, affecting also the decisions of the car dealers.

- **Open Issues:** The central question refers to the local framework conditions, to CE I: is it possible to introduce this kind of policy in Georgia, in a country where cars and the ownership of cars play a comparatively important role? For sure, the public authorities have to prepare the general public for such changes and accompany it perhaps through educational programs.

Summary on the Design of Integrated Environmental Policies for a Circular Economy: These examples of integrated policies make clear that each policy areas requires a somewhat different approach. This is not surprising, if one keeps in mind the origin of these holistic policies: the solution of the allocation problems depends, of course, on the environmental commodities considered. However, the constitutive elements of an integrated policy provide a guideline for the design of such a policy.

7. Final Remarks

In view of the incomplete state of development and implementation of a circular economy, this textbook can only provide a first glance on this topic – from an economic point of view. The focus is on incentive compatibility of the various environmental regulations, not always realized in current legislation.

For the future, environmental policies meant for implementing a circular economy, should much more developed along certain guidelines. The “Constitutive Elements” of an

Integrated Environmental Policy are an attempt to this regard. Such a procedure could certainly help to develop appropriate policies.

Nevertheless, there is an art of designing Integrated Environmental Policies...

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