



Assessment of Policy Impacts on Sustainability in Europe

*Prevention, re-use and recycling of plastic packaging waste in the
Netherlands*

Wytze van der Gaast

Joint Implementation Network Jin

jin@jiqweb.org

Groningen, November 2013

Table of Contents

1. Introduction	4
1.1 Background and problem description.....	4
1.2 Methodology.....	5
2. From EU directives to national policy instruments	7
2.1 EU Directives and corresponding national policy instruments	7
2.2 Selection of key national policy instruments	11
2.3 Identification of stakeholders in plastic packaging material prevention, reuse and recycling.....	12
3. Effectiveness and efficiency of policy instruments.....	13
3.1 Effectiveness of Producer Responsibility in combination with Packaging Tax and Covenant with Municipalities on Plastic Waste Recycling in the Netherlands	13
3.2 Efficiency.....	20
3.2.1 <i>Dynamic efficiency</i>	21
4. Expected and observed system context.....	22
4.1 Defining the system context.....	22
4.2 Impact of expected and observed context factors on effectiveness/efficiency of policy instruments	22
5. Impact of policy transposition and implementation on recycling performance	28
5.1 Policy transposition and implementation of producer responsibility in combination with packaging tax.....	28
5.2 Impact of policy context factors on effectiveness and efficiency of producer responsibility in combination with packaging tax	30
6. Explore policy instrument interaction including an analysis of stakeholder behaviour within the application system.....	35
6.1 Expand and describe the stakeholder system	35
6.2 Identifying possible policy interactions based on PI comparison	36
6.2.1 <i>Impact of packaging tax on the behaviour of stakeholders</i>	37
6.2.3 <i>Impact of producer responsibility on the behaviour of stakeholders</i>	39
6.2.4 <i>Impact of combined policy instruments on stakeholders' behaviour and recycling goals</i>	40
6.3 Impact of combined implementation of producer responsibility and packaging tax on effectiveness towards Dutch plastic waste recycling targets	42
7. Synthesis and Conclusions	44
7.1 Conclusions on Effectiveness and Efficiency.....	44
7.2 Synthesis of the impact of contextual factors, implementation factors and policy instrument interactions on effectiveness of policy instruments towards recycling.....	46

8. Conclusions.....	48
9. References.....	50

List of Figures

Figure 1: Overview of policy instruments in plastic packaging material supply and re-use chain in the Netherlands	12
Figure 2: Trend of recycling of household plastic compared with overall recycling trend.....	19
Figure 3: Direct influence of the packaging tax on stakeholder system	37
Figure 4: Direct influence of the producer responsibility on stakeholder system.....	39
Figure 5: Direct influence of all policy instruments on the stakeholder system	41

List of Tables

Table 1 : Policy scope matrix identifying EU directives	9
Table 2: National policy framework around Waste management – prevention, re-use and recycling of plastic packaging material (CS3 The Netherlands)	11
Table 3: Plastic waste recycling achievements during 2008-2012.....	18
Table 4: Economic context factor impacts on effectiveness of producer responsibility-packaging tax towards plastic waste recycling	23
Table 5: Environmental context factor impacts on effectiveness producer responsibility-packaging tax towards plastic waste recycling	24
Table 6: Technical context factor impacts on effectiveness producer responsibility-packaging tax towards plastic waste recycling	24
Table 7: Socio-political context factor impacts on effectiveness producer responsibility-packaging tax towards plastic waste recycling	25
Table 8: Governance context factor impacts on effectiveness producer responsibility-packaging tax towards plastic waste recycling	27
Table 9: Political & Social Acceptance context factor impacts on effectiveness of producer responsibility-packaging tax towards plastic waste recycling	30
Table 10: Policy coherence context factor impacts on effectiveness of producer responsibility-packaging tax towards plastic waste recycling	31
Table 11: Policy sustainable development consistency impact on effectiveness of producer responsibility-packaging tax towards plastic waste recycling	32
Table 12: Implementability of policy instruments on effectiveness of producer responsibility-packaging tax towards plastic waste recycling	32
Table 13: Stakeholder assessment of direct and indirect impacts of the Packaging tax.....	37
Table 14: Stakeholder assessment of direct and indirect impacts of the producer responsibility	39
Table 15: Expected and observed impact of policy interaction on the effectiveness of policy instruments towards recycling targets	43
Table 16: Impact of all relevant factors on the effectiveness of the combination of policy instruments producer responsibility, packaging tax and covenant producers-government-municipalities	47

1. Introduction

1.1 Background and problem description

Substantial reduction of the use of natural resources is a priority of the EU's 6th Environmental Action Programme. One of the EU's political strategies addressing this issue is the EU's thematic strategy on waste. The EU directive on waste (2008/98/EC)¹ as well as the waste directives preceding it (75/439/EEC, 91/689/EEC, 2006/12/EC) have established the so called 'waste hierarchy' with a preference for prevention/reduction of waste, followed by reuse of waste material and, if that is not possible, recycling of waste for production of new products. With this Directive the EU has demonstrated a clear preference for prevention, reuse and recycling over deposition of waste on landfills, as it avoids a number of serious environmental problems associated with landfilling, *e. g.* emissions of methane as well as the contamination of soils, groundwater and surface water bodies.

Prevention, reuse and recycling of waste also reduce the need for mining and processing of raw materials for production of new products. This contributes to reduction of ecological and social problems associated with mining and processing of primary raw materials, which often takes place in countries with low environmental and social standards.

With respect to the economic and social dimensions of sustainability, the reduction of the use of primary raw materials which is achieved by increasing the use of secondary raw materials can result in reduced costs and increased competitiveness of EU business. As the collection and sorting of wastes are relatively labour intensive activities, waste policies have also the ability to stimulate the EU labour market. On the other hand, an increasing share of reuse and recycling, for instance, reduces the amount of waste available for co-incineration *e. g.* in heat, power and cement plants, where waste is considered an inexpensive energy source.

European policies on waste management have an impact on a wide range of stakeholders, *e.g.* producers, retailers, private households, local authorities, waste management companies, *etc.* With regard to the overall objectives of the APRAISE project and the case studies performed it is important to narrow down the scope of the waste management case study to a specific waste stream. This is in line with the history of EU waste regulation, which - based on the waste directive - established specific directives for hazardous waste streams (*e.g.* waste oils, PCB/PCT, batteries) as well as more complex waste streams, *e.g.* for packaging, end-of-life vehicles (ELV), waste electrical and electronic equipment (WEEE).

The EU packaging directive (94/62/EG)² established specific targets for the recycling of glass, paper, metals and plastics used as packaging material. This case study will focus on plastic waste, because this will allow us to address possible conflicts and synergies between the intended increase in the share of reuse and recycling and other targets in and the beyond environmental policy realm.

¹ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives <<http://ec.europa.eu/environment/waste/framework/>>

² European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste <http://ec.europa.eu/environment/waste/packaging_index.htm>

The overall reuse and recycling performance for plastic waste in the EU is considered to be rather low and there are great differences in the reuse/ recycling performance of the Member States. Therefore, the case study on plastic waste assesses the policy instruments used for the pursuit of the respective target with regard to their effectiveness and efficiency separately and with respect to the interaction with other policy instruments. In order to do so, it identifies the stakeholders affected by the relevant policies and their incentives. The case study will be concluded by an assessment of the efficacy of the evaluated policy instruments and by recommendations as to how conflicts between different policy instruments can be avoided, synergies used and the effectiveness of environmental policy increased in general.³

In the Netherlands, 80% of total waste in 2010 was recycled (38% in EU – 2008 figure). Of the remaining part, 16% was burned in an incineration plant from which energy was produced (about half of this energy is considered as green given the share of biodegradable waste in it) and 4% landfilled. In 2011, 51% of plastic packaging material was recycled while the objective as formulated in the Dutch Packaging Decision (2006-2012) is 42%. Due to the increased recycling activities (next to household waste, also recycling of construction and demolition waste and waste from service sectors) the total recycling goal for 2015 is 83% (+3%-points compared to 2010). As a consequence, the supply of waste for incineration will decrease by 1 to 1.5 million tonne by 2015, which is 10-15% of the incineration capacity.⁴ In order to compensate for this reduced supply, incinerators have the possibility to import waste from other EU Member States (so that incinerators can operate at higher efficiency levels): in 2010, 85% of waste import came from Germany; in 2011, 40% of imported waste was from Germany and 50% from the UK.⁵

In 2006 the Decision on Packaging Material (packaging decision)⁶ became effective in the Netherlands with a focus on prevention, recycling and useful utilisation of packaging material. It was operated during 2006-2012, after which it was renewed with a modified set of policy instruments. In order to have a clear starting and end date of a policy cycle, this case study focuses on the effects of the packaging decision during 2006-2012. Moreover, in order to narrow the scope of analysis, the case study focuses on prevention, recycling and useful utilisation of plastic packaging material. In particular, the case study explores how the policy instruments applied have affected volumes within the plastic waste management chain, such as, for instance, reduced supply of waste for waste incinerators due to increased plastic recycling.

1.2 Methodology

This report assesses the effectiveness and efficiency of the chosen policy instruments under the packaging decision. First, in section 2 an overview is presented of potentially relevant policy instruments which could have direct and indirect relationships with the plastics

³ <http://www.agentschapnl.nl/onderwerp/afvalcijfers-samenstelling-huishoudelijk-restafval>

⁴ Due to the economic crisis and increased recycling activities, the price that waste incinerators pay for waste has dropped from €100/tonne to €60/tonne. De Volkskrant, Afvalverbranders vinden gouden bergen in Napels, MICHAEL PERSSON - 14/01/12, 00:00

⁵ Annex to letter from Secretary of State (Ministry of Infrastructure and Environment) to Parliament; DP2011048374 'Meer waarde uit afval' (higher value from waste).

⁶ Besluit Beheer Verpakkingen en Papier en Karton, 1 January 2006.
<http://wetten.overheid.nl/BWBR0018139/geldigheidsdatum_01-07-2013>

prevention and recycling goals. From these policy instruments, subsequently, a selection will be made of those instruments which have played a key role in achieving these goals. This selection does not imply that the other policy instruments are not important, but helps to keep the analysis focussed and concise. The selected policy instruments will be subject to detailed analysis in terms of: how effective have they been to increase recycling of plastic waste to target levels set by the Netherlands Government in 2006 (Task 3; Tasks 1 and 2 have been completed in module 1 of this case study and these are summarised in section 2). In Task 4, the impact of economic, political, technological and social context factors on the observed effectiveness and efficiency will be analysed. This is followed by an analysis in Task 5 of how the design and implementation of the selected policy instruments have affected ability to reach recycling targets. In Task 6, it is explained how the selected policy instruments have co-existed in terms of supporting plastic waste recycling and whether there have been positive or negative interactions.

The analysis is largely based on a study of Dutch evaluation reports published by research institutes and the ministerial inspection teams for recycling of waste performance. The analysis has furthermore been substantiated by detailed interviews with four stakeholders from different organisations present in the waste-to-recycling value chain: Energy Valley as the Northern Netherlands supporting agency for greening economic processes, including waste management; Attero as one of the organisations that operate in the waste collection and separation processes; NL Agency as the Netherlands government agency responsible for, among others, the implementation and operation of waste-related policy instruments; and the Netherlands Waste Management Association as the organisation representing a broad range of organisations that are active in the Dutch waste management sector.

2. From EU directives to national policy instruments

In this section, an overview will be presented of relevant EU Directives for plastic waste management and of potentially relevant national policy instruments (section 2.1). In section 2.2 a selection will be made from these policy instruments to be focussed on in detail in the next sections.

2.1 *EU Directives and corresponding national policy instruments*

The following EU directives addressing the environmental targets/environmental themes can be identified as potentially relevant for the case study on enhanced prevention and recycling of plastic packaging material in the Netherlands:

Directive on Energy Efficiency: This directive supports the EU objective of achieving a 20% energy efficiency increase by 2020. Prevention, reuse and recycling of waste contributes to energy efficiency in packaging production. In addition, the Directive supports the use of waste heat for energy purposes, which covers the activities of waste incinerators and the use of waste heat as a partly renewable energy source. Therefore, increased prevention, reuse and recycling would increase energy efficiency in production of plastic packaging material, whereas it could reduce the production of waste heat in waste incinerators.

EU-ETS Directive: The EU ETS also covers co-incineration that substitute fossil fuels with burning plastics (e.g. cement). Incineration plants are not covered by the ETS. A possible interaction with waste management could be the incentive to increase burning waste in co-incinerators to reduce CO₂ emissions and free up extra EU emission allowances. This could, in principle, cause a shift from waste incinerators to co-incinerators and from reuse and recycling to co-incineration.

Waste Framework Directive: This directive streamlines waste legislation, including management of all kinds of waste, such as batteries, plastics, hazardous waste, oil, etc. It follows the waste management hierarchy (in the Netherlands known as the “Lansink’s Ladder”): prevention, reuse, recycling, useful use for other purposes, disposal at landfills. This directive has a direct impact on the management of plastic packaging waste.

The resource-efficient Europe flagship initiative: This EU document contains, among others, measures for recycling of materials and improving the overall recycling performance in Europe in different sectors. The Netherlands Government, in August 2011, announced that this initiative will lead to actions to prevent waste and improve the quality of recycling.

Packaging and packaging waste Directive: Based on this directive organizations who supply packaging material in the market for the first time (producers and distributors) are held responsible for reuse and recycling of the material. In the Netherlands this directive led to the introduction of a packaging tax which covered around 4000 producers and distributors. The revenues from this tax were put in a fund from which prevention, reuse and recycling campaigns were financed (e.g. Plastic Heroes), as well as municipalities compensated for improved recycling activities. For the reporting on the performance, the sector established

the organization Nedvang. As of 2013 the tax will be abolished and replaced with a voluntary agreement between government and industry.

Energy and Climate package 2009: This package covers several of the above mentioned decisions and directives: ETS, energy efficiency, renewable energy targets. In terms of climate impacts of waste prevention, reuse, recycling and incineration, these could interact with the ETS (e.g. co-incineration), energy efficiency improvement in producing plastic packaging material, and shipment of waste, reduced waste heat production if incinerator activity reduces due to waste prevention, reuse and recycling.

Energy Taxation Directive: This Directive puts minimum standards on taxation for environmental improvements. It could make the use of some material (e.g. oil) in primary plastic production more expensive so that reuse and recycling become more attractive. Also reduced energy use when producing secondary plastic packaging would avoid energy taxation.

Directive on incineration of waste: This Directive applies to both incinerators and co-incinerators and places operating conditions and technical requirements on waste incineration plants. Under this directive incinerators receive permits from national governments. In the Netherlands, the House of Representatives requested in 2010 to discourage incineration permits in order to steer waste management towards recycling. This was not adopted though as waste incineration has now been considered useful processing of waste, so that in principle no incentive for improved recycling from legislation on incineration of waste can be expected.

Landfill Directive: The Landfill Directive has been translated in Dutch law by a tax on waste disposal which had the objective to steer waste away from landfilling and towards recycling. In addition, there is a list of waste for which disposal in landfills is prohibited, which creates another incentive to look for and invest in alternatives. The prohibition law on waste disposal led to a waste price increase for incinerators towards €100/tonne (which dropped to €60/tonne due to economic recession and increased recycling).

Water Framework Directive: Since almost all remaining substances from incinerators in the Netherlands are in solid forms, no fluids will be released to surface water. The main water consumption in the plastic waste management hierarchy is in the reuse and recycling of plastics. This water will be purified in water purification statements. We therefore do not expect a direct interlinkage of this Directive with recycling and reuse of plastics.

Directive on shipment of waste: There could be an interlinkage between increased recycling and shipment of waste between Member States. For instance, increased recycling reduces waste supply for incinerators which could then import waste from other Member States. On the other hand, there seems minor impact of shipment of waste between Member States on the scope for recycling of plastics within countries. Therefore, we consider this directive as not relevant for this case study.

These directives are summarised in

Table 1.

Table 1 : Policy scope matrix identifying EU directives

Environmental policy theme				
Energy	Climate	Waste	Water	Resource use
Directive on Energy Efficiency (COM/2011/370), repealing Directives 2004/8/EC and 2006/32/EC ⁷	Emissions Trading Scheme Directive (2009/29/EC)	Waste Framework Directive (75/442/EC)	Water Framework Directive (2000/60/EC) ⁸	The resource-efficient Europe flagship initiative ⁹
Energy and Climate Package 2009 ¹⁰		Packaging and packaging waste Directive (94/62/EC) ¹¹		
Energy Taxation Directive (2003/96/EC) ¹²		Regulation EC 1013/2006 on shipments of waste ¹³		
		Directive 2000/76/EC on incineration of waste ¹⁴		
		Landfill Directive 99/31/EC ¹⁵		

In light of these Directives, the following policy instruments can be identified as potentially relevant for this case study:

- **Packaging tax** (*verpakkingenbelasting*) which was a tax paid by producers and/or suppliers of products packed in plastic material (e.g. bottles, tooth paste, milk, butter). The tax was levied over the weight of the plastics used for packing goods and the revenues were transferred to the Government budget, from where it was partly earmarked for, a.o., funding waste separation techniques and prevention of litter (through the so-called Waste Fund managed by the Ministry of Environment; until 31 December 2012 when it was abolished).
- **Producer responsibility** (*producentenverantwoordelijkheid*) which implies that producers and/or suppliers of products packed in plastics are responsible for the collection of the plastic material after consumption of the product. In the case of plastic packaging material producer responsibility was organised during 2006-2012 by letting producers pay a fee (through the packaging tax) which was channelled through the Waste Fund (partly) to municipalities in order to compensate their costs of plastic waste collection and separation from households.¹⁶

⁷ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0370:FIN:EN:PDF>

⁸ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:327:0001:0072:EN:PDF>

⁹ http://ec.europa.eu/resource-efficient-europe/pdf/resource_efficient_europe_en.pdf

¹⁰ http://ec.europa.eu/clima/policies/package/index_en.htm

¹¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1994:365:0010:0023:EN:PDF>

¹² http://ec.europa.eu/taxation_customs/resources/documents/taxation/minima_explained_en.pdf

¹³ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:190:0001:0001:EN:PDF>

¹⁴ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:332:0091:0111:EN:PDF>

¹⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:182:0001:0019:EN:PDF>

¹⁶ Since 1 January 2013 this situation has changed as producers now pay a fee on plastic packaging material supplied to their markets which is directly transferred to municipalities.

- The **responsibility of municipalities**, as formulated in the Dutch national waste management plan 2009-2021, to collect household waste and optimise waste prevention and separation processes.¹⁷ In the case of plastic waste, producer responsibility has been operationalised through an agreement between producers/suppliers and municipalities on the role of municipalities in the collection and separation of plastics from regular household waste and transfer of the separated plastics to recycling installations, while being financially compensated for that from the revenues of the packaging tax (collected by the governmental tax office and paid through the Waste Fund under responsibility of the Ministry of Environment).
- **Differentiation of waste tariffs** as incentive for plastic waste differentiation is a policy instrument that municipalities can apply as a stimulus for households to separate plastics from other household waste, for instance in the form of lower municipal taxes. The tariffs are paid as part of the municipal taxes by households to municipalities.
- **Communication campaigns** can be applied to support household efforts to prevent use of plastics and to separate plastics from household waste, such as for instance *Plastic Heroes* and *Milieuzak* (Bag for the environment). Plastic Heroes organises plastic waste collection by delivering bags to households for plastic waste and placing waste collecting points at shopping malls, etc. *Milieuzak* is an alternative system adopted by a few municipalities in the northern provinces of the Netherlands.
- **European Emissions Trading Scheme (ETS)**, which prices the emissions of greenhouse gases and makes energy-intensive production processes relatively expensive (assuming everything else remaining constant). With high ETS allowance prices, the production of primary plastics would become more expensive which could be an incentive to increase recycling and use more secondary plastics instead. However, high ETS allowance prices could also be an incentive to substitute fossil fuels with energy use from waste through incineration, which could possibly conflict with recycling goals. In reality, the prices of the ETS allowances have been too low during 2008-2012 to have such significant impacts.
- **Incineration tax**, which can be used as an incentive to prevent incineration of waste so that the waste can be used for other services such as production of secondary plastics and energy.
- **Landfilling tax**, which would reduce the attractiveness of landfilling of waste and make recycling and incineration of waste more attractive.
- **Prohibition of landfilling waste types**, which was introduced for plastics.

Table 2 summarises the above by categorising the policy instruments under the policy themes concerned.

¹⁷ Landelijk afvalbeheerplan 2009-2021- Naar een materiaalketenbeleid, Ministry of Housing, Spatial Planning and Environment <[http://www.lap2.nl/sn_documents/downloads/01%20Beleidskader/versie%202010-02%20\(1e%20wijziging\)/beleidskader-00-compleet_2010-02-16.pdf](http://www.lap2.nl/sn_documents/downloads/01%20Beleidskader/versie%202010-02%20(1e%20wijziging)/beleidskader-00-compleet_2010-02-16.pdf)>

Table 2: *National policy framework around Waste management – prevention, re-use and recycling of plastic packaging material (CS3 The Netherlands)*

Policy theme	National Policy instruments					
Energy	Voluntary agreement with industry on energy efficiency (Meerjarenafspraken energie efficiëntie 2001-2020)	Feed-in tariff subsidy scheme to stimulate the production of renewable energy (gases, heat and electricity). Stimulering Duurzame Energie (SDE)	Energy investment tax refund (Energie investeringsaftrek)	Energy tax on the consumption of energy (Energiebelasting)	Price regulation for city-heating and block heating systems (Warmtewet)	
Climate	ETS					
Waste	Voluntary agreements government – industry (4 covenants between 1991 – 2022)	Tax on packaging (part of Verpakking-besluit 2006-2011) (Verpakking s-belasting)	Waste disposal tax (part of law of tax on environmental basis) Stort-belasting	Waste incineration tax (part of law of tax on environmental basis) Verbrandingsbelasting	Producer responsibility (e.g. removal charge or deposit-refund system) Producentenverantwoordelijkheid	Tariff differentiation for household waste

2.2 Selection of key national policy instruments

Of the policy instruments identified and introduced in section 2.1, the packaging tax, producer responsibility and responsibility of municipalities for waste separation will be analysed in detail in the Tasks 3, 4 and 5 as these have been the main national level policy instruments for stimulating the recycling of packaging material such as plastics.

This does not imply that the other policy instruments will no longer be discussed in this case study. For example, differentiation of municipal waste tariffs, to be paid by households as part of their municipal taxes, will be included in the analysis in Task 6 in order to see how this policy instrument could interact with and have an impact on the effectiveness of the packaging tax, producer responsibility and municipality responsibility.

In Task 6, also the possible interaction of incineration tax with the above policy instruments will be analysed in general, in combination with the ministerial decision to qualify waste incineration for energy production as a useful utilisation of waste and alternative for fossil fuels in energy production. The intention of this incentive is to increase the incineration of waste which is not suitable for recycling instead of landfilling it. The incineration tax can be used to increase the attractiveness of waste recycling over waste incineration (which is in line with the waste hierarchy). However, in the Netherlands, the incineration tax has been set

at €0 for a number of reasons. First, existing long-term contracts between municipalities and incinerators would reduce the effectiveness of the tax to steering the waste streams. Moreover, with a tax >0 incineration would become more expensive than landfilling which would be contrary to the waste hierarchy. It is noted that the latter argument does not hold for plastic waste as plastics cannot be landfilled anymore in the Netherlands.

The impact of the European Emissions Trading Scheme (ETS) on the waste management value chain is not analysed in detail in Tasks 3-5 as this impact has been limited due to the low price of ETS emission allowances during the observed case study period (the EU ETS started in 2008). However, its potential impact on making primary plastics relatively expensive and waste incineration more attractive is discussed in section 6 (Task 6).

Communication campaigns will be analysed in Task 6 in combination with the effect of packaging tax and using the revenues for recycling campaigns and support.

2.3 Identification of stakeholders in plastic packaging material prevention, reuse and recycling

Figure 1 presents an overview of value chain for plastic packaging material from the point where the plastics material is produced, through its use for packaging goods, becoming waste of household consumption, its collection for recycling for use as secondary plastic or incineration for energy production. The stage of landfilling of plastics has been crossed out in the figure as this option is prohibited in the Netherlands. The stakeholders in this value chain, how they are affected by the selected policy instruments and how they interact is discussed in further detail in Section 6 (Task 6).

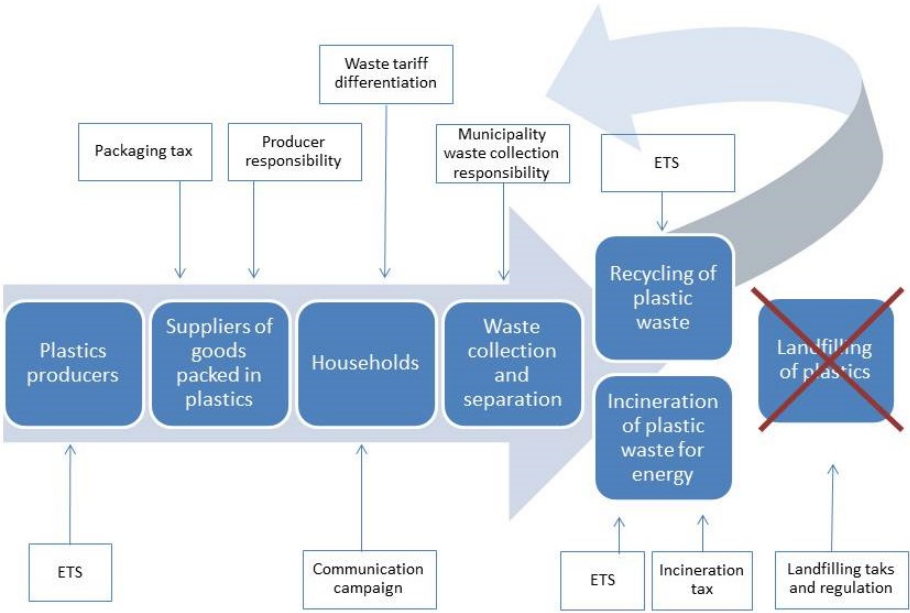


Figure 1: Overview of policy instruments in plastic packaging material supply and re-use chain in the Netherlands

3. Effectiveness and efficiency of policy instruments

3.1 *Effectiveness of Producer Responsibility in combination with Packaging Tax and Covenant with Municipalities on Plastic Waste Recycling in the Netherlands*

Observed impacts of packaging tax on use of primary plastics and plastic waste recycling

The packaging tax was introduced in 2008 in the Netherlands, under the 2006 packaging decision, as an indirect tax to be paid by a producer or supplier who is the first to supply a packed product to another actor in the market. In 2008, a tax of € 0.48 per kg plastic material was levied for primary plastics (€ 0.25 for secondary plastics) followed by € 0,43 in 2009 and € 0,47 in 2010 (in 2008, the first 15,000 kg of plastics were exempted from the packaging tax; in 2010, the first 50,000 kg were exempted).¹⁸ The tax was paid by 8000 to 10,000 producers/suppliers, who jointly are responsible for about 95% of the packaging material supplied to the Dutch market (incl. plastics, paper and cardboard). The objective was to raise €365 million per year, of which €115 million was transferred to a Waste Fund (managed by the Ministry of Environment) to support recycling efforts and to reduce plastic waste from litter.

CE Delft (2010)¹⁹ prepared a qualitative analysis of the first effects of the packaging tax in the Netherlands, a few years after the introduction of the tax. The study database consisted of the data of producers/suppliers which use more than 15,000 to 50,000 kg plastic packaging material (collected by the sector facilitating organisation Nedvang and the Dutch tax office) and interviews with stakeholders. These effects are described in terms of whether the tax has reduced the volume of plastics supplied to the market, whether there has been a substitution to different packaging material and whether and how the tax has resulted in innovation effects. Effects were both assessed with a view to observed short term impacts and expected longer term impacts.

The objective of the tax was to motivate suppliers to reduce the use of plastic packaging material and/or replace the use of primary plastics with secondary plastics (based on recycled material). However, this impact has been limited during the period 2008-2010 for a number of reasons. First, the period analysed is relatively short after the introduction of the tax which makes it difficult to conclude on possible longer term impacts of the tax. During this short-term period, producers/suppliers considered the costs of changing the packaging strategy as relatively high in comparison to the expected costs savings from reduced use of plastic packaging material. This reduced the incentive for producers/suppliers to change the packaging strategy. Second, suppliers could pass on the tax rates to the product prices relatively easily. As a result, price increases due to the packaging tax have, for a selection of

¹⁸ The level of the tax was determined differently for 8 categories of waste material. For each material the tax rate was connected to its environmental impact (i.e. material used, energy intensity, etc.).
http://www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/zakelijk/overige_belastingen/verpakkingenbelasting/tarieven/.

¹⁹ CE Delft, 2010, De milieueffecten van de verpakkingenbelasting,
<http://www.ce.nl/?go=home.downloadPub&id=1091&file=7226_defrapportASC.pdf>

products, only amounted to 1-3%. This has been enhanced by the possible strategy that the tax on one product is not included in the price of that product but passed on to the price of another product (to avoid that the price of a product moves from € 0,99 to over € 1,00 euro the tax is added to the price of a product that costs € 0,90 and would now become € 0,92).

Moreover, the packaging tax only influences the costs of using packaging material, whereas a packaging strategy also depends on such aspects as health, design and whether the supplier operates internationally or only nationally. Some packaging material is difficult to amend in terms of volume as it could reduce the expiration time of the product and could thus result in additional waste of food. Design of the package is usually an important aspect to market a product and suppliers will be careful not to worsen the design of the package in an attempt to reduce use of packaging material. In fact, improved design and heavier plastic packaging material could result in higher product sales which could offset cost increases due to taxation (CE 2010, 32). An assessment of whether these short-term conclusions also hold for the remainder of the 2008-2012 period has not been published yet. However, stakeholders interviewed in CE (2010), as well as the stakeholders interviewed for this case study indicate that a packaging strategy is usually not quickly changed within a short period of time as such a strategy is often formulated for periods of ten years or longer. In order to have an impact on producers/suppliers' strategic packaging decisions, the tax should cover a timeframe which is sufficiently long to enable suppliers to build their packaging strategies on that. Stakeholders interviewed for this case study also stated that a packaging tax as a stand-alone policy instrument, even in the longer run, is less effective than when it is part of a 'package' with other instruments to enable more stakeholder awareness and participation (such as households and municipalities, see also below). In particular, stakeholders argued that multinationals are increasingly concerned about the environmental impacts of their plastic packaging material (such as bottles), not because of a tax but because of consumers' awareness and overall EU policy approach. In their view, a European approach is therefore more effective to change multinationals' packaging strategies than national policy instruments such as a tax. This insight is enhanced by the observation that multinationals often use internationally uniform packages, which makes deviations due to a country's tax difficult.

In conclusion, the short term impacts of the packaging tax in the Netherlands in terms of prevention of plastic packaging and increased use of secondary plastics have been rather limited, although interviewed stakeholders argued that the longer term impacts could be stronger if the taxation period were more in line with companies' packaging strategy timeframe and the taxation were part of an international approach to reduce use of primary plastic and replace this with recycled plastic. With a view to its impact on stimulating plastic waste recycling, stakeholders explained that the packaging tax has been important for that as it generated the funding to financially compensate municipalities for their efforts to separate plastic waste from household waste.

Producer responsibility in combination with agreement with municipalities on plastic waste collection and separation

A key element of the Dutch Packaging Decision is that producers (as well as importers of products supplied to the Dutch markets) remain responsible for separating the packaging

material from other waste sources and for the costs of the waste separation processes.²⁰ According to the decision, producers are responsible for useful application of 75% (in terms of weight) of the packaging material that they have supplied to the markets and for recycling of 70% of that material. These percentages apply to plastics, paper and cardboard. For plastics alone, 45% of packaging material has to be applied usefully (energy, recycling and reuse), of which at least 38% has to be recycled. In 2010, the recycling target for plastics was increased to 42%.^{21 22}

Producers can comply with this responsibility either individually (i.e. collecting the packaging material themselves from product users) or cooperatively with other entities. The latter is more likely as many producers do not have an infrastructure for collecting packaging waste after consumption. Therefore, producers agreed (on 27 July 2007) on a collaboration with municipalities and the Ministry of Housing, Spatial Planning and Environment (VROM) to collect and separate packaging material (from consumption goods) using the existing waste collecting infrastructures of municipalities. As a compensation, municipalities would receive €115 million from the Waste Fund (which is collected through the packaging tax as described above). In this way, for household plastic waste, the producer responsibility essentially boiled down to paying the packaging tax.

Municipalities in the Netherlands generally apply two systems for separating plastics from household waste: separation of plastics before and after household waste collection. The majority of municipalities have adopted a system to separate plastic waste at the household level, which is then either collected from households (in special bags, e.g. 'Milieuzak' or 'green environment bag') by municipality services (or services contracted by the municipalities) or brought by households to collection points in, e.g., shopping malls. The plastics thus collected are then transported to sorting stations. Systems of separating plastics at the household level can be applied in combination with waste tariff differentiation, whereby a municipal tax reduction can be granted to households which separate more plastic waste (measured in kg).

A number of municipalities, however, apply a process to first collect waste from households and then have the packaging waste separated by certified installations. On 20 September 2008, this option was added to the 2007 agreement between suppliers, municipalities and VROM.²³ Currently, there are three such certified installations: one installation operated by the company Omrin and two installations belonging to the company Attero.

According to the Packaging Decision, municipalities are free to decide whether to apply a 'pre-collection' or 'post-collection' plastic waste separation technologies under the condition that the 'post-collection' technique is at least equally effective as 'pre-collection' plastic waste separation. Based on stakeholder consultation²⁴ it can be concluded that this strongly

²⁰ Packaging Decision Articles 2 and 4. Besluit Beheer Verpakkingen en Papier en Karton <http://wetten.overheid.nl/BWBR0018139/geldigheidsdatum_01-07-2013>

²¹ <http://www.rijksoverheid.nl/nieuws/2010/12/24/doelstelling-32-recycling-kunststof-afval-gerealiseerd.html>;

²² Twijnstra Gudde, 2011. Bevindingenrapport evaluatie werking Besluit beheer verpakkingen en papier en karton, Ministerie van Infrastructuur en Milieu, 18 mei 2011, 570373/JGN/ASG.

²³ Nedvang & Vereniging van Nederlandse Gemeenten, 2009. Uitvoerings- en monitoringprotocol; gescheiden inzameling verpakkingsafval (versie 2.0).

²⁴ In addition, an article in De Volkskrant of 22 November 2013 contributed to the 'rule of thumb': "Plastic scheiden: keurige burger versus machine" ['Separating plastics: Gentlemanlike citizens versus a machine'].

depends on the willingness of households to separate plastics at home and that this depends on the context (see below). As a 'rule of thumb' the stakeholder consultations made clear that currently 'post-collection' installations separate approximately 30 per cent of plastics from household waste.

The implementation of the policy instrument was delayed due to the fact that some municipalities requested reopening of negotiations with producers due to the higher costs related to separation of waste after collection. A striking fact was that producers initially had preferred 'post-collection' separation systems but had agreed with a system of separation before collection due to the limited capacity of post-collection separation installations in the country. When it turned out that some 50 municipalities (esp. in some larger cities) preferred post-collection-separation, costs of plastic waste separation became higher. Reasons why these municipalities preferred after-collection-separation were, among others, that in some areas in larger municipalities systems of waste separation do not exist (e.g. garbage chutes are used instead), there are more apartment buildings with waste containers kept at balconies, streets are sometimes too narrow for multiple waste collection trucks and awareness and/or social acceptance among the population of what to separate and where to put it is often lower than in smaller municipalities so that extra costs would need to be made for additional waste separation after collection. These renewed discussions led to a delay in the operationalization of the agreement by almost 3 years after implementation of the Packaging Decision.

Stakeholders indicated that in municipalities which apply 'pre-collection' systems in combination with differentiated municipality tax rates (the Diftar), enhanced plastic waste separation performances could be observed.

Another policy implementation issue related to the producer responsibility is that differentiated targets for different types of plastics (small and large bottles, folios, etc.) have been merged into one common plastics recycling goal of 42%. On the one hand this may have resulted in a differentiation of recycling performance between different types of plastic (with, e.g., polyethylene terephthalate or PET bottles having a higher recycling rate than 42% and other plastics showing a lower recycling performance). On the other hand, Twijnstra Gudde (2011) quote stakeholders who argue that precisely because of the aggregation of targets across different plastic waste sources, the overall target has been set at a 10%-pt higher target as the combined effect of the differentiated targets together before.

Another issue related to the instrument of producer responsibility is that, as a result of the 2007 agreement between municipalities, producers and the Ministry of VROM, in practice both producers/suppliers and municipalities became responsible for the separation of plastics from household waste. A possible implication is that for complying with their responsibility, producers/suppliers depend on the performance of municipalities in terms of separating packaging waste from household waste. In case of underperformance by a municipality, producers/suppliers have no real instruments to comply with their responsibility.

This article discusses experience with the two approaches in the Netherlands of plastic waste collection at household level and plastic waste separation techniques after waste collection and included an interview with Geert Bergsma, who is plastic waste recycling research expert at CE in Delft, the Netherlands.

According to stakeholders interviewed for this case study, producer responsibility has been a good instrument to make producers aware of the material they use for packing their goods and make them responsible for treating the material throughout the waste management life cycle. Generally, the policy instrument works well when producers can be individually approached about plastic waste management, such as car producers and refrigerators producers. They can put in place systems to collect and reuse the plastics once a car or fridge has reached the end of its lifetime. However, for most plastic packaging material such a direct approach is much more difficult as this would imply individually contacting 400,000 companies. For the latter cases, the collaboration with municipalities has been important to operationalise the producers' responsibility instrument.

Overall effect of the combined implementation of the policy instruments on plastic waste recycling

Currently (in 2013), it is not yet clear whether the 42% recycling target for plastics has been achieved in the Netherlands in 2012. Annually, producers report, via their representing organisation Nedvang, to the Ministry of Infrastructure and Environment (formerly VROM) on the realised recycling of plastic waste. The latest available report by Nedvang covers the monitoring results of plastics recycling in 2011 and concludes that 51% of plastic packaging material supplied to the market (by business and households) was separated during that year for recycling. With this percentage, the plastic recycling target would have been achieved.

However, earlier ministerial inspection reports have concluded that the reported recycling percentages overestimate the actual recycling performance. A ministerial inspection in 2011 showed several flaws in the data reported by companies which are active in waste collection and treatment (including preparing for recycling).²⁵ For example, filth attached to plastics adds to the weight of plastic waste which is separated for recycling. Insufficient correction for this leads could result in the net weight of plastics suitable for recycling being less than reported (in 2010 an overall correction of 10% was applied for this reason across companies, but it was absent in the 2011 reporting where it was assumed that companies would correct for filth themselves). In addition, it is uncertain how much plastic packaging material is actually supplied to the market (in the Netherlands, the packaging tax only applied to suppliers with more than 50,000 kilo of packaging material used, so that a large amount of packaging material was not monitored under the tax). Finally, mistakes made by producers/supplies when using the reporting tool WasteTool under the Packaging Decision. According to the ministerial inspection report (VROM-Inspectie, 2010: 39), these mistakes could lead to an overestimation of 10 to 15% of the plastics recycling.

In addition, interviews with stakeholders also resulted in a viewpoint (and recommendation) that the term recycling target as applied in the Packaging Decision is actually a target for 'collection and preparation of plastic waste for recycling'. Stakeholders explained that once plastic waste has been prepared and contracted for recycling, then the recycling installation has a scope of freedom to decide on whether to recycle the plastics as secondary plastics or to send it to an incinerator. Costs are an important determinant for that. Generally,

²⁵ VROM-Inspectie, 2010. Recycling kunststofverpakkingen Op weg naar een volwaardige kunststofrecycling, 0098.

stakeholders indicated that clean, homogeneous plastics are relatively cost-effective to recycle, but that more heterogeneous and more difficult to purify plastics (such as plastics with glued layers of plastics or with colour substances) could become more costly to recycle than having these incinerators.²⁶ Some stakeholders stated that as a result actual recycling figures could be substantially lower than officially reported figures.

At the same time, the reporting on collection of household plastics was considered accurate and useful by the ministerial inspection. The monitoring system as applied for monitoring household packaging waste is rather expensive though and it has been paid for from packaging tax revenues. Industry needs to pay for the monitoring costs themselves so there is an incentive to have simpler systems. Nonetheless, also double counting was spotted by the inspection and identified for repairs.

It has become clear from the inspections that, in terms of contribution to recycling, the performance of plastics separation for reuse/recycling is approximately the same for systems separating before and after household waste collection, albeit that post-collection separation is generally considered as more costly than pre-collection separation. Of the pre-collection waste separation options, collecting plastics from households is 2 to 3 times more effective than procedures whereby households need to bring their separated plastics to collection points.²⁷

Table 3 below summarises the supply of plastic packaging material to the market and recycling of plastic waste during 2008-2011 (2012 data are not yet available).

Table 3: *Plastic waste recycling achievements during 2008-2012*

	2008	2009	2010	2011	2012
Plastics packaging material supplied to market (kton)	442	427,5	454	444	460
Recycling plastics households (kton)	6	16	59	79	82
Recycling plastics industry (kton)	155	148	157	147	137
Recycling percentage (%)	36	38	48	51	48
Useful utilisation household plastic waste after sorting and not recycled (incineration and useful application as energy source)	2	5	19	22	24
Source: Monitoring reports Nedvang for 2008-2012					

Figure 2 shows, based on the data in Table 3, the trend in household plastic recycling during the period 2008-2012 and compares this with the overall plastics recycling trend (including industrial plastics).

²⁶ For instance, as per November 2013, recycled PET bottle plastics generated around €780-800 per tonne, while recycling of more heterogeneous plastics generate less than €350/tonne.

²⁷ KplusV, 2011. Evaluatie-onderzoek bron- en nascheiding kunststof verpakkingsafval, Nedvang en VNG, 1011261-031/hmg/jba.

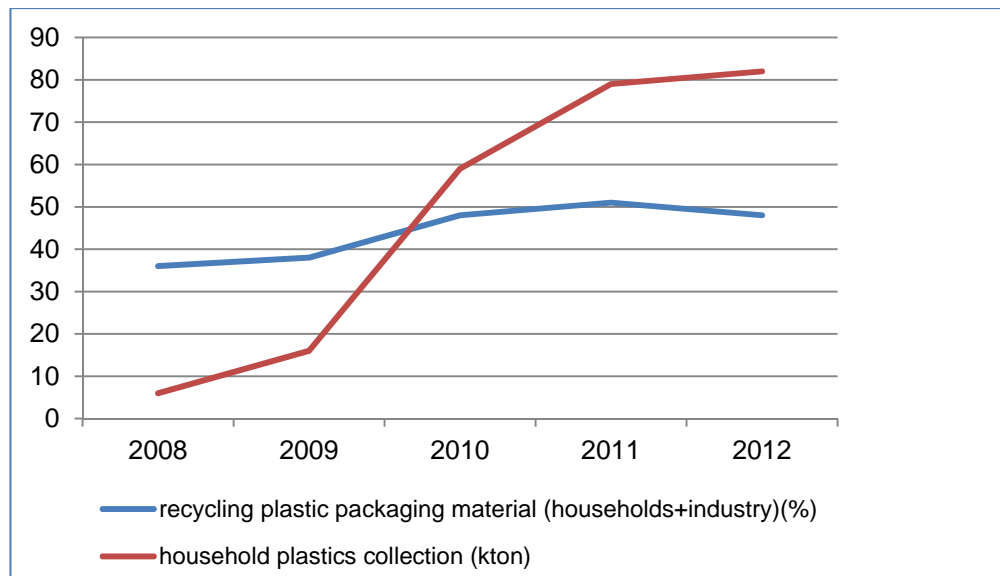


Figure 2: *Trend of recycling of household plastic compared with overall recycling trend*

As a general comment, stakeholders pointed out that although the reported recycling rate (or sorted plastics for recycling rate) is a helpful indicator of progress towards plastic waste recycling, the main issue is the quality of the recycling process chain. If the quality of the sorted and prepared plastics is insufficient, then the recycled product is of lower quality too or, as mentioned above, recycling may become economically less attractive than incineration. Stakeholders indicated that, while techniques and technologies for waste collection, separation and preparation for recycling existed when the Packaging Decision was introduced, the economic crisis seems to have slowed investments in improved techniques and technologies for enhancing the quality of plastic streams for recycling and of recycled products.

In conclusion, the combined implementation of the packaging tax and producer responsibility in combination with municipalities' responsibilities to collect waste from households has resulted in a significant increase in preparing plastic waste for recycling from 6 ktons in 2008 to 79 ktons in 2011. From the analysis in this case study and the stakeholder interviews, these instruments would not have been able to achieve this result if implemented separately. The packaging tax on its own would not have been able, within the relatively short period of time covered by this analysis, to provide similar incentives towards recycling. The producer responsibility for household waste is generally complex due producers' lack of waste collection infrastructures. The combination of these instruments with municipalities' responsibilities in waste collection stimulated activities towards recycling of household plastic waste. However, this combination also limited the practical application of producer responsibility as producers/suppliers did not have to pay directly (only indirectly via the packaging tax) for the waste collection and separation activities and did not actively take part in these activities.

3.2 Efficiency

The key question related to efficiency of policy instruments is whether the effect of the instruments could have been achieved with fewer resources or whether with the same resources a better effect could have been achieved.

The 2006 Decision on Packaging material contained two main policy instruments as described above: a Packaging tax and Producer responsibility in combination with a voluntary agreement between producers and municipalities. The revenues from the packaging tax amounted to around € 350 million per year of which € 115 million was used to cover the costs of plastic waste separation from household waste. Based on 2009 data, municipalities where plastic packaging material is separated before collection received €475 per tonne of plastics as compensation for the collection (on the condition that the plastics separated by households and collected by municipalities comply with quality standards for recycling). In case of separation of plastics after collection in certified separation units, municipalities received €350 per tonne (no extra costs are involved for the collection as this is part of regular household waste collection).²⁸ These compensations were also paid from the € 115 million fund.

For efficiency reasons (a.o. larger scale operation) part of the plastic packaging waste is transported abroad, for instance in case further purification is needed before recycling can take place.

Other costs related to the implementation of the packaging tax and producer responsibility are administrative costs for collecting the packaging tax revenues (for the government), monitoring the plastics supplied to the market (through the producers' organisation N edvang), inspection of the supply and separation data (governmental costs). Data on these costs are difficult to specify for the recycling value chain.

As explained above, during 2008-2012 the packaging tax was collected through the tax office and partly transferred to the Waste Fund. It remains to be seen whether it would have been more efficient if producers jointly had collected funding for compensating the costs throughout the recycling chain directly. Without a tax, producers would need to collect between €106 and €128 million for plastic waste separation instead of the €350 million per year that they paid on tax between 2006 and 2012. In the new voluntary agreement on packaging material (covering 2013 – 2022) the packaging tax has been abolished and producers will be responsible for both the recycling process, in collaboration with municipalities, and the funding.²⁹ How this will work remains to be seen though. During 2006-2012 municipalities sometimes claimed that they needed a higher compensation for the recycling efforts whereas producers in some cases claimed that costs were lower. Direct conflicts between municipalities and producers could be prevented though as the funds were collected and paid through governmental institutes.

²⁸ These compensations are reported by the Association of Dutch Municipalities on its website: <http://www.vng.nl/onderwerpenindex/milieu-en-mobiliteit/afval>.

²⁹ As per 31 December 2012, the packaging tax has been cancelled as part of the governmental operation of the Cabinet Rutte I to cancel small-scale taxes with perceived low effectiveness. <http://financieel.infonu.nl/belasting/86098-kabinet-rutte-1-afschaffing-van-de-kleine-belastingen.html>

Another aspect related to efficiency of producer responsibility in combination with the role of municipalities in waste collection is that using existing municipality infrastructure for collecting and separating plastic waste from household instead of producers/suppliers developing their own infrastructure has increased efficiency of recycling efforts. On the other hand, however, the division of responsibilities between producers and municipalities was considered problematic as producers are responsible for the plastics that they use for packaging their goods but need municipalities for effectuating this responsibility although they have little influence on the waste separation performance of municipalities. The latter delayed the implementation of the agreement between producers and municipalities until 2010 (see section 4.1) and reduced efficiency of producer responsibility as policy instrument.

A final efficiency aspect is that during the period analysed for this case study, 2006-2012, multiple systems for plastic waste collection and separation were in use, whereas theoretically one integrated system would be more efficient as it would be three times less expensive than having multiple systems.³⁰ Whether this efficiency could have been achieved remains to be seen though as it depends on the local contexts. For instance, separation systems collecting plastics at the household levels are less feasible in the larger cities (as explained above). In other words, an integrated system may be less costly but also less effective in terms of recycling performance so that overall efficiency impact is uncertain.

3.2.1 Dynamic efficiency

Given the relatively short period of time (2008-2012) covered by this case study, it is difficult to conclude on whether and to what extent application of the policy instruments has also led to learning effects and cost reductions. However, one indication could be that the compensation for collection of plastic waste which municipalities receive has decreased from € 475 per tonne of plastics in 2009 (as mentioned above) to € 445 per ton in 2013 and will further decrease to € 430.

³⁰ Berger, R., Arbeitsgemeinschaft Verpackung + Umwelt (AGVU), 2007. "European packaging policy - the consequences of a deposit system for disposable packaging based on the German example".

4. Expected and observed system context

4.1 *Defining the system context*

During the period economic growth slowdown and recession since 2008, plastic waste supply from industries decreased while household plastic waste remained quite constant. With respect to the latter, consumer behaviour mainly changed in terms of price categories, but not in terms of whether and how products are packed in plastics.

From stakeholder interviews it has become clear that the main driving forces for successful plastic packaging waste management are producers (e.g. cost reduction incentives, pressure from consumers to lower footprint) and governmental policies. The period 2006-2012 for the Packaging Decision largely coincided with the economic crisis, which has reduced the amount of waste but which has not strongly affected the recycling goals. The main issue is whether during the economic crisis extra investments in separating plastic waste from household waste can be sufficiently justified as an extra cost or tax for consumers.

In terms of environmental awareness, consumers have become much more aware of footprints and quality of processes and are prepared to stand up and protest against products that are clearly produced with a large footprint and low process quality. Producers respond to that by using more environmentally friendly material and through increased willingness to separate waste sources for increased recycling and useful utilisation.

The main impact of technological development has been that in the Netherlands different systems exist for separating waste. This has been an important step as some municipalities refuse (for practical reasons, as explained above in this case study) to introduce a system of plastic waste separation before collection. The process of separating plastic waste at the household level has now been widely introduced in the Netherlands, but this is not really a technical breakthrough, rather has it introduced an additional social dimension to recycling processes. Nevertheless, technologies had to be developed and introduced for the sorting of different plastic types, cleaning the plastics and preparing these for recycling processes.

Although political developments have an impact on recycling and their process, the long-term trend towards sustainability is unmistakably clear (a.o. due to international pressures on multinationals). These social trends determine the direction of recycling activities and strength of the process. The colour of the coalition in office is less important, although the 'right' colour of the coalition can accelerate the process, such as when Centre-left coalition led by Prime Minister Balkenende introduced the packaging tax and finally made the funding available to finance the processes.

4.2 *Impact of expected and observed context factors on effectiveness/efficiency of policy instruments*

The above description of the system context for the policy instruments packaging tax and producer responsibility and how this has had an impact on the performance of plastic waste recycling in the Netherlands is further specified in the table below by focusing in detail on individual economic, environmental, technical, socio-economic and governance context factors. In the table, it is explained: how each factor has evolved during the period 2006-2012

(the timeframe of the Packaging Decision analysed in this case study), how it has affected the performance of the policy instruments towards plastic waste recycling and how strong this impact has been.

The scores in the table below (on a scale from -2 highly negative to +2 highly positive) have been based on desk research and detailed interviews with stakeholders from different stages in the waste collection and separation cycle.

In the discussion below, the packaging tax has been considered to be strongly connected to producer responsibility as the taxation of use plastic packaging material by consumers was part of the implementation of the responsibility of producers/suppliers for recycling and/or useful utilisation of the material after consumption. Therefore, in the table below the context factors are described for both policy instruments at the same time.

Table 4: *Economic context factor impacts on effectiveness of producer responsibility-packaging tax towards plastic waste recycling*

System context factor	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
Annual GDP growth percentage and use of plastics in consumption	0	-1	In 2006, strong economic growth was expected in the Netherlands (2-3% annually) with increasing consumption patterns and higher use of plastic packaging material. However, producer responsibility and packaging tax would lead to higher tax revenues so that the amount of recycled plastics would also increase. In reality, economic growth has been zero or negative, although plastic waste quantities have been less sensitive for this as people continued consumption, albeit in lower price categories. The latter may have had a slightly negative impact on recycling as cheaper products tend to use less advanced packaging techniques and thus use more plastics).	Slightly negative
Cost saving intention of businesses	1	0	It was expected that due to the packaging tax producers/suppliers would adjust their packaging strategies in order to avoid the taxation costs (slightly positive). In this case study, companies have turned out not to base their packaging strategies on a package tax (particularly when the time horizon is relatively short). In general, companies: calculate the tax strategically across products, are limited in their packaging decision by design, health and (multinational) company strategy issues.	No impact
Oil prices	1	-1	Before 2008 oil prices were strongly increasing and this was expected to make use of primary plastic more expensive and to	Slightly negative

System context factor	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/ efficiency
			create an incentive for producers to use more secondary plastics or less plastics for packing goods. In reality, oil price increase has halted/slowed down since 2008.	
Household incomes and savings	1	1	It was expected and observed that in smaller municipalities and those with higher average income levels the willingness to separate plastic waste is higher. Moreover, in some municipalities with pre-collection plastic waste separation systems households pay a lower waste collection tariff if they separate more plastics (due to the lower weight of the remaining household waste).	Slightly positive

Table 5: Environmental context factor impacts on effectiveness producer responsibility-packaging tax towards plastic waste recycling

System context factor	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/ efficiency
Awareness of environmental risks, including pollution	2	1	Around 2006 environmental awareness, including climate change was very large in the Netherlands and it was expected that this would support actions in the direction of plastic recycling. In practice, consumers were limitedly familiar with the packaging tax which was a producer's tax and the price impact of it was limitedly felt by consumers.	Slightly positive

Table 6: Technical context factor impacts on effectiveness producer responsibility-packaging tax towards plastic waste recycling

System context factor	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/ efficiency
Existing infrastructure of waste management	1	2	The revenues from the packaging tax were planned to be used for collection and separation of plastic household waste. However, initially, there was no agreement between producers and municipalities (who operate household waste collection) about plastic waste separation. Producer responsibility was hampered as producers do not have the infrastructure to collect and separate plastic waste. Through the agreement between producers, government and municipalities, and thus combining the impact of the packaging tax	Highly positive

System context factor	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
			and producer responsibility, the existing infrastructure could be much better used for plastic waste collection and separation.	
Availability of techniques for waste separation	1	2	<p>Techniques for separately collecting household waste before processing this were already available and applied in The Netherlands (plastic bottles via supermarkets; glass via containers; paper via containers and door-to-door collection; vegetable and garden waste separated in special containers; and the rest of household waste). However, through the technological development of separating waste after collection also plastic waste recycling could be stimulated from municipalities which refuse (for practical reasons) to introduce a system of plastic waste separation before collection.</p> <p>On the other hand, as indicated by stakeholder interviews, the techniques and technologies used for preparing separated plastics for waste and for the recycling of waste need improvement in order to produce a higher quality waste and recycling stream. This would enable recyclers to produce better recycled plastics produced generating higher prices and a stronger competition profile compared to (co)incineration of plastics.</p>	Slightly positive

Table 7: Socio-political context factor impacts on effectiveness producer responsibility-packaging tax towards plastic waste recycling

System context factor	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
Available skills	2	2	Since the 1990s, through subsequent policy measures and investments in waste management infrastructure, labour skills to operate in the waste collection, separation and recycling chain had become high through job creation and building considerable experience in the past.	Highly positive
Health concerns	-1	-1	During the preparation of the packaging decision precautionary measures were adopted that plastic packaging decision may not threaten people's health. Some plastics may not be recycled as secondary plastics for food packaging if the plastic waste has been in contact with other plastics that may	Slightly negative

System context factor	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/ efficiency
			threaten health. This limits recycling potential. In addition, health standards limit the possibility of prevention of plastic packaging use as some products require a minimum amount of plastic packaging to keep them fresh.	
Role of government coalition	1	2	<p>Although political developments have an impact on recycling, according to stakeholders interviewed recycling performance is mainly determined by long term trends.</p> <p>The colour of the government coalition in office is less important than that, although the Centre-left coalition led by Prime Minister Balkenende introduced the packaging tax in relation to producer responsibility and facilitated the agreement between producers and municipalities</p>	Highly positive
Mentality of waste separation	2	1	The Packaging Decision initially aimed at plastics separation from household waste before waste collection, using the revenues from the packaging tax. However, it turned out that in larger cities the mentality and therefore social acceptance of such separation was relatively low, so that for these municipalities alternative post-collection waste treatment was established.	Slightly positive
Existence of markets for recycled goods	2	2	Before the producer responsibility instrument, implementation techniques for recycling of plastics were already in use and their outputs had already found markets: reuse of plastic bottles, secondary plastic for new plastics production or for production of semi-wooden posts, car parts, etc. This helped marketing recycled household plastics.	Highly positive

Table 8: Governance context factor impacts on effectiveness producer responsibility-packaging tax towards plastic waste recycling

System context factor	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/ efficiency
Tax collection procedures	1	1	The packaging tax was collected through the existing national tax system. For the calculation of the tax base producers had to use a newly developed monitoring service of their facilitating branch organisation Nedvang, as this did not exist. However, as the packaging tax was considered too small (and relatively inefficient) to operate as part of the tax system, it has been abolished as per 1 January 2013.	Slightly positive
Availability of systems for monitoring use of plastic packaging material, waste collection and recycling performance	1	-1	Before the 2006 Packaging Decision, there was no detailed system for monitoring of supplied plastics to the market and collected as household waste. This had to be developed and has resulted in quite detailed insights in separation of plastics from household waste. However, through the details it is considered relatively expensive and there have been monitoring issues with respect to whether all separated plastics will be actually recycled. In addition, the monitoring of waste streams prepared for recycling is unclear. This implies that plastics transferred to recyclers are monitored as recycled whereas in reality, these plastics may still end in co-incineration installations due to cost consideration. Consequently, this monitoring issue may give a wider scope for accounting recycling which in fact is not taking place, therefore claim achievements that are not real and reduce pressure on further improvement of recycling techniques.	Slightly negative
Responsibilities of different parties in the producers responsibility agreement	1	2	Before 2006, producers were already responsible for the packaging material they used. In addition, municipalities were operating the household waste collection systems. The government was responsible for taxation schemes. These responsibilities were combined in the packaging tax scheme and the accompanying agreement among municipalities, government and suppliers. Initially, there were complexities as producers' recycling targets depended on municipalities' collaboration, which they could not influence. However, the combined implementation of the policy instruments had a strong impact on achieving the recycling goals.	Highly positive

5. Impact of policy transposition and implementation on recycling performance

5.1 Policy transposition and implementation of producer responsibility in combination with packaging tax

Further to the analysis in section 3 of the impact of economic, environmental, social, governance and technological factors on the effectiveness of the policy instrument Producer responsibility in combination with the Packaging tax, this section focusses on the policy design and implementation process and how this has contributed to achieving Dutch recycling targets during 2006-2012 through the applied policy instruments.

Policy framework (Producer responsibility and packaging tax)	
EU Packaging Directive 94/62/EC	
Transposition – policy formation, including choice of policy instruments (Producer responsibility and packaging tax)	
<p>In 1991 the first voluntary agreement on packaging materials was made between the central government and suppliers of goods packed in plastics. Main objective of the agreement was to reduce the amount of package material and stimulate reuse and recycling. In 1994, the EU Packaging Directive 94/62/EC was published, which included the commitment for Member States to determine national reuse/recycling percentages targets by 2001. In 1997, the Directive was transposed into Netherlands law, which contained the possibility to agree on voluntary agreements between key players in the packaging waste value chain. This resulted in a new agreement in 1997 ('Convenant Verpakkingen II), which, next to targets for reuse and recycling, also contained targets about maximum quantities of waste to be incinerated or landfilled. In a third agreement in 2002 also an agreement was included on litter: by 1 January 2006 the amount of bottles and cans in litter should be reduced by 80% at least (compared to 2001 levels).</p> <p>The 2006 Decision on Packaging material introduced the packaging tax and combined this with the principle of producer responsibility for collecting and separating plastics for recycling. The Decision has three main goals: prevention of use of packaging material, stimulate its reuse and recycling (including use as energy source) and prevention of litter. The Decision distinguishes between collection and separation of household and industrial waste, as both streams use different infrastructures and have different waste compositions.</p>	
Implementation of policy instruments	
<p>Producer responsibility</p> <p>One year after the Packaging Decision of 2006 producers/supplier, the government and municipalities agreed on a collaboration to use municipalities' waste infrastructure for plastic waste collection and separation. Municipalities are paid for the extra costs from the Waste Fund. This agreement was not part of the 2006 Packaging Decision but was an initiative of producers and municipalities (although stimulated by the Decision's statement that waste separation and collection should mainly use existing infrastructure).</p> <p>In the agreement it was arranged that producers would remain responsible for the process of plastic waste separation even though this process would</p>	<p>Packaging tax</p> <p>For the packaging tax, a tax was introduced to be paid by producers of goods packed in plastics (see section 2.1). The tax is collected based on information reported through the branch organisation Nedvang. The tax is paid to the national tax system and the revenues become part of the government budget. From this budget €115 million was transferred annually to the Waste Fund to support plastic waste separation and recycling.</p>

<p>take place through the infrastructures of municipalities and municipalities did not accept responsibility for the separation, recycling/reuse performance of the chain.</p> <p>Also, there was disagreement about the compensation for municipalities. During the policy instrument implementation it became clear that no uniform system for plastic waste separation could be applied as different regional characteristics required different separation systems. Some municipalities claimed higher compensation during the process, which led to a delay in negotiations so that the policy instruments could only be implemented in 2010.</p>	
<p><i>Monitoring and reporting</i></p>	
<p>Producer responsibility</p> <p>The waste separation performance under the producer responsibility in combination with the role of municipalities is monitored by municipalities in terms kilograms of waste collected. Often this information is used for household waste tariff differentiation (i.e. the more plastics are separated, the lower the weight of the remaining household waste and the lower the waste collection tariffs) in municipalities that apply tariff differentiation.</p> <p>As explained above the monitoring of actual recycling of plastics is not covered by the producer responsibility so that it is unclear which part of the plastics prepared for recycling is actually recycled.</p>	<p>Packaging tax</p> <p>The tax basis for the packaging tax is the amount of plastic packaging material supplied to the market by producers. These data are reported to and monitored by the branch organisation Nedvang. Industrial sectors have used existing monitoring systems for waste. However, these systems were not equipped for dealing with packaging material but were focussed on industrial waste in general. Monitoring of household plastic packaging waste material did not exist and need to be established from scratch and could therefore be immediately designed for plastic packaging material. The monitoring system applied for monitoring household packaging waste is relatively expensive and it has been paid for by the packaging tax revenues. Industry needs to pay for the monitoring costs themselves so there is an incentive to have simpler systems.</p>
<p><i>Inspection and enforcement (Producer responsibility and packaging tax)</i></p>	
<p>The reported quantities are monitored by the Ministerial inspection (VROM Inspectie and, later, I&M Inspectie). The inspection contains random checks of reported quantities.</p> <p>In addition, usual tax system enforcement procedures are in place.</p>	
<p><i>Evaluation</i></p>	
<p>Producer responsibility</p> <p>-The producer responsibility instrument resulted in sufficient scope for selecting plastic waste separation systems that are suitable for the municipality characteristics concerned (e.g. post-collection separation in larger cities and pre-collection separation with differentiated tariffs in smaller municipalities).</p> <p>-The policy instrument contributed to an increase in the recycling of plastic waste, although it is official data may need correction for filth and labels</p>	<p>Packaging tax</p> <p>-Producers found the administrative burden related to packaging tax high: complex forms, unclear software package, etc.</p> <p>-For the taxation office the size of the tax programme (approximately € 350 million per year) was actually too small to manage a separate unit for that. Therefore, the packaging tax was cancelled as per 31 December 2012.</p> <p>-The packaging tax did not effectively address prevention of use of plastics (too short time horizon,</p>

<p>attached to plastic waste.</p> <p>-The division of responsibilities between producers and municipalities was considered problematic: producers are responsible for the plastics that they use for packaging their goods but need municipalities for effectuating this responsibility although they have little influence on the waste separation performance of municipalities.</p>	<p>little impact on strategic packaging decisions, and too low tariff rates to really affect cost levels).</p>
--	--

5.2 Impact of policy context factors on effectiveness and efficiency of producer responsibility in combination with packaging tax

In this section, a number of context factors are identified that relate to the policy design and operationalization of the policy instrument producer responsibility in combination with the packaging tax in the Netherlands during 2006-2012. Each policy context factor is characterised in terms of how it was expected to develop during this timeframe and what was the actual development. Subsequently, it is described how this factor development has had an impact on the effectiveness of these policy instruments towards achieving Dutch plastic waste recycling targets as formulated in the Packaging Decision of 2006 and how this may have differed from the expected impacts.

The scores (on a scale from -2 highly negative to +2 highly positive) have been based on desk research and detailed interviews with stakeholders from different stages in the waste collection and separation cycle.

Table 9: *Political & Social Acceptance context factor impacts on effectiveness of producer responsibility-packaging tax towards plastic waste recycling*

Policy context factors	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/ efficiency
Producers' motivation to invest in plastics recycling	1	1	<p>It was expected that producers may have an incentive to use more secondary plastics as packaging material as this had a considerably lower packaging tax. This increased demand for secondary plastics was expected to stimulate recycling in general.</p> <p>Stakeholders have highlighted that producers have an increasing interest in investing in prevention of plastics and using recycled material since consumer awareness of environmental risks increases.</p>	Slightly positive
Familiarity with prevention and recycling benefits	2	2	<p>Especially municipalities have a long history with waste collection and recycling, whereas also producers were familiar, from earlier voluntary agreements and waste management policies (e.g. paper, glass, biomass waste), with their responsibilities as users of packaging material.</p>	Highly positive

Policy context factors	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
Equity	0	0	The tax was imposed on larger quantities of plastics so that smaller suppliers were exempted. This equity aspect was expected to reduce the tax base. However, as only part of the tax revenue was spent on plastics recycling little impact of this tax basis threshold on recycling was expected and observed.	No impact

Table 10: Policy coherence context factor impacts on effectiveness of producer responsibility-packaging tax towards plastic waste recycling

Policy context factors	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
Coherence with other policies	1	-1	During 2006-2012, in the Netherlands, as well as in Germany, costs of alternative useful utilisation of plastics waste were lower than recycling costs. Therefore, there could be an incentive to prepare waste for recycling up to the level that recycling goals are achieved, but beyond that plastics could be used for co-incineration. According to monitoring procedures, plastics offered for recycling will be monitored but since a substantial amount of plastic waste prepared for recycling is exported, it is not fully clear where this plastic may end up.	Slightly negative
Coordination among institutions	1	2	Given the producer responsibility, but realising producers' lack of infrastructure to collect and separate packaging waste from household waste, it was expected that producers/suppliers would need to collaborate with municipalities using the latter's waste infrastructure. In practice, the agreement between municipalities, government and producers/suppliers on implementing the producer responsibility, and the flexibility to use different collection and separation systems, which was not anticipated, was of key importance to prepare more plastic household waste for recycling.	Highly positive
Perverse incentives in policy design stage	0	-2	Stakeholders consulted for this case study indicated that in the design of the Packaging Decision producers/supplier had relatively strong negotiation influence so that some aspects, such as target setting, exemptions from tax, and monitoring processes, were amended in their interest. For instance, for the monitoring of the recycling performance the branche organisation Nedvang	Highly negative

Policy context factors	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
			became responsible, and some stakeholders consulted for this case study argued that this may have led to perverse incentives regarding monitoring processes and quality in order to be able to claim realisation of recycling goals.	

Table 11: *Policy sustainable development consistency impact on effectiveness of producer responsibility-packaging tax towards plastic waste recycling*

Policy context factors	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
Policy instrument consistency with sustainable development targets	1	1	The producer responsibility in combination with the packaging tax were anticipated to remain as 'highly' as possible in the waste management hierarchy which strongest attention to prevention of plastics use, and reuse and recycling of plastic waste. In practice, the impact of the tax on prevention of plastics use and extra use of secondary (recycled) plastics was limited, but the implementation of the producer responsibility in combination with tax had a positive impact on the recycling.	Slightly positive

Table 12: *Implementability of policy instruments on effectiveness of producer responsibility-packaging tax towards plastic waste recycling*

Policy context factors	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
Administrative set up & feasibility	1	1	Both the packaging tax and the implementation of the producer responsibility made use of already existing administrative (tax and waste) structures. This was expected to enhance the recycling targets, which could also be observed. However, administrative systems set up to determine the tax basis for the packaging tax were new and producers/suppliers faced difficulties in using these. However, this did not negatively affect the amount of money available for plastic waste separation and supply for recycling.	Slightly positive
Monitoring of results	1	-2	The monitoring for household plastic waste is largely done via municipalities' waste collection systems. However, for monitoring of achieving recycling goals, it is important that plastics supplied as packaging material is well accounted for and that the plastics prepared for recycling can be followed throughout the recycling process.	Highly negative

Policy context factors	Expected impact (-2 to 2)	Observed impact (-2 to 2)	Explanation	Impact on effectiveness/efficiency
			<p>According to the Governmental Inspection and stakeholders consulted, these monitoring steps need improvement.</p> <p>Stakeholders also pointed out that in the 2006-2012 plastic recycling case, the producers/suppliers through their branch organisation Nedvang were responsible for monitoring of their own producer responsibility performance.</p> <p>As explained in sections above, monitoring of waste prepared for recycling is unclear and this creates uncertainty about what share of this waste is actually recycled.</p>	
Adaptability	1	2	<p>Beforehand, it was expected that the producer responsibility would be further detailed by agreements between producers and other parties in the waste management chain. In practice, producer responsibility was arranged between producers/suppliers and municipalities, whereby the latter had the flexibility to separate plastic waste after waste collection, while it was expected that separation would take place before collection. This supported plastic waste separation and supply for recycling.</p> <p>The packaging tax rate was anticipated to be modifiable which also happened during 2006-2012, but as only part of the tax revenue was spent on plastics recycling impact on recycling was limited.</p>	Highly positive
Enforceability	2	1	<p>Through the tax system the enforceability of the taxation was high so that the expected revenues could be collected. Moreover, as part of their agreement government and producers municipalities committed themselves to plastic waste separation.</p> <p>The lack of clarity through monitoring of the waste streams that are actually recycled causes the enforceability of plastic waste recycling targets difficult. In practice, only the amount of waste prepared for recycling and contracted by recyclers is monitored for determining whether recycling targets have been met. Therefore, the collection and separation of plastics can be monitored for enforcing measures but not the actual recycling.</p>	Slightly positive

The design and implementation of producer responsibility for plastic waste material has been organised during 2006-2012 on the basis of existing policy structures: the tax system for the packaging tax and the existing infrastructure in municipalities for waste collection and separation. By doing so, also systems could be used with which producers (taxes) and households (waste collection and separation) are familiar, although producers had to work

with a new administrative system to determine the tax basis for the packaging tax and households were only used to separate plastic bottles, not other plastics. Designing the policy based on existing systems also enhanced the enforceability of the policy objectives. This has had a positive impact on the effectiveness of achieving plastic waste recycling goals.

The implementation of the producer responsibility in combination with the packaging tax has shown flexibility during 2006-2012, as tax rates could be amended, depending on the estimated environmental burden of plastics, and municipalities could use different systems for separating plastics from household waste. This flexibility enabled that implementation could be amended depending on the situations in a municipality (e.g. a smaller vs larger municipalities and changing composition of population).

6. Explore policy instrument interaction including an analysis of stakeholder behaviour within the application system

6.1 Expand and describe the stakeholder system

In this section, the 'Producers using plastics for goods' and the 'Retail, shops, supermarkets, etc.' are the direct stakeholders (DS1) addressed by the policy instruments discussed in detail in this case study: producer responsibility in combination with the packaging tax. The reason for identifying these stakeholders as direct stakeholders is that under the Packaging Decision they are responsible for the collection and separation of plastic packaging material when being the first to supply a packed good in the market.

The table below characterises the direct stakeholders in terms of their core business, how they are targeted by the policy instruments and how they interact with other collaborating, competing and facilitating stakeholders in their markets.

Stakeholder name	Producers / Suppliers of plastic packed goods (DS 1)
Core business activities	Production and/or supply of goods packed in plastics and supplied to Dutch market.
Targeted by environmental policy instruments	<ol style="list-style-type: none"> 1) Producer responsibility 2) Packaging tax
Describe policy instruments general compliance options	<ol style="list-style-type: none"> 1) Municipalities are responsible for waste collection and separation and producer responsibility has been 'combined' with that through an agreement between producers, municipalities and government. 2) Payment of tax over plastic packaging material used for supplied goods for quantities over 50,000 kg per year
Functional relationships with stakeholders....	<ul style="list-style-type: none"> - Plastic packaging material producers/suppliers (CS1) - Households consuming good packed in plastics (CS2) - Municipalities for waste collection and separation, including companies contracted for this by municipalities (CS3) - Installations for preparing plastic waste for recycling (CS4) - Waste incinerators (CS5) - Recycling companies for secondary plastics production, which in the Dutch case study could also be Germany companies (CS6) - Co-incinerators, such as cement ovens (CS7) - Nedvang (FS1) - Plastic Heroes for plastic collection systems at supermarkets (FS2) - Governmental agencies for implementation and inspection (FS3) - Vereniging Afvalbedrijven (FS4) is an association of waste management companies in the Netherlands providing support and information to stakeholders in the waste management chain.
Briefly describe nature of stakeholder relation	DS1 – CS1 = packaging material producers/suppliers supply the plastics that commodity producers and suppliers use for packing their products. An important aspect of this relationship could be that a packaging tax could induce producers to reduce the amount of plastics used or increase the use of secondary plastics.

Stakeholder name	Producers / Suppliers of plastic packed goods (DS 1)
	<p>DS1 – CS2 = households are the main consumers of goods packed in plastics. Producers/suppliers are responsible for the collection and separation of plastics used for packing commodities and are therefore responsible for the collection of plastic waste from households.</p> <p>DS1 – CS3 = In order to implement their producer responsibility, producers/suppliers have agreed with municipalities that the latter will separate plastic waste from household waste, using their existing infrastructures. Municipalities have been paid for that through the packaging tax revenues placed in the Waste Fund. CS3 in this case study represents municipalities infrastructure, including companies contracted by municipalities for waste collection and separation tasks.</p> <p>DS1 – CS4 = The plastic waste is collected from households and subsequently, under the responsibility of producers/suppliers, separated from household waste. In case a municipality applies a system of plastics separation after waste collection, CS4 are installations that apply techniques to separate plastics from household waste. In other cases, where plastics are separated before collecting household waste CS4 are installations that collect the plastics from households and prepare this for further treatment.</p> <p>DS1 – CS5 = Producer responsibility implies that producers/suppliers are responsible for useful utilisation of plastic waste. Part of the useful utilisation is when plastic waste that has not been selected for recycling is transported to waste incinerators (or cement ovens) where it can be used for energy production (electricity and heat).</p> <p>DS1 – CS6 = The plastics are transported after separation to recycling companies for production into secondary plastics, which producers/suppliers can use again for packing their products.</p> <p>DS1 – CS7 = Producers are responsible for the recycling or useful utilisation of plastic waste that they use for supplying their products to the market. Waste transported to CS6 (recyclers) is presumed to be recycled but it is possible that if costs of recycling are too high waste will be burned in co-incinerators instead (in case costs of co-incineration are lower than costs of recycling).</p> <p>DS1 – FS1 = Nedvang is an administrative body established for the producers/suppliers to support their administrative producers for the packaging tax.</p> <p>DS1 – FS2 = Plastic heroes is a communication campaign to make consumers familiar with plastic waste collection and separation in the form of plastic waste collection systems at shopping malls and at home. The relation between producers/suppliers and a stakeholder like Plastic Heroes is mainly that Plastic Heroes' activities support producers/suppliers in fulfilling their producers' responsibility. However, not all municipalities that choose for separating plastics at the household level use Plastic Heroes bags; some contract different concepts (e.g. Milieuzak).</p> <p>DS1 – FS3 = Government agencies such as NL Agency and the Ministerial inspection support and monitor stakeholders' (including DS1) compliance with Packaging Decision policy goals and implementation of policy instruments.</p> <p>DS1 – FS4 = In practices there is no direct relation between DS1 and the Dutch waste management association but indirectly FS4 activities support producers' waste management responsibility.</p>

6.2 Identifying possible policy interactions based on PI comparison

After the characterisation of producers/suppliers as direct stakeholders for producer responsibility in combination with the packaging tax, this section focuses on the impact of both policy instruments on the behaviour of the identified stakeholders. It is noted, as a

disclaimer, that disentangling individual policy instruments impact is rather theoretical, as the packaging tax was implemented in combination with producer responsibility.

6.2.1 Impact of packaging tax on the behaviour of stakeholders

The diagram below (Figure 3) shows the impact of the packaging tax (in combination with channelling part of the tax revenues to waste separation activities) on the behaviour of and relations between stakeholders.

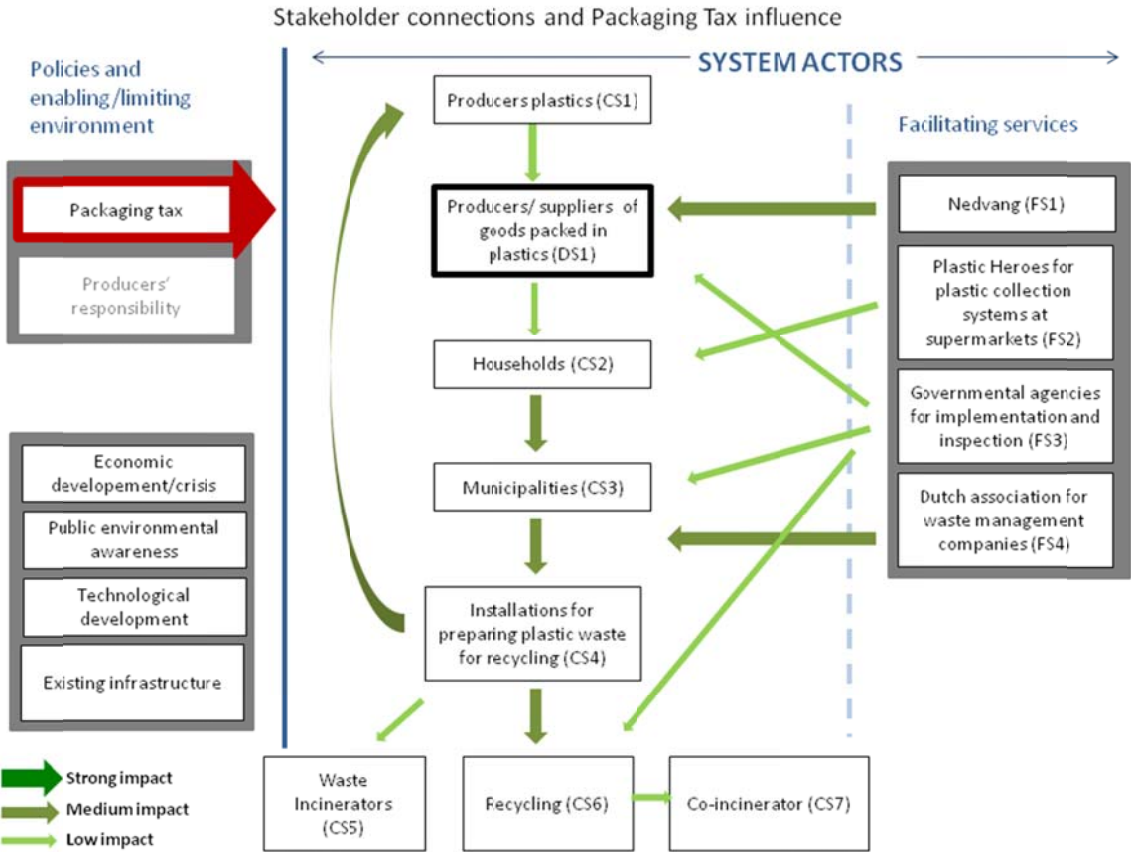


Figure 3: Direct influence of the packaging tax on stakeholder system

Table 13: Stakeholder assessment of direct and indirect impacts of the Packaging tax

Connection	Impact on recycling	Strength
DS1-CS1	A packaging tax could lead to prevention of use of plastic packaging material (or increased use of secondary plastics) so that less primary plastics would be demanded from plastics producers. However, as the tax did not result in a strong prevention or increase in used of secondary plastics, this impact has been low.	Low
DS1-CS2	The tax resulted in a modest price increase of products packed in plastics, but this did not lead to a significant change in consumption patterns.	Low
CS2-CS3	Through the Waste Fund, tax revenues were used to compensate municipalities for their cost of separating plastics from household waste. However, the tax alone with its revenues would not bring a strong impact as the tax would not arrange responsibilities for the waste management and cooperation between stakeholders. For that, an additional agreement was needed.	Medium

Connection	Impact on recycling	Strength
CS3-CS4	Through the funding, municipalities could collect more plastic waste and supply this to installations for preparing plastics for recycling.	Medium
CS4-CS5	As a result of the increased recycling less waste was supplied to waste incinerators. However, the impact of increased household plastic waste recycling on the present overall capacity surplus in the Netherlands (1 million ton = 7.5 mt capacity – 6.5 mt waste supply) is relatively small (e.g. in 2011 79 kt household plastics was recycled).	Low
CS3/4-CS6	Due to the tax and increased municipality actions on waste separation, more plastics became available for recycling.	Medium
CS4-CS1	Recycled plastics are reused as secondary plastic source and as a result partly feeds back to CS1 operations.	Medium
FS1-DS1	Nedvang provides administrative support for DS1 for tax forms and the monitoring of plastics supplied to the market, collected and separated for recycling	Medium
FS2 –CS2	Plastic Heroes informs households on how they can separate plastics from household waste and where to bring the plastics. As a stand-alone relation to increase delivery of plastics to shopping malls, the impact seems to have been relatively low, but this could increase in combination with other measures by stakeholders to increase plastic waste separation awareness	Low
FS3-DS1, CS3, CS6	Governmental agencies support stakeholders in the value chain, are responsible for verification of monitored results and set quality standards. Their role is necessary but in itself it does not strongly stimulate waste separation and recycling actions.	Low
FS4 – CS3-6	The Dutch waste management association supports stakeholders in taking strategic decisions and supports streamlining the value chain.	Medium

6.2.3 Impact of producer responsibility on the behaviour of stakeholders

The diagram below (Figure 4) shows the impacts of the policy instrument producers responsibility on stakeholders' behaviour.

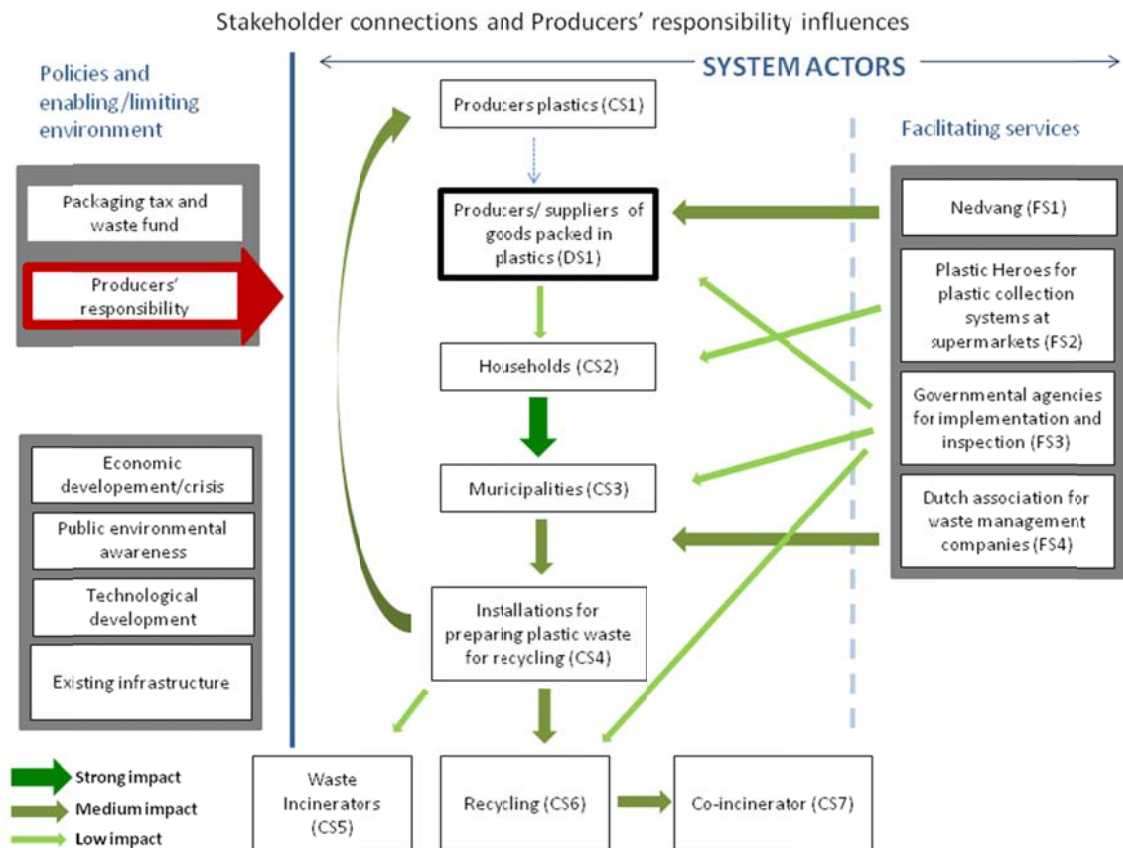


Figure 4: Direct influence of the producer responsibility on stakeholder system

Table 14: Stakeholder assessment of direct and indirect impacts of the producer responsibility

Connection	Impact	Strength
DS1-CS1	Producers' responsibility has not affected the relationship between producers of plastics and producers/suppliers of goods packed in plastic. The responsibility starts when DS1 supply a product to the market.	None
DS1-CS2	Producers' responsibility has made producers formally responsible for the packaging material that they use for goods they produce and/or supply to consumers. However, impact in terms of less packaging material or more secondary plastics used has been low as the policy instrument implementation was mainly focussed on collaboration with municipalities	Low
CS2-CS3	Through the Waste Fund, tax revenues were used to compensate municipalities for their role in separating plastics from household waste. Producer responsibility added a strong aspect to that as producers could only take their responsibility through the infrastructure of municipalities. Therefore, an agreement between Producers (DS1), Government (FS4) and Municipalities (CS3) was formed resulting in larger separated plastic waste streams from households (CS2) through Municipality infrastructure.	Strong

Connection	Impact	Strength
CS3-CS4	Through the agreement with producers/suppliers, municipalities could collect more plastic waste and supply this to installations for preparing plastics for recycling.	Medium
CS4-CS5	As a result of the increased recycling less waste was supplied to waste (co)incinerators. However, the impact of household plastic waste recycling on the present overall capacity surplus in the Netherlands (1 million ton = 7.5 mt capacity-6.5 mt waste supply) is relatively small (e.g. in 2011 79 kt household plastics was recycled). On the other hand, in the Netherlands there is competition between waste recycling and economically more attractive (co-)incineration of waste which is also considered useful utilisation of waste but which is lower in the waste hierarchy than recycling.	Low
CS3/4-CS6	Due to the tax and increased municipality actions on waste separation, more plastics became available for recycling	Medium
CS4-CS1	Recycled plastics are reused as secondary plastic source and as a result partly feeds back to CS1 operations	Medium
FS1-DS1	Nedvang provides administrative support for DS1 for tax forms and the monitoring of plastics supplied to the market, collected and separated for recycling	Medium
FS2 –CS2	Plastic Heroes informs households on how they can separate plastics from household waste and where to bring the plastics. As a stand-alone relation to increase delivery of plastics to shopping malls, the impact seems to have been relatively low, but this could increase in combination with other measures by stakeholders to increase plastic waste separation awareness	Low
FS3-DS1, CS3, CS6	Governmental agencies support stakeholders in the value chain, are responsible for verification of monitored results and set quality standards. Their role is necessary but in itself it does not strongly stimulate waste separation and recycling actions.	Low
FS4 – CS3-6	The Dutch waste management association supports stakeholders in taking strategic decisions and supports streamlining the value chain.	Medium
CS6 – CS7	If the costs of recycling some plastics are higher for CS6 than the costs of co-incinerating it, then more plastic waste may go to CS7, with lower recycling % as a result.	Medium (estimate as no monitoring tool exists)

6.2.4 Impact of combined policy instruments on stakeholders' behaviour and recycling goals

The combined implementation of the *packaging tax* and *producer responsibility* enabled an agreement between producers/suppliers, ministry VROM (on behalf of the government) and municipalities to use revenues from packaging tax for compensating municipalities for their plastic waste separation activities. These combined effects are shown in the diagram below (Figure 5):

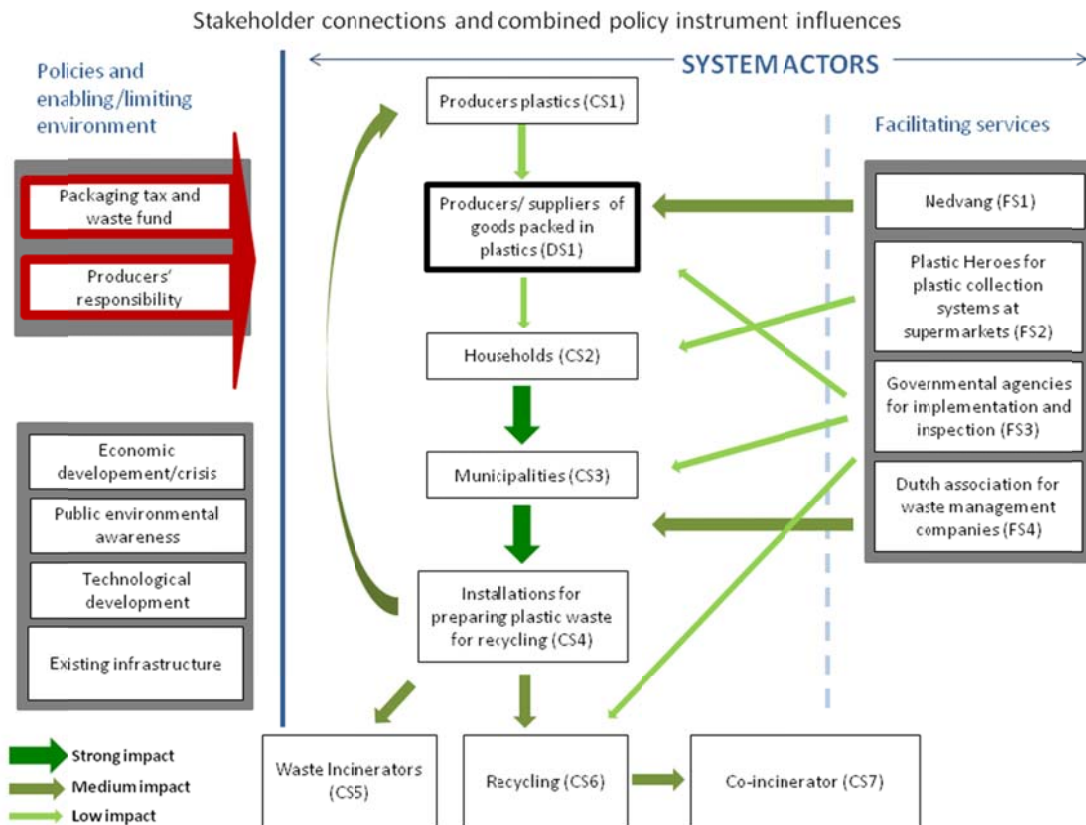


Figure 5: Direct influence of all policy instruments on the stakeholder system

Interactions with other policy instruments through interactions between stakeholders

In Section 1, in addition to producer responsibility and packaging tax a number of other policy instruments were introduced that could potentially have an impact on the effectiveness of plastic waste recycling efforts, but which were not selected for detailed analysis in this case study. In this section, these policy instruments are briefly discussed with a view to their potential interaction with other policy instruments through the behaviour of the identified stakeholders:

- **Differentiation of waste tariffs** („Diftar“) has been used by some municipalities as an extra incentive for households that separate their plastic waste from other household waste; increased plastic waste separation results in lower municipal tax rates. This incentive could stimulate the collection of plastic waste by households (CS2) and municipalities (CS3) and supply to recycling processes (CS4). Stakeholders indicated that in municipalities which apply ‘pre-collection’ systems in combination with differentiated municipality tax rates, enhanced plastic waste separation performances could be observed.
- Communication campaigns can support households’ awareness of plastic waste recycling benefits and inform households (CS2) how to separate plastics. This could have a positive impact on the waste separation and recycling performance, although it has also created confusion among households as in a few municipalities (in the province of Groningen) an alternative household level plastic waste collection system was introduced (such as *Milieuzak*), which was initially not recognized by the government (until May 2009).

- The impact of the **European Emissions Trading Scheme (ETS)** on the waste management value chain has been limited due to the low price of ETS emission allowances. With high allowance prices, production of primary plastics would become relatively expensive which could be an incentive for increased reuse of plastics and increased recycling. Similarly, the possible impact of the ETS on waste incineration activities have been small during 2008-2012.
- Producer responsibility in combination with a **prohibition of landfilling plastics** has required that either use of plastic packaging material has to be limited, or that plastics have to be separated for recycling or incinerated for energy and heat production. In practice, more plastics have been recycled and only the plastics not suitable for recycling have been transported to incinerators. Suitability of plastics for recycling is determined by the *standards for plastic waste* which establish minimum requirements for the quality of separated plastics. Plastic waste of insufficient quality for recycling could still be used in incinerators so that producers' responsibility in terms of useful utilisation of plastic waste could still be met. Achieving recycling goals can be hampered if the waste separation and recycling process leads to insufficient quality levels so that less plastic can be recycled.
- The impact of the **incineration tax** on recycling has similar during 2006-2012 to what was expected as this instrument was practically cancelled with a tax rate of zero. In principle, a low tax rate could make incineration of waste relatively attractive, but from the analysis and stakeholder consultation in this case study no significant impact on plastic waste recycling performance has been found.

6.3 Impact of combined implementation of producer responsibility and packaging tax on effectiveness towards Dutch plastic waste recycling targets

Table 15 summarises the above discussion by explaining the impact of the implementation of producer responsibility and packaging tax on the behaviour of stakeholders (and their interactions) and subsequently on the effectiveness towards achieving plastic waste recycling goals in the Netherlands.

Table 15: *Expected and observed impact of policy interaction on the effectiveness of policy instruments towards recycling targets*

Policy interaction factors	Expected impact (-2 to +2)	Observed impact (-2 to +2)	Explanation	Impact on effectiveness/ efficiency
Stakeholder interaction in waste value chain	1	1	<p>It was intended that producer responsibility would increase awareness among producers and households of the environmental impacts of use of plastic packaging material. By pricing the plastics it was intended that both prevention and recycling would be stimulated. Waste collection and separation (for reuse and recycling) were already in place and it was expected that these would be used for plastic waste separation at household level.</p> <p>In reality, the collaboration between stakeholders (especially between producers/suppliers and municipalities) was formalised through an agreement, which strengthened stakeholder collaboration towards recycling. A negative interaction could exist between recycling and waste incineration stakeholders, but in practice increased incineration capacity had little effect on recycling processes and the increased recycling of household plastic contributed little to incineration overcapacity.</p> <p>Due to limitations in monitoring of plastic waste recycling after sorting waste for recycling it is not clear which part of sorted plastics is actually recycled. However, stakeholders pointed out that interaction between recyclers and co-incinerator in practice leads to increased co-incineration of plastic waste as co-incineration costs or relatively low when compared to costs of recycling some of the plastic waste (non-homogenous and otherwise difficult to purify streams).</p>	Slightly positive
Interaction between policy instruments	2	2	<p>The impact of producer responsibility on recycling was limited as producers/suppliers usually do not have the infrastructure to collect plastic waste back from households. The packaging tax on its own would not strongly stimulate recycling; it may only make primary plastics relatively more expensive when compared to using secondary (based on recycled) plastics. However, the tax generated the strongly needed funding for compensating municipalities for their role in implementing the producer responsibility and organising public awareness campaigns.</p>	Highly positive

7. Synthesis and Conclusions

This case study has focussed on the Dutch policy package between 2006 and 2012 to increase recycling of plastic packaging material, as part of the 2006 Packaging Decision. In Task 3 the effectiveness and efficiency of the main policy instruments for this purpose, producer responsibility and packaging tax in combination with a voluntary agreement between government, municipalities and producers, has been discussed. Tasks 4, 5 and 6 have focussed on how differences between expected and observed impacts of the policy instruments can be explained from: developments in economic, social, technical and policy contexts (Task 4); implementation of the policy instruments (Task 5); and interactions between policy instruments through the behaviour of stakeholders (Task 6). This section synthesises the outcomes of Tasks 3-6.

7.1 Conclusions on Effectiveness and Efficiency

Policy target to be achieved

According to the Dutch Packaging Decision of 2006, producers are responsible for useful application of 75% (in terms of weight) of the packaging material that they have supplied to the markets and for recycling of 70% of that material. These percentages apply to plastics, paper and cardboard. For plastics alone, 45% of packaging material has to be applied usefully (energy, recycling and reuse) of which at least 38% has to be recycled. In 2010, the recycling target for plastics was increased to 42%.

Policy instruments used

A key policy instrument of the Dutch Packaging Decision is *producer responsibility* which states that producers/suppliers remain responsible for separating the packaging material from other waste sources and for the costs of the waste separation processes. As this responsibility is difficult to operate by producers for household plastic waste, as they lack a waste collection infrastructure, the producer responsibility was operationalised through a *covenant* between municipalities, which operate the household waste collection infrastructure, producers/suppliers and the Government. According to this covenant, municipalities would collect and separate plastic waste from household waste and organisation preparation of this waste for recycling. The costs would be covered by the Ministry of Environment using the revenues of the *packaging tax*.

Achievement of recycling targets

As stand-alone policy instruments, the packaging tax and the producer responsibility would not have been able to bring the Dutch household recycling rates for plastic packaging material at the target levels. For instance, the packaging tax in itself provided insufficient incentives during 2006-2012 to significantly reduce the use of plastic packaging material and to replace primary plastics with secondary (recycled) plastics. In combination, with the covenant between producers, ministry and municipalities, the packaging tax was an effective vehicle to generate funding for paying for municipalities' efforts in separating plastics from household waste and preparing this for recycling. The combined application of the policy instruments packaging tax, covenant and producer responsibility stimulated the preparation of household plastics for recycling from 8 ktonnes in 2008 to almost 80 kt in 2011. This also

support the achievement of the Dutch plastics recycling targets: 51% in 2011 while 42% was the goal.

As explained in section 3, governmental inspections have highlighted that due to monitoring issues, the recycling achievement figures are surrounded by uncertainties.

Costs and cost development

The revenues from the packaging tax amounted to around € 350 million per year of which € 115 million was used to cover the costs of plastic waste separation from household waste. Based on 2009 data, municipalities where plastic packaging material is separated before collection received €475 per tonne of plastics as compensation for the collection (on the condition that the plastics separated by households and collected by municipalities comply with quality standards for recycling). In case of separation of plastics after collection in certified separation units, municipalities received €350 per tonne (no extra costs are involved for the collection as this is part of regular household waste collection). These compensations were also paid from the € 115 million fund.

Given the relatively short period of time (2008-2012) covered by this case study, it is difficult to conclude on whether and to what extent application of the policy instruments has also led to learning effects and cost reductions. However, one indication could be that the compensation for collection of plastic waste which municipalities receive has decreased from € 475 per tonne of plastics in 2009 (as mentioned above) to € 445 per ton in 2013 and will further decrease to € 430.

Efficiency

The main question with respect to efficiency is whether the achieved effect could have been realised with lower costs. For producers the answer is probably affirmative as their packaging tax payments were much higher than the compensations paid from it to municipalities for separating plastics from household waste and preparing these for recycling (€ 350 million tax versus € 115 million per year). In addition, the government decided that for the post-2012 policy making the tax would no longer be applied as it is too small to be operated through the national tax office.

A strong efficiency aspect of the operationalization of the producer responsibility for household plastics was that it could largely be based on the existing household waste collection infrastructure operated by municipalities.

Technically, efficiency of collecting, separating and preparing plastic waste for recycling could have been higher if throughout the Netherlands a uniform system had been applied. However, due to different local context characteristics, in practice different systems were developed: either separation of plastic waste at the household level or separation of plastics after collection by specialised plants.

7.2 Synthesis of the impact of contextual factors, implementation factors and policy instrument interactions on effectiveness of policy instruments towards recycling

Table 16 provides an overview of all factors (context, implementation and interaction) influencing the effectiveness of the policy instruments intended to promote the recycling of plastic package material. It also summarizes their impact insofar as it shows the impacts of the combination of all policy instruments supporting the recycling targets, i.e. producer responsibility, packaging tax and covenant producers-government-municipalities.

Table 16: *Impact of all relevant factors on the effectiveness of the combination of policy instruments producer responsibility, packaging tax and covenant producers-government-municipalities³¹*

Factors		Impact on effectiveness
Context factors	CF1 Cost saving intention of businesses	Light Green
	CF2 Oil price development	Light Green
	CF3 Household incomes and savings	Light Green
	CF4 Awareness of environmental risks, including pollution	Light Green
	CF5 Existing infrastructure of waste management	Dark Green
	CF6 Availability of techniques for waste separation	Light Green
	CF7 Available skills	Dark Green
	CF8 Health concerns	Yellow
	CF9 Role of government coalition	Light Green
	CF10 Mentality of waste separation and people's familiarity with waste collection	Light Green
	CF11 Existence of markets for recycled goods	Dark Green
	CF12 Tax collection procedures	Light Green
	CF13 Availability of systems for monitoring use of plastic packaging material, waste collection and recycling performance	Yellow
	CF14 Responsibilities of different parties in the producers responsibility agreement	Dark Green
	Overall assessment	Light Green
Implementation factors	IF1 Producers' motivation to invest in plastics recycling	Light Green
	IF2 Familiarity of implementing entities (e.g. municipalities) with prevention and recycling benefits	Dark Green
	IF3 Coherence with other policies	Yellow
	IF4 Coordination among institutions	Dark Green
	IF5 Perverse incentives in policy design stage	Red
	IF6 Policy instrument consistency with sustainable development	Light Green
	IF7 Administrative set up & feasibility	Light Green
	IF8 Adaptability	Dark Green
	IF9 Enforceability	Light Green
	IF10 Monitoring of quantities of packaging plastics and plastics actually recycled	Red
	Overall assessment	Light Green
Interaction factors	INT1 Interaction between policy instruments (packaging tax-covenant-producer responsibility)	Dark Green
	INT2 Interaction with EU ETS	Red
	INT3 Interaction with useful utilisation of plastic waste in co-incineration	Yellow
	Overall assessment	Light Green

³¹ Similar to Tasks 3-6, the policy instruments have been assessed in combination, since while being individual policy instruments, their implementation in practice was strongly linked by the covenant between producers, Ministry of Environment and municipalities. This makes disentangling their individual effects difficult.

8. Conclusions

In terms of the factors described in the tasks 4, 5 and 6 above, the most important factors for the efficacy of producer responsibility, in combination with a packaging tax, towards plastic waste recycling goals have been:

- The agreement between producers/suppliers, Government and municipalities which enabled implementation of producer responsibility in collaboration with municipality waste collection and separation infrastructure, whereby the funding was generated by the Government by taxing producers/suppliers' used of plastic packaging material and making part of the funding available for compensating municipalities for their activities.
- Willingness of households to separate plastics from waste at home: positive impact in relatively smaller municipalities but mainly when the separated plastics are collected from households (instead of households having to bring plastics to special containers at shopping malls).
- In other municipalities, waste is separated after collection for which an important context factor has been that technologies were already available, with partial ownership of municipalities, as well as different mentality regarding waste separation in larger cities, infrastructure in several apartment blocks not suitable for waste separation (e.g. garbage chutes) and insufficient space in the street for extra containers.
- Economic conditions (recession, etc.) have reduced waste material supply, but plastic waste quantities have remained relatively stable as people changed their consumption patterns in terms of consuming in different price categories but not in terms of type of consumption goods (e.g. cheaper butter or bread which is still packed in plastics). In the relatively short term of the case study observed (2006-2012) limited impact of the recession on recycling could be observed. In a longer term perspective, interviewed stakeholders indicated that stronger economic growth would support recycling as collecting more funding for recycling would be easier accepted.
- An increase in plastic separation activities leads to lower supply of waste to incinerators which could have the following possible consequences:
 - Waste incinerators operate below capacity levels for efficient through-put of waste incineration, so that operation may have to be terminated or waste be imported from other countries.
 - Waste incinerators would produce less power and heat so that less fossil-fuel based energy is replaced (assuming that energy from waste incinerators replaces energy otherwise produced by oil, gas or coal combustion). This would increase greenhouse gas emissions.
 - Caloric values of waste incinerated become lower if the share of plastics in the waste supply reduces.
 - However, the impact of increased recycling of households plastic waste on incineration over capacity is relatively low as the overcapacity in Dutch incinerators

combined currently amounts to approximately 1 million ton waste (7.5 million ton capacity – 6.5 million ton waste supply). Currently, the Dutch waste incinerators compensate for their waste supply shortage by importing waste from other countries (incl. EU Member States).

- The European Emissions Trading Scheme (ETS) could have a positive impact on recycling of plastic waste as a high price on CO₂ emission would make primary plastics relatively expensive compared to secondary (recycled) plastics. This effect could, however, not be observed during the 2006-2012 period for this case study as ETS prices were generally too low for that.

9. References

- Berger, R., 2007. "European packaging policy - the consequences of a deposit system for disposable packaging based on the German example", Arbeitsgemeinschaft Verpackung + Umwelt (AGVU).
- BRBS, 2008. KANSEN BENUTTEN - Recycling in CO2-perspectief, http://www.brbs.nl/files/Kansen%20Benutten_%20Recycling%20in%20CO2%20perspectief%20Versie%205%20definitief_1.pdf
- CE Delft, 2010, De milieueffecten van de verpakkingenbelasting, <http://www.ce.nl/?go=home.downloadPub&id=1091&file=7226_defrapportASC.pdf>
- European Commission, 2000. DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 October 2000 establishing a framework for Community action in the field of water policy <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:327:0001:0072:EN:PDF>
- European Commission, 2009. The climate and energy package <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0265:FIN:EN:PDF>
- European Commission, 2011. DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on energy efficiency and repealing Directives 2004/8/EC and 2006/32/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0370:FIN:EN:PDF>>
- European commission, 2011. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee of the Regions - A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy http://ec.europa.eu/resource-efficient-europe/pdf/resource_efficient_europe_en.pdf
- European Parliament and Council, 1994. Directive 94/62/EC of 20 December 1994 on packaging and packaging waste <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1994:365:0010:0023:EN:PDF>
- European Parliament and the Council, 2000. Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:182:0001:0019:EN:PDF>
- European Parliament and the Council, 2006. Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:190:0001:0001:EN:PDF>
- KplusV, 2011. Evaluatie-onderzoek bron- en nascheiding kunststof verpakkingafval, Nedvang en VNG, 1011261-031/hmg/jba.
- Ministry of Spatial Planning and Environment, 2010. Landelijk afvalbeheerplan 2009-2021. <http://www.lap2.nl/beleidskader.asp?i=1>

- Ministry of Infrastructure and Environment, 2011. Meer waarde voor afval – Letter from Secretary of State 25 August 2011 <http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/kamerstukken/2011/08/25/betreft-meer-waarde-uit-afval/lp-i-m-0000001057.pdf>
- Nedvang & Vereniging van Nederlandse Gemeenten (2009), *Uitvoerings- en monitoringprotocol; gescheiden inzameling verpakkingsafval (versie 2.0)*.
- Netherlands Government, 2012. Wet belastingen op milieugrondslag http://wetten.overheid.nl/BWBR0007168/geldigheidsdatum_06-11-2012#HoofdstukVIII
- NL Agency, 2008. MJA3 Meerjarenaafsprak Energie-efficiëntie 2001 – 2020, final draft 1 July 2008 <http://www.agentschapnl.nl/content/convenanttekst-meerjarenaafsprak-energie-efficiency-2001-%E2%80%93-2020-mja3>
- NL Agency, 2011. Samenstelling van het huishoudelijk restafval: resultaten sorteeranalyses 2011 http://www.agentschapnl.nl/sites/default/files/bijlagen/1AFVA1201_Samenstelling_van_het_huishoudelijk_restafval_2011_0.pdf
- Twijnstra Gudde, 2011. Bevindingenrapport evaluatie werking Besluit beheer verpakkingen en papier en karton, Ministerie van Infrastructuur en Milieu, 18 mei 2011, 570373/JGN/ASG <http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/rapporten/2011/08/25/betreft-meer-waarde-uit-afval-bijlage-definitief-eindrapport-evaluatie-werking-besluit-beheer-verpakkingen-en-papier-en-karton-defv/lp-i-m-0000001059.pdf>
- Volkskrant - Afvalverbranders vinden gouden bergen in Napels, Michael Persson- 14/01/12 <http://www.volkskrant.nl/vk/nl/2844/Archief/archief/article/detail/3121370/2012/01/14/Afvalverbranders-vinden-gouden-bergen-in-Napels.dhtml>
- VROM-Inspectie, 2010. Recycling kunststofverpakkingen Op weg naar een volwaardige kunststofrecycling, 0098.