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Plastic Packaging Tax Effects

Environmental Costs and Benefits of
a Norwegian Tax on Plastic
Packaging

Final Report



Resources & Waste
Advisory Group ^{SCE}



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1. Introduction

1.1. The assignment

WWF's No Plastic in Nature initiative aims to tackle the root cause of plastic pollution. WWF Norway has advocated for a national fee on plastics as a necessary and cost-effective way of reducing plastic consumption following the polluter pays principle. The advocacy work of WWF was inspired by the *Plastics: the costs to society, the environment and the economy* report issued by the WWF in 2021, which demonstrated that the cost of plastic to society is 10 times higher than its market price.

However, the Norwegian Government decided not to pursue a tax on plastic packaging due to "uncertain effects on the environment and climate" and "high administrative costs". Therefore, at the end of 2023 WWF Norway launched a technical assistance assignment to seek additional information on the costs and benefits of a potential tax on plastic packaging. The terms tax and fee has both been used when referring to the proposed economic instrument, but it has been clarified early on during inception phase of this study that in fact the study is about a plastic packaging tax rather than a fee. A fee is charged to cover the cost of a service, i.e. in case of EPR it is charged to cover costs of recycling. The purpose of the plastic packaging tax is to discourage consumption of plastic, encourage recycling and generate a revenue to the government.

The task of this study is (1) to gather and reflect information on the administrative arrangement and effects of material/plastic fees from other European and OECD countries where such fees have been implemented; and, drawing on previous experience, (2) to identify three scenarios for implementing the plastic packaging tax and to estimate its impact on:

- reducing greenhouse gas emissions
- intentional and unintentional pollution (including microplastic pollution), avoided cleanup and reduced marine pollution
- potential earnings from a plastic packaging fee/tax
- likely administrative costs

The different scenarios could consider inter alia legally binding versus voluntary systems, and differentiate between these (i.e. modulate) based on environmental criteria.

1.2. Content and structure of the report

Following this introductory chapter, the report presents the EU policy framework and its future developments regarding plastics in **Chapter 2**. This is relevant, as Norway is following and implementing EU legislation. **Chapter 3** discusses policy in Norway as well as relevant current and planned economic instruments.

Chapter 4 presents the case of the Netherlands and Lithuania in more detail regarding plastic fees and taxes used there, the results in terms of changes in generated quantities of plastic and in the way how plastic waste is treated, the revenues and administrative costs associated to these taxes, the methods for compliance control and lessons learned. The experience with a plastic tax in Europe and other countries is still limited and correlation between this tax alone and increased recycling or prevention is not clear. The research points to the conclusion that a more complex set of instruments and policies is needed to reach the desired results.

Starting with **Chapter 5**, the quantitative baseline is set up for the scenario development, establishing plastic waste quantities, composition, and treatment in Norway. **Chapter 6** introduces the three analysed scenarios, explaining the economic instruments for each, assumptions for the impact of these instruments and the expected results in terms of quantities of plastic put on the market and waste generation. Chapter 6 lays out the limitations of a plastic tax if to be

applied alone to solve plastic pollution, as some plastic products have very low-price elasticity, other plastic products do not have a viable alternative, etc. Efforts therefore must include supporting measures to give viable alternatives to industry and consumers.

Chapter 7 is the cost-benefit analysis of the scenarios with a focus on greenhouse gas (GHG) impacts, marine ecosystem impacts and direct costs and revenues to the government related to the tax introduced. The chapter concludes with the cost-benefit ratio, which is in favour of introducing the plastic tax and other economic instruments to curb plastic production. The chapter on conclusions includes a discussion on the limitations of the report and acknowledges the need for further work for improving the accuracy of the results but argues that the overarching conclusions would stay valid as further evidence is made available.

2. EU regulation on plastic and plastic packaging products and waste

This section presents current and forthcoming EU policies and regulations on plastic packaging, given the fact that Norwegian regulations follow and implement EU policies, in line with changes in EU regulations¹. Notably, the argumentation provided by the Norwegian Tax authorities against introducing a plastic packaging tax in Norway refer to forthcoming EU regulations arguing that it could make such a tax redundant in Norway.

However, EU's Plastic Strategy refers to the use of taxation as having a vital role in steering investments to prioritize waste prevention and recycling at national level. In particular, according to the Strategy, high or gradually rising fees or taxes could improve the economics of plastic recycling.² Likewise, eco-modulation of fees under the extended producer responsibility schemes, deposit and return systems are listed as applicable economic instruments. Furthermore, the impact assessment carried out by the European Commission argues that the packaging waste regulations from the EU alone will not be enough to reach the suggested packaging waste targets.

New and forthcoming EU regulation is aimed at reducing virgin materials, increasing reuse and material recycling rates. At the time of writing of this report, on 5 March 2024 the European Parliament and Council has just reached a new agreement on reducing packaging, regardless of the materials used. The agreement sets packaging reduction targets (5% by 2030, 10% by 2035 and 15% by 2040) to reduce in particular the amount of plastic packaging waste.³

The EU's plastic tax is one of several tax reforms proposed as part of the EU Green Deal which aims to reduce the consumption of raw materials and waste, promoting the shift towards a circular economy. The EU has introduced a plastic tax as part of the EU recovery package, and as a result of the surge in plastic use during Covid 19. This plastic tax is an own resource to the 2021–2027 EU budget and it is not applicable in Norway. In practice, this is not a tax, but a contribution from the member states to the EU budget, based on the amount of non-recycled plastic packaging waste produced by each member state. The contribution is calculated by the weight of non-recycled plastic packaging waste

¹ Description of EU regulations relating to plastic packaging and alternatives to tax – communication to WWF by Norway's Environment Agency.

² <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN>

³ <https://www.europarl.europa.eu/news/en/press-room/20240301IPR18595/deal-on-new-rules-for-more-sustainable-packaging-in-the-eu>

with a uniform rate of EUR 0.80 per kilogram. 13 of the member states decided to include a corresponding plastic tax in their national tax system (more details on the experience of the member states with this is included in Chapter 4.3.).

For plastic packaging, three regulations are the most relevant for the purposes of this report, two of which are draft:

- the proposed Regulation on packaging and packaging waste⁴ (which will replace the current Directive 94/62/EC on packaging and packaging waste),
- the proposed Regulation establishing a framework for setting ecodesign requirements for sustainable products⁵ (which will replace the current ecodesign Directive 2009/125/EC regulating energy-related products), and
- the Plastic Products Directive (EU 2019/904) regulating the management of single-use plastic products (also known as the SUP Directive).⁶

We discuss the most relevant requirements of each of these in the sections below.

2.1. Proposed Packaging and Packaging Waste Regulation

The purpose of the regulation is to deal with the increasing quantities of packaging waste causing environmental problems and also to remove barriers in the internal market of the EU caused by countries adopting different rules on packaging design. The draft regulation lists the following requirements with relation to plastic fee/tax and its eco-modulation:

- Article 6 foresees that all packaging should be designed to be recyclable (starting with 2030 packaging shall be considered recyclable if 70% or more of its content is recyclable).
- Article 7 foresees that minimum recycled content in plastic packaging shall be 35% starting with 2030, for contact sensitive packaging and single use plastic beverage bottles this will be lower – 10-30%, exception is granted for medical use and for compostable packaging.
- Article 8 refers to compostable packaging – lightweight plastic carrier bags and coffee/tea bags/containers for single use shall be compostable.
- Article 9 refers to packaging minimisation to the minimum necessary; minimisation shall be demonstrated based on technical documentation.
- Article 10 defines what constitutes reusable packaging and deems necessary to demonstrate compliance based on technical documentation.
- Article 29 establishes that by 31 December 2025, the annual use of plastic carrier bags must be reduced to 40 units per person.
- Article 38 urges to reduce waste from all packaging per inhabitant compared to 2018. The reduction targets are: 5% reduction by 2030; 10% by 2035; 15% by 2040.
- Articles 40 to 43 address producer responsibility and the extended producer responsibility for their packaging in line with Article 8 and Article 8a of Directive 2008/98/EC.
- Article 44 requires a deposit and return system (DRS) for single-use plastic beverage bottles with the capacity of up to three litres by 1 January 2029.

⁴ https://environment.ec.europa.eu/publications/proposal-packaging-and-packaging-waste_en

⁵ https://environment.ec.europa.eu/publications/proposal-ecodesign-sustainable-products-regulation_en

⁶ <https://eur-lex.europa.eu/eli/dir/2019/904/oj>

- Article 46 sets for plastic packaging specifically a target of 50% material recycling by 31 December 2025 and 55% by 31 December 2030.

Annex II of the Draft Regulation, Categories and parameters for assessment of recyclability of packaging, defines an indicative list of packaging materials, types and categories referred to in Article 6 above. These include flexible and rigid, transparent and coloured plastics. This is relevant when attempting to define a tax base and eco-modulation for a potential plastic tax.

The cost-benefit analysis conducted by the Commission for the draft packaging regulation has been criticised by industry and right-wing lawmakers⁷ for its failure to differentiate between packaging materials and for its lack of comprehensive analysis of the proposed targets.

2.2. Proposal for Ecodesign for Sustainable Products Regulation

The proposed ecodesign regulation aims at having more environmentally sustainable, energy efficient and circular products. The requirements included in the draft potentially relevant to a plastic fee/tax include:

- Information requirement about the proportion of recycled content in packaging.
- Mandatory design of refillable packaging for cosmetics and cleaning products.
- Requirements for reduced packaging (quantity/size) relative to the product being packaged.

The new Digital Product Passport requirement is set to be adopted in 2026⁸. It will help public authorities to better perform checks and controls including the proportion of recycled content in packaging and will ease the administrative costs for businesses in case of a differentiated tax on plastic packaging. The DPP will function as a centralized database, storing vital information about each product's origin, composition, and environmental footprint. Utilizing secure digital technologies, it will enable seamless data sharing across the supply chain, ensuring transparency, traceability, and informed decision-making for businesses, consumers, and regulatory authorities alike. Furthermore, the Digital Product Passport may incorporate NFC (Near Field Communication) or QR code technology, allowing for convenient access to product information via mobile devices, enhancing user engagement and accessibility.

2.3. Plastic Products Directive

The directive (EU 2019/904) aims to reduce the environmental impact of plastic products, especially single-use plastic (SUP). It regulates SUP, products made from oxo-degradable plastic, and equipment from fisheries, aquaculture and recreational fishing that contain plastic. Most relevant among the articles of the directive are:

- Article 4: Reduced consumption of disposable plastic cups for beverages and food containers for take away.
- Article 5: Ban on cotton bud sticks and straws, except for medical use, on SUP as cutlery, plates, beverage stirrers; sticks to be attached to and to support balloons, beverage and food containers made of expanded polystyrene.
- Article 6(5): Content of recycled material in plastic bottles; from 2025 PET bottles should contain at least 25% recycled plastic, and by 2030, at least 30%.
- Article 8: Extended producer responsibility for:

⁷ Kira Taylor, EU's cost benefit analysis under fire in pushback against packaging law, Euactive, <https://www.euractiv.com/section/energy-environment/news/eus-cost-benefit-analysis-under-fire-in-pushback-against-packaging-law/>

⁸ GS1 UK Ltd, Digital Product Passports: setting new standards for sharing product information, January 3, 2024, <https://www.gs1uk.org/insights/news/Digital-Product-Passports-setting-new-standards-for-sharing-product-information>

- food containers, packets and wrappers, beverage containers with a capacity of up to three litres, cups for beverages, lightweight plastic carrier bags, wet wipes and balloons;
- fishing gear containing plastic placed on the market.

3. Policy and economic instruments in Norway

Norway's waste management and environmental policies, particularly regarding plastic waste, are strongly influenced by its relationship with the European Union as an EEA country. This has led to the incorporation of EU directives into Norwegian law, making objectives and requirements of these legal acts binding for Norway. The country has developed its plastic policies taking into account the relevant EU policies, focusing on goals like increased recycling, zero pollution, less waste, and eliminating hazardous substances in plastics⁹.

3.1. Plastics policy

Norwegian Plastic Strategy: This strategy aims to manage plastic waste effectively, highlighting the significant contribution of packaging waste to overall plastic waste. Extended Producer Responsibility (EPR) is a key element, requiring producers to finance the collection, sorting, recycling, and treatment of their products' waste. Other instruments such as voluntary agreements by industry players and a deposit refund scheme for beverages are also reported on and highlight examples of measures initiated by the business community. Introduction of new measures and their potential impact is discussed, like the introduction of an additional tax on household refuse waste in the pay-as-you-throw (PAYT) system, potentially increasing sorting and recycling.¹⁰

Downstream legislation: Norway implements the EU Waste Framework Directive through its Pollution Control Act, which sets basic requirements for waste handling, including guidelines and responsibilities to avoid pollution and littering. The Norwegian Waste Regulation, particularly Chapters 6, 7, and 10a, implement EU directives into Norwegian law, defining waste types and management processes. These chapters address beverage packaging, packaging waste, and household waste sorting and recycling, respectively.

Producer responsibilities: Norwegian law sets specific recycling targets for plastic packaging, with increasing percentages to be achieved by 2024, 2025, and 2030. Producers are responsible for disposal and recycling of sorted plastic, with municipalities handling household waste separation systems and collection.

Marine litter and public procurement: Norway, a country with a lengthy coastline, places emphasis on combating marine litter through legislation and initiatives like the Norwegian Centre Against Marine Litter (Marfo) and action plans for commercial and recreational fisheries and aquaculture. The country also aims to leverage public procurement to support environmental goals.

Global partnerships and standards: Norway is part of international efforts like the Global Partnership on Plastic Pollution and Marine Litter and aims to adhere to standards and certifications, such as ISO standards, to manage plastic waste effectively.

⁹ https://sintef.brage.unit.no/sintef-xmlui/bitstream/handle/11250/3097429/plastrapport_24.05%2B%25281%2529.pdf?sequence=1&isAllowed=y

¹⁰ The Norwegian Ministries, Norwegian Plastics Strategy, 2022, <https://www.regjeringen.no/en/dokumenter/norwegian-plastics-strategy/id2867004/>

Despite comprehensive regulations, analysis of the regulation points to challenges including the need for better monitoring of plastic amounts entering the market and enhanced sorting systems across municipalities. A recent report on *The regulatory landscape on plastic governance – a Norwegian perspective*, produced in the framework of a project that receives support from the Research Council of Norway¹¹ recommends transparency in the lifecycle of materials and a global agreement on plastics, emphasizing that a mix of top-down and bottom-up solutions are needed and that there is no single instrument capable to tackle the issue of plastic. The report also mentions the need identified in the Norwegian Plastic Strategy to improve sorting of household waste.

In summary, Norway's approach to waste management, especially plastics, involves a blend of national regulations influenced by EU directives, extended producer responsibility, initiatives targeting marine litter, and efforts to enhance recycling and waste sorting. These measures are part of a broader strategy to reduce environmental pollution and promote sustainable waste management practices.

3.2. Economic instruments for plastics

Introducing a plastic tax or fee has been considered and analysed by the Norwegian Tax Administration, but it has not yet been pursued as explained in the introduction of this report. Economic instruments in the context of managing plastic waste and packaging in Norway are the following:

1. **Producer Responsibility Organizations (PROs) and EPR scheme:** Producers and importers supplying the market with packaging are required to finance the **collection, sorting, recycling, and other treatments of a proportion of their resulting waste**. This is achieved through membership in an approved PRO. The Norwegian Waste Regulation mandates these financial responsibilities as part of the extended producer responsibility (EPR) scheme.
2. **Deposit return system and environmental fee on beverage packaging: An environmental tax is applied to beverage packaging** to incentivize increased collection of such waste. This tax is adjusted based on the return rate, as determined by the Norwegian Environment Agency. The tax aims to promote an effective return system and reduce littering from beverage packaging.

Beverage containers are subject to an "environment fee" which must be paid by the producers. The fee for plastic bottles in 2023 is 3,91 NOK per unit. However, the fee is reduced if more than 25% of bottles are returned, and the fee will be removed entirely if more than 95% of beverage containers in the given return system gets returned. There are no additional taxes, specific to packaging or plastics.
3. **Plastic bag tax and Norwegian Retailers' Environment Fund:** Established in response to the EU Directive on plastic bags, this fund involves **a fee on plastic carrier bags sold to customers**. Retailers who choose to participate in the arrangement contribute a contingent to the fund for each plastic bag sold, which is used for environmental projects, including those aimed at reducing plastic pollution and increasing plastic recycling. In 2021, 190 plastic carrier bags/cap were counted. At the fee of 1NOK per bag, 30% reduction of sale was reported or 132 bags/cap in 2022. Since 1 Aug 2023 the fee is increased to 2 NOK, thus a bag costs at least 4 NOK.
4. As of 1st January 2022, a mandatory **waste incineration tax** of NOK192 per tonne of fossil-based CO₂ is levied on all waste that is delivered to waste disposal plants in Norway. The tax is calculated by multiplying the tonnage of waste that is delivered to the incineration plant by a pre-determined national factor of 0.5498 per metric ton of CO₂ arising from the incineration of fossil content of the waste, therefore the cost of the tax per

¹¹ Cowan E., Tiller R., Sørfonn Moe S., Hanslien-Olsson S., Fagermæs C.C., Hercz L. Y., Bratz M.C., Håberg H., Throne-Holst M. (2023). PLASTICENE: The regulatory landscape of plastic governance - a Norwegian perspective. 52pp

tonne of waste was approximately NOK 106.¹² In 2023 the incineration tax was increased to NOK 131 per tonne of waste, and it will be increased to NOK 485 per tonne in 2024.¹³ This fee applies to non-quota-obligatory incineration plants.

Currently, the Norwegian Environment Agency is recommending a regulation with requirements to extend producer responsibility for selected single-use plastic products:

- packaging and some products that are not packaging (food containers for fast food, takeaway food or "takeaway" including lids, flexible packaging for fast food, beverage containers under 3 litres, drinking cups including lids and plastic bags)
- wet wipes and balloons
- tobacco products with filter and filter for use together with tobacco products

4. Good practices. EPR and plastic tax

As of today, 13 countries in the EU have implemented a plastic tax. Since these instruments are national, there is a great variety across Europe on the tax base, on the collection mechanism, on eco-modulation and definitions of environmental criteria and on mechanisms for monitoring and enforcement. Some countries use a differentiated tax on plastic packaging designed to provide incentives to increase the content of recycled materials in packaging or the recyclability of materials used in the packaging. The UK has also introduced a plastic packaging tax and the US is considering a tax on virgin plastic¹⁴. Unfortunately, the effects of these taxes - whether flat rate or eco-modulated - are not well known and are scarcely monitored.

The consultant has reviewed the relevant studies available on plastic tax. The main references include WTS Global, *Plastic Taxation in Europe: update 2023*¹⁵ and Zero Emilie Rohde Larsen "Material Tax Insights from Europe (November 2023)". Further desktop research was conducted on the state of plastic taxation in the UK and USA, sources duly referenced below. Of the available examples, the Lithuanian and Dutch examples seemed more advanced and inspiring, therefore more in-depth research was carried out for these, including interviews. The consultant reached out and consulted with Sorainen Ltd, a law firm from Lithuania, knowledgeable on taxation in the country and the Rebel Group, from the Netherlands.

4.1. The Netherlands

4.1.1. EPR product fees and recycling rate

The EPR system of the Netherlands includes an annually increasing product fee and eco-modulation for recyclability and recycled content. The country has made progress in reaching and even surpassing packaging recycling targets and

¹² Sources:

<https://avfallsbransjen.no/2022/01/20/forbrenningsavgiften-forstar-ikke-hvordan-departementet-regner/>

<https://www.recycling-magazine.com/2022/01/28/industry-group-calls-on-norway-to-re-think-incineration-tax/>

<https://www.epa.ie/publications/circular-economy/resources/Comparative-study-of-waste-recovery-taxes-levies-in-Europe.pdf>

¹³ <https://www.ragnsells.no/om-oss/nyheter-og-presse/artikler/forbrenningsavgift-2024/>

¹⁴ Oliver Ward, "Inside U.S. Trade: Democrats introduce bill to tax 'virgin plastic' sales, including imports", September 21, 2023, <https://doggett.house.gov/media/in-the-news/inside-us-trade-democrats-introduce-bill-tax-virgin-plastic-sales-including>

¹⁵ WTS, *Plastic Taxation in Europe: Update 2023*, <https://wts.com/global/publishing-article/20230522-plastic-taxation-europe-update-2023-publishing-article>

therefore it is an interesting case study. In fact, Nedvang, the Dutch PRO has helped the country surpass the recycling targets of 70% for all packaging. The country’s overall packaging recycling rate rose by 11% over 2006-2007, when Nedvang was founded. Since then, its plastic packaging recycling rate has doubled. Nedvang is funded by a tax/fee paid by producers and importers, and this money is used to manage the sorting and recycling of the country’s waste. The municipality organizes separate commercial and curbside waste collection, funded by the PRO¹⁶.

According to legal requirements, EPR schemes should be designed in a way that generates sufficient tax revenue from producers to fund and manage efficient operations. In theory this should result in more incentive to recycle as product fees surge. As funding full cost of operations, including street cleaning became a responsibility of the EPR scheme in the Netherlands, the rates increased annually. The increase was implemented simply to be able to cover costs and not necessarily having in mind a correlation between increased product fees and increased recycling.

Further information on eco-modulation is provided in the *Explanation: Fee Modulation Plastic Packaging*¹⁷ report. The regular rate applied to plastic packaging may be lowered for producers and importers based on certain value-addition to recycling or recyclability up to a maximum discount of 50% of the fee rate, i.e. deductions can apply if the producer or importer uses only one colour of material (i.e. transparent), one type of plastic (i.e. mono) or uses labels and provides clear information on recyclability. The economic rationale of providing these discounts is that if the packaging product fulfils these requirements, recycling will be cheaper and therefore the costs of the PRO with that importer and/or producer will be lower. If the producer and/or importer uses recyclable content in the packaging, again a deduction is possible, and a differentiation is made between the requirement for food contact and no food contact plastic.

Additional to this, the insight from the interview with Rebel Group highlighted that the implementation of these exemptions and deductions is under constant discussion, negotiation and scrutiny. The producers and importers need to provide information and justification for their claims, audits and checks are also carried out. Given the constant changes in materials and the lack of a clear regulation, these deductions being established and implemented by the Fund, the implementation is cumbersome, the negotiations and discussions take up a lot of time and effort.

Product fees and corresponding recycling rates are available in the Netherlands and are shown below in a table format, followed by a graph format.¹⁸ The data does not show an obvious correlation between the increase in product fee and the increase in recycling as the reported rates of recycling increased during 2017-2019 without any change of the product fee. Throughout the analysed period no quality requirements were introduced, nor are those foreseen for the EPR system at the time of writing this report.

Table 4-1 Fees by material, net of VAT

Material	2017	2018	2019	2020	2021	2022	2023	2024
Plastic rigid lower rate ¹⁹	0.38 €/kg	0.38 €/kg	0.38 €/kg	0.34 €/kg	0.41 €/kg	0.44 €/kg	0.79 €/kg	1.22 €/kg
Plastic regular rate	0.64 €/kg	0.64 €/kg	0.64 €/kg	0.60 €/kg	0.67 €/kg	0.70 €/kg	1.05 €/kg	1.32 €/kg
Plastic packaging recycling rate ²⁰	50%	52%	57%	49%	48%	46%		

The above data is presented on the following graph:

¹⁶ <https://www.bloomberg.com/netzeropathfinders/best-practices/extended-producer-responsibility-the-netherlands/>

¹⁷ [PowerPoint-presentatie \(afvalfondsverpakkingen.nl\)](#)

¹⁸ [Tarieven | Afvalfonds Verpakkingen](#)

¹⁹ Data for rates is taken from annual reports of PRO Europe “Participation costs”, see at <https://www.pro-e.org/>

²⁰ https://ec.europa.eu/eurostat/databrowser/view/env_waspacr__custom_10176051/default/table?lang=en

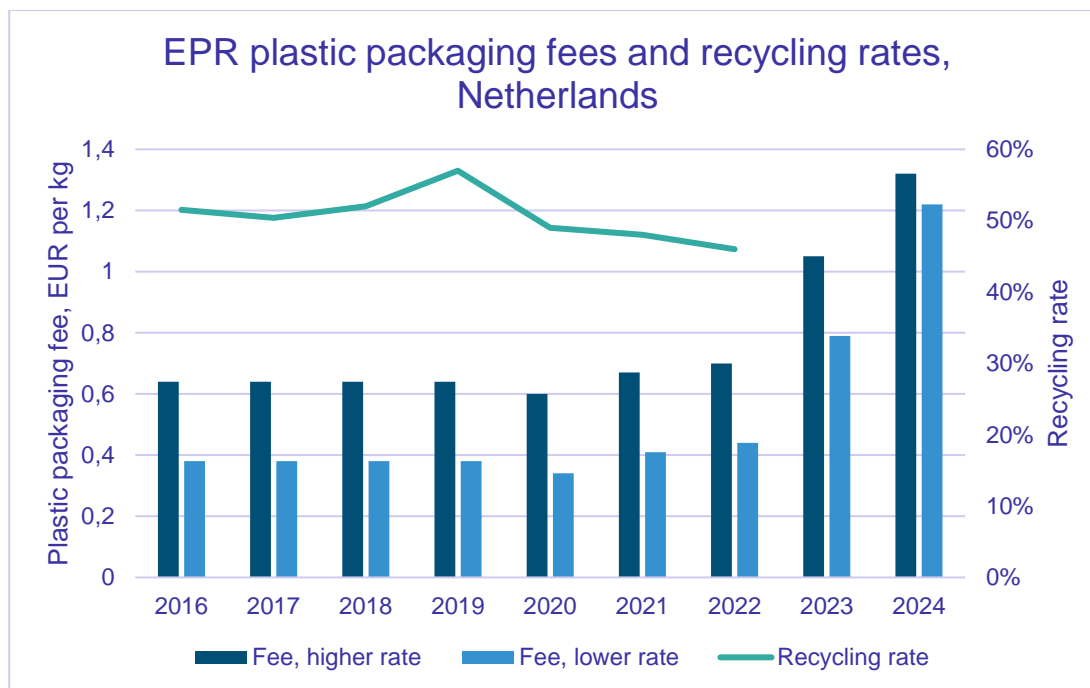


Figure 1 Plastic packaging producer fees and plastic packaging recycling rates

One of the key lessons learned from the Dutch EPR system is that setting quantitative targets will fuel the cheapest recycling, which in fact is often downcycling. Therefore, it is very important to set targets in terms of quality of recycling and keep materials longer in the production cycle.

4.1.2. Taxes on SUP

Since 2023, a surcharge of €2.3 per 1000 pieces net of VAT²¹, for each of the following SUP was introduced:

- Beverage cups
- Beverage packaging
- Moulded SUP food packaging
- Flexible SUP food packaging
- Carrier bags <50 micron

Starting from July 1, 2023, the Netherlands imposed a tax on disposable plastic cups and food packaging for takeaway and delivery, as announced by their document on new rules for disposable plastic cups and containers. In addition, a reusable alternative must be offered. The tax is implemented by large retailers, supermarkets and food chains but is likely less implemented in the small coffee shops, bistros, buffets. There is no monitoring data yet on the results of the measures since it is too early in the implementation, but overall from the point of view of the consumer, this tax seems to have an impact, since it works directly as a consumer incentive. It works especially well if the consumer has a real alternative choice available.

From January 1, 2024, the use of disposable plastic food packaging for dine-in options was prohibited.

The prices for plastic articles recommended by the government are:

- €0.25 for cups

²¹ <https://www.natureko.nl/en/waste-management-fee> (previous wrong data from source <https://www.afvalfondsverpakkingen.nl/nl/tarieven>)

- €0.50 for a meal (which may include several pieces of packaging)
- €0.05 for pre-packaged vegetables, fruit, nuts, and portion packs.

These rules apply to all single-use plastic cups, even articles that are only partly made of plastic (e.g. have plastic coating). For food packaging, the rules only apply to ones out of which food can be directly eaten without preparation and that are made entirely of plastic. The same rules apply for bioplastics. Bags and wrappers are not included.

4.2. Lithuania

In 2019 Lithuania reported a 27% recycling rate of plastic waste. From 1 January 2022, different tax rates have been set for recyclable and non-recyclable types of plastic packaging. Lithuania is an interesting case study since the plastic packaging tax here is separate from the EPR system and qualifies as a pollution tax, applies to a wider tax base as compared to the fees in the EPR system and is eco-modulated on relatively simple criteria.

4.2.1. Plastic Pollution Tax

A manufacturer or importer supplying filled packaging to or within Lithuanian market are liable to pay the tax at the time of first supply.

The tax should be paid by the manufacturer or importer. However, the manufacturer or importer may be exempted:

- In case the quantity of the single-use packaging does not exceed 0.5 tons of the total amount of filled packaging supplied to the Lithuanian market during tax period;
- For the quantity of filled packaging that will be recycled or recovered once it becomes waste and for which the recovery or recycling can be proven;
- For the quantity of the packaging which is reusable, provided that the whole task of collection and reuse is performed and can be proven.

Additionally, quantities that are exported and are proven to be exported are also exempted from the tax.

The applicable tax rates and tax base for 2022 for plastic packaging are as follows:

Table 4-2 Plastic tax rates, 2022

Type of packaging	Tariff for reusable packaging and recyclable disposable packaging, €/ton	Tariff for non-recyclable disposable packaging, €/ton
Plastic packaging	618	875
PET (polyethylene terephthalate) packaging	618	875
Combined packaging	900	1200

The legal amendments introduced in 2024 increased taxes and added clarity on the tax base as follows:

- 1) €0.80 for one kilogram of plastic packaging, which can be recycled, but was not recycled during the reporting period;

2) €1.25 for one kilogram of plastic packaging, the material properties render it unrecyclable, and which was not reused during the reporting period.²²

The taxpayers need to register in an online system, where they declare the quantities of plastic packaging they put on the market. This is a separate system from EPR, and the compliance control is weak. The impact of the tax on consumption or recycling is not known or monitored but is thought to be low, as these rates represent a relatively minor level of tax to pay for the producers and traders. The tax has likely not deterred plastic consumption, nor has it harmed the competitiveness of any related industries/products of Lithuania. Tax revenues accrue to the national budget and are not earmarked for use for a special purpose.

4.2.2. Other economic instruments

Since 2016, Lithuania has also been running a deposit system for plastic bottles (and other types of containers). A deposit of €0.10 is added to each plastic bottle when it is purchased, i.e. it is not included in the price of the product. This amount is then refunded, and the container is recycled when it is returned to the special deposit collection points.

In Lithuania, there is a ban on landfilling of untreated municipal waste, as well as a ban on landfilling of biodegradable waste from gardens, parks and green areas. In addition, there is a tax of €10/t in 2021 for the disposal of non-hazardous waste at landfills, with an escalator increasing the tax by €5/t annually up to €25/t in 2024. The tax covers also outputs of MBT plants that are landfilled.

The revenues of the landfill tax go to the Waste Prevention and Management Program.

5. Plastic waste

The challenge with plastic waste is the increase in generation rates of which 40% is plastic packaging. Industrial plastic recycling rates are high but plastic packaging recycling rates were low at 28% in 2020 in Norway. By comparison, Eurostat reports that in the same year the EU average plastic packaging recycling rate was at 39.7% with many well-performing countries reaching above 50% targets in that year.

The majority of plastic packaging is imported, and the producers and traders of Norway often refute additional measures and taxes claiming that the industry in Norway has no real influence on the internationally traded plastic packaging quality, recyclability or recycling content as it is a small market that is unable to influence those global supply chains. According to Plastretur, plastic food contact packaging currently accounts for around 60 per cent of all plastic packaging on the Norwegian market. This type of plastic is difficult to reduce and substitute in a commercially viable way, thus many of the EU proposed and existing regulations treats this type of plastic packaging waste as a sub-category to which lower reduction targets apply.

5.1. Sources of generation

*Plastic account for Norway*²³, a report published in July 2023, aims to create a more complete picture of plastic fluxes in Norway based on available data sources. Data from the waste accounts, which is the overall umbrella statistics on waste in Norway, sorting analysis and several external articles and sources have been used to provide results by sector and

²² <https://www.vestnesis.lv/op/2023/247.4>

²³ <https://www.ssb.no/natur-og-miljo/miljoregnskap/artikler/plastic-account-for-norway>

product groups. A preliminary estimate suggested that in 2021 approximately 620,000 tonnes of plastic waste were generated, and less than 30% was recovered. Out of this total, 250,000 tonnes are categorised as sorted plastic waste, while the remaining 370,000 tonnes end up as mixed waste:

Table 5-1 Plastic waste per sector, 2021

Sectors	Sorted out [tonnes]	From mixed waste [tonnes]	Total [tonnes]
All sectors	248,800	371,400	620,200
Agriculture, forestry and fishing	25,000	6,000	31,000
Mining and quarrying	600	200	800
Manufacturing industries	58,000	23,000	81,000
Electricity, gas, steam and air conditioning supply	200	200	400
Water supply, sewerage, waste management, remediation activities	15,000	23,000	38,000
Construction	11,000	14,000	25,000
Service industries	78,000	127,000	205,000
Other or unspecified	0	33,000	33,000
Households	61,000	145,000	206,000

The major sources are households and service industries. According to the Waste Plan 2020-2025 of Norway, waste from service industries is similar to household waste, with the exception of 15% that is service industry waste from health services. This is potentially infectious, cannot be recycled and needs to be incinerated for safety reasons.

It is to be noted that due to the Covid-19 crisis, there was a reduction in plastic waste and in mixed waste in 2020 and 2021. Thus 2022 data shows higher quantities, as separately collected plastic waste is 276,000 tonnes, equal to the 2018 value, but still below the amount reported in 2019, which was 290,000 tonnes.

The table below summarises estimates on major product groups that generate plastic waste:

Table 5-2 Plastic waste per product group

Product groups	Total waste amount [tonnes]	Plastic fraction	Total amount of plastic [tonnes]
End-of-life vehicles	242,000	0.1	24,000
End-of-life boats	4000	0.68	3000
WEEE	140,000	0.2	28,000
Fishing and aquaculture			28,000
Packaging	250,000	1.0	250,000
Textiles	100,000	0.5	50,000
Car tyres	62,500	0.24	15,000
Agriculture	22,000	0.525	12,000
Construction and Demolition	11,000 plastic + 260,000 mixed waste	0.055	25,000
Other			185,200
Total			620,200

46 kg/cap/year is plastic packaging waste in Norway, second highest in Europe and by far the most significant source of plastic pollution. Plastic packaging represents 40% of plastic waste in the country.

The table below summarises quantities of waste from single use plastics in 2018 (source: Waste Plan 2020-2025):

Table 5-3 Quantities of single use plastics, 2018

SUP	Sales, mln units	Tonnes/year	Status in 2023
Beverage carton	1,361	18,240	
Cigarette filter	800	96	
Lightweight plastic carrier bags	770	6,670	
Drinking bottles, corks and lids	632	22,570	
Cotton swabs	631	150	banned, exclusions
Wet wipes	599	650	
Straw*	526	210	banned, exclusions
Pads, tampons and tampon applicators	478	2,780	
Disposable cutlery*	455	1,180	banned
Contact lenses	274	3	
Very light plastic carrier bags	263	360	
Take-away boxes, disposable plates and trays (except EPS*)	137	2,750	plates banned
Candy wrappers	184	990	
Cigarette pack film	126	1	
Take away boxes made of EPS*	122	610	banned
Drinking cup and corresponding lid	106	1,490	EPS banned
Snuff boxes	80	1,200	
Stirring sticks*	79	50	banned
Cartridge cases	8	30	
Balloon sticks*	0.3	2	banned
Balloons	26	80	
Sum	7,573	59,652	

* The use of single-use plastics in the following products are prohibited: cotton swabs, cutlery (forks, knives, spoons & chopsticks), plates, straws, swizzle sticks, balloon sticks and associated parts, food containers from expanded polystyrene (EPS), drink packaging made of EPS and lids and drinking cups from EPS and their lids. Cotton swabs and straws may contain single-use plastics if used as medical equipment. Banned SUP represent appr. 9% of SUP in Norway.

5.2. Recovery and treatment

The table below summarises treatment of plastic waste as it was reported for 2021²⁴:

Table 5-4 Treatment of plastic waste, 2021

Treatment methods	Plastic - sorted out [tonnes]	Plastic in the mixed waste [tonnes]	Total [tonnes]	Per cent of total	Per cent of sorted out
Treatment, total	248,000	371,000	619,000	100%	100%
Sent to material recovery	151,000	29,000	180,000	29%	61%

²⁴ Source: Table 2.2 Treatment of plastic waste. 2021 from the *Plastic account for Norway*, <https://www.ssb.no/natur-og-miljo/miljoregnskap/artikler/plastic-account-for-norway>

Incineration	80,000	270,000	350,000	57%	32%
Landfill	13,000	40,000	53,000	9%	5%
Unknown	4,000	32,000	36,000	6%	2%

29% of all plastic and 61% of preliminary sorted plastic was recovered and recycled. Still, 15% of the total plastic waste was landfilled or its final destination was not reported.

In 2020, the PRO covering 80% of the inhabitants in Norway reported that 29% of the plastic packaging waste originating from both households and industry was recycled and only 23.9% of this waste originating from households was recycled (Grønt punkt Norge, 2021). Additional measures are required to reach 50% recycling towards 2025.

While current waste management practices minimise landfilled waste, it does not comply sufficiently with the waste hierarchy, and material recycling targets cannot be achieved without additional measures.

6. Scenarios

EU countries have agreed to collect a plastic tax from the member states as of January 2021 in the value of 800 EUR per ton. This is paid by member states as a contribution based on how much residual plastic packaging waste a country generates (the non-recycled fraction). While this is a clear revenue generator for the EU budget, the countries pay this still mostly as a national contribution based on data reported on non-recyclable plastic package quantities to Eurostat. European countries have limited experience implementing such a tax nationally and the lessons learnt on results are limited. Each country must determine the definition of taxed products, the mechanism to collect the tax, the refund options, etc.

Some countries go in the direction of taxing virgin plastic, others go for taxing non-recycled plastic packaging, plastic based on recyclable content or recyclability of materials used. All these initiatives target the industry. High consumer plastic taxes, especially on single-use plastic products and plastic bags have also been tried with varying success depending on the elasticity of demand of the different products. In general, taxing consumption while providing real alternatives is currently thought to generate better results based on the relatively wide and positive experience of for example introducing plastic bag tax. However, the response may be very different for products with a lower price elasticity and for which alternatives do not exist.

The reports on the results of such taxes are still rather limited, but they all point to the fact that a plastic tax alone will not solve the over-consumption of plastic and the plastic pollution problem and that a combination of economic instruments, bans and policies is needed to achieve the desired results.

Based on this we have considered 3 scenarios, (1) a business as usual (BAU) scenario taking into account the current and planned economic instruments in Norway, (2) an eco-modulated plastic packaging tax with a focus on increasing recycling and (3) an additional set of policy and economic instruments to minimise plastic consumption.

Forecast covers years 2025-2030.

Plastic packaging and SUP plastic, that is not packaging, are considered.

Quantities of banned SUP (both packaging and non-packaging are excluded) from all scenarios.

Beverage plastic packaging is also excluded as subject to environmental tax and covered by deposit return scheme.

6.1. Scenario 1. Business as usual

According to Table 4.1 in the OECD publication, *Global Plastics Outlook: Policy Scenarios to 2060*²⁵, OECD countries will continue to generate the most plastic waste per capita in 2060 as compared to other countries, although annual growth rates are expected to be lower. The forecast envisages for the period 2019-2030 a total growth of:

- 16% of plastic waste per capita in the OECD EU countries.
- 22% of plastic waste per capita in OECD non-EU countries.

Due to the Covid-19 pandemic there was a substantial decrease in household waste and service industry waste in 2020-2022, and in 2022 the quantities of plastic waste were equal to the 2018 quantities. It is assumed that the increase envisaged for the period 2019-2030 will take effect in the 2023-2030 period, or it is assumed that annual growth of plastic waste generation rate will be equal to 2%. Official forecast for population growth of Norway is used²⁶. Calculations show an increase of plastic packaging and single-use plastics that is not packaging from 275,000 tonnes in 2024 to 319,000 tonnes in 2030.

The already implemented and planned bans will have an immediate effect and are reflected in the quantities above. It is assumed that increased incineration tax will not impact the treatment structure. No clear pattern is visible in the impact of incineration taxes on the rates of recycling, landfilling and incineration based on the European Environmental Agency Report related to the impact of incineration taxes.²⁷ Therefore, material and energy recovery and residual waste disposal structure is left as currently reported (refer to Table 2.2 Treatment of plastic waste – 2021 in the *Plastic account for Norway* report)²⁸.

6.2. Scenario 2. Eco-modulated plastic packaging tax

An eco-modulated tax based on recycled plastic content or recyclability is introduced. It is suggested that the tax will apply to plastic packaging producers and importers, this means there will be an overlap with those already in the EPR system, but the pool of contributors to the tax base will be larger, to include all producers and traders without a limit on quantities put on the market. Working with the same tax base or an overlapping tax base can be beneficial from a tax collection and monitoring point of view, since a system for registering and reaching much of the industry players is already in place. Exempt from this would be only beverage containers for which a deposit refund system is in place, no further exemptions are foreseen.

Eco-modulation will be established following good practices from the Netherlands and Lithuania by establishing a maximum fee and granting deductions for recycled plastic content and recyclability of the waste generated. There is no standard yet on recyclability and recyclable content that is universally applicable; the EU is currently working on establishing a digital product passport with standardized information which will make eco-modulation easier. Currently this is left to the member states to implement.

The benefits and advantages of the systems used in the Netherlands and Lithuania are discussed above and could be used as inspiration to define eco-modulation for Norway. Specifically, in the Netherlands eco-modulation is decided by the industry and fee reductions are given to those industries who can prove that in one way or the other their plastic packaging is easier to recycle and therefore ultimately cheaper for the PRO to ensure recycling of materials they put on

²⁵ https://www.oecd-ilibrary.org/sites/aa1edf33-en/1/3/2/3/index.html?itemId=/content/publication/aa1edf33-en&_csp_=ca738cf5d4f327be3b6fec4af9ce5d12&itemIGO=oe&itemContentTypes=book

²⁶ <https://www.statista.com/statistics/1234082/forecast-of-population-growth-in-norway/>

²⁷ <https://www.eea.europa.eu/publications/economic-instruments-and-separate-collection>

²⁸ <https://www.ssb.no/natur-og-miljo/miljoregnskap/artikler/plastic-account-for-norway>

the market. One aspect that arose as a conclusion from the Dutch case study is the importance of recycling quality targets, and this would be important to consider in the product tax eco-modulation. In Lithuania, exemptions are possible for quantities that are recycled or reused and there are higher tax rates for materials that are more difficult to recycle.

In light of the experience from Europe and the UK we advise introducing an eco-modulated tax, as a flat tax would have less effect on the increase of recycling and recyclability. However, in the framework of this report further details on how Norway should eco-modulate is not possible. The assumed fees we have included for this scenario are as shown in the table below. The level of tax rates used here are consistent with the EU plastic packaging tax levels introduced in 2021 and collected by the EU from member states.

Table 6-1 Tax rates applied for Scenario 2 (NOK/t)

Eco-modulated tax rates	2025	2026	2027	2028	2029	2030
Lower tax rate applied to recycled plastic packaging	4,000	4,250	4,500	4,750	5,000	5,250
Regular tax rate to non-recycled plastic packaging	8,000	8,500	9,000	9,500	10,000	10,500

To further encourage recycling this tax might best be coupled with other economic instruments for better results. In particular, better sorting needs to be incentivised at household level and more attention and incentives are needed to ensure alternatives exist for consumers. The following instruments are suggested:

- A higher tax on refuse waste²⁹ charge at household level in the pay-as-you-throw system, deterring households from throwing away waste as refuse waste and encouraging them to source separate more efficiently. This issue has been identified as a challenge in the analysis above, it is pointed out in the Plastic Strategy as well, and it is reflected as a challenge in the relatively low (23.9%) recycling rate of household plastic packaging waste.
- Tax cuts and incentives such as subsidies, access to grants for those companies introducing biomaterial-based solutions to the market to substitute plastic packaging. It is still a much-debated issue what the best biomaterials are as substitutes for the different plastic products and what real choices consumers have for materials with a better eco-balance than plastic. This measure would point to those companies who innovate and put their research and development efforts to alternative materials and solutions for zero plastic with a positive eco-balance. Similarly to the issue of eco-modulation, there is currently no clear guideline on what these materials may be, as it is a subject of innovation, each innovator proving their case in order to obtain the tax cut (or subsidy).

The targeted impact of the policy package would be to reach 10% prevention of packaging waste until 2030 through a gradual decrease of consumption and increased recycling to reach EU Directive targets. Assumptions related to results also include:

- Gradual decrease of waste generation, reaching a 10% prevention by 2030 as compared to BAU.
- Increase of recycling rates from current level to reach 55% towards 2030.
- Structure of energy recovery and final disposal remains as in BAU.

The following graph represents the targeted reduction in plastic packaging waste and increased recycling:

²⁹ Refuse waste is mixed waste which is not recyclable and is not separately collected for its reuse and recovery, destined either for incineration or disposal

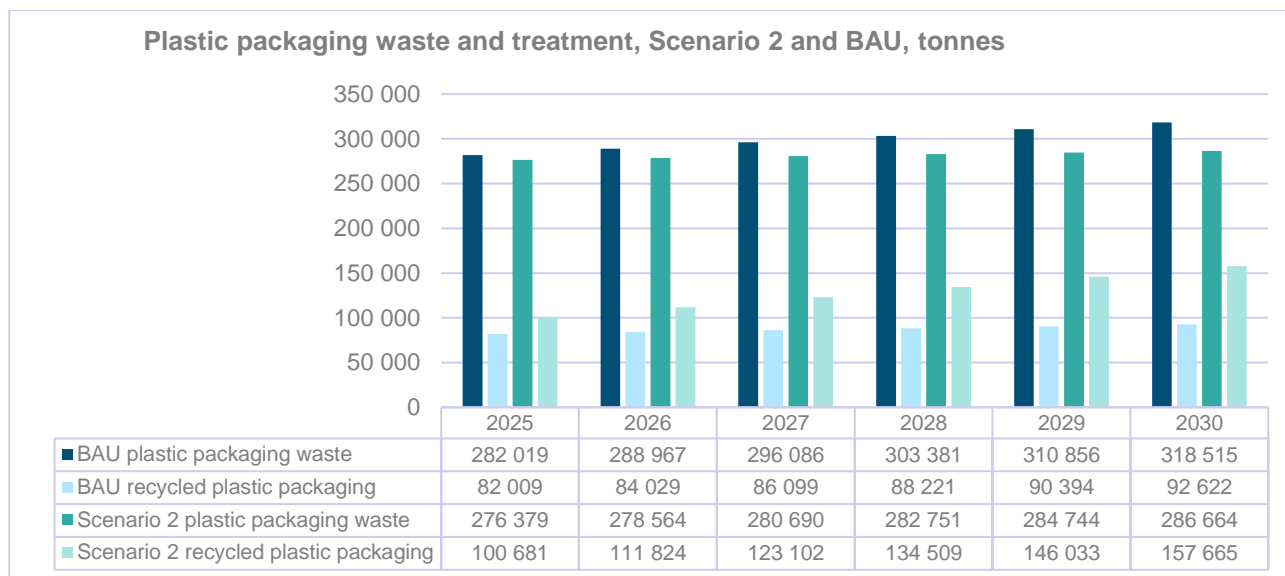


Figure 2 Comparison of BAU and Scenario 2 for plastic packaging waste and recycling

6.3. Scenario 3. Complex policy and economic instruments package

This scenario is formulated as a potential roadmap towards a target, rather than building on experience of other countries with plastic taxes, since such experience is still rather limited. What is known and is unequivocal is the message from the scientific community and the subsequent work of professionals and politicians to reduce plastic production and consumption. In fact, mounting evidence of the negative effects of plastic on environment and human health has propelled the Global Plastic Treaty. As part of this economic and policy instruments play a significant role. The policy and economic instruments package proposed in this scenario is inspired by these goals.

To increase impacts, we have increased the tax rates applied, keeping the same eco-modulation.

Table 8 Tax rates applied for Scenario 3 (NOK/ t)

Eco-modulated tax rates	2025	2026	2027	2028	2029	2030
Lower tax rate applied to recycled plastic packaging	5,000	6,000	7,000	8,000	9,000	10,000
Regular tax rate to non-recycled plastic packaging	10,000	12,000	14,000	16,000	18,000	20,000

Therefore, building on the economic instruments above and adding to those, this policy package might also include the following policy and economic instruments to maximise prevention impact:

- Plastic capping for the production and import of plastic packaging based on historically reported data. Plastic credits are already a reality but are applied on a voluntary basis; they will likely become a mechanism for reaching targets in the Plastic Treaty. There is an abundance of grey literature and scientific research on how a plastic cap could work, one of these articles explaining this option based on lessons learned from GHG emission trading is on Enhanced plastic economy referenced below.³⁰This system could work similarly to

³⁰ Kuok Ho Daniel Tang, Enhanced plastic economy: a perspective and a call for international action, March 13, 2023, <https://pubs.rsc.org/en/content/articlehtml/2023/va/d3va00057e>

greenhouse gas emission trading systems at national, regional or global level and could target at first the largest plastic producers and traders.

- Awareness raising among consumers, further bans and high consumer tax for selected avoidable plastic packaging products. The consumer tax and ban efficiency is showcased by the implementation of plastic bag bans and consumer tax on plastic bags or on different SUP products that could be extended to other products as well. Products that are not recyclable or not refillable, are single use and/or are hard to recycle such as composite plastic packaging or are unnecessary may be subject to a consumer tax or high consumer tax, especially if the consumers have a viable alternative with a better ecological footprint.

The targeted impact of the policy package would be a gradual increase to reach 30% prevention of packaging waste in 2030 and increased recycling to reach EU Directive targets. Assumptions related to results also include:

- Gradual decrease of waste generation, reaching a 30% prevention by 2030 as compared to BAU.
- Recycling rates increase from current level to reach 55% towards 2030.
- Structure of energy recovery and final disposal remains as in BAU.

The following graph represents the targeted reduction in plastic packaging waste and increased recycling:

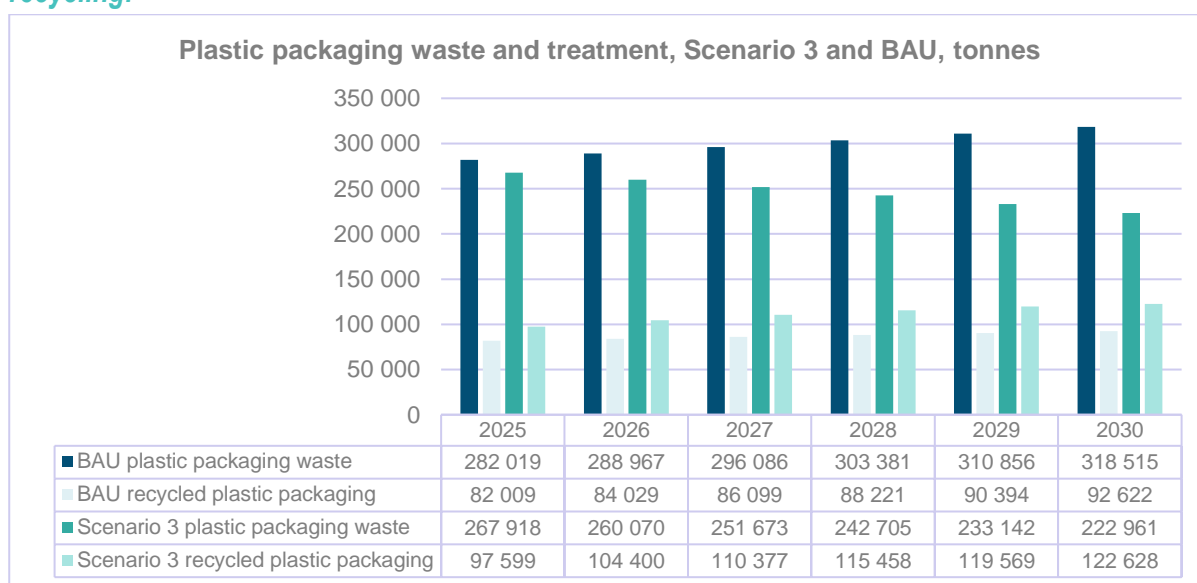


Figure 3 Comparison of BAU and Scenario 3 for plastic packaging waste and recycling

7. Cost-benefit assessment of the scenarios

The cost-benefit assessment of the proposed scenarios revolves around the following potential impacts and effects:

- Intentional and unintentional pollution (including microplastic pollution), avoided cleanup and reduced marine pollution.

- Reduced greenhouse gas emissions.
- Potential earnings from a plastic packaging fee/tax.
- Likely administrative costs.

These were quantified and monetized to the extent possible and feasible in the framework of this assessment. The quantification methodology and the ensuing results are presented below. This section concludes with a cost-benefit ratio in the last section and final conclusions and thoughts.

7.1. Benefits arising from reduced marine litter

For determining quantities of plastic waste entering the oceans the consultant relied on the methodology used and defined by IUCN in *The marine plastic footprint* report³¹. The methodology focuses on mismanaged waste or littering as the primary pathway through which the macro-plastic waste enters the marine environment. The leakage originates from mismanaged waste in coastal areas but also inland. Added to this are lost fishing gears and primary microplastic; the latter two are not part of the estimations in this section since the focus of the analysis is on plastic packaging waste.

The assumed rate of litter or mismanaged plastic is 1%³². Of this amount of mismanaged or littered plastic only a fraction, more precisely 15%³³ is assumed to be released in marine environments, the rest is assumed to stay on land, be burned or be cleaned up. This means that 0.15% of the generated plastic packaging waste can be assumed to become marine litter following this methodology, that is 0.08 kg per capita per year in the case of Norway.

The ecosystem service cost of plastic pollution on marine ecosystem was determined on the basis of the findings of WWF's study *Plastics: the costs to society, the environment and the economy*.³⁴ This includes the estimated decline in the value of ecosystem services oceans offer in terms of providing food, regulating climate, ensuring habitats and cultural services. The estimations are conservative but take into account that plastic continues to incur costs over the years, as it breaks down and becomes secondary microplastic. Thus, the estimated lifetime impact on marine ecosystem services per tonne of plastic entering the ocean is between US\$204,270-408,541. Applying the average value, the lifetime cost is 3,247,898 NOK per tonne of waste entering the marine ecosystem. The results in terms of lifetime impact of plastic marine litter are presented on the graph below.

³¹ *The marine plastic footprint*, 2020, IUCN, Gland, Switzerland. <https://portals.iucn.org/library/sites/library/files/documents/2020-001-En.pdf>

³² "Approximately two percent of national waste generation ends up as litter, lowest - 0.1% Switzerland", Box 2, *The marine plastic footprint*.

³³ The most commonly used release rate estimate to date is 25%, published by Jambeck et al., *Plastic waste inputs from land into the ocean*.

<https://jambeck.engr.uga.edu/wp-content/uploads/2022/02/science.1260352-Jambeck-et-al-2015.pdf>, but here the publication presents three possible values: 15%, 25%, and 40%.

³⁴ <https://media.wwf.no/assets/attachments/Plastics-the-cost-to-society-the-environment-and-the-economy-WWF-report.pdf>

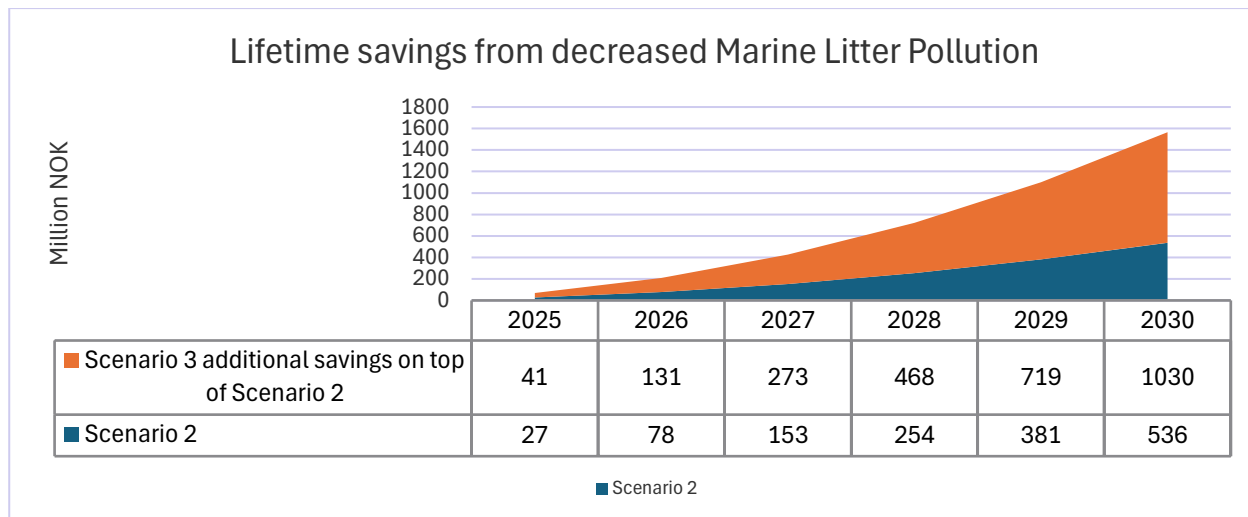


Figure 4 Savings (lifetime impact) from decreased marine pollution, in comparison with BAU

Additional benefits from avoided marine litter include potential economic benefits related to improved tourism services, as tourists prefer uncluttered beaches and clean water, but also to fishing and aquaculture industries, as these may be negatively impacted by marine litter which is known to affect fish larvae survival. These are not estimated in this cost-benefit analysis to exclude any risk of double counting as some of these benefits are also reflected in the marine ecosystem services assessments above.

7.2. Benefits arising from greenhouse gas (GHG) mitigation

The assessment includes the GHG mitigation impact throughout the lifecycle of plastic production, consumption, management and mismanagement of plastic. The potential impact categories are outlined below, explaining for which of these the GHG mitigation impact was calculated.

1) GHG mitigation related to reduced fossil fuel extraction and transport are not quantified.

- This impact is acknowledged, but is not part of the estimations, since it would require a complex understanding of the sources of import of plastic, where and how the extractions occur and how plastic is transported to Norway. It is not common practice to estimate this impact and a complex modelling of the mass balance of fossil fuel extraction for plastic and transport of primary or virgin plastic that ends up in Norway is not available to the authors. The GHG impact is positive, as with decreasing plastic consumption, less fossil fuel will be extracted for plastic production and less virgin plastic will be transported. This impact was not quantified for the purposes of this study, but a global study published under the egis of the UN, *Climate impacts of plastic* estimates this to be 7% of the total life cycle emissions of plastic³⁵.

2) GHG mitigation related to reduced plastic refining and manufacture is quantified.

- Plastic refining and manufacturing are energy intensive processes; most plastic production in the world is in coal-based economies (China, South Africa), and since Norway is a net plastic importer, it is likely that plastic is imported from these countries as well to Norway. The study entitled *Greenhouse gas emission factors for recycling of source-segregated waste materials* reports on emission factors for both primary and secondary

³⁵ GRID-Arendal (a UNEP Partner), *Climate impacts of plastics. Global actions to stem climate change and end plastic pollution*, 2024, https://gridarendal-website-live.s3.amazonaws.com/production/documents/s_document/1076/original/ClimateImpactsOfPlastics.pdf?1709631241

materials.³⁶ For the purposes of this calculation the emission factor for producing mixed plastic was used to calculate emissions avoided by reduced plastic production.

3) GHG mitigation related to more recycling and less incineration is quantified.

- GHG benefits of recycling derive from replacing primary materials with secondary materials which have less embedded carbon. Recycling of plastic is rather energy intensive, still, it results in avoided emissions. Emission factors for replacing primary mixed plastic with secondary (recycled) mixed plastics³⁷ were taken into account to estimate this mitigation impact.
- Process emissions from incineration of plastic are rather high and even though there are plans to do carbon sequestration in Norway, these are not concrete enough to factor them in. Thus avoided GHG emissions from incineration are calculated as benefits. The source for the emission factor was the Norwegian Emission Inventory.³⁸

4) The ongoing impact of plastic waste once it reaches the oceans, waterways, and landscapes are likely insignificant and not quantified.

- This is limited in Norway and any open burning of plastic waste or other GHG emitting consequences are not known to the consultant and are likely insignificant at scale.

The resulting savings in term of CO₂ equivalents are presented below for the two scenarios. To put this into perspective, we note that Norway's total waste sector emissions, which include wastewater sector and emissions arising from all waste types were reported at 1.4 million CO₂ equivalents for 2020. The achieved mitigation results just by measures dealing with plastic in a circular way can be as much as 21% in case of Scenario 2 and 34% in case of Scenario 3 of the waste sector emission levels of 2020.

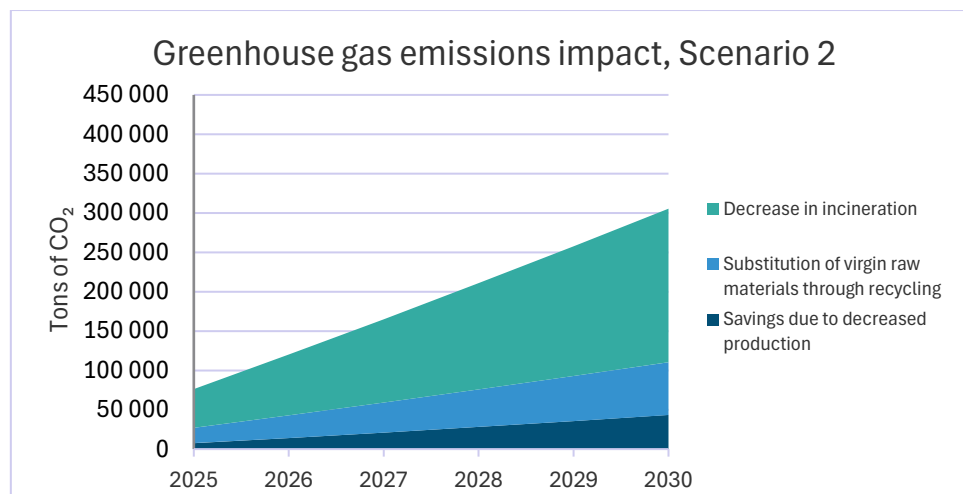


Figure 5 Mitigation of GHG emissions, Scenario 2

³⁶ Turner, David A. & Williams, Ian D. & Kemp, Simon, 2015. "Greenhouse gas emission factors for recycling of source-segregated waste materials," *Resources, Conservation & Recycling*, Elsevier, vol. 105(PA), pages 186-197. <https://core.ac.uk/download/pdf/82404126.pdf>

³⁷ Ibid.

³⁸ Trond Sandmo, The Norwegian Emission Inventory 2016, Documentation of methodologies for estimating emission of greenhouse gases and long-range transboundary air pollutants https://www.ssb.no/en/natur-og-miljo/artikler-og-publikasjoner/_attachment/279491?_ts=1576a6ddf40

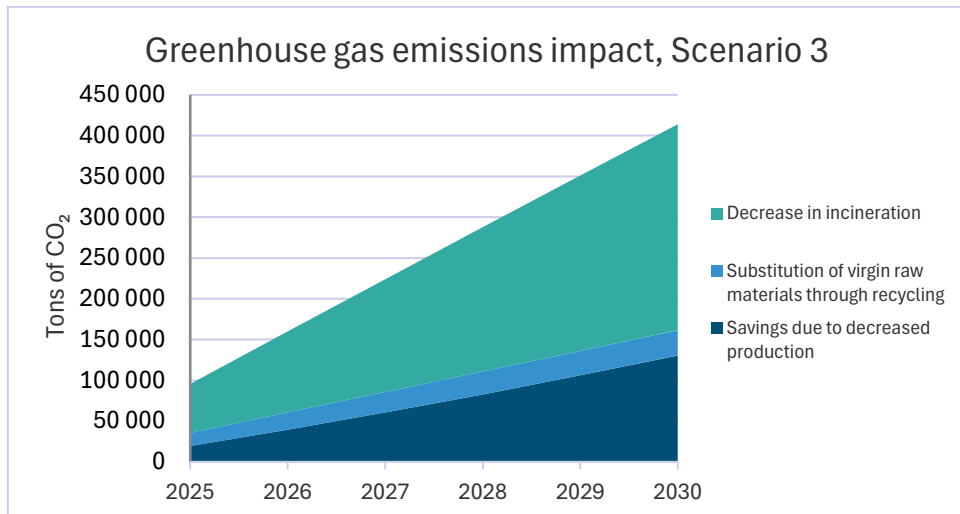


Figure 6 Mitigation of GHG emissions, Scenario 3

For monetizing the GHG mitigation impact, the values for shadow cost of carbon as indicated in the *EIB Group Climate Bank Roadmap 2021-2025* for the period 2020-2050 (€2016/tCO₂e) are used.³⁹

The following graphs present the CO₂ emission savings, resulting from both scenarios:

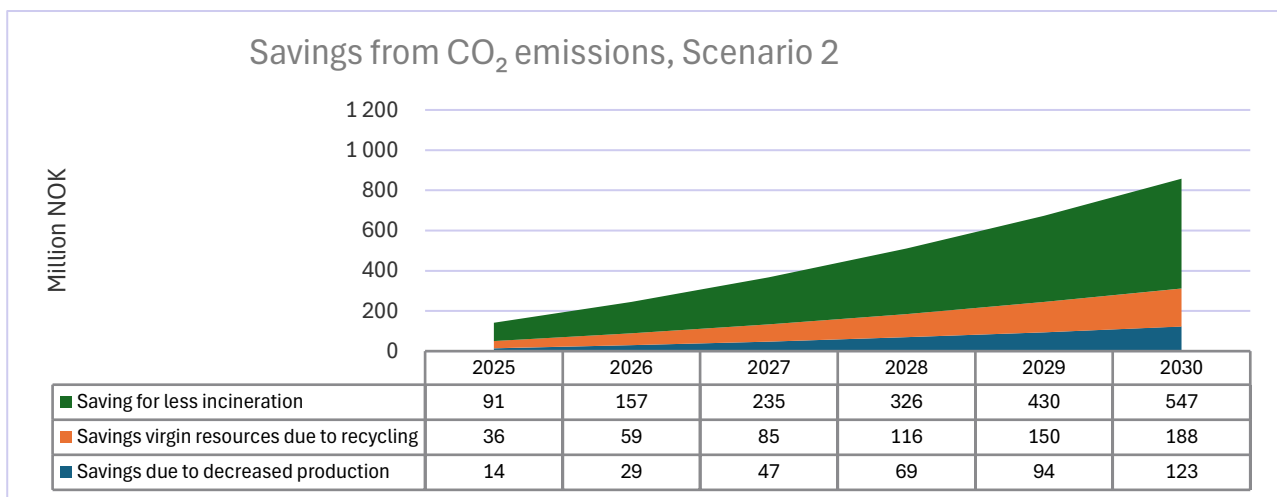


Figure 7 Benefits from CO₂ emissions savings, Scenario 2

³⁹ Table A6: Recommended aligned EIB shadow cost of carbon (€2016/tCO₂e) for the period 2020-2050, page 121, *EIB Group Climate Bank Roadmap 2021-2025*, <https://www.eib.org/en/publications/the-eib-group-climate-bank-roadmap>

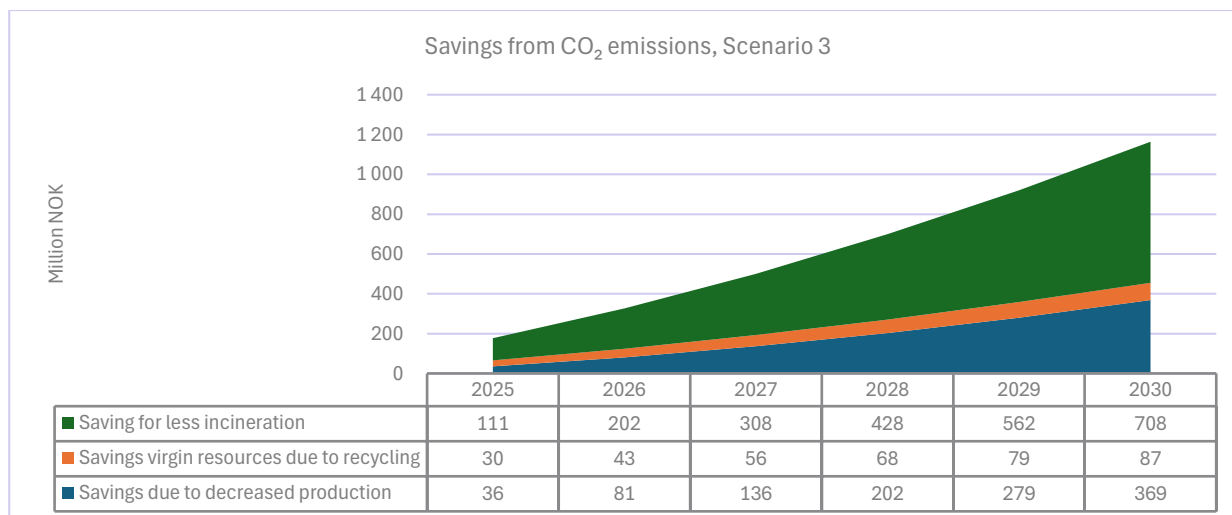


Figure 8 Benefits from CO₂ emissions savings, scenario 3

The table below summarizes the monetary value of the benefits to the environment of reduced plastic packaging waste and increased recycling:

Table 7-1 Monetary value of benefits, summary for options (mln NOK)

Summary of benefits	2025	2026	2027	2028	2029	2030
Marine litter pollution savings, scenario 2	27	78	153	254	381	536
GHG emissions savings, scenario 2	141	245	368	511	674	858
Summary benefits, scenario 2	168	323	521	764	1,055	1,394
Marine litter pollution savings, scenario 3	69	209	426	721	1,100	1,566
GHG emissions savings, scenario 3	176	326	501	699	920	1,164
Summary benefits, scenario 3	245	536	927	1,420	2,020	2,729

7.3. Potential revenue from a plastic packaging tax

In order to assess the potential revenue from the implementation of the plastic packaging tax, the following assumptions were made:

- Regular tax rate of 10,000 NOK per tonne of plastic waste that is not recycled, annually growing by 500 NOK, and a lower tax rate to 50% of the tax for plastic waste that is recycled (besides beverages) is assumed for scenario 2.
- Regular tax rate of 12,000 NOK per tonne of plastic waste that is not recycled, annually growing by 2000 NOK, and a reduced tax rate to 50% of the tax for plastic waste that is recycled (besides beverages) is assumed for scenario 3.

The tax base forecast for scenarios and the revenue forecast is given in the following tables:

Table 7-2 Tax revenue forecast

Tax base scenario 2	2025	2026	2027	2028	2029	2030
Plastic packaging base for lower rate, tonnes	100,681	111,824	123,102	134,509	146,033	157,665
Plastic packaging base for higher rate, tonnes	175,698	166,740	157,587	148,242	138,711	128,999
Lower tax rate	5,000	5,250	5,500	5,750	6,000	6,250

Regular tax rate	10,000	10,500	11,000	11,500	12,000	12,500
Revenue, mln NOK	2,260	2,338	2,411	2,478	2,541	2,598
NOK/cap/year	411	423	434	444	453	461

Tax base scenario 3	2025	2026	2027	2028	2029	2030
Plastic packaging base for lower rate	97,599	104,400	110,377	115,458	119,569	122,628
Plastic packaging base for higher rate	170,319	155,671	141,296	127,247	113,573	100,332
Lower tax rate	6,000	7,000	8,000	9,000	10,000	11,000
Regular tax rate	12,000	14,000	16,000	18,000	20,000	22,000
Revenue, mln NOK	2,629	2,910	3,144	3,330	3,467	3,556
NOK/cap/year	478	527	566	597	619	632

The potential revenue from both scenarios on the above assumptions is presented on the following graph:

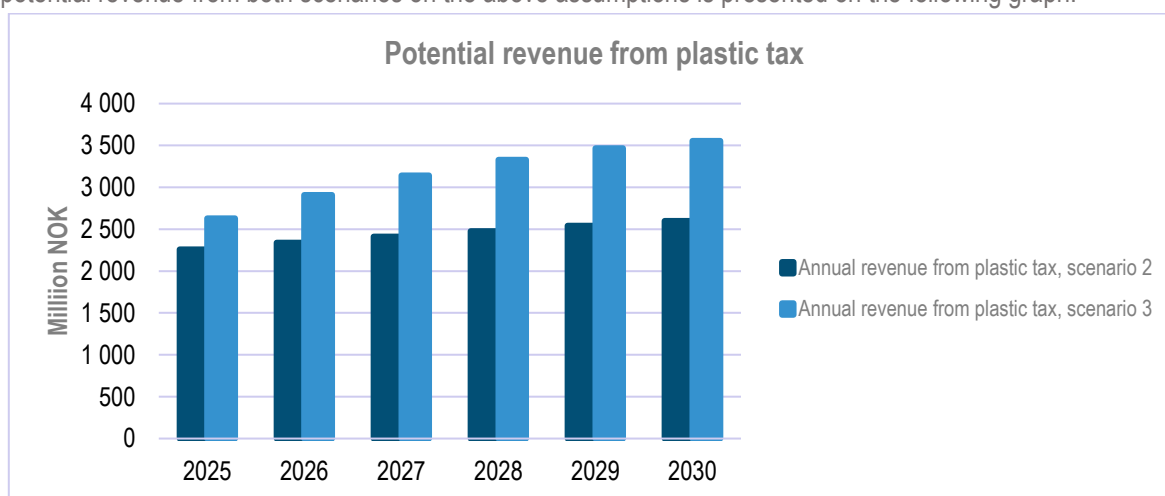


Figure 9 Potential revenue from plastic tax

7.4. Administrative costs of implementing the tax

The initial administrative cost per tonne of packaging is defined on the basis of the Dutch EPR system for 2024, assuming that 15% of the plastic fee is aimed to cover administrative costs of the system, adjusted to reflect the 25% higher average level of salaries in Norway. Annual increase of the share of administrative costs is assumed in relation to the higher monitoring and control that is to be exercised with a tax increase. Assumptions and forecast of administrative costs related to the two scenarios are presented in the following table:

Table 7-3 Administrative costs forecast

	2025	2026	2027	2028	2029	2030
Share of administrative costs for Scenario 2	15%	16.0%	17.0%	18.0%	19.0%	20.0%
Administrative cost NOK per tonne of plastic packaging waste	2,802	2,988	3,175	3,362	3,549	3,736
Annual administrative cost, Scenario 2, mln NOK	774	832	891	951	1,011	1,071
Share of administrative costs for Scenario 3	16%	18.0%	20.0%	22.0%	24.0%	26.0%
Administrative cost NOK per tonne of plastic packaging waste	2,988	3,362	3,736	4,109	4,483	4,856
Annual administrative cost, scenario 3, mln NOK	801	874	940	997	1,045	1,083

7.5. Benefit-cost ratio and conclusions

Cost-benefit analysis measures overall performance of an intervention, defined by indicators as Benefit-cost ratio. Benefit-cost ratio considers benefits to society – financial and environmental in relation to costs to the society. Monetary value of marine litter pollution and GHG emission savings represent the main environmental benefits from reduced plastic packaging waste and its increased recycling.

The benefit-cost ratio is a simple indicator commonly used to show the ratio between overall benefits and costs of a policy, economic instrument, or investment. The financial ratio refers to the direct financial revenues and administrative costs to the government with implementing the tax, while the benefits and costs refer to the wider impact in terms of environmental, social and economic considerations from the point of view of society at large.

The benefit-cost ratio calculated based on the assumptions listed in this document is favourable for scenarios 2 and 3, and for both the financial and the economic assessment. In the tables below it can be seen that the benefit-cost ratio is above 1 for scenarios 2 and 3, and higher for scenario 3, which justifies the introduction of the plastic tax in these scenarios based on financial and economic grounds.

Table 7-4 Benefit-cost ratio, Scenario 2

Scenario 2	2025	2026	2027	2028	2029	2030
Economic benefits (EB)	168	323	521	764	1,055	1,394
Revenue from plastic tax (R)	2,260	2,338	2,411	2,478	2,541	2,598
Administrative costs (C)	774	832	891	951	1,011	1,071
Financial benefit-cost ratio (R/C)	2.9	2.8	2.7	2.6	2.5	2.4
Economic benefit-cost ratio ((EB+R)/C))	3.1	3.2	3.3	3.4	3.6	3.7

Table 7-5 Benefit-cost ratio, Scenario 3

Scenario 3	2025	2026	2027	2028	2029	2030
Economic benefits (EB)	245	536	927	1,420	2,020	2,729
Revenue from plastic tax (R)	2,629	2,910	3,144	3,330	3,467	3,556
Administrative costs (C)	801	874	940	997	1,045	1,083
Financial benefit-cost ratio (R/C)	3.3	3.3	3.3	3.3	3.3	3.3
Economic benefit-cost ratio ((EB+R)/C))	3.6	3.9	4.3	4.8	5.3	5.8

Limitations related to uncertainties of the effect of a plastic tax

The results should be interpreted with caution, as there are limitations and uncertainties **due to the lack of sufficient experience and knowledge of the effects of plastic tax**. Also, the foreseen results are estimations for a set of economic and policy instruments and not foreseen as a result of the plastic tax alone. The implementation of the additional policies and instruments herein suggested would entail further administrative costs to the government.

The estimated results in terms of recycling impact and prevention for Scenario 2 follow current targets set in EU legislation for recycling and assume a modest prevention impact. The recycling rates are achievable and certain EU countries have achieved these, the tax rate proposed is in line with either fees or taxes or their combination in other high-recycling countries, and there is experience with the eco-modulation proposed. The higher charge on unsorted household waste is also widely used in pay-as-you-throw systems and is an economic instrument referred to in Norwegian policy as a potential future instrument. Tax cuts and subsidies for innovation are not new either.

The estimated results in Scenario 3, achieving a higher prevention rate and essentially a decoupling of plastic consumption from economic growth is not based on experience or on currently planned economic instruments, but it is rather a forward-looking scenario formulated as a roadmap. The roadmap instruments are inspired by those currently

proposed in various zero waste roadmaps or those for achieving plastic treaty goals, and include plastic package capping, plastic credits trading in a capped system and further bans and high consumer taxes. For these instruments models do exist, i.e. the EU emission trading system for GHGs is a good example of capping and trading. Bans and consumer taxes already exist for certain materials, but for prevention to really take off these bans and taxes are needed for more plastic packaging products.

Limitations related to benefits and cost estimations

Furthermore, we acknowledge that estimating all costs and benefits was not possible in the framework of this assignment. Below we acknowledge certain costs and benefits that were not part of this cost-benefit assessment.

- Further administrative costs with other policy instruments included in the scenarios.

The results in terms of benefits are not attributable to the plastic tax alone, rather those are attributable to a wider set of policy instruments as outlined in the scenario descriptions. The costs of implementation estimated here are limited to the costs of implementing the tax, while the benefits would need concerted action on all the policy instruments mentioned in the document that would be more costly in terms of administrative costs. The benefit–cost ratio is estimated on assumption that the Government will continue its efforts to introduce a supportive policy and that an enabling economic environment for reducing plastic packaging and recycling plastic packaging will be at place. The benefit–cost ratio holds valid only if these other policies and instruments are implemented, ideas for which these could be are included in the scenario definitions.

- Economic impact on plastic packaging and alternative packaging industry

The direct and indirect impacts on industry would likely be a zero-sum game in terms of shrinking of plastic industry for certain products outweighed by growth in recyclable and reusable packaging solutions, use of readily available and more eco-friendly alternatives, alternative packaging solutions, research and development of bio-materials, etc.⁴⁰ This is especially so, because the scenarios would result in up to 30% reduction of packaging, so they will not be overly ambitious and would not push for solutions that are too expensive or for which a reasonable alternative does not exist. Achieving zero plastic packaging is a different and more complex scenario that needs more research and innovation.

- Other benefits of reduced plastic consumption and reduced plastic packaging waste

At the same time, benefits of reduced plastic would be far larger than those estimated and quantified, as these include among others reduced health impacts due to reduced microplastic in the environment, improved terrestrial ecosystem services due to less littering on land, less extraction of fossil fuel for plastic production, job creation in the recycling industry, etc. Other benefits include avoided waste management costs and clean-up costs that are also not quantified in this study.

On balance we can say with confidence that even when considering these additional costs and benefits, the benefit-cost ratios overall would stay in the favourable range and most likely would be strengthened.

Overall conclusion

First, it is correct that there is not enough certainty regarding the effect of a plastic tax. However, there is enough experience with a set of policy and economic instruments, as those proposed in Scenario 2, and it can be said with confidence that the effects of the policy and economic instruments package proposed is likely to lead to the expected

⁴⁰ The EU plastic strategy implementation Q&A section refers to positive impacts on the economy, see https://ec.europa.eu/commission/presscorner/detail/sv/MEMO_18_6

results based on experience in the EU. While the effects of a more ambitious policy and economic instrument package under Scenario 3 are less known, the scenario is considered by the global community and first movers are expected to arise for the implementation of these more ambitious, albeit less known instruments.

Second, considering that Scenario 2 is reasonable and achievable based on experience of other countries and Scenario 3 is desirable and is a valid ambition for Norway, the cost-benefit analysis clearly shows benefits outweighing costs with reasonable certainty. Even acknowledging all the limitations of the cost-benefit analysis, the benefit-cost ratios overall are going to stay in the favourable range and most likely would be strengthened as further evidence becomes available to be included in the economic analysis.

If we consider a more future looking outlook, it is clear that material tracking and compliance control in the age of big data and digital solutions will become increasingly easier, and therefore the administrative costs of introducing, implementing and monitoring policy and economic instruments will diminish. At the same time, the scientific community continues to identify and assess the ways in which plastic impacts us all. As the negative environmental and health impacts of plastic consumption and plastic waste are increasingly understood and quantified, the benefit-cost ratio of taking action will keep tilting more and more towards the benefits.

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