



SUP and Packaging Waste Prevention Policy Recommendation for Thailand

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LIST OF ABBREVIATIONS

CE	Circular Economy
BCG	Bio-Circular-Green Economy
CAP SEA	Collaborative Actions for Single-Use Plastic Prevention in South-East Asia
BMUV	German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection
SUPs	Single Use Plastics
D4R	Design for Recycling
TEI	Thailand Environment Institute
MTEC	National Metal and Materials Technology Center
NSTDA	National Science and Technology Development Agency
TISI	Thailand Industrial Standards Institute
F.T.I	Plastic Industry Club of the Federation of Thailand Industry
PCD	Pollution Control Department
PITH	Plastic Institute of Thailand
TBCSD	Thailand Business Council for Sustainable Development
NXPO	The Office of National Higher Education Science Research and Innovation Policy Council
DEQP	Department of Environmental Quality Promotion
OIE	Office of Industrial Economic
DIW	Department of Industrial Works
FDA	Food and Drug Administration

EXECUTIVE SUMMARY

In Thailand, increasing urbanization and changing lifestyles have spurred an enormous increase in the use of single-use plastics and packaging. Sound management of plastic waste is, thus, one of the major challenges faced by the country. Currently, most of the plastic waste is still either disposed of in the environment and uncontrolled dumpsites, landfilled, or incinerated. Such practices lead to wastage of primary resources and cause pollution and littering. While policies, investments and debate to improve waste management, such as better waste collection, segregation and recycling, continue to progress over the years in Thailand, tangible plans to follow the circular economy principle of Thailand's Bio-Circular-Green Economy (BCG) Action Plan 2021-2027 that aims at reducing the overall consumption and incentivizing widespread reuse of plastics, have not been prepared yet.

The objective of this policy brief is to support the vision of the Bio-Circular-Green Economy Model (BCG Model) of Thailand. The main focus of this policy brief is on promoting the circularity of plastic materials through upstream measures, i.e., prevention, reuse, and design approaches for supporting better recycling in Thailand. Downstream measures related to waste management are only touched on briefly but would require separate research, and dedicated analysis of plastic material flow. The policy brief was prepared within the project "Collaborative Actions for Single-Use Plastic Prevention in South-East Asia (CAP SEA)", with the support of the partner institutions in Thailand that contribute to the development and implementation of the BCG Action Plan.

The focus is on identifying measures to support the "C (Circular)" pillar of the BCG model in the field of plastics. For this purpose, the policy brief has identified 5 clusters of measures:

- **Measures on market restrictions and bans**, these include identifying the most relevant & problematic single-use plastic products in Thailand and extending the ban to cover more products than currently addressed under the Roadmap on Plastic Waste Management (2018-2030).
- **Measures for consumption reduction and promoting reuse**, these include initiating the transition to reusable food packaging, promoting reusable systems in restaurants, take-aways, food delivery services and open markets, using the power of Green Public Procurement, introducing levies on carry-out bags and introducing a deposit-return-system for reusables.
- **Measures to strengthen the recycling market**, these include defining clear institutional set-up and roles and responsibilities for standardization, certification and verification of design-for-recycling guidelines, institutionalizing material flow analysis for plastics, and setting recycled content targets.
- **Fiscal measures**, include mobilizing investments for reusable packaging, packaging with recycled content, and Material Recovery Facilities (MRF), introducing taxation for single-use plastic items and designing an appropriate Extended Producer Responsibility (EPR) system.
- **Measures on biobased and biodegradable items**, include labeling requirements for biobased and biodegradable materials, and promoting their use in selected fields of application, such as third-party certified and labelled garbage bags for separate collection of wet waste, and biobased plastics made from agricultural waste and by-products as raw materials

The policy paper will serve to initiate a dialogue and stakeholder consultation between March and June 2022 in Thailand. The results of the stakeholder consultation will help in adapting the recommendations of the policy brief and will be handed over to the Circular Economy Sub-committee of the BCG Action Plan 2022-2027 and the Plastic Waste Management Sub-committee of the Pollution Control Board through the Pollution Control Department.

1. BACKGROUND – THE PLASTIC CRISIS IN THAILAND

Thailand has been facing the challenges on waste management and the negative consequences of waste pollution, particularly plastic waste. In 2020, approximately 25.37 million tons of solid waste were generated in the country. Among these, only 33% or 8.36 million tons of the solid waste were recycled and approximately 36% or 9.13 million tons of the solid waste were properly managed, while about 31% or 7.88 million tons were not disposed properly (Figure 1).

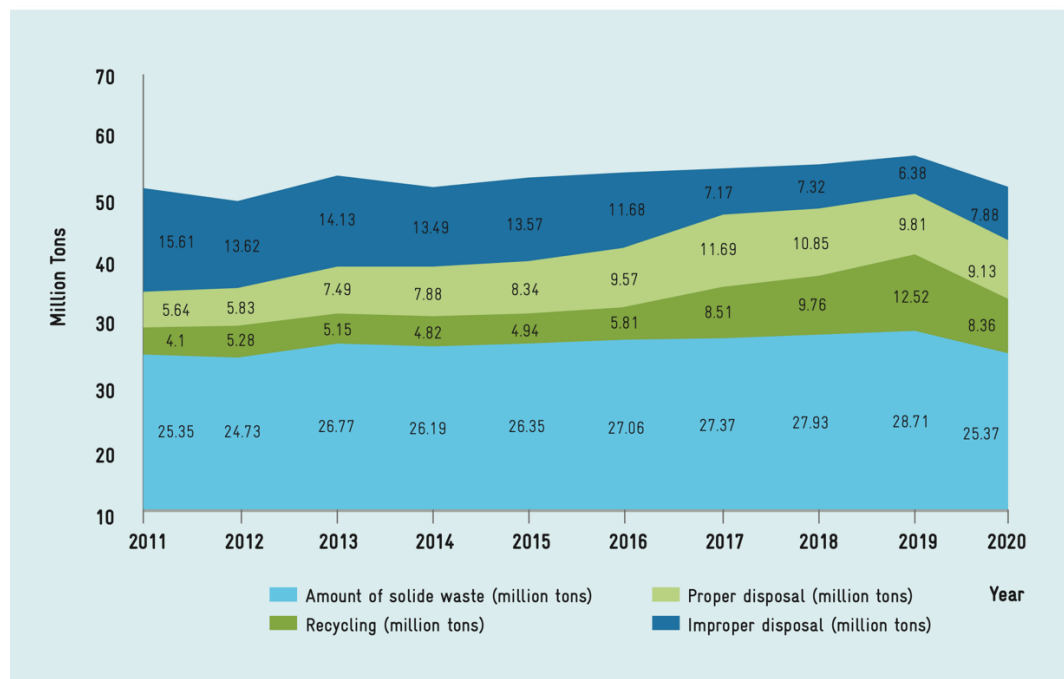


Figure 1: Amount of solid waste generated, recycled, proper disposal and improper dispersal in 2011-2020 (Modified from PCD, 2021: Thailand State of Pollution Report 2020)

PCD (2021) reported that Thailand generated about 2 million tons/year of plastic waste and only approximately 25% of this plastic waste (0.5 million tons) were recycled. The 1.5 million tons of non-recycled plastic waste comprised mainly of single-use plastics (SUPs) such as plastic bags, plastics cups, plastics straw and Styrofoam. This portion of non-recycled waste are typically transferred to landfill dump sites and had high potential to leak to the environment. According to the Ministry of Industry, demand for recyclable plastic waste of the recycling industry was 680,000 tons in 2021¹

In addition, information of plastic waste generated in a year with COVID-19 outbreak and a prior year were compared. It is reported that plastic waste generated in 2020 (COVID-19 outbreak) accounted for 6,300 tons per day and increased about 15% compared to 2019 (prior to the COVID-19 outbreak) (PCD, 2021). The Department of Marine and Coastal Resources calculated the number of marine debris in 2020 based on waste generated and mismanagement of solid waste in the 23 coastal provinces and found approximately 34.3–51.5 tons of marine debris were leaked to the ocean.

¹ <https://www.bangkokbiznews.com/social/954268>; accessed: 30.01.2022

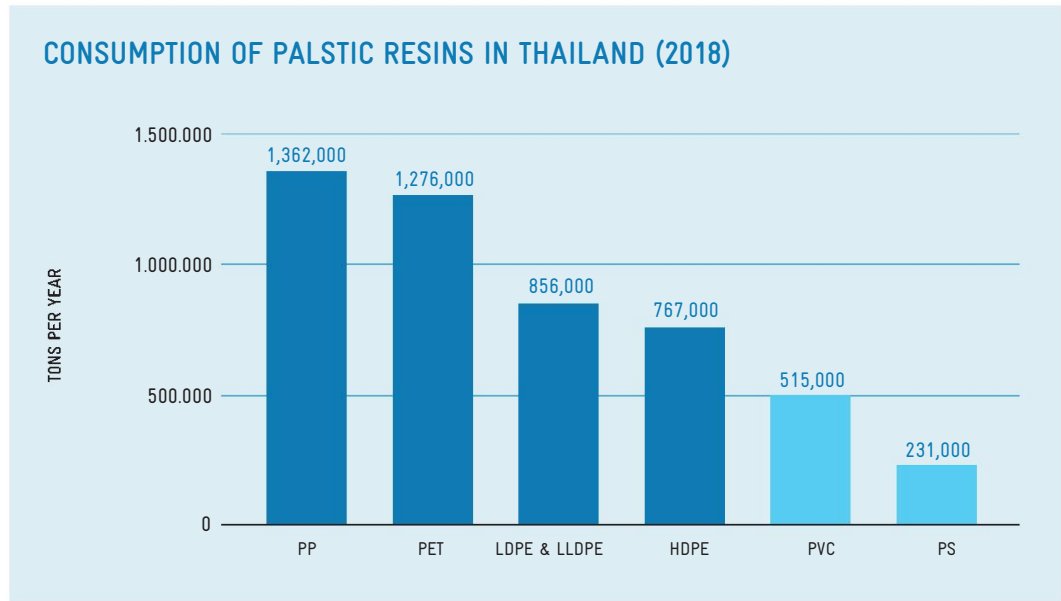


Figure 2: Breakdown of resin consumption in Thailand in 2018 (before accounting for product lifespans and import/export of semi-finished products). Source: World Bank, 2021: Market Study for Thailand: Plastics Circularity Opportunities and Barriers.

According to a plastic market study for Thailand (World Bank, 2021), the five major plastic resins consumed in Thailand (2018) were PE, PET, LDPE & LLDPE, HDPE and PVC (Figure 2).

Pollution from poorly managed solid waste and plastic waste has been causing socio-economic and environmental problems in all sectors: Thailand spends approximately 20,000 million baht/year on waste collection while the household waste collection free collected by Sub-District Administrative Organizations is only 2,800 million baht/year. Considering financial losses just from waste collection alone, the government spend 17,200 million baht/year for subsidy (Environmental Research Institute, 2021). There are also much more additional costs from unsustainable uses, misused and management of plastic pollution such as costs on pollution management, health impacts, impacts on natural resources and wildlife, and losses of opportunities in key sectors such as fisheries, agriculture and tourism sectors.

2. INTRODUCTION

The Collaborative Actions for Single-Use Plastic Prevention in South-East Asia (CAP SEA) project is supporting the Thai government to address the plastic crisis by focusing on upstream approaches to prevent single-use plastics from entering the market (such as re-use, recycled content targets, design for recycling and eco-design). The project provides technical support to the Circular Economy Sub-committee under the National Management Committee to drive the BCG Economy in which the National Science and Technology Development Agency (NSTDA) is a secretariat.

Thailand Environment Institute (TEI) is the project secretariat that engages following institutions to collaborate in this project:

- National Metal and Materials Technology Center (MTEC)
- National Science and Technology Development Agency (NSTDA)
- Thailand Industrial Standards Institute (TISI)
- Plastic Industry Club of the Federation of Thailand Industry (F.T.I)
- Pollution Control Department (PCD)
- Plastic Institute of Thailand (PITH)
- Thailand Business Council for Sustainable Development (TBCSD)
- The Office of National Higher Education Science Research and Innovation Policy Council (NXPO)
- Department of Environmental Quality Promotion (DEQP)
- Office of Industrial Economic (OIE)
- Department of Industrial Works (DIW)
- Food and Drug Administration (FDA)

Since April 2021, the aforementioned agencies have been founded as the project's Technical Working Groups (TWGs) and Steering Committee (SC) accordingly.

The TWGs role are as follows:

- To develop the project's work plan
- To provide technical data and knowledge that is used as a basis for developing the Single Use Plastic (SUP) prevention policy recommendation, standards and guidelines
- To enable a cooperation among relevant government departments and institutes

The project transfers technical knowledge from the Oeko Institute (Germany) to support the development of the two key products

1. SUP and packaging waste prevention policy recommendation paper,
2. Design for Recycled (D4R) guideline for three plastic product groups, namely HDPE non-food containers, PET bottles (food-grade) and PP cups/containers (food grade).

Using a knowledge transfer approach: The project has deployed a series of public seminars and dialogues among the policymakers, key experts from the plastic industry, including manufacturers & recyclers, academic institutions, civil society institutions and international organizations. The objective was to share lessons learnt from abroad on SUP and packaging waste prevention policies, design for recycling standard, plastic recycled content target, life cycle assessment, biobased and biodegradable materials, economic and fiscal measures for plastic waste reduction and municipality actions. Publications in Thai and English on the following's topics are made available for TWGs in order to prepare them for the project's deep dive workshops:

- Considerations for packaging classification
- Design-for-Recycling (D4R)
- Recycled content in plastic material with focus on PET, HDPE, LDPE, PP
- Material choices for environment-friendly packaging design
- Biobased and biodegradable plastics
- Economic & fiscal measures for packaging waste reduction (in preparation)

Additionally, the project is piloting the SUP reduction with the Phuket municipality in order to demonstrate good practices e.g. innovative solution on “reuse packaging as a service business model”, SUP free at festivals. The actions at municipality level are used as an example of innovative solutions that need political and policy support from national level.

CAP SEA works in Thailand, Malaysia, Indonesia and is part of a global project “Export Initiative for Green Technologies”, commissioned by the **German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)**. The project employs a blended approach, consisting of policy advice on circular economy approaches, capacity development for key stakeholders, local government pilot activities and support for innovative business models tackling SUP prevention.

3. POLICY CONTEXT ADDRESSING SUP AND PACKAGING WASTE

Although there is not a specific law addressing SUP and packaging waste management in Thailand, management of SUP and packaging waste are generally treated as “waste” under the Public Health Act B.E. 2535 (A.D. 1992), the Maintenance of the Cleanliness and Orderliness of the Country Act B.E. 2535 (A.D. 1992) and the National Environmental Quality Act B.E. 2535 (A.D. 1992). These Acts give authority and responsibility to the local administrations for waste collection, transportation, and disposal.

As plastic waste pollutions and its impacts become more of the concerns regionally and globally, the Royal Thai Government has mainstreamed its efforts to combat plastic waste and considered plastic waste pollution as one of the national agenda. In 2018, a Sub-Committee on Plastic Waste Management chaired by Minister of MONRE was established under the National Environmental Board (Note: The Sub-Committee on Plastic Waste Management was canceled in 2020, and the NEB established the Plastic and Electronic Waste Management Sub-committee instead). The government announced and started the implementation of the first **National Roadmap on Plastic Waste Management (2018-2030)** in the same year, and in 2020 the 1st of the Action Plan Plastic Waste Management Phase I (2020-2022) was implemented. The Roadmap aims to

- ban 7 types of SUP (Oxo-degradable plastic, cap seal, microbead, thing bags (thickness less than 36 microns), straw, SUP cup, Styrofoam food container) by 2022, and
- bring 100% of target plastics (HDPE/LLDPE/LDPE/PP bag, HDPE/LL/LDPE mono-film package, bottle, cap, cup, food tray/box, utensil) to recycle by 2027.

In 2021, the government endorsed **Bio-Circular-Green Economy Model (BCG Model)** as a new national agenda. Application of circular economy (CE) to sustainable manage plastic waste is one of the priority projects (a.k.a. big rock projects) under the “Comprehensive plastic waste management including segregation, collection and circulation for sustainable use” under the C pillar of the BCG Model. The BCG Model Action Plan (2022-2027) identified key activities under 5 operation guidelines (Figure 3), however, implementation plan, budget and specific timeline are not yet identified. Both the **Roadmap on Plastic Waste Management (2018-2030)** and the **Bio-Circular-Green Economy Model (BCG Model)** provide direction and scope of framework to tackle plastic waste but lack the enforcement power.

ROADMAP - PLASTIC WASTE MANAGEMENT 2018-2030

THE 1ST GOAL

Plastic reduction and elimination is the main goal, aiming to achieve this goal by using environmentally friendly material instead.

2019



Oxo-biodegradable plastic



Plastic cap seal



Microbead

2022



Foam food container



Thin, single/use plastic glass



Plastic bag
Thickness < 36 Micron



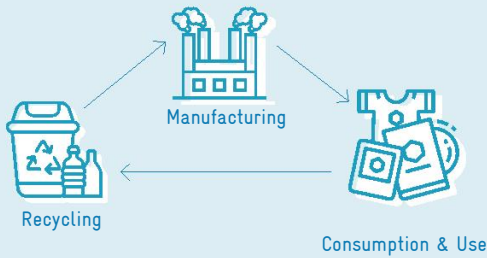
Plastic straw

THE 2ND GOAL

Recycling plastic waste.

2027

100%



PLASTIC WASTE MANAGEMENT

1. Plastic waste reduction from the beginning
2. Plastic waste reduction from the consumption
3. Plastic waste management after consumption

BIG ROCK PROJECT - TO CREATE MAJOR CHANGES IN THAILAND



Project 1: Comprehensive plastic waste management including segregation, collection and circulation for sustainable use.

Project 2: Management and Integrated information for reduction of food loss and food waste at the national level.

Project 3: Development and application of CE Model in construction sector

OPERATIONAL GUIDELINES

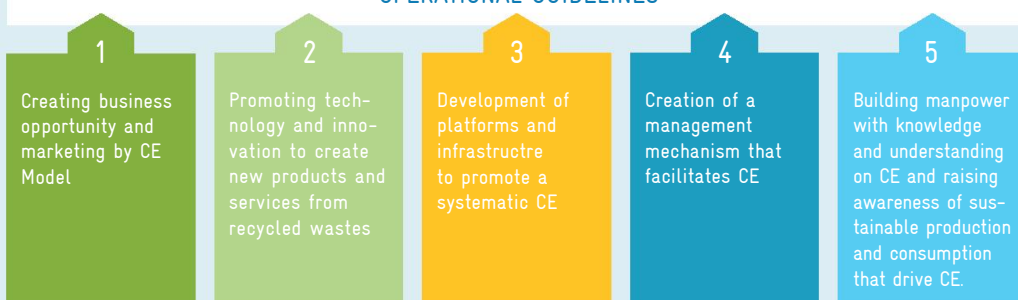


Figure 3: National Roadmap on Plastic Waste Management (2018-2030)

Figure 4: Three Big Rock Projects under the CE Economy of the BCG Model and 5 operational guidelines.

4. STANDARDS & GUIDELINES FOR SUP AND PACKAGING IN THAILAND

Thailand has developed a number of standards and guidelines related to SUP and plastics packages. The criteria for the standards and guidelines largely cover product quality and health safety issues while environmental aspects are not key focuses. Relevant TISI standards are:

- Standards for Plastic utensils for food part 1 - part 4 (TIS 655 part 1- part 4)
- Standards for Symbols for recycling plastics (TIS 1310-1995)
- Standards for other plastics containers; milk containers, drinking water containers, canteens, babies' bottle, containers for microwave, various plastics food containers, and various plastic films

With the increasing environmental concerns, a number of biodegradable or compostable products for SUP have been developed and used in recent years. Some standards and guidelines for SUP alternative products are:

- Specifications for compostable plastics (TIS. 17088-2019)
- Single-use compostable plastic straw for food (TIS. 2744-2016)
- Compostable plastic bag for waste (TIS. 2793-2017)
- Compostable plastic bags (TIS. 2995–2019)
- Single-use compostable plastic packages and utensils for food Part 1 poly (lactic acid) (TIS. 2884 Part 1-2017)
- Biodegradable plastics mulch films for agriculture use (TIS. 2997–2019)
- Biodegradable plastics nursery bags (TIS. 2996–2019)

Moreover, TISI has adopted two circular economy related standards including

- **Framework for implementing the principles of the circular economy in Organizations-Guide** (TCAS 2-2019) which was translated from the BSI's standard on Framework for the implementation of the principles of the circular economy in organization- Guide (BS 8001:2007); and
- **Circular economy management system for organization Part 2: Requirements** (TCAS 2-2021).

Furthermore, draft TCAS on **Plastics Recycling Traceability and Assessment of Conformity and Recycled Content: Requirements** is in an approval process.

In addition to the TIS and TCAS standards and guidelines, there are Green Label standards on recycled plastics (TGL-01-R2-12), plastics packaging (TGL-105-15) and biodegradable plastics products (TGL-44 -R1-21). The plastic packaging standard was revised and currently in the process of approval.

5. CORPORATE APPROACHES FOR ADDRESSING SUP AND PACKAGING WASTE

Private sectors in Thailand have been playing the key roles in addressing the challenges emerged from plastic waste pollutions both as individual organizations and as part of associations/collaborative platforms. In 2018, a public-private sector initiative, **Thailand PPP-Plastics (Public-Private Partnership for Plastic and Waste Management)** was established by Thailand Business Council for Sustainable Development (TBCSD) and the Federation of Thai Industries (FTI). PPP Plastics supports the development and implementation of the Roadmaps of Plastic Waste Management and its associated action plans. PPP-Plastics focus on 6 priority areas: i) Policy: supporting government policy; ii) Infrastructure: developing model for waste management with CE; iii) Innovation: promoting collective efforts of members/partners on innovation; iv) Education and communication: supporting development of CE course for general education and enhancing communication to promote sustainable use and management of plastics; v) Database: developing national database (Material Flow) for target plastics; and vi) Funding: mobilizing funding for supporting sustainable plastic waste management pilot projects.

Additionally, there are several private sector initiatives/projects developed to promote circularity of SUP packaging by creating an ecosystem to collect SUP and a few other single use products back to the manufacturing stream.

1 Won project (Won means 'circulate' in Thai): Initiated in April 2019, Won Project sets up drop points to collect 12 types of flexible plastic bags and film (PE). During April 2019 and March 2021, Won project collected 186 tons of flexible plastics back to recycled from their 350 drop points.

2 Magic hand x Won project: Initiated in 2020 by PPP-Plastics in collaboration with Won project, this project sets up about 200 drop points for 12 types of flexible plastic bags and film (PE) (Figure 4). Approximately 14.5 tons of plastics were collected between June 2020 and Feb 2021.

3 Transform plastics to merit project: Initiated in 2020, this project sets up 20 drop points in government building to collect flexible plastic packaging and hard plastics (food containers, cups, straws, utensils, and bottles). From June 2020 to Feb 2021, 1.4 tons of flexible plastics and 1.7 tons of hard plastics were collected.

4 Send plastics home project: The project was implemented in May to October 2020 aiming to collect flexible and hard plastics from 31 drop points accounting for 4.9 tons of plastic waste.

5 Green roof project /BECARE: Initiated in 2018, the project installed 150 drop point for milk cartons in Big C supermarket and 220 additional dropping points in 14 provinces. 500 ton/year of cartons were collected from Big C markets and 700 tons/year collected from 14 provinces.

6 Magic box project: Initiated 1982, the project collected 10 tons/year of drink cartons from 30 drop points.

7 Disassemble, clean and collect project: Initiated 2020, the project collected about 1.4 tons/year of drink cartons.



Figure 5: Twelve plastic packages collected from drop points under Magic hand x Won.
 Note: These 12 flexible plastic packages are the same types of flexible plastic collected from Won Project, Transform plastics to merit project and Send plastics home project.

6. INTERNATIONAL EXAMPLES

In this chapter, a brief collection of international practices for single-use plastic and packaging waste prevention policies has been compiled. The compilation is not exhaustive but provides references for the measures proposed in this policy brief.



EU SINGLE-USE PLASTICS DIRECTIVE

The directive came into force in 2019 and aims to tackle the 10 single-use plastic items most commonly found on Europe's beaches, and promote sustainable alternatives. The ten items being addressed by the directive are:

- Cotton bud sticks
- Cutlery, plates, straws and stirrers
- Balloons and sticks for balloons
- Food containers
- Cups for beverages
- Beverage containers
- Cigarette butts
- Plastic bags
- Packets and wrappers
- Wet wipes and sanitary items

Where sustainable alternatives are easily available and affordable, single-use plastic products cannot be placed on the markets of EU Member States. This applies to cotton bud sticks, cutlery, plates, straws, stirrers, and sticks for balloons. It will also apply to cups, food and beverage containers made of expanded polystyrene, and on all products made of oxo-degradable plastic.

For other single-use plastic products, the EU is focusing on limiting their use through:

- reducing consumption through awareness-raising measures
- introducing design requirements, such as requirements to connect caps to bottles
- introducing labelling requirements, to inform consumers about the plastic content of products, disposal options that are to be avoided, and harm done to nature if the products are littered in the environment
- introducing waste management and clean-up obligations for producers, including Extended Producer Responsibility (EPR) schemes

Specific targets include:

- a 77% separate collection target for plastic bottles by 2025 – increasing to 90% by 2029
- incorporating 25% of recycled plastic in PET beverage bottles from 2025, and 30% in all plastic beverage bottles from 2030

More information can be found on:

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



GERMAN PACKAGING ACT, AMENDMENT 2021

The German Packaging Act (VerpackG) transposes the European Packaging Directive 1994/62/EC into German law. It regulates the placing of packaging on the market as well as the return and high-quality recycling of packaging waste. The law replaced the existing Packaging Ordinance (VerpackV) in 2019 and was amended in 2021. The revised Packaging Act (VerpackG2) has been in force since July 3, 2021. The main amendments in VerpackG2 with respect to the upstream measures and relevant for this policy brief are summarized below:

- From 1st January 2022, extension of deposit and return obligations (mandatory deposit) to all single-use beverage bottles and drink cans (exemption for single-use beverage bottles filled with dairy products for which the obligation applies as of 1 January 2024)
- From 1st January 2023, all final distributors shall offer and indicate alternative and not “more expensive” reusable packaging in addition to single-use plastic food packaging and single-use beverage cups. Furthermore, small companies should advise customers that products can be filled in reusable containers brought by the end consumers as an alternative to single-use packaging. Furthermore, there is an obligation to take back “own” returnable packaging.

More information can be found on: <https://verpackungsgesetz-info.de/en/>



UK PLASTIC PACKAGING TAX

On April 1, 2022, the UK will introduce a tax on all plastic packaging that does not contain at least 30% secondary plastic. All manufacturers and importers of plastic packaging who place at least 10 tons on the market in the UK each year will be affected. In the case of packaging consisting of several materials, only packaging containing at least 50% plastic by weight will be subject to taxation. Packaging in which the use of secondary materials is not permitted (especially with regard to food safety standards) is exempt from taxation. The tax is a flat rate of 200 GBP/t. A tax rebate requires proof that the corresponding packaging contains at least 30% recycled content.

More information can be found on:

<https://www.gov.uk/government/collections/plastic-packaging-tax>



SPAIN'S TAX ON SINGLE-USE PACKAGING

With an amendment to the Waste and Soil Protection Law („Ley de Residuos y Suelos Contaminados“), a tax on plastic packaging amounting to €0.45/kg was introduced in Spain in December 2021. All non-reusable types of packaging made entirely or partly of plastic will be taxed. Packaging for pharmaceuticals, health products, food for special medical purposes, baby food for hospital use, and silage film for agriculture and livestock are exempt. The basis of assessment is the plastic weight of a package, with paints, inks, varnishes and adhesives excluded from the calculation. Portions made from recycled plastic are exempt from the tax, which is intended to create an incentive for increased plastic recycling. The tax is levied when the packaging is first made available or when the packaging or packaged product is imported

More information can be found on: https://www.congreso.es/docu/docum/ddocum/dosieres/sleg/legislatura_14/spl_21/pdfs/1.pdf



ITALY'S TAX ON SINGLE-USE PACKAGING

Italy plans to introduce a tax on single-use plastic products (manufatti con singolo impiego, „MACSI“). The tax was already passed into law in 2019, but its introduction has been postponed several times and is currently scheduled for 2023. The law stipulates that - with the exception of compostable products (according to EN 13432: 2002), medical products, as well as packaging of pharmaceuticals - all single-use plastic products will be taxed at €0.45/kg. In the case of products that contain other materials in addition to plastic, the respective plastic content is subject to the tax. If proof can be provided of the secondary plastic content, this portion will be exempt from the tax.

The tax is levied on companies that manufacture the corresponding disposable products in Italy for the Italian market or import them into Italy.

In addition to the plastic tax, the law provides economic incentives to switch to compostable products within a transition period of 1 year. Thus, tax credits of 10% can be claimed on costs incurred for corresponding technological adaptations, with a maximum amount of €20,000 per beneficiary, and €30 million in total.

More information can be found on: <https://www.gazzettaufficiale.it/eli/id/2019/12/30/19G00165/sg>



FRANCE'S APPROACH OF REDUCING PLASTIC PACKAGING

France has adopted a series of measures restricting more single use plastic items than covered by the EU SUP directive and going beyond the minimum requirements set in the Directive. Few examples include:

- 20% reduction target of which 50% is achieved through the reuse of packaging and elimination of SUP packaging
- 100% reduction of unnecessary packaging
- 50% reduction of plastic bottles placed in the market by 2030
- Minimum share of reuse packaging: from 3% in 2022 to 10% by 2027
- A ban on the sale of fresh unprocessed fruit and vegetables with packaging made up entirely or in part of plastic in 2022
- From 2022, public spaces must provide water fountains to reduce the use of plastic bottles; press and publicity publications must be shipped without plastic wrapping, while fast-food restaurants can no longer offer free plastic toys.
- From January 2023, France will also ban throwaway crockery in fast-food restaurant for meals consumed on-site.

More information can be found on: <https://rethinkplasticalliance.eu/wp-content/uploads/2021/06/SUP-Assessment-Design-final.pdf>



GERMANY'S DEPOSIT-RETURN SYSTEM (DRS)

Germany has deposit systems for both reusable/refillable and single-use containers (added recently in the amendment of the packaging act in 2021). As the target of share of beverages filled in reusable beverage containers of at least 70 percent was missed, it was decided to include single-use containers in the DRS. It is applied to beverage cans and disposable glass and plastic beverage bottles, if they have a capacity between 0.1 liters and 3 liters. To ensure single-use containers do not overtake reusables/ refillables, a higher

deposit value is set for single-use containers (25 cents). The returnable deposit is only 8 cents (beer bottles) or 15 cents (other reusable bottles).

Single-use packaging subject to a deposit can be returned at any point of sale that sells single-use containers made of the same material. The decisive factor is the material alone and not the shape, brand or content of the packaging. Examples: Anyone who offers cola in plastic bottles and cans must also take back plastic mineral water bottles or beer cans. Anyone who only sells beverages in disposable plastic bottles must only take back disposable plastic bottles. Those who sell only cans must take back only cans.

Retailers must take back empty packaging and pay the deposit of 25 cents, even if the beverages were purchased at another store. The refund of the deposit is not tied to a new purchase.

For stores with a sales area of less than 200 square meters (for example, kiosks or smaller petrol stations), a special rule applies: they only have to take back empties of those brands and materials that they themselves carry in their assortment. Example: Only XY brand cola cans are sold, then only XY brand cola cans must be taken back (it does not matter where the XY cans were purchased).

Following exemptions exist for single-use DRS:

- Milk and mixed milk beverages and other drinkable milk products in plastic bottles (deposit only from Jan. 1, 2024)
- Alcohol products subject to the alcohol tax if they are filled in non-refillable glass bottles
- Dietary beverages offered exclusively for infant and young child feeding if offered in non-refillable bottles
- Beverage cartons, tubular and stand-up pouch packaging

More information can be found on: <https://verpackungsgesetz-info.de/en/>



EU POLICY FRAMEWORK ON BIOBASED, BIODEGRADABLE AND COMPOSTABLE PLASTICS

The EU Circular Economy Action Plan emphasizes the need for a policy framework to address the sustainability challenges linked to

- sourcing, labelling and use of biobased plastics to ensure their use results in genuine environmental benefits, going beyond reduction in using fossil resources,
- use of biodegradable and compostable plastics, based on an assessment of the applications where such use can be beneficial to the environment, and the criteria for such applications.

Currently, there is a lot of confusion regarding the definitions, claims, benefits, and risks related to biobased, biodegradable and compostable plastics. As a result, consumers do not have access to clear and trustworthy information when making their purchasing decisions or disposing such products. Thus, the EU Commission has started an initiative and launched a stakeholder consultation on this topic to collect further evidence and feedback on this topic. The initiative aims to clarify the role biobased, biodegradable and compostable plastics can play to deliver on Commission's commitments on a carbon neutral and circular economy. It will help improve the understanding of the full lifecycle environmental impacts of these plastics as well as the applications which are likely to be the most appropriate to deliver genuine environmental benefits as compared to conventional plastics. The following measures will be considered:

- establishing clear definitions and overarching principles applying to both biobased plastics and biodegradable and compostable plastics in light of the circular economy and waste hierarchy principles as well as relevant national experience in this field; follow-up actions will also be considered where appropriate,
- for biobased plastics (BBP), clarifying the measurement method and labelling of the part of a plastic product that is entirely or partly derived from biomass (the 'biobased' content) as well as the sustainability of the biological feedstock used to produce BBP by considering sustainability criteria,
- for biodegradable and compostable plastics, clarifying definitions, applications and criteria for such applications, as well as the role of testing, labelling and certification to ensure effective biodegradation, alignment with actual disposal infrastructure, and avoid consumer confusion.

More information can be found on:

https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13138-Policy-framework-on-biobased-biodegradable-and-compostable-plastics_en

7. POLICY RECOMMENDATIONS FOR REDUCING SUP AND PACKAGING WASTE IN THAILAND

7.1 ESTABLISHING A CIRCULAR ECONOMY WASTE HIERARCHY

A waste hierarchy is a universally accepted notion that ranks waste management options according to what is best for the environment. According to this principle, waste prevention and re-use are the most preferred options, followed by recycling, then energy recovery, while waste disposal through landfills should be the very last resort.

The above-mentioned notion of the waste hierarchy can be identified in the high-level policy objectives of Thailand: For instance, one of the key principles of Thailand's [12th National Economic and Social Development Plan \(2017-2021\)](#) is the Sufficiency Economy Philosophy (SEP), which postulates a holistic approach with an emphasis upon appropriateness, reasonableness, resilience, competitive advantage, low risk, avoiding over-investment and over-dependence on other countries. Accordingly, these principles should significantly contribute to balanced and sustainable development. In the [BCG model](#), the “C” pillar, which stands for the Circular Economy, aims at reusing and recycling resources. The BCG Action Plan 2021 has included a target on reducing national resource consumption by 25% until 2027. In the field of plastics, Thailand's [Roadmap on Plastic Waste Management](#) mentions the following two targets:

- Reduce and replace some single-use plastics by using environmentally friendly products
- 100% target plastic waste to circular economy (this is described as “100% of target plastic waste will be recycled by applying Circular Economy Principle”).

In a nutshell, the 12th National Economic and Social Development Plan (2017-2021), the BCG model and the Roadmap on Plastic Waste Management highlight a clear preference for reducing the resource consumption (“upstream approach”). However, in the context of plastics, specific measures and activities appear to focus strongly on the downstream part of the plastic value chain, i.e., collection, recycling, material and energy recovery and end-of-pipe waste management solutions. While not underestimating the potential of such measures, technological, logistical and economic barriers will always lead to irreversible losses of primary raw materials. Furthermore, the environmental impact reduction potential of the downstream measures is much lower than the measures targeting the upstream part of the plastic value chain, i.e. prevention, reduction and reuse, see Figure 7 (next chapter).

Thus, in line with the objectives of the 12th National Economic and Social Development Plan (2017-2021), the BCG model and the Roadmap on Plastic Waste Management, it is deemed important that measures and activities should contribute towards an absolute reduction of material and energy. Such an approach will also be in line with the concept of a circular economy where “the value of products and materials is maintained for as long as possible, waste resources are minimized, and when a product reaches the end of its life, it is used again to create further value”. Hence, a circular economy is more than mere waste management. It seeks to slow down and close resource loops in our current linear production systems by preventing, reducing, reusing and recycling materials instead of primarily extracting finite resources to produce new materials.

The CAP-SEA project recommends setting a clear definition of a Circular Economy, as mentioned above, in the high-level policy objectives of Thailand. At the same time, measures, activities, investments and other support mechanisms should be designed according to a Circular Economy Waste Hierarchy. A Circular Economy Waste Hierarchy should differentiate between different forms of recycling. In this regard, mechanical material recovery should be preferred to other forms of recycling. Large scale investments in high-cost technologies, such as waste-to-incineration for energy recovery and pyrolysis as well as gasification for chemical recovery could lead to severe lock-in effects for the future and undermine efforts to promote reuse and mechanical recycling for material recovery, including source segregation and sorting.

A recommendation for a Circular Economy Waste Hierarchy for Thailand is presented below:

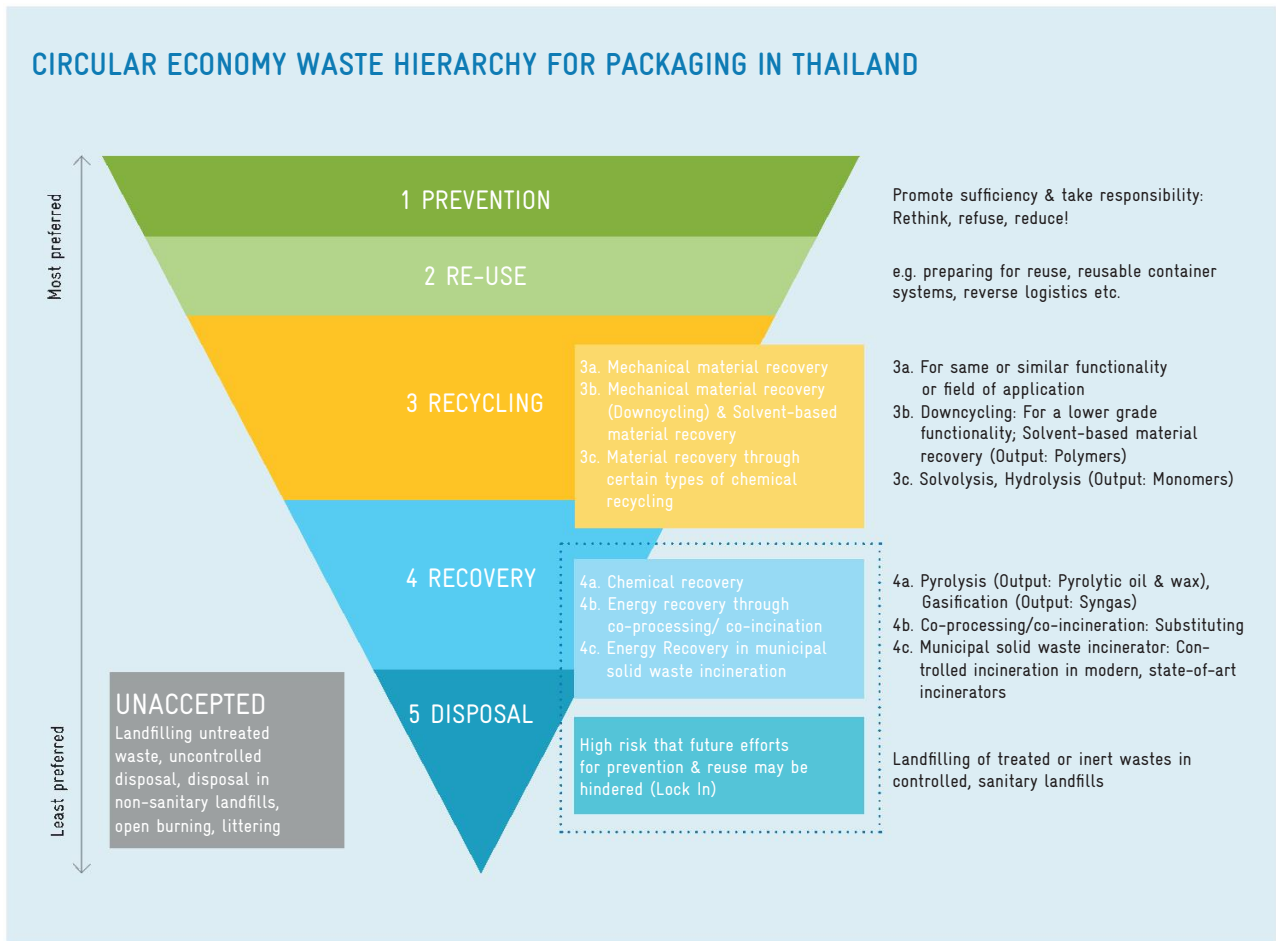


Figure 6: Circular Economy Waste Hierarchy for Packaging in Thailand
Source: Öko-Institut, 2022

7.2. SCOPE OF POLICY RECOMMENDATIONS

Following products are in the scope of this policy paper:

- Beverage bottles and containers
- Food packaging
- Beverage cups
- Plastic bags
- Single-use plastic items (e.g. straws, beverage stirrers, cutlery, plates, balloon sticks, cotton buds)
- Oxo-degradable plastics
- Non-beverage & non-food bottles & packaging

The focus of the recommendations is on the upstream part of the value chain, as also shown in the figure below (scope highlighted in blue colour). The downstream part of the value chain is not in the focus and is only covered briefly.

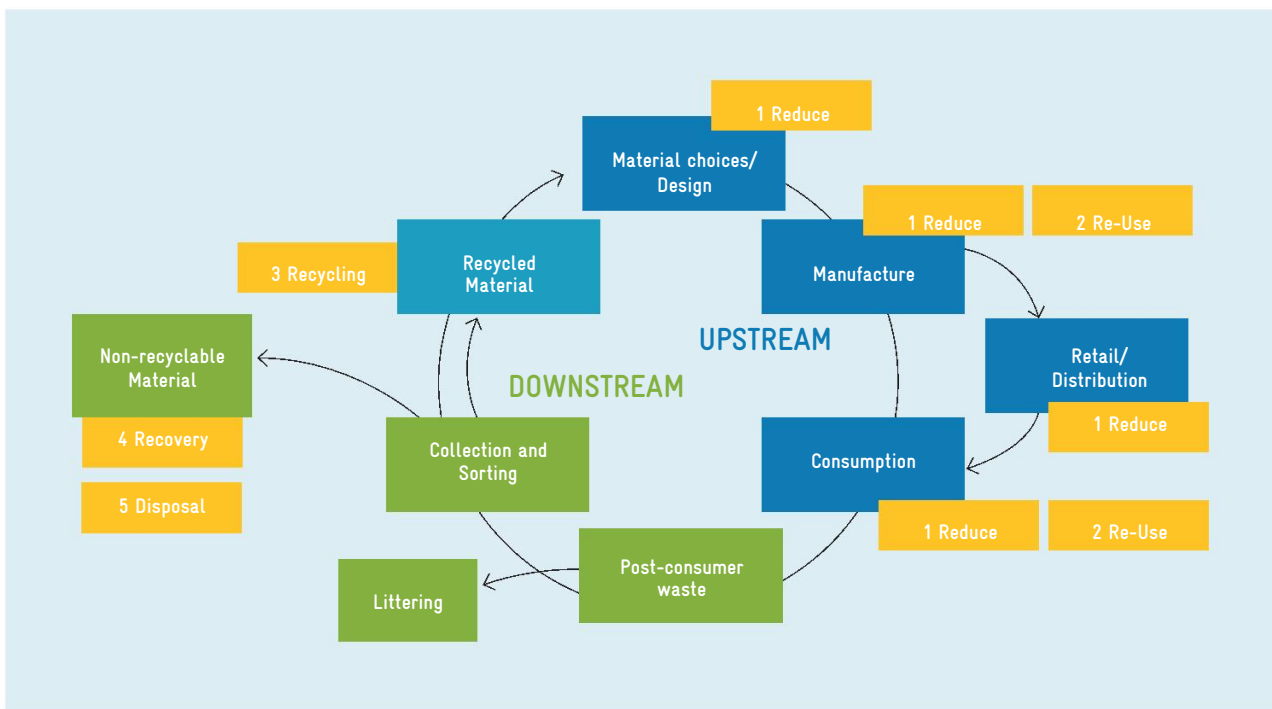


Figure 7: Graphic explanation of “upstream” (blue boxes) based on life cycle approach and waste hierarchy combined. Source: Öko-Institut, 2022

7.3. MARKET RESTRICTIONS AND BANS

The Roadmap on Plastic Waste Management (2018-2030) has foreseen a ban on seven single-use plastic items:

- Plastic cap seals in water bottles, oxo-degradable plastics² and plastic microbeads have already been banned in 2019.
- Plastic bags less than 36 microns in thickness, Styrofoam food boxes, plastic straws, and single-use plastic cups & glasses thinner than 100 microns are planned to be banned in 2022.

² The EU Single-Use Plastic Directive [Directive (EU) 2019/904] defines oxo-degradable plastics as “plastic materials that include additives which, through oxidation, lead to the fragmentation of the plastic material into micro-fragments or to chemical decomposition”



7.3.1. CAP SEA RECOMMENDATION: IDENTIFY PROBLEMATIC SINGLE-USE PRODUCTS IN THAILAND

A study shall be conducted with the objective to identify most relevant single-use products (including alternative products to the single-use plastic products covered under the ban in the Roadmap on Plastic Waste Management (2018-2030)). This study shall be conducted as soon as possible and should involve representatives of junk yards, waste pickers and other relevant actors.

The study shall:

- List 10 most problematic single-use items, irrespective of their material
- List the 10 most common single-use plastic items found at Thai beaches
- Verify the environmental and end-of-life management problems of the identified items, including review of life-cycle analysis studies on the potential alternatives
- If needed, add more relevant items to the list of potential candidates, e.g. PET bottles smaller than 500 ml volume,
- Suggest which of the identified items under 1, 2 and 4 shall be banned, and
- For each of the suggested items, explain the item which will most likely be the alternative that will evolve in the market as a consequence of a ban, and how to deal with the alternatives if they are not necessarily environment-friendlier than the banned items.

The methodology of the study shall serve as a blueprint to collect data on product level (e.g., single-use items). It is recommended to include this study format under the umbrella of the Steering Committee nominated to conduct Material Flow Analyses (see recommendation 7.5.2). It can be used to monitor the progress made in single-use plastic prevention with regards to the items monitored and banned.

The same study shall be re-conducted 2 years after coming into force of the ban on other single use products in order to evaluate its effectiveness as well as the resource reduction achieved.

Justification: TWG members suggested to substantiate the ban on more single-use items on the basis of a profound research. Identifying probable alternatives to those single use products suggested for a ban shall build the basis for considerations on additional measures to avoid regrettable substitution.



7.3.2. CAP SEA RECOMMENDATION: BAN ON ALL SINGLE-USE PRODUCTS, IRRESPECTIVE OF THE MATERIAL

Within two years after publication of the study mentioned under recommendation 7.3.1, the existing ban on single-use plastic products shall be extended to more single-use items.

The extended list of single-use items to be banned should not only focus on single-use plastic items, but also consider banning single-use items made from materials beyond plastics. This approach shall be discussed in a participatory process with all stakeholders before implementation.

In a transition period of 1 year, the use of old stocks shall be allowed.

Together with the ban, define a list of exemptions, e.g., for emergency and health-related products, products with post-consumer recycled content, recyclable products according to the existing design-for-recycling standards etc.

The implementation of the ban shall be preceded by an action plan for consumption reduction and phase-out of identified single-use items with concrete activities.

Biobased, biodegradable, and compostable single-use products should not be exempted from this requirement. The only exception shall be given to biodegradable and compostable plastic bags for separate collection of organic waste in private households, or products made from biobased materials from agricultural waste.

Justification: Substituting single-use products with other single-use products made from a different material is not an environmental-friendly option: No single-use product is better than the other in all environmental impact categories. There is just a burden shifting. While conventional fossil-based plastics have a higher climate impact, biobased plastics are associated with a higher acidification and eutrophication potential as well as land requirement. Thus, they cause competition for land with food production and also lead to a loss of forest areas, thus threatening biodiversity.

Also, from the perspective of the TWG members, this measure shall not lead to regrettable substitution by using single-use items based on non-plastic materials. It was proposed to implement this measure in combination measures under 7.4: Measures for consumption reduction and promote reuse. For example, if banning single-use plastic shopping bags are leading to a higher consumption of single-use paper bags, an option could be to charge a fee for all single-use bags, irrespective of the material.

As for single-use biodegradable products, the time required for decomposition is very long in ambient environment, e.g. home composter, marine water etc. Thus, biodegradable packaging does not solve the problem of littering. In industrial composting plants, biodegradable packaging requires more time to decompose than other organic waste, resulting in management problems for composting plants. Biodegradable plastics also cause sorting problems in the recycling process of fossil-based plastics, leading to quality degradation of the recycled material.



7.3.3. CAP SEA RECOMMENDATION: BAN ON FOAM OR RIGID POLYSTYRENE (PS) AND POLYVINYL CHLORIDE (PVC)

Implement a ban on distribution and sales of single-use food ware, containers and cups made from foam (EPS, XPS) or rigid polystyrene (HIPS) and polyvinyl chloride (PVC) for the purpose of serving of single meals and beverages. This includes PVC-based cling film (household use) and wrap film (industrial use). Industry has made progress and technical improvement of PE/PP alternatives so that they can be used as the substitute PVC cling wrap.

In a first phase, this shall apply to:

- dine-in places for instant consumption,
- take-away restaurants,
- company- owned take-away stands (compared to individuals selling food, drinks and fruits in the streets), and
- retail stores.

This phase shall start as soon as possible. Only in a second phase, for instance after a transition period of 2-3 years, the ban shall apply completely to all application areas including “traditional” markets and street vendors.

Multiple-use EPS containers for transportation of fresh fruits, for the cooling of beverages, etc. as well as any products for logistics and construction sector shall not be affected.

Please note that this recommendation shall be confirmed by the retail sector representatives (e.g. supermarkets) and will be discussed among Plastics Industry Club Committee to assess the technical and economic concerns. Feedback is expected to be provided through the stakeholder consultation.

Justification: Foam or rigid PS will cover all forms of polystyrene, including expanded polystyrene (EPS) and extruded polystyrene (XPS). EPS & XPS are often confused and used interchangeably. XPS should be considered a subcategory of expanded polystyrene. Both are non-solid polymers, not the normal form of styrene, but rather a foam. Using foam or rigid PS (HIPS) in scope will help in preventing circumvention. EPS and XPS are mostly not recycled due to high costs and have a high littering potential due to light weight.

PS-based clam-shell food containers are much cheaper than alternative food containers so vendors in the "traditional" markets and street vendors are still using them. In order not to burden the small vendors and open markets, they shall be given a transition time.

End-of-life management of PVC is a serious concern. Recycling of PVC is difficult & costly, poorly controlled incineration of PVC leads to the emission of toxic dioxins of furans.



7.3.4. CAP SEA RECOMMENDATION: PREPARE A BAN ON PLASTIC PACKAGING FOR UNPROCESSED FRESH FRUIT AND VEGETABLES IN RETAIL

A dialogue should be initiated together with the retail sector with the objective to discuss the framework conditions for a ban on plastic packaging for unprocessed fresh fruits and vegetables in retail. This includes questions such as what the appropriate weight of the packaged fresh fruit for display for sale in retail would be, and which local fruits and vegetables shall be exempted due to concerns of rapid deterioration. Other clarifications shall be made as to the need for a differentiation between fruits and vegetables.

The responsible organization for this dialogue shall consider widening the stakeholder group for this discussion, e.g., consulting representatives from open and fresh markets. It is recommended to use the existent expertise at NSTDA/MTEC.

The overall target of this measure is to implement a ban on plastic packaging for unprocessed fresh fruit and vegetables that are displayed for sale in all retail outlets. The measure shall reduce unnecessary packaging, e.g., fruit foam nets & expanded PE), while at the same time reducing food waste for those fruits and vegetables that need long shelf life. Exemptions can be made to fruit and vegetables packaged in batches of a certain weight and to fruit and vegetables presenting a risk of deterioration when sold in bulk.

It is recommended that the final measure differentiates different levels of ambition for modern and traditional, open markets.

Justification: Proper handling, storage and distribution of fresh fruits and vegetables in the supply chain are important to prevent food damage and loss. Appropriate packaging is important, but only one of many aspects that need to be considered. Distribution and display of fresh products in retail can happen in large packed batches which reduces the total volume of plastic packaging used. The retail can also display unpackaged fresh fruit and vegetables in small batches. France has introduced a ban on the sale of fresh unprocessed fruit and vegetables with packaging made up entirely or in part of plastic in 2022.

FURTHER READING FOR MARKET RESTRICTIONS AND BANS

European Commission (2022): Decree n° 2021-1318 of October 8, 2021 relating to the obligation of presentation for sale of unprocessed fresh fruits and vegetables without packaging composed entirely or partly of plastic material, https://ec.europa.eu/growth/tools-databases/tris/en/search/?trisaction=search_detail&year=2021&num=149, accessed: 20.01.2022

European Commission (2019): Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment: <https://eur-lex.europa.eu/eli/dir/2019/904/oj>

IFCO Systems (2021): Stopping food waste and food loss, <https://www.ifco.com/stopping-food-waste-and-food-loss/>, accessed: 20.01.2022

Öko-Institut (2021): Material choices for environment-friendly packaging design - Analysis of existing Life Cycle Assessment (LCA) studies, <https://greentechknowledgehub.de/publications/material-choices-environment-friendly-packaging-design>

Öko-Institut (2021): Why are biobased and biodegradable plastic not part of the solution to reduce plastic waste? - Checking the facts!, <https://greentechknowledgehub.de/publications/why-are-biobased-and-biodegradable-plastic-not-part-solution-reduce-plastic-waste>

Zero Waste Europe (2021): The polyvinyl chloride debate: Why PVC remains problematic material, <https://zerowasteurope.eu/wp-content/uploads/2021/08/2021-06-22-PVC-briefing-FINAL.pdf>

7.4. MEASURES FOR CONSUMPTION REDUCTION AND PROMOTE REUSE

The BCG Action Plan 2021 has included a target on reducing national resource consumption by 25% until 2027. However, sector-specific targets for achieving this objective have not been defined. The Roadmap on Plastic Waste Management (2018-2030) has the objective to reduce and replace some single-use plastic with environmentally friendly products (target 1). Apart from the ban of seven single-use plastic items, as presented under 7.3, only few concrete actions have been defined until now to achieve reduction objectives.

According to the Pollution Control Department (PCD), actions to reduce plastic waste would include, among others, stop using plastic cap seal for drinking water bottles with five large drinking water producers from 1 April 2018 onwards, and implementing measures to reduce and separate waste in government sectors and educational institutions^h. More specific mandatory targets and measures for reduction and reuse are not known to be defined or implemented yet. Where measures are detailed, they focus on education and awareness programs and supporting voluntary industry initiatives and pledges.

In this regard, the following proposed measures present additional possibilities to reduce plastic waste at sources (in the industries) and reduce the use of single-use plastic and packaging at consumption process.

³ Pollution Control Department: Thailand's Roadmap on Plastic Waste Management 2018-2030, https://www.pcd.go.th/wp-content/uploads/2021/10/pcdnew-2021-10-19_08-59-54_995414.pdf; Pollution Control Department, Thailand: Thailand's Roadmap on Plastic Waste Management and current initiatives on single-use plastic in food delivery and takeaway, https://www.thai-german-cooperation.info/wp-content/uploads/2020/09/1.2_PCD_Wassana_Jangprajak_Thailand.pdf, accessed 20.01.2022



7.4.1. CAP SEA RECOMMENDATION: LONG-LIST OF MEASURES TO INITIATE AND SUPPORT THE TRANSITION TO REUSABLE FOOD PACKAGING

A high amount of single use plastic is associated with food and beverage consumption. The long-term measure to promote reusable alternatives to food and beverage packages (measure 7.4.2) shall be initiated and supported with a variety of activities as detailed below:

- Integrate a dedicated overarching objective to promote the reusable packaging in food and beverage sector in the BCG Action Plan and define new Big Rock Projects specifically for a transition to reusables.
- Decision makers shall assign the task to take leadership in the transition to reusable food packaging to an existing governmental body. This competent body / agency shall take the lead in or commission the following tasks:
 - Conduct a study on good practice examples from Thailand where reuse tableware is already common (e.g., in several open markets, each stall uses differently colored or formed plates which after use are collected in a central place next to tables and sorted based on form and color).
 - Conduct various prototype pilot projects, e.g., in collaboration with large stores and chains with a large number of stores.
 - Conduct a survey on the objections and willingness of consumers for reusable tableware. Thereby, identify the actual challenges and options for consumers to switch to reusable tableware.
 - Design an information and awareness campaign that present examples from the study and prototypes as well as provide comprehensive information on objections and willingness of consumers for reusable tableware. A part of that campaign shall focus to incentivize the public to bring own reusable food boxes and cups when taking food away in the street.
 - Set up a round table / working group / reuse network that includes temples, sport stadiums, universities, restaurants, businesses and others interested in promoting reuse. Such working group or network shall discuss potential mechanism for convenience and uniformity of reuse systems in Thailand.
 - After two years, but not later than by the end of 2025, the competent body / agency shall publish a status-quo report on the use of reusable containers for food and beverages.
- The standardization institute (TISI) and the food- and drug agency (FDA) shall develop a set of guidelines and standards for reusables and thereby establishing criteria for both products (reusable containers and cups) as well as processes (collection, transportation, washing etc.). This measure shall be implemented in combination with the measure recommended in 7.5.1 (Moving towards the mandatory implementation of environment-friendly packaging standards).

- The competent body / agency mentioned in point 2 shall reach out to the relevant governmental bodies with the objective to
 - Set up and promote an investment and financial incentives program in the infrastructure or in businesses active on reuse, e.g., through the creation of an app-based return logistics network, see recommendations on fiscal measures in chapter 7.6.
 - Establish a fund for promoting reusable food ware and for covering the costs of installing off-site dishwashing services that comply with the requirements of XYZ as well as covering costs of setting-up logistic and distribution systems for reusable food ware, beverage containers and beverage cups.
- If by the year 2024, no centralized off-site dishwashing services are established, the competent body / agency mentioned in point 2 shall take measures to support entrepreneurs willing to engage in this business.
- The National BCG Economy Management Committee shall set out targets (%) for reusable containers in the 4 use scenarios described under 7.4.2 that shall be reached until 2030.

It is expected that initiating and supportive measures could start right away. As they pave the way for additional measures on promoting reusable alternatives, they should start as soon as possible.

Justification: TWG members discussed reusable alternatives and identified various factors that facilitate acceptance, create awareness or are perceived as crucial for the broad transition towards reusable tableware and food and beverage containers. The list of measures above has shown effectiveness in various other countries, see the chapter on further reading.



7.4.2. CAP SEA RECOMMENDATION: PROMOTING REUSABLE ALTERNATIVES

It is favorable to reduce single-use plastic consumption associated with food and beverages through the implementation of reusable systems. Such systems might be differently designed depending on the use scenario. It is recommended to differentiate between:

- dine-in orders,
- public events and governmental buildings,
- food delivery businesses, and
- so-called open systems.

The complexity to implement reusable alternatives for food and beverage packaging increases with ascendant numbers (1-4). Therefore, the timeline for implementation of reusable alternatives should be envisaged as a phased approach: While reusables in dine-in places and in public events and governmental buildings is perceived to be implementable in very short term, i.e., in parallel with measures recommended under 7.4.1, for use scenarios 3 and 4, it is important to implement the supportive measures (recommendation 7.4.1) first. It is recommended to start the implementation of reusables in the use scenarios 3 and 4 not later than 2025.

Generally, where the reusable containers should be provided with an appropriate deposit fee. The fee has to be reimbursed after the reusables have been returned by the customer with X days, either at the premises of purchase, or at a different location to a contractual partner of the service provider. It shall be mandatory that the selling price of food and beverages offered in single-use food ware, beverage containers and beverage cups is not lower than the selling price of the product offered in reusables (including deposit fee).

In the following details of implementation are addressed:

USE SCENARIO (1): DINE-IN ORDERS

Restaurants, hotels, eating joints and other providers of food and beverages shall be obliged to serve food and beverages only in reusable containers⁴ for immediate (dine-in) consumption on their premises, irrespective of outdoor or indoor dining area.

It is recommended to discuss possible exemptions for this requirement, e.g.:

Small restaurants, hotels, eating joints and other providers of food and beverages for immediate (dine-in) consumption with less than X employees (permanent, temporary, full-time, part-time, sub-contracted and others) or with total sales area less than Xm² (including outdoor and indoor dining area and storage area), or

those offering reusable alternatives without an on-site or off-site dishwashing capacity to sanitize reusable containers in compliance with XYZ.

In order to ensure a transition to reusable containers also in the businesses proposed for exemption, the Thai government shall set-up a Fund for promoting reusable containers (see item 3.2 in longlist under recommendation 7.4.1). The fund shall be used, for e.g. for covering the costs of installing off-site or shared on-site dishwashing services that comply with the requirements of XYZ as well as covering costs of setting-up logistic and distribution systems for reusable containers.

By year 2025, all businesses shall have access to on-site or off-site dishwashing facilities, including logistic and distribution systems for reusable containers.

USE SCENARIO (2): PUBLIC EVENTS AND GOVERNMENT BUILDINGS

Drinks should not be served in single-use beverage containers and cups in public events or government buildings starting one year after introducing measures described under 7.4.1 but not later than 2024. It should be mandatory to install refillable large containers for the provision of drinking water to the visitors.

Until 2024, public events can be exempted from this requirement if event organizers can guarantee that at least 90% of beverage containers and cups are separately collected and recycled, primarily for material recovery, in recycling centers.

From 2024 onwards, food shall also not be served in single-use food containers and using single-use cutlery at public events, open markets or government buildings.

The scope of premises of public events is not limited to government territory, but also to private properties that are used to execute public events contracted by the government.

⁴ Within this report, reusable containers are used as a collective term to describe food ware, beverage containers and beverage cups.

USE SCENARIO (3): FOOD DELIVERY BUSINESSES

Food delivery services shall be obliged to offer reusable containers to customers. They shall be obliged to inform the final consumers in all media sections (print, website, videos etc.) by means of clearly visible and legible information or signs of the possibility to obtain the products in reusable alternatives.

When using single-use containers, food delivery services shall be obliged to pay an annual fee of XYZ BHT to the XYZ.⁵ The fee can be calculated on the basis of the weight of single-use containers sold, or X% share of income achieved as a result of selling food and beverages in single-use containers. Fees collected on this basis shall be deposited to the government Fund for promoting reusable alternatives (see item 3.2 in longlist under recommendation 7.4.1).

After X years of implementation of this rule, food delivery services shall achieve a minimum share of xx% reusable containers delivered to the consumers. The share of reusables shall increase by minimum 10% every year afterwards.

As soon as the minimum share of reusables in food delivery services is mandatorily implemented, the businesses shall be obliged to implement a take-back system, either individually or in partnership with other businesses, including external service providers. The take-back system shall ensure that at least 70% of reusable containers (by weight) are collected, prepared for reuse, and re-introduced in the service loop.

After X years, single-use cutlery – if not banned through measures under 7.3 – should be phased-out completely and customers shall be given the opportunity to opt-out of receiving reusable cutlery and use only home cutlery.

Food delivery services shall be obliged to install on-site dishwashing equipment, either individually or in partnership with other food delivery systems. In absence of on-site dishwashing equipment, external off-site dishwashing service providers can be contracted. The dishwashing services shall fulfill the requirements of XYZ (e.g. standard for dishwashing facilities for reusable containers).

Introduction of a reimbursable deposit fee for reusables delivered to customers should be possible. The deposit fee for reusables should not lead to a higher price of delivered food and beverages compared to the goods offered in single use containers.

USE SCENARIO (4): OPEN-SYSTEMS

In this policy paper, in contrast to closed systems where the boundaries are clearly defined, e.g., a restaurant's area, open systems include take away orders, open markets, fresh markets, and street food.

Latest by 2025, business operators in open systems, shall be obliged to offer reusable containers to customers. They shall be obliged to inform the final consumers at the point of sale by means of clearly visible and legible information boards or signs of the possibility of:

- obtaining the products in reusable alternatives, or
- consumers getting the goods filled into self-brought reusable containers.

⁵ The fee shall be calculated on the basis of the weight of single-use containers sold, or X% share of income achieved as a result of selling food and beverages in single-use containers.

If entities, where immediate (dine-in) consumption is possible (see use scenario 1), offer take-away options, they shall be obliged to increase the share of reusable containers continuously as also described under use scenario 3 for food delivery businesses.

Justification: Increasing the reuse rate of packaging products has the highest potential for reducing environmental impacts. Environmental burden of additional logistics, transportation and washing cycles for reusable packaging products does not reverse their environmental superiority over single-use products.



7.4.3. CAP SEA RECOMMENDATION: LEVY ON CARRYOUT BAGS

In Thailand, few supermarket chains have started voluntarily to charge a fee for single-use carryout bags. In few cases, this practice has been ceased, apparently due to unacceptance by the consumers.

As a preparation of a broader introduction of a levy on carry out bags, the following steps shall be implemented:

- Carry a survey among consumers and retail stores on requirements for accepting a levy on single-use carry out bags
- Identify the amount of the fee that actually let people reflect whether they need a bag.
- Carryout bags are not only used in supermarkets but also in open markets, fresh markets, and street food joints. In cooperation with representatives of these entities, a concept shall be developed which allows to introduce the levy on carryout bags in this area as well.

By year 2023, all retail stores and small shops shall charge a non-reimbursable fee of X BHT for each carryout bag (independent of the material, size, and materials) provided to any customer. Retail stores and small shops shall allow customers to bring their own carryout bags to purchase products. There should not be any compulsion to buy a new carryout bag from the stores for purchasing products.

The coming into force of this obligation shall be a phased approach where retail stores and small shops shall comply from 2023 onwards, whereas for a transition phase of 2-3 years shall be given for open markets, fresh markets, and street food joints.

The fee shall provide an incentive for the shops to implement this policy and be kept by the retailers, shop owners and vendors.

Carryout bags labelled as biobased, biodegradable, compostable or any other term suggesting the breakdown of the product shall not be allowed to be sold or delivered to the customers.

This measure shall be accompanied by activities preventing a regrettable substitution:

- Non-woven carryout bags shall clearly indicate, e.g., through imprint, that they are reusable.
- Paper carryout bags and reusable durable plastic bags sold by retail stores shall have a minimum post-consumer recycled content (see the details of recycled content requirements in chapter 7.5.4)
- Cashiers shall be instructed to not give out carryout bags but only to provide them when costumers ask for it.

Justification: About 80% of all plastic waste generated in Thailand consists of single-use plastic bags. Very few bags are collected for recycling. They are lightweight and often too contaminated for recycling. Over 60% of bags are improperly disposed or leak into the environment. In Thailand, the 'no single-use plastic bag' policy is already being practiced by many supermarkets, retail stores, department stores, and universities. This suggested measure aims to help scale the impact of the existing effort onto the wider market across the country. In Ireland, over 90 % decrease in consumption of plastic bags was achieved after the introduction of a plastic bag levy (from 328 bags per consumer per year to 21 bags).



7.4.4. CAP SEA RECOMMENDATION: GREEN PUBLIC PROCUREMENT (GPP)

GPP 1: SET A GPP PRIORITY ON REUSABLE FOOD WARE, BEVERAGE CONTAINERS AND CUPS

The basis for introducing measures in the relatively new topic of consumption reduction and reuse should be an announcement indicating the high priority of the government for promoting reusables within the framework of the Green Public Procurement. It will help in creating acceptance for reusable systems in the mass market.

Against this background, ideally before the end of the year 2022, of the Comptroller General's Department and Pollution Control Department shall jointly announce that the GPP program in Thailand sets a priority on promoting reusable containers. Together with this announcement, the Pollution Control Department shall take lead and be responsible for the introduction of the following sub-recommendations for measures related to GPP.

GPP 2: CRITERIA FOR REDUCING SINGLE-USE PLASTIC CONSUMPTION

It is recommended to develop criteria for reducing the single-use plastic consumption for the Thai Green Label (TGL) and Thai Green Cart for the following product groups and services until the end of 2023:

- Reusable systems to-go (take-away) for food and beverages
- Environmentally sound returnable bottles
- Food and Catering Services
- Provision of clean drinking water in government buildings, hospitals and schools

The criteria should include requirements for the reusable items as well as for the service providers, for instance on take-back and recycling and logistical concept for ensuring high number of reuse cycles.

Materials that are harmful to the environment and health should be avoided in the production of the reusables (e.g. use of melamine resins and polycarbonate plastics which can release bisphenol A, shall not be permitted). Additionally, the reusables should be designed to ensure a minimum durability and a service life ensuring a high number of wash cycles (e.g. 400 -500).

GPP 3: RULE OUT THE USE OF SINGLE-USE BIOBASED, BIODEGRADABLE, AND COMPOSTABLE PRODUCTS

In addition, GPP criteria should rule out the use of single-use biobased, biodegradable, and compostable products. In the first X years, biodegradable or compostable single-use products shall only be allowed if the service provider (e.g. for food and catering services or reusable systems) can guarantee that they:

- comply with the Thai standards mentioned in Annex 1 of this report,
- are separately collected and treated in a certified industrial composting facility.

In case of biobased single-use products, they shall only be allowed if produced from agricultural waste.

GPP 4: REPORTING ON TENDERS FOR REUSABLE FOOD WARE

By year X, all national level ministries and public authorities as well as municipalities shall be required, on an annual basis, to submit a report to the Comptroller General's Department or to the Pollution Control Department on the consumption of single-use and reusable containers through public procurement tenders (in terms of contract values & number of tenders, amount/weight, type of materials used and post-consumption treatment). The report should also include specific targets and measures to reduce the percentage share of single-use containers periodically until a complete phase-out in 10 years.

Justification: Green Public Procurement is a strong instrument to use the large buying power of the government for triggering sustainable innovations. Ecolabel criteria serves as a sound scientific base to deriving the technical criteria on the basis of a life-cycle analysis. Ecolabels can also serve as a means to verification in the public procurement tenders.



7.4.5. CAP SEA RECOMMENDATION: DEPOSIT-RETURN SYSTEM (DRS)⁶ ON BEVERAGE CONTAINERS

As a long-term measure, it is recommended to introduce a deposit-return system (DRS) on single-use and reusable beverage containers: Final distributors of single-use and reusable beverage containers filled with beverages shall be obliged to participate in a mandatory DRS by year 2025. This comprises any container, e.g., cups, cans, paper cartons and bottles, irrespective of the material.

Such a long-term measure needs to be well prepared. In advance of the introduction of the mandatory DRS, it is recommended to work on the following topics:

- Defining the scope of the measure, e.g., clarify in the regulation on DRS or in an official communication to support the implementation of the law on who (e.g. all final distributors?) shall be obliged to participate, and which containers (e.g. size) and beverages shall be covered.

⁶ DRS is a system whereby consumers buying a product pay an additional amount of money (a deposit) that will be reimbursed upon the return of the packaging or product to a collection point. The system is based on offering an economic incentive for consumers to return empty containers to any shop to ensure that they will be reused or recycled" (Zero Waste Europe, 2019; <https://zerowasteurope.eu/2019/07/deposit-return-systems-an-effective-instrument-towards-a-zero-waste-future/>; accessed: 28.01.2022).

- Setting the deposit fee for single-use and reusable containers, e.g., the mandatory deposit for single-use beverage containers shall be higher than the mandatory deposit for reusable beverage containers.
- Commission a (governmental) institution to set up and run the DRS, e.g., the Thailand Institute of Packaging and Recycling Management for Sustainable Environment (TIPMSE) as a central agency. Such organization shall be subject to a transparent, reporting and verification system.
- Define the economics of the DRS: Costs of implementing a DRS for beverage containers shall be shared between manufacturers, importers and retailers participating in the scheme. The financial contribution of manufacturers and importers of beverage containers shall be calculated on the basis of the total amount of single-use beverage containers (for each material type) brought into the market. The financial contribution of manufacturers and importers shall decrease corresponding to amount of reusable beverage containers (for each material type) that they bring into the market. Revenues, such as unredeemed deposits, should stay in the system to cover both setup and operational costs of a DRS on beverage containers.
- Establish a reporting structure as a basis for DRS participation fees. Methodologically, the reporting could be set up back-to-back with the Material Flow Analysis (recommendation 7.5.3).
- After a transition period, jointly set out collection rates:
 - For single-use beverage containers, all participating entities (larger than Xm2 sales area) shall be obliged to achieve a collection and return rate of at least 60% (by weight and for each material type, i.e. plastic, glass, aluminum etc.) with respect to their total annual sales by year X. The share of collection and return rate shall increase continuously and reach 90% by year X.
 - For reusable beverage containers, all participating entities (larger than Xm2 sales area) shall be obliged to achieve a collection and return rate of at least 10% (by weight and for each material type, i.e. plastic, glass, aluminum cans etc.) with respect to their total annual sales by year X. The share of collection and return rate shall increase continuously and reach 70% by year X.

Special provisions can be defined for smaller stores (less than Xm2 sales area), e.g. by requiring them to take back empties of only those brands and materials that they themselves carry in their assortment (irrespective of the place of purchase).

This measure is interlinked with CAP SEA recommendation 7.4.2. Both recommendations overlap in scope (reusable beverage containers) and the idea of a reimbursable fee in order to maximize the number of reuse cycles. When developing details for a DRS, the (already established) system of reusable take-away containers shall serve as a blueprint, e.g., drop off points.

Justification: DRS is one of the most efficient instruments to increase the collection rate of beverage containers and prevent their leakage into the environment. According to the Zero Waste Europe, DRS can reduce drink containers in the ocean by up to 40%. If implemented properly, DRS would result in net savings for municipalities and they do not imply extra costs for public institutions.

FURTHER READING FOR CONSUMPTION REDUCTION AND PROMOTE REUSE

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California Clean Water Fund (2015): Model Ordinance Requiring Reusable Food ware for Restaurants Serving Food and Beverages for On-Site Dining, https://cdn.ymaws.com/www.productstewardship.us/resource/resmgr/model_legislation/sample_resuables_for_onsite_.pdf, accessed: 20.01.2022

Camps-Posino L, Battle-Bayer L, Bala A, Song G, Qian H, Aldaco R, Xifré R, Fullana-I-Palmer P. Potential climate benefits of reusable packaging in food delivery services. A Chinese case study. *Sci Total Environ.* 2021 Nov 10;794:148570. doi: 10.1016/j.scitotenv.2021.148570. Epub 2021 Jun 21. PMID: 34323748.

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EU GPP Criteria: https://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm;
accessed: 28.01.2022

German Packaging Act, 2019 (Amendment 2021), <https://verpackungsgesetz-info.de/en/>, accessed 20.01.2022

GIZ (2022): Role and scope of municipalities in Preventing and Reducing Single-use Plastics. Public Dialogue Event within CAP SEA Project, held on 08.02.2022, accessible through <https://www.youtube.com/watch?v=GckEyINSvF8> (assessed 11.02.2022)

Munich: <https://www.ris-muenchen.de/RII/RII/DOK/SITZUNGSVORLAGE/2826186.pdf>;
Accessed: 21.07.2021

Öko-Institut (2021): Material choices for environment-friendly packaging design – Analysis of existing Life Cycle Assessment (LCA) studies, <https://greentechknowledgehub.de/publications/material-choices-environment-friendly-packaging-design>

Pollution Control Department (PCD) (2019). Booklet on Thailand State of Pollution 2018, <http://www.oic.go.th/FILEWEB/CABINFOCENTER3/DRAWER056/GENERAL/DATA001/00001462.PDF>

Rethink Plastic Alliance (2021): Moving on from Single-use plastics: How is Europe doing? Assessment of European countries' transposition of the Single Use Plastics Directive, <https://rethinkplasticalliance.eu/wp-content/uploads/2021/06/SUP-Assessment-Design-final.pdf>, accessed 25.01.2022

RESOLVE (2021): The PR3 Reusable Packaging System Design Standard, accessible at <https://www.resolve.ngo/site-pr3standards.htm>, accessed 11.02.2022

Sustainable Events Guide: Reusable cups at events – Why it matters and how to do it?, Manchester City Council, <https://www.vision2025.org.uk/wp-content/uploads/2021/10/Reusable-cups-guide-why-and-how.pdf>, accessed: 28.01.2022

TOMRA (n.y.): Rewarding Recycling – Learnings from the World’s Highest Performing Deposit Return Systems, White Paper, <https://www.tomra.com/en/collection/reverse-vending/deposit-return-schemes/white-paper>; accessed 28.01.2022

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WWF Thailand (2020): Scaling up circular strategies to achieve zero plastic waste in Thailand, https://wwfint.awsassets.panda.org/downloads/zero_plastic_waste_in_thailand_en.pdf

Zero Waste Europe (2021): It’s time to acknowledge the role of Deposit Refund Systems (DRS) in achieving a Circular Economy for beverage packaging in the EU; <https://zerowasteurope.eu/press-release/its-time-to-acknowledge-the-role-of-deposit-refund-systems-drs-in-achieving-a-circular-economy-for-beverage-packaging-in-the-eu/>; accessed: 30.01.2022

7.5. MEASURES TO STRENGTHEN THE RECYCLING MARKET



7.5.1 CAP SEA RECOMMENDATION: MOVING TOWARDS THE MANDATORY IMPLEMENTATION OF ENVIRONMENT-FRIENDLY PACKAGING STANDARDS

It is understood that the responsibility of controlling packaging related standards is distributed mainly between the Thai Standardization Institution (TISI) and Thai Food and Drug Agency (FDA). FDA is responsible for food safety standards, e.g. by ensuring that hazardous substances do not migrate from the packaging material into the food. TISI is responsible for developing standards for environment-friendly packaging, e.g. recycling-friendly design, recycled content, biodegradability etc. Packaging filled with goods from food and beverage sector lies in the responsibility of FDA. As FDA is apparently not responsible for testing the environment-friendliness of the packaging, the TISI standards stay unapplied. In few cases, manufacturers of packaging may decide to use TISI standards for environment-friendly packaging, albeit only on voluntary basis. Therefore, it is likely that large-scale implementation of packaging standards targeting their environment-friendliness would remain ineffective in practice.

Thus, it is recommended to establish a clear institutional mechanism between FDA and TISI on how implementation and enforcement of standards on environment-friendly packaging can be realized on a mandatory basis. Against the backdrop of the planned EPR in Thailand (see the chapter 7.6 on fiscal measures), a reliable mechanism for evaluating the recyclability and environment-friendliness of packaging will be indispensable.



7.5.2 CAP SEA RECOMMENDATION: SUPPORTIVE MEASURES FOR RECYCLED CONTENT TARGETS

It is recommended to allow the use of rPET in food and beverage containers as soon as possible.

Furthermore, it is recommended to develop an action plan to allow the use of other recycled polymers in food grade applications by the end of the year 2022.

For creating acceptance for such measure, a standard or a labeling scheme for high quality recyclates in food containers shall be developed by the end of the year 2023. As a basis, it is suggested to set a list of criteria for a recyclate to be called a high-quality recyclate so that it may be used as a secondary resource in the production of food-contact material.

Minimum quality criteria for recyclates that are used in food-contact material could be developed in a joint work of Thai FDA and TISI, and could be implemented, i.e., controlled, through the mechanism agreed upon in the consortium establishes as part of recommendation 7.5.1.



7.5.3 CAP SEA RECOMMENDATION: INSTITUTIONALIZING MATERIAL FLOW ANALYSIS IN THAILAND

The TWG members have emphasized the importance of data for setting targets and measuring them reliably. Thus, it is recommended to establish a standardized procedure and steering structure for conducting Material Flow Analysis (MFA) for packaging by mid-2023 for the purpose of data collection and decision-making for setting product-specific collection, reuse and recycling targets for food and beverage containers as well as non-food and non-beverage containers.

The steering committee of the MFA shall identify the data needed for the proper MFA. The overall task is to design data collection criteria (type, amount, flow, rapporteur). With the help of the Industrial Statistic Office, available data shall be gathered, and gaps shall be identified (e.g., it is understood that there is currently no data declarations from recyclers). Where additional data is needed, the committee shall undertake measures to set up (mandatory) reporting to the industrial statistic office.

The data that is expected to be generated through this approach will support almost all other measures recommended in this paper.



7.5.4 CAP SEA RECOMMENDATION: PRODUCT-SPECIFIC RECYCLED CONTENT TARGETS

It is important to notice that this recommendation targets product-specific recycled content targets. Targets should be differentiated for different polymers and applications because materials are used in different functions with different requirements related to hygiene.

Generally, it is recommended to introduce mandatory minimum recycled content targets for relevant packaging applications (food and non-food grade) Targets for the following specific application types are recommended:

- Non-beverage and non-food bottles and packaging (including plastic bags) made from HDPE and PP should incorporate (calculated on average for all products sold or imported, and not for every individual product) a 10% recycled plastic content by 202X, and 20% by 202X.
- Non-beverage and non-food bottles and packaging made from PET (including plastic bags) should incorporate (calculated on average for all products sold or imported, and not for every individual product) a 20% recycled plastic content by 202X, and 30% by 202X.
- Beverage bottles and packaging made from PET should incorporate (calculated on average for all products sold or imported, and not for every individual product) a 10% recycled plastic content by 202X, and 20% by 202X.

- Paper carryout bags and reusable durable plastic bags sold by retail stores shall have a minimum post-consumer recycled content (calculated on average for all products sold or imported, and not for every individual product) of X% by 202X.

It is suggested to engage with recyclers and packaging manufacturers to define mid- and long-term targets for a continuous increase in the minimum recycled content for all products for which targets are set. The recycled plastic content target, as mentioned above, should be set only with respect to the domestically collected post-consumer waste.

This measure is interlinked with recommendation 7.5.1 as recycled content targets have the need of a third-party control system. Recycled content cannot be physically or chemically determined at the level of the final product or packaging and requires reliable market surveillance and enforcement.



7.5.4 CAP SEA RECOMMENDATION: DESIGN-FOR-RECYCLING STANDARDS

The CAP SEA project works on three specific design-for-recycling standards on HDPE non-food bottles, PP containers and PET bottles. These are provided to TISI for endorsement. It is recommended to require compliance on a mandatory basis as also described in recommendation 7.5.1.

Furthermore, it is recommended to implement mandatory use of Design-for-Recycling standards for other food ware, beverage containers and cups and non-food-contact packaging, e.g., PS or non-plastic packaging applications.

As a priority, an overarching framework for ensuring the update of existing and developing of new D4R guidelines shall be created. As part of this framework, it is recommended to establish a definition of recyclability and a process/criteria to assess recyclability.

In accordance with recommendation 7.5.1, a process shall be established to demonstrate compliance with the guidelines,

Recommendations from European undertakings show that different guidelines for the same products and/or polymers should be avoided.

Justification: The collection-for-recycling rate for HDPE in Thailand is 8-25%; for PP between 10-20%. rHDPE can be used in shampoo bottles or plastic garbage bags; rPP can also be used for packaging applications. Collection-for-recycling rate for PET in Thailand is 31 to 62%, while rPET for non-food grade applications & rPET fibre comes up with a share of about 24 to 52%. Collection for Recycling Rate for PET in Thailand is between 31 to 62%. However, only 3% is manufactured as rPET for food grade applications and is currently exported completely.

FURTHER READING ON STRENGTHENING THE RECYCLING MARKET

Öko-Institut (2021): Recycled content in plastic material with focus on PET, HDPE, LDPE, PP - State-of-play; <https://greentechknowledgehub.de/publications/recycled-content-plastic-material-focus-pet-hdpe-ldpe-pp>; accessed: 31.01.2022

World Bank Group (2021): Market Study for Thailand: Plastics Circularity Opportunities and Barriers. Marine Plastics Series, East Asia, and Pacific Region. Washington DC.

7.6. FISCAL MEASURES

In many countries, the economic and fiscal incentives are used to discourage packaging waste generation and penalize wasteful behaviors. Economic measures provide basic economic and regulatory guidance to influence the demand and supply for specific packaging materials and/or product groups. Selected measures are recommended by relevant stakeholders in Thailand based on their likelihoods of being implemented with moderate or low effort and potential positive impact to reduce consumption of single-use plastic packaging, strengthening the markets for reusable items, and increasing demand for packaging with recycled content. These measures are discussed in detail below.



7.6.1 CAP SEA RECOMMENDATION: INVESTMENTS

- **Recycling investment** – Thailand recycled about 17.6% of the key plastic resins in 2018—a significant shortfall from the National Plastic Waste Management Roadmap 2018-2030 target of 22% for 2018. About 2.8 million tons per year of plastics are disposed of (i.e., not recycled) and 87% of the material value of plastics is lost. This is translated to a plastic material value loss of USD 3.6-4.0 billion/year (World Bank Group 2021). To achieve the 100% circular economy for target plastics by 2027, a suite of incentives must be devised to strengthen the recycling industry whilst public communication campaigns to promote the separation of recyclable waste at source must be carried out continuously.

Currently, BOI offers the exemptions of import duty for machinery, corporate tax, and other privileges, for industries, large or small, which invest in the recycling processes using modern technology, such as manufacturers of recycled resin and recycled products. Similar incentives are also offered for businesses that engage in the development of software or platform for digital content or services (e.g., online apps). Start-up companies which connect different players in the recycling supply chain may be qualified for these incentives subject to the required conditions.

The privileges may and should also cover investment in the Material Recovery Facilities (MRF) which provide economies of scale to sort and segregate dry waste in their respective categories, which can then be sent to their respective recyclers. MRFs also provide secure jobs for workers from the informal collection sector and can be operated as micro-enterprises. Additionally, MRFs improve productivity and quality by integrating technologies such as optical sorting systems. Furthermore, privileges shall also be used to promote packaging that fulfills Design-for-Recycling standards that will be developed by the project partners together with TEI and TISI.

The voluntary pilot Extended Producer Responsibility (EPR) program, now being implemented in Chonburi Province, will be a good driver for increased recycling activities in Thailand and a demand for recycled and reusable products.

To ensure a well-functioning recycling ecosystem, other players (e.g., processor, waste shops, waste collectors) are also playing important roles in the resource recovery and recycling processes. While a small number of enterprises may be eligible for BOI's support if they employ certain levels of mechanized or modern systems in their operations, those with much smaller operational size and dependent on manual labor, are usually excluded. A similar set of tax support may be considered as a sub-category for plastics and packaging industry.

- **Use of reusable packaging** – It is proposed to create a new category for circular economy promotion under the current BOI's support industries. With the new category, selected businesses and activities that aim to promote the 3Rs principle and meet the set conditions by BOI can be entitled to BOI's privileges (e.g., tax holidays, import duty exemption, seed grant, investment loans). Five types of businesses are proposed for this new category.
 - **Food delivery and takeaways** - The food sector may be a viable candidate for this new support package because it is one of the largest user of single-use plastic packaging in Thailand with a growing trend in food delivery and takeaways over the last two years. Section 7.4.2 discusses a possibility of creating a new business in this sub-sector for food delivery and takeaways where a company provides reusable food containers for takeaway services and home delivery, and collect, clean, as well as sanitize the used containers before bringing them back to the reuse loop.
 - **Fast-moving consumer goods** - A new model may be rolled out where food and fast-moving consumer goods (e.g., soap, shampoo, detergent, milk) are sold by retailers in refillable packaging with a deposit included in the product price. After consumption, the consumers return the empty package to any participating retailers and get the deposit refunded. The package will then be returned to the manufacturers, sanitized, and refilled with new content and put back in the market again.
 - **Refill stations and shops** - Refill shops sell consumer goods (e.g., shampoo, liquid soap, detergent, cereal grains, etc.) by the volume/weight. The customers must bring in their own containers to buy the products. There are over a dozen refill shops in operation in Thailand now, most of them are small businesses or social enterprises. Refill stations are the vending machines which supply refillable water or other drinks without a single-use container. These business models contribute directly to the circular economy's goal and are therefore recommended for the new circular economy tax incentive package.
 - **Service providers of washing facilities** – Stakeholders in Thailand raised concerns on hygiene issues related to washing of reusable containers. Especially in open markets, it will be difficult for small shops and street vendors to offer reusables and comply with the expected hygiene standards at the same time. However, it is noteworthy mentioning that reusables are used in many open markets in Thailand and cleaned at the back of the shops. Although this is a widely accepted practice without concerns related to hygiene & food safety, introducing mandatory use of reusables is likely to be met with hygiene and health related arguments from vested interest groups. Therefore, it is recommended to provide tax incentives to providers of washing facilities (on-site or off-site) that comply with minimum safety and hygiene standards of the Thai government. The washing facilities can either be offered by independent, third-party service agencies, or may be run by the organizing committee responsible for the open markets.

The tax incentive shall be extended to washing facilities beyond those serving open market participants, i.e. washing facilities operating in contractual agreement with modern market participants, such as food courts, restaurants etc.

- **Collection, transportation & logistics** – Efficient collection of reusables and their transportation to washing facilities, restaurants and premises of food delivery services is a big challenge. Such a service is likely to entail extra costs. Businesses offering these services (either external service providers or self-owned by restaurants & food delivery services) shall also be eligible for a tax incentive. The tax incentive shall also support the development of a software-based digital program for tracking the whereabouts of reusables and maintaining the payment system (e.g. booking a fee if the reusables are not returned after a certain period).

To support the businesses offering reusable solutions, it is strongly recommended that TISI develops Design-for-Reuse standards for food ware, beverage container and cups.

- **Use of packaging with recycled content** – Under the new circular economy promotion category for BOI's support, selected tax incentives are suggested for manufacturers of plastic packaging with recycled content. The privileges are suggested for selected plastic packaging made of PP, PET⁷, HDPE, and LDPE—the top four resins by production volume in Thailand. This measure should be introduced along with the EPR program⁸ and the upcoming guideline for recycling content traceability for plastic industry, as well as future requirements for recycled content in plastic packaging to strengthen its efficacy.
- **Raising awareness on biodegradable plastic and investments in treating facilities:** With the 3-year extended timeframe for tax deduction on the purchase of biodegradable plastics, it may be fair to assume the consumption of biodegradable plastics in Thailand would rise over the next three years thereby causing the price to be competitive with conventional plastics. This may render benefits to the Plastics Waste Management Roadmap (2018-2030) which aims to phase out four additional plastics by the end of 2022, including Styrofoam food box. But it also poses a danger for regrettable material substitution especially if the public is not aware of the degradability conditions of biodegradable plastics. To mitigate such a problem, a series of public communication campaigns must be launched to inform citizens about the degradable conditions. Proper disposal and collection of such packages must also be put in place as well as the investment in the facilities for treating the disposed packaging. For the latter, an additional BOI's support will be timely and most impactful if introduced through the above-mentioned tax support package.



7.6.2 CAP SEA RECOMMENDATION: TAXATION

Secondly, to complement a fee to be collected at the retailers for single-use plastic bags, applying a tax (e.g., excise tax) for single-use plastic containers made of the top four resins is expected to increase the product prices at the consumption stage thereby influencing the consumer's behavior towards using the reusable containers or refillable services. The tax rates must be adjusted periodically to maintain their outcome.

⁷ With the anticipation Thai FDA will relax its rules on the food-grade recycled PET packaging, including drink bottles

⁸ The pilot EPR program currently targets PET, HDPE, LDPE, and flexible plastics (with subsidies provided)

A tax on packaging (irrespective of the material) can generate a steering effect towards environmentally friendly packaging solutions, whereby the following steering directions shall be considered and studied in detail:

- Steering toward reusable solutions (greater taxation of single-use solutions)
- Steering toward lower material use for packaging (strong weighting of the amount of material used in the taxation)
- Steering toward better recyclability (stronger taxation of packaging with poor recycling properties).
- Steering towards higher recycle use (higher taxation of packaging with low recycle use)

The steering effects outlined here can be targeted individually or in combination. What they all have in common is that the respective steering measures are associated with verifiable environmental benefits and that these are also largely valid across the board for all packaging types and applications. Rebound effects are conceivable in individual cases, but it seems unlikely that these will impair the positive overall picture of the steering direction.

For an excise tax on disposable packaging to work, the types of packaging to be taxed must be clearly defined, and the basis for assessing consumption must be unambiguously established (e.g., weight of the amount of packaging placed on the market each year, graduated according to packaging type). See recommendation 7.5.3 on Material Flow Analysis in Thailand. Likewise, it must be clearly defined by which actors the tax is levied. Multiple taxation at different points in the product life cycle shall be avoided. It should be reviewed if a consumption tax for privately consumed goods that can be passed on to the end consumers is a better option than a taxation at early stages of the production chain (e.g. provision of raw materials and intermediate products).

An effective design also requires a well-considered tariff structure so that the intended incentive effects are actually achieved. This requires various further analyses and surveys. If no steering effect is intended with regard to packaging materials, a tariff scale between glass, metal, plastic, etc. must be designed in such a way that the specific material weights and characteristic wall thicknesses are considered. Since glass packaging is generally significantly heavier than plastic packaging, plastic packaging must be taxed more heavily per unit of weight. Otherwise, a shift towards more single-use plastic packaging is to be expected.



7.6.3 CAP SEA RECOMMENDATION: EPR

Thirdly, the Extended Producer Responsibility (EPR) program is expected to increase the supply of recyclable packaging materials within the country and boost the demand for recycled products. It is worth mentioning that a pilot voluntary EPR program, a public-private partnership between FTI and a host of brand owners and packaging manufacturers, is now being implemented in the municipalities of Saen Suk, Sri Racha, and Ban Bueng of Chonburi Province. A parallel effort led by PCD and FTI is being pursued to propose a draft EPR law to formalize the program in the country.

An effective EPR program in Thailand should ensure it integrates the informal sector and, where possible, avoid models that divert recyclables from the informal sector. Strengthen support for the informal waste management sector by registering informal waste workers officially, providing them with ID cards and investing in capacity building to strengthen their ability to

collect waste more efficiently. The establishment of cooperatives should be supported, potentially by a government subcontractor.

Promote the welfare and living standards of informal waste pickers – perks and initiatives could include annual health check-ups, life insurance and annual bonuses for collecting more than a certain amount. Consider using health as an entry point for engaging with the informal sector by establishing a health initiative and providing a complimentary service to informal workers to provide a platform for further engagement and capacity building.

Finally, an evaluation of the pilot program must be undertaken to assess its impact against the program objectives and a clear timeline must be developed for the introduction of a nationwide regulated EPR program.

It must be noted a new royal decree aimed at waiving capital gains tax for investment in startups is expected to come into force by the first quarter of 2022. This new legislation will provide startups which invest in any of the proposed businesses above with an alternative to BOI's support to help get their business up and running more quickly.

FURTHER READING ON FISCAL MEASURES

Öko-Institut (2022): Economic & Fiscal Measures for Packaging Waste Prevention (currently in preparation)

World Bank Group 2021. Market Study for Thailand: Plastics Circularity Opportunities and Barriers. Marine Plastics Series, East Asia, and Pacific Region. Washington DC.

Zero Waste Europe (2018): Research paper on a European tax on plastics – Report; Available: https://zerowasteurope.eu/wp-content/uploads/2019/11/zero_waste_europe_position_paper_plastic_tax_in_europe_en.pdf; Accessed: 18.02.2022

7.7. MEASURES ON BIOBASED, BIODEGRADABLE AND COMPOSTABLE ITEMS



7.7.1 CAP SEA RECOMMENDATION: LABELLING REQUIREMENT OF BIOBASED, BIODEGRADABLE AND COMPOSTABLE PRODUCTS

Based on the standards attached in the annex to this paper, a mandatory labelling scheme for compostable, biodegradable and biobased plastic shall be established: For those plastics that comply with the standard, a label demonstrates the compliance, by clearly specifying if the relevant material is designed for biodegradation in industrial composting, home composting or composting in the natural environment, time and conditions required for biodegradation, mentioning the appropriate disposal method etc.). No other than this label shall be allowed to be used to claim compostability or biodegradability and biobased content.

It is recommended to communicate the label to consumers in a broad awareness campaign in order to counter false claims.

Prior to such a campaign, a research study shall be commissioned to collect common claims used in the Thai market with respect to compostable, biodegradable and biobased plastics and evaluate their reliability and correctness.



7.7.2 CAP SEA RECOMMENDATION: ALLOW SELECTED USES FOR BIOBASED, BIODEGRADABLE AND COMPOSTABLE PRODUCTS

Do not incentivize the production and use of biobased, biodegradable and compostable plastics for packaging and other single-use plastic items that are already banned in Thailand and are recommended to be banned by this policy paper.

The exception to be above-mentioned recommendation should apply to following three segments:

- Third-party certified and labelled garbage bags for separate collection of wet waste;
- Biobased plastics made from agricultural waste and by-products as raw materials.
- Managed effective system for collection and separation for biobased, biodegradable and compostable plastics for packaging

Justification: A simple substitution of fossil-based materials by biobased alternatives is not appropriate to encounter problems associated with waste generation. Furthermore, this substitution does not lead to environmental benefits to the extent needed in the light of the challenges associated with plastic and packaging waste. Furthermore, biobased and biodegradable materials shall not undermine the waste hierarchy according to which the avoidance of waste is preferred over all other options. Additionally, there is a lot of confusion regarding the definitions, claims, benefits, and risks related to biobased, biodegradable and compostable plastics. As a result, consumers do not have access to clear and trustworthy information when making their purchasing decisions or disposing such products. A reliable labelling scheme would help in creating transparency for consumers.

FURTHER READING ON BIOBASED, BIODEGRADABLE AND COMPOSTABLE PLASTICS

European Commission (2020): Relevance of biodegradable and compostable consumer plastic products and packaging in a circular economy, Final report prepared by Eunomia, https://op.europa.eu/en/publication-detail/-/publication/3f-de3279-77af-11ea-a07e-01aa75ed71a1/language-en?WT.mc_id=Searchresult&WT.ria_c=41957&WT.ria_f=5702&WT.ria_ev=search; accessed: 01.02.2022

Öko-Institut (2021): Material choices for environment-friendly packaging design - Analysis of existing Life Cycle Assessment (LCA) studies, <https://greentechknowledgehub.de/publications/material-choices-environment-friendly-packaging-design>

Öko-Institut (2021): Why are biobased and biodegradable plastic not part of the solution to reduce plastic waste? - Checking the facts!, <https://greentechknowledgehub.de/publications/why-are-biobased-and-biodegradable-plastic-not-part-solution-reduce-plastic-waste>

7.8. SUPPORT MEASURES IN DOWNSTREAM SEGMENT

The focus of this policy recommendation paper is on strengthening upstream part of the single-use plastic and packaging value chain. The objective is to reduce the overall plastic & packaging consumption and to promote use. However, upstream measures need to be aligned and accompanied with downstream measures in order to be effective, especially when it comes to requirements pertaining to collection, reverse logistics and sorting as well as recycling for the purpose of producing high quality recyclates.

In the following, few specific recommendations for the implementation of downstream measures within the framework of the Roadmap on Plastic Waste Management (2018-2030) and the BCG Action Plan 2021 are made (non-exhaustive list). These recommendations are intended to support the targets of the Thailand government in terms of achieving 50% plastic waste recycling by 2022 and 100% by 2027.

- Ban imports of plastic waste and focus on strengthening the domestic collection, sorting and recycling infrastructure;
- Investment in domestic recycling, i.e., material recovery infrastructure for ensuring stable supplies of high-quality recycled plastic for selected packaging applications;
- Investment in Material Recovery Facilities (MRF) for sorting dry waste;
- Introduce a mandatory segregation obligation of wet, dry and biomedical waste in the households as well as in public and private sector by year 2023;

	Collection target beverage containers & cups	Recycling target beverage containers & cups	Collection target food containers	Recycling target food containers	Collection target non-beverage containers	Recycling targets non-beverage containers	General packaging
Plastic	X%	X%	X%	X%	X%	X%	X%
Glass	X%	X%	X%	X%	X%	X%	X%
Metals (e.g. Fe, Al)	X%	X%	X%	X%	X%	X%	X%
Paper-based (incl. carton, cardboard)	X%	X%	X%	X%	X%	X%	X%
Composite packaging	X%	X%	X%	X%	X%	X%	X%
Other	X%	X%	X%	X%	X%	X%	X%

- Introduce specific collection and material recycling targets (in mass%) for selected packaging applications by year 2023:
- The plastic recycling targets defined in the Roadmap on Plastic Waste Management (2018-2030) are not specific with respect to the type of recycling. Thus, the recycling targets for plastic packaging should distinguish between mechanical and chemical material recovery as well as chemical and energy recovery (see Circular Economy Waste Hierarchy in chapter 7.1). The preference should be given to mechanical material recovery and the targets should reflect this priority, meaning increasing the

percentage share of mechanical material recovery over the years. Preference to and increasing share of mechanical material recovery would help in increasing the amount of recyclates in the market.

- Set a clear definition for what is currently subsumed as ‘chemical recycling’. Solvolysis, Hydrolysis (chemical material recovery)) should be clearly differentiated from pyrolysis and gasification (chemical recovery). The latter should be included at a lower level in the waste hierarchy.
- Investment in industrial composting plants for wet waste.
- Introduce financial mechanisms, such as Pay-As-You-Throw (PAYT)⁹, to encourage reduction of waste in households as well as private sector by year 202X.
- Analyze the feasibility and effectiveness of introducing incineration and landfill taxes to encourage material recovery of plastic waste by year 202X.

⁹ Individuals, households or communities are charged for the collection of waste based on the amount of waste they throw. PAYT treats waste management services like other utilities (e.g. electricity or gas). PAYT system are also called unit-pricing or variable-rate pricing systems.

8. CONCLUSION AND WAY FORWARD



The recommendations made in this policy paper are based on the analysis of good practices in the global context and interviews as well as a workshop with selected stakeholders & experts in Thailand. The paper has attempted to draft the recommendations keeping the local context of Thailand in mind as much as possible. At the same time, the policy paper is of a visionary nature and has tried to strike a balance between what is potentially required to curb single-use plastic consumption and what is achievable in medium and long-term in Thailand.

The policy recommendations comprise of a proposal of establishing a circular economy waste hierarchy for setting priorities for political measures and investments (chapter 7.1), recommendations pertaining to 5 clusters targeting upstream SUP and packaging prevention measures (chapters 7.3 to 7.7) and examples of supportive downstream measures (chapter 7.8).

Lack of data and adequate institutional capacities in Thailand have led to several recommendations that seek to close the data gap, clarify institutional responsibilities, and initiate a process of societal acceptance for political measures in the field of single-use plastic reduction. The importance of such processes should not be underestimated. Ambitious medium to long-term objectives, as also recommended in this policy paper, would be effective or enforceable in the context of Thailand, only if there is a societal acceptance for them and socio-economic as well as cultural aspects are adequately addressed.

In this regard, this policy paper builds the basis for a broader stakeholder consultation in Thailand. The objective of the stakeholder consultation is to include the perceptions of all possible stakeholder groups that will be affected by the policies on single-use plastic reduction. This will help in strengthening a dialogue process in Thailand as well as in designing a stepwise & phased approach that reflects the implementation capacities, socio-economic and cultural aspects, and requirements in Thailand.

The stakeholder consultation process started in January. The specialists from Öko-Institut and GIZ conducted site visits to a leading recycler of packaging material and a community sorting facility (Wat Jak Daeng Temple in Sumut Prakarn province). Furthermore, selected expert interviews were conducted with officers of MTEC/NSTDA, Plastic Institute of Thailand and Federation of Thailand Industry's Plastic Industry Club. Additionally, recommendations from the study on economic and fiscal measures that was commissioned by the CAP SEA project, were discussed in an expert workshop. Finally, a technical stakeholder workshop was conducted on 4th February in Bangkok to discuss the zero draft of the SUP prevention policy brief, prepared by the Öko-Institut. The zero draft was revised by the Öko-Institut on the basis of the feedback from all the above-mentioned activities.

The online stakeholder survey was scheduled from 18 April to 17 May 2022 to get inputs from the plastics value chain stakeholders. The survey result was discussed at the online stakeholder consultation workshop on 27 May. The participants were a representative from resin producers, plastic packaging producers, wholesalers, retailers, consumers, fresh markets, junkshops, government departments, universities. The policy brief was adjusted considering the stakeholders' suggestions.

Following this process, the CAP SEA project handed over the final SUP prevention policy brief and recommendations to the Circular Economy (CE) Sub-committee, under the national BCG steering committee, chaired by the Prime Minister. Last year, the national BCG steering committee guided the respective government organizations to develop the BCG Action Plan 2021-2027. The Cabinet approved the plan in February 2022.

This plan has four plus five (4+1) sectorial strategic approaches, including i) agriculture and food, ii) health and medical service, iii) energy-materials and biochemistry, iv) tourism and innovative economy, v) circular economy. The CE Sub-committee can guide the relevant government organizations to use the SUP prevention policy brief and recommendations for developing their sectorial planning and budgeting in accordance with the BCG Action Plan. These include the Big Rock project no. 1 of the BCG Action Plan 2021-2027. In addition, the CAP SEA project handed over this SUP policy brief and recommendations to the Pollution Control Department for their consideration and mainstreaming the upstream plastic waste management measures in the draft Plastic Waste Management Action Plan phase 2, which is required to get an endorsement from the Plastic Waste and Electronic Waste Management Sub-committee of the National Environment Board.

ANNEX

A1: STANDARDS FOR BIODEGRADABLE AND COMPOSTABLE PLASTICS

A1.1 PRODUCT STANDARD	
2744-2559	หลอดพลาสติกสลายตัวได้แบบใช้ครั้งเดียวสำหรับอาหาร Single-use compostable plastic straw for food
2793-2560	ถุงพลาสติกสลายตัวได้สำหรับรองรับมูลฝอย Compostable plastic bag for waste
2884 เล่ม 1-2560	ภาชนะและเครื่องใช้พลาสติกสลายตัวได้แบบใช้ครั้งเดียวสำหรับอาหาร เล่ม 1 พอลิแล็กติกแอซิด Single-use compostable plastic packages and utensils for food Part 1 poly(lactic acid)
2995-2562	ถุงพลาสติกสลายตัวได้ทางชีวภาพ Compostable plastic bags
2996-2562	ถุงพลาสติกแตกสลายได้ทางชีวภาพสำหรับเพาะชำกล้าไม้ Biodegradable plastics nursery bags
2997-2562	ฟิล์มพลาสติกคลุมดินแตกสลายได้ทางชีวภาพสำหรับงานเกษตรกรรม Biodegradable plastic mulch films for agriculture use
17088-2562	ข้อกำหนดพลาสติกสลายตัวได้ทางชีวภาพ Specifications for compostable plastic
A.1.2 TEST STANDARDS	
3084-2563	พลาสติก – วิธีเตรียมตัวอย่างสำหรับการทดสอบการแตกสลายได้ทางชีวภาพ Plastics - Methods for the preparation of samples for biodegradation testing of plastic materials
3115-2563	พลาสติก – การหาการแตกสลายทางชีวภาพในขั้นสุดท้ายแบบไม่ใช้ออกซิเจนภายใต้ระบบควบคุมการย่อยตะกอน – วิธีวัดการผลิตก๊าซชีวภาพ Plastics - Determination of the ultimate anaerobic biodegradation of plastic materials in controlled slurry digestion systems - Method by measurement of biogas production
2251-2563	พลาสติก – การหาการแตกสลายทางชีวภาพในขั้นสุดท้ายแบบใช้ออกซิเจนของพลาสติกในดินโดยการวัดปริมาณความต้องการออกซิเจนด้วยเครื่องวัดการหายใจหรือการวัดปริมาณคาร์บอนไดออกไซด์ที่เกิดขึ้น Plastics - Determination of the ultimate aerobic biodegradability of plastic materials in soil by measuring the oxygen demand in a respirometer or the amount of carbon dioxide evolved
2509-2554	การหาการแตกสลายทางชีวภาพแบบใช้ออกซิเจนของพลาสติกภายใต้การควบคุมสภาวะการหมัก Determination of the aerobic biodegradation of plastics under controlled composting conditions
2511-2563	พลาสติก – การหาระดับการแตกเป็นส่วนของพลาสติกภายใต้สภาวะการหมักทางชีวภาพที่กำหนดในการทดสอบระดับโรงงานต้นแบบ Plastics Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test

A.1.2 TEST STANDARDS	
2512-2563	<p>พลาสติก – การหาระดับการแตกเป็นส่วนของพลาสติกภายใต้สภาวะการหมักทางชีวภาพที่กำหนดในการทดสอบระดับห้องปฏิบัติการ</p> <p>Plastics - Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test</p>
2986-2562	<p>พลาสติก – การหาการแตกสลายทางชีวภาพ แบบใช้ออกซิเจนของพลาสติกที่จมอยู่ระหว่างชั้นน้ำทะเลกับผิวตะกอนทราย – วิธีวัดปริมาณความต้องการออกซิเจนด้วยเครื่องวัดการหายใจแบบปิด</p> <p>Plastics - determination of aerobic biodegradation of non-floating plastic materials in a seawater/sandy sediment interface - method by measuring the oxygen demand in closed respirometer</p>
2987-2562	<p>พลาสติก – การหาการแตกสลายทางชีวภาพ แบบใช้ออกซิเจนของพลาสติกที่จมอยู่ระหว่างชั้นน้ำทะเลกับผิวตะกอนทราย – วิธีวิเคราะห์คาร์บอนไดออกไซด์ที่เกิดขึ้น</p> <p>Plastics - determination of aerobic biodegradation of non-floating plastic materials in a seawater/sandy sediment interface - method by analysis of evolved carbon dioxide</p>
2988-2562	<p>พลาสติก – การหาการแตกสลายทางชีวภาพในขั้นสุดท้ายแบบไม่ใช้ออกซิเจนของพลาสติกภายในระบบที่มีน้ำ – วิธีวัดการผลิตก๊าซชีวภาพ</p> <p>Plastics - determination of the ultimate anaerobic biodegradation of plastic materials in an aqueous system - method by measurement of biogas production</p>
2989-2562	<p>พลาสติก – การหาการแตกสลายทางชีวภาพในขั้นสุดท้ายแบบไม่ใช้ออกซิเจนของพลาสติกภายใต้สภาวะการหมักสารอินทรีย์ที่มีปริมาณของแข็งสูง – วิธีวิเคราะห์การปลดปล่อยก๊าซชีวภาพ</p> <p>Plastics - determination of the ultimate anaerobic biodegradation under high-solids anaerobic-digestion condition - method by analysis of released biogas</p>

A2: TISI PLASTIC AND CE PRODUCT STANDARDS

TISI standard-plastics รายชื่อมาตรฐานอุตสาหกรรม มาตรฐานการตรวจสอบและรับรองแห่งชาติ ที่สัมพันธ์กับ CE Product ของประเทศไทย

ลำดับ	เลขที่มาตรฐาน Standard Number	ชื่อมาตรฐาน (ไทย) Thainame	ชื่อมาตรฐาน (อังกฤษ) English Name	สถานะ- Status
1	มอก. 17088-2562	ข้อกำหนดพลาสติก สลายตัวได้ทางชีวภาพ	Specifications for com- postable plastics	มีผลบังคับใช้ : 4 ก.พ. 63
2	มอก. 1310-2538	สัญลักษณ์สำหรับ พลาสติกแปรรูปใหม่	Symbols for recycling plastics	มีผลบังคับใช้ : 2 พ.ย. 38
3	มอก. 653-2554	สัญลักษณ์สำหรับ พลาสติกแปรรูปใหม่	Plastic containers for milk and milk products	มีผลบังคับใช้: 2 พ.ย. 38
4	มอก. 655 เล่ม 1-2553 Mor Or Kor 655 Part 1-2553	ภาชนะและเครื่องใช้ พลาสติกสำหรับอาหาร เล่ม 1 พอลิเอทิลีน พอลิพรอพิลีน พอลิส ไตรีน พอลิเอทิลีนเท เรฟทาเลต พอลิไวนิล แอลกอฮอล์ และพอลิ เมทิลเพนทีน	Plastic utensils for food part 1 Polyethylene, Polpropylene, Polys- tyrene, Poly (Ethlene Terephthalate), Poly (Vinyl Alcohol) and Poly (Methyl Pentene)	มีผลบังคับใช้: 9 พ.ย. 53
5	มอก. 655 เล่ม 2-2554 Mor Or Kor 655 Part 2-2554	ภาชนะและเครื่องใช้ พลาสติกสำหรับอาหาร เล่ม 2 พอลิไวนิลคลอ ไรด์ พอลคาร์บอเนต พอ ลิเอไมด์ และพอลิเมทิล เมทาคริลเลต	Plastic utensils for food part 2 poly (Vinyl Chloride) polycarbonate polyamide and poly (Methylmethacrylate)	มีผลบังคับใช้: 29 ก.ย. 54
6	มอก. 655 เล่ม 3-2554 Mor Or Kor 655 Part 3-2554	ภาชนะและเครื่องใช้ พลาสติกสำหรับอาหาร เล่ม 3 อะคริโลไนโตรล- บิวทไดเอน-สไตรีน และ สไตรีน-อะคริโลไนโตรล	Plastic utensils for food part 3 acrylonitri- le-butadiene-styrene and styrene-acrylo- nitrile	มีผลบังคับใช้: 29 ก.ย. 54
7	มอก. 655 เล่ม 4-2561 Mor Or Kor 655 Part 4-2561	ภาชนะและเครื่องใช้ พลาสติกสำหรับอาหาร เล่ม 4 เมลามีน-ฟอร์มัล ลดีไฮด์ ยูเรีย-ฟอร์มัล ลดีไฮด์ และเมลามีน-ยู เรีย-ฟอร์มัลลดีไฮด์	Plastic utensils for food Part 4 Melami- ne-formaldehyde urea-formaldehyde and melamine-urea-formal- dehyde	มีผลบังคับใช้: 29 ม.ค. 63
8	มอก. 776-2552	หลอดพลาสติกสำหรับ อาหาร	Plastic straws for food	มีผลบังคับใช้: 10 ก.ย.52
9	มอก. 997-2554	ภาชนะพลาสติกสำหรับ บรรจุอาหารที่มีกรด อินทรีย์	Plastic containers for organic acid food	มีผลบังคับใช้: 29 ก.ย.54
10	มอก. 998-2553	ภาชนะพลาสติกสำหรับ บรรจุน้ำบริโภค	Plastic containers for drinking water	มีผลบังคับใช้: 9 พ.ค. 54

ลำดับ	เลขที่มาตรฐาน Standard Number	ชื่อมาตรฐาน (ไทย) Thai Name	ชื่อมาตรฐาน (อังกฤษ) English Name	สถานะ Status
11	มอก. 1002-2553	กระติกน้ำพลาสติก	Plastic canteens	มีผลบังคับใช้: 9 พ.ย. 53
12	มอก. 1027-2553	ถุงพลาสติกสำหรับ บรรจุอาหาร	Plastic bags for food	มีผลบังคับใช้: 10 มี.ค. 54
13	มอก. 1069-2552	สีสำหรับพลาสติกทำ ผลิตภัณฑ์ที่สัมผัส อาหาร	Colourants for plastics for food contact use	มีผลบังคับใช้: 12 ต.ค. 52
14	มอก. 1181-2536	ขวดนมพลาสติก	Plastic babies' bottles	มีผลบังคับใช้: 2 ก.ย. 36
15	มอก. 1254-2537	ถุงพลาสติกแบบกดปิด	Zip plastics bags	มีผลบังคับใช้: 7 ก.พ. 38
16	มอก. 2490-2554	ฟิล์มพลาสติกสำหรับ อาหารที่มีกรดอินทรีย์ และน้ำบริโภค	Plastic films for organic acid food and drinking water	มีผลบังคับใช้: 15 ก.ย. 54
17	มอก. 2491-2554	ฟิล์มพลาสติกสำหรับนม และผลิตภัณฑ์นม	Plastic films for milk and milk products	มีผลบังคับใช้: 15 ก.ย. 54
18	มอก. 2492-2554	ฟิล์มพลาสติกสำหรับ น้ำมันและไขมันบริโภค	Plastic films for edible oils and fats	มีผลบังคับใช้: 30 ก.ย. 54
19	มอก. 2493 เล่ม 1-2554	ภาชนะพลาสติก บรรจุอาหารสำหรับ เตาไมโครเวฟ เล่ม 1 สำหรับการอุ่น	Plastic food containers for microwave oven part 1 for reheating	มีผลบังคับใช้: 15 ก.ย. 54
20	มอก. 2493 เล่ม 2-2556	ภาชนะพลาสติก บรรจุอาหารสำหรับ เตาไมโครเวฟ เล่ม 2 สำหรับการอุ่นครั้งเดียว	Plastic food containers for microwave Part 2 for single reheating	มีผลบังคับใช้: 22 เม.ย. 57
21	มอก. 2504-2553	ถุงพลาสติกบรรจุ อาหาร : แบบกดเปิด	plastic sacks for packaging of foodstuffs	มีผลบังคับใช้: 4 ส.ค. 53
22	มอก. 2568-2555	ถุงพลาสติกบรรจุ อาหาร : รูปตัวยู	Plastic bags for food : u-shape	มีผลบังคับใช้: 7 ธ.ค. 55
23	มอก. 2569-2555	ถุงพลาสติกบรรจุ อาหาร : แบบกดเปิด	Plastic bags for food : zip type	มีผลบังคับใช้: 14 ธ.ค. 55
24	มอก. 2744-2559	หลอดพลาสติกสลาย ตัวได้แบบใช้ครั้งเดียว สำหรับอาหาร	Single-use compostable plastic straw for food	มีผลบังคับใช้: 24 ก.พ. 60
25	มอก. 2793-2560	ถุงพลาสติกสลายตัวได้ สำหรับรองรับมูลฝอย	Compostable plastic bag for waste	มีผลบังคับใช้: 22 ก.พ. 61
26	มอก. 2995-2562	ถุงพลาสติกสลายตัวได้ ทางชีวภาพ	Compostable plastic bags	มีผลบังคับใช้: 4 ก.พ. 63
27	มอก. 3021-2563	ฟิล์มและถุงพลาสติก สำหรับยืดอายุผักและ ผลไม้สด	Plastic film and bag for extending shelf-life of fresh fruits and vegetables	มีผลบังคับใช้: 5 ต.ค. 63

ลำดับ	เลขที่มาตรฐาน Standard Number	ชื่อมาตรฐาน (ไทย) Thai Name	ชื่อมาตรฐาน (อังกฤษ) English Name	สถานะ Status
28	มอก. 3022-2563	ถุงพลาสติกบรรจุ อาหารสำหรับอุ่น ไมโครเวฟ	Microwavable food plastic bag for reheating	มีผลบังคับใช้ : 21 เม.ย. 63
29	มอก. 2734 เล่ม 1-2559	พลาสติก – สัดส่วนชีว ฐาน - เล่ม 1 : ทั่วไป	Plastics - Biobased content - Part 1: General principles	มีผลบังคับใช้: 21 ก.ย. 59
30	มอก. 2734 เล่ม 2-2559	พลาสติก – สัดส่วนชีว ฐาน - เล่ม 2 : การหา สัดส่วนคาร์บอนชีวฐาน	Plastics - Biobased content - Part 2: Determination of biobased carbon content	มีผลบังคับใช้: 21 ก.ย. 59
31	มอก. 2734 เล่ม 3-2559	พลาสติก – สัดส่วน ชีวฐาน - เล่ม 3 : การ หาสัดส่วนพอลิเมอร์ สังเคราะห์ชีวฐาน	Plastics - Biobased content - Part 3: Determination of biobased synthetic polymer content	มีผลบังคับใช้: 21 ก.ย. 59
32	มอก. 2734 เล่ม 4-2560	พลาสติก – สัดส่วนชีว ฐาน - เล่ม 4 : การหา สัดส่วนโดยมวลชีวฐาน Plastics - Biobased content - P.4: Determination of biobased mass content	Plastics - Biobased content - Part 4: Determination of biobased mass content	มีผลบังคับใช้: 3 ก.ค. 62
33	มอก. 2734 เล่ม 5-2560	พลาสติก – สัดส่วนชีว ฐาน - เล่ม 5 : การแสดง สัดส่วนคาร์บอนชีว ฐาน สัดส่วนพอลิเมอร์ สังเคราะห์ชีวฐาน และ สัดส่วนโดยมวลชีวฐาน	Plastics - Biobased content - Part 5: Determination of biobased carbon content, biobased synthetic polymer content and biobased mass content	มีผลบังคับใช้: 3 ก.ค. 62
34	มอก. 2884 เล่ม 1-2560	ภาชนะและเครื่องใช้ พลาสติกสลายตัวได้ แบบใช้ครั้งเดียวสำหรับ อาหาร เล่ม 1 พอลิแล็ก ติกแอซิด	Single-use compostable plastic packages and utensils for food Part 1 poly(lactic acid)	มีผลบังคับใช้: 14 พ.ค. 62
35	มอก. 711-2530	ฟิล์มพลาสติกโพลี เอทิลีนสำหรับงาน เกษตรกรรม	Polyethylene plastic film for agriculture	มีผลบังคับใช้: 19 ส.ค. 30
36	มอก. 712-2530	ฟิล์มพลาสติกโพลีไ นัลคลอไรด์สำหรับงาน เกษตรกรรม	Polyvinyl chloride plastic film for agriculture	มีผลบังคับใช้: 19 ส.ค. 30
37	มอก. 2997-2562	ฟิล์มพลาสติกคลุมดิน แตกสลายได้ทางชีวภาพ สำหรับงานเกษตรกรรม	Biodegradable plastics mulch films for agriculture use	มีผลบังคับใช้: 4 ก.พ. 63
38	มอก. 2373-2551	ลังพลาสติกสำหรับ บรรจุผักและผลไม้	Plastic crate for vegetables and fruits	มีผลบังคับใช้: 1 พ.ค. 51

ลำดับ	เลขที่มาตรฐาน Standard Number	ชื่อมาตรฐาน (ไทย) Thai Name	ชื่อมาตรฐาน (อังกฤษ) English Name	สถานะ Status
39	มตช. 2-2562 TCAS 2-2019	แนวทางการใช้หลักการเศรษฐกิจหมุนเวียนในองค์กร	Framework for implementing the principles of the circular economy in organizations – guide	มีผลบังคับใช้: 24 ม.ค. 63
40	มตช. 2 เล่ม 2-2564 TCAS 2-2021	ระบบการจัดการเศรษฐกิจหมุนเวียนสำหรับองค์กร เล่ม 2 ข้อกำหนด	Circular economy management system for organization Part 2: Requirements	มีผลบังคับใช้: 28 ม.ย. 64
41	มตช. 9-2564 TCAS 9-2021	(ร่าง) มาตรฐานการตรวจสอบและรับรองแห่งชาติ พลาสติก-พลาสติกรีไซเคิล-การตรวจสอบย้อนกลับพลาสติกไซเคิลและประเมินความสอดคล้องและสวนผสมรีไซเคิล-ข้อกำหนด	Plastics Recycling Traceability and Assessment of Conformity and Recycled Content : Requirements	During the approval process อยู่ระหว่างประกาศใช้ (มีเอกสารฉบับเวียนขอความเห็น เมื่อ ก.ค. 2564)
42	มตช. 14006-2564	ระบบการจัดการสิ่งแวดล้อม-แนวทางสำหรับการรวมการออกแบบเชิงนิเวศเศรษฐกิจ	Environmental management systems - Guidelines for incorporating ecodesign	มีผลบังคับใช้: 25 พ.ย. 64
43	มตช. 14009-2564	ระบบการจัดการสิ่งแวดล้อม-แนวทางสำหรับการรวมการหมุนเวียนวัสดุในการออกแบบและการพัฒนา	Environmental management systems - Guidelines for incorporating material circulation in design and development	มีผลบังคับใช้: 25 พ.ย. 64

ที่มา : http://appdb.tisi.go.th/tis_dev/p3_tis/p3tis.php

ประกาศกระทรวงสาธารณสุข

1	ประกาศกระทรวงสาธารณสุข (ฉบับที่ 295) พ.ศ. 2548	เรื่อง กำหนดคุณภาพหรือมาตรฐานของภาชนะบรรจุที่ทำจากพลาสติก	ตามประกาศฯ ข้อ 8 ระบุว่า “ห้ามมิให้ใช้ภาชนะบรรจุที่ทำขึ้นจากพลาสติกที่ใช้แล้วบรรจุอาหาร เว้นแต่ใช้เพื่อบรรจุผลไม้ชนิดที่ไม่รับประทานเปลือก”	มีผลบังคับใช้: 6 ม.ค. 49 ปัจจุบันอยู่ระหว่างแก้ไข ต้นปี 62 มีการตั้งคณะกรรมการด้านวิชาการ เพื่อกำหนดข้อกำหนดฯ ให้ครอบคลุมพลาสติกรีไซเคิล
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