CIRCULAR ECONOMY IN THAILAND:

Steps towards a Transition in Plastic Packaging and Food Waste Management

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Abstract

Adopting the model of a Circular Economy (CE) has proved to be an effective way of combatting the pollution of our environment and saving resources, while at the same time promoting socially just growth. Thailand has felt the negative impacts of the current linear economy in many areas, such as plastic packaging and food waste management. This paper examines the opportunities and challenges of the implementation of a CE in the latter areas. It finds that the current policy direction in Thailand facilitates the transformation towards circularity in plastic packaging and food waste management. However, the ecosystem of rules and policies for a CE is still incomplete and circularity has so far mainly been driven by voluntary efforts by the private and public sectors, which is not sufficient. While in the case of plastic packaging an enhanced legal framework is required, enhanced food waste management in the future must rely on clear targets that should be set at the sectoral level.

About this publication

This publication presents the essential findings and recommendations from an in-depth study conducted and published in Thai to support the policy dialogue among crucial stakeholders. It comes at a time when the concept of circularity is discussed intensively in Thailand, being one of the core aspects of the government's Bio-Circular-Green (BCG) model for economic development. The publication adds to the discourse by identifying potential obstacles on the way to circularity and offering policy recommendations on the systemic changes necessary to overcome these challenges. The objective of the English publication is to make the content accessible to international audiences who advocate a transformation towards a Circular Economy and to foster the dialogue on this topic.

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1 I EXECUTIVE SUMMARY

Transitioning towards a Circular Economy (CE) promises to help countries achieve economic growth while maintaining a healthy natural resource base. By contrast, the current Linear Economy (LE) that is the norm all over the world has been found to generate economic growth at the cost of environmental and social impacts. For Thailand, promotion of CE promises to bring about environmentally-friendly growth while promoting social justice, making it one of the core aspects of the government's Bio-Circular-Green (BCG) model for economic development. Systemic changes are needed to transition to a CE. However, just like in many countries, economic and institutional obstacles hinder the shift towards a CE in Thailand. A new FES study, which was conducted and published in Thai to support the policy dialogue among crucial stakeholders, examines how institutions can be used to create incentives to promote a CE transition. This policy paper summarizes its essential findings and recommendations in English with the aim to foster the dialogue on CE with international audiences.

The study examines the cases of plastic packaging and food waste management as examples of non-degradable and degradable materials. Plastic packaging comprises most of the plastic waste generated in Thailand. However, only 17.6 percent of plastic resin is recycled. This non-circularity of plastic leads to a loss of 87 percent of the value of plastic material. Organic waste such as scraps of food, fruits, and vegetables comprises 64 percent of municipal solid waste. However, only 43 percent of this waste is appropriately managed through incineration and composting. Promoting the circularity of food waste not only reduces negative environmental and social impacts, but also allows for value creation that can positively contribute to economic and social justice.

By carefully examining the desired outcomes, tracing it back to the policy environment that affects the action of stakeholders, considering the characteristics of plastic and food materials, and comparing the existing situation in Thailand with other countries, the study finds that the policy direction in Thailand is aligned with the goal of fostering circularity in plastic packaging and food waste management. Circularity initiatives in Thailand are driven mainly by the voluntary efforts of both the private and the public sectors. Nonetheless, the ecosystem of policies and rules needed to encourage systemic shifts that lead to CE is still incomplete. For plastic packaging, the legal framework should be strengthened to ensure plastic circularity from the management of waste by producers, through the application of the Extended Producer Responsibility (EPR) framework, to the encouragement of the usage of recycled content from targets and mandates for large producers. For food waste management, setting clear targets at the sectoral level should be undertaken in Thailand. This could entail specifying who should be responsible for reducing and sorting waste, enacting rules and standards to encourage food donation, and creating awareness and providing information on how to minimize food waste.

2 I THE IMPORTANCE OF CIRCULAR ECONOMY

A Circular Economy (CE) is one where resource use is planned so that they can be recovered and reused, and flow in a closed loop in a way that creates value from the circularity of materials. Key to achieving a CE is the reduction in the use of new materials, ensuring long-term value creation with existing materials, while minimizing negative impacts. These characteristics differentiate a CE from a Linear Economy (LE), which is the global norm. In a LE, resources are extracted, used to provide services or to manufacture products for consumption, and then discarded as waste. In a CE, waste is seen as resource that can be recovered and value can be created by cycling materials in the value circle. Thus, a LE is often depicted in a "take-make-dispose" diagram, while in a CE, it is a "take-use-return" model (see Figure I). The linear usage of materials makes the current economic system unsustainable (Frosch and Gallopoulos, 1989). In a LE, economic growth results in social and environmental problems (Anand and Sen, 2000; Rees, 2010; Schaefer and Crane, 2005). Transitioning towards a CE can help countries achieve economic growth while maintaining a healthy natural resource base, mitigating greenhouse gas emissions, and reducing social injustices that are the result of linear economic practices. Cities, with their economic resources and activities, and large and dense population concentration, are well-suited to spearhead the CE transition, and stand to gain from the benefits of a circular economy.

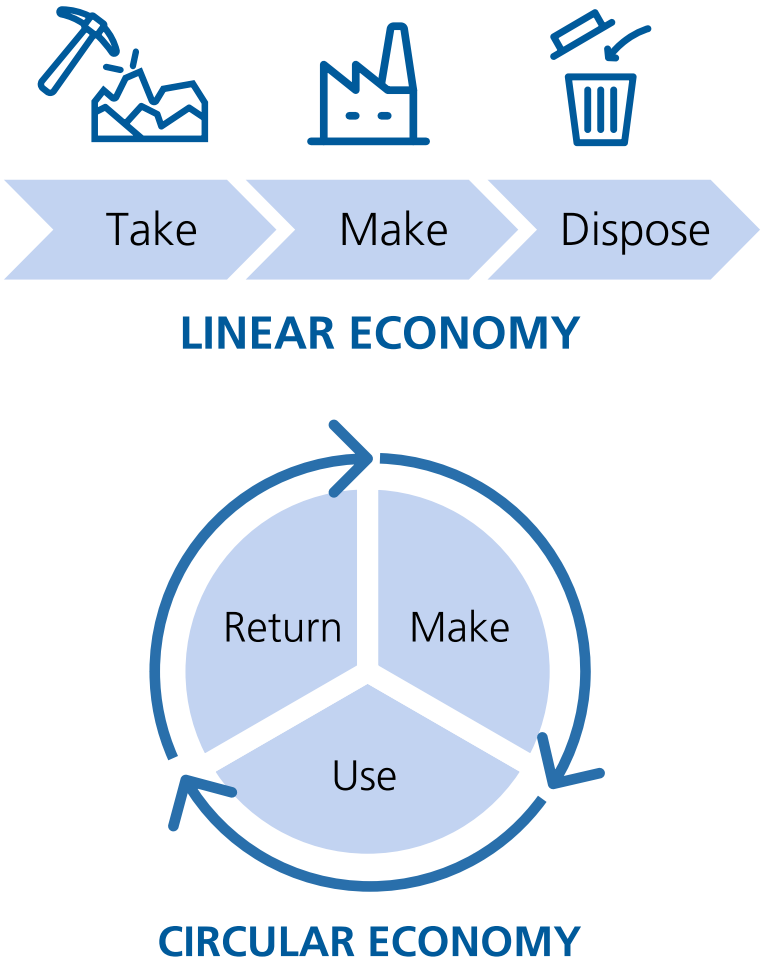


Figure 1. Linear Economy and Circular Economy Models

3 I THE FOCUS ON WASTE MANAGEMENT

This study examines how incentives can be created to transition Thailand towards circularity. For Thailand, a CE is one pillar of the country's Bio-Circular-Green (BCG) model for economic development. Creating a CE in Thailand requires the creation of supporting factors that allow the country to move away from the current LE model towards a circular one. This requires systemic changes that begin with the design of products, the selection of raw materials, the manufacturing process, and extends throughout a product's life cycle, including waste management. For countries like Thailand that are in the early phases of a CE transition, waste management and the 3Rs principle of reduce, reuse, and recycle are key components that need to be put in place. Thus, the research is focussed on waste management in the study of incentives. Case studies of plastic packaging and food waste are used as representatives of non-biodegradable materials and biodegradable materials respectively.

Plastic packaging and food waste are key waste management issues for Thailand. In 2019, the amount of mismanaged plastic waste in the country was approximately 19.56 kilograms per person, significantly higher than the average for Asia of 8. 67 kilograms (Meijer et al. 2021). Plastic packaging in the form of single-use plastics (SUP) represent the bulk of plastic waste generated in Thailand. Single-use plastic bags and bottles account for 75 percent of the 1.85 million tons of plastic waste treated annually (PCD 2021). The World Bank (2021) estimates that 87 percent of the value of plastic material is lost due to the non-circularity of the existing plastic waste management practices. Organic waste such as scraps of food, fruits, and vegetables comprise 64 percent of municipal solid waste (DEQP 2019). However, only 43 percent of this waste is appropriately managed through incineration and composting (TDRI 2019). UNEP (2021) also estimates that Thais generate 79 kilograms of food waste per person per year, which is higher than the average for upper middle-income countries and comparable to high-income countries. These numbers do not include food waste from producers and retailers. Transitioning towards the circular economy will not only reduce the amount of waste that needs to be treated, but also generate value from previously discarded materials, create jobs, and reduce negative social impacts from a linear economy.

4 I INSTITUTIONS AND INCENTIVES FOR A CIRCULAR ECONOMY TRANSITION

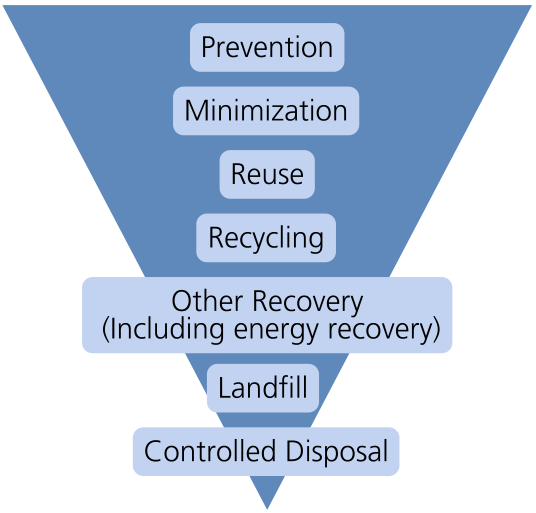
In studying circular economy transition, data from multiple country cases was gathered and compared with data from Thailand. The authors adopt an institutional economics perspective and apply the Institutional Analysis and Development (IAD) Framework to examine the use of incentives conducive to a CE transition in Thailand. Developed by the Nobel laureate, Elinor Ostrom, the framework is used to facilitate the analysis of institutional processes that affect individual and collective action by breaking complex problems into action arenas and components that are related to the action arenas (Ostrom et al. 1994, Rudd 2004). By applying the IAD framework, the appropriate institutional structure is determined from the identification of the desired outcomes and tracing backwards to aligned actions, and the supporting policy environment and enablers.

Institutions refer to the rules of the game that affect actors in an economy and their enforcement. Institutions can be formal, such as legislation, rules, standards, or informal, such as norms and agreements (North, 1990). The design of institutions can affect incentives for resource conservation (Tambunlertchai and Pongkijvorasin, 2020, 2021). Appropriately designed institutions have been found to motivate the protection of natural resources (Dietz et al., 2003; Handberg and Angelsen, 2015; Marks et al., 2020; Ostrom, 1990; Ostrom et al., 1994). On the flip side, poorly designed institutions can lead to actions that degrade natural resources (Frey, 1997; Frey and Jegen, 2001) and obstruct a CE transition (Fischer and Pascucci, 2017).

Promoting a CE transition requires an institutional environment that allows for key hurdles to be overcome. In the status quo in Thailand and many other countries, the existing institutional structure – the ecosystem of regulations, rules, standards, and norms pertaining to production and consumption practices – is developed to facilitate a LE and does not fully support circularity. In the existing system, the negative impacts from linear economic activities are not fully borne by producers, while the positive impacts from circular economic activities are not fully priced into the value of circular products. This puts circular activities at a cost disadvantage and effort is required to undertake them. Circularity is more an exception rather than the norm. Recrafting institutions can help reduce the cost disadvantage of circularity and facilitate systemic and behavioural change needed to bring about a circular economy. This can be done through creating a policy environment conducive to a CE transition, employing both financial and non-financial incentives to facilitate change, and creating demand for circular products and services. To ensure a just transition, the design of institutions should be derived from a participatory process involving key stakeholders from all social groups.

5 I LESSONS LEARNED ON INCENTIVIZING THE PLASTIC PACKAGING CIRCULARITY FROM INTERNATIONAL EXPERIENCE

For non-biodegradable materials such as plastic, the waste management hierarchy (see Figure II) represents the desired outcome that is needed in early phases of a CE transition. Measures that should be prioritized appear at the top of the hierarchy. Prevention and waste minimization should be strongly promoted, followed by reuse and recycling practices. Recovery should be applied to leftover waste, and remaining outputs should be appropriately handled by burying in a landfill or other controlled disposal methods. Circular flows of recovered materials such as usage of recycled content as raw materials form an important component in ensuring the circularity of plastic packaging.



WASTE MANAGEMENT HIERARCHY

Figure II. Waste Management Hierarchy
Source: UNEP (2015)

Creating circularity means everyone in the supply chain has a role to play. A review of country case studies and regional guidelines indicate that an incentive structure needed to promote the participation and behavioural change of both producers and consumers focus on four aspects. These are:

(1) Assignment of roles and responsibilities to producers and consumers Producers should be responsible for managing plastic packaging throughout its life cycle in accordance with the Extended Producer Responsibility (EPR) principle. Implementation of EPR includes assigning producers the responsibility of arranging the collection, recycling, and proper disposal of post-consumption products. Local governments should promote waste minimization and recycling and ensure that the remaining waste is sustainably managed. Citizens should play an important role in reducing and sorting waste. These roles and responsibilities should be clearly laid out in legislation, under waste management laws, or laws to promote recycling, or CE promotion legislation.

(2) Reduction of materials at the source to prevent and minimize waste This can be done by banning or controlling production, sale, and imports. This is especially relevant for single-use plastic packaging.

(3) Promotion of supply and demand of recycled materials through legislation/rules that promote green procurement and setting targets for recycled content in plastic packaging with clear timelines. Supportive tax measures include incentives for recycling businesses, using taxes to promote usage of recycled content in plastic packaging. Some countries stimulate demand by using ecolabels to provide information for consumers to differentiate environmentally-friendly products. Ecolabels that certify plastic products with recycled content include Germany's Blue Angel label, Sweden's Nordic Swan label, and New Zealand's Environmental Choice label.

(4) Applying the voluntary approach to support circular activities For producers, the aim of voluntary measures is to create awareness and familiarity with circular practices and stimulate innovations. Different methods have been used in many countries. For example, the South African Plastics Recycling Organisation: SAPRO uses competitions for the recycled plastics product award to stimulate new designs in recycled plastic packaging. Again, the Singapore Packaging Agreement (SPA), a collaboration between the government, industries, and non-profit organizations, incentivizes the reduction of packaging waste through designs that reduce plastic raw materials, and by providing the average weight of certain types of packaging to be used as benchmarks in product design. Multilateral agreements at the regional and global levels targeting plastic packaging help countries set policy direction, and push for more concerted action.

Experience from multiple countries including Germany, Japan, Singapore, and South Korea shows that legal frameworks conducive to circularity are adopted together with economic and voluntary measures to incentivize participation in value circles (UNEP 2019, JCPRA 2020, EMF 2021). In the initial stages of transition, the voluntary approach is used to ease stakeholders into adopting circular approaches. Nonetheless, systemic shifts cannot take place unless there is widespread adoption of circularity. This requires mandatory measures in the form of bans, targets, standards, and regulations.

6 I CREATING INCENTIVES FOR THE CIRCULARITY OF PLASTIC PACKAGING IN THAILAND

In Thailand, the policy direction is aligned with more advanced countries in terms of promotion of plastic packaging circularity. Waste management, and the Bio-Circular-Green (BCG) economy model, a model for economic development that aims to promote inclusive and sustainable economic growth by emphasizing three types of economies, are national agendas. Committees and working groups have been set up to work on plastics management. There are road maps and action plans on plastic waste management that focus on CE practices. Among the key principles are the Extended Producer Responsibility (EPR) and life cycle management guide policies. Standards are being developed, there is a CE product label, and there is voluntary action by citizens, the government, and the private sector. A case in point is the PPP Plastics project (Public Private Partnership for sustainable plastic and waste management). Activities under PPP Plastics include implementing a comprehensive model of plastic

waste management in the Klong Toey and Rayong areas, and the Magic Hand x Won project that encourages citizens to sort plastic waste and drop it off at designated points.

Despite existing efforts to promote a CE in Thailand, gaps exist. A CE transition is driven mainly by voluntary action, which is not sufficient for systemic change. While Thailand is preparing to draft a law applying EPR to plastic packaging, the country still does not have targets or other mandatory measures to promote use of recycled content in packaging, the ban on single-use plastics is non-comprehensive, and the country's large informal waste management sector is largely excluded from existing efforts to promote circularity which aim to target large private sector players and households. Nonetheless, informal waste collectors who are often vulnerable groups should be included when designing policies regarding the circularity of plastics. Laws could be strengthened to promote demand and supply of recycled products.

To promote the circularity of plastic packaging in Thailand, measures are needed to: (a) reduce the use of new plastics; (b) create value circles; and (c) increase waste sorting and collection. These measures appear in Figure III.

Reduce New Plastics	Create Value Circles	Increase Waste Sorting and Collection
• Control / ban single use plastics • Set targets for reuse • Set ratio for recycled content in packaging • Apply tax measures to incentivize recycled materials usage • Promote design of packaging that reduces new material usage	• Promote green procurement in the private and public sectors • Promote circular businesses • Set standards on circular products • Promote circular product labels • Support innovation • Ban imports of plastic waste	• Assign manufacturers responsibility for packaging throughout its life cycle according to the EPR concept • Assign responsibility to households and waste generators to reduce waste and sort generated waste • Apply PAYT* fee collection. Provide information/ create awareness • Provide information/ create awareness

Figure III. Recommended Measures to Promote Plastic Packaging Circularity in Thailand

Note: *PAYT is a policy whereby waste disposal charges are calculated based on the amount of waste generated. For example, in an area where the local government uses PAYT scheme for charging solid waste management costs, households that successfully reduce waste will pay a lower solid waste management fee to the local government.

7 I LESSONS LEARNED ON INCENTIVIZING FOOD WASTE MANAGEMENT FROM INTERNATIONAL EXPERIENCE

Food waste is a biodegradable material. The journey to circularity for countries in the early phase of a CE transition like Thailand is to strive to achieve the food waste management hierarchy (see Figure IV). To reduce food loss and food waste and ensure the circularity of biological materials in value circles, stakeholders throughout the supply chain should be included. They should be incentivized to prioritize prevention of food waste, reuse food, ensure that the nutrients and biochemical components of food are recycled, facilitate the recovery of energy from discarded food, and properly dispose of remaining waste. Throughout this process, food waste should be sorted from other types of waste to ensure appropriate management.

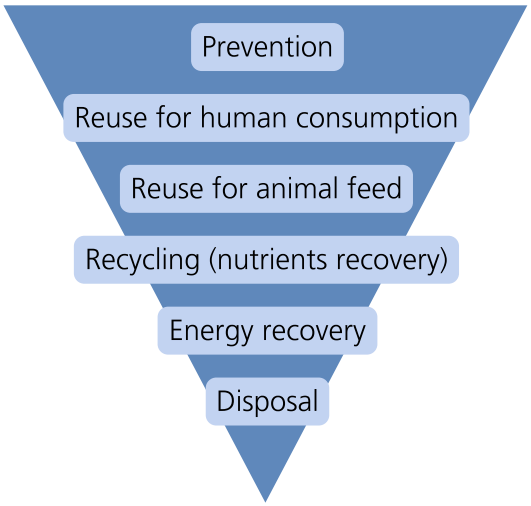


Figure IV. Waste and Food Waste Management Hierarchy
Source: Papargyropoulou et al. 2014

Based on a review of the literature and of country cases, and interviews with policymakers, social enterprises, private companies, and non-profit organizations, it was found that incentives for food waste management can be created through nine components. These are as follows:

(1) Setting targets for food loss and food waste Target 12.3 of the global Sustainable Development Goals (SDGs) aims to halve per capita food waste and reduce food loss by 2030. Several countries have adopted this goal or set similar goals at the country level. This includes developed as well as developing countries.

(2) Regulations assigning responsibilities in managing surplus food, and in reducing food loss and food waste Various countries make managing food waste mandatory, but there are variations in terms of the entities and activities regulated. Some limit the amount of organic waste generated by large private enterprises, others prohibit large supermarkets and retailers from discarding nearly expired food as waste. Heavy fines are used to enforce regulations, leading to food donations.

(3) Protection of food donors To incentivize donation of edible food, many countries have rules in place to exempt food donors from liability. This includes the Philippine's Food Donation Acts (2009), South Korea's Vitalization of Food Contributions Act (2011), the United States' Bill Emerson Good Samaritan Act of 1996, and New South Wales, Australia's Civil Liability Amendment (Food Donation) Act (2005). It should be noted that exemptions are made on the condition that the donated food meets hygiene standards. Thus, this measure works in conjunction with standards on the hygiene of food (covered in point (4)).

(4) Rules regarding the hygiene of food To protect recipients of donated food from harm, standards on the hygiene of food are often used with regulations that exempt donors from liability. These include both technical and hygiene standards such as the standard of vehicles used to transport food, and standards on food safety.

(5) Tax incentives that motivate the management of surplus food to reduce food waste This is in the form of reductions in income tax or Value Added Tax (VAT). Donors can claim tax credits, or quality for tax exemptions. While details differ in terms of eligibility, many countries have caps on the value of food donation that qualify for tax incentives.

(6) Guidelines on date marking on food Misunderstanding on the part of producers and consumers can lead to discarding edible food. Clear guidelines on how to set sell-by dates and use-by dates can help reduce this misunderstanding and prevent food waste.

(7) Agreements to reduce food waste Country case studies reveal that both mandatory and voluntary agreements can be applied. In the United States' Federal Food Donation Act (2008), food procurement by government agencies that exceed a certain value must have agreements with businesses regarding the management of surplus food. In Germany, there is a General Agreement on the Reduction of Food Waste between the Federal Ministry of Food and Agriculture (BMEL) and associations in the agricultural sector, food industry, and hotel and catering services to reduce food waste throughout the supply chain and in households. There is an ongoing effort to develop agreements at the sectoral level through the food supply chain. In the United Kingdom, there is the Courtauld Commitment 2030, which is a voluntary agreement to reduce food waste, greenhouse gas emissions, and water resource pressures throughout the food supply chain. Clear targets are set, and supporting measures are put in place to facilitate the achievement of food waste reduction.

(8) Provision of knowledge and infrastructure to incentivize food waste reduction Actions to prevent and reuse food waste may not be entirely known to those who handle food. Tips, guidelines, or guidebooks can reduce this knowledge gap and lead to reductions in food waste. In Germany, the German Hotel and Catering Association has developed a handbook on food loss and food waste. In the United Kingdom, the Waste and Resources Action Programme (WRAP), a charity, uses a variety of channels to communicate tips and toolkits to minimize food loss. Similar activities also exist in the United States. Provision of information and encouragement to reduce food waste can create new social norms that maximize resource use.

(9) Platforms to facilitate the matching of supply and demand of food surplus This can be done physically via food banks, or digitally via applications or online platforms. Edible food could be donated to food banks, sent to those in need, or sold to consumers. Operators of food banks and donations tend to be charitable organizations, while online platforms for reselling edible food tend to be start-ups with a profit-oriented business model.

While countries adopt a different mix of measures, it is clear that they all aim to act according to the food waste hierarchy. From the waste management perspective, countries mandate that large waste generators have the responsibility to reduce and sort waste. The voluntary approach is used to incentivize households and smaller waste producers to reduce food loss and food waste using a combination of financial and non-financial incentives.

8 I CREATING INCENTIVES FOR THE CIRCULARITY OF FOOD WASTE MANAGEMENT IN THAILAND

Thailand's policy direction is aligned with other countries, and there are activities on the ground that promote the reduction in food loss and food waste. However, the study finds that there are many gaps in the institutional ecosystem needed to provide incentives for systemic shifts that lead to a CE in the country. The legal framework in Thailand does not state that households and the private sector have a duty to reduce food waste. Instead, it merely states that households have a duty to sort waste. The voluntary approach is adopted only in getting people to sort waste. Furthermore, the institutional infrastructure is created by the private sector and non-profit organizations, resulting in non-comprehensive coverage and non-standardized policies and procedures. Thailand also lacks laws that exempt food donors from liabilities, policies that incentivize food donation, and lacks data on surplus food and food waste.

To promote the circularity of food waste in Thailand, measures are needed to: (a) limit food loss and food waste at its source; (b) create value circles; and (c) increase waste sorting and collection. These measures appear in Figure V. It should be noted that measures to bring about the circularity of food waste not only benefit the environment, but also have potential to reduce costs in handling waste, and for job-creation. Addressing surplus food by encouraging food donation benefits vulnerable groups as they are often the recipients of donated food.

Limit Food Loss and Food Waste at Source	Create Value Circles	Increase Waste Sorting and Collection
• Set targets at the sectoral level in addition to national-level targets • Assign responsibilty to prevent food loss and reduce food waste to large waste generators and households • Promote donation of surplus food through tax incentives and supporting regulations • Provide guidelines to prevent food loss and reduce food waste	• Set standards on food reuse • Support infrastructure for maximizing value of food including platforms for food reuse, and infrastructure for extracting nutrients and biochemical components from food waste • Promote circular businesses that create value from surplus food/ food waste • Promote circular product labels • Support innovation	• Assign responsibility to sort waste to large retailers and households • Create awareness of importance of reducing food waste • Provide guidelines on appropriate waste sorting • Apply Pay As You Throw fee collection

Figure V. Recommended Measures to Promote Food Waste Circularity in Thailand

9 I CONCLUSIONS AND RECOMMENDATIONS

Transitioning from a linear economy (LE) towards a circular economy (CE) promises to create economic growth while minimizing social and environmental impacts. For Thailand, a CE is identified as one of the key pillars of the country's Bio-Circular-Green economy model for development. The study shows that the design of incentives for transitioning from the current status quo of linearity towards circularity begins by identifying the desired outcomes the incentives are meant to achieve and determining the ecosystem of regulations, rules, standards and norms (i.e., institutions) conducive to attaining those outcomes. For countries in the early phases on a CE transition such as Thailand, the focus should be on achieving appropriate waste management as identified in the waste and food waste management hierarchies. It should be noted that cities, with their economic resources and activities, and large and dense population concentration, are well-suited to spearhead the CE transition, and stand to gain from the benefits of a circular economy.

For the case of plastic packaging, institutions created should focus on three aspects – reducing new materials, creating value circles and increasing waste sorting and collection. For the case of food waste, the focus should be on limiting food loss and food waste, creating value circles that incentivizes food donations, reuse and circular businesses, and increasing waste sorting and collection. For an economy still predominantly linear such as Thailand's, the emphasis should be on reducing, sorting and collecting waste. Clear responsibilities should be assigned to major generators of waste. For plastic packaging, the Extended Producer Responsibility (EPR) should be used to make producers responsible for waste throughout their life cycle. For food waste, entities who are large generators of food waste should be required to prevent food loss and reduce food waste. Citizens should have a role to play in reducing and sorting waste. Incentives aligned with waste sorting include charging fees based on the amount of waste generated and providing information/guidelines/toolkits to stakeholders. For food, tax incentives can be used to motivate food donation.

Creating value circles is an essential part in a CE. For both plastic packaging and food waste, setting clear product/ food standards can facilitate circularity. Utilizing product labels and supporting innovative business models that are aligned with circular practices contribute to closing the loop. For food waste, platforms that match the demand

and supply of surplus food should be encouraged. For plastic packaging, green procurement can create demand for circular products, providing incentives to producers.

In terms of reducing the use of new materials in the case of plastic packaging and limiting food loss and food waste, targets can be used to incentivize circularity. Targets on reuse and recycled content minimize the use of new materials. Tax incentives can be used to support recycling activities. For food waste, targets should also be set at the sectoral level such as restaurants, catering services, and the hospitality sector. Food donation should be promoted through supporting regulations such as food and safety standards on donated food and food transportation. Tax incentives can also be considered. Guidelines and kits to prevent food loss and reduce food waste should be created and disseminated to all stakeholders.

In creating an institutional environment conducive to a CE transition in Thailand, in addition to requiring stakeholders to take responsibility for preventing, reducing and managing waste, priority should be given to setting clear targets. This should happen both at the national level in terms of plastic packaging the reuse and recycled content of and at the sectoral level for food waste. Existing voluntary action activities should be further encouraged and studied in order to be able to advise policymakers on questions of policy design, setting standards, capacity building needs and possibilities for scaling up. Low-cost measures such as provision of information/guidelines/toolkits should also be implemented. More costly measures such as tax incentives should be used sparingly and after careful study on their effectiveness. Such measures should also take into consideration potential impacts on vulnerable groups to ensure a just transition. Policies should be designed through a participatory process involving key stakeholders from all social groups. Finally, coordination among different parts of the institutional environment is needed to ensure the achievement of the desired outcomes in engendering circularity in degradable and non-biodegradable materials in Thailand.

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