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EXPERTISE FRANCE

Rethinking Plastics
Circular Economy Solutions to Marine Litter

Circular Economy in Singapore

Comparative Policy Study, EU-Singapore

TABLE OF CONTENTS

TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS IN THIS REPORT

- **ASEAN**: Association of Southeast Asian Nations
- **ASTAR**: Agency for Science Technology and Research
- **BCA**: Building and Construction Authority
- **CDR**: Container Deposit Return
- **CNA**: Channel News Asia
- **DRS**: Deposit Refund Scheme
- **EASAC**: European Academies Science Advisory Council
- **EPR**: Extended Producer Responsibility
- **EU**: European Union
- **GPP**: Green Public Procurement
- **GHG**: Greenhouse Gases
- **HDB**: Housing Development Board
- **IBA**: Incineration Bottom Ash
- **ICT**: Information and Communication Technology
- **IWMF**: Integrated Waste Management Facility
- **INCUBATE**: Innovative and Curating Better Automation and Technologies for Environmental Services
- **JTC**: Jurong Town Council
- **KSTP**: Keppel Seghers Tuas Waste-to-Energy Plant
- **LEED**: Leadership in Energy and Environmental Design
- **MBT**: Mechanical Biological Treatment
- **MERC**: UK Material Environmental Research Council
- **MEWR**: Ministry of the Environment and Water Resources (renamed as MSE)
- **MRF**: Material Recovery Facility
- **MSE:** Ministry of Sustainability and the Environment
- **MSW:** Municipal Solid Waste
- **NEA**: National Environment Agency (Singapore)
- **NRF**: Singapore National Research Foundation
- **OECD**: European Organization for Economic Cooperation and Development
- **PET**: Polyethylene Terephthalate
- **PUB**: Public Utilities Board
- **PWCS**: Pneumatic Waste Conveyance System
- **RSA**: Resource Sustainability Act
- **SEC**: Singapore Environment Council
- **SPA**: Singapore Packaging Agreement
- **SPPEL**: Sustainable Public Procurement and Ecolabelling
- **SRF**: Solid Recovered Fuel
- **SEC**: Singapore Environment Council
- **WFD**: Waste Framework Directive
- **WRP**: Water Reclamation Plant
- **WTE**: Waste to Energy

EXECUTIVE SUMMARY

Singapore has embraced the need for strong policy measures that will allow for sustainable growth and resilience to climate change. Recognizing the opportunity to examine closely the progress of Circular Economy adaptation within a nation with strong policy, this report seeks to explore the gaps and opportunities in advancing Circular Economy principles within the Singapore framework.

The European Union's approach to Circular Economy is evident both in the regulatory framework as well as the principles that underlie this regulatory framework. The underlying principles include:

- **Clear prioritization of waste management initiatives as evidenced by the waste hierarchy,** which allows for the emphasis on treatments that are higher up on the hierarchy. For e.g. supporting recycling over waste to energy.
- **The setting of measurable targets,** which allows each of Member States to develop plans to reach the required target rates such as recycling or recovery and explore the appropriate instruments (EPR, packaging fees, etc.) which will allow them to achieve the targets.
- **Development of focused and customized approaches for each object of circularity,** which allows for a more customized effort depending on the material and its circularity potential, for e.g. organic waste, waste, and electrical equipment (WEEE/ e-waste), packaging, single-use plastics.

In the context of circular economy, the regulatory framework retains the twin goals of ensuring that targeted businesses remain competitive and consumers are not inconvenienced. The EU legal framework consists of several Directives, which are binding for the 27 EU member states and need to be transposed into national laws and regulations. They include in particular the EU Waste Framework Directive, the EU Directive on Packaging and Packaging Waste, the EU Directive on the reduction of the impact of certain plastic products on the environment, the EU Directive on waste electrical and electronic equipment, and the EU Directive on the landfill of waste. Concerning plastic waste, the European Strategy for Plastics in a Circular Economy of 2018 has provided the policy orientation during the last two years. Amongst others, it sets the goal that by 2030 all plastic packaging placed on the European market is either reusable or recyclable in economic terms.

The most recent additions to the EU framework are (i) The Circular Economy Action Plan (as part of the EU Green Deal) which prioritizes a more legislated (rather than voluntary) approach towards product policies across the entire life cycle (not limited to energy consumption or sustainable sourcing) and (ii) The New Industrial Strategy for the EU which is intended to ensure the competitiveness of industry while becoming greener, more circular and more digital. The scrutiny on certain sectors is emphasized, along with a more harmonized approach to waste reduction (with a target to reduce residual or non-recyclable waste by 50%). This plan also recognizes the need for a market for secondary raw materials (ensuring offtake of recycled materials) as well as improving the state of local recycling efforts and reducing reliance on exports.

A review of the EU framework provides an expansive set of best practices, highlights potential challenges, and helps identify critical instruments that could help achieve circularity goals. Furthermore, it provides a rich discussion ground for policy forward economies such as Singapore that have made forays into the field of circularity more recently. Singapore's policy frameworks are driven by an obvious emphasis on an **integrated planning** approach as engaging in **dynamic urban governance** i.e. engaging extensively with the public, industry, and other stakeholders. Also important to the Singapore policy framework is aligned with its focus on **resilience**. The Climate Change Action Plan and the more recent Zero Waste Master Plan lay the foundations for increasing circularity in Singapore. The Zero Waste Master Plan spells out specific targets such as a 30% reduction in waste to landfill by 2035 and a 70% overall recycling rate (81% non-domestic recycling rate and a 30% domestic recycling rate). The key drivers for action in the Zero Waste Master Plan are identified as follows:

- **Firstly, pushing boundaries through Research and Infrastructure,**
- **Secondly, transforming the environmental services industry,**
- **Lastly, co-creating solutions with the community.**

The Resource Sustainability Act 2019 provides legislative support to the Zero Waste Master Plan, mandating specific reduction and reporting requirements for e-waste, food waste and packaging waste. The Resource Sustainability Act introduces EPR for e-waste and packaging waste, which is a big step in terms of reorganizing financing and organizing of collection, sorting and recycling of waste.

Singapore's waste management is marked by some really noteworthy accomplishments as well some challenges - the recycling rates for construction waste as well as ferrous and non-ferrous metals are extremely high (99% and 81% respectively), however the recycling of other materials such as glass, paper, fabrics and plastics is considerably low. The low levels of household recycling (17%) and the particularly low plastics recovery (4%) rate has been recognized as an area of concern and has prompted some initiatives to address the situation. These include introducing a state-of-the-art integrated waste management facility (IWMF) intended to extract recyclables as well as awareness-building efforts such as the Recycle Right Campaign. Other examples of exploring innovative technologies include the repurposing of incinerator ash into construction material, repurposing plastic waste into oil (chemical recycling into NEWoil) and piloting a Pneumatic Waste Collection System to extract recyclables from households etc. These **technology centred efforts** are supported by **community and industry-focused efforts** such as the RecycleRight campaign to build awareness, the INCUBATE program to support SMEs in the recycling sector, plastic bag fee pilots to explore consumer behaviour, as well as **research-based efforts.**

Singapore is in the process of significantly **improving its infrastructure** with state of the art waste processing facilities which are diverse in nature covering: waste to energy, recyclables segregation and plastics processing as well as biological treatment. Each of these efforts reflects a carefully considered approach to identifying innovative solutions to waste. In addition, in line with its multi-stakeholder approach to urban governance, the Singapore government is **fostering industry growth,** including, partnerships such as: those of Alba and Wah Hua to improve waste management efforts in the Jurong urban region[1]; SME development through its INCUBATE program: government-industry partnership as the reverse vending machines pilot with the company F&N Foods[2] Singapore; as well as government to government initiatives with the Sino-Singapore Tianjin Eco-City project. Each of these efforts is a step towards more efficient resource management and ultimately will have an impact on Singapore's sustainability and circularity goals.

Singapore has **a unique leading position within the ASEAN** region that cannot be ignored when it comes to implementing the Circular Economy. Much like in Europe, certain countries in ASEAN are leading the way (including Singapore) and all benefit from one another by learning from their respective strengths and weaknesses. Like with many other schemes, it is likely that policies implemented in Singapore with regards to the Circular Economy will be replicated in other ASEAN countries and a good example of this is the Singapore Green Label or the Singapore Green Mark Scheme considered as raw models and benchmarks in the region.

Viewing Singapore's efforts within a comparative framework across some of the more significant features of the EU Circular Economy framework reveals both the similarities and contrasts between the two approaches and also brings

[1] The ALBA Group, is a recycling and environmental services companies, which was awarded the contract by the Republic of Singapore to set up a completely new waste management system in the Jurong urban region of over half a million people, to be served by a digitalised system meeting high environmental standards and providing capacity to collect around 17,000 tonnes of waste a year. Wah & Hua Pte Ltd (WH) is a Singapore waste management provider, which is providing collection, recycling, processes and disposal services and technologically-driven energy generation across the island. Source : https://www.alba-wh.sg/#about

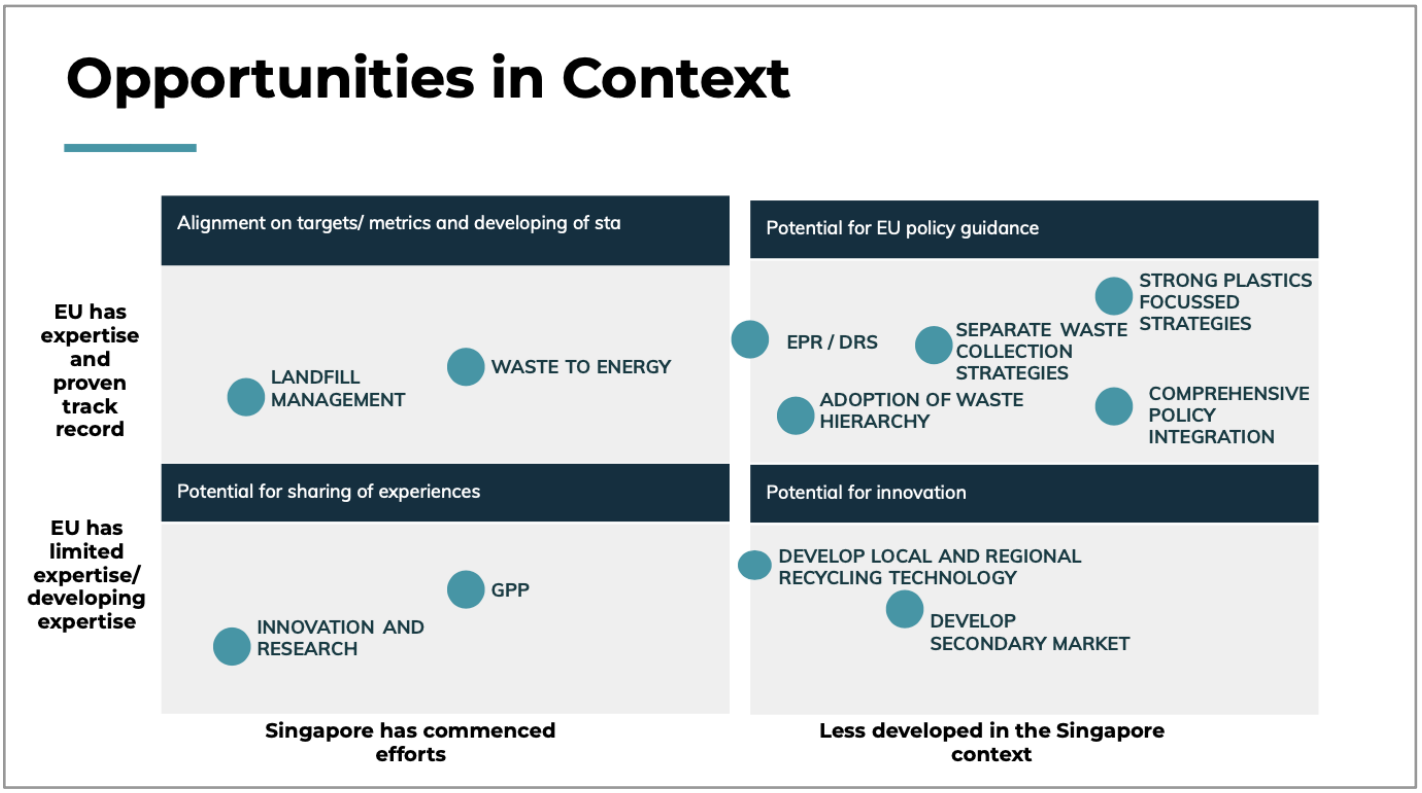
[2] https://www.fnnfoods.com/

to light some of the opportunities for bilateral collaboration. This report highlights the avenues that are most promising for EU-Singapore Collaboration, which are summarised in the following table.

OPPORTUNITIES FOR EU -SINGAPORE COLLABORATIONS	
Policy Integration	Singapore could consider embracing a more comprehensive approach to the Circular Economy by enhancing its Zero Waste Master Plan while also benefiting from the refinements introduced by the EU. The shared goals of resource efficiency and climate resilience would also further the dialogue between the EU and Singapore.
Waste Hierarchy	Singapore could consider re-examining the waste hierarchy and identifying examples and opportunities from the EU to introduce greater emphasis and interventions at the reducing, reuse and recycling stages. Recognising the shared challenges of offshore recycling, both the EU and Singapore are in a good position to identify regional collaborations that are well supported and less vulnerable to political and business risks. Opportunities to explore innovative recycling infrastructure is another area of collaboration.
Plastics Focussed Strategies	A strong plastics focus could be considered with the possibility of drawing from the EU Directives, and adapting as necessary these to the Singapore context, by prioritizing more challenging aspects. These could include: progressively reducing single-use plastics production and consumption, reducing packaging waste, and increasing the recovery of packaging and other plastics. Using the EU approaches of quantifying and identifying the most challenging types/ forms of plastics would be beneficial to Singapore. For example, the EU Directive 2019/904 introduces a mix of measures that are tailored to certain plastic products (cutlery, plates, straws, cotton bud sticks, beverage stirrers, etc.) and includes an EU-wide ban on single-use plastic products whenever alternatives are available (effective 2021).
Economic opportunity	Given the focus on economic independence and maintaining its status as an attractive base for businesses, identifying economic and business opportunities through circularity would be paramount in the Singapore context. Studies and findings that substantiate this effect from the EU could be very useful.
Circular Economy in Design, Waste Management & Recycling	The EU and Singapore could collaborate in establishing and improving the collection of recyclables and to identify opportunities for recycling both locally and regionally. While the EU has considerable expertise with separate waste collection for recycling, many Member States may find themselves in a situation not too different from Singapore when looking for local recycling infrastructure and technology as well as regional offshoring potential. Therefore learning from this process would also benefit the EU.
Extended Producer Responsibility	The EU could collaborate with Singapore in sharing its EPR expertise and experiences. The varied use of EPR and other strategies to address plastics and packaging waste in the EU offer not only different approaches to enforcing these regulations but also the challenges to be anticipated and avoided. For example, Singapore's EPR regulation with respect to e-waste has already established the requirements of the PRO.
Green Public Procurement	Even as the EU advances its efforts in establishing markets for secondary raw materials (or recycled materials) and adds greater emphasis to the offtake of green goods through mandatory green procurement targets, Singapore too, is on the cusp of expanding its green procurement policy. It is opportune timing to explore potential policy standards that could also be extended throughout the region.

Innovation and Research	Singapore has invested heavily in its research and development capabilities and has a strong preference for innovation. Sharing of research and collaborating on new research could be an important opportunity to liaise with the EU[3].
Regulatory Frameworks	The advanced regulatory framework in Singapore allows for exploring potential adaptations of successful EU regulations paving the way for a more harmonized global policy framework.

The opportunities discussed in the table above can be categorised based on the following approaches and what the priorities for each country are. The different approaches have been identified as **Policy Cooperation, Innovation & Collaboration, Standardisation, and Sharing of Learnings**. Each of the opportunities/ policy instruments is then placed within this context and indicated in the figure below:



While each of the above policy measures is important in its own capacity, to manage the scope of the report we limit a more detailed exploration to Extended Producer Responsibility (EPR) and Green Public Procurement (GPP). Both of these policy instruments have been prominent within the EU frameworks and have been carefully considered within Singapore as well.

The report examines the opportunities for EU - Singapore engagement with respect to more detailed aspects of each of these instruments:

- **EPR** - The EU approach to EPR is discussed keeping in mind the varied applications across Member States. The Singapore EPR policy specifically with respect to E-waste as well as the requirements with respect to

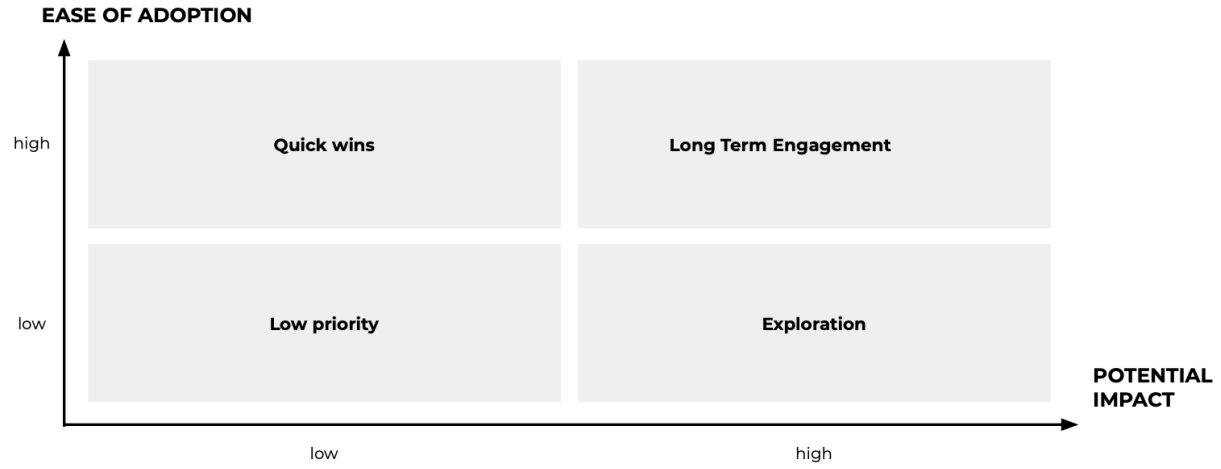
[3] In this regard, the research collaborative partnership between the French CEA and the NTU Singapore focussing on electronic waste and the Circular Economy, called 'SCARCE', could provide some useful lessons learned for future collaboration between Singapore and EU Member States

packaging (mandatory reporting and DRS systems) are discussed. Given the relatively nascent EPR policy application in other industries within Singapore, it could explore the EPR potential for other materials based on EU experiences. The EU has a long experience with DRS systems which could certainly be of use to Singapore's implementation agenda. To the extent that there are innovative and industry-centric schemes that engage businesses in developing unique and novel approaches to address the issue of packaging design and recycling, Singapore could adapt these EU initiatives to its local context.

- **GPP** - Singapore's public purchasing power is very powerful yet currently unexploited with regards to GPP. Considering its extensive experience, the EU could contribute to policy formulations and customizing sector-specific purchasing solutions. Singapore's GPP directives are predominantly targeting the country's own labelling schemes. While it is a good effort to promote local initiatives this also restricts the choice of green products and services. Exploring bilateral partnerships between Singapore Environmental labelling schemes and the EU Eco labels could be an avenue for GPP collaboration.

The report concludes with a framework to prioritize next steps with respect to Singapore-EU collaboration.

Prioritizing Action



QUICK WINS

Given the ease of adoption, these strategies will build trust and create a conducive environment for longer-term engagement. Examples include:

- Adoption of the Waste Hierarchy.
- Alignment on Landfill Management Principles. In Singapore, landfill solutions have become an urgent matter as its only offshore landfill is reaching saturation.
- Innovation and Research. Singapore is pushing for active research on circularity and welcomes foreign expertise. There is also significant funding available for research in Singapore.
- Adoption of GPP and strengthening of Eco Labels.
- Regulation to phase-out of certain single-use plastic products.

On this last point, based on the EU Single Use Plastics Directive (EU Directive 2019/904), Member States are required to have regulations in place that restricts the placing on the market of single-use plastic cutlery, plates, straws, beverage stirrers, styrofoam food, and beverage containers/cups, cotton bud sticks, sticks attached to balloons. EU Member states need to have regulations in place by July 2021. It remains to be seen how the market adapts, whether reusable

alternatives or alternatives made of other materials will be available and the debate will focus on what is actually environmentally friendly and what is not. An exchange between Singapore and Europe exploring possibilities could be interesting.

LONG TERM ENGAGEMENTS

These strategies will lead to high levels of circularity and already have the required framework to adapt to the Singapore context.

- Segregated Waste Disposal and Collection.
- Adoption of EPR and DRS System.

LOW PRIORITY

These strategies are neither easy to adopt nor likely to have a great impact in terms of circularity for Singapore, given disparities when compared with the EU. Examples are:

- Alignment on production and source reduction standards (this would be very complex to implement in Singapore and it will take time to change the regulatory framework, furthermore Singapore is a very competitive economy so it is unlikely that the Government would put a break on the manufacturing sector easily especially for SMEs).
- Developing Secondary Market strategies. While these strategies are much needed, it would be best to strengthen existing frameworks before exploring secondary markets. Recycled content standards with a long implementation horizon could work, however Singapore would need to identify global sources for recycled feedstock, given the lack of a recycling industry. Secondary markets in the EU are still being developed and are not yet mature.
- Waste to Energy. This aspect is already well taken care of in Singapore and would be the least preferred option in terms of developing the Circular Economy.

EXPLORATION

These strategies may be harder to adopt/ implement but are likely to have great impact on circularity. They merit careful consideration. Developing longer term engagement with the EU will allow for continuous guidance and knowledge sharing. Examples include:

- Alignment on a comprehensive circular economy policy with deep focus on plastics.
- Local and Regional Recycling Opportunities.

Looking beyond Singapore, the context in **Europe and ASEAN are similar,** considering the great disparity between individual member countries on the adoption of Circular Economy principles. Singapore has a robust legal framework and is leading the way on certain circularity aspects such as research and construction waste recycling. However, other aspects and in particular plastic recycling are better reflected in other ASEAN countries, like Thailand. As in Europe there are a lot of opportunities to **learn from best practices at the regional and global level**. The Circular Economy journey has only just started in Asia and much still needs to be done to truly adhere to such a business model.

The timing for collaboration between the EU and Singapore could not be better as both geographies are in the process of increasing their efforts in waste prevention and management, and aiming for stronger circularity within their frameworks. This is well expressed in recent published reports in both geographies released at about the same time. There are clear synergies of objectives to achieve and many of the specific targets set out in these reports are well aligned; a promising sign that mutual collaborations could strengthen their individual programs.

SECTION 1
CIRCULAR ECONOMY IN THE EU AND SINGAPORE

1.1 INTRODUCTION

REPORT BACKGROUND

Much like the European Union (EU), Singapore has a policy forward approach to achieving its economic and sustainability goals. Circular Economy thinking has been widely adopted as a long-term strategy and solution for plastics and packaging and policies related to it have been gaining popularity globally. While circular economy policies have been well established in the EU and its Member States, it has only recently gained popularity in Asia and Singapore in particular. Singapore, often hailed as one of the leading examples of growth and innovation in ASEAN and greater Asia, offers a unique opportunity to witness the adaptation and implementation of a Circular Economy framework, given the recent policy developments.

Recognizing the opportunity to examine closely the progress of Circular Economy adaptation within a nation with strong policy, this report seeks to explore the gaps and opportunities in advancing Circular Economy principles in Singapore (primarily) and the region to some extent.

REPORT OBJECTIVES AND METHODOLOGY

While addressing the broader concepts of Circular Economy, this report aims to align with the global focus on plastics circularity. The report first briefly examines the EU framework along with its underlying principles and most recent Circular Economy developments and then goes on to explore the Singapore landscape. In exploring the EU principles, the report explores the evolution and development of Circular Economy policies, however, the specific implementation of these policies within the Member States is beyond the scope of this report. The section concludes with an analysis that identifies gaps and opportunities for learnings from the EU context.

In the second part of the report, two important instruments of the circular economy policy frameworks, Extended Producer Responsibility (EPR) and Green Public Procurement (GPP), are reviewed to identify their varied application in both the EU and in Singapore. Also explored is the potential for both of these instruments to enhance the Circular Economy efforts in Singapore. While there are numerous other interventions, the scope of the research is limited to EPR and GPP as informed by the initial design of the project and the opportunities they present for bilateral collaboration between the EU and Singapore.

The report relies primarily on secondary sources, but also includes insights and learnings gained from presentations and materials shared by experts and authorities in Singapore. Additionally, key stakeholders in government and industry were invited to respond to a series of questions so as to gather key perspectives. The questions, the list of stakeholders contacted, and a summary of the responses are included in the Appendix.

1.2 EUROPEAN UNION (EU) - DEVELOPMENT OF A CIRCULAR ECONOMY FRAMEWORK AND ITS IMPACT ON PLASTICS

UNDERLYING PRINCIPLES AND POLICY LANDSCAPE

The Roadmap to a Resource Efficient Europe (European Commission, 2011) was a first step towards integrating Circular Economy principles in EU-wide policy making, stressing the key success factor of involving a wide range of stakeholders in priority setting, implementation and governance. Soon thereafter the Manifesto for a Resource-efficient Europe (European Commission, 2012) was released, calling for a circular, resource-efficient, and resilient

economy. Then came the EU Action Plan for the Circular Economy (European Commission, 2015)[4] which resulted in the 2018 Circular Economy Package. The Circular Economy Package includes measures that aim to help stimulate Europe's transition towards a circular economy, boost global competitiveness, foster sustainable economic growth and generate new jobs. As part of these measures, the European Commission presented the EU Strategy for Plastics in a Circular Economy (2018), and prepared a new EU Directive on the reduction of the impact of certain plastic products on the environment, which entered into force in June 2019.[5] This new EU Directive has enhanced the legal framework at European level, which also includes other Directives, such as the EU Waste Framework Directive 2008/98/EC, the EU Directive 94/62/EC on Packaging and Packaging Waste and the EU Directive 2012/19/EU on waste electrical and electronic equipment.[6] These approaches have been amplified in the most recently launched Circular Economy Action Plan (March 2020).

The European Union's approach to circular economy is premised on the following underlying principles, all the while recognizing the need for a competitive economy and consumer satisfaction[7]:

A clear prioritization of waste management initiatives

The EU has an established waste hierarchy which prioritises reduction and reuse models above recycling. The Waste Framework Directive (WFD)[8] introduces a five-step waste hierarchy where prevention is the best option, followed by re-use, recycling and other forms of recovery, with disposal such as landfill, as the last resort. EU waste legislation aims to move waste management up the waste hierarchy. There is a ranking which indicates a clear preference for: first, closed-loop recycling (i.e. items recycled into the same products); then, downcycling (i.e. content recycled into another product); and then, molecular recycling (i.e. extracting valuable chemicals), followed by energy recovery. Incineration and landfill are seen as a last resort which is a contrast with Singapore which currently sees incineration as its main solution.

The setting of measurable targets

Each step in the EU Circular Economy journey has been marked by the setting of specific targets and timelines for achieving these. Such targets are aimed at ensuring a steady but assured transition to a circular economy and include common targets such as those for recycling of municipal solid waste and packaging waste but also specific ones related to different packaging materials.[9]

Development of focused and customised approaches for each object of circularity

The EU approach to circular economy focuses on the three main aspects of:

- Sustainable production (eco-design, business models);
- Sustainable consumption (eco-consumption, reuse and preparation for reuse, collaborative economy); and
- Material resource management (waste prevention, systemic eco-innovation, 'raw material' strategy, recycling).

The EU policies aim to address each aspect of circularity and customised approaches have been developed for different products (e-waste, plastics, etc.). The policies also address specific requirements based on usage (Single Use Plastics

[4] https://ec.europa.eu/environment/circular-economy/first_circular_economy_action_plan.html

[5] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32019L0904

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01994L0062-20180704

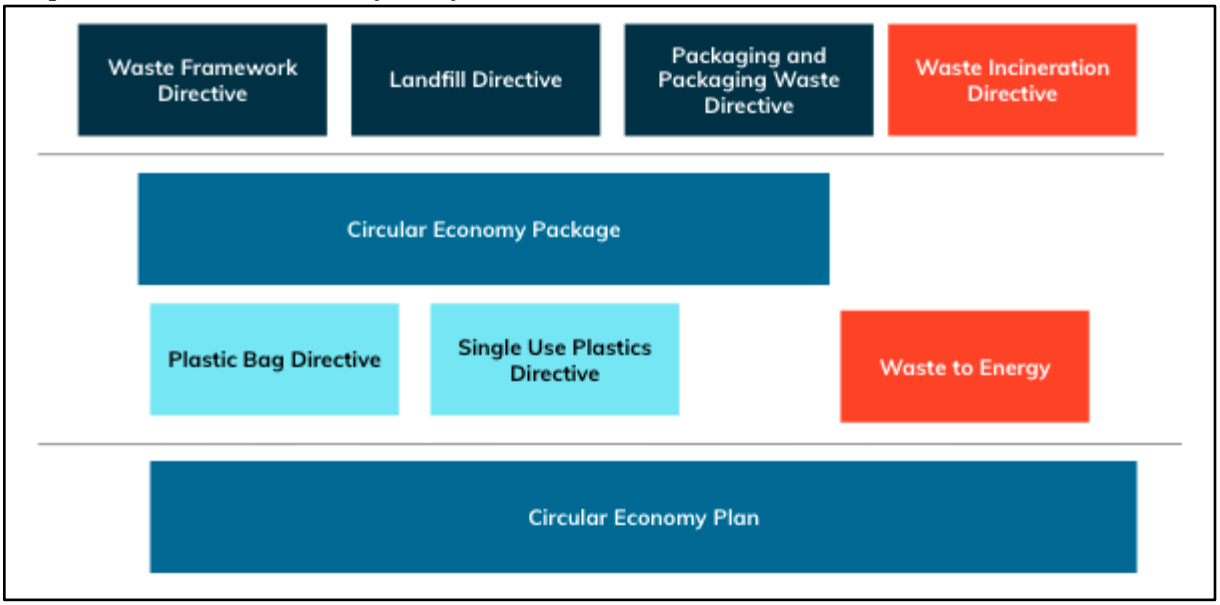
[7] http://sos2019.sea-circular.org/wp-content/uploads/2019/11/FINAL_THE-ROLE-OF-PACKAGING-REGULATIONS-AND-STANDARDS-IN-DRIVING-THE-CIRCULAR-ECONOMY.pdf

[8] EU Waste Framework Directive: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098

[9] The EU Action Plan for the Circular Economy establishes a common EU target for recycling 65% of municipal waste by 2035; a common EU target for recycling 70% of packaging waste by 2030; and specific targets for packaging materials like, Paper and cardboard (85%), ferrous metals (85%), Glass (75%), Plastic (55%) and Wood (30%). It also stipulates a binding landfill target to reduce landfill to maximum of 10% of municipal waste by 2035.

Directives) or material types (Biodegradables, Glass, PET etc.), an approach which ensures that opportunities for circularity are accelerated for specific material streams.
The WFD, the Landfill Directive[10] and the Packaging Waste Directive[11], constitute the legal framework which has contributed to the relatively higher recycling and recovery rates of packaging waste in the EU Member States (with much variation among the Member States). Each of these Directives and the ones that followed have established specific targets and timelines for the achievement of those targets which have hastened the advancement of the Circular Economy in many of the EU Member States. National, regional and local governments and authorities support the circular economy through sector policies, laws and regulations, as well as by setting up platforms or funding schemes. Stakeholders interact and share experiences via the European Circular Economy Stakeholder Platform (ECESP). The platform was established in 2017 by the European Commission and the European Economic and Social Committee to promote the circular economy across territories, sectors and themes by gathering knowledge and fostering dialogue. Table 5 in the Appendix summarizes the key features of each of the EU policy instruments in greater detail.

Graphic 1: EU Circular Economy Policy Framework



The Circular Economy Action Plan of 2020: The Circular Economy Action Plan [12] was announced in alignment with European Green Deal[13] and the New Industrial Strategy[14], presenting EU's most ambitious roadmap to date with respect to circularity. **The EU Circular Economy Action Plan** can be subdivided into six key actions to take place over the next decade:

- **Products Policy Framework**: First, the EU aims to put a greater emphasis on circularity concepts for products recognizing that designing for circularity cannot be limited to the sustainability and energy efficiency of products or be solely addressed by voluntary labelling initiatives and green procurement practices. The EU will propose a Sustainable Product Policy Legislative Initiative following directive principles. The aim is to expand to a broader sustainability framework and also to move from a voluntary

[10] EU Landfill Directive: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31999L0031

[11] EU Packaging Waste Directive: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01999L0031-20180704

[12] EU Circular Economy Action Plan: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

[13] European Green Deal: https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF

[14] EU New Industrial Strategy https://ec.europa.eu/commission/presscorner/detail/en/fs_20_425

based system to one which is increasingly legislated. Some further initiatives planned include: the establishment of a European Dataspace for Smart Circular Applications; greater products content transparency to provide customers trustworthy information (some EU Eco-labelling schemes have been misleading); and the introduction of a "right to repair" policy to push manufacturers to redesign products for extended use. Last, the EU will also propose minimum mandatory GPP criteria and phase in compulsory reporting to monitor its uptake. Noteworthy is that GPP is gaining momentum in Europe especially in the past few years (refer to section 4).

- **Prioritizing Sectors** such as Electronics and ICT; Batteries and vehicles; Packaging; Plastics; Textiles; Construction; as well as Food, Water and Nutrients. While all sectors should be given attention, it is important to prioritize according to the sectors which have both the most impact and potential for improvement.

- **Waste reduction:** Next, the EU will aim for lesser wastage and valuing waste. Despite efforts, the amount of waste generated in the EU has to date not gone down. Indeed, annual waste generation from all economic activities still amounts to 2.5 billion tonnes (or 5 tonnes per capita) a year and each citizen produces on average nearly half a tonne of municipal waste. The objective going forward is to halve the amount of residual (non-recycled) municipal waste by 2030 (Singapore's target by comparison is 30%). These efforts will be supported by enhancing the implementation of existing EPR systems, rolling out the Sustainable Product Policy, as well as harmonizing separate waste collection systems; increasing high-level exchange on the Circular Economy and stepping-up cooperation with member states, regions and cities (refer to section 3).

- **Creating a secondary market:** Another component of the strategy will be to create a well-functioning EU market[15] for secondary raw materials. This will be achieved by introducing requirements for recycled content and EU-wide end-of-waste criteria for certain waste streams; Enhancing the role of standardization; Imposing restrictions on substances of high concern and creating a market observatory for key secondary materials.

- **Addressing waste exports from the EU:** For many years, businesses within developed countries such as EU members have been exporting their recyclable waste (e.g. plastics) to developing countries for treatment. There has been much media scrutiny and public debate with regards to the sustainability and ethical acceptability of such exports. At the start of 2019, EU exports of plastic waste to countries outside the EU amounted to around 150,000 tonnes per month at the start of 2019.[16] The European Commission's Plastic Strategy addresses this issue, stating that:

  > "It will also be important to ensure that any plastics sent abroad for recycling are handled and processed under conditions similar to those applicable in the EU under rules on waste shipments, supporting action on waste management under the Basel Convention, and developing an EU certification scheme for recycling plants."[17]

  Many receiver countries such as Malaysia, Indonesia and the Philippines have already started to respond by banning the import of certain types of waste (e.g. plastics) into their territories and sometimes even returning[18] the waste as a show of dissatisfaction. The EU is exploring the opportunities to promote recycling within the EU, and new rules on waste shipment are currently being developed based on the Basel Convention.

[15] EU secondary market: https://resource.co/article/eu-plastics-strategy-aims-build-secondary-markets-make-recycling-plastics-profitable-12352

[16] https://www.eea.europa.eu/themes/waste/resource-efficiency/the-plastic-waste-trade-in

[17] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN

[18] Indonesia returning plastic wastes to the EU: https://www.channelnewsasia.com/news/asia/indonesia-to-return-49-containers-of-waste-to-europe--us-11684324

- Last but not least, the **EU intends to make circularity work for people**, regions and cities. The actions required to make this possible will involve a diversity of community programmes and initiatives. There is again a high potential for collaboration on such aspects with Singapore as it is also in the process of rolling out ambitious waste management communication plans at the city level.

WHY THE EU FRAMEWORKS ARE AN IMPORTANT STARTING POINT

The EU has a long history of integrating Circular Economy within its policy and legal frameworks (not only strategies and action plans), and continues to strategically improve upon its efforts in this direction. This dynamic approach allows for other regimes to learn not only from policies that have resulted in success, but also from those that either were circumvented, inadequately adapted or simply unsuccessful. The EU's Directives have had differentiated adoption and application in each of the Member States affording a rich source of learnings and opportunities, especially for developed and policy-forward nations such as Singapore.

Governments, businesses, local authorities, consumers and non-governmental organisations need to work together to overcome these and create an environment where consumables can be exploited without negative side-effects. These complexities provide insights into identifying an improved or more customised approach for newer policy regimes.

For the specific example of plastics, a recent study[19] led by the EASAC (European Academies Science Advisory Council) has pointed out that to move forward with a Circular Economy model a Systems Approach to the problem must be adopted. For instance, looking at the packaging issue will require changes throughout the value chain: i) Packaging manufacturers would need to simplify their current complex mixtures to become easier to recycle ; ii) Retailers would need to contribute by thinking as hard about effective end of life reuse or recycling as they do about the attractiveness of their packaging to the consumers ; iii) Consumers, who have embraced the "on the go" and "throwaway" culture, would need to could start to see packaging as something to be returned rather than to be discarded.

[19] EASAC Report: Packaging Plastics in the Circular Economy: https://easac.eu/fileadmin/PDF_s/reports_statements/Plastics/EASAC_Plastics_Web_complete_6May2020_FINAL.pdf

Graphic 1: Evolution of the Recycling Rate of Plastic Packaging in the EU

(Source: European Commission, Eurostat)[20]

The above graphic shows that the recycling rate of plastic packaging has overall steadily increased since 2006. The slowing down in recycling rates in recent years (likely due to export limitations) is, however, an indication that it is time to renew circularity efforts. Furthermore, the consumption of packaging, including plastic packaging, is rapidly increasing.

Most of the attention over the last decade has been put in improving waste management aspects and processes (e.g. collection, landfills). The recycling rates have improved over the years but by relying heavily on waste exports (primarily, plastics and e-waste). However, the tightening of international policies with regards to treatments of foreign wastes as well as materials toxicity regulations (e.g. the Basel Convention) is now forcing the EU to rethink its strategy and to develop treatment solutions for waste within its borders.

Reviewing the EU landscape provides a comparative backdrop for Singapore's circularity efforts. Furthermore, similar to the EU's attempt to facilitate a harmonised approach towards circularity amongst Member States, with a comprehensive policy framework, Singapore too can pioneer a similar approach within the ASEAN region.

CIRCULAR ECONOMY IN EUROPE

The concept of Circular Economy is not new in the EU, in fact it has been on the agenda **for the last twenty years**. However, despite some successes achieving efficient recycling rates in countries leading the way such as The Netherlands, Denmark and Germany, waste prevention and management in **the EU still has a long way to go to achieve a Circular Economy model.**

[20] Eurostats, recycling rate of plastic https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20181129-1

While aiming for a Circular Economy, the EU demonstrates **strength** on several waste management fronts including a **widespread recycling mind-set**; some significant advancements in **technologies and research**; developed **policies and frameworks** and particularly strong **eco-labelling and EPR** schemes (refer to section 4).

On the other hand, the EU is also facing major challenges such as significant circularity adoptions **disparities** between member states, **complicated regulatory frameworks** between the European Union and individual member countries, and most recently **restrictions on exports** which is forcing the EU to increase its domestic recycling capacities instead of relying on foreign waste treatment.

Some new initiatives under development are promising and could lead to interesting collaborations such as the creation of a **secondary market** for recycling as well as "right to repair" policies. It is important to highlight that the EU has a **well-established waste hierarchy** which prioritises reduction and reuse models above recycling.

Overall the EU shows a **strong will to strengthen** its position on the Circular Economy and **brings decades of trials and errors**.

The next section will explore the specific context of Singapore, one of the world's smallest nations yet a powerful economy with big ambitions and aiming to lead the way on the Circular Economy in ASEAN.

1.3 SINGAPORE - POLICY FRAMEWORK AND WASTE MANAGEMENT LANDSCAPE

Singapore's incredibly rapid development over the last 50 years into a high-income economy has been one marked by economic growth, but also its remarkable environmental transformation. This section of the report will focus on Singapore's efforts in addressing waste management while exploring the opportunities and challenges to pursuing an approach of Circular Economy especially with relevance to plastics and packaging.

Underlying Principles

Singapore generates more than 7 million tonnes of solid waste annually, of which more than 4 million tonnes was reported to be recycled.[21] The remaining is either incinerated or landfilled at the Semakau Landfill which is anticipated to reach capacity by 2035. The tonnes recycled do not reflect the domestic recycling rate which is reported to be only 17% for 2019. The government in Singapore has made some deliberate efforts to combat these realities. The Ministry of Sustainability and the Environment designated 2019 as the Year Towards Zero Waste to raise awareness of waste issues in Singapore, rally Singaporeans to treasure its resources and build a strong reduce-reuse-recycle culture, and pave the way towards a Circular Economy and a zero-waste nation. The Sustainable Singapore Blueprint[22] released in 2015 set a target of increasing the national recycling rate to 70% and domestic recycling rate to 30% and non-domestic recycling rate to 81% by 2030. The underpinnings of the Singapore approach are highlighted in this blueprint and related examples:

- **Integrated planning** by making use of digital planning tools, new and innovative technologies to model future scenarios using data. Successful examples include developing the Deep Tunnel Sewerage System and the satellite-based Electronic Road Pricing System (to manage congestion).

[21] https://www.nea.gov.sg/our-services/waste-management/waste-statistics-and-overall-recycling

[22] Singapore Sustainable BluePrint: https://www.mse.gov.sg/docs/default-source/module/ssb-publications/41f1d882-73f6-4a4a-964b-6c67091a0fe2.pdf

- **Dynamic urban governance**: engaging government institutions while also engaging the public and community groups as well as the private sector in allowing everyone to invest in their well-being. Examples are evident in the Community in Bloom program[23] (a community garden initiative), The Clean and Green Singapore [24](a campaign aiming to inspire Singaporeans to care for and protect common spaces and the environment by adopting a clean and sustainable lifestyle) and the Singapore Packaging Agreement (SPA), a voluntary agreement to which the National Environment Agency (NEA) and 170 organizations including businesses and industry organizations are signatories.

Another key driving force underlying Singapore's policy framework is its **resilience strategy** which targets climate change while at the same time ensuring resource and economic resilience[25].

Circular Economy, although not explicit in the Climate Action Plan, it has been identified as the recommended approach in the Zero Waste Masterplan[26] which also aims at resource conservation. The Singapore Zero Waste Master Plan states that "in a resource and carbon constrained world, we need to adapt a circular economy approach where scarce resources are valued and kept in use as long as possible," and also that "by conserving resources, we can also reduce GHG emissions". This builds up Singapore's Climate Action Plan[27] which was released in 2016 and outlines strategies for climate change adaptation and mitigation. In an attempt to rally the public and industry, 2018 was identified as the Year of Climate Change with a focus on carbon and greenhouse gas emissions. The Carbon Pricing Act[28] in operation from 2019, requires the measuring and reporting of emissions, with taxable businesses facing a tax rate of SGD[5] per tonne of GHG emissions. Together, these climate and Circular Economy policies constitute a solid base upon which further Circular Economy efforts can be developed and implemented.

Policy Landscape: Singapore's Zero Waste Masterplan

Singapore's economy is still to date predominantly based on the linear "take-make-dispose" model and its vision is clearly to move away from it through one that reuses resources endlessly. In the "Zero Waste Masterplan Report" which presents the national waste management strategy, the focus is on the Circular Economy over the next 10 years. The overall objective of this Master Plan is to strengthen three resilience in Singapore: i) Climate Resilience by addressing existential threats especially rising sea level, ii) Resource resilience by ensuring a safe and secure supply of critical resources such as food and water and iii) Economic resilience by ensuring that the future of Singapore's economy remains competitive by overcoming carbon and resources constraints. It is clear throughout this Masterplan that the main strategy will surround the adoption of a Circular Economy concept uniting and ensuring greater sustainability in the production process, consumption practices and waste management solutions.

The Resource Sustainability Act[29] (2019) establishes a regulatory framework to address the waste streams identified in the Zero Waste Master Plan:

- Food Waste: from 2024 onwards, owners and occupiers of commercial and industrial premises that generate large amounts of food waste will be required to segregate their food waste for treatment, either on-site or off-site.
- E-waste: a regulated management system will be introduced by 2021 to collect and properly treat e-waste.

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[23] Community in Bloom Program: https://www.nparks.gov.sg/gardening/community-in-bloom-initiative

[24] Clean and Green Singapore Campaign https://www.cgs.gov.sg/

[25] Singapore's Climate Action Plan: A Climate-Resilient Singapore, For a Sustainable Future. https://www.nccs.gov.sg/docs/default-source/publications/a-climate-resilient-singapore-for-a-sustainable-future.pdf

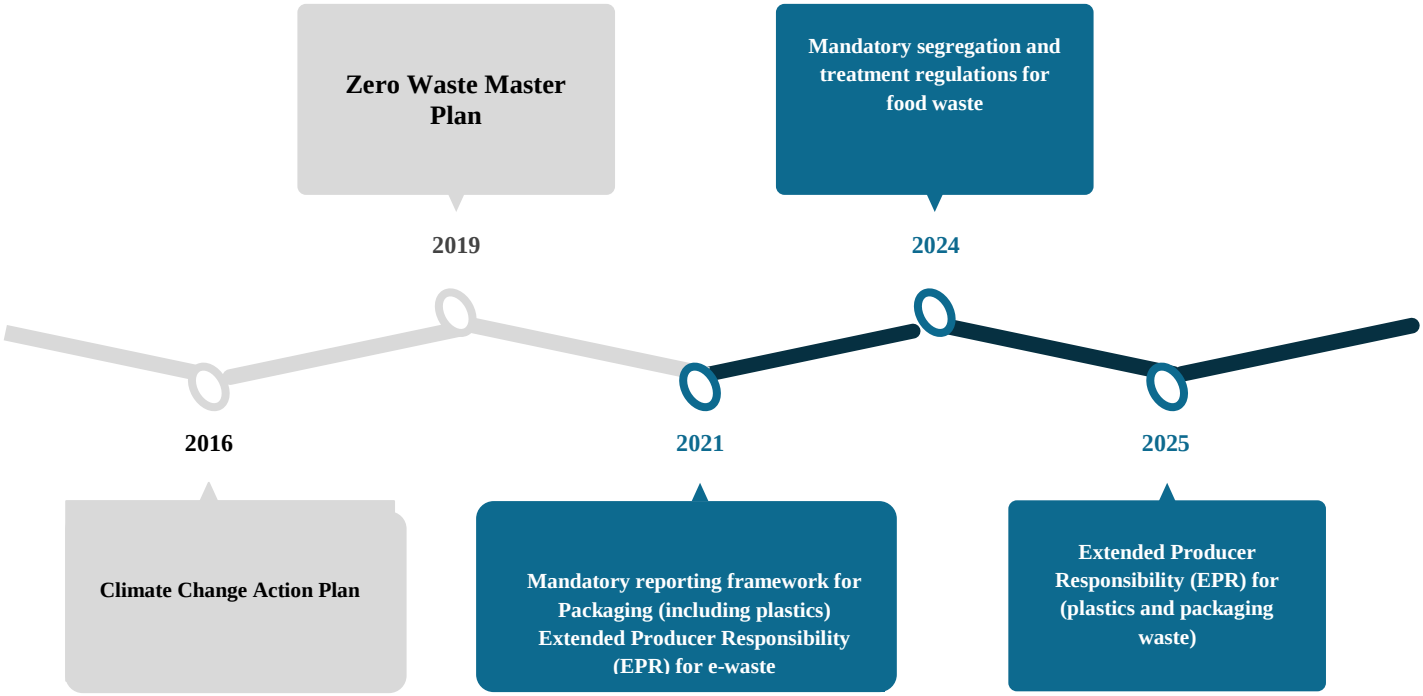
[26] Singapore Zero Waste Master Plan https://www.towardszerowaste.sg/zero-waste-masterplan/

[27] Singapore Climate Action Plan: https://www.mewr.gov.sg/docs/default-source/default-document-library/a5finalmerw.pdf

[28] Singapore Carbon Pricing Act: https://sso.agc.gov.sg/Acts-Supp/23-2018/Published/20180601?DocDate=20180601

[29] Singapore Resource Sustainability Act: https://sso.agc.gov.sg/Acts-Supp/29-2019/Published/20191004?DocDate=20191004

- Packaging waste including plastic: businesses that produce packaged products are required to collect their packaging data and 3R plans from July 1st, 2020 for submission to the NEA in 2021. (*This has now been extended by a year to accommodate COVID-19 related challenges).*



Targets: When it comes to achieving tangible results, the government has set clear targets through this Masterplan. First, it aims to **extend the Semakau's landfill lifespan beyond 2035**, secondly, it wants to **reduce the amount of waste sent to the landfill per capita per day by 30% by 2030** and last to **achieve a 70% overall recycling rate by 2030** (81% non-domestic recycling rate and a 30% domestic recycling rate). To meet these targets initiatives have been launched such as:

- the "Say YES to Waste Less" campaign,
- the 3R (Reduce, Reuse, Recycle) Awards for Shopping Malls and Hotels,
- the Towards Zero Waste Challenge for schools,
- donation of unsold or excess food to food distribution organisations.

To achieve this Masterplan, the Singapore Government has **identified three pillars for action**:

- **Firstly, pushing boundaries through Research and Infrastructure**: As part of its Circular Economy deployment plan, some interesting innovations are currently under development. These include: a state of the art Pneumatic Waste Conveyance System that when operational will convey large quantities of reusable wastes throughout the city (mostly underground); the TuasOne waste to energy incineration plant which would be an upgrade from the current primary incinerator; as well as a Pilot Mechanical Biological Treatment Facility. Additionally is the development of a new industrial zone called Tuas Nexus which will comprise of an integrated Waste Management facility and Tuas Water Reclamation Plant to harness synergies across the water-waste-energy nexus. Another significant development is NEWSand, which will make use of incineration bottom ash in construction materials. These initiatives will require significant financing and as part of the Masterplan the authorities have already announced the deployment of SGD 45 million to close the

waste loop R&D initiative[30] (as per 2019, 8 projects worth SGD 20 million have already been funded). Furthermore, they will also be allocating SGD 25 million on the waste to energy programme to test an SGD 40 million waste to energy research facility.

- **Secondly, transforming the environmental services industry**: the Government foresees that more than 2,000 firms acting in the waste management field will be required to make the Circular Economy possible. To facilitate the transition and development of this new field, 30,000 workers will benefit from the Environmental Services Transformation Map[31] by 2025 allowing them to upgrade their skills to meet the new challenges posed by the Circular Economy. Furthermore, the government will also put into place a SGD 30 million Productivity Solutions Grant to assist companies (especially SMEs) to adapt through the transition and last new partnerships will be facilitated to speed-up the Circular Economy under the INCUBATE programme.

- **Lastly, co-creating solutions with the community**: a series of initiatives have been planned to help communities adapt and become part of the Masterplan. For instance, the Government has launched the "RecycleRight" campaign aiming to educate Singaporeans on adopting better recycling habits, a new design for recycling bins labels has been rolled out to make the segregation at source clearer and more comprehensive, citizen's workgroup will be created to better address household recycling, consultations of more than 250 companies will be carried out as well as a survey of over 5,000 households to better understand individual recycling habits and finally, more than 1,300 people will participate in public consultations. In Singapore, community involvement and overall people's mind-set towards recycling is still low and many actions such as these will be required over the next few years to turn this trend around.

Waste Management Landscape in Singapore

Administrative Landscape

Singapore has a well-structured and efficient policy framework and this is relevant in the waste sector as well. When it comes to waste management the highest authority is the Ministry of Sustainability and the Environment (MSE) formerly the Ministry for the Environment and Water Resources or MEWR. The MSE comprises of several agencies including the National Environment Agency (NEA) which deals with all the solid waste matter disposed of in Singapore with the exception of vegetal wastes which are under the National Parks Board (NParks) and certain categories of liquid wastes which fall under the Public Utilities Board (PUB). The roles of key government bodies relevant for Solid Waste Management (SWM) in Singapore, and the implementation of the Mandatory Packaging Reporting Framework under the Resource Sustainability Act are listed as below:

Table 1: Singapore Government Waste Management Framework

MSE	Solid Waste Management framework for implementation of the Resource Sustainability
	Regulating and administering solid waste management systems in Singapore.

[30] Closing the Waste Loop https://www.nea.gov.sg/programmes-grants/grants-and-awards/closing-the-waste-loop-initiative

[31] Environmental Services Industry Transformation Map https://www.nea.gov.sg/industry-transformation-map/environmental-services-industry-transformation-map

NEA	Administration of the Resource Sustainability Act	Review packaging data reports submitted by the relevant producers an retailers
		Support companies in their efforts to reduce packaging waste through: 1) Promoting the sustainable use of resources in supply chains 2) Expending industry capacity in the 3Rs 3) Heightening consumer and industry awareness of packaging waste management

Household Waste Disposal

The population density cannot be taken out of the picture when considering waste management solutions for Singapore. Indeed, as one of the world's most densely populated countries (8,358 people per Km^2 as opposed to 34 per Km^2 in Europe), Singapore needs an efficient and safe waste collection system. One of the early solutions to address this problem was the decision by authorities to incorporate a central chute in all high rise public housings (HDBs) which shelter over 80 % of the resident population. These chutes present on every floor have provided an easy solution to the collection of domestic wastes, and have also safeguarded public hygiene. In its transition from "kampong" living (i.e. traditional rural villages with limited sanitation) to modern high rise building blocks, Singapore has held a large scale successful campaign to encourage residents to put all their disposables in plastic bags and to drop them down these chutes for public workers to collect the wastes daily; it is an effective process but not a sustainable one. In addition to fuelling the linear waste management model, the chute system is also the main reason why plastic bags have not been significantly reduced or even phased-out (2.5 billion[32] plastic bags are used on the island every year) as opposed to many other countries like in the EU. This concept has remained in Singapore since, and due to the ease of the practice, it is now posing challenges to transform the public mind-sets to adopt waste segregation at source and overall mindful disposal habits. For this particular reason, education and change of mind-sets towards waste are one of the main challenges that Singapore will have to overcome in its journey towards circularity.

Municipal Waste Collection

Regarding the manpower required for waste management, it is important to highlight that Singapore is also notably different from the situation in Europe. Until today, most low skills employment in the waste industry such as garbage collection (e.g. collection of household rubbish from HDBs central chutes), cleaning of public places and waste segregation are not done by Singaporeans, but by foreign workers from nearby countries (typically Pakistan and Bangladesh) usually paid on minimum wages to clean up Singapore continuously. That is a very significant waste management workforce to ensure that the city stays clean. A recent study[33] pointed out that Singapore employs an army of 58,000 cleaners to clear up the island's housing estates, roads, walkways and waterways three times a day. For this reason, Singapore is currently more accurately a "cleaned city" rather than a "clean city," a relevant factor recognizing awareness levels and prevailing behaviours amongst the residents of Singapore.

Household Recycling in Singapore

Singapore introduced the National Recycling Program in 2001 which began with door-to-door collection of recycling bags which eventually evolved to the placement of recycling bins at common areas of residential blocks in 2007.

[32] Singapore plastic bag usage: https://www.eco-business.com/news/singapore-green-group-calls-for-mandatory-plastic-bag-charge/

[33] Singapore foreign workforce highlight: https://www.eco-business.com/news/singapore-to-give-cleaners-day-off-to-alert-residents-to-citys-waste-problem/#:~:text=Singapore%20employs%20an%20army%20of,be%20given%20the%20day%20off.

Although much has been done to facilitate recycling amongst the public, the domestic recycling rate has remained stagnant at around 20% since 2013. In fact, in a commentary published by CNA (Channel News Asia), the national collection-for-recycling effort collected only 2% of household waste, while the local informal recycling sector, which consists of rag pickers and door to door collectors (*Karang Gunis)*, collected close to 20% resulting in the 22% household collection-for-recycling rate. Hence, new strategies are required to achieve the 2030 domestic recycling rate target of 30%.

In order to fully understand the household recycling landscape in Singapore it is important to describe the recycling activities conducted in Singapore, before sending the materials for treatment overseas (Singapore is in the process of developing modern recycling facilities using the latest technologies):

- First, the trucks collect the recyclable items around Singapore which have been collected in the blue recycling bins. The trucks then take them to one of Singapore's recycling facilities[34] registered under the NEA and operated by public waste collectors where they will unload the items;
- Secondly, the recyclables go through a machine that opens up the bags containing the recyclables and spreads them on a conveyor belt for the first round of manual sorting where workers remove non-recyclable items;
- After this, the recyclables are transported by a conveyor belt and pass below a large magnet where ferrous metals such as drink cans are picked up from the rest;
- The next step sees the remaining recyclables go through a process that segregates two dimensional (e.g. paper) from three-dimensional items (e.g. crushed bottles);
- Following this, the recyclables undergo another round of checks for contamination which involves removing any remaining non-recyclables from the mix (non-recyclables removed at each stage of the process are sent for incineration);
- And last, the recyclables are compacted and packaged for exportation.

The below pictures show typical setups at Singapore waste recycling facilities from dumping of the recyclables to manual sorting and compacting (source ZerowasteSG[35]).

[34] Singapore registered recycling facilities: https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/collectors-traders-and-local-recycling-facilities

[35] Recycling processing facilities http://www.zerowastesg.com/recycle/

Recycling in Singapore

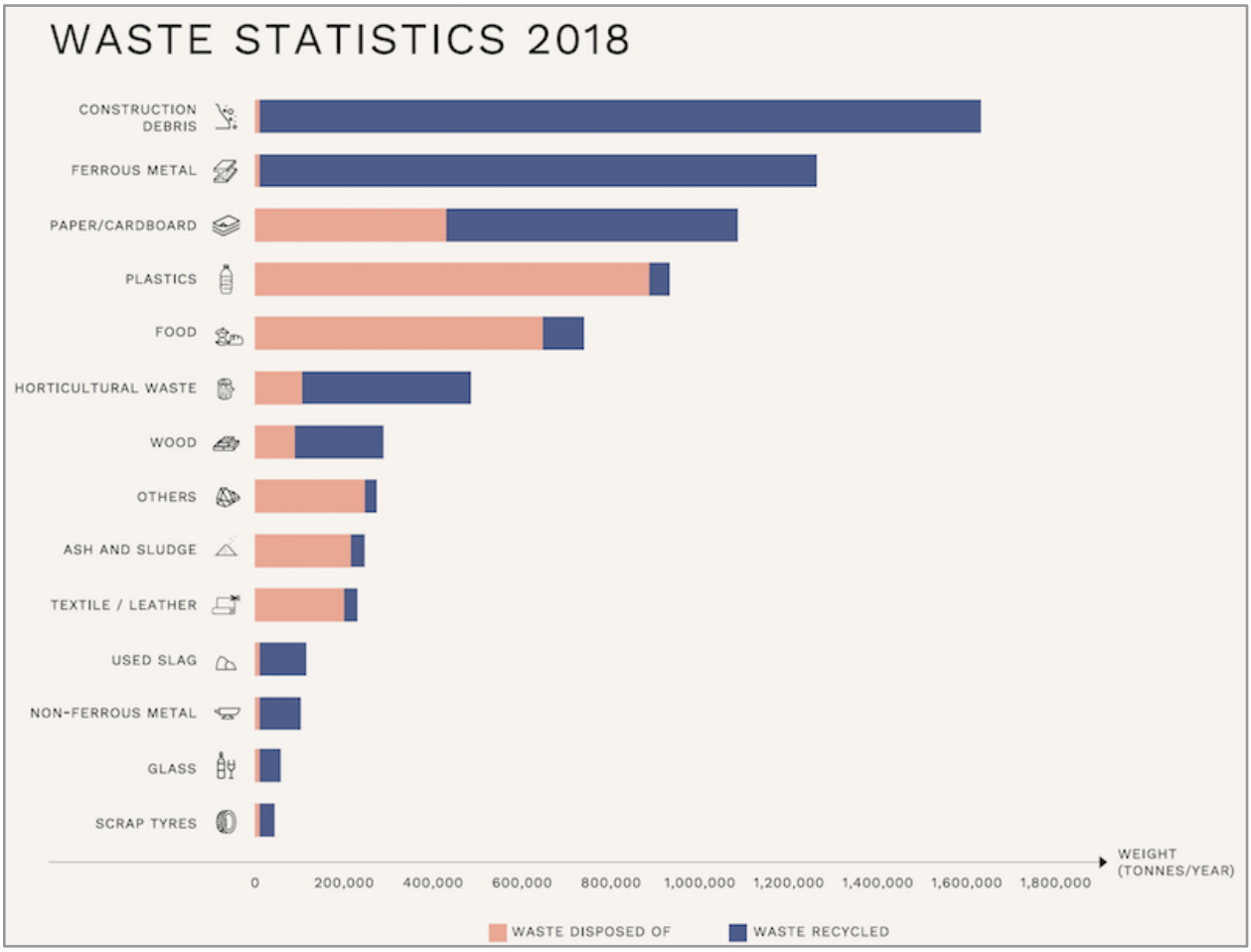
Singapore has achieved impressive recycling rates for construction waste as well as ferrous and non-ferrous metals, however, the recycling of other materials such as glass, paper, fabrics and plastics is considerably low. The following realities can be seen as contributing factors and outcomes for this scenario:

- The absence of a recycling industry or mechanical recycling solutions within Singapore
- The heavy reliance on export of recyclables to other countries
- Low levels of segregation of recyclables at the household collection or disposal stage
- Incineration of plastics allows for improved energy recovery

To put Singapore's waste management situation into context the below graphic showcases the relative recycling of different items for 2019 (Source: Zero Waste Masterplan[36]). In the image below, plastics were indicated to have a recycling rate of only 4%, even lower than the other recyclables such as glass 14% and paper/cardboard at 44%. Singapore's success with respect to construction waste and the retrieval of ferrous metals is exemplary and can be followed as it attempts to address circularity for food, e-waste and packaging.

[36] https://www.towardszerowaste.gov.sg/zero-waste-masterplan/chapter2/managing-waste-sustainably/

Graphic 2: Singapore's Recycling Rates



Data Source: NEA[37]

Challenges for Packaging and Plastics

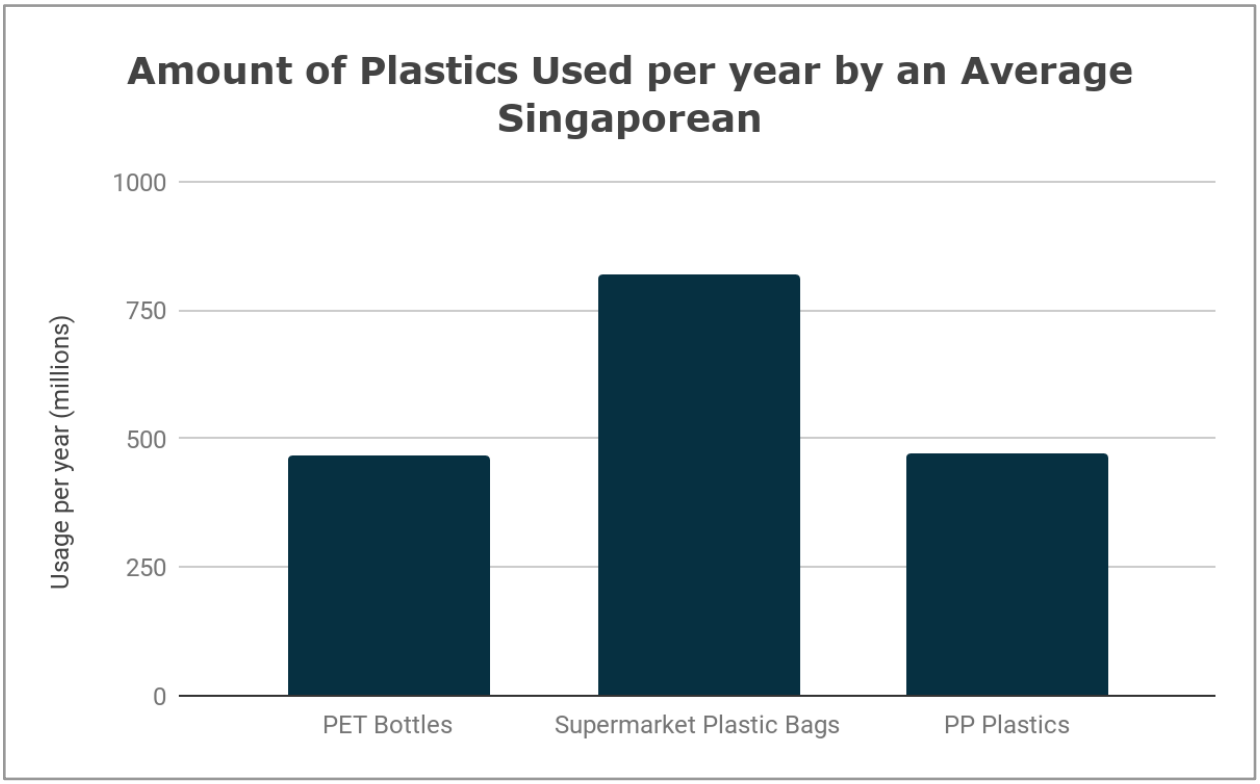
In the absence of a recycling sector with respect to plastics, most of the recyclable materials collected and sorted in Singapore are exported to countries such as Indonesia, Malaysia, Myanmar, Philippines, Thailand and Vietnam[38]. Poor disposal and high levels of contamination in the household recycling stream serves as an impediment to recycling in Singapore. About 40% of the materials suitable for recycling cannot be recycled as it is contaminated by food or liquid and is therefore incinerated. Waste collectors have to bear the cost of collection, storage, and transportation of recyclable materials. Reliance on offshore buyers, import restrictions, and volatile export prices reduce the incentive for the waste sector to collect recyclables in Singapore.

Considering the low recycling rate of plastics highlighted above (4%), it is worth taking a closer look to better understand the gaps and potential going forward. Various studies have been conducted in recent years to better understand the local waste landscape. The below graphic shows the outcome of a recent study conducted by the Singapore Environment Council (SEC) and the consulting firm Deloitte:

37 https://www.nea.gov.sg/docs/default-source/default-document-library/waste-recycling-stats-2016-to-2018.pdf

38 Prior to the ban on import of plastic in China, as a result of the National Sword Campaign (January 2018) , China was a popular destination for scrap plastics from Singapore.

Graphic 3: Breakdown of plastics consumption in Singapore



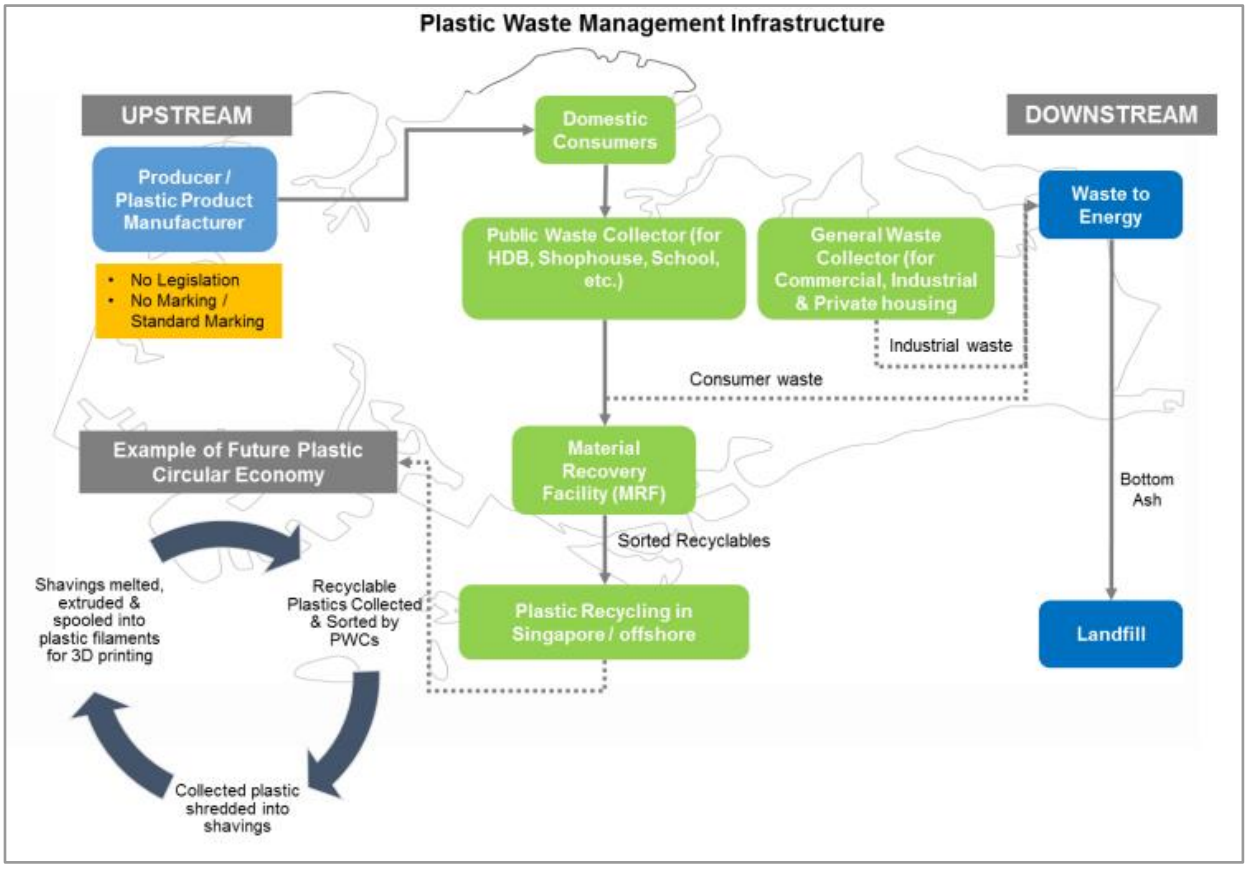
A study conducted by the Singapore Environment Council and Deloitte found that Singaporeans use 467 million PET bottles per year, 820 million plastic bags per year, and 473 million PP plastics per year. [39]

Given the contrast of high plastic consumption on one hand and the very low plastics recycling rates, on the other hand, there is a significant gap in the Singaporean recycling landscape which also means a potential for improvement. Solutions would need to be customized to each of the main categories of plastics (PET, single used plastic bags, and PP), all of which require different approaches and processing techniques, like it has been done in Europe.

Currently, in Singapore, the plastic downstream can be summarized as going through the incineration process with energy being extracted in the process and the ash being sent to the landfill. According to the SEC research, the reason for the low plastic recycling rate includes a lack of public awareness of what can be recycled, as well as the limited opportunities for recycling in Singapore.

39 SEC/Deloitte study on plastics https://sec.org.sg/wp-content/uploads/2019/07/DT_PlasticResourceResearch_28Aug2018-FINAL_with-Addendum-19.pdf

Graphic 4: Current Singapore Plastic Waste Management Landscape



The above graphic provides a partial overview of the plastic waste landscape in Singapore (Source: Singapore Environment Council)[40]

In terms of what happens to the plastic waste collected to be recycled in Singapore most of it was previously sent to China but following the ban on waste imports this is no longer the case and the waste is now sent to other destinations in Asia. The city-state generated a total of 949,300 tonnes of plastic waste in 2018, of which 40,700 tonnes, or 4.3 per cent, was recycled, according to the NEA. Of the total figure, local exporters sent 37,851 tonnes of plastic abroad while only 2,849 tonnes were processed in Singapore. The remainder of the waste is sent to waste to energy facilities for incineration.

Waste to Energy

Currently, solid waste disposal infrastructures consist of four waste-to-energy (WTE) plants namely: Tuas Senoko, Tuas South and Keppel Seghers Tuas Waste-To-Energy Plant (KSTP), as well as the Semakau Landfill. Incineration was chosen as the main waste processing method solution so that the volume of solid waste could be reduced by about 90% and sent to the only offshore landfill available. In the process of incinerating, energy derived is reinjected into the national grid contributing to only 2% of the energy mix (most of the energy produced is used to run the incineration plants). In Singapore the vast majority (95%) of the energy is produced by burning natural gas, the remaining is from waste to energy, a very small amount of renewables (photovoltaic) and greenmass[41].

[40] SEC Plastic Resource Research https://sec.org.sg/wp-content/uploads/2019/07/DT_PlasticResourceResearch_28Aug2018-FINAL_with-Addendum-19.pdf

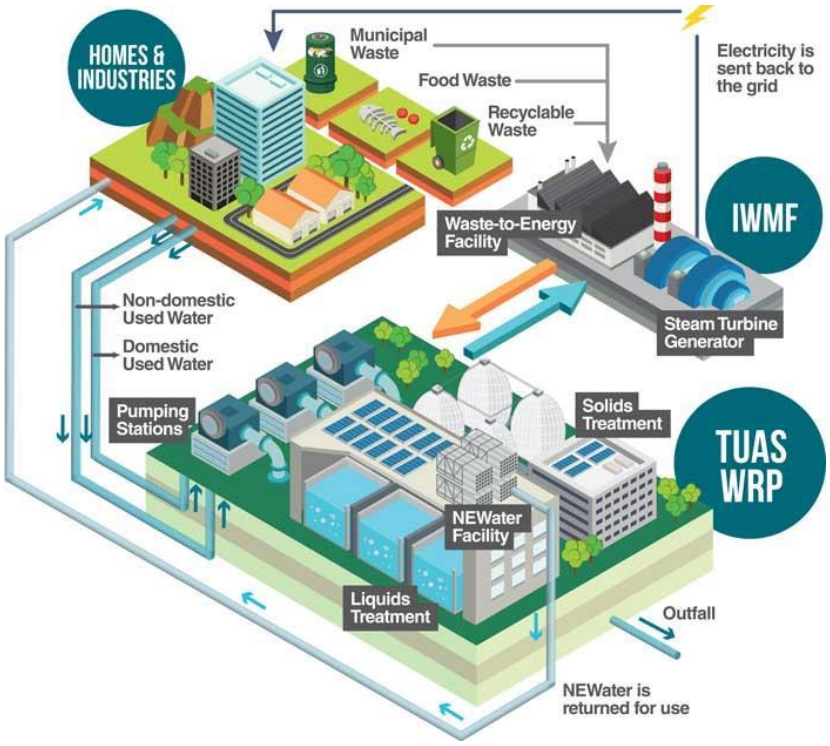
[41] Singapore Energy Mix: https://www.ema.gov.sg/Singapore-Energy-Statistics-2019

SOME EXAMPLES OF SINGAPORE'S WASTE MANAGEMENT EFFORTS

With a view to improve the current waste to energy capacity but also to diversify the waste processing solutions, Singapore is developing and has introduced numerous efforts ranging from an Integrated Waste Management Facility (IWMF), to a Mechanical Biological Treatment Facility (MBT), a RecycleRight campaign and some others. Each of these solutions is explored as a case study in the section below.

This next section highlights some of the case studies relevant to waste management and therefore by extension to the Circular Economy. It is important to note that the efforts emphasize technology, infrastructure, industry partnership, and behaviour change. These reinforce the underlying policy principles of innovation and dynamic urban governance. These efforts also indicate another aspect integral to Singapore's approach: precautionary testing of solutions before deploying them at a national scale. Examples include the plastic bag fee, the bottle recovery system, the food waste digester, as well as similar approaches in the renewable energy space.

Case Study 1 (Infrastructure)	Integrated Waste Management Facility, Tuas Nexus



(Image source: NEA)

An important development in Singapore that will improve the country's capacity to recycle waste is Tuas Nexus, a SGD 1.5 billion project which will comprise two distinct facilities operating under the jurisdiction of different state agencies: first the Integrated Waste Management Plant[42] (IWMP) under the National Environment Agency and secondly a Water Reclamation Plant (WRP) under the Public Utilities Board (PUB). The IWMP will comprise of a Waste to Energy facility capable of treating 2900 tonnes of waste per day and a Material Recovery Facility (MRF)

42 NEA IWMP https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/waste-management-infrastructure/integrated-waste-management-facility

capable of processing 250 tonnes per day. This MRF module will become one of Singapore's key technological solutions to the Circular Economy as it will be capable of sorting metals, paper, cardboard and plastics automatically. In addition to power generation, the IWMF will provide several key solid waste treatment processes in an integrated facility to effectively handle various waste streams such as incinerable waste, household recyclables collected under the National Recycling Programme, source-segregated food waste and dewatered sludge from Tuas WRP.

Furthermore, its proximity to the WRP facility will make it economically feasible to treat the dewatered sludge from water reclamation (a common practice in Singapore) which will complete the loop of a water-energy-waste nexus. The Tuas Nexus concept marks a significant change of mind-set as most waste projects have previously been developed individually with little or no collaboration between them. However, the Circular Economy will require a much stronger synergy between projects to gain collaborative efficiency. Some concerns surround the fact that enhancing the capacity of waste processing, with a heavy reliance on Waste to Energy treatment will not serve to reduce the generation of waste and that improved Waste to Energy processes may only serve to reduce the amounts of ash heading to landfill, without ensuring a focus on reducing the amounts for incineration.

Case Study 2 (Community Engagement)

RecycleRight[43] campaign

The infrastructure for Singaporeans to voluntary recycle their waste is already in place. As a matter of fact, since 2014 every public apartment block (HDBs) has been provided with a recycling bin - up from one bin for every five blocks. There are also dual chutes for refuse and recyclables in all-new HDB flats and non-landed private residential developments. The government recently conducted some studies to investigate the waste segregation habits of Singaporeans and the results show that the collection for recycling rate for the domestic sector only stands at 22%. Furthermore, 40%[44] of the domestic waste disposed of in recycling bins cannot be recycled due to contamination. Apart from newspapers which historically have been well collected (but, recently impacted by the drop in paper prices), other items and especially plastics and packaging have a relatively low recycling rate.

To improve the waste segregation at source, the Singapore government has launched the RecycleRight campaign under the broader Clean and Green Singapore initiative, a nationwide programme to raise awareness on sustainability. The RecycleRight campaign is built around three easy steps: i) Check: to follow the labels printed on the recycling bins that provide clear instructions on what items can be recycled ii) Clean: encourage people to wash items before disposing them to prevent contamination and iii) Recycle: ongoing disposal of the items in the recycling bins provided. Many public events and community gatherings are already organised surrounding this campaign to spread awareness of good recycling practices within the community.

Insights from Industry

JTC has an interesting case study that would support the RecycleRight initiative. Four years ago, JTC started to distribute recycling bins to its various partner facilities management companies. At first it was found that the participation and quality of the segregating was poor (i.e. lack of involvement and a high degree of contaminated waste). To turn the trend around, JTC put into place a new initiative called the Green Bonus scheme that returned to the companies as a bonus, any cost savings that resulted from the segregation of the waste. Following this new

[43] RecycleRight Campaign https://www.straitstimes.com/singapore/environment/transparent-bin-and-other-fresh-ideas-from-public-workgroup-to-help-singapore

[44] Recycling contamination https://www.towardszerowaste.sg/recycle-right/

scheme, it turned out that participation and quality significantly improved and remains successful to date. This specific JTC case study highlights a broader trend and one of the main challenges faced by Singapore with regard to recycling. Unless incentives are put in place for people (and companies) to segregate their waste, it is unlikely that it will succeed. Furthermore, it is important to customize the incentives to the targeted groups which may differ significantly in their behaviour triggers.

Besides this segregation example, Jurong Island, an artificial island home to the country's energy and chemicals industry, is set up in such a way that one refinery's waste stream is another industry's feedstock. In other words, JTC has designed Jurong Island to apply the Circular Economy by design and within the island's framework which is a great example of a specific large scale deployment of the Circular Economy concept in Singapore. Learning from this case study to deploy similar concepts at the national level could be a step in the right direction.

Case Study 3 (Technology)	**NEWSand Recycling of Incineration Fly Ash**

The above image shows a path and a bench made out of NEWSand (Image source NEA)

As previously discussed, Singapore's waste strategy to date has been heavily relying on incineration. Through the process, large amounts of waste ashes are generated and continuously sent to the offshore landfill. To expend its lifetime, an avenue is to significantly reduce the amount of ash sent for disposal. This can be achieved in two ways: firstly by reducing the amount of waste being incinerated in the first place for instance through increased recyclability, and secondly by reusing the ashes for other purposes. NEWSand[45] aims to collect the Incineration Bottom Ash (IBA) from the incinerator and to utilise it as raw material for construction-related applications which could include roads, pathways and a range of conventional concrete made items. To date, a pathway and 3D printed concrete projects using NEWSand have been developed and the technology is undergoing research to determine the material strength but also whether any hazardous substances could leak to the environment after storm events. As Singapore is uniquely using much of the island as an urban rainwater catchment area, this is potentially an issue that will need to be closely monitored.

[45] NEWSand NEA initiative: https://www.nea.gov.sg/media/news/news/index/newsand-a-key-to-closing-singapore-s-waste-loop

Case Study 4	NEWOil

While still in the early stages of development, Singapore wants to create NEWOil[46] by perfecting a process to give discarded plastic new life in the form of pyrolysis oil - a potential replacement for the fossil fuel petroleum. To harness this new source of oil from plastic waste, the country will need to develop its chemical recycling industry, including establishing a pilot plant that will help anchor the chemical recycling value chain.

NEWOil is an interesting project because it would add a new angle to the plastic waste issue and provide another avenue to value them. It would also make it possible to recycle plastics that are not currently included in recycling chains such as contaminated plastics, single used plastics or even plastic bags through a chemical plastic recycling process rather than conventional mechanical means. While these solutions are still being developed and are yet to be commercially viable or scaled, the innovation efforts can contribute to exploring solutions for plastics.

In addition to contributing to the plastic problem, NEWOil would also help tackle other issues such as energy dependency (Oil) and Climate Change (reduce Greenhouse Gas Emissions). Neste, the Finnish oil refining company, is one of these companies actively looking into such products. At the end of 2018, Neste made an investment decision of 1.4 billion euros to expand the Singapore refinery, which will increase Neste's renewable products[47] production capacity by 1.3 million tonnes/year, bringing the total global renewable product capacity close to 4.5 million tonnes/year when the expansion is completed in 2022. There could be a strong avenue for partnership between such European companies willing to invest heavily in Singapore and the Singapore Government with regards to the Circular Economy.

Case Study 5 (Technology)	Singapore's Pneumatic Waste Conveyance System (PWCS)

Image: PWCS system (source HDB)

Singapore has provided an efficient and easy central chute system for waste disposal in high rise buildings which however requires significant maintenance such as regular cleaning of the chutes to avoid pest proliferation. In Singapore, the ease of disposing of recyclable items has been linked to the recycling rate. In the earlier public buildings, a single chute was incorporated into every flat, which dissuaded people from going to the basement to dispose of the recyclable items in separate bins. However, newer building designs have shifted to a common floor

46 NEWoil Straightimes article https://www.straitstimes.com/politics/after-newater-look-out-for-newoil-newsand

47 Neste renewable products: https://www.neste.sg/neste-in-singapore-and-asia-pacific/who-we-are/production/singapore

chute and added a separate one for recyclables which have resulted in improving the domestic recycling rates significantly, as mentioned above.

The PWCS[48] is a cleaner automated waste collection system that uses a vacuum-type vertical and underground pipe network to collect household waste, which is then transported to a sealed container. Trucks then periodically collect the waste for disposal. The entire waste collection process is automated, thereby reducing manpower requirements and increasing productivity. Through the PWCS, separation of the waste for recycling will be made more efficient in addition to a more hygienic waste collection process.

Case Study 6 (Technology)	Mechanical Biological Treatment Facility

Another significant technology addition to boosting Singapore's waste management solution could be the Mechanical Biological Treatment Facility[49] (MBT). This will be one of only ten such facilities in Asia using next-generation technology. Typically MBT projects have three treatment components: i) extraction of the recyclables such as metals and plastics through mechanical sorting ii) the remaining waste is converted into solid recovered fuel (SRF) through biological treatment and iii) energy can be produced from the SRF with greater efficiency than if the waste was incinerated without treatment. The pilot plant will be able to process around 300 tonnes per day of domestic waste. As Singapore disposes of about 4,500 tonnes per day of domestic waste, such a plant should be able to handle around 7% of the domestic waste.

Case Study 7 (Industry Partnership)	INCUBATE Programme

Initiated by the National Environment Agency (NEA), the Innovating and Curating Better Automation and Technologies for Environmental Services (INCUBATE) programme embodies the partnership between the technology providers and services providers, premises owners, and the government, to collectively innovate and curate better technologies, solutions and innovations for the Environmental Services industry. Through this partnership, the various stakeholders for the private premises will be able to collaborate with NEA in the following areas: identify challenge statements of common interest in the areas of environmental services; conduct trials for technology, solutions and innovations to address challenge statements, and study the feasibility of wide-scale adoption in their respective premises; coordinate efforts and participate in joint projects to address challenge statements; share information and learnings from the trials; and execute viable technologies, solutions and innovations in their respective premises when ready.

While still in its early stage of deployment, some INCUBATE projects already explore the implementation of technology such as smart bins and food waste digesters (for instance JTC has been testing food waste digesters on their properties) to increase productivity and reduce costs. Automations, smart systems (e.g. artificial intelligence) and robotics applied to recycling could significantly improve recovery rates and the INCUBATE programme promises to deliver interesting innovative solutions leveraging Singapore's strong research in this field. It is interesting to note that an avenue to improve the Circular Economy is also to partner with other leading research fields in Singapore where the government is investing significantly including Biotechnology and Information Technology.

[48] HDB PWCS: https://www.hdb.gov.sg/cs/infoweb/about-us/our-role/smart-and-sustainable-living/hdb-greenprint/waste-management

[49] NEA MBT project: http://www.zerowastesg.com/tag/mbt/

Case Study 8 (Industry Partnership)	ALBA W&H Smart City

Alba Group, a Berlin-based environmental solutions company, partnered with Singapore company Wah & Hua (W&H) to drive waste management solutions in Singapore. The consortium has won a contract to provide public waste collection services within the Jurong region. Alba W&H has integrated sustainable, digital, and productive environmental solutions into its waste collection systems. For example, Alba W&H is adding fully electric waste collection trucks to its fleet to reduce fuel consumption and carbon emissions. Sensors will also be installed in some waste containers to monitor refuse level to enable greater efficiency in waste collection.

Case Study 9 (Industry Partnership)	Sino-Singapore Tianjin Eco-City (SSTEC)

Another example is the Sino-Singapore Tianjin Eco-City (SSTEC), a government-to-government project between Singapore and China. Designated as a pilot zero-waste city, novel zero-waste environmental solutions and initiatives will be explored within the SSTEC to establish a replicable zero waste reference model for other Chinese cities/areas.

Case Study 10 (Skills Development)	Environmental Services Industry Transformation Map

The **Environmental Services Industry Transformation Map,** which will enable about 30,000 people from the industry to benefit from higher-value jobs through skills upgrading and technology adoption by 2025. To prepare the industry to meet the new challenges, ES ITM was launched in December 2017 to transform the industry with higher productivity and capabilities to meet future challenges. NEA launched the Productivity Solutions Grant (PSG) in Sep 2018 to support companies to adopt commercially available and proven ES technologies, such as plastic recycling systems as well as tonnage monitoring solutions, to achieve operational efficiency and productivity while reducing manpower reliance.

Case Study (Pilot Testing)	Plastic Bag Fees

Singapore has a long history of trying soft measures to convince customers to limit their usage at supermarket outlets. It is common in Singapore for people to use double bags (usually not necessary) on grocery items which reflects a plastic bag overuse culture that needs to change. It can be said that Singapore is one of the countries with the highest plastic bag usage; indeed the numbers are revealing: 820 million plastic bags used in Singapore supermarkets alone every year for a population of fewer than 6 million people. Measures to limit the usage of plastic bags included the "Bring Your Own Bag Day" campaign by the Singapore Environment Council (SEC) or more recently small fees (SGD 0.10 per bag) charged for plastic bags at a few supermarket outlets. Often these initiatives have resulted in mixed feelings among the community as it undermines a bigger problem which is the replacement solution to dispose

of household waste down the chutes.[50] Responding to the community's reluctance to switch, the fees have now been withdrawn. While there has been a lot of debate and criticisms surrounding the use of plastic bags in Singapore the alternatives have been considered and the challenges raised are that degradable bags are not viewed as beneficial when waste is incinerated not composted, and the life cycle costs of single-use paper and degradable bags are not attractive.

Case Study (Pilot Testing)

Reverse Vending Machines

The Recycle N Save initiative by NEA and F&N Foods Pte Ltd, where 50 smart Reverse Vending Machines have been rolled out across Singapore to offer members of the public a convenient and rewarding way to return their used beverage containers. After an overwhelming response to the initial rollout of 16 machines offering SGD 0.20 for four(4) beverage containers and noting that machines were unable to handle the volumes, 34 additional machines have been introduced with the incentive dropping to SGD 0.20 for 20 beverage containers. The bottles thus collected enter the sorted plastics stream and eventually exported for treatment.

Case Study (Research)

Plastic Waste Related Research

Singapore has stepped up its research activities on how to make better use of waste and especially plastics. There are a range of ongoing research projects in Singapore laboratories, some which have already come up with promising results:

- For instance, scientists from NUS (the National University of Singapore) and the Singapore Institute of Manufacturing Technology (SIMTech) have converted polyethylene terephthalate (PET) bottles into a highly insulating and absorbent material called "aerogel"[51]. It is the first time an aerogel has been made from PET, the same plastic used for water and soft drink bottles. Their possible real-life applications include: serving as a lining for fire-retardant coats and carbon dioxide absorption masks that could be used during a fire; better heat and sound insulation in buildings; and cleaning oil spills.

- A second example is research conducted by NTU (Singapore's National Technological University) that converts[52] plastics into useful chemicals using sunlight. In laboratory experiments, the research team mixed plastics with their catalyst in a solvent, which allows the solution to harness light energy and convert the dissolved plastics into formic acid - a chemical used in fuel cells to produce electricity.

- Besides technologies to reduce plastics, a better understanding of the impacts is also required. Another example to highlight that Singapore is strengthening its plastic research is a new partnership created between the UK and Singapore. Singapore's National Research Foundation (NRF) and the UK's Natural Environment Research Council (NERC) are collaborating on research projects under the "Understanding the Impact of Plastic Pollution on Marine Ecosystems in South East Asia" (South East Asia Plastics SEAP) programme. The aim of the programme is to support collaborations between researchers in the UK, Singapore, and the wider South East Asian region to increase understanding of the impacts and risks of plastics in marine

[50] SEC study on plastic bags https://www.sec.org.sg/byobe/files/SEC_Position_Paper_on_Reducing_Plastic_Bag_Wastage_in_Singapore.pdf

[51] Singapore aerogel technology: https://www.channelnewsasia.com/news/cnainsider/made-singapore-solution-world-plastic-waste-problem-aerogel-nus-11072016

[52] NTU plastic research: https://www.eurekalert.org/pub_releases/2019-12/ntu-nss121119.php

ecosystems (including mangroves, coral reefs and beaches) and the essential services these ecosystems provide, in order to support the development of mitigation measures.

Case Study (Alternative materials)

Single-Use Plastic Alternatives

Many small businesses have been established to develop alternatives to Single-Use Plastics. These include plant-based plastics that are biodegradable (Bio-Pak), services that use returnable containers that provide alternative delivery models (e.g. barePack[53]). The World Wildlife Fund's Alternative Materials Tool (AMT)[54] is intended to aid food and beverage retailers to make conscious decisions on single-use packaging where reuse is not an option.

And several other examples, most still at the experimental stage, show that Singapore has stepped up its research activity in terms of finding innovative solutions to the waste problem. Usually, it takes many years before such innovations reach the market place and this can be expected to happen within the decade.

SUMMARY OF SINGAPORE WASTE MANAGEMENT EFFORTS

Singapore is in the process of significantly improving its infrastructure with state of the art waste processing facilities which are diverse in nature covering: waste to energy, recyclables segregation and plastics processing as well as biological treatment. Each of these efforts reflects a carefully considered approach to identifying innovative solutions to waste.

Early developments in Singapore and notably the implementation of a central chute in households combined with a mass plastic bags disposal campaign have created a situation where it has become too easy to dispose of waste without segregation and shifted public interest in the matter. Going forward, concurrently to new technological solutions implementation, **changing mind-sets towards recycling is a major challenge for Singapore**.

The current recycling landscape in Singapore shows a **great recycling disparity** between categories of items. In general, construction related wastes are very well taken care of (close to 99% recycling) but on the other hand items such as plastics (only 4%), glass and textile products have very low or comparatively (e.g. ASEAN) low recycling rates. This significant disparity highlights that more needs to be done but also points to the fact that Singapore has the potential to be a performant recycling nation by leveraging its construction waste successes and applying it to the other items along with new solutions.

Furthermore, from these solutions highlights, it appears that Singapore's strategy towards a more Circular Economy is currently **more focused on technological inputs**. Indeed, the vast majority of the funds (e.g. 1.5 billion for the IWMF) are allocated to the construction of major waste processing facilities while significantly less on other aspects of the waste stream.

A combination of significant **research** (e.g. NTU, NUS) and foreign companies i**nvestments** (e.g. Neste) in relation to the Circular Economy (especially plastics) is helping build up capacity for a new framework prone to the deployment of the Circular Economy in Singapore.

[53] https://www.barepack.co/

[54] https://www.wwf.sg/?uNewsID=364677

SINGAPORE AND BROADER ASIAN CONTEXT

To fully understand the potential for Circular Economy adoption and opportunities that the EU could seek with Singapore it is also important to understand how the Circular Economy concept has been spreading across Asia and Singapore's role within this regional trend.

A Circular Economy model is not only sought by Singapore but by several other countries in the region. While the situation varies between countries, all are facing significant waste challenges (with some being more urgent than others), marked by huge surges in the volumes of e-waste and packaging waste which is pushing these countries to increasingly pursue the Circular Economy path. As with other emerging trends, such a pursuit has become more than just finding solutions to the waste problem, but also an opportunity for thought leadership.

For instance, the Chinese government embarked on its Circular Economy journey as early as 2002 as a way to approach its urgent problems of environmental degradation and resource scarcity. China's Circular Economy grew by 15 % annually between 2006 and 2010 and reached 1.8 trillion yuan in 2015. Furthermore, a report by the Fung Global Institute and the Ellen MacArthur Foundation[55], notes that China has the potential to lead the adoption of circular economies in Asia, and possibly globally. This report highlights three important points regarding the evolution and specific challenges faced by the Circular Economy in Asia compared to the rest of the world:

- **China and Asia are experiencing rapid economic growth**. This is accompanied by rapid urbanization, infrastructure development, strains on natural resources and pollution challenges. The speed of development makes it difficult to ensure that comprehensive planning is taking place, and at the same time, it offers tremendous potential for leapfrogging to a circular system, learning from the experience of other markets and avoiding getting locked into a linear model.

- **The policy and regulatory frameworks of China and Asia present further barriers and opportunities.** Trade policies, particularly those relating to used and remanufactured goods, in some cases prevent the flow of valuable goods because they are not treated as potential resources or inputs.

- **Asia presents a diversity of cultures.** An approach that is successful in one part of the region cannot always be applied to another. The region's history and civilizations also set it apart from the EU at some cultural levels, which could, for example, impact consumer preferences. These differences should be acknowledged and taken into account.

The Circular Economy is not new in Asia and has been happening for many years. In recent years, ASEAN Member States have commenced efforts both at the regional and national level to identify tools and interventions to address the growing issue of plastics in the marine environment. These interventions include Circular Economy policies and instruments. Most recently, the ASEAN Framework of Action on Marine Debris was developed to act on the recommendations from the ASEAN Conference on Reducing Marine Debris in ASEAN Region in Phuket in November 2017. On 5 March 2019, the ASEAN Member States announced the Framework of Action on Marine Debris in Bangkok, Thailand. This Framework comprises four (4) priority areas namely: (i) Policy Support and Planning; (ii) Research, Innovation, and Capacity Building; (iii) Public Awareness, Education, and Outreach; and (iv) Private Sector Engagement. Each priority area consists of actions and suggested activities for further collaboration in the ASEAN region and among ASEAN and its partners in combating marine debris.[56] A recent collaboration between the European Union and ASEAN has resulted in the publication of the work[57] "**Circular Economy and plastics: a**

[55] CE in Asia report https://www.asiaglobalinstitute.hku.hk/storage/app/media/pdf/Circular-economy_tnv3.pdf

[56] https://asean.org/storage/2019/06/3.-ASEAN-Framework-of-Action-on-Marine-Debris-FINAL.pdf

[57] ASEAN/EU case study: https://environment.asean.org/wp-content/uploads/2020/02/Circular-Economy-gap-analysis-final.pdf

gap analysis in ASEAN member states". Below is a summary of some key findings from this report providing an overview of Major Gaps and Opportunities for the implementation of the Circular Economy in Asia:

ASEAN Country	Major Gaps and Opportunities for Follow Up Actions
Brunei	● Tackling data challenges ● Strengthening institutional capacity and addressing coordination issues ● Addressing multiple sources of plastic waste ● Promoting engagement with frontline stakeholders
Indonesia	● Reduce institutional fragmentation and establish clearer institutional responsibilities, among national government ministries as well as between the national and sub-national levels ● Strengthen technical skills and increase financial resources of local governments to implement and enforce national waste management laws and policies ● Increase the budget allocation and capacity building from central government to local government ● Encourage private sector investments for improving waste management systems and increase waste collection fees ● Develop upstream policies on product design, and plastic packaging and strengthen related legislation ● Establish strategies on Extended Producer Responsibility for the packaging sector to stimulate actions by the private sector ● Encourage dialogue among stakeholders along packaging value chains concerning design and recycling for a shift towards circular economy ● Take measures to integrate informal sector workers in collecting and sorting packaging waste ● Develop strategies for reducing plastic waste through sustainable consumption and production, including public awareness-raising and regulations ● Developing metrics for monitoring and estimating the volume and flow of plastics waste leakage ● Customise recycling technology to local contexts ● Develop structured learning programs for students on good waste disposal practices ● Raise public awareness on the issues, including by encouraging wide public participation in regular community-led-voluntary clean-up campaigns at beaches, river and mangrove forests
Laos	● Address the institutional fragmentation and unclear mandates and role sharing. In particular, clarify roles and ● responsibilities related to reduction of plastics use, source segregation, and of expansion and improvement of plastics recycling ● Expand waste separation at source for plastics. This can be done through establishing community bins for plastics and through waste banks ● Assess the demand for plastics in Laos and explore whether a domestic recycling industry could become viable. ● Provide policy support for domestic recycling companies ● Support waste pickers by providing protective gear and regular health checks. Try to organise waste pickers into cooperatives and seek ways to stabilise buying prices for waste plastics
Malaysia	● Sharing of experiences on cross-ministerial policy-making; models for how to effectively coordinate and align the work of separate ministries and government agencies ● Awareness-raising and capacity strengthening of plastics and packaging manufacturers, especially SMEs ● Support to the drafting of a packaging law, drawing from the experiences of countries that already have such legislation in place ● Guidance on how to implement EPR for selected types of plastic packaging ● Guidance on how to include plastics in the system for green public procurement ● Guidance on how the government can stimulate a dynamic national innovation system around bio-based plastics, ● involving also private financial lenders and other non-government funding sources
Myanmar	● Strengthen technical skills and increase financial resources of local governments to implement and enforce national waste management laws and policies

	• Guidance on how the government can increase the private investment for MSWM and technology development, particularly for improving plastic product design and capacity building from central government to local government • Guidance on how to develop holistic policies and strategies on plastics use and production at a national level (e.g. upstream policies on product design, and plastics packaging and strengthen legislation, public awareness-raising and regulations). • Guidance on how the government can take effective measures to integrate the informal recycling sector in collecting and sorting packaging waste to have a more integrated waste management system particularly for packaging waste • Developing capacity for monitoring and estimating the volume and flow of plastics waste leakage • Sharing of experiences on how the government and private sector can customise technology for MSWM for local contexts • Sharing of experiences on how to reduce institutional fragmentation and establish clear institutional responsibility for plastic waste management as well as product design • Encouraging dialogue among stakeholders along packaging value chains concerning design and recycling for a shift towards a circular economy • Raise public awareness on issues such as by encouraging public engagement in regular community-led voluntary clean up campaigns at beaches, rivers and mangrove forests
Philippines	• Technical advice to the drafting of a National Policy on Plastics and Marine Litter, to be developed in 2020 following the finalisation of a National Plan of Action on Plastics and Marine Litter • Capacity building on plastics issues, including also climate impacts and chemical risks, for government officials from several related federal departments – including at least all the departments that are members of the National Solid Waste Management Commission • Support to the piloting of EPR for one type of single-use plastics, reflecting past experiences of applying different EPR models (such as financial vs. physical responsibility, individual vs. joint responsibility) for various products and settings • Training of government officials on how to effectively commission and interpret life-cycle assessments, especially for comparing waste treatment options, recycling scenarios and the evaluation of alternatives to single-use plastics • Advice on circular economy options for small islands and communities in other remote locations where high transport costs result in shipping post-consumer plastic to recycling facilities prohibitively expensive • Pilot study on biodegradable/compostable diapers and sanitary pads to explore consumer/public acceptance, suitable composting methods and potential needs to revise the existing guidelines on the use of compost in agriculture • Evaluate experiences carrying out numerous existing local regulations of single-use plastics (bans and charges) • Support updating existing procurement systems to enable more sustainable sourcing, focusing the minimisation of plastics, including reducing the consumption of single-use and stimulating demand for products manufactured from recycled plastics
Thailand	Thailand is one of the largest consumers of plastics in ASEAN with the highest per capita consumption. As such, plastic waste is considered a high priority issue. Although the Ministry of Interior has led efforts to promote source separation of waste at the community level, a major obstacle is the continued contamination of low-quality waste plastics such as plastic bags. Even if future recycling activities are promoted, the relatively low value of these materials, coupled with Thailand's lack of an existing market to absorb increasing volumes of collected waste will continue to pose challenges.

Singapore despite being the smallest country in ASEAN has **an important role to play in the deployment of the Circular Economy in the region**. First, it is a small but wealthy country with a GDP of 364.2 billion USD (2018) more than any other nation (except Brunei) in ASEAN and as a result, it has the financial resources to take risks and to invest in new infrastructures, research and development necessary to fuel the Circular Economy development. Secondly, Singapore has a stable and effective government structure where policy changes can happen faster than other parts of Asia. Lastly, Singapore is often seen as a model in Asia when it comes to public policies and innovations. Successful initiatives that start in Singapore are likely to be either adopted in their current form with a Singapore branding as a mark of quality or to inspire similar actions as ASEAN countries' own initiatives. Some recent examples of this include the Singapore Green Mark Scheme and the Singapore Eco-label. The role that Singapore has to play

on the Circular Economy in Asia can be compared to what is expected for the Climate Change crisis: countries in the region expect Singapore to act first because of its economic attributes and setting. The status of current Circular Economy policies and frameworks present in ASEAN is provided in the Appendix.

The most important point to highlight about the development of the Circular Economy in Asia is that all countries have different situations with their own strengths and weaknesses. It is therefore of mutual interest that ASEAN economies start working together to lift existing barriers at the regional level and overcome these challenges by learning and supporting one another. A good example of this is the recently created Asia Plastics and Packaging Agreement 2050[58] which aims for stronger collaboration within the region on the Circular Economy.

To address this gap, the following sections will explore in greater details where the opportunities are beyond just technology adoptions and provide a detailed waste management comparative analysis between the EU and Singapore.

1.4 ADVANCING THE CASE FOR CIRCULAR ECONOMY IN SINGAPORE

The first two sections have provided specific insights on the Circular Economy contexts in both the EU and Singapore. In order to identify more opportunities and emit recommendations, the next sections of the report will focus on comparative analysis. The table below highlights some of the key building blocks for the Circular Economy in both Singapore and the EU while identifying the opportunities to improve and advance this approach in Singapore.

Table 2: Comparison of Singapore and EU Contexts

Areas of Opportunity	Singapore Context	EU Context
Policy Integration	Singapore has recently developed the Zero Waste Masterplan which invokes Circular Economy principles. However, these principles are seen to apply to the waste collection and disposal mechanisms, solely. The Resource Sustainability Act provides the legal framework for enacting and enforcing EPR and other regulations. A broader, more comprehensive framework which contemplates aspects such as source reduction, design, reduced consumption, recycling targets and landfill bans remains to be developed.	The EU's new Circular Economy Action Plan within the European Green Deal and earlier Circular Economy Packages reflect a committed attempt to introduce and ensure a Circular Economy in the EU. The EU has created and continuously further develops a legal framework, in this regard. It consists of specific Directives such as: • EU Waste Framework Directive (2008/98/EC). • EU Directive 94/62/EC on Packaging and Packaging Waste • EU Directive 2019/904 on the reduction of the impact of certain plastic products on the environment. (entered into force in June 2019) • EU Directive 2012/19/EU on waste electrical and electronic equipment.
OPPORTUNITY 1: Singapore could embrace a more comprehensive approach to the Circular Economy by enhancing its Zero Waste Master Plan while also benefiting from the refinements introduced by the EU. The shared goals of resource efficiency and climate resilience would also further the dialogue between the EU and Singapore.		
Underlying Principles (Waste Hierarchy)	While Singapore's waste management framework acknowledges the 3R principles and more recently the reduced waste approach, there is still a bias towards incineration and not a clear preference for a waste	The waste hierarchy is embedded in the early EU Directives and further emphasised in the more recent ones. The reliance on offshore recycling, limited treatment at

58 APPA https://drive.google.com/file/d/1EZvp_sxPxOw1o8of6Rd2aqKYA40MuZrx/view

	hierarchy that prioritizes reduction, reuse and recycling before recovery and incineration. An emphasis on resilience is clearly preferred- and all measures must align with its need to remain attractive to businesses maintaining its economic independence.	source and reuse efforts are now being revisited in the more recent strategies.
OPPORTUNITY 2: Singapore could re-examine the waste hierarchy and identify examples and opportunities from the EU to introduce greater emphasis and interventions at the reducing, reuse and recycling stages. Recognising the shared challenges of offshore recycling, both the EU and Singapore are in a good position to identify regional collaborations that are well supported and less vulnerable to political and business risks. Opportunities to explore innovative recycling infrastructure is another area of collaboration.		
Plastics Focussed Strategies	Even while acknowledging the challenge of plastics, to date Singapore has been overall quite weak on plastics waste policies (for instance compared to other ASEAN countries such as Thailand). Plastic bag charges have been applied with only limited success and withdrawn on cultural factors basis (e.g. reliance on hawker centres for meals and hence the extensive use of single use plastics) are often cited as going against a strict ban on single use plastics. With only 4% of collected plastics being recycled and the remainder (as much as 96%) sent for incineration, recycling policies are also lacking. Furthermore, there are currently no policies (or public discussions) in Singapore with respect to microplastics even though plastic leakage to the environment which eventually ends up becoming microplastics entering food chains is a major issue in Asia.	Europe has been much stronger on plastic recycling than Singapore. Of Europe's 25 million tonnes of plastic waste: 30% is recycled, 39 % is incinerated and 31% goes to landfill. In 2020 new rules will be proposed to ensure that by 2030 all plastic packaging in the EU market will be either reusable or recyclable. The EU Directive on the reduction of the impact of certain plastic products on the environment, which entered into force in June 2019, includes the following policy instruments: ● Restrictions on placing on the market ("bans") of cutlery (forks, knives, spoons, chopsticks); plates; straws; beverage stirrers; cups, food and beverage containers made of expanded polystyrene; cotton bud sticks; sticks for balloons by July 2021. ● Consumption reduction: EU member states can choose between different instruments to quantitatively reduce the consumption of certain single-use plastic products between 2022 and 2026 ● Product design requirements: By July 2024, caps and lids need to remain attached to bottles to avoid their leakage into the environment. By 2025, PET bottles need to contain at least 25% of recycled plastics. By 2030, all kinds of single-use plastic bottles need to contain at least 30% of recycled plastics. ● Marking requirements: Through harmonised labels on products and packaging, consumers will be informed about the presence of plastics in the product, how it should be disposed of and what negative environmental impacts would arise from littering. ● Extended Producer Responsibility (EPR): EPR obligations are extended to food and beverage containers as well as packets and wrappers for immediate consumption on-the-spot or takeaway; cups for beverages including caps and lids; lightweight plastic carrier bags; wet wipes and balloons, tobacco products with filters ● Separate collection: The Directive introduces a new separate collection target for plastic beverage bottles: 77% by 2025 and 90% by 2029. ● Awareness raising: Consumers should be informed about reusable alternatives to single-use plastics and how to correctly dispose of their waste. They should also be informed about negative environmental impacts of

		littering and improper disposal. The same applies for users of fishing gear. The EU Plastic Strategy of 2018 envisages that by 2030 all plastic packaging in the EU market will be either reusable or recyclable. The EU plans for the development of new Micro-plastic Policies and is in the process of conducting EU-wide surveys.
OPPORTUNITY 3: A strong plastics focus could be introduced to adapt the EU Directives as necessary for the Singapore context, prioritizing more challenging aspects, such as progressively reducing single use plastics production and consumption, reducing packaging waste and increasing the recovery of packaging and other plastics. Using the EU approaches of quantifying and identifying the most challenging types/ forms of plastics would be beneficial to Singapore.		
Economic Opportunity	A fourfold increase in plastic reuse and recycling by 2030 could generate US 60 billion in profit for the petrochemical and plastics sector according to a global study[59]. Preliminary studies have estimated that Singapore could reach a net benefit of 40 million by recovering and reusing materials from e-waste alone. A Circular Economy approach will also provide new economic opportunities by creating synergies and job creations.	Applying Circular Economy principles across the EU economy have the potential to increase EU GDP by an additional 0.5 % by 2030 creating 700,000 new jobs. Individual companies spend on average 40% on materials; there is therefore a significant cost reduction potential to adopt circularity.[60] Social and environmental costs are being internalized into products which will require discussions with authorities.
OPPORTUNITY 4: Given the focus on economic independence and maintaining its status as an attractive base for businesses, identifying economic and business opportunities through circularity would be paramount in the Singapore context. Studies and findings that substantiate this effect from the EU would be very useful.		
Circular Economy in Production and Design	**Source Reduction** The Singapore Packaging Agreement mentions an intent to reduce the amount of plastic waste in packaging. **Design for Reuse/ Repair In Singapore:** there are currently no regulations to oblige manufacturers to design their products more sustainably outside of the voluntary Eco-label efforts.	The EU will propose a Sustainable Product Policy Legislative Initiative.
Circular Economy in Consumption	Another opportunity for partnership is that there is a clear lack of 'Repair Culture" in Singapore where dysfunctional items are usually thrown away rather than fixed (this is not the case in other ASEAN countries which reuse and repair items to a much greater extent- Singapore is still predominantly a linear consumer centric society).	The EU will also implement a "Right to Repair" policy. In the EU, Public Authorities purchasing power represents 14 % of EU GDP and can serve as a powerful driver for the demand for sustainable products. To tap into this potential, the EU Commission will prepare a minimum mandatory Green Public Procurement criteria and targets sectoral legislation. It will also phase in compulsory reporting to monitor the uptake of GPP. The EU could learn from the Singapore Green Mark Scheme especially for the built environment and construction sectors.
Circular Economy in Waste Management	Singapore has a centralized waste collection system, which is implemented by several private waste companies. They follow the government established protocols for waste collection and disposal including the dual bin system (a blue bin for recyclables and a green	The EU Member States have successfully enforced the collection of recyclables in separate streams engaging with municipal and private waste collectors.

[59] https://www.mckinsey.com/industries/chemicals/our-insights/how-plastics-waste-recycling-could-transform-the-chemical-industry#

[60] https://ec.europa.eu/commission/presscorner/detail/en/ip_20_420

	bin for common waste). Unlike in some EU countries which have separate individual containers, all recyclables are disposed of in the same bin often leading to contamination. **Disposal Behaviour:** In Singapore more than 80% of the population lives in high rise apartment blocks with a central chute waste disposal system which further reduces the incentive to separate and segregate. Low awareness levels and a reluctance to be inconvenienced suggest that behaviour change is a critical missing component.	
Circular Economy in Recycling	**Offshoring:** Singapore has been affected by the China ban on waste exports which has shifted its plastic recycling logistics. It is important to highlight that Singapore is a major shipping hub and could play a role in the EU waste shipment regulatory formulations especially because many of the countries where the EU have been exporting their wastes are within ASEAN (e.g. Indonesia). Furthermore, the EU mind-set shift of wanting to value waste by transforming them into usable raw materials may create a waste export market for Singapore. A mutually beneficial trade agreement could be inked for this purpose. **Infrastructure:** Singapore is still to date predominantly dealing with its waste through an incineration process. Some recycling facilities are in place but currently not sufficient to develop a Circular Economy. At the current waste disposal rates, Singapore would need to build a new incineration plant every 7 to 10 years. However, Singapore is in the process of developing several high-end waste processing facilities and new infrastructures that will give a significant boost to the existing recycling capacity. Concurrently to developing these new facilities, Singapore is also trying to develop synergies between them; an experience it is currently lacking.	For many years, the EU has been exporting a significant amount of untreated wastes to third world countries. However, going forward the EU has made clear in its recent reports that it will ensure to no longer export its waste challenges to third countries and promote a “recycle in the EU” branding instead. To do this the EU will implement rules on wastes shipment.

OPPORTUNITY 5: The EU and Singapore could collaborate in establishing and improving upon the collection of recyclables and to identify opportunities for recycling both locally and regionally. While the EU has considerable expertise with separate waste collection for recycling, many Member States may find themselves in a situation not too different from Singapore when looking for local recycling infrastructure and technology as well as regional offshoring potential. Therefore learning from this process would also benefit the EU. *(*this point is elaborated further in the note on recycling capability below)*

Circular Economy Instruments	Singapore's Extended Producer Responsibility will cover packaging by 2025. It is however lacking the expertise to do so and therefore there is an imminent need for collaboration in preparation for 2025 frameworks. The EU has much knowhow on EPR to transfer to Singapore. Furthermore, Singapore is planning for a mandatory reporting framework for packaging. In Singapore, reporting has been found to improve actions for instance sustainability reporting made mandatory in 2018 for SGX listed companies is already showing signs of greater voluntary corporate actions. Singapore has started to testbed DRS systems in NTUC supermarkets. Initial findings seem to indicate low participation and high contamination rates and that much more would need to be done to make DRS a mainstream reality in Singapore.	The EPR instruments and DRS systems have been adopted across multiple Member States and the merits and demerits of each of the variations have been well recorded. Advanced reporting schemes have also been established both by government led and privately run producer responsibility organizations (PROs).
OPPORTUNITY 6: The EU could support Singapore in further deepening its EPR expertise. The varied use of EPR and other strategies to address plastics and packaging waste in the EU offer not only different approaches to enforcing these regulations but also the challenges to be anticipated and avoided. For e.g. Singapore's EPR regulation with respect to E-waste calls on experts from Netherlands and Norway. It has already been established that there will be only one PRO in operation (thus avoiding the competitive models seen in some EU countries).		
Secondary Markets and GPP	**Secondary Market**: A market for secondary raw materials is not well developed in Singapore. There is much room for improvement in this aspect. **Green Public Procurement (GPP):** Singapore's broader GPP policy can be tapped into to support increased circularity.	The EU intends to create a well-functioning EU market for secondary raw materials through: requirements for recycled content, enhanced standardization, restrictions on substances of very high concern and creating a market observatory for key secondary materials.
OPPORTUNITY 7: Even as the EU advances its efforts in establishing markets for secondary raw materials (or recycled materials) and adds greater emphasis to the offtake of green goods through mandatory green procurement targets, Singapore too is on the cusp of expanding its green procurement policy. It is an opportune timing to explore potential policy standards that could also be extended throughout the region.		
Innovation and Research	Singapore has strong research facilities and there could be multiple elements of plastic research partnerships with the EU. It is noteworthy that Singapore also has a highly developed oil and gas (and plastic) industry which can help in advancing circular solutions for plastics. Singapore has plans to set up an INCUBATE programme to help with waste innovations. Besides its Circular Economy masterplan, the Singapore Government is also investing in IT technologies. Another avenue to implement the Circular Economy is to link or connect to prominent sectors already receiving research funding such as biotechnology, IT and water. By leveraging on other fields, it would become much easier to have access to grants and funding for the Circular Economy.	

	NEA recently conducted a series of workshops[61] and the SEC produced a report on developing the local plastic recycling[62] industry and is planning (refer to the case studies in section 2.2) a deeper dive into various recycling solutions. For example, mechanical recycling to turn waste plastic into plastic pellets for manufacturing new products or chemical recycling to turn plastic waste into chemical feedstock or fuel.	
OPPORTUNITY 8: Singapore has invested heavily in its research and development capabilities and has a very strong preference for innovation. Sharing of research and collaborating on new research would be an important opportunity to liaise with the EU.		
Regulatory Framework	**Regulatory Framework**: Singapore has been well recognised for its well-developed regulatory framework especially with respect to monitoring and enforcement on other policy issues. Such an environment ensures the success of well-considered policies and measures. **Fees:** Singapore has a strong taxation framework already in place on many aspects such as carbon (recently implemented) and transportation. The implementation of a plastic tax could well work in Singapore through a progressive approach.	
OPPORTUNITY 9: The advanced regulatory framework in Singapore allows for exploring potential adaptations of successful EU regulations paving the way for a more harmonized global approach.		

OPPORTUNITY FOR ENGAGEMENT

Each of the opportunities identified above to advance the case for the Circular Economy in Singapore provide for engagement with the EU. The form of engagement could vary in accordance with the degree of expertise and advancement in the field within the EU and in Singapore. Below are main areas where opportunities for bilateral partnerships could be advanced:

Policy Cooperation: Addressing policy gaps especially where the EU has experience or expertise will advance the policy dialogue, and has the potential to support the development of strategies and solutions.

Innovation Collaboration: In contrast, where neither the EU nor Singapore have an established track record, there lies an opportunity to co-innovate and advance a combined effort.

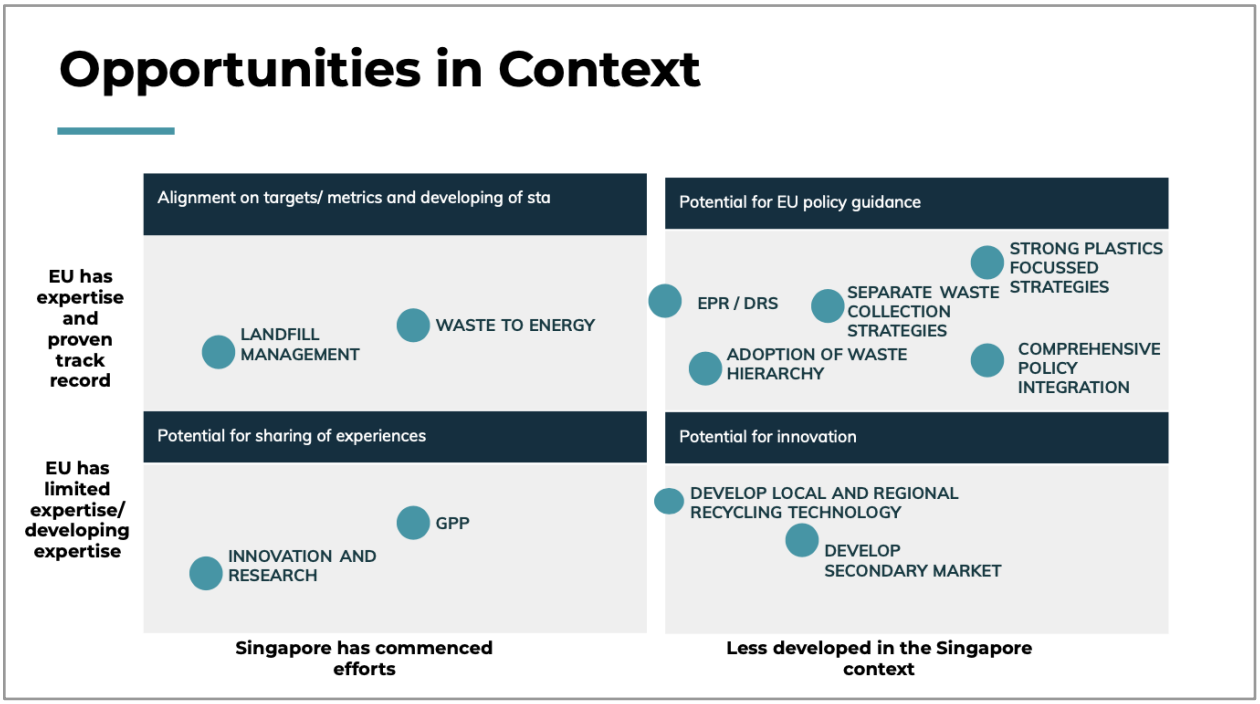
Standardisation: In the instance where both Singapore and the EU have a sufficiently rigorous approach, the form of engagement can be one that allows for aligning of standards and harmonization.

Learnings/Sharing: Where the EU has limited expertise, but Singapore has made advances (especially when it comes to innovation) there lies the opportunity to share learnings and a potential for deeper understanding of Singapore's success.

61 NEA Plastic Management Workshop https://www.nea.gov.sg/docs/default-source/envision/plastic-waste-management-in-singapore.pdf

62 SEC Plastic recycling study https://sec.org.sg/seaa/wp-content/uploads/2018/09/SEC-Plastic-Resource-Study-Paper_Final1.pdf

Graphic 5: Opportunities in Context



The above diagram puts the proposed opportunities into context drawing from the strengths and weaknesses of both geographies. It is clear that some opportunities are drawn from bilateral strength while others would utilize the strength of one geography (Singapore or the EU) to fill a weakness in the other (e.g. The EU is much stronger on plastic strategies than Singapore at this stage).

Note on Recycling Capability: As pointed out in ”Opportunity 5” an avenue where the EU and Singapore could clearly learn from one another is the regional nature of the recycling framework. Currently, Singapore collects the recyclable wastes, sorts and packages them before sending them for processing overseas. While most of the recyclables used to be sent to China, this is no longer the case following a ban on imports and now new markets need to be developed within ASEAN which explains (among other reasons) why the recycling rates have reduced in recent years (i.e. a transition period). Currently, there are no clear and transparent processes nor regulations to select overseas recycling processing partners. This decision is left to the Singapore waste contractors to decide individually. The introduction of certifications is useful in this regard. For example, EuCertPlast for a certification approach of plastic recycling companies within and outside of the EU.[63] There are also some few certified recyclers in China and Malaysia. It is understood that such decisions are business oriented to maximize the profit and as such the most economical and logistically advantageous solutions are favoured which usually means exports within close proximity (e.g. Johor in Malaysia or nearby Indonesian islands) and cheapest processing options. It is worth noting that due to this economical pressure and absence of guidance, decisions on the choice of overseas recycling facilities are not necessarily the best in terms of efficiency and efficacy (i.e. the waste may not end up being appropriately recycled overseas).

With new high end technologies and processing facilities being developed in Singapore it is expected that the recycling landscape will shift to become more and more localized rather than depending on exports. However, as it will take some time for Singapore to become self-sufficient, new policies and/or frameworks with regards to the trade of recyclable wastes within the region could be looked at beyond just safety measures which are well taken care of (e.g. trade of hazardous waste).

[63] https://www.eucertplast.eu/

The EU is facing a similar dilemma, for many years it has relied on export to process parts of its recyclable waste including exports to countries in Asia. However, following the tightening of regulations and bans on waste imports by several countries it is now forced to treat the waste within the EU.

SUMMARY ON THE EU/SINGAPORE CONTRASTS

When comparing Singapore and the EU it becomes apparent that both geographies are clearly targeting Circular Economy but are on different paths that sometimes converge and other times don't.
The comparison highlights the fact that both geographies have strengths and weaknesses. For instance, Singapore's strength relies on the **stability of its legislative system** and the ease to **enforce change**. Singapore also has the means to **invest in significant infrastructures** but on the other hand, it needs a nation-wide **mind-set change** to shift attitudes towards recycling. The EU main strengths rely on a **longer period of adoption** of a legal waste management framework which provides a strong basis for continuous evolution based on trial and error. Collaborating with the EU on the Circular Economy, Singapore could save years of trial and errors by leapfrogging innovations and implementation proved frameworks, policies and technologies.

In Singapore, it is clear that the shift to a circular economy will not occur through the actions of the private sector or communities alone but that the Government will have to step in to force a change through **regulations**. To this regard, learning from the EU will certainly be beneficial in identifying the most successful regulatory instruments.

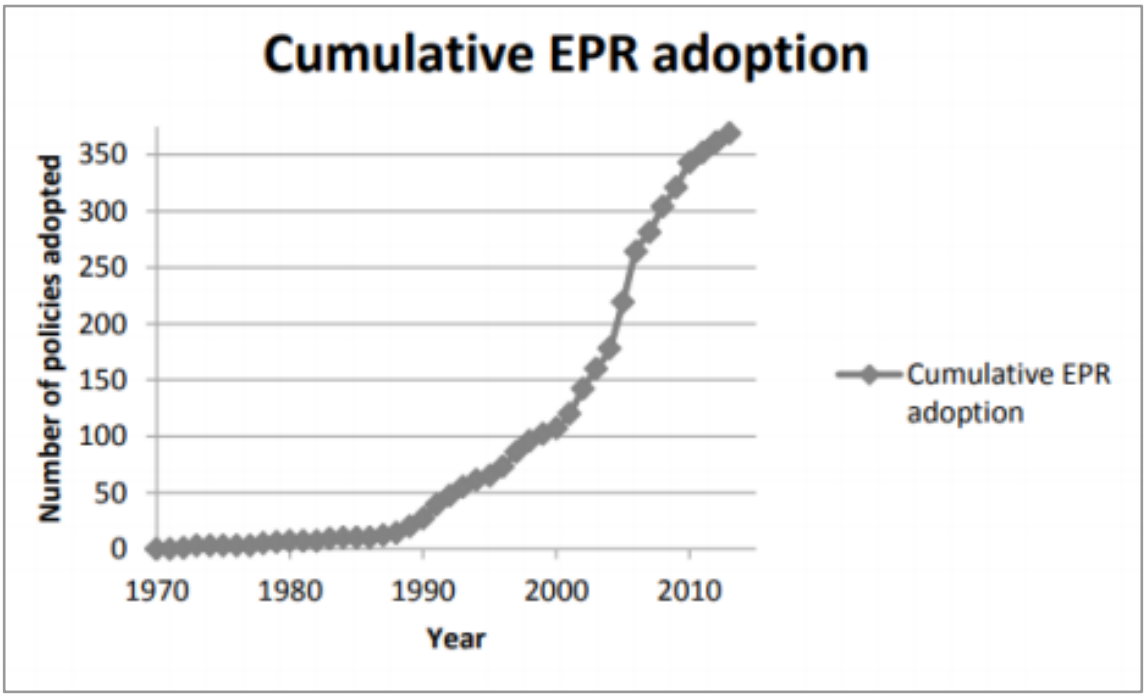
SECTION 2
EXTENDED PRODUCER RESPONSIBILITY

EPR IN THE EU AND SINGAPORE

2.1 EPR IN THE EU

Extended Producer Responsibility is a policy instrument where producers are given significant responsibility, financial and/or physical, for the collection, sorting and recycling or environmentally sound treatment of the products and/or packaging they put on the market after consumer use. Since the introduction of the EPR approach in Europe in the early 1990s, and in particular over the past 15 years, it has been quite a popular approach with over 400 EPR schemes currently in use globally, many of them in EU countries.

Graphic 6: Adoption trend of EPR in the EU



Cumulative global EPR policy adoption over time (Source: Kaffine and O'Reilly, 2015).

Such schemes promote circularity by encouraging producers to design their products and packaging in a manner that it has an end of life value. Producers would also be best suited to identify closed-loop solutions, which would mean that they are able to utilise the material value recovered from their products within their manufacturing processes. Furthermore, EPR schemes ensure industry participation in the waste management challenges and could take the form of fees, deposit-refund systems, voluntary or mandatory take-back schemes etc. According to the categorisation provided by the OECD (Organisation for Economic Co-operation and Development), four broad categories of EPR instruments have served as a backbone to Europe's EPR strategy:

- First, "product take-back requirements" which commonly involve establishing either mandatory or voluntary collection targets for specific products and materials, and assigning responsibility to producers or retailers for end-of-life management to achieve these targets.
- Secondly, "economic and market-based instruments" which provide a financial incentive to producers to implement the EPR policy in several forms, including deposit refund systems (DRS) and advance disposal fees (ADF), which are fees levied on individual products at the point of purchase.
- The third instrument is "regulations and performance standards" including technical standards and mandatory recycling rates.

- and last “Information-based instruments” which aim to indirectly support EPR programmes by raising public awareness via reporting requirements, labelling of products and information campaigns for consumers about producer responsibility and waste separation.

The choice of EPR as a preferred instrument is evident from the fact that such schemes for waste streams including packaging, waste of electrical and electronic equipment (WEEE), batteries and end-of-life vehicles (ELVs) have been systematically implemented in almost all Member States to achieve the required targets. The EU Directive on waste electrical and electronic products outlines the responsibilities of producers and distributors. The EU Waste Framework Directive’s revision in 2018 has included a definition and joint principles for EPR schemes. In its newest revision from 2018, the EU Directive on packaging and packaging waste requires that all EU member states have established EPR schemes for all packaging by December 2024, and countries such as Denmark are currently working on it. General minimum criteria for EPR schemes in EU member states are currently in development.[64]. Additional waste streams for which EPR schemes have been most commonly identified within the European Union are tyres, graphic paper, oils, and medical waste and agricultural films. In addition to the main EPR schemes, other product streams are covered by a limited number of EPR schemes in some Member States.

While the EU EPR guidance is broad and comprehensive it is variably adapted in each of the Member States resulting in the lack of a harmonised definition and scope for EPR. Moreover, many of the EPR schemes are being reviewed to remedy some typical challenges:

- Limited transparency of information especially regarding cost coverage;
- The inadequacy of control/monitoring mechanisms;
- The failure to accurately determine the amount of costs that should be internalised through recycling targets, even though they are regarded as common performance indicators for EPR policies. Thus, separate collection targets should also be considered as EPR schemes covering separate collection and treatment costs, but not a mixed waste collection;
- The lack of compliance and poor enforcement of the stakeholders involved due to multiple Producer Responsibility schemes.

To implement an effective and customized EPR framework in Singapore it would be wise to face these challenges by learning from EU best practices. Learning from the EU challenges, failures and successes, could become a significant asset for Singapore and help to significantly reduce its own risks of implementing EPR schemes. This point is also relevant to the overall Circular Economy adoption considering the fact that the EU has been implementing it for a much longer time and thus has more experiences to share.

2.2 THE SINGAPORE CONTEXT

Legislative framework: Singapore while recognizing the relevance of EPR systems has only limitedly applied this approach - and it is only recently being contemplated in the context of plastics and packaging. The RSA has mandated EPR requirements for e-waste and mandatory reporting requirements for packaging. A few companies have a voluntary take back program (e.g. Ricoh which collects back its photocopy machine ink cartridges)65 The RSA also contemplates a DRS system but it shall come into effect only in 2022 and the mechanics of such a system are yet unknown. Early-stage piloting of DRS systems have been underway in Singapore by NTUC supermarkets with little success to date which further highlights a current lack or recycling mind-set among Singaporeans[66].

[64] https://www.eunomia.co.uk/reports-tools/ec-waste-framework-directive-epr-recommendations-for-guidance/

[65] Resource Sustainability Act: https://sso.agc.gov.sg/Acts-Supp/29-2019/Published/20191004?DocDate=20191004

[66] CNA NTUC Reverse Vending Machines https://www.channelnewsasia.com/news/singapore/reverse-vending-machine-ntuc-vouchers-tampines-hub-recycling-12262070

EPR for E-waste: Singapore's approach to EPR is currently focused on e-waste. Singapore is applying a four step process to EPR implementation which comprises:

- **Definition of Regulated Waste:** The NEA defines precisely what would fall under the regulation. This comprises categories and subcategories of products to avoid any misunderstanding of what type of products are covered.
- **Producer Responsibility Scheme (PRS):** The NEA will appoint a PRS operator to develop and implement a system to organise the collection and recycling of regulated consumer products, on behalf of the producers. The PRS Operator will be appointed through an open tender in 2020, and the winning bidder will be required to: develop programmes to encourage the public to recycle e-waste; provide avenues for e-waste recycling (e.g. scheduled collection drives and e-waste bins in public areas); collect and transport the e-waste to NEA-licensed e-waste recyclers; and report the tonnage of e-waste collected to NEA.
- **Producer obligations:** provides guidelines on precisely what actions the producers need to take. For instance in the case of e-wastes this implies producers to: Register with the NEA; Keep records on regulated products supplied; Submit records on regulated products to NEA; Being a member of the licensed Producer Responsibility Scheme; Ensure collection and disposal of unwanted products; Keep records on regulated non-consumer products collected and how they are managed; and submit records on non-consumer products collected and how they are managed to the NEA.
- **Retailers' obligations:** provides guidelines on precisely what actions the retailers need to take. For instance for e-waste this involves: providing 1-for-1 take back of regulated consumer products and in-store collection of e-waste.

The case of packaging waste: Packaging waste accounts for about one-third of Singapore's domestic waste, hence represents a substantial opportunity for reduction through improved design and recycling. In 2021, brands, manufacturers, importers and retailers with a turnover over 10 million Singapore dollars are required to submit their packaging waste report as well as plans to reduce waste. As this is a new approach, it is expected that the deployment of e-waste EPR will be closely monitored by authorities to understand its weaknesses, perception by the stakeholders and areas for improvement before deploying the next category of plastics and packaging. Looking at how other schemes have been deployed in Singapore, it is expected that audits and surveys will be conducted.
If successfully implemented in Singapore, EPR has the potential to contribute to solving several waste management challenges including

i) Providing incentives to prevent waste at the source

ii) Promoting product design for the environment, which was locally initiated by the Singapore BCA (Building and Construction Authority) and SEC (Singapore Environment Council) agencies through their eco-products schemes and by a few private companies such as GreenPack, and

iii) Supporting the achievements of public recycling and materials management goals.

This will subsequently enable the Deposit-Return-Scheme (DRS) that is aimed to further increase recycling of certain types of packaging. More measures will be rolled out as part of the overall EPR program.

2.3 OPPORTUNITIES FOR EPR WITHIN THE EU-SINGAPORE CONTEXT

The table below examines in greater detail the application of EPR in Singapore so as to highlight the opportunities to most effectively use EPR in the context of plastics.

Table 3: Exploring Opportunities in the EPR Context.

Areas of Opportunity	Singapore Context	EU Context
Reporting Requirements	In Singapore, the mandatory packaging reporting requirements under the Resource Sustainability Act will commence from 1 July 2020. Companies that supply regulated goods into the Singapore market, such as manufacturers and importers of packaged products, as well as retailers such as supermarkets will be required to report data annually on the amount of packaging that they put into the market. It is worth mentioning that a significant number of products are not currently covered by the reporting requirements (only for electronics and subsequently packaging items) and that only certain companies reaching a sufficient turnover fall under the scheme. As with Eco-Labels, **the very restrictive nature of such schemes may have a negative impact on its efficiency.**	In the EU, data on packaging waste generation, recovery and incineration at waste incineration plants with energy recovery and recycling have to be provided annually by the Member States.
OPPORTUNITY 11: As this EPR process is new to Singapore there will need to be an adaptation phase for accurate data to be generated and reported by the producers. Also, relevant will be learnings from industry experience of reporting data (especially from those that have reporting obligations in other jurisdictions) and the development of advanced, transparent and effective data collection systems		
DRS Systems	The NEA will Implement a Deposit Refund Scheme (DRS) by 2022 as the first phase of the Extended Producer Responsibility framework for Packaging Waste Management. The Deposit Refund Scheme will encourage the take-back and recycling of packaging such as plastic bottles and aluminium cans. In 2019 Singapore launched the "Recycle N Save" programme. As part of this pilot, 50 vending machines were deployed at supermarket outlets throughout Singapore in what the government described as the biggest initiative of its kind to encourage the public to recycle, but initial enthusiasm has now diminished as indicated by lower participation rates. As highlighted by the MSE and other respondents, the deposit recovery system being contemplated in Singapore is partly based on systems that are in use in Germany and Norway.	DRS systems have been implemented in several EU countries such as Norway, Sweden and Germany, achieving a high recycling rate of beverage containers of over 80 %. These systems have different governance and administration models.
Advanced Disposal Fees (ADF)	Singapore has not implemented an ADF system yet.	A range of schemes[67] have been deployed throughout EU member countries especially with regards to plastic bags and batteries items. It is quite clear that there are a number of innovative approaches being implemented across Europe, but the approach is uneven. All packaging EPR schemes in the EU include some very basic fee modulation since they charge different fees to producers for each packaging material placed on the market. Fees for plastic and for composite packaging materials tend to be

[67] EPR and Plastic report https://ieep.eu/uploads/articles/attachments/95369718-a733-473b-aa6b-153c1341f581/EPR%20and%20plastics%20report%20IEEP%209%20Nov%202017%20final.pdf?v=63677462324

		significantly higher than fees for other packaging materials such as paper, card, glass and metals.
Packaging, Waste, and Landfill Taxes	Singapore is not looking into a waste tax system at this time however this could be on the agenda in the near future given other recently implemented taxes and especially the carbon tax. It is likely that the carbon tax implementation will be closely monitored by authorities and could serve as a benchmark to implement packaging and waste taxes.	Taxes also form part of the picture in the EU. The landfill taxes that are currently in place in 20 EU Member States often help to drive waste away from landfill towards preferable alternatives such as composting, recycling, and reuse. This can be particularly successful when teamed with bans on landfilling specific materials such as biodegradable and recyclable waste. Fifteen EU countries currently have landfill bans on various types of waste Packaging taxes, typically applied to producers based on the amount of material they place on the market, are also in use in several EU countries, including Belgium, Bulgaria, Croatia, Denmark, Estonia, Finland, Latvia, Malta, Netherlands, Romania and Slovenia. Some taxes relevant to plastic packaging have direct links to EPR. For instance, the Finnish beverage packaging tax incentivises participation in the DRS by offering a lower tax rate for participants registered in a DRS system. Note: It is important to note that taxes themselves are different from EPR but a useful tool to ensure/ prompt industry to consider EPR.
EPR in E-waste	**E-waste**: Singapore generates 60,000 tonnes of electrical and electronic waste each year. The NEA has only recently introduced a regulated e-waste management system that will ensure the proper collection and handling as well as the extraction of valuable resources from e-waste. The five e-products classes regulated under this EPR system are Solar photovoltaic panels, information & communications technology, ICT equipment, large appliances, batteries and lamps.	The E-waste collection and responsibility schemes vary within the EU member countries and it would be beneficial to match the most relevant case studies. Other schemes introduced in the EU are for batteries, hazardous waste, and tyres.

OPPORTUNITY 12: Given the relatively nascent EPR policy application in other industries within Singapore, it could explore the EPR potential for other materials based on EU experiences. This could also be linked to DRS systems deployments which currently lack a proper framework. The EU has a long experience with DRS systems which could certainly be of use to Singapore's implementation agenda.

Industry Partnerships	A research grant call under the "Closing the Waste Loop Initiative" was launched for the sustainable design of plastic materials for Singapore. The goal is to allow for plastics to be more reusable, easier to recycle and to extract value from waste plastics.	Together with industry, academia and public stakeholders, the European Commission has launched a Circular Plastics Alliance. It envisages to increase the EU market for recycled plastics to 10 million tonnes by 2025.[68]

OPPORTUNITY 13: To the extent that there are innovative and industry centric schemes that engage businesses in developing unique and novel approaches to address the issue of packaging design and recycling, Singapore could adapt these EU initiatives to its local context.

2.4 EPR RELATED RECOMMENDATIONS

Valuing wastes: One of the main issues going forward would be to find ways to value the waste beyond just energy production. For items besides the construction sector, the concept of circularity is relatively new in Singapore and making the business case for circularity of plastics and packaging will allow for a more robust EPR intervention. Moreover, this could also be an opportunity to advance new businesses and technologies even starting with areas such as e-waste. In 2016, the global e-waste industry was valued at €55 billion and the Singapore market is estimated at $234 million. Developing cutting-edge competence in the field of e-waste processing under environmentally and socially sustainable conditions with help from the EU could allow local businesses to lead the Asian e-waste industry, which accounts for 40 per cent of global e-waste generation. Furthermore, there is a link between plastic and e-waste recycling considering the fact that a significant portion of e-waste (e.g. circuit boards) is made of plastics (various polymers). Challenges that need to be overcome include contamination and separation of the different types of polymers from e-waste for recycling.

Recognizing Singapore's challenges: Any proposed EPR system or industry obligation must account for the limitations posed by the lack of both separate collection and recycling infrastructure in Singapore. As the situation is shifting due to significant developments in waste processing infrastructures, the EPR would need to be progressively deployed in line with available developing capacity, a situation that similar contexts in the EU could serve as case studies. Contrastingly, some relative advantages in Singapore can be capitalised upon such as a strong regulatory framework with effective enforcement and monitoring systems already in place.

Behaviour Change: Invoking the "information requirements of EPR" could be an important opportunity in Singapore, harnessing the industry to help direct behaviour change. Singaporeans lack a recycling culture to systematically segregate their waste effectively in view of circularity. As it has been highlighted in previous sections, the central chute system, implemented in the vast majority of households, and the lack of regulations on disposal have created this climax of a throwaway linear mind-set. To adopt similar recycling standards than in EU countries such as France or Germany, large scale educational campaigns would need to be carried out on an ongoing basis and EPR would be a good focus point. An example would be advertisements by manufacturers to incite consumers to return their product recyclable used parts (such as ink cartridges) and the EU could leverage on its experience to assist Singapore with this communication process.

Alternative mechanisms: Exploring other mechanisms such waste management fees as well other landfill taxes may also further the potential for engagement with the EU. Singapore's Carbon tax could be used as a framework to develop an equivalent one for plastics and packaging.

[68] https://ec.europa.eu/growth/industry/policy/circular-plastics-alliance_en

SECTION 3
GREEN PUBLIC PROCUREMENT

GREEN PUBLIC PROCUREMENT (GPP) IN EU AND SINGAPORE

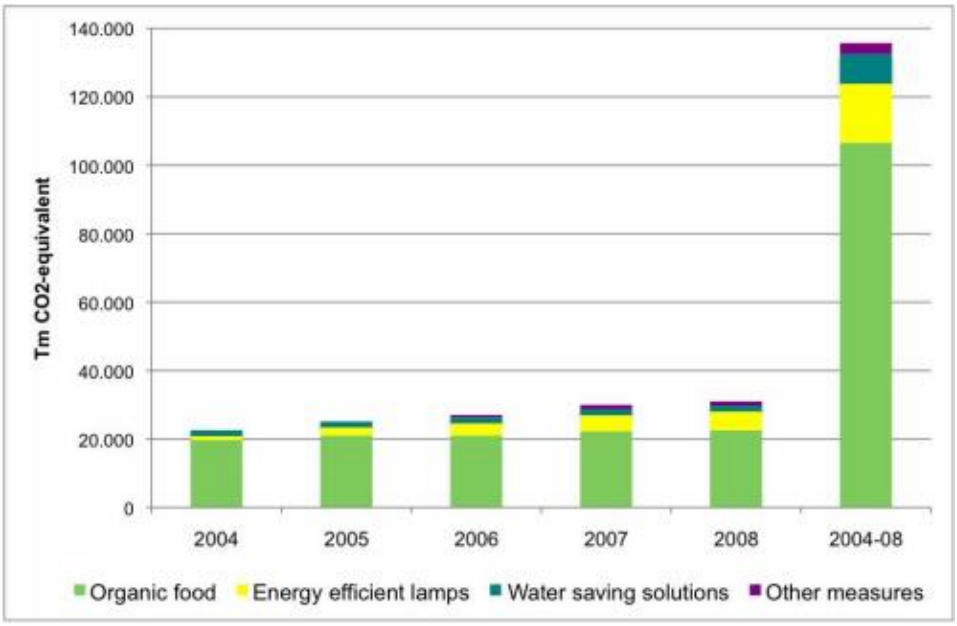
3.1 GPP IN THE EU

As defined by the European Commission, GPP (Green Public Procurement) often also referred to as "Green Purchasing" is a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured.

GPP aims to leverage the public sector's significant share of a country's purchasing power to reduce environmental impacts through the adoption of more responsible purchasing practices but also to influence the market towards the adoption of more sustainable practices. By promoting and using GPP, public authorities can provide the industry with incentives for developing sustainable technologies and products. Additionally, GPP can help stimulate demand for more sustainable goods and services, which would otherwise be difficult to reach the market, and in doing so help create a new market for these.

Case study: In 1998, the city of Vienna introduced the EcoBuy program with the aim of introducing ecological criteria in the city's procurement process. The program has been used by the city and its affiliated enterprises since 2003 and it has saved EUR44.4 million and over 100,000 tonnes of CO2 in the first three years of operations alone; it is a good example of how GPP can also be successful at saving public costs while meeting environmental targets.

Graphic 7: CO2-eq. reduction achieved with GPP in Vienna, Austria (2004-2008)



Source: Clean Energy Ministerial[69]

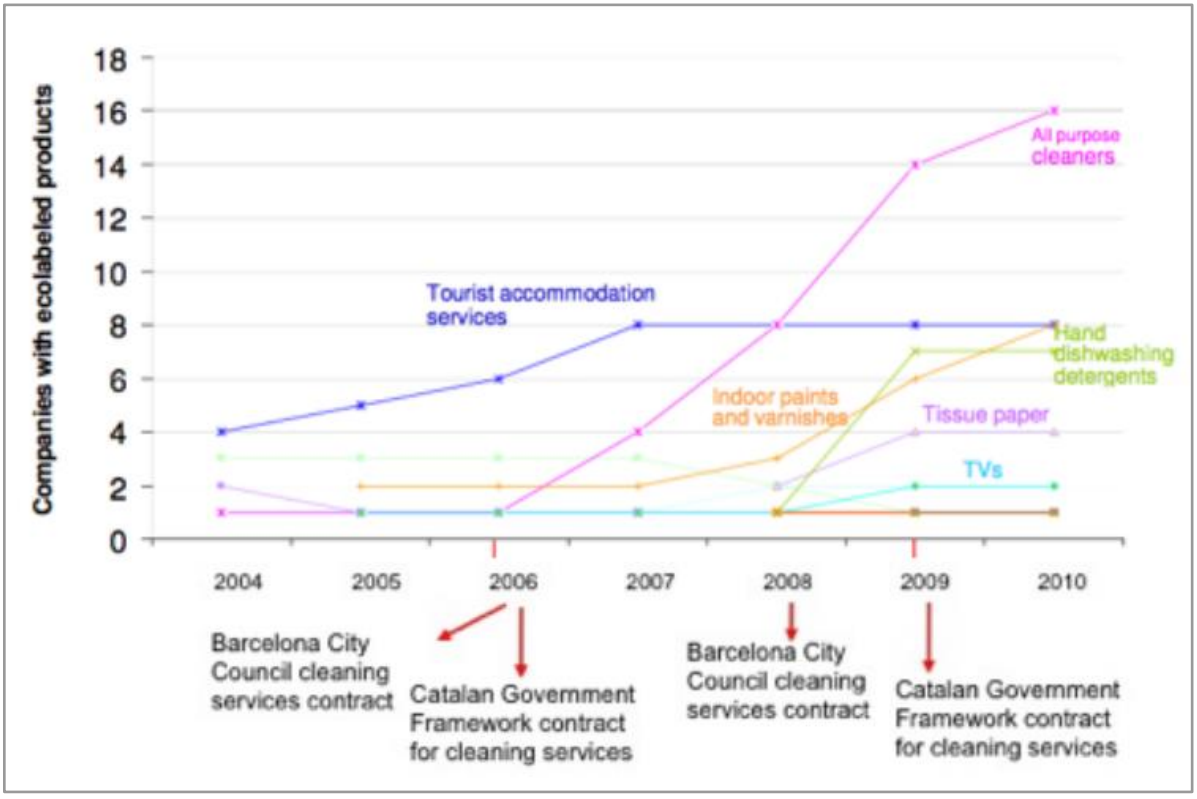
In Europe, at the centre of GPP policies are eco-labelling and similar environmental schemes which have been put in place to guide consumers on the purchase of products and services with lesser environmental and social footprints. Europe has many such labels, some of the most cited include the German Blue Angel or the Nordic Swan. With eco-labels, consumers select products and services according to specific environmental and social criteria. These criteria help guide our purchasing decisions by providing information about reusability, the use of recycled content,

69 GPP in the city of Vienna https://c2e2.unepdtu.org/wp-content/uploads/sites/3/2016/04/sead-gpp-me-guide-final-colors.pdf

reparability, etc.[70]. For businesses, eco-labels provide a means of measuring performance and also communicating and marketing the environmental credentials of a given product/ packaging. These eco-labels also encourage the behavioural change of producers and consumers towards long-term sustainability.

Case Study: Companies apply for an eco-label for many reasons, including to enhance their reputation, gain market advantage, or respond to customers' demands. Since 2004, the Department of Territory and Sustainability of the Catalan Government has been the responsible body in Catalonia for awarding the European Eco-label. In 2012, in a review of the evolution of companies by ecolabel product categories, a relatively clear relation was identified between the increase in the number of companies certifying professional multipurpose cleaners with the EU ecolabel and significant GPP actions in the Region. After major janitorial contracts for the Barcelona City Council (in 2006 and 2008) and the Catalan Government (in 2006 and 2009) included environmental criteria for cleaning products, the number of companies certifying professional cleaning products increased considerably (see graphic 8). This, together with other evidence (e.g. marketing messages stating that the company's products comply with GPP criteria) indicate that GPP has stimulated the market of such eco-labelled products in the region. For other product categories, the relationship was not seen, for several reasons such as: reduced number of manufacturers in the region that requested certification by the Catalan body (figures were only available for companies certified in Catalonia, and not Europe-wide) and lack of other product categories oriented mainly for professional use and not the general public. What this case study shows is that **GPP has the potential to significantly influence the market** towards more sustainable practices.

Graphic 8: Evolution of Companies Ecolab ling Cleaners in Relation to Major GPP Actions in Catalonia



Source: Sans, M. (September, 2012) Green Public Procurement policies drive green market in Catalonia, 8th EcoProcura Conference, Malmö, Sweden.

[70] Further analysis of these voluntary labels with regards to aspects related to circular economy (reusability, reparability, use of recycled materials and recyclability, etc.) would be helpful.

3.2 GPP IN SINGAPORE

In Singapore, current GPP directions are strongly in favour of its schemes comprising the Singapore Green Label, Energy label, Water Efficiency Label and the BCA Green Mark Scheme for buildings and construction products. However, a notable difference is that the EU has many policies and frameworks already in place on top of the Eco Labels criteria whereas Singapore still relies on its Eco Labels as main guiding principles for its GPP i.e. the current policy measures are primarily limited to public authorities purchasing items that have acquired an EcoLabel. Another important element to highlight is that green purchasing can be broad and may not necessarily relate to the Circular Economy, for instance, the purchase of energy-efficient appliances (e.g. L.E.D lights) is often considered a type of green procurement. Thus, if GPP intends to benefit the Circular Economy it is important for governments to define what is meant by green procurement.

The implementation of GPP in Singapore is likely to drive similar patterns by pushing for more products gaining endorsement under the Singapore Green Labelling Schemes. In doing so, companies will have to adapt their products and manufacturing process to more stringent ecological requirements imposed by the schemes.

Learning from Europe's journey, typically the adoption of a GPP framework would require going through a series of steps including:

- **The analysis and fitting of the GPP within local legal and policy frameworks**: Often agencies already have a set of procurement guidelines to follow legal requirements on aspects such as safety (e.g. office furniture to meet fire safety standards), ethics or competitive market rules. While implementing a GPP framework, categories of more sustainable products alternatives need to be individually assessed to ensure that such legal requirements are met, a process which can be tedious and lengthy.

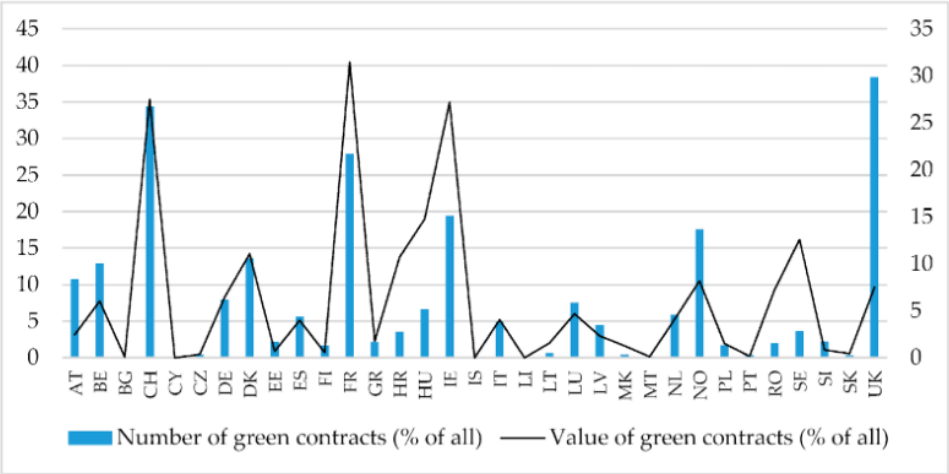
- **Understanding the market capacity and assessing costs and benefits**: Currently, sustainable products endorsed by eco-labels only cover a small portion of consumer items, thus gaining an understanding of the state of the green market is important before instructing agencies to purchase green products. The costs aspects are also of importance because usually public agencies operate on limited allocated budgets and often sustainable alternatives are still more expensive than normal options. As the cost variation depends on the type of products or services, researching the market is important to create feasible purchasing guidelines.

- **Introducing new environmental standards in procurement**: The key to GPP requires customization to the geography where it is implemented. For instance, the types of products and services purchased in Europe and Asia can differ substantially as well as the environmental impacts involved. A good example would be the palm oil or fisheries practices in Asia which would need to be reflected strongly in Green Procurement practices.

- **Raising awareness and monitoring**: To date, GPP has been a voluntary instrument, which means that public authorities can determine the extent to which they implement it. To convince the parties involved to adhere to GPP it is primordial to raise awareness on the need to shift to more responsible procurement and the mechanisms available to do so.

While GPP is widespread and has been happening in Europe for over a decade, the concept is very new to Singapore and is still in the process of being fully implemented. Given the state of advancement of GPP in the EU over Singapore, it is clear that on this aspect there is a lot of know-how to be transferred and to learn from challenges faced. For instance, the fact that GPP is not uniformly implemented throughout the EU member states reflects that implementation challenges differ greatly between countries and that customization of a framework would be required for Singapore.

Graphic 9: Green Contracts in European Countries



The proportion of green contract value, as well as the green contract quantity, out of all contracts in each country for 2012 (a more recent assessment is not readily available). If looking at all countries, the value of green contracts takes 21.81% of the total procurement value; and the green contract quantity accounts for 9.49% of all contracts. Switzerland, Denmark, Belgium, France, Ireland, Norway are countries with the highest uptake of GPP. (Source: Centre for European Policy Studies and College of Europe).

This GPP implementation disparity is also observed within ASEAN. While Singapore currently lacks focus on its GPP strategy, other Asian countries are at a more advanced stage of deployment. For instance, Thailand's GPP program started in 2005 and has targeted policies on biodegradable plastics. While biodegradable plastics strategies would not apply to Singapore considering that there are no common landfill (all waste goes to incineration before reaching the landfill), Singapore would require a more customized and targeted approach to GPP.

3.3 OPPORTUNITIES FOR GPP WITHIN THE EU-SINGAPORE CONTEXT

In order to better understand the context between Singapore and the EU, the below table provides a comparative analysis and resulting opportunities.

Table 4: Exploring Opportunities for GPP

Areas of Opportunity	Singapore Context	EU Context
Public Purchasing power	Government spending in Singapore is around 17% of GDP (2012). However, Singapore has a unique structure very different from the situation in Europe whereby the Government runs two investment companies, GIC Private Limited and Temasek Holdings, which manage Singapore's reserves. Both operate as commercial investment holding companies independently of the Singapore Government despite strong links to it, If those investment companies are counted as public purchasing, the public share of GDP would be	EU Public authorities are typically large administrations and also major consumers spending approximately 1.8 trillion euro annually which represents around 16 % of the EU's gross domestic product![71] Furthermore, in some EU sectors, public purchasers comprise a significant share of the market including public transport and construction, health services and education. Thus by using their purchasing power to choose goods and services with lower impacts on the environment (i.e. GPP), they can make an important contribution to sustainable consumption and production at the European and member countries level.

71 https://ec.europa.eu/environment/gpp/what_en.htm

	significantly higher and as a result GPP in Singapore could have a very significant impact depending on how public purchasing is defined.	
OPPORTUNITY 12: Singapore's public purchasing power is very powerful yet currently unexploited with regards to GPP. Considering its extensive experience, the EU could contribute to policy formulations and customizing sector specific purchasing solutions.		
Purchasing Guidelines	In its published "Public Sector Sustainability Plan," Singapore has provided a clear roadmap for government agencies' strategy to lead in sustainability practices for the period 2017-2020. To date, GPP initiatives remain limited in Singapore and can be summarized in four directives: First, the government has requested that all public agencies only purchase **paper products certified under the Singapore Green Label** (SGLS) administered by the Singapore Environment Council. Secondly, **all electrical appliances purchased by public agencies should now be certified with high energy efficiency** including refrigerators, televisions, air conditioners and lamps. Noteworthy is that many of these appliances are certified under Singapore's own Energy Efficiency label which is used as the guiding purchasing criteria. Thirdly, where possible, the government has aggregated demand across agencies to achieve economies of scale and **Green Sourcing requirement has been included in the government procurement contracts**. Again purchasing criteria are focused on the SGLS. And lastly, government agencies are required to organize **events and functions in Singapore Green Mark** (US LEED equivalent) certified venues. For leasing agencies, the minimum standard has been set at Green Mark Gold.	Over the years the EU has produced a range of documents including "The Buying Green Handbook on Environmental Public Procurement" advising purchasers on legal and practical aspects of GPP as well as a range of other written and online materials that could be valuable case studies for Singapore's own GPP agenda. Furthermore, since 2008 the EU Commission has developed more than 20 common GPP criteria covering various product and service groups. The priority sectors for implementing GPP were selected through a multi-criteria analysis including scope for environmental improvement; public expenditure; potential impact on suppliers; potential for setting an example to private or corporate consumers; political sensitivity; the existence of relevant and easy-to-use criteria; market availability and economic efficiency.
OPPORTUNITY 13: Singapore's GPP directions are predominantly targeting the country's own labelling schemes. While it is a good effort to promote local initiatives this also restricts the choice of green products and services. Exploring bilateral partnerships between Singapore Environmental labelling schemes and the EU Eco labels could be an avenue for GPP collaboration.		
Deployments	GPP is very new in Singapore. Main events can be linked to the Singapore GPP movement: First, the **Singapore Green Labelling Scheme** has been for many years the only source of guidance on green purchasing. The scheme has broadened its products significantly in recent years. Secondly, the **haze event** that Singapore has endured in 2012 has pushed the government to act and require all public agencies to purchase paper from sustainable sources. This was a direct response to some paper products sold in Singapore originating from companies linked to the haze.	As opposed to Singapore, GPP is already widespread in Europe and has been adopted by almost all European countries. The European GPP agenda has reached such a level of maturity that initiatives have started to spread beyond its borders. For instance the 10YFP/One Planet Network Programme on Sustainable Public Procurement was developed as a global multi stakeholder platform supporting the implementation of SPP around the world. Examples of their activities include the Asia Pacific Green Public Procurement and Eco Labelling of ASEAN countries. Another international initiative supported by the EU is the Sustainable Public Product and Ecolabelling (SPPEL) project, implemented by UN Environment. The project combines the two elements of ecolabelling and sustainable public procurement to stimulate the demand and supply of sustainable products in countries across the world.

	And thirdly, the setup of the **Green Mark Scheme** in Singapore has started a movement surrounding the construction industry focused on energy efficiency but also increasingly on buildings retrofit products.	

OPPORTUNITY 14: The EU already has an international GPP deployment programme while Singapore has some elements of this programme already in action. Seeking stronger partnerships between Singapore and the SPPEL could be a good avenue for collaboration.

3.4 GPP RECOMMENDATIONS

Broadening the GPP purchasing scope: Currently, Singapore is relying on its Green Labelling Scheme as guidance for the GPP, however, there is an opportunity to significantly broaden the choice of green products and services by collaborating with EU Ecolabels and other EU green services providers. Noteworthy, is that based on criteria description comparison the Singapore Green Label is less stringent (e.g. toxicity benchmarks, certificates) than some other European labels such as the German Blue Angels or the Nordic Swan which are known in the industry as having some of the highest standards in the world. Thus extending the list of purchasable items to EU eco-labels would not result in any quality drop. Stronger partnership with EU Eco Labels is an avenue for collaborations and this could be done through the Sustainable Public Product and Ecolabelling (SPPEL) framework already put in place by the EU.

Moving from a voluntary GPP basis to regulatory: while GPP has been a voluntary instrument, perhaps the next step would be to make it mandatory for all public agencies and also to extend it to the private sector. Considering its stronger experience in GPP, Europe could assist Singapore with this transition and policy formulation.

SG/EU Government Partnerships: As Singapore and the EU are aligned on their objectives to implement a GPP framework; this could be an opportunity to strengthen direct collaborations between Singapore and European Public Agencies. A good start would be a collaboration between the Singapore Ministry of Foreign Affairs and the European Commission as well as involvement with Singapore Enterprise. The latest is active with organising trade business missions overseas with close collaboration with the Singapore Business Federation. Trade missions could be an excellent avenue to exchange the respective Eco Labels criteria and products. Also strengthening partnerships on GPP and the broader Circular Economy between MSE/ NEA and the European Environment Agency could be explored.

Last but not least, the **ASEAN perspective** should not be taken out of the picture while looking into EPR and GPP frameworks. While to date actions have taken place at the country's level (e.g. Thailand's bioplastics policies) there is a great potential for uniformization of such policies at the ASEAN level in a similar way then what has been done by the European Commission in Europe. Considering the similar context there is an opportunity for Europe to contribute its experience on the implementation of EPR and GPP on a regional level.

SECTION 4
THE WAY FORWARD

4.1 ALIGNMENT WITH THE SINGAPORE CONTEXT

Even as each opportunity whether pertaining to Circular Economy or either of EPR and GPP is considered, some important steps must be taken into account. First alignment with the Singapore context is important. This includes:

1. **Alignment on Shared Principles:** This study explores the underlying principles and policy, however a deeper dive into the policy preferences especially with regard to the waste hierarchy is important. Reviewing Singapore's targets aimed landfill reduction and recycling to assess their impact on plastics and/or packaging. Finally, the case for a plastics focussed approach may be emphasized given the evolution of Circular Economy in the EU.

2. **Making the Business Case/ Economic Argument:** The EU may emphasize the financial benefits and therefore reinforce the economic case for a Circular Economy using examples from the Member States while also making the case for resource efficiency. Given Singapore's focus on economic independence, maintaining its status as an attractive business location and high priority on resource efficiency, this approach should be well aligned with existing goals.

3. **Aligning with the Innovation/ Pioneering Model:** Creating opportunities for innovation and allowing Singapore to leapfrog some of the stages of a Circular Economy evolution through learnings from the EU will resonate with Singapore's research and innovation centric approach.

4. **Establishing industry and community engagement:** Given the need for Singapore to ensure alignment with industry and community players, and the emphasis on a multistakeholder approach within the EU context, it makes sense to lead the dialogue with industry partnerships as well as effective behaviour change activities and community engagements.

The main opportunities for Europe are on several fronts and have been highlighted in the report. Synthesising the findings, the five most significant opportunities to seize are:

1) Strong Plastics Focused Strategies
2) Comprehensive Policy Integration
3) Separate Waste Collection Strategies
4) EPR/DRS Systems
5) Adoption of a waste hierarchy

Among all policy frameworks, **EPR** and **GPP** are the most promising considering their success stories in Europe. Particular efforts should be put in strengthening collaborations on the two policy aspects.

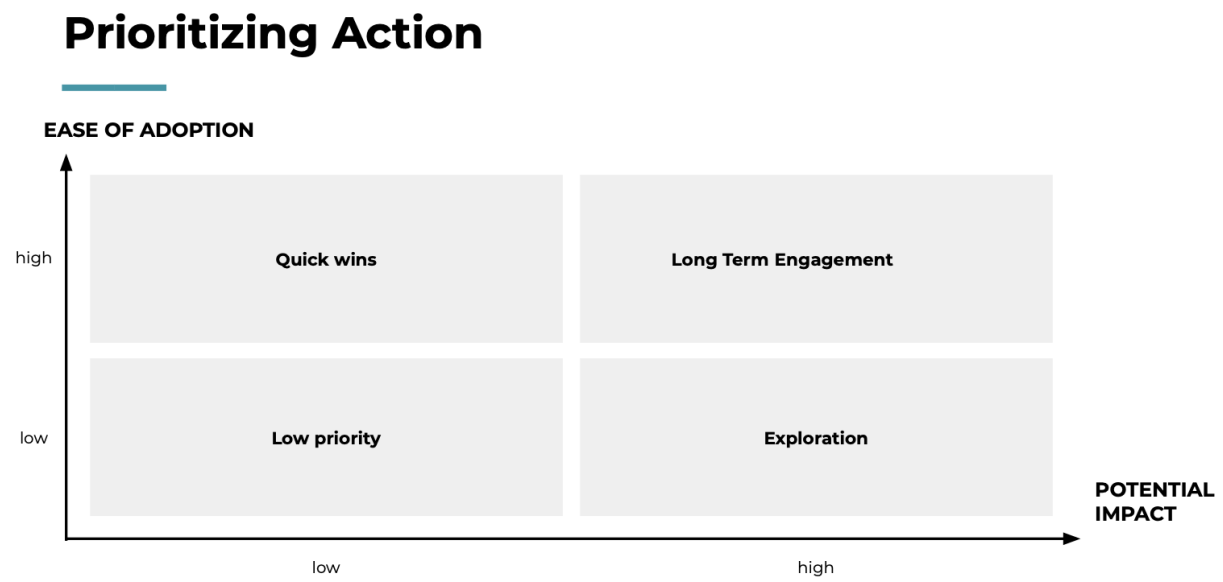
While opportunities are available and that the timing is right, the EU will inevitably face challenges partnering with Singapore on its circularity agenda. Some of these key challenges will include European technologies not always being suitable for the Singapore context, or that Singapore may favour collaborations within ASEAN over Europe. Last but not least the current **geopolitical and economic situation is rapidly shifting** (e.g. COVID 19) which could make partnerships more difficult and delay the Circular Economy adoption plans. The EU has therefore integrated circular economy and the European Green Deal into its efforts for "green recovery" from the COVID-19 pandemic.

Overall, Singapore and the EU are **well aligned** on their objectives of developing a stronger Circular Economy presence which gives an **excellent basis for collaboration**. This unique opportunity should not be delayed and this report has highlighted several areas for ongoing partnerships, some which could be implemented rapidly while others

would require a longer approach. Both geographies offer strength but also face challenges and risks which could greatly be reduced through bilateral partnerships on the Circular Economy.

4.2 PRIORITIZING ACTION

While all opportunities presented are important, in order to maximize the chances of partnerships it is important to prioritize actions and to plan a collaborative strategy accordingly. Such prioritization can also help determine the amount of efforts and resources that would need to be allocated for each opportunity. The proposed below assessment relies on a two way matrix that measures potential impact against the ease of adoption with a rating ranging from low to high:



QUICK WINS

Given the ease of adoption these strategies will build the trust and create a conducive environment for longer term engagement. Examples include:

- Adoption of the Waste Hierarchy. Singapore currently has no waste hierarchy in place as the vast majority of the waste still goes to incineration. On the other hand the EU has a developed waste hierarchy which has been in place for many years. Therefore there is a clear opportunity for experience transfer from the EU to Singapore on this aspect. As EU policies are already established this can be done quickly.
- Alignment on Landfill Management Principles. In Singapore landfill solutions have become an urgent matter as its only offshore landfill is reaching saturation.
- Innovation and Research. Singapore is pushing for active research on circularity and welcomes foreign expertise. There is also significant funding available for research in Singapore. Research partnerships between universities and research institutes in the EU and Singapore through student exchange etc. could be explored.
- Adoption of GPP and strengthening of Eco Labels. GPP is only at its early stages in Singapore but has been in place for decades in the EU. Furthermore Singapore's approach to GPP is focused on its own localized eco-labelling schemes. Exploring a more globalized approach aligned with the developed eco labels in Europe could provide a quick boost to Singapore GPP with stronger regional potential as well.

LONG TERM ENGAGEMENTS

These strategies will lead to high levels of circularity and already have the required framework to adapt to the Singapore context.

- Segregated Waste Disposal and Collection (Singapore requires a significant mind-set change towards recycling which will take a long time. Furthermore changing the collection mechanisms will also require a change in the processing facilities and overall waste management infrastructure which will take many years)
- Adoption of EPR and DRS System (such approaches are linked to the mind-set change required and will take many years to materialize)

LOW PRIORITY

These strategies are neither easy to adopt nor likely to have great impact in terms of circularity for Singapore, given disparities when compared with the EU. Examples are:

- Alignment on production and source reduction standards. This would be very complex to implement in Singapore - the charges on plastics bags have faced heavy criticism and bans on plastics may be equally resisted. The source reduction strategies may need to be prefaced by some attempts to ensure community alignment.
- Developing Secondary Market strategies. While much needed, it would be best to strengthen existing frameworks before exploring secondary markets; also gaining access to the EU secondary market would require high level trade negotiations and thirdly the secondary market is not mature yet and still in the process of being developed in the EU.
- Waste to Energy. This aspect is already well taken care of in Singapore and would be the least preferred option in terms of developing the Circular Economy.

EXPLORATION

These strategies may be harder to adopt/ implement but likely to have great impact on circularity. They merit careful consideration. Developing longer term engagement with the EU will allow for continuous guidance and knowledge sharing. Examples include:

- Alignment on a comprehensive circular economy policy with deep focus on plastics (first a proper mechanism and infrastructures would need to be in place which will take many years)
- Local and Regional Recycling Opportunities (while important and part of the solution, before embarking on regional opportunities Singapore should focus on improving its own waste management landscape).

CONCLUSION

This report has provided a detailed comparative analysis of the state of the Circular Economy in Europe and Singapore to advise the EU on where the opportunities stand in Singapore and to some extent the broader Asian region which cannot be omitted from the Circular Economy strategy given the regional nature of the waste framework.

Looking beyond Singapore, the context in **Europe and ASEAN are similar** considering the great disparity between individual member countries on the adoption of Circular Economy principles. Singapore has a robust legal framework and is leading the way on certain circularity aspects such as research and construction waste recycling. However, other aspects and in particular plastic recycling are better reflected in other ASEAN countries like Thailand. As in Europe there are a lot of opportunities to **learn from best practices at the regional and global leve**l. The Circular Economy journey has only just started in Asia and much still needs to be done to truly adhere to such a business model.

The timing for collaboration between the EU and Singapore could not be better as both geographies are in the process of increasing their efforts in waste management and aiming for stronger circularity within their frameworks. This is well expressed in recent published reports in both geographies released at about the same time. There are clear synergies of objectives to achieve and many of the specific targets set out in these reports are well aligned; a promising sign that mutual collaborations could strengthen their individual programs.

It is clear from this analysis that **Europe is overall more advanced** in terms of recycling policies, technology and deployment than Singapore's Circular Economy journey to date which is still in early stages. However, **Singapore is in the process of significantly stepping-up actions** as highlighted in its recent Zero Waste Management Master Plan providing a clear road map going ahead and has a proven track record with respect to its policy forward approach.

APPENDIX

WASTE POLICIES IN THE EU

Table 5: An overview of Waste Policies in the EU

EU Directive	Specific
EU WASTE FRAMEWORK DIRECTIVE	The **EU Waste Framework Directive 2008** provides the concepts and definitions related to waste management, waste, recycling, and recovery. Waste legislation policy is imposed as a priority in accordance with a five-tiered hierarchy of **(i) waste prevention, (ii) preparing for reuse, (iii) recycling, (iv) recovery, and (v) disposal (landfill / incineration without energy recovery)**. The waste management hierarchy is essentially an extension of the precautionary and prevention principles, establishing a priority order for waste treatment options in terms of the lowest possible environmental impact and minimization of final waste. This is done in order to provide a framework to support decision making for waste management systems at the local and/or national levels.
EU LANDFILL DIRECTIVE	The **EU Landfill Directive 1999** identifies landfilling as the least preferable option for waste disposal and requires that it should be limited to the necessary minimum. Where waste needs to be landfilled, it must be sent to landfills which comply with the requirements of the Landfill Directive. The objective of the Directive is to prevent or reduce as far as possible negative effects on the environment, in particular on surface water, groundwater, soil, air, and on human health from the landfilling of waste by introducing stringent technical requirements for waste and landfills. The Landfill Directive defines the different categories of waste (municipal waste, hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into landfill. In 2014, the European Commission adopted a legislative proposal to review waste- related targets in the Landfill Directive which aims at **phasing out landfilling by 2025 for recyclable waste** (including plastics, paper, metals, glass and bio-waste) in non-hazardous waste landfills, corresponding to a maximum landfilling rate of 25%. Also, this focus on packaging waste is reinforced by the more general target which requires that the amount of municipal waste landfilled must be reduced to 10% or less of the total amount of municipal waste generated by 2035.
PACKAGING AND PACKAGING WASTE DIRECTIVE	**The Packaging and Packaging Waste Directive 1994** specifically addresses the aspects of packaging waste, and the balancing of the sometimes conflicting policies of environmental protection and the smooth functioning of the packaged goods market. In 2004, the Directive was amended to provide criteria clarifying the definition of the term 'packaging' and increase the targets for recovery and recycling of packaging waste. In 2005, the Directive was revised again to grant new EU member states transitional periods for attaining the recovery and recycling targets. The latest revision of the Packaging and Packaging Waste Directive occurred on 29 April 2015 with the adoption of Directive (EU) 2015/720 of the European Parliament and the Council Amending Directive 94/62/EC as regards the consumption of lightweight plastic carrier bags. This directive requires that the EU countries must take measures to reduce the consumption of plastic carrier bags with wall thickness between 15-50 microns. Consumption must be limited to a maximum annual 90 bags per person by 2019 and 40 bags per person by 2025. Furthermore, these plastic carrier bags are not to be provided free of charge at points of sale of goods so as to discourage consumption. The European Packaging Directive is considered to be a world-leading benchmark for packaging sustainability. This Directive covers all packaging placed on the European Parliament and the Council market and all packaging waste, whether it is used or released at

	the industrial, commercial, office, shop, service, household or any other level, regardless of the material used. The European Packaging Directive establishes '**essential requirements**' for different aspects of packaging such as manufacturing, and composition of packaging as well as disposal and end of life treatment. The overarching packaging standard requires that: • Packaging weight and volume be kept to the minimum amount needed for safety, hygiene and consumer acceptance of the packed product; • Noxious or hazardous constituents be kept to a minimum; and, • Packaging can be reused or recovered once it has been used. • Packaging must be designed, produced and commercialised in such a way as to permit its reuse or recovery, including recycling, and to minimise its impact on the environment when packaging waste or residues from packaging waste management operations are disposed of. Packaging must be so manufactured that the presence of noxious and other hazardous substances and materials as constituents of the packaging material or of any of the packaging components is minimised with regard to their presence in emissions, ash or leachate when packaging or residues from management operations or packaging waste are incinerated or landfilled. The standards specified include: • **Source reduction (CEN EN 13428).** This standard requires that packaging weight and volume be kept to the minimum amount needed for safety, hygiene and consumer acceptance of the packed product; • **Reuse (CEN EN 13429).** The standards covering reuse require that the packaging must enable a number of trips under "predictable" conditions of use. These standards also require that the recovery standards (below) apply to such packaging when reuse is no longer possible. • **Recovery (CEN EN 13430).** These standards cover the minimum requirements for packaging recycling and recovery, specifically in the context of: • **Material Recycling (CEN EN 13431).** Establishment of a weight-based percentage of packaging material (depending on material type) that must be included in the packaging. • **Energy Recovery (CEN EN 13432).** Establishment of a minimum calorific value to allow for the optimisation of energy recovery. • **Organic Recovery (CEN EN 13433):** Establishment of requirement with respect to compostable packaging, such that it doesn't challenge existing composting processes or applications. With respect to biodegradable packaging, the resulting compost must breakdown into the components of carbon dioxide, biomass and water.

WEEE DIRECTIVES	Two directives aimed at improving the environmental management and resource efficiency of WEEE are:
	• **The WEEE Directive 2002** [72] which addresses:
	  ○ Preventing the creation of waste electrical and electronic equipment (WEEE)*;
	  ○ Promoting reuse, recycling and other ways of recovering waste from the electrical and electronic equipment.
	  ○ Supporting the efficient use of resources and recovery of valuable secondary raw materials.
	• The **RoHS Directive 2011,** which restricts the use of certain hazardous substances in electrical and electronic equipment.[73]

[72] https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=CELEX:32012L0019

[73] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32011L0065

CIRCULAR ECONOMY PACKAGE 2015	The **Circular Economy Package** released in 2015 presented an action plan for the circular economy and four legislative proposals amending directives on waste including three relevant to packaging waste: Waste Framework Directive, Landfilling Directive and Packaging Waste Directive. [1]The new recycling and landfilling targets are expected to boost the re-use of valuable material in waste and improve the way municipal and packaging waste is managed, thus making the circular economy a reality. These include : • Recycling targets for municipal waste are set at 55% by 2025 and 65% by 2035 (previously 50% by 2020) with differentiated targets for each of the different waste streams. • Packaging waste has higher target rates with 65% to be recycled by 2025 and as much as 70% by 2030. • In addition to the separate collection, which already exists for paper and cardboard, glass, metals and plastic, new provisions for separate collection, the inclusion of bio-waste is expected to boost the quality of secondary raw materials and their uptake. The Circular Economy Package anticipates the use of effective economic instruments and other measures in support of the waste hierarchy. Producers are given an important role in this transition through EPR schemes – meaning a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle.
PLASTICS STRATEGY	Under the Plastics Strategy 2018, the European Union decided to announce a series of actions to spearhead a global movement towards Circular Economy. The highlights of the Plastics Strategy are to: • Make recycling profitable for businesses, • Curb plastic waste, • Stop littering at sea, • Drive investment and innovation, and • Spur change across the world.
SINGLE USE PLASTICS DIRECTIVE	The **Single Use Plastics Directive 2019,** is a recent initiative being considered by the EU which goes one step further in addressing plastics products and plastic packaging that are typically intended to be used just once or for a short period of time before they are thrown away. One of the main purposes of this proposed directive is to reduce the amount of plastic waste created. The language of this proposed directive requires that the design of plastic products should always take into account the reusability and recyclability of the product. Where possible, the measures laid down in this proposed directive and their implementation should give priority to waste prevention or to the transition to reusable products rather than to other single-use alternatives. The products banned include: • Plastic cutlery (forks, knives, spoons and chopsticks), plates and plastic straws; • Food containers made of expanded polystyrene, such as fast food boxes, with or without a cover, used to contain food that is intended for immediate consumption either on-the-spot or take-away, and that is ready to be consumed without any further preparation, like cooking, boiling or heating; • Beverage containers made of expanded polystyrene; • Cups for beverages made of expanded polystyrene; and, Products made from oxo-degradable plastic (this term refers to plastic materials which contain additives that promote oxidation of that plastic into micro fragments under aerobic conditions). These oxo-degradable additives can include organic and inorganic additives such

	as plant starch material, and metal ions such as iron, cobalt, nickel and other stearates. In addition, the member states will be required to take the necessary measures to achieve a measurable quantitative reduction in the consumption of the following products: • Food containers made of plastic, such as fast food boxes, with or without a cover, used to contain food that is intended for immediate consumption either on-the-spot or take-away, and that is ready to be consumed without any further preparation, like cooking, boiling or heating; • Plastic cups for beverages, including their covers and lids; and • There will be a binding target of at least 25% of recycled plastic for Polyethylene Terephthalate (PET) beverage bottles from 2025 onwards, and by 2030 all plastic bottles will be required to comprise at least 30% of recycled content.
CIRCULAR ECONOMY ACTION PLAN 2020	The Circular Economy Action Plan (March 2020) aims to make the EU economy fit for a green future, strengthen competitiveness while protecting the environment and give new rights to consumers. Make sustainable products the norm in the EU. The Action Plan includes focus on a Sustainable Product Policy, to ensure that products placed on the EU market are designed to last longer, are easier to reuse, repair and recycle, and incorporate as much as possible recycled material instead of primary raw material. Single-use will be restricted, premature obsolescence tackled and the destruction of unsold durable goods banned. The Action Plan also brings focus on the sectors resource-intensive and where the potential for circularity is high. This includes: • Electronics and ICT – a 'Circular Electronics Initiative' to have longer product lifetimes, and improve the collection and treatment of waste • Batteries and vehicles – new regulatory framework for batteries for enhancing the sustainability and boosting the circular potential of batteries • Packaging – new mandatory requirements on what is allowed on the EU market, including the reduction of (over)packaging • plastics – new mandatory requirements for recycled content and special attention on microplastics as well as biobased and biodegradable plastics • Food – new legislative initiative on reuse to substitute single-use packaging, tableware and cutlery by reusable products in food services. The Action Plan also proposes the transformation of waste into high-quality secondary resources that benefit from a well-functioning market for secondary raw materials. An EU-wide, harmonised model for the separate collection of waste and labelling has been proposed under the Action Plan. The Action Plan also puts forward a series of actions to cut down EU exports of waste and tackle illegal shipments.

Table 6: Current Plastics policies and strategies of ASEAN Member States
(Source: Enhanced Regional EU-ASEAN Dialogue Instrument Report[74])

Country	Plastic specific strategy	Ban of Single use plastics	Levy/charge on single-use plastics	Deposit Refund scheme	EPR-based recycling policies	Sorted collection	Voluntary scheme/ pilot projects	Import regulation
Brunei							No Plastic Bag Everyday Initiative	3 percent excise duty imposed on plastic imports
Cambodia			Sub-Decree on Management of Plastic Bags (2017)			Sub-decree on plastic waste management		
Indonesia	National policy and strategy on solid waste management (including plastic waste) regulated by Presidential Regulation No. 97/2017. National Action Plan on Marine Debris (2017-2025)	Bali Province and 18 cities and regencies have enacted regulations banning single-use plastic including shopping bags, straws, and foam containers for food.	Finalising government regulation concerning excise on plastic shopping bag. Based on modern retailer association initiative, some stores charge IDR200 per plastic shopping bag.	Planning to use DRS scheme for PET bottle and aluminium can.	Finalising ministerial regulation on EPR road map to prevent and reduce product and packaging waste from brand owner manufacture r, retailer, and food/beverages service industry	Partially implemented in some cities and regencies.	Three pilot projects of take-back and recycle scheme for PET bottle, TetraPak carton, and flexible plastic (sachets and pouches)	Import of waste (any types of waste including plastic waste) is prohibited by Law. However, import of plastic scrap that is ready for recycling is still accepted.
Lao PDR						Mandatory by law but not enforced	Community solid waste management project	
Malaysia	Roadmap towards Zero Single-Use Plastics (2018-2030)	Drinking straw ban	Pollution charge; Ban on nonbiodegradable plastics; Levy on plastic bags		Planned –but not yet applied	Pilot level in selected city areas		Taxation of waste plastics

74 https://environment.asean.org/wp-content/uploads/2020/02/Circular-Economy-gap-analysis-final.pdf

Myanmar	National MSW strategy includes Plastics section					Pilot level in selected city areas		Notification No 22/2019 of Ministry of Commerce: all import of wastes to Myanmar is restricted
Philippines	Under development	Partial bans on the use of plastic bags			Proposal under discussion in the Senate	Yes	Local bans on the use of plastic bags	
Thailand	Thailand Roadmap on Plastic Waste Management (2018-2030)	Phasing out of single-use plastics by 2022 - Products containing Oxo - Plastic cap seals - Plastic bags thinner than 36 micron - Foam containers for foods - Straws and glasses	Tax reduction for retailers using biodegradable plastics - Planning levy or tax on single use plastic products and packages	Studying possibility of deposit refund system for packaging	Development of WEEE and 3R promotion laws with concepts of EPR and circular economy	The Ministry of Interior and the Ministry of Public Health notifications on municipal solid waste separation and collection	Pilot project on plastic waste collection in Coastal area - Reduction of plastic bag in department stores and convenience stores	Import ban on plastic wastes
Viet Nam	Planning (National Strategy on ISWM to 2025, vision to 2050)		Levy on nonbiodegradable plastics		Not yet applied		Program on control of waste from plastic bags	Trade import regulation for quality; Considering tax for import of single-use plastics

QUESTIONNAIRE SENT TO KEY STAKEHOLDERS IN SINGAPORE

Q1. In its Zero Waste Master Plan, Singapore is aiming to reduce the amount of waste (per capita) to be sent to landfill by 30%. What do you think are key changes Singapore would need to make to achieve this target?

Q2. What is your opinion of the efforts Singapore has made to transition to a Circular Economy, specifically, the soon to be launched Integrated Waste Management Facility, the Mandatory Reporting Requirements, and the Deposit Recovery System?

Q3. In your opinion how does Singapore benchmark at present against other countries in terms of its Circular Economy strategy and related achievements? Within ASEAN and/on a global level? What could Singapore teach, or learn, from other countries?

Q4. In what way are the Circular Economy frameworks adopted in other countries, particularly the EU, relevant or irrelevant to the Singapore context?

Q5. What do you see as the main challenges to implement a widespread Circular Economy framework in Singapore (e.g. behavioural change, technological changes, policy changes…)? Please elaborate on why you think they are major challenges given the Singapore context.

Q6. In your opinion what would be the most appropriate infrastructure and/ or technology investments to make the Circular Economy a reality in Singapore?

Q7. What limitations, if any, are posed by current practices and behaviours such as chute disposal, reliance on food courts and hawker centres in transitioning to a more circular economy with respect to plastics and packaging?

Q8. How might the current processes, such as investments in incineration plants and the absence of recycling infrastructure limit the transition to a Circular Economy? What do you think of the financial viability of Circular Economy within a reasonable timeframe here in Singapore?

Q9. It is clear that the adoption of a Circular Economy will require involvement from public, private and civil society. What contribution do you anticipate from each of these three sectors?

Open question: Do you have any thoughts or insights in the transition to a Circular Economy or its more popular instruments such as EPR, Green Procurement Policies etc.?

SUMMARY OF RESPONSES TO QUESTIONNAIRE

In order to capture specific insights from a range of stakeholders, we have submitted the above questionnaire to the following agencies: **BASF, EDB, JTC, Norwegian MFA, ZeroWaste SG, NEA, and MSE.**

The general feeling that the answers convey is **positive** regarding the fact that Singapore is stepping up its efforts on the Circular Economy. All respondents felt that **not enough has been done to date** in Singapore and that it is critical that solutions to the waste crisis be found within the decade.

All respondents felt that Singapore will **not be able to solve its waste problem on its own** and that collaboration is key. They also acknowledge the fact that the **EU has more experience** on the matter and will be able to bring in valuable knowledge and experience to boost Singapore Circular Economy strategy.

Respondents felt that Singapore's response may be **too focused on technology** and that **diversified actions are urgently required**. While most supported the technology investments. Some even felt that technology alone may worsen the problem further.

All agreed that **mind-set change is one of the key challenges** that Singapore will face in adopting the circular Economy and that it will take time to change poor recycling habits. Some respondents highlighted the fact that Singapore has made it **"too easy" for people to dispose of waste** without segregation and that this waste culture has been anchored in people's mind-set and habits. As one of the respondents puts it clearly, changing mind-set will require much effort on the magnitude of the Dengue prevention campaigns.

Some respondents highlighted the fact that providing **stronger incentives is required** to change mind-set and initiate recycling habits and that finding the right incentives to convince specific groups will be key to success.

While some felt the Government should take the lead on the Circular Economy others argued that the private sector has an equally important role to play and could drive faster change.

Overall, respondents felt positively about the strengthening of the Circular Economy Agenda in Singapore and that the **EU could significantly improve the situation** in Singapore but not without challenges; in the end, it is up to Singapore to make the change.

IMPRINT

This Comparative Policy Study was commissioned by Expertise France in connection with the project “Rethinking Plastics – Circular Economy Solutions to Marine Litter.” The “Rethinking Plastics” project is funded by the European Union and the German Federal Ministry for Economic Cooperation and Development (BMZ) and is implemented by Expertise France and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The contents of this publication are the sole responsibility of Expertise France and GIZ and do not necessarily reflect the views of the European Union or the German Federal Ministry for Economic Cooperation and Development.

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ACKNOWLEDGEMENTS

Cover Photo Credit: Photo by https://unsplash.com/@visualscenes

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We are very grateful for the contributions, inputs, and insights provided by the below organizations in the course of developing this research report.

The below organisations have contributed to our Circular Economy Questionnaire.
MSE: Ministry of Sustainability and the Environment
NEA: Singapore National Environment Agency
MFA: Norwegian Ministry of Foreign Affairs
EDB: Singapore Economic Development Board
JTC: Singapore Jurong Town Council
ZERO WASTE SG: Singapore non-profit organization
BASF: Chemical multinational company