Singapore International Chamber of Commerce

The voice of international business in Singapore

SICC's Position Paper on Circular Economy in Singapore

Call for action of the position paper

The Singapore government needs to create and communicate a circular economy roadmap for Singapore – which has consideration of appropriate standards and processes that can be utilized and potentially incentives to encourage industry to adopt these standards.

1. This will put Singapore in the forefront in ASEAN and ensure that Singapore is in-line with other industrialized nations such as those in Europe with existing national roadmaps for circular economy.

2. This roadmap will enable every major industry and government agency in Singapore to understand the role that they can play to move towards a circular economy.

Singapore's current position in circular economy

In a first Facebook live panel discussion broadcasted worldwide in May 2018, Singapore Minister for Environment and Water Resource Mr. Masagos Zulkifli stressed on the importance of a circular economy which is complemented by the adoption of smart technology. The aim is for Singapore to become a 'zero waste' society by 2030. It is also reported that adoption of smart technology for circular economy will help Singapore spearhead towards a creation of more start-ups in this area and will see an increase in demand for additional jobs in technology solution providers.

There are existing initiatives and programmes in place by the National Environment Agency (NEA) around the 3Rs (i.e. Reduce, Reuse and Recycle) such as the 3R Fund, Close the Waste Loop Initiative, e-waste management and food waste management, Singapore Packaging Agreement (SPA) and the National Recycling Program. These initiatives and programmes provide opportunities as well as initial guidelines for both businesses and individuals to participate in the 3Rs.

However, there's increasing need for the government to work together with people and industry to realise its goals. This could be achieved by providing the necessary framework and support needed for all individuals and businesses to start adopting a 3R mindset and put that into action.

Building a supporting environment for circular economy in Singapore and the region

With the rapid increase in waste generation following an increase in population size, there's a need and potential for Singapore to take the lead in Asia's circular economy. E-waste in Asia alone is estimated at SDG 35 billion annually[1] and continues to grow. A structured system both for e-waste, packaging waste and food waste should be in place. Much is also needed in ensuring that standards for green bonds are in place as they pose strong growth across all bonds in the future.

[1] Analysis based on The Global E-waste Monitor 2017

It is crucial that Singapore starts building a strong foundation to support the circular economy by focusing on key business aspects of turning waste streams into resources, as well as on energy and greenhouse emissions, all critical contributing factors to maintaining a safe and comfortable living environment.

E-waste

Singapore has the second highest per capita generation of e-waste in Asia at an estimated 21 kg in 2018[2]. Only 6% is known to be recycled, as revealed by a recent National Environment Agency (NEA) survey. This is less than one-third of the global average of e-waste that is documented to be collected and properly recycled[3]. The remaining 94% is untracked and at least a quarter is known to end up in the trash bin.

E-waste contains hazardous substances that requires safe handling for environmental and health reasons. It is also rich in precious metals that will be lost to the economy if not properly recycled. NEA recently announced that it would be enforcing Extended Producer Responsibility (EPR) legislation for e-waste in Singapore by 2021. A well-formulated EPR and investments in the e-waste sector can give Singapore the following benefits:

1. Increased volume of collected e-waste, leading to economies of scale of the e-waste industry.

2. Developing cutting edge competence in the field of e-waste processing will enable Singapore to lead the Asian e-waste industry, estimated at SGD 35 billion.

3. Safe handling of all parts of the e-waste stream. Cherry picking of valuable components and rejection of non-profitable items is inevitable without an EPR.

4. One overall system is easier to communicate and comply with than scattered voluntary efforts.

Below are four key success factors from the Swedish e-waste collection system, which has one of the highest e-waste recycling rates at 55.4%[4], a relevant case for Singapore to take inspiration from:

1. **Clearly defined stakeholder roles and responsibilities**

   The Swedish e-waste EPR legislation clearly describes the roles and responsibilities of each stakeholder. This, coupled with close collaboration between stakeholders, has been a key to the success.

[2] Regional E-waste Monitor 2017
[3] The Global E-waste Monitor 2017
[4] EuroStat 2016

2. **Availability of recycling drop-off locations**

   The Swedish collection system is well distributed, easily accessible and keeps improving over time. Information is easily accessible on municipalities' or recycling organizations' websites.

3. **Transparent data collection and sharing**

   The Swedish system tracks and monitors the amounts of e-waste generated and processed, composition, efficiency of collection and recycling methods. Producers are compelled to report on predefined statistics, much of this data being publicly available. This enables the government to:

   i. Assess, set and follow up reduction and recycling rate targets
   ii. Provide a foundation for efficient policy making
   iii. Ensure safe recycling practices and policy compliance
   iv. Identify best practices, improvement potential and new opportunities

4. **Extensive recycling campaigns and public buy-in**

   The Swedish EPR requires the various stakeholders to inform and educate consumers on why and how to segregate and recycle their e-waste. What truly distinguishes Sweden's recycling campaigns is a quality and invested effort that clearly communicates that recycling is a priority.

Food waste

In 2017, 809,800 tonnes of food waste was generated in Singapore. Of this, 16% was recycled, the rest was sent to waste-to-energy plants for disposal and was subsequently incinerated.[5] In order to tackle food waste, NEA has developed 4 food waste management strategies: 1) Prevent and reduce food wastage at source, 2) Redistribute unsold / excess food, 3) Recycle / treat food waste 4) Recover energy. Outreach programs such as educational materials, guidebooks and community-led initiatives as well as resource packages for schools have also been developed. NEA's 3R Fund provides companies the opportunities to get co-funding up to 80 per cent of qualifying costs, subject to a cap of $1 million per project, for projects that can reduce, reuse or recycle at least 100 tonnes of waste for the duration of the project. This is particularly attractive for new and innovative processes and concepts which target waste streams with low recycling rates such as food.

As food waste disposed in Singapore has increased by 35% over the past 10 years, more can be done between the public and private sector, as well as individuals to promote and instill a culture of reducing and recycling food waste.

At the industry level, NEA is currently conducting food waste audits with several establishments across the food industry including manufacturers, wholesalers, warehouses, caterers, hotels, shopping malls, hawker centers and supermarkets.

[5] NEA 2017 Waste Statistics

We would like to urge the legislators to consider Japan's Law for Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources (also known as the "Food Recycling Law") that came into effect in 2001 and amended in 2007.

Prominent features of this law include:

1. A call for the reduction of overall food waste generated

2. Setting numerical 2019 recycling targets for food industry groups:

    a. Food manufacturers (95% recycling target)
    b. Food wholesalers (70% recycling target)
    c. Food retailers (55% recycling target)
    d. Restaurant industry (50% recycling target)

3. Mandatory regular reporting of the amount of food waste generated by businesses which produce more than 100 tons of food waste annually

4. Development of criteria for food-related business to reduce waste generation, waste volume and to increase recycling

5. Development of measures specifically to promote food waste recycling by the private sector through the registered recycling business operator system and recycling business plan approval system

An example of this law's success is showcased by the increase in food waste recycling among food industry groups:

a. Food manufacturers (recycling rate increased from 60% in 2001 to 95% in 2015)

b. Food wholesalers (recycling rate increased from 32% in 2001 to 60% in 2015)

c. Food retailers (recycling rate increased from 23% in 2001 to 47% in 2015)

d. Restaurant industry (recycling rate increased from 14% in 2001 to 23% in 2015)

The overall food industry recycling rate in Japan has increased from 37% in 2001 to 85% in 2015 since the implementation of the Food Recycling Law.

Within the food retail industry, UK's Tesco offers a benchmark for retailers in a few areas:

1. **Data Transparency**

    Tesco in the UK is a global benchmark for retailers with regards to food wastage and data transparency across the supply chain for its commitments. They have been openly reporting their food wastage data for specific food wastage hot spots since 2013 with clear definitions and explanations on how the food waste and loss data is calculated.

2. **An agreement to donate surplus food**

   Tesco signed the Courtauld Commitment 2025, a voluntary agreement to cut food waste by 20% by within the decade. Tesco uses an app, FoodCloud, to itemize the surplus food in each store at the end of the day which is then shared with local charities that collect the food.

3. **International standards**

   Tesco follows the Food Loss & Waste Accounting Standard (FLW Standard) in its annual food wastage reporting. The Food Loss and Waste Protocol which comprises of UN's Food & Agriculture Organization (FAO), UN Environment (UNEP), World Business Council for Sustainable Development (WBCSD) and other globally respected organizations launched the FLW Standard to help companies, countries, and others understand how much, where, and why food loss and waste (FLW) is occurring—so they can measure and manage it.

   The FLW Standard is a global standard that provides requirements and guidance for quantifying and reporting on the weight of food and/or associated inedible part removed from the food supply chain—commonly referred to FLW. Using the standard enables countries, cities, companies, and other entities to develop inventories of how much FLW is generated and where it goes.[6]

At the household level, as part of the Solid Waste Management Technology Roadmap, NEA has screened a few technologies for effective separation of food waste in HDB blocks and condominiums. These include dual chute separation systems or technology to upgrade single-chute based system, indirect separation through colored bags and pay-as-you-throw and save-as-you-reduce system by use of RFID tracking.

All these technologies hold promise in terms of providing a clear financial incentive to households to reduce food waste and increase recycling. We look forward to seeing implementation of these technologies.

Packaging

Packaging waste makes up almost one-third of household waste in Singapore[6]. Of the 815,200 tonnes of plastic waste generated in 2017, only 6% was recycled.[7] The remainder was sent for incineration. One of the major challenges faced by Singapore is China's recently enforced National Sword Policy, which imposes restrictions on import of unprocessed materials for recycling and reduces accepted contamination rates to less than 0.05% by weight. Approximately 75% of Singapore's post-consumer waste was being exported to China in 2016.[8]

[6] NEA 2017 Waste Statistics
[7] NEA 2017 Waste Statistics
[8] Channel NewsAsia

The Singapore Packaging Agreement (SPA) is a voluntary joint initiative by government, industry and NGOs to reduce packaging waste. Under the SPA, NEA has launched an eco-label that helps consumers identify products with reduced packaging. 300 products from 24 SPA signatories are eligible to use this label. However, there is a need to exercise caution here, as reducing packaging can encourage producers to move towards light weighting and towards flexible plastics which often cannot be recycled or are not economically viable to be recycled.

The NEA plans to introduce mandatory reporting of packaging data and waste reduction plans by 2020, applicable to all businesses that place packaging on the consumer market including brand owners, importers and large retailers. This mandatory reporting includes:

1. Amounts of packaging placed on the market
2. Type of packaging placed on the market
3. Packaging waste reduction plan

We would like to urge legislators to follow the example of Japan and European countries for an Extended Producer Responsibility (EPR)[9] system which have the following defining characteristics:

1. **Clear definition of which businesses need to comply with the reporting**

   Japan's Containers and Packaging Recycling Law specifies that businesses that use packaging, be it in manufacturing or selling of merchandise, are bound by law and obliged to recycle their packaging.

2. **EPR fees collected are directed towards funding major recycling costs**

   EPR fees collected by these systems are directed towards capital expenditure (for land, buildings, trucks, carts etc. one-time costs with investment horizon of several years or longer), operating expenses required on an ongoing basis and funding for public education, program expansion, and other continuous improvement programs.

3. **Recovery and recycling targets are set for each type of packaging material**

   The European Directive 94/62/EC set recovery goals for its member states to be accomplished within a limited timeframe.

4. **Annual reporting is mandated and monitored**

   Both the Japanese and EU systems require producers of packaging to report in terms of amounts and material put on the market. This reporting then forms a basis for the EPR fee.

[9] EPR systems typically begin as a voluntary, industry-led system which generates funds to be utilized by a non-profit entity for the implementation and execution of segregation and recycling initiatives. This is then converted to legislation and made mandatory.

5. **Use of recycled materials is encouraged to create a market**

   The member states of EU are encouraged to take measures to encourage the use of recycled materials.

6. **Mandatory information and marketing campaigns**

   In both the Japanese and EU systems, information towards households and business to increase source segregation and recycling by all stakeholders involved in the EPR scheme is provided.

In order to create an effective recycling industry supported by the EPR, clear definition and standardization of materials and recovery methods must be considered, similar to the Japanese system, the CEN system of the European Union or the global ISO system. These standards enable:

1. **Clear definitions of the term "packaging"**

   Japan's Containers and Packaging Recycling Law has very clear definitions and guidelines towards identifying which packaging products are covered by the legislation and towards identifying the packaging producers.

2. **Harmonization of materials used in packaging**

   Harmonized standards that set requirements for packaging materials on toxic content, recyclability and/or biodegradability enable the industry in the EU to understand and meet these benchmark standards.

3. **Clear definitions of accepted recovery and recycling methods**

   The European Directive 94/62/EC defines energy recovery[10], material recycling and organic recovery as accepted recovery and recycling methods.

4. **A standard for labelling**

   Labelling standards in the EU enable the consumer to easily identify the material and recyclability of the packaging.

Consumer goods companies in their European and Japanese operations have accepted EPR fees as a pre-competitive, appropriate cost of doing business and of being responsible corporate citizens. This shows that the industry in Europe and Japan, instead of looking at EPR fees as a burden, sees it as an opportunity for resource recovery and innovation.

However, an EPR would be fruitless if it is not coupled with higher source of segregation rates. We would like to urge the legislators involved to consider making source segregation mandatory for the users of packaging, whether it be a household or business, to enable the implementation of a successful EPR system.

[10] EUROPEN's 2016 European and National Legislation on Packaging and the Environment proposed to remove recovery targets for packaging as incineration with energy recovery is not seen as promoting recycling

Energy and greenhouse gas emissions

The concept of circular economy in relation to the energy system is largely represented in the move to net zero carbon energy. There is a transition currently occurring within the energy system and in the economy at large that provides a number of opportunities for business into the future. There are two key drivers in focus here, the ongoing reduction in costs for renewable energy sources and the global need to reduce emissions as a means of managing climate change. Currently, the vast majority of primary energy consumption globally generates emissions and is inherently linear in nature. This includes the burning of coal, oil and natural gas products either directly such as in industrial processes, heating and transport or via an energy carrier such as electricity, which provides energy for industrial and residential purposes. In addition, the overall efficiency of primary energy (i.e., the amount which is used for useful end-use energy compared the total energy input) is relatively low.

The Paris Agreement, which is the primary framework for managing climate change after 2020, sets an overall goal of limiting temperature rise to well below 2°C by the year 2100. The scale of change required is very large and, as such, this is a key driver in the move towards a circular energy system. The Paris Agreement itself can be distilled to six key points, though the headline requirement is that to achieve the overall temperature goal, emissions will need to be net-zero between 2050 and 2070 and negative after that point. This scale of change, both in breadth and depth of change required and in the timeframe in which it is required, presents a significant challenge to businesses, policymakers and civil society and everyone must work together to achieve these goals**.**

Key aspects of the Paris Agreement

- Limit temperature increase to well below 2C whilst pursuing efforts to limit the increase to 1.5C
- Reach global peaking of emissions as soon as possible to achieve net zero between 2050 and 2100
- Nations commit to communicating their reduction targets every five years, increasing ambition
- Flexibility to allow for nations to cooperate using market based and non-market-based mechanisms
- Nations will communicate their adaptation plans with developing countries receiving enhanced support
- Technology, capacity building and finance flow from developed countries to developing countries

For the energy system to move towards a state that is more circular in nature, some key things need to happen, and support is needed in some areas to effect this change. A circular economy, with a net zero carbon energy system will have the following characteristics:

1. **High reliance on electricity**

   Electrification of everything with high efficiency appliances such as heat pumps for water heating, induction cooking, very high penetration of electric appliances in industry, 100% penetration of electric vehicles.

2. **Net zero carbon electricity generation**

   Decentralized, interconnected microgrids powered by renewable energy, zero carbon hydrogen and batteries for long- and short-term storage of energy.

3. **Carbon capture, utilization and storage**

   Capture of CO_2 emissions and subsequent storage of those emissions or utilization in products from parts of the economy that are currently difficult to decarbonize fully (e.g., steel manufacture, cement manufacture, agricultural chemicals).

4. **Advanced biofuels**

   In applications where total decarbonization is not yet technically or economically possible such as air transport and long-range shipping or trucking.

5. **Green hydrogen**

   Hydrogen produced from electrolysis of water using renewable energy as the electricity source. In the future, it will be used as an energy carrier to export renewables from high production areas such as Australia and the Middle East to other economies, and also used as a replacement for natural gas in industrial settings and in fuel cell vehicles for heavy transport and trucking and some light vehicles. The use of hydrogen in aviation is also likely to be increasing employed in coming decades.

6. **Maximum energy efficiency**

   Use of very high efficiency appliances as well as high efficiency systems such as shared autonomous personal mobility, minimum standards for efficiency in residential, industrial and transport settings.

7. **Digital networks**

   Utilizing greatly increased computer technology, digitization, artificial intelligence and connectivity to improve overall energy efficiency and productivity of industrial facilities, buildings and other systems. The reduction in costs of internet enabled sensors coupled with advances in computing power and capability will create a hyper connected world where business operations are optimized on an enterprise wide basis in real time.

8. **Bioenergy CCS**

   Growing biomass (which absorbs CO_2) then using that biomass to generate energy in a combustion process that has carbon capture and storage, this is a key technology to achieve negative emissions, which are required in the latter part of the century if the world is to achieve the goals set out in the Paris Agreement.

9. **Offsets**

   To achieve net zero emissions, offsets will have a very large part to play as not everything can be decarbonized in the energy system in the time scale required. Projects that achieve permanent abatement in other areas of the economy or in other countries are required.

Currently, although technology does exist in the majority of these areas to make the change, it can be either expensive or not yet commercialized at scale. In other cases, policy frameworks may not allow uptake to occur in an accelerated manner. Developing these and other relevant technologies is a key part of achieving circularity in the energy system in Singapore. To drive this change, policy at a high level must be set in such a way as to achieve the goals of the Paris Agreement in the required time frame. This must also involve increases in ambition through the Paris Agreement Nationally Determined Contributions[11].

Policy frameworks to support this overall ambition must also be set. This includes the current carbon tax policy, energy efficiency policy, public transport policy, overall energy policy and other enabling policies. In addition, new policy frameworks will be required to cover emerging technology such as energy storage, electric vehicles and the use of autonomous vehicles. There is potentially an opportunity for Singapore to supplement the forthcoming carbon tax with the ability to acquire certain permits internationally (i.e., those that meet minimum requirements with regard to fungibility and provenance of these permits) – particularly in the ASEAN region – to enable Singaporean businesses to have flexible compliance mechanisms. The ability to generate permits from development of local offset projects may also be able to be taken into account to provide liquidity to a potential market.

Singapore should be developing robust agreements with other countries to allow for co-operation between countries under the Paris Agreement. At this stage, negotiations should be ongoing to cover the potential for mechanisms to transfer abatement of emissions between countries. This will allow Singapore to increase ambition and reduce emissions to net zero through offset and abatement projects being undertaken in other jurisdictions.

Support should also be given for ongoing research and development in key areas of the energy system to ensure that technologies are implementable and towards commercialization. Singapore businesses may have an opportunity to export these technologies to the ASEAN region and globally. Singapore will also need to apply some of these technologies domestically to ensure that the goal of net zero emissions is reached as soon as possible. The Singapore government may be able to provide a supportive environment for this technology research and development by setting national direction and investment priorities, potential grants and/or incentives for such research and development. Singapore, with its status as a regional leader in research and development has an important part to play with respect to test bedding and researching new technologies. Particular areas of focus could be in electric vehicles and in research associated with the use of hydrogen in the economy.

As research and development proceeds and uptake of these technologies increases globally, cost will eventually decrease leading to greater investments from the business community.

[11] Nationally Determined Contributions are the individual targets for decarbonization that are set by nations under the Paris Agreement. Singapore's current target is a 36% reduction in emissions intensity by 2030 – coupled with a peak in absolute emissions by this time.

Society at large has an important part to play in achieving overall climate change goals. The economy at large being more circular in nature will have profound impact on emissions. Encouraging appropriate use, repair and reuse of products and encouraging the correct end of life treatment of products to minimize use of new materials when making new products will minimize energy use and ultimately emissions. Civil society can be encouraged in this regard through knowledge sharing and information provision. Businesses will also have a role to play particularly in information provision to help consumers make informed choices.

The move to a circular energy system requires a profound change to the way energy is created and ultimately used, and also the types of primary energy that are used. There will be a move to increasing electrification as the electricity generation system is progressively decarbonized. In line with this move to electrification, there must also be a push toward increasing the efficiency of final use. A large portion of the global decarbonization effort can be achieved through efficiency gains and increasing energy productivity, and energy efficiency is recognized by the International Energy Agency as the "first fuel" of economic development. To achieve these goals, there is a role for the Singapore Government to continue to provide incentives for energy efficiency – and potentially extend the concept to energy productivity – and potentially the use of regulatory frameworks such as minimum equipment performance standards to residential, commercial and industrial equipment.

Related to energy efficiency and energy productivity, the use of technology as an enabler for streamlining the production, transmission and use of energy. Digitization of the energy system, linking supply and demand in real time, using artificial intelligence with outside parameters for forecasting of demand, the use of Internet of Things connectivity of energy loads and providing a technological backbone for peer to peer trading of electricity are all transformative for the industry and will help to achieve goals relating to energy and emissions reduction. The Singapore Government has always been very good at promoting technology uptake and with supporting the startup industry and there is an opportunity to continue this support as rollout of these disruptive technologies proceeds. There may be, in future years as this technology becomes more commercialized, an opportunity for regulation or mandates in this area to help the nation achieve its overall goals with regard to energy and emissions.

Overall, there are many challenges to achieving circularity in the energy system and reaching net zero emissions for the economy in the second half of the 21st century is not negotiable. Where there are challenges though, there are opportunities for businesses and government, and opportunities for all as the new, efficient energy system based on zero carbon energy will be cheaper than the current system.

Financing

Financing plays a key role in supporting the ecosystem of achieving a circular economy. This is essential for Singapore as a regional and global financial center. Green bonds are an investment vehicle that have been used to encourage finance flows into environmental and climate related projects since 2007. From modest beginnings, the green bonds industry is now worth over $150b USD per year and more investments will be required in the coming years.

Forecasters expect investments in green bonds to exceed $200b USD in 2018 and the number needs to be substantially increased over time. It has been suggested by the New Climate Economy (The Global Commission on the Economy and Climate) that $90 trillion USD in investments in climate solutions is required in the next 15 years. It is widely said that in the future, there won't be a distinction between green bonds and other bonds, as all investments will be green. Even though current investments are significant in terms of absolute financing and continuing to grow strongly, it is still relatively small compared to the total amount invested in the fixed income market. The US alone issued in excess of $8 trillion USD in new debt securities in 2017.

With increased investments in this area, more clarity in the standards for instruments need to be in place. The ASEAN Green Bond Standard is a start in this direction. Investors in general are most keen to know that their investments can achieve environmental aims and provide additionality[12]. There is a role for groups like the Monetary Authority of Singapore (MAS) to play in ensuring that the right standards are in place and followed through.

There is a role for banks and investment companies to play in making these investments available by focusing on more environmentally friendly ones.

The Singapore government already has a green bond grant scheme covering eligible additional expenditure incurred for green bonds. In addition, a memorandum of understanding (MOU) was signed in June 2018 between the International Finance (IFC) Corporation and the Monetary Authority of Singapore (MAS). This MOU encourages green bond issuances by financial institutions in two ways:

1. Enhance the awareness and knowledge of professionals working in FIs on green finance issues through capacity building programs; and

2. Promote the use of internationally recognized green bond standards and frameworks

The outcomes of this MOU should be followed through as they present a good opportunity to continue to build acceptance of green bonds in the country and throughout the region. There may also be an opportunity for the Singaporean Government to lead by example and consider the issuance of sovereign green bonds. The market for these instruments is still very small globally but they do represent a firm commitment from Governments to sustainability related issues.

In addition to green bonds, there are continuing opportunities for grant programs and other flows of financial assistance from Government and larger industry to smaller enterprises on a merit basis. The Singapore Government has already announced that revenue raised from the carbon tax will be returned in part to businesses in the form of grants to promote energy efficiency and, ultimately, reduction in emissions. The Government is encouraged to continue with these schemes to help Singaporean businesses with the transition. To encourage the move to a circular economy, there may be an opportunity to expand the remit of these programs so that projects in line with this economic transformation receive assistance in some cases.

[12] Additionality refers to the fact that the impact of an investment must increase the quality or quantity of environmental outcomes beyond what would have otherwise occurred.