EU-Japan Centre for Industrial Cooperation
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The Japanese market of single-use plastic products and potential substitutes

Opportunities for EU innovative SMEs proposing alternative solutions

12 - 2018

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1. Abstract

Marine pollution from plastic waste is a growing concern that is attracting more and more attention. In response, the European Commission has proposed new rules specifically targeting 10 disposable plastic items and fishing equipment. In addition to the environmental benefits, the Commission's initiative also aims to support small and medium-sized European companies that have developed innovative alternatives to oil-based plastics by creating a large, secure and structured market.

This report analyses the Japanese market of single-use plastic products and potential substitutes, focusing on the items targeted by the EU, with the aim of identifying opportunities for innovative European SMEs offering alternative solutions.

As a first step, the report considers the international context affecting Japan. As a matter of fact, in a globalized world, the decisions and actions of one country often have impacts on others. Until now, the Japanese method of recycling plastic waste mainly consisted in incineration or shipment to China. The China's Green Sword policy therefore had direct and tremendous consequences on the Japanese market.

At the same time, Japan's refusal to sign the "G7 Oceans Plastic Charter" in Canada in June 2018, and the EU's initiatives on disposable plastic items, reinforced the impression that Japan was falling behind in terms of environmental protection. In response, the Japanese government decided to take the lead on this issue at the next G20 summit that will take place in Osaka in 2019 and is preparing for major announcements.

Japan is a world leader producer and consumer of plastic and disposable products. The Japanese chemical industry (including the "plastic products manufacturing industry" and the "rubber products manufacturing industry") is the second largest manufacturing industry in the country and Japan is the world's second largest single-use plastic producer after the United States. Plastics are mainly used in the container and packaging sector.

As an island nation, Japan's shores are sensitive to marine pollution, especially as it is neighbour to countries identified as those who dump most of the plastic waste into the oceans. Several surveys have concluded that Japanese shores suffered largely from poor waste management from surrounding countries. These results have strengthened Japan's conviction that marine pollution is not a problem that can be solved by one country alone but requires international collaboration, particularly with developing countries.

Bioplastics reduce the use of oil as a raw material and have a positive impact on GHG emissions, but cost remains an obstacle. To support the sector and stimulate research and production, the Japanese Ministry of the Environment has planned subsidy programs. The objective is to increase production from less than 50,000 tonnes in FY2013 to approximately 2 million tonnes by FY2030, with an intermediate target of 790,000 tonnes for the FY2020.

The legislative framework for waste management aims at a circular economy. The Fourth Fundamental Plan for Establishing a Sound-Material Cycle Society (June 2018) defines a strategy based on 7 pillars and introduces medium- and long-terms measures. Plastics have been identified as one of the five priority areas of the pillar "resource circulation throughout the lifecycle". The focus will be on reducing, collecting and promoting alternatives such as bioplastics. In addition, non-binding measures against microbeads have also been adopted earlier this year (2018). With regard to the countermeasures following China's ban, Japan has decided to encourage and support the domestic circulation of resources. The introduction of a new financial system is one of the levers for increasing and strengthening the capacity of recycling facilities in Japan.

A council bringing together representatives of relevant ministries, agencies and other experts has been set up to examine various options that consider the needs and concerns of businesses and citizens and should present a strategy with concrete measures and numerical targets for the reduction of single-use plastic waste before the end of this year. The Ministry of the Environment is expected to adopt the plan before the G20 to be held in June 2019. A draft proposal suggests reducing by 25% single-use plastic products by 2030, increasing the quantity of bioplastics up to 2 million tonnes by 2030 (around 50,000 tonnes in 2013), increasing the share of recycled / reused plastic containers to 60%, and using 100% of plastic waste efficiently by 2035, including through thermal recycling by incineration. The Japanese Ministry of Environment and the industry also strive to make Japanese companies take advantage of the emerging market of plastic alternatives, at the national and global levels.

Given the size of the country, landfilling is a major concern and thermal recycling is the main method of treatment. Sorting instructions vary by municipality, but waste separation is usually done at the source. PET bottles are generally considered as "recyclable materials" and collected separately. Plastic containers and packaging are generally considered as combustible, although some municipalities collect and recycle them.

Service, quality and appearance are decisive criteria for Japanese customers and in Japanese culture. The overall level of awareness of environmental matters is relatively low, although it has increased recently. To further raise awareness and support initiatives to tackle plastic waste, the Japanese government launched the Plastics Smart campaign in October 2018.

Many announcements regarding the reduction in the use of disposable plastic have been made in recent months. On the one hand, the global strategy of international market players (Starbucks, IKEA) will also apply in Japan and, on the other hand, Japanese companies have followed the trend. The report presents a selection of initiatives aiming at reducing plastic consumption and/or switching to greener alternatives in the sectors of foodservice (Skylark Holdings), cosmetics (Kao, KOSÉ) and beverages (Suntory Holdings Limited). Further examples present initiatives and innovations of material manufacturers in the field of bioplastics (Kaneka Corporation), pulp and paper industry (Nippon Paper, Oji Holdings) as well as the new LIMEX material from TMC Co., Ltd.

The second section of this report focuses on disposable plastic products specifically targeted by the new European rules in Japan.

The Japanese market is characterized by a dwindling population, an ageing society, small households, a demand for service and convenience, an obsession with freshness and hygiene and a taste for novelty. Due to demographics (one-person households, ageing population), lifestyle (few home cooking) and market characteristics (many vending machines, constant renewal of seasonal products), food and beverage containers are usually small-sized, and the products consumed immediately. The call for the shift from disposable to reusable containers is gaining resonance due to increasing public awareness about plastic marine litter.

Ecological alternatives are already available, but cost remains the biggest barrier to widespread use. Manufacturers are hoping that mass production and the willingness to pay more for environmentally friendly products will help launch the market.

Finally, the report provides an overview of potential business opportunities and makes recommendations for European small and medium-sized enterprises.

Due to the stability of its economic, political and legal systems, the Japanese market is generally considered to be business-friendly and being active and successful in Japan is perceived worldwide as a pledge of quality.

As the market for plastic alternatives is new and still under construction, it represents at the same time a business chance and a risk.

The export of products may be limited to high quality products for starred restaurants or trendy cafes which could be keen to adopt an eco-friendly image.

Additional feedstock to produce bioplastics will be needed to meet the high targets set by the government, but price will be a determining factor. Currently, most of the raw material is imported from Brazil and, to a lesser extent, South-East Asian countries.

Technological partnership, particularly under the Horizon 2020 programmes, can also be promising.

Bioplastic recycling technologies and best practices could be a further opportunity of collaboration.

Japan has already committed to announcing important measures and actions in the very near future and the industry is therefore eager to find concrete and realistic solutions. In that context, it is a good time for companies that already have knowledge and experience. It is important to stay updated on new decisions and take advantage of upcoming events (G20 in Osaka in 2019, Tokyo Olympics and Paralympics in 2020) that will certainly act as catalysts in the implementation of green measures.

To be successful, EU SMEs need to be well prepared, find a good partner on site and adapt their communication. The latter can focus on education to fill the lack of awareness, refer to the concept of *Mottainai* to preserve Japanese values and / or emphasize the European origin to highlight the quality and respect of the environment. Certifications and awards can be considered as objective proof of quality. Several plastic and / or environmental trade fairs and exhibitions take place in Japan and provide a good opportunity to understand the market and to meet potential partners and customers as well as other stakeholders (governments, business associations, media). SMEs in the EU can also rely on the many services of support organisations.

2. Introduction, Description, Scope of Coverage

Marine pollution due to plastic litter is a growing concern that has been catching more and more attention recently. Alarming reports stating that there will be more plastic than fish in 2050 and other viral videos spreading on social networks have raised consumers' awareness around the world and the demand for eco-friendly products and services is booming.

In parallel, the import ban on plastic waste enforced beginning 2018 by the Chinese government is causing great turmoil across the globe, notably in Japan and Europe.

In response, the European Commission proposed new rules to tackle the marine litter issue and is specifically targeting 10 disposable plastic items as well as fishing gear. These products account all together for 70% of all marine litter found on European beaches.[1]

Proposed measures are adapted to the characteristics of each products, but the ultimate goal is to shift from single-use plastic to more sustainable alternatives for all these items. Besides the environmental benefits, the Commission's initiative also aims to support European small and medium companies engaged in substitutes of oil-based plastic by creating a large market with a secured framework.

This report analyses the Japanese market of single-use plastic products and potential substitutes with the objective to identify opportunities for innovative European SMEs proposing alternative solutions. It is divided into three parts. First, it will provide useful information on the current situation of the Japanese plastic market, including latest regulations and business trends. Then it will focus on the 10 single-use plastic products targeted by the new EU rules in Japan. Finally, it will list an overview of potential business chances and formulate recommendations to European Small and Medium Enterprises.

Methodology: This report is based on desk research, site/events' visits and discussions with various stakeholders.

[1] "Single-use plastics: New EU rules to reduce marine litter", European Commission - Press release (http://europa.eu/rapid/press-release_IP-18-3927_en.htm)

3. Analysis of the Japanese market of single-use plastic products and potential substitutes

a. International context impacting Japan

i. China National Sword Policy (2018)

As China became the world's leading manufacturer in the 1990s, it started buying scraps from developed nations such as Japan, the United States and Europe. In 2016, two-thirds of the world plastic waste were exported to China. Japan accounted for 842 million of metric tons and was the leading exporter of polystyrene (PS).[2]

In that context, China's sudden change of policy, so-called "National Sword" (or "Green Sword"), end of 2017 had a tremendous impact on many countries, notably Japan, who were heavily reliant on their export to China to manage their waste.

To measure the impact of China's ban on Japanese local governments and waste disposal businesses, a ministry survey was conducted during the first semester of 2018. 122 municipalities and 605 waste processing companies have been contacted, and among them 102 municipalities and 177 firms responded. According to the results, the costs of processing waste plastic have been increasing and this waste stream has become more difficult to handle. 34.9% of the surveyed firms were already restricting or considering limiting the quantity of plastics they accept. Consequently, more than a third of the municipalities expressed difficulties to find a destination for their waste and limit violations was observed in five local governments. In parallel, incineration and landfilling of plastic waste increased.[3]

As a temporary measure, companies have tried to divert their waste flow to other Asian countries such as Malaysia, Vietnam or Thailand. However, these countries have less capacities than China and have quickly been overwhelmed by the new arrivals and countries like Malaysia have in their turn announced import ban on waste.[4] Moreover, the damages caused on the environment and health of the population of these countries which knowingly lack appropriate infrastructures cannot be ignored and it is clear that a more sustainable solution must be found by cutting waste generation at source.

In response to China National Sword Policy, Japan has decided to promote domestic resource circulation as explained in the section 3. d) Recent political/legislative trends.

ii. Marine pollution knows no border

China, Indonesia, Philippines, Thailand, and Vietnam have been identified as the countries dumping more plastic into oceans than the rest of the world combined. Marine pollution knows no human borders and several surveys concluded

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[2] "Plastic Recycling Is Broken. Here's How to Fix It.", National Geographic (https://news.nationalgeographic.com/2018/06/china-plastic-recycling-ban-solutions-science-environment/)
[3] "Plastic waste piling up in Japan after Chinese import ban", The Japan Times (https://www.japantimes.co.jp/news/2018/10/18/national/plastic-waste-piling-japan-chinese-import-ban/#.W961jtUzbIV)
[4] "Malaysia to curb imports of plastic waste – minister", Reuters (https://www.reuters.com/article/us-malaysia-waste-imports/malaysia-to-curb-imports-of-plastic-waste-minister-idUSKCN1N028P)

that Japanese seashore were largely suffering from waste mismanagement from surrounding countries, with debris from other Asian countries drifting to its coasts.[5]

These reinforced Japan's conviction that marine pollution is not a problem that can be solved by one country alone but that requires international collaboration, especially towards developing countries.

iii. Single-use plastics ban: New EU rules to reduce marine litter (2018)

The audacious initiative of the European Union placed it at the forefront of the environmental fight and Japan must react if it doesn't want to face criticisms or appear to be falling behind on the international stage.

In addition, Japan considers this new market situation as a business opportunity for Japanese companies proposing alternative solutions.

iv. G7 Oceans Plastic Charter (2018)

In June 2018, the world leaders met in Charlevoix, Canada and drafted the "G7 Oceans Plastic Charter"[6] to limit plastic pollution and promote recycling. This document set inter alia a target of 100% reuse, recycling and collection of all plastic products by 2030. Five countries of the Group of Seven, namely Canada, France, Germany, Italy, the United Kingdom and the European Union, signed up this charter. Japan, along with the United States, refrained from approving this document and justified its decision by arguing that more time for discussions and a careful assessment on the impact on people's lives and on industries was necessary before committing to such tight regulations. In addition, Japan stressed that ocean plastic pollution was not a problem that developed countries alone could solve and that developing countries must also be involved.

In response to the criticisms of non-signature, it is expected that the targets of the Japanese Plastic Strategy currently under discussion will exceed or at least meet the objectives of the G7 Charter.

v. G20 Osaka Summit (2019)

On the 28th and 29th of June 2019, the Group of Twenty will gather for the first time in Japan. The EU's leading role model and the failure to sign the G7 Charter are likely to influence the way Japan leads the summit. The Japanese government indeed intends to make environmental challenges such as climate change and ocean pollution at the heart of the discussions during its presidency.

Domestically, the Osaka summit is set as a deadline for the announcement of Japan's new plastic strategy.

[5] "Sea of Japan Becoming a Dumping Ground for Trash From China and South Korea", HuffPost (https://www.huffingtonpost.com/jeb-harrison/sea-of-japan-becoming-a-dumping-ground-for-trash-from-china-and-south-korea_b_8005772.html)
[6] "G7 Oceans Plastic Charter" (https://g7.gc.ca/wp-content/uploads/2018/06/OceanPlasticsCharter.pdf)

Concurrent with the Summit meeting, the Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth will be held in Karuizawa, Nagano Prefecture.

vi. Tokyo Olympic and Paralympic Games (2020)

Tokyo counts on this international event to showcase its model of a sustainable city and become a global environmental leader.[7] The Olympic Committee strives for Green Games with reduced environmental impacts. The Sustainability Plan aims at a sustainable delivery of the Games and hopes to contribute to the United Nations' Sustainable Development Goals (SDGs). The sustainability concept of the Tokyo 2020 Games is set as "Be better, together - For the planet and the people."[8]

Among its objectives, the Olympic Committee aims to fully power the Games with renewable energy. The electricity from all venues (including the Olympic Village, the International Broadcasting Centre and the Media Centre) will be derived from renewable sources. The Committee also plans to use rental services to ensure that 99% of the items used during the Games will be reused or recycled (except for doping test kits and some other products). Waste such as plastic bottles and food will be subject to a recycling and reuse target of 65% (compared to 62% at the London Games). The Committee is also considering other projects involving citizens, in addition to the production of medals with metals recovered from collected mobile phones.[9]

b. The Japanese plastic market in figures

i. Production and sales

The Japanese chemical industry (including the "plastic products manufacturing industry" and the "rubber products manufacturing industry") is the second largest manufacturing industry of the country, behind transportation machinery. In 2015, the total value of shipments reached approximately 44 trillion yen (almost 12 trillion yen for plastic products), accounting for 14% (3.8% for the sole plastic products) of all output value of the Japanese manufacturing sector. The chemical industry employs over 870,000 people which corresponds to 11.7% of Japan's manufacturing-related workforce. Investments in R&D are high: 2.6 trillion yen in FY2016 (189 billion yen for plastic products, which represents 1.6% of the total of the manufacturing industry).[10]

Japanese industrial groups are usually highly diversified, with many subsidiaries and companies are typically embedded in a strong network of alliances with other companies through their participation in "*keiretsus*"[11]. Major corporations are dominating the Japanese chemical industry. Five companies out of the world's 30 leading chemical

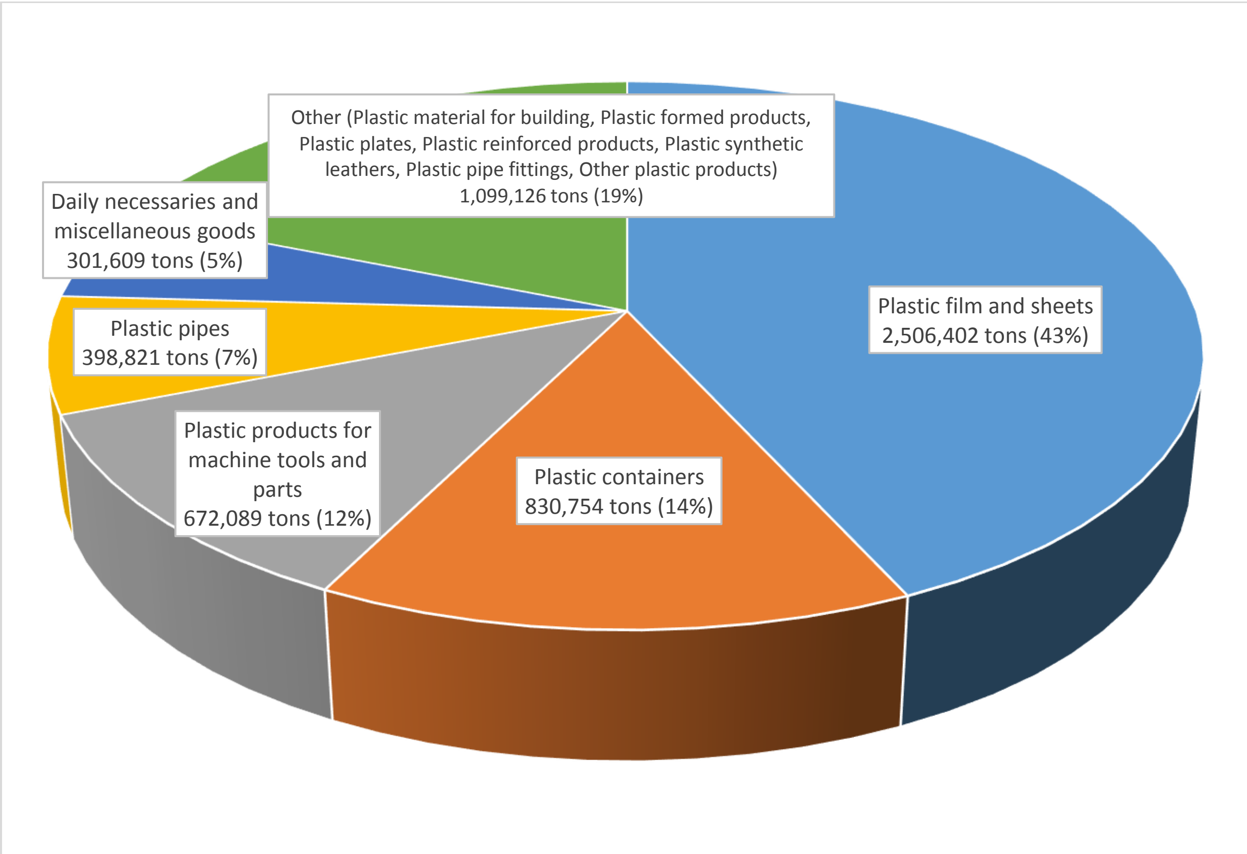
[7] "Tokyo focuses on environment two years out from Olympics", Reuters (https://www.reuters.com/article/us-olympics-2020-tokyo-governor/tokyo-focuses-on-environment-two-years-out-from-olympics-idUSKBN1KD0Y0)
[8] Official website of The Olympic and Paralympic Games (https://tokyo2020.org/en/games/sustainability/)
[9] "Actualités Japon - Énergie, Environnement, Transport, Construction - Juillet 2018 (I)", Pôle Développement durable - SER de Tokyo (https://www.tresor.economie.gouv.fr/Articles/2018/07/05/actualites-japon-energie-environnement-transport-construction-juillet-2018-i)
[10] "2017 Chemical Industry of Japan in Graphs", Japan Chemical Industry Association (https://www.nikkakyo.org/sites/default/files/2017%20CHEMICAL%20INDUSTRY%20OF%20JAPAN%20IN%20GRAPHS.pdf)
[11] A "*keiretsu*" is a set of companies with interlocking business relationships and shareholdings. (Wikipedia)

companies are Japanese: Mitsubishi Chemical, Toray Industries, Sumitomo Chemical, Mitsui Chemicals and Shin-Etsu Chemical Industry.[12]

Japan ranks second in the production of single-use plastic per person in the world, after the United States.[13]

In 2017, the total production of plastics materials amounted to 11.02 million tons (sales of 10.5 million tons), while the production of plastics products reached 5.81 million tons (sales of 6 million tons). Plastic film and plastic sheets accounted for the largest share of plastic products produced in Japan, with approximately 2.51 million tons.[14]

Graph 1: Production of Plastics Products 2017 Japan



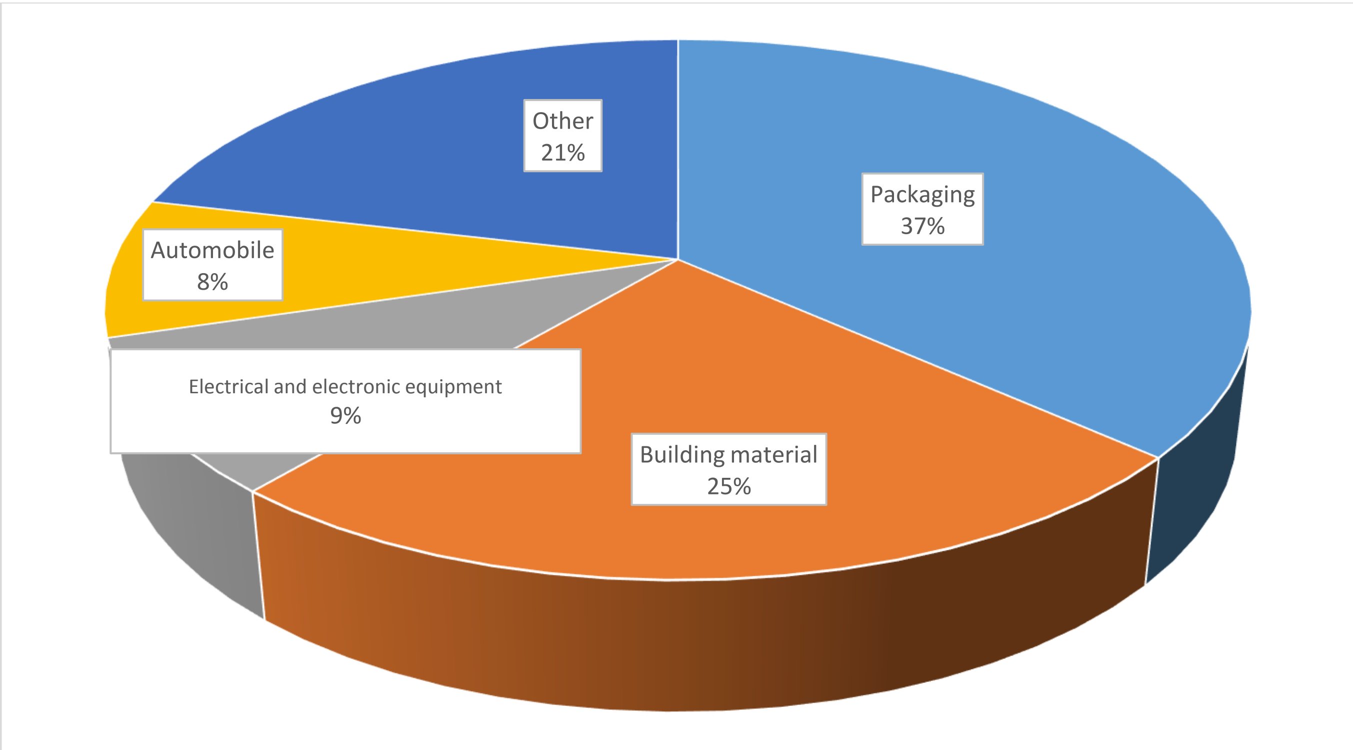
Source: Japan Plastics Industry Federation (JPIF)

[12] "2017 Chemical Industry of Japan in Graphs", Japan Chemical Industry Association (https://www.nikkakyo.org/sites/default/files/2017%20CHEMICAL%20INDUSTRY%20OF%20JAPAN%20IN%20GRAPHS.pdf)
[13] "Plastic straws headed for reduction in Japan", Nikkei Asian Review (https://asia.nikkei.com/Spotlight/Environment/Plastic-straws-headed-for-reduction-in-Japan)
[14] A detailed breakdown of the plastics products and materials produced and sold in Japan in 2017 and 2018 (monthly data) are available on the website of the Japan Plastics Industry Federation (JPIF): http://www.jpif.gr.jp/english/statistics/index.html

In terms of sales value, the annual quantity of plastic products sold exceeded JPY 4.21 trillion, with plastic products for machine tools and parts (including lighting equipment) accounting for JPY 1.26 trillion, followed by plastic film and plastic sheets (JPY 1.23 trillion).[15]

Plastics is mainly used in the containers and packaging sector.[16]

Graph 2: Use of plastics in Japan (2012)

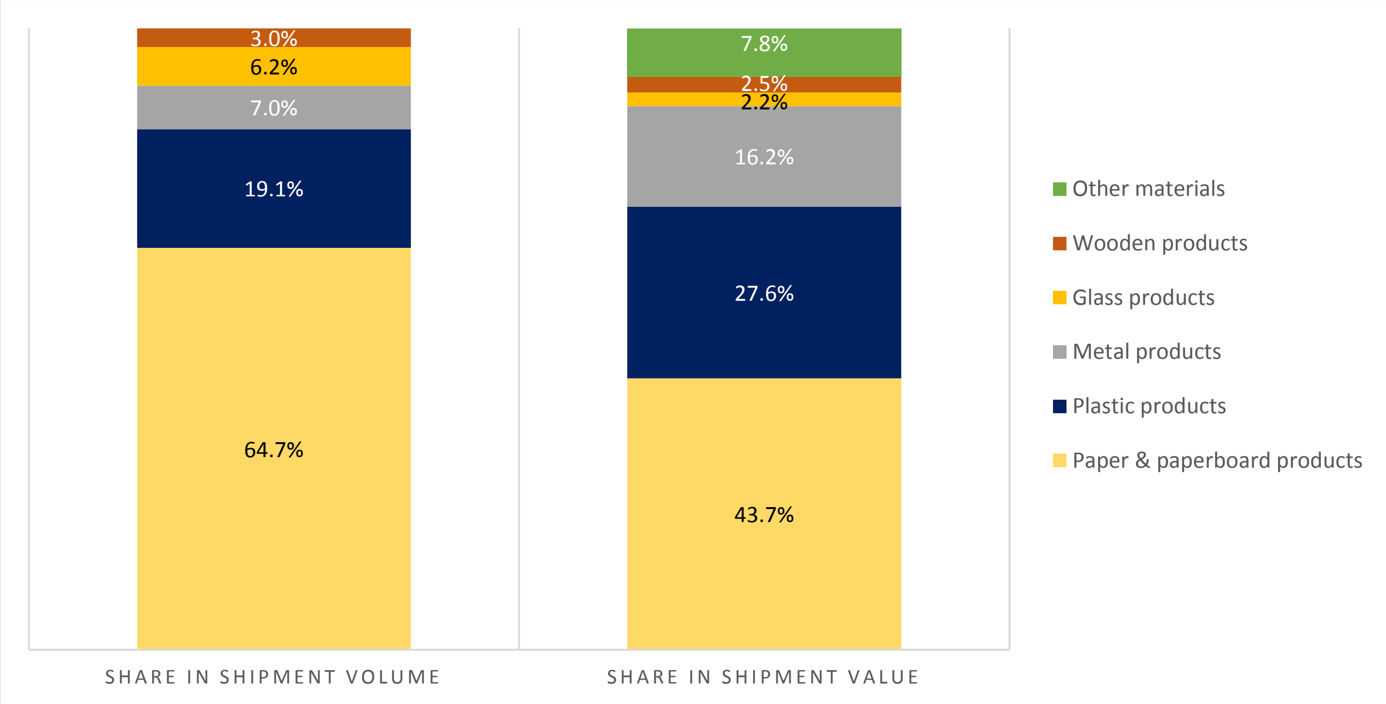


Source: Japan Plastics Industry Federation (JPIF)

The containers and packaging market consists of packaging made of paper and carboard, plastic, metal, glass, wood and other materials. This market was impacted by the general global recession, natural disasters that struck Japan as well as legislation promoting the 3Rs and fluctuated significantly over the past years. In FY2017, the shipment volume of packaging materials and containers increased to 19.44 million tons (from the 19.02 million tons produced in previous year). It represented a value of 5,653 billion yen (compared to 5,673 billion yen in FY2016). Paper products held the highest market share of shipment volumes (64.7% of the total packaging volume placed on the market) and value (43.7% of all packaging sales) while plastic products rank second (19.1% in terms of volume and 27.6% in terms of value).[17]

[15] Plastic Products Statistics, METI (http://www.meti.go.jp/statistics/tyo/seidou/result/ichiran/08_seidou.html)
[16] Japan Plastics Industry Federation (JPIF): http://www.jpif.gr.jp/5topics/conts/world3_c.htm
[17] Statistics on the Scale of Japanese Packaging Industry in 2017, Japan Packaging Institute (http://www.jpi.or.jp/english/ , page Statistics)

Graph 3: Share of packaging materials in shipment volume & value in 2017



Source: Japan Packaging Institute

ii. Waste emission and Recycling

In FY2015, total waste emission (43,980,000 tons) and waste emission per person per day (939 grams) slightly decreased compared to previous year (-0.8%)[18]. Officials estimate that plastic bottles and packaging, which account for a significant share of plastic waste, summed up to 4.07 million tons in 2016.[19]

A survey led by the Ministry of the Environment in the second half of 2014 detailed the composition of household waste in terms of weight. The results showed that the garbage was primarily composed of paper & paper products (34.4%), closely followed by kitchen waste (32.4%). Plastics ranked third at 11.5%, while the other fractions (glass, fibres, wood/bamboo/grass, and metal) represented each between 3 and 5%.[20]

According to the Plastic Waste Management Institute[21], the total waste plastic emissions slightly decreased in 2016 (-1.7%) reaching 8.99 million tons (92% post-use products and 8% production and processing loss). When considering the total of plastic waste, containers and packaging accounted for 45.3%, electric and machinery 20.2%, building materials 7% and household articles 6.7%. When focusing on domestic waste, the share of containers and packaging made up for 77.8%, household articles 10.8% and electric & machinery 5.1%.

18 "Municipal solid waste emissions and disposal in FY2015", Ministry of the Environment Japan
19 "Japan eyes reducing amount of plastic waste by as much as 25% by 2030", The Japan Times (https://www.japantimes.co.jp/news/2018/10/14/national/japan-eyes-reducing-amount-plastic-waste-much-25-2030)
20 "An Introduction to Plastic Recycling" (2016), Plastic Waste Management Institute (https://www.pwmi.or.jp/ei/plastic_recycling_2016.pdf)
21 PWMI Newsletter, Number 47 (2018.3) https://www.pwmi.or.jp/ei/siryo/ei/ei_pdf/ei47.pdf

The breakdown of total waste plastic emissions (8.99 million tons) by resin types ranks polyethylene first at 33%, followed by polypropylene at 22.4%, polystyrene (including SAN, ABS) at 12.2% and polyvinylchloride at 7.7%. The remaining 24.7% are composed of "others".

In terms of treatment methods, recycling (mechanical and chemical) accounted for 27%, energy recovery methods (incineration with power generation, RPF/cement raw fuel and heat utilization) summed up to 57% while 16% of plastic waste ended up being non-utilized (incineration without power generation nor heat utilisation and landfilling). It represented an effective plastic utilization rate (comprising recycling and recovery) of 84% in 2016, a world-high number constantly on the rise.

For mechanical recycling, the top 3 post-use products are PET bottles (500kt), wrapping films (210 kt) and home electric-appliance housings, etc. (170 kt).

According to the Japan Containers and Packaging Recycling Association[22] for the year 2014, recycled PET bottles were turned into textiles (44.9%), plastic sheets (39.4%) and bottles (13.1%, a share in steady progression). As for plastics packaging and containers, trays are to 100% reused for moulding materials, while other plastic types are mainly used as chemical raw materials for the coke oven (40.4%), then for moulding materials (38.5%), synthetic gas (11.6%) and finally reducing agent in blast furnaces (5.8%).

iii. Marine debris on Japanese coasts

The Ministry of the Environment estimated that 1.72 million pieces of microplastic per km^2 are found in Japan's seas, which is 27 times that of the global average. Japan's heavy usage of plastic reportedly results in 9 million tons of plastic waste per year.[23] This amount is completed with waste drifting from other countries.

Japan has been monitoring the damage caused by marine litter.[24] In 2016, Japan conducted research on several locations of its seashores to collect data and determine the type as well as the origin of marine litters that wash up on its coasts. The origin of plastics bottles collected on Japanese coasts was deduced from the labels of the manufacturers and revealed that in some locations most of the plastic litter that washed up on Japanese coasts was actually coming from surrounding countries. For example, in Amami, Kagoshima prefecture, only 1% of the bottles collected were Japanese, while 72% came from China and 12% Korea. Similarly, in Tanegashima (Kagoshima prefecture), Tsushima and Goto (Nagasaki prefecture) and Kushimoto (Wakayama prefecture) collected bottles originated from China and Korea (42% to 57%), Russia and Taiwan.[25]

On the other hand, it must be noted that Japanese waste are also drifting through the global seas and pollute other countries. The isolated island of Henderson, one of the most remote places in the Pacific has been found covered with

[22] Website of The Japan Containers and Packaging Recycling Association, page "Statistics" (http://www.jcpra.or.jp/english/tabid/612/index.php)
[23] "Japan: Heavy Plastic User, Late to React", Tokyo Broadcasting System Television, Inc. (http://news.tbs.co.jp/newsi_sp/osen/en/archive/20180329.html)
[24] "Progress in Addressing Marine Litter in Japan" (June 2018), Office of Marine Environment of Ministry of the Environment (http://www.nowpap.org/meetings/ICC_2018/TEMM-presentations/Progress%20in%20Addressing%20Marine%20Litter%20in%20Japan.pdf)
[25] "Japan to Propose Marine Plastic Waste Solution at G20 in Osaka", The Sankei Shimbun translated by JAPAN Forward (https://japan-forward.com/japan-to-propose-marine-plastic-waste-solution-at-g20-in-osaka/)

over 37 million pieces of trashes, mainly plastic. Researchers found that identifiable items mainly originated from China, Japan and Chile.[26]

iv. Bioplastics

The term “bioplastics” refers to biomass plastics, that are made from organic materials such as corn or sugarcane, and biodegradable plastics, that can be decomposed by microorganisms. Products are usually a mix of bioplastics and ordinary (oil-based) plastics.

As Japan mainly relies on imports of naphtha, bio-based alternatives enable a diversification of the feedstock. However, the lack of space and natural resources restrain the domestic production of organic materials and the country still depends on importation, mainly from Brazil but also South-East Asian countries.

Another incentive factor for bioplastics is the fight against global warming. As part of its prevention plan, the government intends to reduce CO_2 emissions by 2.09 million tons by raising the domestic bioplastic shipments to 1.97 million tons by FY 2030, with an interim goal of 790,000 tons in FY2020.[27]

From a technological point of view, bioplastics could already replace petroleum-based plastics, but cost constitutes the main obstacle as it can exceed that of ordinary plastics by more than 50%. The market remains therefore at the same relatively low level since 2013 (less than 1% of all plastics[28]). According to the Japan BioPlastics Association (JBPA), the volume of domestic bioplastics shipments (estimation 2017) lied at 39,500 tons and consisted of 35,500 tons biomass plastic (including derived from partial biomass), 2,300 tons of biodegradable plastics and 1,700 tons of other biomass plastics.[29]

Table 1: Estimate shipments of bioplastics in Japan (2017)

Unit: tons

Biomass Plastic		**35,500**
Bio-PET	*19,000*	
Bio-polyamide	*6,500*	
Bio-polyethylene	*5,300*	
Polylactic acid	*4,700*	
Biodegradable plastics		**2,300**
Other biomass plastics		**1,700**
		39,500

Source: Japan BioPlastics Association (JBPA)

[26] “Exceptional and rapid accumulation of anthropogenic debris on one of the world’s most remote and pristine islands”, Jennifer L. Lavers and Alexander L. Bond (http://www.pnas.org/content/early/2017/05/09/1619818114)
[27] “Japanese govt to encourage bioplastics production through subsidies”, the Japan News (http://annx.asianews.network/content/japanese-govt-encourage-bioplastics-production-through-subsidies-80569)
[28] “Japanese chemical makers bet on bioplastics”, Nikkei Asian Review (https://asia.nikkei.com/Business/Biotechnology/Japanese-chemical-makers-bet-on-bioplastics)
[29] Overview of Bioplastic, Japan BioPlastics Association (http://www.env.go.jp/council/03recycle/y0312-02/y031202-5r.pdf)

A drastic increase will therefore be necessary to achieve the ambitious governmental targets.

To encourage the production of bioplastics, including the development of new technologies as well as the expansion and improvement of existing facilities, and research about collection and valorisation processes, the Ministry of Environment has planned a budgetary request of 5 billion JPY for next fiscal year in order to subsidize companies and universities.

Major chemical/plastic companies are engaged in bioplastics. A list of the Japanese (bio)plastic companies as well as foreign (bio)plastics companies active in Japan is available on the website of Bioplastic News[30] with a short profile.

Table 3: Japanese (bio)plastics companies

MITSUI	KUREHA CORPORATION	Toyo Seikan Group Holdings
Mitsubishi Chemical Corporation	DAICEL POLYMER Ltd	Toyobo Co
Teijin Limited	Dainichiseika	Toppan Printing
Toray Industries	Dai Nippon Printing	Nippon Synthetic Chemical Industry
AJINOMOTO	Chuo Kagaku	Unitika Limited
FP CORPORATION	CHORI / Miyako Kagaku	RISU PACK
Kaneka Corporation *	SOJITZ PLA-NET	

Source: Bioplastic News

** Recent initiatives and investments of Kaneka Corporation are presented in the section Business trends and company initiatives.*

Table 4: Foreign (bio)plastics companies active in Japan

Novamont / CHEMITECH	NatureWorks	BASF
Total Corbion PLA	DuPont Specialty Products Kabushiki Kaisha	ZHEJIANG HISUN BIOMATERIALS

Source: Bioplastic News

[30] “Can Japanese Companies Lead the Bioplastics Industry?”, BioPlastics News (https://bioplasticsnews.com/2018/08/24/japan-bioplastics-companies-leadership/)

Japanese Business Associations & Certifications

The **Japan BioPlastics Association (JBPA)**[31], formerly known as Biodegradable Plastics Society (BPS), promotes biomass-based plastics and biodegradable plastics. It is a private organisation composed of 240 members (resin manufacturers, processing makers, final products manufacturers, trading companies, etc.).

JBPA set up 2 identification systems with associated logo:

- **"GreenPla"** for "materials or products that include in their components biodegradable organic materials that are broken down by the action of microorganisms in the natural environment and which ultimately become carbon dioxide or water", and
- **"BiomassPla"** for "plastic products that contain at least a specified quantity of substances derived from renewable organic resources as a constituent element of the plastic."

The **Japan Organics Recycling Association (JORA)**[32] is delivering the **"Biomass Mark"**[33]. Based on the Cabinet Decision "Biomass Nippon Strategy" in 2002 (MAFF), the "Biomass Mark" is a labelling system for the promotion of products which contain biomass derivative materials. A minimum of 10% of bio-based resource is required to obtain the mark, and the percentage (as a multiple of 10) appears in the mark. The mark is not only for plastic but also intended for a wide-range of products, such as textile and fuel. JORA's approach with its "Biomass mark" resembles the American BioPreferred program managed by the U.S. Department of Agriculture (USDA).

As part of the new plastic strategy, a Biomass Roadmap should be created, and may include the introduction of a mark. METI and the two associations mentioned above (JBPA and JORA) would then discuss the conditions (new mark, merge of the two existing, etc.)

c. Waste Management in Japan (focus on plastic)

i. Background and current legislation

In the post-war period, waste related issues resulted in pollution and health concerns. Next, Japan's economic growth led to the pattern "mass production - mass consumption - mass disposal" with increasing difficulties to manage the waste due to the quantity and complexity of the waste streams. Nowadays, scarcity of valuable resources, energy dependence and awareness of the human impact on the fragile ecosystem are the main drivers. In response to this changing environment and emergence of new issues, the Japanese government constantly adapted the legal system, focusing first on public health, then prevention of pollution and protection of the environment and finally on the establishment of a sound-material cycle society.[34]

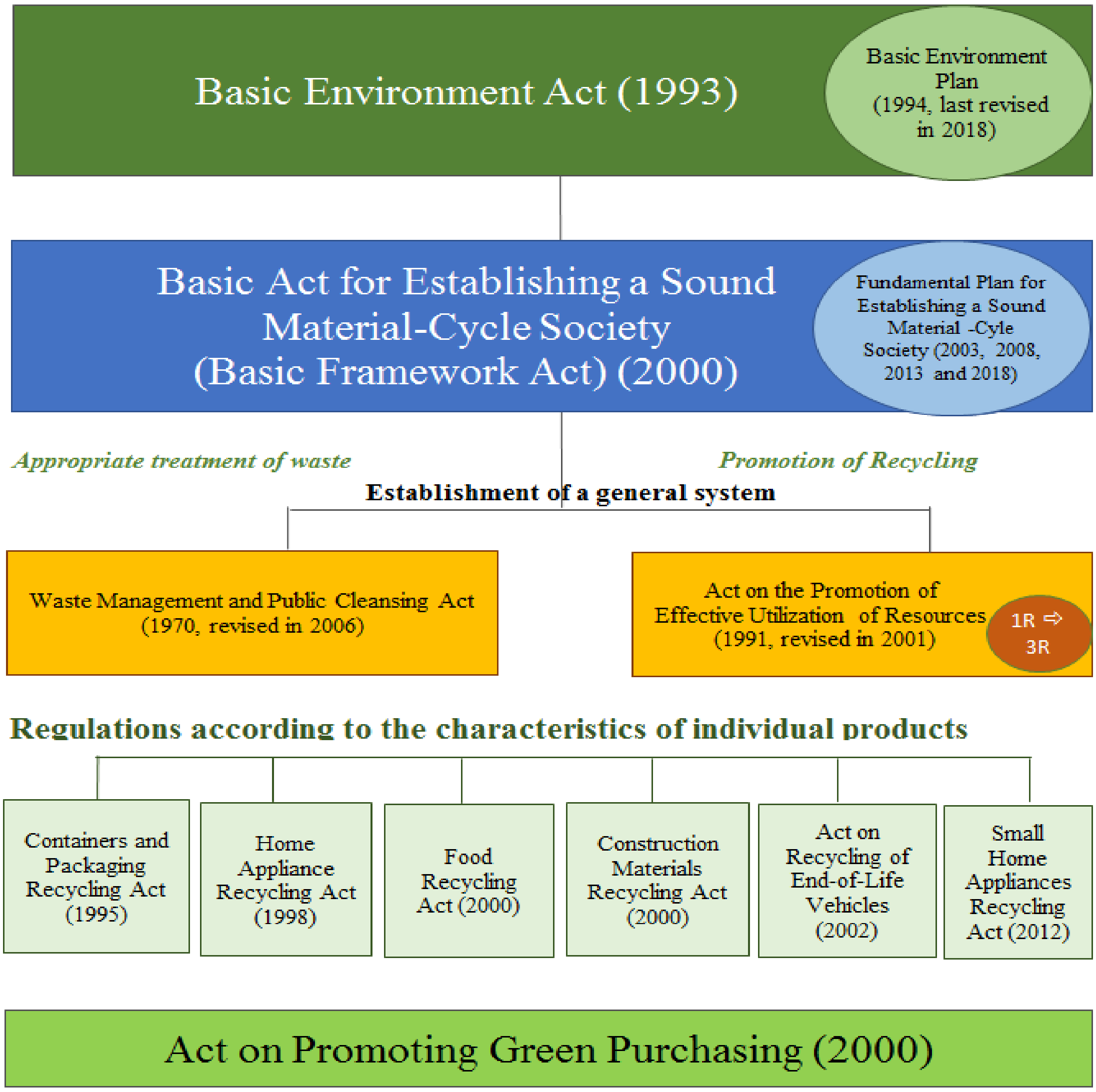
[31] Official website of JBPA: http://www.jbpaweb.net/english/english.htm
[32] Official website of JORA: http://www.jora.jp/txt/eng/index.html
[33] The Biomass Mark: http://www.jora.jp/txt/katsudo/bm/index.html
[34] "History and Current State of Waste Management in Japan", Ministry of the Environment (https://www.env.go.jp/en/recycle/smcs/attach/hcswm.pdf)

A further essential aspect to take into account to understand Japanese waste management policies and practices is the small size of the country and consequently limited space for landfill. Reducing the amount of waste going to landfill remains one of the main objectives. [35]

The current legal framework is based on several acts that set basic principles for the management of waste and specific regulations that address the characteristics of individual waste streams, and supports Japan's efforts towards a circular economy.

The concept of extended producer responsibility (EPR) was first introduced by the Container and Packaging Recycling Act in 1995. Voluntary measures from businesses to reduce waste are also encouraged.

Figure 1: Legal system for Establishing a "Sound Material-Cycle Society"



Main source: Ministry of the Environment of Japan

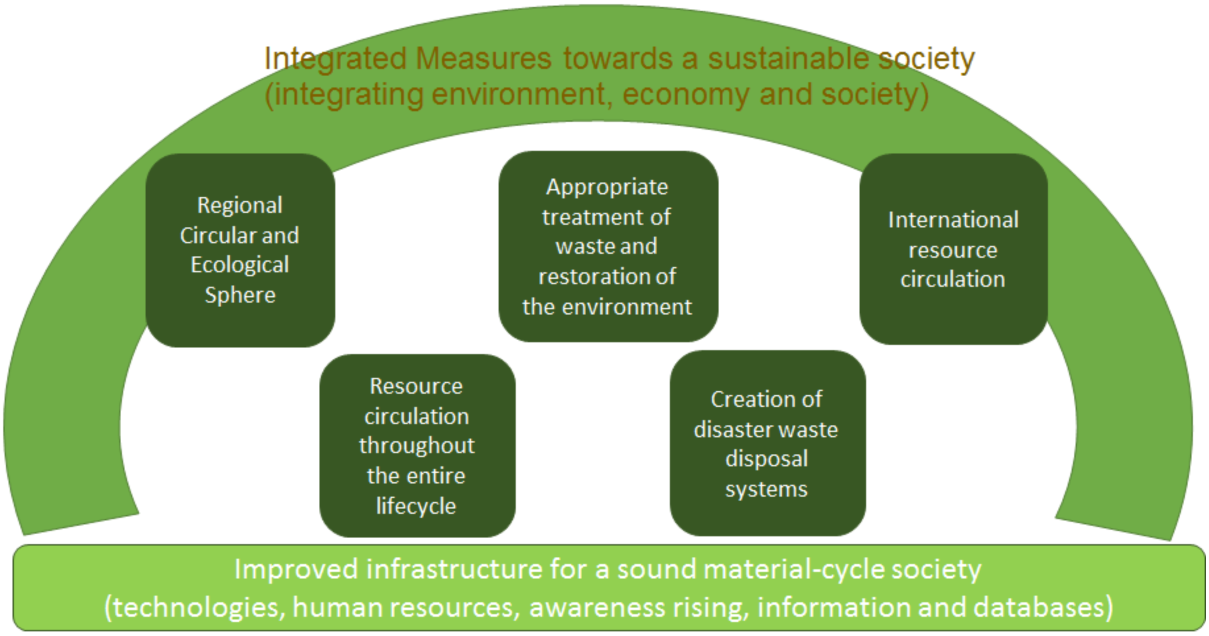
[35] "Waste Management and Recycling in Japan: Opportunities for European Companies (SMEs focus)", Christine Yolin, EU-Japan Centre for Industrial Cooperation (https://www.eu-japan.eu/publications/waste-management-and-recycling-japan-opportunities-european-companies-smes-focus)

In 2018, both the Basic Environmental Plan (based on the Basic Environment Act) and the Fundamental Plan for Establishing a Sound-Material Cycle Society (based on the Basic Framework Act) have been revised and approved by the Cabinet.

The Fifth Basic Environmental Plan[36] (April 2018) indicates long-term measures for the environmental conservation. It fixes six "priority strategies": economic, national land, community, life, technologies and international with a focus on partnerships binding all stakeholders and establish "Regional Circular and Ecological Sphere (SDGs City)".

The Fourth Fundamental Plan for Establishing a Sound-Material Cycle Society[37] (June 2018) defines a strategy based on 7 pillars and introduces mid- to long- term measures.

Figure 2: Pillars of the Strategy



Source: Ministry of the Environment of Japan

The "resource circulation throughout the entire lifecycle" defines five priority areas, namely plastics, biomass, metals, stone/construction materials and recently spread products and materials.

A special emphasis is put on plastics to tackle marine litter. Plastic resource circulation is based on:

- the reduction of disposable packaging and containers,
- a complete and effective collection and recycling,
- promotion of bioplastics and other alternatives to fossil-fuel derived plastics.

Discussions to establish a dedicated "Plastic Strategy" are currently in progress (see section below New Plastic Strategy).

[36] "Outline of the Fifth Basic Environment Plan", April 2018, Ministry of the Environment of Japan
[37] "The 4th Fundamental Plan for Establishing a Sound-Material Cycle Society", Ministry of the Environment of Japan

Also, in an effort to reduce marine pollution caused by plastic, the “Act on Promoting the Treatment of Marine Debris Management” was amended in June 2018 to address i.a. the issue of microplastics.[38]

ii. Japanese concepts and approach to waste management system

The 3Rs

Similar to the so-called “waste hierarchy” promoted by the European Union and that sets a priority order for the treatment of waste (prevention, preparing for re-use, recycle, other recovery, disposal), the Japanese communicates on the 3Rs, an acronym for “Reduce” (the amount of waste generated), “Reuse” (the same items again) and “Recycle” (resources to be used as raw materials to make new products).

According to the Ministry of the Environment, resource productivity increased by 58% and final disposal amount decreased by 74% thanks to the 3Rs during the period FY2000-2015.[39]

Mottainai

This Japanese exclamation describes the Japanese deep feeling of regret when an object or resource is not properly utilized and wasted. The word first appeared in the 13th century and was popularized outside of Japan by Kenyan environmentalist Prof. Wangari Maathai. Many awareness campaigns and other projects now emphasizes this concept in their communication.

Life-Cycle Assessment (LCA)

This “cradle to grave” approach is an assessment method and decision-making tool that takes into account every aspects and stages throughout the entire product life in order to consider the whole impact on the environment. This approach was promoted in the 3rd Fundamental Plan for Establishing a Sound-Material Cycle Society and often put forward by plastic related organisations.

iii. Collection and treatment (focus on plastic)

Waste categories

Sorting instructions are not homogeneous across Japan but depends on municipality’s needs and characteristics. It is closely linked to the available facilities in the area. Generally, waste separation is performed at source. There are four

[38] “Bill to reduce microplastics released into the environment passed by Japan's Upper House”, The Japan Times (https://www.japantimes.co.jp/news/2018/06/15/national/bill-reduce-microplastics-released-environment-passed-japans-upper-house/#.XDIKzFUzbIU)
[39] “The 4th Fundamental Plan for Establishing a Sound Material-Cycle Society” (English pamphlet), MoEJ (http://www.env.go.jp/recycle/recycle/circul/keikaku/pam4_E.pdf)

main categories: recyclables, incombustibles, combustibles and large-sized waste, but, in average, municipality requires waste separation in 10-20 categories. A famous extreme example is the Zero-Waste city of Kamikatsu, Tokushima Prefecture, where the residents have to separate their garbage into more than 40 bins.[40]

Figure 3: Main waste categories in Japan

Main sources: Ministry of the Environment of Japan and Municipalities

Focus on the fraction plastic

Plastic products can be divided into four categories, namely PET bottles, packaging, PS trays and goods.

PET bottles are typically considered as "recyclables" and collected separately, usually without caps and labels which are made of a different plastic type.

Some municipalities collect plastic containers and packaging (typically those with the プラ [Pla] mark) separately. Otherwise plastic packaging is generally considered as "combustible".

It must be noted that in Japan, most of the packaging are separated and thrown away at home as there are very little garbage bins in the streets and people are encouraged to bring their own trash back home. However, one can find bins in/near convenience stores and near beverage vending machines. In this case PET bottles are usually collected separately while plastic containers and packaging are discarded in the bin for "combustible".

According to the Japan Containers and Packaging Recycling Association 1,202 municipalities (out of 1,553) had a contract for taking-back PET bottles and 1,081 for plastics in 2014.[41]

[40] "The Kamikatsu Zero Waste Campaign: How a Little Town Achieved a Top Recycling Rate", The Nippon Communications Foundation (https://www.nippon.com/en/guide-to-japan/gu900038/)
[41] Website of The Japan Containers and Packaging Recycling Association, page "Statistics" (http://www.jcpra.or.jp/english/tabid/612/index.php)

Depending on their size, goods can be disposed of as burnable or bulky waste.

In FY2017, an experiment where plastic products were collected and recycled together with packaging was conducted in 7 model cities (Yokohama, Kawasaki, Osaka, Nagoya, Toyama, Hiroshima and Kitakyushu). The results were positive in terms of quantity, quality, efficiency and civilian's acceptance.[42]

Municipal Waste Treatment methods

As mentioned above land scarcity is one of the main concerns of Japan and much efforts have been placed into waste reduction. Consequently, waste incineration, that reduces the size by 1/20 and benefits of a positive image in terms of hygiene, has been strongly promoted and supported by the government, municipalities and industries. Continuous research and heavy investment have been put in the development of clean technologies that ensure incineration methods that are safe for the surrounding environment and the health of the people living near the plants (in cities like Tokyo, incineration plants are located very close to residential areas).

In that context, the Waste Disposal Law was amended in May 2005 in order to deviate plastic from landfill and states that "first, emission of waste plastic should be reduced, after which recycling should be promoted, any remaining waste plastic should not go to landfill as it is suitable for use in thermal recycling". The following year, in June 2006, the Container and Packaging Recycling Law was also amended to include thermal recycling as an acceptable method for the recycling of plastic containers and packaging.

More recently, the development of waste to energy technologies that contribute to Japan's strategy to switch to more sustainable energy sources and reduce greenhouse gas emissions, plays in favour of this treatment method.

In FY2015 Japan counted 1,141 incineration plants across the country. This number is slightly decreasing but the capacity per plant is increasing (159 tons/day in FY2015) and the percentage of plants with power generation facilities is increasing (30.5% of total in FY2015 compared to 28% in FY2013). Waste reduction rate reached 98.9% (only 1.1% was directly disposed in landfill). The recycling rate remains stable around 20% (in FY2015: 9 million tons, which represented 20.4%). As of 31st March 2016, the number of remaining sustainable years in the landfills laid at 20.4 years and securing landfill capacity is still considered as challenging.[43]

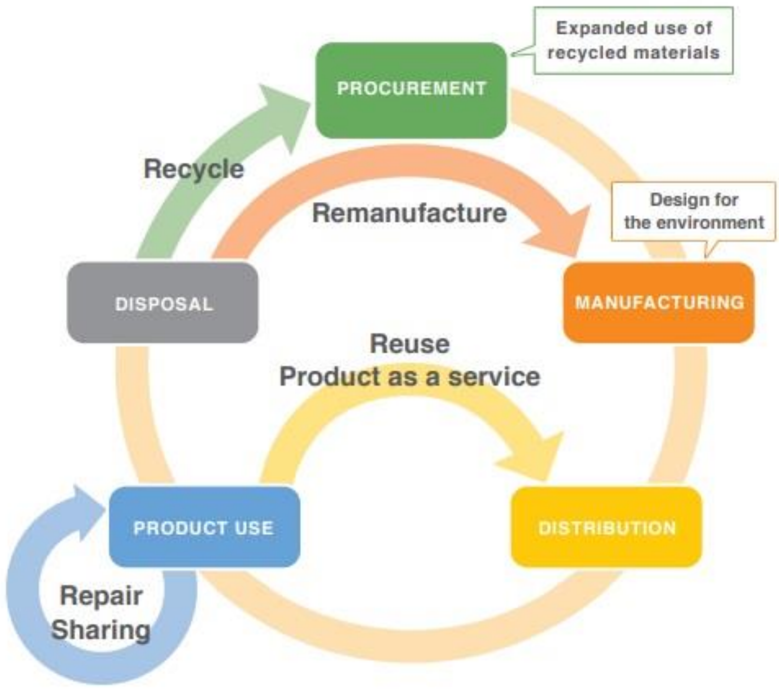
iv. Circular Economy

The Ellen Mac Arthur foundation defines circular economy as a framework for an economy that is restorative and regenerative by design. It involves gradually decoupling economic activity from the consumption of finite resources and eliminating waste from the system. It is based on three principles: 1) design out waste and pollution, 2) keep products and materials in use and 3) regenerate natural systems.[44] It opposes the existing linear model of "take – make – dispose" which gradually leads to resource depletion.

[42] Japan's Resource Circulation Policy for Plastics, Ministry of the Environment of Japan (http://ec.europa.eu/environment/international_issues/pdf/S2-02-Yusuke%20Inoue.pdf)
[43] "Municipal solid waste emissions and disposal in FY2015", MoEJ (http://www.env.go.jp/press/files/en/711.pdf)
[44] Ellen MacArthur Foundation official webpage (https://www.ellenmacarthurfoundation.org/circular-economy/concept)

Because of its geographical and geological constraints, Japan always faced natural resources scarcity and has to rely on imports for its energy use and economic growth. The oil crisis of 1970s prompted the government to review the country's dependence. The report "Towards the circular economy: Accelerating the scale-up across global supply chains"[45] of the World Economic Forum and the Ellen MacArthur Foundation describes the implementation of circular economy in Japan as a three-pronged approach based on 1) structural adjustments to lessen the reliance on imported raw materials and enhance the energy efficiency, 2) the enactment of a comprehensive legal framework and 3) public awareness and participation.

Figure 4: Resource Circulation Throughout the Entire Lifecycle



Source: "The 4th Fundamental Plan for Establishing a Sound Material-Cycle Society"[46] (English pamphlet), MoEJ

The legal framework regulating circular economy includes various policies, especially the Basic Act for Establishing a Sound Material-Cycle Society with the Fundamental Plan for Establishing a Sound Material-Cycle Society (4th Plan published in 2018, see above), the Law for the Promotion of Effective Utilization of Resources (1991) and six product-

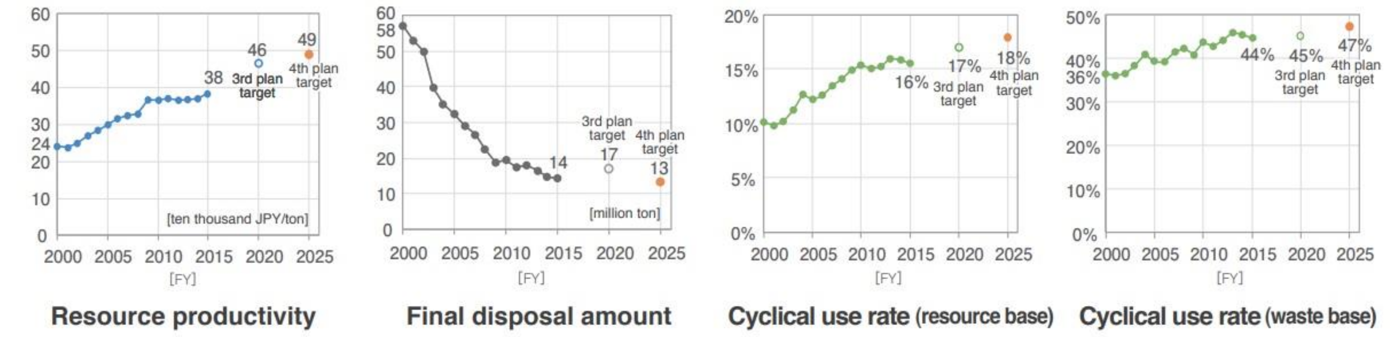
[45] "Towards the circular economy: Accelerating the scale-up across global supply chains" , World Economic Forum and Ellen MacArthur Foundation (http://reports.weforum.org/toward-the-circular-economy-accelerating-the-scale-up-across-global-supply-chains/)
[46] "The 4th Fundamental Plan for Establishing a Sound Material-Cycle Society" (English pamphlet), MoEJ (http://www.env.go.jp/recycle/recycle/circul/keikaku/pam4_E.pdf)

specific regulations (containers and packaging, home appliances, food, construction materials, end-of-life vehicles and small home appliances).

Guidelines, standards and markings have also been introduced to facilitate disassembly and separated collection. When possible, recovered materials are reused for the production of similar products, forming a closed loop.

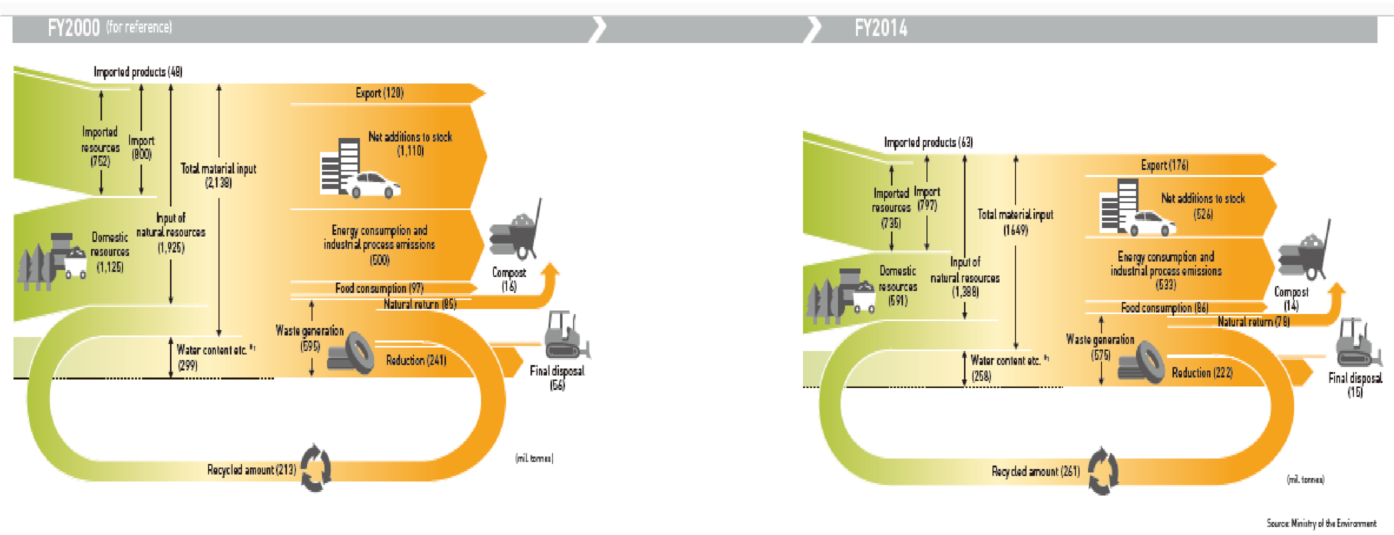
Indicators and targets that are regularly updated have been implemented to follow the material flow and monitor progress.

Graph 4: Material Flow Indicators (Fundamental Plans for Establishing a Sound Material-Cycle Society)



Source: "The 4th Fundamental Plan for Establishing a Sound Material-Cycle Society"[47] (English pamphlet), MoEJ

Figure 5: Material Flow in Japan (FY2000 and FY2014)



Source: "Annual Report on the Environment, the Sound Material-Cycle Society and Biodiversity in Japan 2017", MoEJ[48]

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[47] "The 4th Fundamental Plan for Establishing a Sound Material-Cycle Society" (English pamphlet), MoEJ (http://www.env.go.jp/recycle/recycle/circul/keikaku/pam4_E.pdf)
[48] "Annual Report on the Environment, the Sound Material-Cycle Society and Biodiversity in Japan 2017", MoEJ (https://www.env.go.jp/en/wpaper/2017/pdf/2017_all.pdf)

According to the Ministry of the Environment the market size of businesses related to a sound-material cycle society increased from 40 trillion JPY in FY2000 to 47 trillion JPY in FY2014 and is expected to roughly double compared to FY2000 by FY2025 (target).[49]

As a further demonstration of its commitment and support to the circular economy, Japan hosted the 2nd edition of the World Circular Economy Forum (WCEF)[50], initiated by the Finnish Innovation Fund Sitra, in Yokohama in October 2018.

Note: The Executive Agency for Small and Medium-sized Enterprises (EASME), organized the side event "EU going global: innovative solutions for circular services"[51] during the WCEF 2018. To prepare for this Circular Economy Mission to Japan, a webinar[52] about "Circular Economy in Japan" and the "Japanese Business Culture" was organized by DG Environment, EASME and the EU-Japan Centre for Industrial Cooperation.

d. Recent political / legislative trends regarding single-use plastic in Japan

i. Promotion of domestic resource circulation

Japan used to export annually, mainly to China, 1.5 million tons of plastics, including 0.3 million PET bottles. In response to the ban, Japan is promoting and supporting domestic circulation of the resources. One lever to increase and reinforce the capacity of recycling facilities in Japan is the introduction of a new financial scheme. A budget of 4 million US dollars in FY2017 and then approx. 15 million US dollars (1.5 billion yen) in FY2018 were allocated by the Ministry of the Environment to provide subsidies to waste management companies (sorters, recyclers, etc.) to upgrade and build new state-of-the-art facilities and acquire new equipment. According to this new scheme, 50% of the cost of new facilities should be covered by a subsidy.[53,54]

ii. Microbeads

Following other countries such as the US, Britain and France which have already banned the production of cosmetics with microbeads, the Japanese Diet (upper house) passed mid-June 2018 a bill aiming at reducing the volume of microplastics discharged into the ocean and combating marine pollution. This new anti-plastic law was enacted unanimously by the lawmakers of both the ruling and opposition camps. According to this new text, manufacturers of cosmetic products such as soaps, exfoliating creams and toothpaste will have to end using microplastics in their products. Critics pointed out that this legislation doesn't provide sanction for failure to comply raising questions about

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[49] "The 4th Fundamental Plan for Establishing a Sound Material-Cycle Society" (English pamphlet), MoEJ (http://www.env.go.jp/recycle/recycle/circul/keikaku/pam4_E.pdf)
[50] Official website of WCEF2018: https://www.sitra.fi/en/projects/world-circular-economy-forum-2018/
[51] EASME website: https://ec.europa.eu/easme/en/news/world-circular-economy-forum-side-event-register-today
[52] Webinar available on EU Business in Japan (restricted access): https://www.eubusinessinjapan.eu/
[53] "How China's plastic waste ban has left Japan to deal with mountains of trash", South China Morning Post (https://www.scmp.com/news/asia/east-asia/article/2153690/how-chinas-plastic-waste-ban-has-left-japan-deal-mountains-trash)
[54] Japan's Resource Circulation Policy for Plastics, Ministry of the Environment of Japan (http://ec.europa.eu/environment/international_issues/pdf/S2-02-Yusuke%20Inoue.pdf)

its impact. That being said, major manufacturers of the industry have already started to take measures to address the concern about microplastics and stopped using microbeads.[55]

iii. New Plastic Strategy

This summer (2018), the government gathered representatives from relevant ministries and agencies (such as the Ministry of the Environment and the Ministry of Economy, Trade and Industry), the industrial sector and other experts to set up a council that will draft a plan to reduce plastic waste. The expert panel is discussing various options taking into account businesses and citizens' needs and concerns and should present a strategy including concrete measures and numerical targets for reducing single-use plastic waste by the end of this year. Discussion topics might also encompass the support to developing countries. The Ministry of the Environment is expected to adopt the plan before the G20 that will be held in June 2019.

A preliminary draft submitted to the Central Environment Council in October suggests following objectives[56,57]:

- cut the amount of single-use plastic products, including shopping bags, plastic bottles and drinking straws by 25% by 2030
- boost the amount of bioplastics by 2030 (from less than 50,000 tons in fiscal year 2013 to up to 2 million tons annually)
- raise to 60% the share of recycled/reused plastic containers by 2030
- effectively use 100% of plastic waste, including thermal recycling by incineration, by 2035

Among the steps to achieve these objectives, it has already been announced that it will become mandatory for retailers to charge for plastic shopping bags (with some relief measures for small businesses). Further measures should include enhanced recovery and reuse of plastic resources, ban of microbeads in personal care products, subsidy program for biodegradable plastics, etc.

The set of proposals didn't face any strong objections among stakeholders and the Keidanren (Japanese Business Federation) seems willing to collaborate to achieve these ambitious targets.[58]

METI (industry) and MAFF (agriculture) are also setting up their own committees to focus on areas within their scope.

[55] "Step up war on plastic pollution", The Japan Times (https://www.japantimes.co.jp/opinion/2018/06/23/editorials/step-war-plastic-pollution)
[56] "Japan to make charging for plastic shopping bags mandatory", The Japan Times (https://www.japantimes.co.jp/news/2018/10/20/national/science-health/japan-make-charging-plastic-shopping-bags-mandatory/)
[57] "Japan eyes reducing amount of plastic waste by as much as 25% by 2030", The Japan Times (https://www.japantimes.co.jp/news/2018/10/14/national/japan-eyes-reducing-amount-plastic-waste-much-25-2030)
[58] "Environment Ministry compiles targets to combat single-use plastic pollution", The Mainichi (https://mainichi.jp/english/articles/20181020/p2a/00m/0na/024000c)

iv. Subsidy program for alternatives

The Japanese Government has identified cost concerns as the major barrier for the development of alternatives to plastic and officials think that the subsidy approach will be more effective than the regulatory method adopted by the European Union to encourage the industry to develop and switch to plastic substitutes and set high targets on reducing plastic litter. [59]

The Ministry of the Environment therefore plans to provide subsidies to companies and research institutions that develop and/or use biodegradable plastics and other alternatives to single-use plastic products. The total budget for this measure is planned to reach 5 billion yen (45 million USD) for the fiscal year 2019. The amount allocated to companies will depend on the type and volume of products they produce. One-third to half of new investments in equipment should be supported by the governmental subsidies in an attempt to boost the production of plastic alternatives. [60]

In addition, the Ministry intends to commission companies and research institutions to develop products commonly used in daily life (for example food containers) made from bioplastics in order to stimulate demand for the material.[61]

Besides the environmental benefits of biodegradable plastics, the government also seeks to boost and support Japanese companies against overseas competitors.

e. Market Analysis of plastic alternatives in Japan

i. Consumption trends and market characteristics impacting plastic use

Japan is known for being service oriented and customer care is of primary importance. Japanese consumers are now used to a high level of quality of service and are expecting businesses to do their best to serve them. The Japanese expression "The Client is God" perfectly describes this relationship. This explains why shops, especially convenience stores and department stores, are reluctant to limit the usage of carrier bags at register and proactively give a free bag even for just a chocolate bar or bottle.

Besides, Japanese customers pay close attention to external quality and won't buy products which are not in perfect condition. Small scratches or slightly damaged items may result in rejection. This obsession for perfection often leads to useless additional layer of packaging. Typical illustrations of this overwrapping are the packaging of fruits and vegetables such as bananas sold individually in a plastic bag or apples wrapped in a foam net, or box of cookies which are all wrapped individually.

In addition, packaging is sometimes as much valued as the product itself, especially when it comes to presents. This also lead to overwrapping and complex packaging.

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[59] "Plastic straws headed for reduction in Japan", Nikkei Asian Review (https://asia.nikkei.com/Spotlight/Environment/Plastic-straws-headed-for-reduction-in-Japan)
[60] "Japan Government Promotes Bioplastics" Bioplastics News (https://bioplasticsnews.com/2018/08/27/japan-government-bioplastics/)
[61] "Japan environment ministry to back development of biodegradable plastics", The Mainichi (https://mainichi.jp/english/articles/20180827/p2a/00m/0na/003000c)

Another aspect of the Japanese consumption habits that has an effect on waste production is the fondness of consumers for new products, seasonal items and limited editions. This constant renewal in the product range impacts the shelf life of goods and generates both packaging and product/food waste.

ii. Consumer awareness

Until now, plastic waste control measures have focused mainly on recycling while reduction efforts have been rather neglected.[62]

Lack of awareness

Japanese people are often deemed to be environmentally conscious, especially when looking at the spotless streets, and images of the soccer supporters who gather their trash before leaving the stadium have widely contributed to this stereotype. While this is indeed true, a general lack of awareness about environmental issues, such as marine pollution or the negative sides of plastic, has been pointed out by various stakeholders such as NPOs and eco-friendly citizens.

Education and communication emphasized recycling and the adoption of appropriate behaviour when sorting waste. However, the first 2 Rs (Reduce and Reuse) have been less promoted. Consequently, many people tend to consider that throwing their waste in the good container is enough. The issues of ocean pollution due to plastic litter, the Pacific Garbage Patch, etc. is often either unknown or considered as an issue not related to Japan / for which Japanese are not responsible.

Media are sometimes criticised for not addressing environmental topics enough, and more generally not providing enough background information, explanations, perspectives, etc. in their coverage resulting in auditors lacking elements to grasp cause-effect relationships and form a thoughtful opinion.

Nevertheless, mentality is evolving, and the population becomes more sensible to this global issue and the impact on and of Japan. This awareness was triggered i.a. by recent reports about the impact of marine pollution on aquatic animals ("more plastic than fish in the ocean by 2050") and the plastic waste ultimately reaching people's plate through the food chain. These were powerful arguments in an island country heavily reliant on marine life for its daily diet. Further, the video of the turtle with a plastic straw stuck into its nose became viral and showed on large scale the damages on wildlife. Finally, the announces of some renowned and well-implemented companies such as Starbucks who took the decision to phase out straws from all their stores (see below) led to questioning as it is directly impacting consumption habits.

Mottainai

As explained above, the concept of "*mottainai*" resumes Japanese feeling towards wasting something valuable. This expression is widely used in awareness campaign related to waste. For example, the Japanese Ministry of Agriculture

[62] "Japan aims to compile strategy to cut plastic waste", Star Advertiser (http://www.staradvertiser.com/2018/06/21/news/japan-aims-to-compile-strategy-to-cut-plastic-waste/)

Forestry and Fisheries currently refers to "*Mottainai*!" in its actions and communication to promote food recycling and reduce food waste/loss.[63]

When Ms Yuriko Koike (current Governor of Tokyo since 2016) was Minister of the Environment (2003-2006), she also referred to this Japanese value and created the "*Mottainai Furoshiki*". *Furoshiki* is a traditional Japanese wrapping cloth that can be folded to serve as a bag. Combining these two symbols deeply rooted in the Japanese culture was an attempt to reduce plastic bags used by households.[64] An exhibition about this ecological bag was held in Paris, France from 30th October 2018 to 10th November 2018.[65]

Plastics Smart Campaign

Plastics Smart is an awareness campaign launched by the Japanese government in October 2018 in order to promote smart and sustainable ways to handle plastics, such as smart consumption, to prevent marine plastic waste and ocean pollution.

The online platform[66], available in Japanese and English, aims to increase awareness and understanding of the population regarding marine litter, collect and share best practices and initiatives of various stakeholders (municipalities, companies, NPOs, individuals, etc.), as well as promote the reduction and reuse of plastics.

The campaign primarily relies on wide spreading initiatives and original ideas through social media. Individuals and organisations are encouraged to share their pictures and comments on Instagram, Facebook and Twitter using the hashtag #プラスチックスマート (Japanese for #Plastics Smart). In addition, companies and organisations are invited to apply and present their actions to tackle the issue of marine plastic litter. Contributions will be published on the Plastics Smart website as well as on the different social media accounts of the Ministry of the Environment and will be presented during the "Plastics Smart" Forum. If appropriate, they might also be shared on PACE, the Platform for Accelerating the Circular Economy, a public-private collaborative platform launched in 2017 and managed by the World Economic Forum for the promotion of circular economy. Award ceremony and presentation on the occasion of the G20 Environment Ministers Meeting are also on the agenda.

The campaign fosters cooperation and collaboration between citizens, NGO, industries and governments. The organisation and participation to clean-up activities are encouraged.

iii. Business trends and company initiatives

The decision of the EU to ban specific single-use plastic products, followed by the announce of some international corporations to also adapt their offer, ultimately impacted the Japanese market. On the one hand, the international strategy of global brands will also apply in Japan and on the other hand Japanese companies followed the trend.

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63 "Reducing Food Loss and Waste & Promoting Recycling - "MOTTAINAI" for Foods Once Again", MAFF (http://www.maff.go.jp/e/policies/env/attach/pdf/index-5.pdf)
64 "Minister Koike created the "*Mottainai Furoshiki*"", Ministry of the Environment (https://www.env.go.jp/en/focus/060403.html)
65 "Furoshiki Paris", Maison de la culture du Japon à Paris (https://www.mcjp.fr/fr/agenda/furoshiki-paris-a-la-mcjp)
66 Plastic Smart Official website: http://plastics-smart.env.go.jp/en/index.html

In that context, many announces towards a reduction of single-use plastic usage have been made in the past few months.

Foreign capital companies in Japan

Starbucks: the American coffee chain opened its first Japanese store in Ginza, Tokyo on 2nd of August 1996 and expanded quickly nationwide. As of the end of September 2018, the network encompassed 1,392 stores throughout the country.[67] Starbucks announced that they will phase out straws in all their stores, including in Japan. Starbucks is a very popular chain in Japan and this decision sparked many questions among consumers about the impact of single-use plastic items that they were routinely using in their daily lives without thinking about the consequences.

IKEA: The Swedish furniture retailer IKEA Japan opened its first Japanese store in 2006 and now counts about 10 stores across the country. One of their top-selling items on the Japanese market is a series of resealable plastic bags (allowing for example to keep food fresh) with seasonal patterns called "ISTAD" that is otherwise not so popular on other markets. [68]

IKEA Japan CEO Helene von Reis announced in August 2018 that by 2020 all single-use plastic products, such as straws and food storage bags, will be removed. The company intends to stop selling 7 disposable plastic products. They will be replaced by paper products, materials from nature origin or recycled.[69]

The above mentioned ISTAD bags are since 2017 made of at least 85% renewable materials, mostly by-products from the sugar cane industry.[70] This item is the first bioplastic product put up for sale on big-scale at IKEA.

Japanese companies (reduce / recycle)

Major Japanese companies of various fields have taken concrete actions to reduce their use of oil-based plastic. It is assumed that they will influence their sector and that other companies will follow these trends. This section presents initiatives in the catering (Skylark Holdings Co., Ltd.), cosmetics (Kao, KOSÉ) and beverage (Suntory Holdings Limited) industries.

Restaurant chain: Skylark Holding

Founded on 4th April 1962 Skylark Holdings Co., Ltd. is a Japanese company specialised in food services and related businesses. While the headquarters are located in Musashino-shi, Tokyo, the group counts 3,200 stores worldwide, of which 3,143 are located in Japan (as of 30th September 2018), and over 100,000 employees (full-time employees and

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[67] Starbucks Japan website: http://www.starbucks.co.jp/en/company.html
[68] "Ikea Japan putting it all together for the future", Japan Today (https://japantoday.com/category/features/executive-impact/Ikea-Japan-putting-it-all-together-for-the-future)
[69] "IKEA Japan to remove all single-use plastic products", NTV News 24
[70] Catalog of IKEA Japan (https://www.ikea.com/jp/en/catalog/products/40385289/)

crew, as of June 2018).[71] The group was a pioneer in the family restaurant business in Japan and is now world's largest directly operated restaurant chain. It mainly operates family restaurants, coffee shops and fine dining, offering a vast variety of cuisine types (Japanese, Western, Chinese, etc.), including for example their flagship brand Gusto (family restaurant), Jonathan's (family restaurant), Bamiyan (Chinese dishes), Yumean (Japanese cuisine), Grazie Gardens (Italian restaurant) or Flo Prestige (French confectionary and delicatessen). It is estimated that about 105 million plastic straws are used per year in their shops.

Mid-August 2018, the Skylark Holdings Co. announced that they will ban disposable plastic straws from all their outlets in and outside the country by 2020, when Tokyo will host the Olympic and Paralympic Games. As a first step, plastic straws will be removed from the restaurant chain "Gusto" (1,370 stores) by the end of this year (2018). Skylark is the first major Japanese restaurant chain operator to decide a ban on plastic straws in the nation and it is assumed that this resolution will influence other restaurants across Japan.[72]

Consumer packaged goods companies: Kao, KOSÉ

Personal care and household cleaning products companies have introduced since long various initiatives to reduce the impact on the environment of their products and activities and build a sustainable society, typically reducing the weight and/or composition of their packaging and more recently voluntarily shifting from plastic microbeads to naturally derived components in their personal care products.

The Japan Cosmetic Industry Association urged its members in 2016 to limit the use of microplastics. Thanks to this self-regulation of the industry, all cosmetics products should be free from microplastics by end of 2018.[73]

Besides, it is noteworthy to point out that, in Japan, personal care and home cleaning products (such as shampoos, laundry, etc.) are generally sold as refill pouches and consumers reuse the original containers many times.

Kao Corporation (founded in 1887, headquartered in Tokyo) has defined a sustainability strategy based on a 4R's approach: Reduce, Renewable, Reuse and Recycling. Renewable include switching from petroleum-based resins to plant-based alternatives (since 2012). Their refill packaging are made of 15% bioplastics in container weight. The CuCute Large Refill (7 Refills) Bottle's rate of bio-polyethylene reaches 35%. Recycled materials are also used, such as measuring spoon for Attack laundry detergent (100% recycled resin, developed in 1987) or dry and wet sheet fibres of floor cleaning tools (100% recycled PET material, launched in 1994).[74]

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[71] Company profile of official website (https://www.skylark.co.jp/company_e/skylark_profile.html)
[72] "Plastic straws to be phased out at all Skylark-run restaurants", The Asahi Shimbun (http://www.asahi.com/ajw/articles/AJ201808170030.html)
[73] "The end of microplastics in Japan's cosmetics", BeautyTech.jp (https://medium.com/beautytech-jp/the-end-of-microplastics-in-japans-cosmetics-c3f21c0a3aa)
[74] Kao Sustainability Data Book 2018 (https://www.kao.com/content/dam/sites/kao/www-kao-com/global/en/sustainability/pdf/sustainability2018-e-all.pdf)

The “RecyCreation” initiative has both social and environmental dimensions. Based on the concept “*Throwing it away after use. We want to change this common practice*”, the initiative aims to promote the collection of used refill pouches by local communities and upcycle them into different products (e.g. building blocks).[75]

KOSÉ Corporation (founded in 1946, headquartered in Tokyo) used to include microplastic beads in their rinse-off cleansing products. It shifted to plant-derived materials for the development of new cleansing products in 2014 and finished replacing their traditional range that was still containing plastic microbeads with new products. The shipment of cleansing product containing microplastic beads has completely ended since January 2018.

In terms of packaging KOSÉ is striving to reduce the use of resin while increasing the share of plant-based plastic (instead of oil-based) for the production of its containers. The bottle of Softymo Speedy Cleansing Foam is made since 2013 of 90% plant-based PE (polyethylene). Further initiatives include containers that are easy to dismantle for easier waste separation and the promotion of refills.[76]

Beverage: Suntory Holdings Limited

Suntory Holdings Limited, whose headquarters are located in Osaka, is one of the world leaders in the beverage industry. Its history started in 1899 with the production and sales of wine as well as western-style liquors and diversified later into other fields. In terms of sales, the segment Beverage and Food (that includes non-alcoholic beverages, health drinks, processed food, and other products) accounted 57% of the consolidated revenue for FY2017, Alcoholic Beverage (spirits, beer, wine and other alcoholic beverages) 33% and Others (health food, ice cream, restaurants, flowers, operations in China and other operations) 10%.[77]

Suntory Group established voluntary “Guidelines for the Environmental Design of Containers and Packaging” in 1997 and strives to consider environmental standards such as the 3Rs in its containers and packaging. [78]

Already in 2007, the Ribena soft drink brand became the first in Britain to use 100% recycled bottles but, at least until now, the brand decided to use exclusively virgin plastic for the Japanese market.[79]

The company introduced in 2011 Japan’s first bottle-to-bottle mechanical recycling system. At first, the rate of reused PET resin was at 50% and increased to 100% after a year operation when it was confirmed that stable supply and production was possible.

Suntory collaborates since 2012 with Anellotech Inc., an American-based sustainable technology company specialised in the development of non-food biomass, with the objective to reach 100% bio-based PET bottle products for its

[75] Kao's RecyCreation Initiatives Are Underway: Kao's Contribution in Revitalizing Onagawacho (Miyagi Prefecture) Using Used Refill Packs (https://www.kao.com/global/en/news/2018/20180327-001/)
[76] KOSÉ official website (http://www.kose.co.jp/company/en/csr/theme2/commodity/)
[77] “Suntory Group Corporate Profile 2018” (https://www.suntory.com/about/overview/pdf/profile2018.pdf)
[78] Webpage of the company, page “Sustainability”: https://www.suntory.com/csr/activity/environment/reduce/resources/recycle/
[79] “How China’s plastic waste ban has left Japan to deal with mountains of trash”, South China Morning Post (https://www.scmp.com/news/asia/east-asia/article/2153690/how-chinas-plastic-waste-ban-has-left-japan-deal-mountains-trash)

beverage range. Beginning of 2016 they jointly built a development and testing plant in Texas, USA to develop plant-derived PET raw material.[80] The companies announced this summer (2018) significant progress.[81]

"2R+B" Strategy for PET Bottles

The 2 Rs stand for Reduce and Recycle while the B represents Bio (using plant-based resources). It aims at reducing the overall quantity of plastic used and incorporating recycled and plant-based materials.

The group defines its Reduce/Recycle + Bio strategy as an "*approach that promotes reductions in volumes of resin used and the effective use of resources through material recycling as well as the aggressive use of renewable alternatives to petroleum-based raw materials. The Reduce aspect of this approach is applied not only to bottles, but also to labels and caps in order to promote volume reduction. The Recycle aspect involves creating a mechanical bottle-to-bottle recycling system, the first of its kind in Japan. The Bio aspect has already been implemented through the use of 30% plant-based materials for Suntory Tennensui (550ml)*".[82]

The environmentally-friendly Green Eco Bottle of the mineral water brand "Suntory Tennensui" (550ml) is composed of the lightest domestically produced cap and bottle, both elements using 30% plant-based materials, and the thinnest label manufactured in Japan, using 80% recycled PET resin.

A joint collaboration with Kyoei Industry Co., Ltd (Japanese recycled materials manufacturer involved in the recycling, processing and sale of synthetic resins), and the European companies SIPA SpA (Italian manufacturer of beverage filling equipment) and EREMA Group GmbH (Austrian equipment manufacturer) resulted in 2017 to the development of the "FtoP Direct Recycle Technology". This innovation based on new processes for the preform production of soft drink PET bottles is said to reduce CO_2 emissions by about 25%.[83]

Further R&D projects and initiatives include extremely lightweight heat-resistant PET bottle, weight reduction of cans and glass bottles, FSC certification obtention, etc.

Suntory Beverage & Food Ltd.'s received many awards for its efforts and innovations to reduce the impact on the environment and contribution to a sound-material cycle society.

Japanese industry (alternatives)

Bioplastics

Kaneka Corporation (founded in 1949, with head offices in Tokyo and Osaka and 4 manufacturing sites across Japan) is a leading chemical manufacturing company.

[80] "Decision to Construct Development and Testing Plant in U.S. for Development of 100% Bio-based PET Bottles", News release Suntory (https://www.suntory.com/news/article/12563.html)
[81] "Suntory states it has taken a big step towards a 100% bio-based plastic bottle", Food Navigator Asia (https://www.foodnavigator-asia.com/Article/2018/08/13/Suntory-states-it-has-taken-a-big-step-towards-a-100-bio-based-plastic-bottle)
[82] "World's First PET Beverage Bottle Featuring Caps Made with 30% Plant-based Materials", News release Suntory (https://www.suntory.com/softdrink/news/pr/article/SBF0380.html)
[83] "Development of "FtoP Direct Recycle Technology" for Use in Soft Drink PET Bottle Preform Production" (https://www.suntory.com/news/article/13135E.html)

KANEKA Biodegradable Polymer PHBH™, “the world’s first completely bio-based polymer with soft and heat-resistant properties”[84], is made from vegetable fats and oils and other biomass as its primary raw materials. More than 90% degrades into carbon dioxide and water within 6 months in seawater at 30 degrees Celsius.[85] The characteristics of this biopolymer make it suitable for a wide range of use, such as materials used in agriculture, civil engineering, packaging and car interiors.

In response to stricter environmental legislations overseas, the company has decided to multiply by 5 their bioplastics production. They’re planning to invest about 2.5 billion yen (22.5 million USD) to increase the annual production capacity of their plant located in Takasago, Hyogo Prefecture to about 5,000 tons. Works are scheduled to be completed by December 2019 and the company is considering to further expand its capacity to about 20,000 tons annually in the future. With the recent EU ban on single-used plastic products in mind, Kaneka is expecting to use the polymer in products such as straws, forks and materials used in harbours. [86,87]

Pulp & Paper Industry

As a consequence of the society becoming more and more paperless and the decline of the domestic population, the Japanese paper industry has been rather sluggish in recent years and welcomes the new tendency towards plastic reduction and growing demand for alternatives to plastic-based packages as a great opportunity. Costs remain a major restraint factor that some companies hope to overcome through awareness raising (willingness of the consumers to pay more) and/or mass production.[88] Besides the food & beverage sectors, paper manufacturers also hope to persuade the consumer goods industry to change from plastic containers to milk-carton style packaging for liquid products such as shampoo or shower gel.[89]

Nippon Paper Industries Co., Ltd. (founded in 1949, headquartered in Tokyo) is one of the world's top pulp and paper manufacturing company.

The company reportedly managed to overcome the usual drawbacks of paper drinking straws, such as loss of resistance in case of long-term immersion and risk of affecting taste and plans to launch these new biodegradable straws by the end of this year (2018).[90]

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[84] Company website, page “New Business Development” (http://www.kaneka.co.jp/en/branch/nb_development/)
[85] “Japanese Companies Expand Bioplastics Production”, Bioplastics News (https://bioplasticsnews.com/2018/08/24/japan-bioplastics-production/)
[86] Japanese Companies Expand Bioplastics Production”, Bioplastics News (https://bioplasticsnews.com/2018/08/24/japan-bioplastics-production/)
[87] “Starbucks straw ban fuels rush to eco-friendly plastics”, Nikkei Asian Review (https://asia.nikkei.com/Business/Business-Trends/Starbucks-straw-ban-fuels-rush-to-eco-friendly-plastics)
[88] “Greater demand for paper packaging in Japan as awareness of plastic pollution spreads”, Food Navigator Asia (https://www.foodnavigator-asia.com/Article/2018/10/02/Greater-demand-for-paper-packaging-in-Japan-as-awareness-of-plastic-pollution-spreads)
[89] “Japan’s paper industry pushes sector to replace plastic”, Financial Times (https://www.ft.com/content/791adc60-b9b3-11e8-94b2-17176fbf93f5)
[90] “Nippon Paper develops paper straws just as strong as plastic ones”, Nikkei Asian Review (https://asia.nikkei.com/Business/Companies/Nippon-Paper-develops-paper-straws-just-as-strong-as-plastic-ones)

The company also strives to develop innovative beverage containers and related technologies that will support the wide spreading of paper packages. It newly developed "NSATOM" (acronym of Nippon- Shikoku Aseptic Total Optimized Method), “*the world's first aseptic filling system for paper packaging in ambient distribution that supports 'particle, long-fibre and high-viscosity filling', 'high hygienic quality with 6 log reduction' and 'automated cleaning of filling sections'*”.[91]

Oji Holdings Corporation (founded in 1873, headquartered in Tokyo) is one of the world’s largest manufacturer of paper products.

The Group’s range of products already counts a wide variety of paper-based packaging and containers for food and beverages, including for yogurts, ice-cream or oily products served in fast food restaurants.

In April 2018, they opened a Packaging Innovation Centre that is currently conducting research on biodegradable plastics (such as development of composite materials made from biodegradable plastic and pulp) and paper products with added functions, including water and heat resistant paper lids for disposable cups and paper-based recyclable packaging with barriers properties against oxygen and moisture. The company is planning to start mass production of the paper wrapper next year, mainly targeting food producers.[92]

New material: LIMEX by TMC Co., Ltd.

LIMEX is a new innovative material developed by the Japanese company TBM Co., Ltd. (founded in 2011, headquartered in Tokyo) that could become an alternative to paper and plastic products.

Mainly made from limestone (70%, the remaining 30% being resin from petroleum), its fabrication requires no water nor trees, thus not causing deforestation and saving resources (water, oil) when compared to conventional plastic or paper manufacturing. The resulting sheet is light, water resistant and recyclable.[93]

Current products made of LIMEX include menus, business cards, maps, boxes, banners, bags, etc. for the paper alternatives; while packaging containers, backlit posters, folders, stationary goods count among the plastic substitutes.[94]

The company received various awards, such as Japan Venture Awards 2016 (Organisation for Small and Medium Enterprises and Regional Innovation, SMRJ).[95]

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[91] “Nippon Paper Industries Develops "NSATOM®", a New Aseptic Filling System for Paper Packaging”, press release (https://www.nipponpapergroup.com/english/news/year/2018/news180919004228.html)

[92] “Development of Biodegradable Plastics” and “Development of Paper Products with Added Functions” that take the global environment into consideration” (https://www.ojiholdings.co.jp/Portals/0/resources/content/files/english/ir/news/2018/6BTcFYw.pdf?TabModule1281=0)

[93] “LIMEX set to revolutionize paper, plastic industry”, JapanToday (https://japantoday.com/category/features/executive-impact/limex-set-to-revolutionize-paper-plastic-industry)

[94] Official website of TMC Co., Ltd.: https://tb-m.com/en/limex/products/

[95] J-GoodTech (https://jgoodtech.jp/en/web/page/corp/-/info/JC0000000002704/appeal/eng?get-similar-corp-id=JC0000000002704)

Despite its interesting properties, one major concern is the recycling as the inorganic content, mixed in the waste flow, could prevent proper paper or plastic waste recycling, and/or increase the quantity of ash if burned.

4. Focus on the products targeted by the new EU rules in Japan

This section will focus on the single-use plastic products that the European Commission has identified as being responsible for 70% of total marine litter on European beaches. It encompasses 10 disposable plastic items as well as fishing gear.

As mentioned above the Japanese government is currently working on a new legislation that will introduce numerical reduction targets, promote collection and reuse as well as support bioplastics and other sustainable alternatives. However, according to stakeholders, it is unlikely that measures will target specific items (except for plastic shopping bags).

The environmental NGO "Ocean Conservancy" is organizing yearly the International Coastal Clean-Up, a garbage pick-up activity in coastal areas and in waters around the world. This event is an opportunity to collect data about the type of waste found on the sea shores of the globe. The results of every participating countries are aggregated in a report. The top 10 items collected globally correspond to the products targeted by the new EU regulation. The table below gives the figures of Japan from the 2018 report "Building a Clean Swell"[96].

Table 2: Top 10 items collected in Japan during Ocean Clean-Up 2017

Top 10 items collected globally (2017)	Japan (quantity) Total items collected: 110,119	Japan (% of total)
Cigarette butts	12,508	11.36
Food wrappers	5,312	4.82
Plastic beverage bottles	6,599	5.99
Plastic bottle caps	4,658	4.23
Plastic grocery bags	2,575	2.34
Other plastic bags	3,121	2.83
Straws, stirrers	1,062	0.96
Plastic take out / away containers	3,723	3.38
Plastic lids	1,341	1.22
Foam take out / away containers	2,216	2.01

Source: "Building a clean swell - 2018 report", Ocean Conservancy

[96] "Building a clean swell - 2018 report", Ocean Conservancy (https://oceanconservancy.org/wp-content/uploads/2018/07/Building-A-Clean-Swell.pdf)

a. Cotton buds

Japanese are particularly sensitive to hygiene and excited by novelty even when it comes to staple products such as cotton buds. Black cotton buds, head of various shape or with messages printed on the stem... consumers have the choice.

Paper cotton buds are already available in any drugstores chain or 100-yen shops.

"*Mimikaki*", a Japanese traditional ear cleaner, is a stick typically made of a wood (bamboo) with curved form to remove ear wax. It is said to exist since Edo period and last for an entire life.

Major Japanese players on the cotton buds market include:

- **Heiwa Medic.Co.,LTD** (http://www.heiwamedic.com/), founded in 1960, is considered as the first cotton swabs producer in Japan (1965) and is now one of the leading companies of cotton products in Japan with a daily productivity of 10,000,000 units and is manufacturing 40% of swabs produced in Japan. Product categories are mainly branded under the name "LIFE".
- **Sanyo Co., Ltd.** (https://www.sa-n-yo.co.jp/en/) for whom "Made in Japan" is a guarantee of high-quality and safety. Product categories encompass cotton buds for sanitary use, babies, cosmetic use and auxiliary nursing. In terms of sales amount of cotton buds for general use, the company records about 40% share in the domestic market.
- **Suzuran K.K.** (https://www.suzuran-corp.co.jp), founded in 1980, is engaged in sales and import / export of sanitary materials, cosmetics, pharmaceuticals, etc. Its product range includes cotton bud with paper stem sold under the brand Lilybell / Lilian.

b. Cutlery, plates, straws & stirrers

Straws surely benefit of the most public awareness and voluntary initiatives from businesses, due to the announcements of leading companies and the viral video of the turtle with a straw stuck in its nose.

The recent decisions of Starbucks and Skylark to ban plastic straws in their stores is likely to influence other restaurants and coffee shops.

It is estimated that it costs less than 1 yen to produce a plastic straw but around 13 yen for a paper straw[97] (even the cheapest paper straw would cost 6 times more than its plastic equivalent[98]) but this gap should decrease with mass production. Long-lasting options (steel, glass) are already available. Wood / bamboo alternatives also exist but it must be noted that these materials are usually considered as single-use, especially if used in restaurants/cafes.

Major Japanese players on the straw market include:

- **SHIBASE KOGYO Co., Ltd.** (http://www.shibase.co.jp/index.html), founded in 1926, started production of straw in 1969. The company is located in Asakuchi City, Okayama Prefecture, which is considered to be the

[97] "Japan eyes reducing amount of plastic waste by as much as 25% by 2030", The Japan Times (https://www.japantimes.co.jp/news/2018/10/14/national/japan-eyes-reducing-amount-plastic-waste-much-25-2030)
[98] "Japan's paper industry pushes sector to replace plastic", Financial Times (https://www.ft.com/content/791adc60-b9b3-11e8-94b2-17176fbf93f5)

birthplace of (wheat) straws in Japan. Today, about 80% of the domestic production of straws still comes from Asakuchi City. Among the straw manufacturers located in the area, SHIBASE KOGYO CO., LTD. is the domestic top manufacturer of drinking straws, producing more than 200 kinds of straws.[99]

- **NIPPON STRAW Co.,Ltd** (http://www.nipponstraw.com/en/index.html), founded in 1955, headquartered in Tokyo with plants in Shizuoka and Kumamoto prefectures, is mainly specialised in the manufacture of drinking straws, milk caps and other plastic products. It is the largest producer of bendable & telescopic straws used in pack drinks, etc. with an output of nearly 6 billion pieces a year. In response to the global trend of reducing disposable plastic items, the company will invest 300 million yen and establish a new R&D centre in its Kumamoto plant for the development of bioplastic and paper alternatives.[100]

In terms of **cutlery**, the Japanese market is much more limited than the European simply because of the different eating habit. Although Japanese people heavily resort to lunch boxes for their meals, and service-oriented convenience stores, supermarkets and restaurants of course provide the necessary disposable cutlery, they are mostly wooden chopsticks. Spoons, and occasionally forks, are available but knives are barely to be found (mainly because unnecessary).[101]

According to the Japan Plastics Industry Federation, 109,981 tons of plastic **plates** have been sold (93,246 tons of flat and 16,735 tons of wave plates) in 2017.[102]

As for **stirrers**, the disposable wooden alternative for hot drinks is already widely spread and reusable metal stirrer for coffee and cocktails are available as well.

c. Sticks for balloons and balloons

The Japanese toy market stagnated for several years but is on the upturn again. FY2014 was the best of the decade with an expansion of 9% to ¥736.7 billion yen. Despite the low birth rate, the buying power per child is very high. Adults are also consumers of toys. It is reported that 20 % of the industry's products target the age category 20+[103].

The Japan Balloon Association[104] is the only association of the balloon industry in Japan and consists of 84 individual companies and corporate members nationwide. Its goal is to revitalize the sector by exchanging information, knowledge and technology among its members and by contributing to improving the quality of the balloon industry and developing business performance. They also try to encourage the general public to better understand balloons.

Japanese companies on the balloon market include:

- **Marusa Saito Gom Co. Ltd.** (http://maru-sa.co.jp/), founded in 1950 and headquartered in Chiba, is the last remaining handcrafted balloons factory in Japan. The balloons are made from 100% natural rubber.

[99] Grape Japan: https://grapee.jp/319398
[100] Research Institute for Environmental Finance (RIEF) (http://rief-jp.org/ct12/83184)
[101] "Why Japanese Convenience Stores Won't Give Out Plastic Knives", Grape Japan (https://grapee.jp/en/87354)
[102] Sales of Plastics Products 2017 Japan: http://www.jpif.gr.jp/english/statistics/monthly/2017/2017_sales_products_e.htm
[103] International fair programme World of Toys by Spielwarenmesse eG: http://www.world-of-toys.org/asia-pacific/market-overview-asia-pacific/japan/
[104] Official website of the Japan Balloon Association: http://jba1.jp/index.html

- **Suzuki Latex Industry Co., Ltd.** (http://balloon.suzukilatex.co.jp/english/index.html), located in Chiba prefecture, is a manufacturer of latex products (balloons and finger cots). The company is leading manufacturer of YoYo Balloons (small-sized balloon filled with water and air, hold by an elastic string with a finger loop at the end, commonly found in Japanese *matsuri* festivals) since 1950. YoYo balloons and pumps are made in Japan.
- **Takara Kosan Co., Ltd.** (http://www.balloonworld.jp/), established in 1979 and headquartered in Tokyo, is a balloon specialist. They do business with major toy distributors, ad agencies and major amusement parks. Their product range encompasses a wide range of balloon types, including large-sized character balloons. They also have know-how in performances with balloons.
- **BALLOON'S PRO Inc.** (https://ssl.balloons-pro.co.jp/) is the Japanese company of the Belgian Belbal Group.

To be noted than there exists a Japanese traditional paper balloon called "*kami fusen*"[105]. It is said that they were created in the 1890's as an alternative to the (expensive at that time) rubber balloons. "K*ami fusen*" are popular during events and can be used as decoration or toy.

d. Food containers / Packets & wrappers (for crisp, sweet)

The overall packaged food sector in Japan is rather sluggish as a consequence of the demographic evolution. The trend is for healthy, high-quality and convenient products. Supermarkets remain the main distribution channel but the share of convenience stores in on the rise. The competitive landscape is mainly composed of domestic manufacturers (Meiji, followed by Yamazaki Baking and JA Group).[106]

On the packaging industry side, it has been reported that flexible, small, and convenient packaging that keep products fresh are becoming more and more popular.[107]

According to the Japan Containers and Packaging Recycling Association, more than 60% (by volume) of Japan's household waste is made up of packaging and containers, mainly for food and beverages, and a large part is made of plastic.

Japanese have a culture of eating "bento"[108] and the busy lifestyle fostered the convenient takeaway market (convenient stores, bento shops, restaurants, etc.) where **lunch boxes** are usually made of plastic.

The Japan PET Tray Association[109] is the umbrella organisation of PET sheet and tray makers. They focus on hygiene and safety.

Regarding **packets & wrappers**, the obsession for quality and freshness result in many products being packaged individually. The on-the-go consumption habit, positive image of snacking as well as shrinkage of households' size

[105] "Brighten Up Any Day With Kami Fusen: Japanese Paper Balloons", Japan Info (http://jpninfo.com/47526)
[106] "Packaged Food in Japan", Euromonitor International (https://www.euromonitor.com/packaged-food-in-japan/report)
[107] "Packaging Industry in Japan", Euromonitor International (https://www.euromonitor.com/packaging-industry-in-japan/report)
[108] A "bento" is a single-portion take-out or home-packed meal common in Japanese cuisine. (Wikipedia)
[109] Official website of the Japan PET Tray Association: http://www.pettray.jp/

induced an upward trend for small-sized packages. Besides, the possibility to see the content through the packaging recently led to a shift from canned fruits and vegetables to plastic pouches.[110,111]

It is noteworthy to remind that food containers also play an important role in the fight against food waste and that plastic packaging is considered to have a positive impact by protecting fresh food and extending the shelf-life of packaged items.

Note: Food safety information and related legislation can be found on the website of the Ministry of Health, Labour and Welfare[112].

e. Beverage containers, their caps & lids

While the global Cups and Lids Market is expected to expand, the growth should mainly be observed in developing countries, especially India and China. The market in developed countries such as Japan should be supported by the usage of eco-friendly alternatives to plastic that are still slightly more expensive.[113]

The busy life style of Japanese is fostering the consumption on-the-go of (hot) drinks. Coffee shop chains Starbucks and Tully's Coffee are gaining share on the Cafés/Bars market.[114] Convenience stores, leaders in the fast-food sector, also expand their offer of take-away drinks.[115]

While cups for take-away hot drinks are usually made of paper, lids are still in plastic.

Reusable containers, especially those keeping the drinks hot/cold, are getting more popular.

f. Beverage bottles

According to a report from 2017[116], Japan's share of beverage packaging in plastic in the APAC region accounted for 29%, ranking second behind China (49%) in 2016 and this market was expected to increase mainly due to the growing demand of emerging economies.

The Japanese market of soft drinks slowly increased in 2017 although negatively impacted by the ageing population. Ready to drink beverages are boosted by the busy lifestyle of consumers who appreciate convenient containers. Japanese consumers are always keen to taste novelties and their consumption habits can be influenced by new

[110] "Confectionery Packaging in Japan", Euromonitor International (https://www.euromonitor.com/confectionery-packaging-in-japan/report)
[111] "Processed Fruit and Vegetables Packaging in Japan", Euromonitor International (https://www.euromonitor.com/processed-fruit-and-vegetables-packaging-in-japan/report)
[112] Official website of MHLW, Food Safety Information: https://www.mhlw.go.jp/english/topics/foodsafety/
[113] Reuters (https://www.reuters.com/brandfeatures/venture-capital/article?id=41993)
[114] "Cafés/Bars in Japan", Euromonitor International (https://www.euromonitor.com/cafes-bars-in-japan/report)
[115] "Fast Food in Japan", Euromonitor International (https://www.euromonitor.com/fast-food-in-japan/report)
[116] "Beverage Packaging Market by Plastic - Geographical Segments and Growth Prospects", by Technavio (https://www.businesswire.com/news/home/20170809005480/en/Beverage-Packaging-Market-Plastic---Geographical-Segments?)

packaging design. The demand for healthy products is particularly on the rise. The competitive landscape mainly consists of major global companies with Coca-Cola Japan as market leader, followed by Suntory Beverage & Food.[117]

Soft drinks and water bottles are usually in plastic, while milk and juices are typically in paper drink packs, alcoholic beverages such as beer or (hot) coffee are usually in steel or aluminium cans, and alcoholic beverages such as wine or spirits are rather in glass containers. Soft drink containers predominantly consist of PET bottles.[118] PET bottles and other plastic beverage containers enter the scope of the Containers and Packaging Recycling Law.[119]

As a result of Japan's demographic (single-person households, ageing population) and lifestyle (lunch boxes, few home cooking/dining) and market characteristics (many vending machines, new taste / seasonal products), beverage containers are usually small sized to be consumed immediately. The call for the use of reusable containers instead of disposable containers is gaining resonance due to increasing public awareness of plastic marine litter.

Between 2004 and 2016, shipments of PET bottles boomed from 14.8 billion to 22.7 billion, but collection rate decreased to less than 90% which represents about 2.5 billion PET bottles uncollected every year.[120]

The Council for PET Bottle Recycling estimates that 596,000 tons of PET bottles were sold in fiscal 2016 (an increase of 33 thousand tons from the previous fiscal year) and 500,000 tons were recycled (279,000 tons domestically and 221,000 tons overseas) resulting in a recycling rate of 83.9% (-3.0 points from the previous year).[121]

g. Cigarette butts

For this item, it is noteworthy to point out that Japanese regulations and practices regarding smoking outdoors is stricter than in Europe. People are only allowed to smoke in designated areas where ash-bins are available and portable ashtrays are widespread. In that context, it is relatively uncommon to see cigarette butts littering streets in Japan.

In 2016, the Japanese tobacco market was dominated by cigarette, which represented 94% of total sales, and cigarette sales amounted 3,781 billion yen. However, the Japanese market for traditional cigarettes has been declining for several years and, although heated tobacco is reshaping demand, the Japanese tobacco market is expected to keep falling.

The tobacco industry in Japan is suffering from socio-demographic changes such as decreasing and aging population, growing health awareness, image change of the smoking habit, stricter smoking legislation, restrictions on the occasion of the Olympics & Paralympics, etc. Compared to 2007, cigarettes lost 33% consumption volume (from 260 billion sticks in 2007 down to 174 billion sticks in 2016). In 2016, retail sales continued to fall (- 5% in volume and - 3% in value).

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[117] "Soft Drinks in Japan", Euromonitor International (https://www.euromonitor.com/soft-drinks-in-japan/report)
[118] "Soft Drinks Packaging in Japan", Euromonitor International (https://www.euromonitor.com/soft-drinks-packaging-in-japan/report)
[119] Guidebook "The Containers and Packaging Recycling Law" (http://www.meti.go.jp/policy/recycle/main/english/pamphlets/pdf/the_containers_e.pdf)
[120] "Cut back on disposable plastic", the Japan Times (https://www.japantimes.co.jp/opinion/2018/11/03/editorials/cut-back-disposable-plastic)
[121] "The Council for PET Bottle Recycling, Statistical Data (http://www.petbottle-rec.gr.jp/data/calculate.html)

In spite of an overall lower demand, the new alternative of heated tobacco is gaining popularity and achieved sales of 222 billion JPY in 2016. Phillip Morris Japan launched iQOS in 2014 and it was an immediate success. Japan Tobacco and British American followed in 2016 but iQOS is still leader of this new segment.[122]

The competitive landscape is made of the domestic company and former state monopolist Japan Tobacco (61% volume share), followed by Phillip Morris Japan (24%) and British American Tobacco Japan (13%)[123, 124]

Japan Tobacco International and the American recycling company TerraCycle work in collaboration for the recycling of cigarette butts.[125]

h. Lightweight plastic carrier bags

It is estimated that 30 to 45 billion plastic bags are consumed annually in Japan. Until now, retailers were only encouraged to charge for shopping bags, but this was not obligatory. While some supermarkets have started to charge or give benefits to their customers refusing free plastic bags (loyalty points, monetary discount) since the 2000s, convenience stores (which represents about one-third of the total of single-use plastic cashier bags handed out in Japan) and department stores have been rather reluctant to implement such measures because of the risk to lose customers and potential decrease in sales. As mentioned above it has been announced that new regulations will make the charging for disposable checkout bags mandatory (providing points might be recognised as a way to reduce consumption). The existing law on containers and packaging recycling may be updated to incorporate the new regulation. These measures should result in a major reduction in plastic bags consumption.[126,127,128]

i. Sanitary items: wet wipes and sanitary towels

The Japanese market of personal **wipes** decreased in terms of retail volume in 2017, especially due to the declining birth rate that directly impacts the sales of baby wipes. On the other hand, home care wipes kept increasing in 2017 and refill wipes/pads are particularly successful.

Leading companies are Kao Corp and Unicharm Corp[129] owing to their broad portfolio. In the segment of wipes for general purposes, where quality is less a concern, private labels manage to secure an acceptable share thanks to price attractive products, which is quite uncommon in the Japanese retail hygiene industry.[130] A research report identified

[122] "Tobacco in Japan: Shifting Preferences", Tobacco Asia (https://www.tobaccoasia.com/features/tobacco-in-japan-shifting-preferences/)
[123] "Tobacco in Japan", Euromonitor International (https://www.euromonitor.com/tobacco-in-japan/report)
[124] "Japan Tobacco: securing the brand in a disrupted market, Financial Times (https://www.ft.com/content/1794a9a2-4d44-11e8-8a8e-22951a2d8493)
[125] Newswitch: https://newswitch.jp/p/8900
[126] "Shops should charge for plastic bags to combat waste: environment minister", The Mainichi (https://mainichi.jp/english/articles/20181005/p2a/00m/0na/007000c)
[127] "Japan gov't to make charging for plastic shopping bags mandatory", The Mainichi (https://mainichi.jp/english/articles/20181013/p2a/00m/0na/010000c)
[128] "Plastic bag fees to be mandatory for Japanese retailers", Nikkei Asian Review (https://asia.nikkei.com/Spotlight/Environment/Plastic-bag-fees-to-be-mandatory-for-Japanese-retailers)
[129] Official website of Unicharm Corp: http://www.unicharm.co.jp/english/index.html
[130] "Wipes in Japan", Euromonitor International (https://www.euromonitor.com/wipes-in-japan/report)

Japan as the least lucrative region for growth of the consumer wet wipes market for the forecast period 2017-2026 (in terms of volume).[131]

The decline in the birth rate and the ageing of the population also have a negative impact on the market for **sanitary protections**, as the number of consumers decreases. Yet, the augmentation of Japanese women in the active population leads up to an increasing demand for high-quality products.

Unicharm Corp remained top leader in 2017, followed by Kao Corp. Both companies offer a wide range of products and innovative features that match the needs of working women. There's not much room nor potential for private labels.[132]

The Japan Hygiene Products Industry Association (JHPIA)[133] is the industry organisation for hygiene products and their materials. The products manufactured by its members encompass first aid (bandages, cotton swabs, gauze, etc.), hygiene (disposable diapers, sanitary napkins, tampons, wet wipes/towels, face masks, etc.), cosmetics (cotton puffs) and nursing care (disposable diapers, wet wipes, paper sheets, etc.) to be used at home, hospital or nursing home. Voluntary standards and guidelines are available on their website, including "Guidelines for the indications regarding disposable diapers for baby and adults", the Japanese specification of sanitary napkins, antibacterial hygiene material and voluntary standards for safety and hygiene of nonwoven fabrics for disposable diapers.

j. Fishing gear

As an island country, fishing is an integral part of Japan, at the crossroads of economy and culture. Fish is still one of the staple foods in Japanese diet. The annual consumption of fish and fishery products per person reached 40.2 kg in 2001 but has since declined, falling by 0.1 kg year-on-year to 27.3 kg in 2014. The self-sufficiency rate of fish and fishery products remained stable at 60% in 2014.

Japan is one of the top ten fishing nations in the world in terms of volume. The fishing industry is a regional key industry. Fisheries and other related industries such as fishing gear, ship equipment, fuel, fish processing, etc. play a vital role in regional economies by providing significant employment opportunities and profits. The number of fishers stood at 166,610 in 2015, down 4% from the previous year.[134] About a thousand fishery cooperatives maintain exclusive access rights to fish in coastal areas. Some of these cooperatives have been active since the feudal era, when fishermen's guilds were allocated specific areas of coastal littoral waters for their exclusive use. The size of cooperatives varies from several dozen to several thousand fishermen, with an average size of about fifty people.[135]

131 "4 Key Research Findings from Fact.MR's Report on Consumer Wet Wipes Market for Forecast Period 2017 – 2026" (https://www.factmr.com/media-release/422/consumer-wet-wipes-market)
132 "Sanitary Protection in Japan", Euromonitor International (https://www.euromonitor.com/sanitary-protection-in-japan/report)
133 Official website of JHPIA: http://www.jhpia.or.jp/site_en/index.html
134 "FY2015 Trends in Fisheries, FY2016 Fisheries Policy, White Paper on Fisheries: Summary", MAFF (http://www.maff.go.jp/e/data/publish/attach/pdf/index-49.pdf)
135 "O2 report: Opportunities for sustainable fisheries in Japan", Ocean Outcomes (https://s3-us-west-2.amazonaws.com/staticassets.oceanoutcomes.org/supporting+documents/OceanOutcomesJapanOppReport.pdf)

In the fishing tackle industry, 2 out of the 4 big global players are Japanese, namely Shimano (mainly producing rods, reels, accessories and lines) and Globeride / Daiwa (rods, reels, lures, apparel and accessories), and Gamakatsu (Hooks, rods and accessories) is in the top 15.[136]

The Japan Fisheries Association[137], founded in 1882, counts over 400 members representing the whole Japanese fishing industries.

JAFTMA, the Japan Fishing Tackle Manufacturers Association[138], founded in 1992, is the umbrella organisation for companies engaged in the fishing goods industry. It conducts survey research and provide information on technology related to fishing gear and fishing related commodity in order to promote the sound development of the fish industry in Japan and overseas. The association is promoting the development and use of environmentally friendly fishing items and efforts to beautify the environment. Among its actions for sustainable fishing, the association formulated certification criteria for products adapted to environmental preservation and manufacturers who comply with the guidelines can display the “environmental protection mark” (e-Mark) on their products.

[136] “RAPALA VMC OYJ CAPITAL MARKETS DAY”, Rapala VMC Corp. (https://rapalavmc.com/sites/rapalavmc.com/files/attachments/CMD%20Presentation%20-%20Web_0.pdf)
[137] Official website of Japan Fisheries Association: http://www.suisankai.or.jp/index_e.html
[138] Official website of JAFTMA: http://www.jaftma.or.jp

5. Overview of the opportunities for EU innovative SMEs proposing alternative solutions and Recommendations

a. Overview of the opportunities & challenges

i. Opportunities of the Japanese market in general

With a GDP of 4,872.14 billion USD in 2017[139], Japan is the world's third largest economy. Thanks to its stable economic, political and legal systems as well as good living conditions, Japan is considered as having one of the most business-friendly environments and being one of the most attractive and dynamic business hubs in the world.[140]

Business relationships are meant to be long-term so that, generally, once the agreement is reached, collaboration is smooth and lasting. Both parties can thus benefit from stability, flexibility and mutual support, even in the event of unexpected market turbulence.[141] In addition, cost is not always the main criterion because Japanese are often willing to pay more for quality and service.

Europe and Japan are longstanding partners who share fundamental values[142] and the Strategic Partnership Agreement and the Economic Partnership Agreement signed recently are expected to significantly boost bilateral relations[143]. Complementarities and synergies between European and Japanese technologies, export experiences and working style can result in successful partnerships.

Moreover, being active and successful in Japan is perceived worldwide as a pledge of quality and constitute an undeniable asset for future expansion in Asia or even in other developed countries.

ii. Opportunities of the Japanese market of plastic alternatives

Plastic waste became a hot topic only recently in Japan. The need for alternatives is slowly becoming clear to the general public. The Japanese government is preparing a drastic shift and wants to take major actions in the very near future (G20 in Osaka, Tokyo 2020), but the market is still in its infancy and not yet shaped. This is therefore a good timing for companies that already have knowledge and experience.

Europe is considered worldwide to be at the forefront in the environmental field. This leadership position has been reinforced by the recent initiatives taken by the European Commission to tackle the problem of plastic marine litter.

A recent example of the commitment of Japan and Europe to collaborate on environmental issues is the signature of the Memorandum of Environmental Cooperation between Japan and Finland (who will take the EU's presidency in 2019). This agreement was signed by M. Yoshiaki Harada, Japanese Minister of the Environment and M. Kimmo

[139] World Bank
[140] Talk to JETRO First – About Business in Japan! (https://www.jetro.go.jp/ext_images/en/invest/whoweare/talktojetro_en_20180119.pdf)
[141] J-Global Inc. (http://j-globalgroup.com/en/)
[142] EU-Japan relations factsheet by European External Action Service (https://eeas.europa.eu/sites/eeas/files/factsheet_eu-japan_relations_1.pdf)
[143] "EU-Japan Summit: a landmark moment for trade and cooperation", European Commission - Press release (http://europa.eu/rapid/press-release_IP-18-4504_en.htm)

Tiilikainen, Finnish Minister of the Environment, Energy and Housing during the World Circular Economy Forum (WCEF) that took place in October 2018 in Yokohama, Japan, and should lead to intensive collaboration between companies, universities and research institutions.[144]

Considering the low value of disposable products, it is unlikely to be economically profitable to export single-use products made of alternative materials (bioplastics, paper).

Alternative products which are meant to be long-lasting (beverage containers, straws, etc.) might be able to benefit from the positive image conveyed by traditional "table art" of some countries (France, Italy) to reach a high-end positioning in the catering industry. Starred restaurants and trendy bars could be convinced to abandon the decried disposable plastic and adopt an eco-friendly image. The fact that Japanese firms are relatively weak in terms of marketing and communication, especially for environmental matters, can leverage this opportunity. European SMEs can take advantage by using media effectively and educate potential consumers.

The export of raw materials for bioplastics could also represent an opportunity. Japan's own resources is mainly composed of wood. Sugar cane, etc. must be imported, often from Brazil. To achieve the high governmental targets, additional imports will be necessary. For trading/importing companies, price is a decisive factor.

Business and/or research opportunities related to pioneering technologies also appear as promising.

Technology transfer could be an option for EU companies who developed cutting-edge processes and/or very innovative new materials.

Considering the governmental efforts to support Japanese companies and to promote the development of alternative technologies domestically, joint collaboration in R&D projects could be a particularly suitable approach. Having an on-site partner will bring the added benefit of providing a smooth outlet on the Japanese market as it will then benefit from the network of the Japanese partner (and in Japan, much relies on trust and relationships, see below) and technology will me more readily accepted as suitable for the Japanese market than imported foreign technology.

To this regard, the European funding program "Horizon 2020"[145] might be particularly relevant for European Small and Medium Enterprises. Until now, Horizon 2020 has already provided more than 250 million EUR to finance R&D in areas of direct relevance for the Plastics Strategy. About 50% has been used to support the development of alternative feedstocks. By 2020, an additional 100 million EUR will be devoted to financing priority actions under this Strategy, including the development of smarter and more recyclable plastics materials, more efficient recycling processes and the removal of hazardous substances and contaminants from recycled plastics.[146]

Another opportunity could lie in the recycling of plastics as the new strategy should promote more recycled materials and less incineration. Chemical and mechanical recycling technologies may therefore be needed. In addition, as the market expands, innovative methods for collecting and processing bio-based plastics could become necessary.

[144] Embassy of Finland, Tokyo (http://www.finland.or.jp/public/default.aspx?contentid=379348)
[145] Horizon 2020: https://ec.europa.eu/programmes/horizon2020/en/
[146] "A European Strategy for Plastics in a Circular Economy" (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2018:28:FIN)

iii. Challenges of the Japanese market in general

Entering the Japanese market requires heavy investment in terms of finance, time and human resources.

Communication is usually the first obstacle encountered. Only few foreigners have a business level of Japanese, and many Japanese do not speak English with confidence. In addition, it is a low context culture, which means that many things are not said, and nonverbal communication can be very difficult to decipher for non-Japanese. But language and other intercultural differences are only the most obvious challenges.

The market is tough and competitive, with powerful national players already having the network and essential references. In general, Japanese are not willing to take risks and tend to prefer continuity and stability. As a result, they tend to favour domestic products and manufacturers, and are loyal to their existing business partners. According to consultants, if foreign technologies are not at least 40% better than domestic technologies, Japanese will buy domestic products.

Moreover, in a country that considers that "the customer is God", a high level of service and impeccable quality are considered normal. In this perspective, a transaction is not considered finished after delivery, as the Japanese generally expect free maintenance and after-sales service. In this respect, foreign companies are often considered as too "tolerant" in terms of defect ratio and lacking zeal to improve. Prospects will often ask for many detailed information and expect precise answers.

Another different aspect is the collaborative working style of Japanese organisations which often results in tedious processes. Since decisions in Japanese companies are often the result of extensive consultations with many people in various departments of the organisation, the decision-making process is particularly lengthy, and several meetings are required to reach an agreement.

In this context, even though the Japanese are increasingly open to the idea of working with foreigners, a number of constraints remain and dealing with foreigners is still perceived as difficult. Some Japanese also think that the Japanese market is so different from the European market that European technologies, products and/or practices cannot match Japanese demand.

The main challenge therefore probably lies in the close customer-supplier relationships that must be created before the business can actually start. Mutual trust is the key, but it takes time.

iv. Challenges of the Japanese market of plastic alternatives

The market of plastic alternatives is a new market in its creation / implementation phase and the business environment is therefore still uncertain and unstable. The regulatory framework is not yet fixed, and many discussions are still in progress. Also, there is general lack of awareness of the population regarding environmental matters. Japanese consumers tend to favour convenience and service and are not familiar with the concepts of biomass, biodegradable products, etc.

There are differences in consumer preferences and market characteristics, so that Europe and Japan may sometimes face different challenges and solutions are not always easily transferable.

The chemical industry is a major and strong industry in Japan, with Japanese companies among the world leaders. Investments in R&D are high, and plastic enjoys a positive image. The industry and the government would like Japanese companies to take advantage of this new market, domestically and globally. For this purpose, the Japanese government provides subsidies to accelerate the development of new technologies and increase the production of alternatives.

This competitive market is also hard to penetrate by newcomers, even more if foreigners, due to the long-standing *keiretsus* network. In this type of conglomerate, unique to Japan, the member's companies own small portions of the shares in each other's companies, centred on a core bank; this system helps insulate each company from stock market fluctuations and takeover attempts, thus enabling long-term planning in projects. It is a key element of the manufacturing industry in Japan.[147] Assimilated to a non-tariff barrier, this affiliation system results in mega-companies, excluding outside interference and restricting free market competition. Traditionally companies will only do business within the same keiretsu and connections might take priority over price or efficiency. It is therefore crucial for newcomers to understand and take into account the historical relations that exist between Japanese companies.[148]

For low value products, cost is a decisive factor and Japanese firms are used to dealing with China and other South-East Asian countries that produce at low cost and are geographically near.

In addition, the shift to alternatives will likely have an impact on the waste management sector, in particular thermal recycling. The industry has heavily invested in clean technologies to enable the incineration of plastics and the country counts many incineration plants.

Finally, Japanese legislation and standards are strict, especially for products in contact with food.

b. Recommendations

i. General recommendations to enter the Japanese market

Some business practices and tips can apply indistinctively from the industry. This section will therefore start with general recommendations when approaching the Japanese market and more detailed advices for plastic alternatives will follow.

As mentioned above, entering the Japanese market requires heavy investment in terms of finance, time and human resources. Companies must prepare well and have a long-term strategy, and do not expect rapid outcome.

Japanese business culture and etiquette are famous for being formal and strict. Even if foreign companies are not expected to master all the rules, attention should be paid to basics such as punctuality and reliability.

Credibility is a key value and one of the major concerns of Japanese companies dealing with foreigners. The Japanese are very attentive to details, so it is necessary to check in advance the feasibility internally to ensure that all promises can be kept.

[147] Wikipedia (https://en.wikipedia.org/wiki/Keiretsu)
[148] "Keiretsu: Why Foreign Companies Struggle In Japan", Halal In Japan (https://www.halalinjapan.com/blog/keiretsu-why-foreign-companies-struggle-in-japan)

Personal relationships and networks are key for success and introduction is the most effective approach. Building trust is a long process, even more for a foreign company. The latter will have to prove its commitment to operate on the Japanese market through intensive communication and regular physical encounters (fairs, f2f visits). On this topic, it is noteworthy to point out that business cards are much more used in Japan than in Europe and you should bring a large stockpile (in Japanese) when coming to Japan.

Translation of all documents, good interpreters and Japanese staff can smoothen the communication and avoid misunderstanding. A presence in Japan (agent, distributor or own business) can be reassuring, especially in terms of service or maintenance. It is important to find a reliable partner from the very beginning and particular attention should be paid to the selection process.

ii. Market specific recommendations

As the market of plastic alternatives is being established, it is important to monitor the changing business environment and to stay updated about new decisions, particularly concerning the legislation and business trends. There should be decisive announcements on the occasion of the Osaka Summit (2019). The Olympics and Paralympics (2020) are also deemed to be an important step in the environmental commitment of Japan in general, and Tokyo in particular.

For the export of products, it would be advisable to sell through a distributor or an agent. Favour a distributor/agent with knowledge, experience and network in your industry and who is ideally representing other companies in your area so that you can easily arrange meetings during their business trips in Europe. "*Sogo shosha*" are huge and influential general trading companies that cover a wide range of products and materials, while "*Senmon shosha*" are smaller trading companies specialized in a limited range of products. They are used to working with foreigners and have a well-developed network, which makes it much easier to enter the market. However, it is difficult to contact them directly, and it is said that companies can only be referenced if they have been hunted or introduced. Since *sosha* usually have branches around the world, it may be easier to contact their representation in your home country rather than directly the headquarters in Japan.

Communication can focus on education to fill the lack of awareness, refer to *Mottainai* to address Japanese values and/or emphasize the European origin to highlight the quality and eco-friendliness.

In case of technology transfer or partnership, finding the right partner will obviously be the cornerstone. Introduction via a support organisation such as a business association is recommended. The Horizon 2020 programme suits European SMEs looking for research partners in Japan.[149] Plastics counts among the targeted area. The Commission has identified a range of measures to implement the plastics strategy. Several are relevant for research and innovation.[150]

Japanese are convinced by facts and figures. It is therefore important to provide detailed documentation including test results, certifications, etc. Labels, awards and public speaking reinforce credibility.

[149] Official website of the National Contact Point Japan: https://www.ncp-japan.jp/horizon-2020
[150] Horizon 2020, Plastics: https://ec.europa.eu/programmes/horizon2020/en/area/plastics

Certifications & awards

Certifications and awards can be considered as an objective proof of quality. Among overseas labels, Der Blaue Engel (Germany) and BioPreferred (USA) are generally recognized by the Japanese industry.

In addition to the “GreenPla” and “BiomassPla” labels of the Japan BioPlastics Association (JBPA) and the “Biomass mark” of the Japan Organics Recycling Association (JORA) introduced earlier, the Eco Mark Program[151], operated by the Japan Environment Association (JEA), is probably the most famous and familiar environmental label in Japan.

The Eco Mark label can be attached to a wide range of products and services[152] that are friendly to the environment throughout the entire lifecycle, from “production” to “disposal”. Besides the common categories of stationery and uniforms, certified products also include building materials, civil engineering products and engine oils. Supermarkets, car sharing, hotels, etc. can also be certified by the Eco Mark. In 2017, the Eco Mark Award for the category “Product of the Year” has reward plastic packaging using recycled plastic and plastic packaging using plant-based plastic.[153]

Furthermore, Japanese Industrial Standards (JIS) is a set of national standards defining the criteria for products that can be sold in Japan, including quality, performance, safety, etc. The standardization process is coordinated by the Japanese Industrial Standards Committee (JISC)[154] and published through the Japanese Standards Association (JSA)[155].

Relevant fairs & exhibitions related to plastic and/or environment in Japan:

For a better understanding of the market and in order to enhance their network, SMEs engaged in the plastic (substitute) industry should visit fairs & exhibitions specialised in plastic and/or environment. Below is an overview of major events taking place in Japan for these sectors:

Name	Description	Next edition (in Japan) / Organiser
Highly-functional PLASTIC EXPO OSAKA http://www.plas.jp/en/	The show gathers all kinds of plastics/composite materials as well as its manufacturing and processing technologies. It is held concurrently with shows specialised in other materials (metal, ceramics, pain & coatings, etc.)	May 22 (Wed) to 24 (Fri), 2019 at INTEX Osaka Reed Exhibitions Japan Ltd.
Highly-functional PLASTIC EXPO TOKYO http://www.plas.jp/en/		Dec. 4 (Wed) to 6 (Fri), 2019 at Makuhari Messe (Chiba Prefecture) Reed Exhibitions Japan Ltd.
N-EXPO (New Environmental Exposition)	Reuse of resources, waste disposal, demolition / Water treatment, water purification / Soil, air and environmental	March 12 (Tue) to 15 (Fri), 2019 at Tokyo Big Sight Nippo Business Co., Ltd.

151 Eco Mark Office, Japan Environment Association: https://www.ecomark.jp/english/ecomark.html
152 Official website, Product Categories: https://www.ecomark.jp/english/nintei.html
153 Eco Mark News No. 112 of April 1, 2018: https://www.ecomark.jp/english/news/enews102e.pdf
154 Official website of JISC: http://www.jisc.go.jp/eng/
155 Official website of JSA: https://www.jsa.or.jp/en/

N-EXPO 2018: https://www.nippo.co.jp/eng/n-expo018/index.htm GWPE (Global Warming Prevention Exhibition) is held concurrently.	improvement / Bioplastics, packaging and ecological products / Biomass and organic waste treatment / Related groups and academic organisations / Environmental software, scales, measurement, analysis, environmental solutions / Collection, shipping, transportation, storage and distribution / Thermal / Civil engineering, construction, disaster response / Confidential document and security measures.	
International Plastic Fair / IPF Japan 2020 https://www.ipfjapan.jp/english/	Raw Materials, Machines, Molds and Services relating plastic and rubber production	Oct. 6 (Tue) to 10 (Sat), 2020 at Makuhari Messe (Chiba Prefecture) International Plastic Fair Association
Tokyo International Packaging Exhibition http://www.tokyo-pack.jp/en/	With a variety of exhibits from packaging materials and machinery to converting, packaging, distribution, environmental protection equipment etc., Tokyo Pack will serve as a platform for business negotiations and international exchanges and contribute to the development of society from an international perspective.	Feb.24 (Wed) – 26 (Fri), 2021 at Tokyo Big Sight Japan Packaging Institute (JPI)
EcoPro EcoPro 2018: http://eco-pro.com/2018/english.html	Eco-products / Eco-solutions / Environmental and Energy technology / Environmental, CSR initiatives, SDGs	Not announced yet. Likely to be in December 2019 at Tokyo Big Sight

Business Associations:

Affiliation to a professional association enables to be kept informed about relevant information, such as new laws or technologies, and is a good way to expand your network, including with other companies and government officials.

The Japan Society of Biomass Industries (JSBI)[156], for example, can organise business matching, thus helping find new customers or partners, and award prizes for successful promotion of biomass.

Most organisations now have an international network. Don't hesitate to contact your local federation and check if they already have partner organisations in Japan.

[156] Official website of JSBI: http://www.jora.jp/rinji/biomass_product/index.html

6. Conclusion

Japan is a major producer and consumer of plastic and disposable products. The general level of awareness of environmental issues is relatively low, although it has increased recently.

Until now, the recycling of plastic waste mainly consisted of incineration or shipping to China. China's Green Sword Policy therefore had a direct and tremendous impact on the Japanese market. In parallel, Japan has been criticized for not signing the G7 Charter in Canada in June 2018 and the audacious EU initiatives on disposable plastic items strengthened the impression that Japan is falling behind in terms of protection of the environment. In response, the government decided to take the initiative on this issue at the next G20 summit to be held in Osaka in 2019 and is preparing for major announcements.

The Japanese Ministry of the Environment and other stakeholders are working on an action plan with the dual objective of reducing marine plastic waste, while taking advantage of this new emerging market at national and global levels. This plan includes the drafting of a new plastic strategy with concrete measures and numerical targets, subsidy programs to boost bioplastics and support material recycling as well as the reduction of plastic waste emissions.

For EU Small and Medium Enterprises, the Japanese market in general, and of plastic alternatives in particular, can be challenging but they can benefit from a positive image in terms of quality and respect of the environment. Although the export of products may seem limited, the export of raw materials for the production of bioplastics and technological partnership can be promising. Bioplastic recycling technologies and best practices could be a further opportunity of collaboration.

To be successful, EU SMEs should be well-prepared, find a good partner onsite and adapt their communication. The latter can focus on education to fill the lack of awareness, refer to *Mottainai* to address Japanese values and/or emphasize the European origin to highlight the quality and eco-friendliness.

Support organisations can provide assistance and tools, such as the platform EU Business in Japan, Enterprise Europe Network (EEN) or the Horizon 2020 programme, to smoothly enter the market.

Annex 1: List of abbreviations, figures, tables and charts

List of abbreviations

3Rs	Reduce, Reuse, Recycle
ABS	Acrylonitrile butadiene styrene
DG ENV	Directorate-General for the Environment
EASME	Executive Agency for Small and Medium-sized Enterprises
EEN	Enterprise Europe Network
EPA	(Japan-EU) Economic Partnership Agreement
EPR	Extended Producer Responsibility
EU	European Union
FY	Fiscal Year (in Japan from April 1st to March 31st)
GDP	Gross domestic product
GHG	Greenhouse Gas
IGES	Institute for Global Environmental Strategies
IPF	International Plastic Fair
JAFTMA	Japan Fishing Tackle Manufacturers Association
JBPA	Japan BioPlastics Association
JCPRA	The Japan Containers And Packaging Recycling Association
JEA	Japan Environment Association
JETRO	Japan External Trade Organisation
JHPIA	Japan Hygiene Products Industry Association
JIS	Japanese Industrial Standards
JISC	Japanese Industrial Standards Committee
JORA	Japan Organics Recycling Association
JPIF	Japan Plastics Industry Federation
JPY	Japanese yen

JSA	Japanese Standards Association
JSBI	Japan Society of Biomass Industries
kt	kilotons
LCA	Life Cycle Assessment
MAFF	Ministry of Agriculture, Forestry and Fishery
METI	Ministry of Economy, Trade and Industry
MHLW	Ministry of Health, Labour and Welfare
MoEJ	Ministry of the Environment of Japan
MSW	Municipal Solid Waste
N-EXPO	New Environmental Exposition
NGO	Non-governmental organisation
NPO	Non Profit Organisation
PACE	Platform for Accelerating the Circular Economy
PE	Polyethylene (or Polythene)
PET	Polyethylene terephthalate
PWMI	Plastic Waste Management Institute
R&D	Research and Development
RDF	Refuse-derived fuel
RPF	Refuse Plastic & Paper Fuel
SAN	Styrene Acrylonitrile
SDGs	Sustainable Development Goals
SME	Small and Medium Enterprises
USD	United States dollar
WCEF	World Circular Economy Forum

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Annex 2: Bibliography, Literature & Web links

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