

Plastic: An Undegradable Problem

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Plastic: An Undegradable Problem

An Introduction to Malaysia's Plastic Waste Problem

Plastic is undeniably one of the greatest inventions in the last century. The fact that it has made our lives convenient is probably a huge understatement. Without even realising it, plastic is ubiquitously integrated into our daily lives. However, concerns over the detrimental aspects of plastic were escalated in 2018, when there was a visibly marked increase of foreign plastic waste into Malaysia, perceived by many as turning our country into a dumpsite.

The issue was triggered when China notified the World Trade Organization (WTO) in July 2017¹ and made the decision to ban the imports of most plastic waste from 1 January 2018 in line with their “National Sword Policy” to reduce pollution levels². China banned 24 types of plastic waste imports and only allowed plastic with a purity rate of 99.5% or higher³. Prior to 2018, China was the largest global importer of plastic waste⁴. However, due to the ban, plastic waste diverted to other countries, especially to Southeast Asian countries including Malaysia. Containers of low quality, contaminated and mostly non-recyclable plastic piled up in the Malaysian ports. Some importers managed to bring in plastic waste into Malaysia without proper documentation by falsifying declaration forms and using a different commodity code, HS3920 which does not require a permit instead of the designated code for plastic waste, HS3915⁵.

Even if we disregard the falsely declared imports, plastic waste was still imported into the country in enormous amounts. Countries that exported the largest quantities of plastic waste under the commodity code HS3915 to Malaysia were developed nations. Based on Figure 1, there was a dramatic increase in the import of plastic by Malaysia from developed countries upon China's announcement of the ban, with the United States contributing the most in 2018 with approximately 218,000 tonnes, followed by Japan (~119,000 tonnes) and the United Kingdom (~112,000 tonnes). Moreover, polyethylene is the most common form of plastic import (Figure 2), which explains why most of the rubbish found in Malaysian landfills were plastic packaging wrappers.

While a bulk of the plastic problem originates from Malaysians as well, the increase in the inflows of plastic waste from other countries—driven by the ban in China—has raised attention on larger issues surrounding Malaysia's plastic waste problem.

¹ WTO (2017)

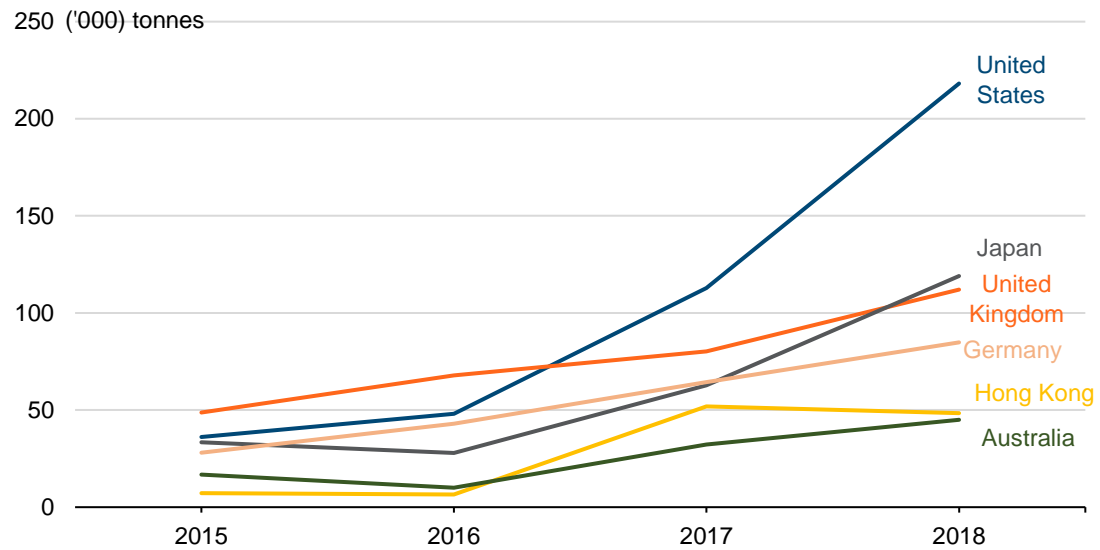
² France-Presse (2019)

³ Parker (2018)

⁴ Ibid.

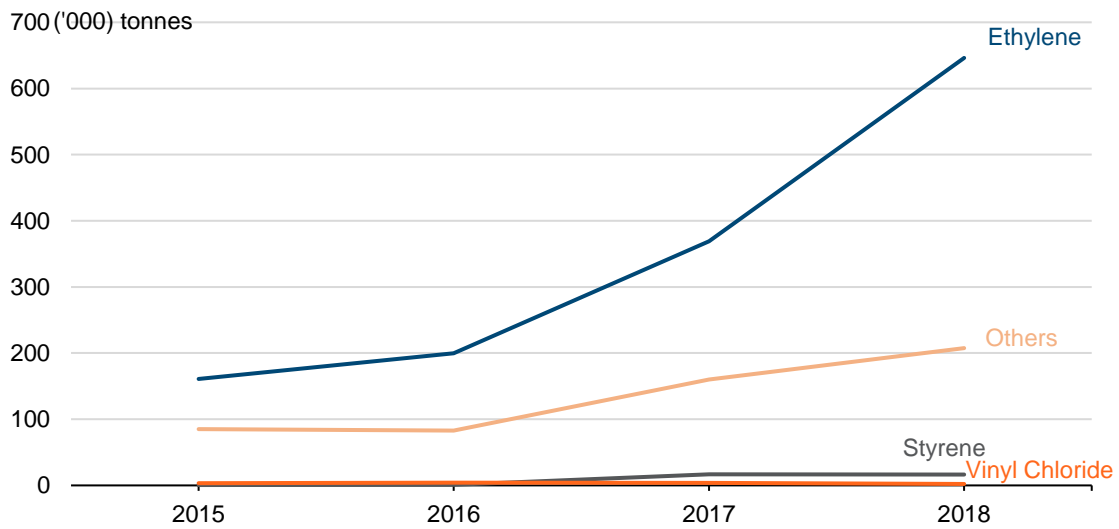
⁵ Commodity code HS 3920 (Other Plates, Sheets, Film, Foil and Strip, of Plastic) was used by some plastic waste importers instead of HS3915 (Waste, Parings and Scrap, of Plastic). Source: KAJIDATA Research (2019), Zhou (2019)

Figure 1: Malaysia's Imports of Plastic Waste from Top 6 Countries, 2015-2018



Source: UN Comtrade (2018)

Figure 2: Breakdown of Malaysia's HS3915 Imports of Polymers, 2015-2018



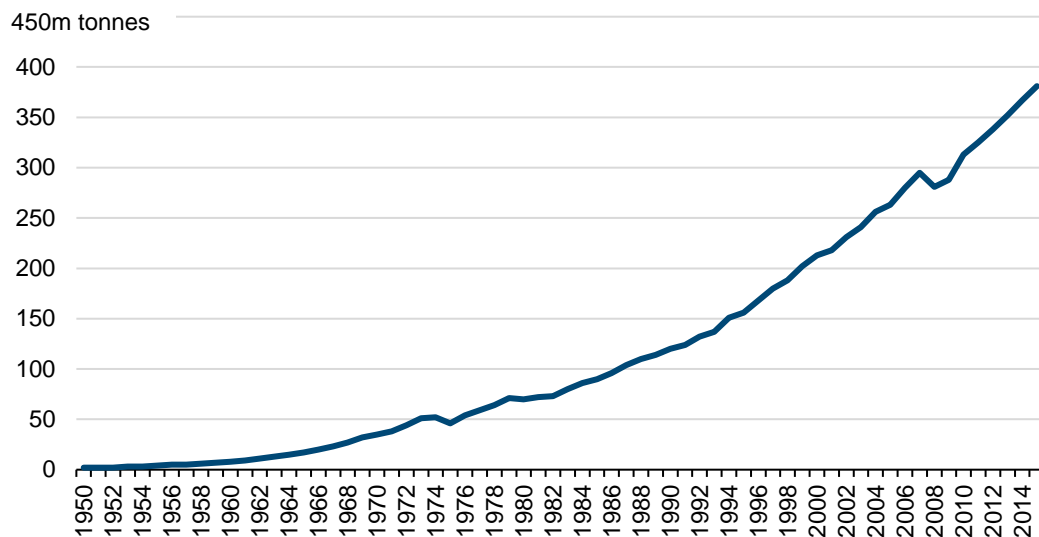
Source: UN Comtrade (2018)

Plastic Problems in Our Own Backyard

1. Plastic Production in Malaysia and the World

In less than 100 years, annual global plastic production increased from a mere 2million (m) tonnes in 1950 to 381m tonnes in 2015 (Figure 3). In terms of what plastic are commonly used for, nearly 40% of total plastic produced globally are for packaging purposes (see Figure 4). This explains the prevalence of plastic wrapping or packaging found as rubbish floating on the sea, dumped at landfills, or ingested by marine animals⁶. The situation is similar in Malaysia as the market share of plastic is highest in the packaging segment in 2008 at 40% with an increase of 8 percentage points at 48% a decade later, as seen in Figure 5.

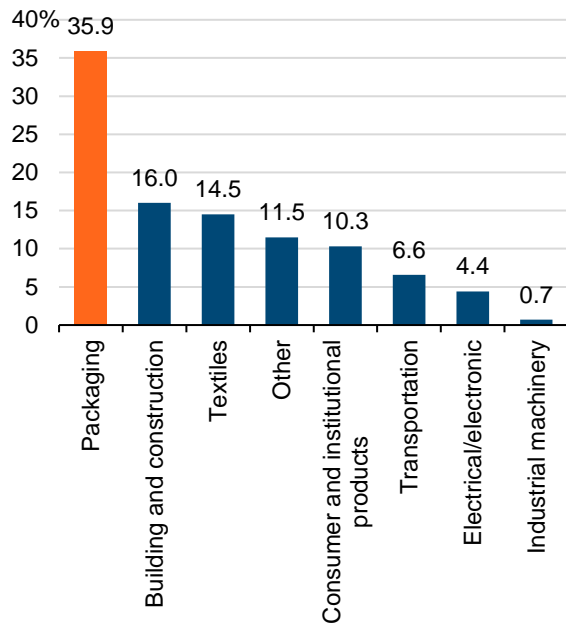
Figure 3: Annual Global Plastic Production, 1950-2015 (million tonnes)



Source: Ritchie et al. (2018)

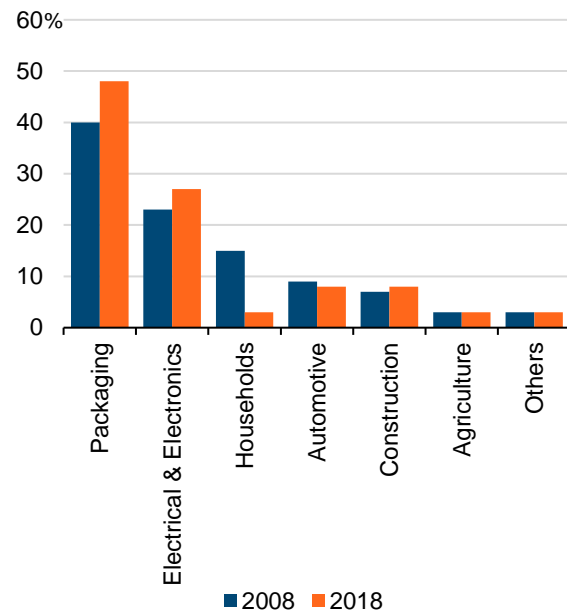
⁶ Azzarello et al. (1987), Lazar et al. (2011), Wilcox et al. (2016)

Figure 4: Global Plastic Use, 2018



Source: Ritchie et al. (2018)

Figure 5: Market Share of Plastic in Major Market Segments in Malaysia, 2008 and 2018



Source: JPSPN (2011), MPMA (2019)

2. Malaysia's Recycling Process and Capabilities

There are many types of plastic produced globally. Generally, plastic is divided into seven categories, and not every type can be recycled in Malaysia. According to Table 1, Malaysia has the capabilities to recycle categories 1, 2 and 5⁷. According to the National Solid Waste Management Department, the most common method to recycle plastic waste is through mechanical recycling⁸. Through this process, the plastic is reproduced into a new form, but its initial chemical composition remains unchanged⁹. Most of the plastic which undergoes this recycling process consist of the 3 categories stated above.

⁷ Wong (2017)

⁸ JPSPN (2011)

⁹ European Bioplastics (2015)

Table 1: Categories of Plastic

No.	Category	Product of Uses	Recyclable in Malaysia
1.	Polyethylene Terephthalate (PET/PETE)	Mineral Water Bottles, Cookie Jars	Yes
2.	High-Density Polyethylene (HDPE)	Milk Containers, Buckets, Shampoo Bottles	Yes
3.	Polyvinyl Chloride (PVC)	Pipes, Synthetic Leather	No
4.	Low-Density Polyethylene (LDPE)	Bubble Wrap, Plastic Bags	No
5.	Polypropylene (PP)	Disposable Food Containers, Bottle Caps	Yes
6.	Polystyrene (PS)	Disposable Cups, Plates, Cutlery	No
7.	Others	Miscellaneous Plastic, Nylon	No

Source: JPSPN (2011) and Wong (2017)

Although we are capable of recycling only 3 out of 7 categories of plastic, the local recycling industry only concentrates its resources on plastic that is easily retrievable and hold high value, for example PET mineral water bottles¹⁰. Low quality plastic that is used to manufacture food packaging are rarely recycled. This is probably why our landfills are filled with low quality plastic wrappers and packaging. Thus, due to Malaysia's limited capabilities to recycle plastic, it is intuitive for us to reduce the consumption of plastic.

3. Poor Law Enforcement

Environmental laws exist in Malaysia, but their effectiveness must be supported by strong enforcement. For example, In July 2018, the Ministry of Energy, Science, Technology, Environment and Climate Change Malaysia (MESTECC) temporarily revoked import permits for plastic waste under HS Code 3915 and stopped the issuance of scrap plastic import permits. In October 2018, the ban was temporarily lifted. Less than a year later, many illegal recycling factories mushroomed in the country, giving rise to mountains of plastic waste—most of which is contaminated and non-recyclable¹¹. Several actions were taken by the authorities, such as introducing 18 new conditions for importing plastic scrap to Malaysia¹². Holders of these import permits are only allowed to store and process plastic scrap in approved premises. There are also strict guidelines regarding the storage of

¹⁰ MESTECC (2018)

¹¹ Watson et al. (2019)

¹² Some of the conditions include true capacity of the processing machine must be verified by Standard and Industrial Research Institute of Malaysia (SIRIM) and providing an invoice which is stamped and signed.
Source: JPSPN (2018)

plastic scrap in factories. According to the Housing and Local Government Ministry, only 62 Malaysian companies have valid permits to import plastic waste from overseas¹³. If this is the case, the bales of foreign, low-quality plastic waste could be due to irresponsible illegal recyclers that took advantage of the possibly lax enforcement.

Furthermore, the federal government initiated a ban on plastic straws which started in January 2019 for Putrajaya, Kuala Lumpur and Labuan. The state government of Selangor followed suit in July 2019¹⁴. However, reporters have found that there is little to no reduction in plastic straw usage¹⁵. There may be “No Straw” signs plastered on counters and tables, but there is little attention towards it. What is supposed to be a ban looked like a campaign to discourage the use of straws instead. However, it may take some time until individuals and businesses are acclimatized to the ban.

Other than the straw ban, there seems to be no clear direction to handle plastic waste in Malaysia. Minister Yeo Bee Yin asserted that there will be “no mercy” for illegal plastic recyclers¹⁶ while on the other hand, Housing and Local Government Minister Zuraida Kamaruddin mentioned that the plastic recycling industry is a lucrative one worth RM30b a year, albeit companies are tied to strict regulations and only allowed to import clean plastic scrap¹⁷. While it may be true that the plastic recycling industry is profitable for an economy¹⁸, this activity will be at the expense of the environment if the plastic is of low quality and contaminated, as they are typically burned and release toxic chemicals in the process or end up in landfills.

Additionally, waste segregation was made compulsory in a few states and federal territories on 1 September 2015¹⁹. Compounds and fines can be issued to those who violate the law. Four years later, there is still not much awareness about waste segregation. According to a recent article, the reason this programme did not achieve much success was due to the lax enforcement and the mixing of garbage during the disposal stage, despite the effort of some households that actually sort their rubbish²⁰. Recently, the Housing and Local Government Minister said that a 2-year period is required for the waste segregation programme to be in full force²¹.

In face of this plastic crisis, MESTECC introduced “Malaysia’s Roadmap Towards Zero Single-Use Plastics 2018-2030” in 2018 (see Table 2). It is a policy guideline with the aim of ensuring environmental sustainability and eliminating the use of single-use plastic by 2030²². It mainly centres on introducing bio-degradable alternatives to plastic and reducing single-use plastic such as grocery

¹³ Bernama (2019)

¹⁴ Rajendra (2019)

¹⁵ Rajendra et al. (2019)

¹⁶ Zhou (2019)

¹⁷ Bedi (2019)

¹⁸ The global recycled plastic industry is expected to be worth USD54.6b by 2025. Estimates have also shown that the industry in the United States and Canada alone will be worth USD120b if technology is able to keep up to the increasing market demand. Source: Closed Loop Partners (2019), Hexa Research (2019)

¹⁹ The programme was compulsory for Putrajaya, Kuala Lumpur, Pahang, Johor, Melaka, Negeri Sembilan, Perlis and Kedah. Source: KPKT (n.d.)

²⁰ Soo (2019)

²¹ Ibrahim (2019)

²² MESTECC (2018)

bags and straws. Since this roadmap is currently only in its second year, a longer time horizon is needed to assess the effectiveness of the initiatives in the roadmap in solving this issue.

Table 2: Summary of MESTECC's Roadmap Towards Zero Single-Use Plastics 2018-2030

Initiatives and Plans	
Phase 1 (2018-2021)	<ul style="list-style-type: none"> • Review existing laws and develop legal framework • Nationwide implementation of pollution charge at a minimum of RM 0.20 for plastic bags • No straws given to customers by default. Plastic straws only given on request. • Communication, Education & Public Awareness (CEPA) Programs nationwide
Phase 2 (2022-2026)	<ul style="list-style-type: none"> • Biobag to replace plastic bags • No straw by default practice continues • Expand to more biodegradable and compostable products (food packaging, cutleries) • Research & Development (R&D) funding on eco-friendly substitutes • Introduction of legal framework on single-use plastic • Levy to be imposed on plastic bag manufacturers
Phase 3 (2026-2030)	<ul style="list-style-type: none"> • Substantially increase the volume of production of biodegradable and compostable alternatives • More Research & Development (R&D) • In 2030, an implementation report will be published

Source: MESTECC (2018)

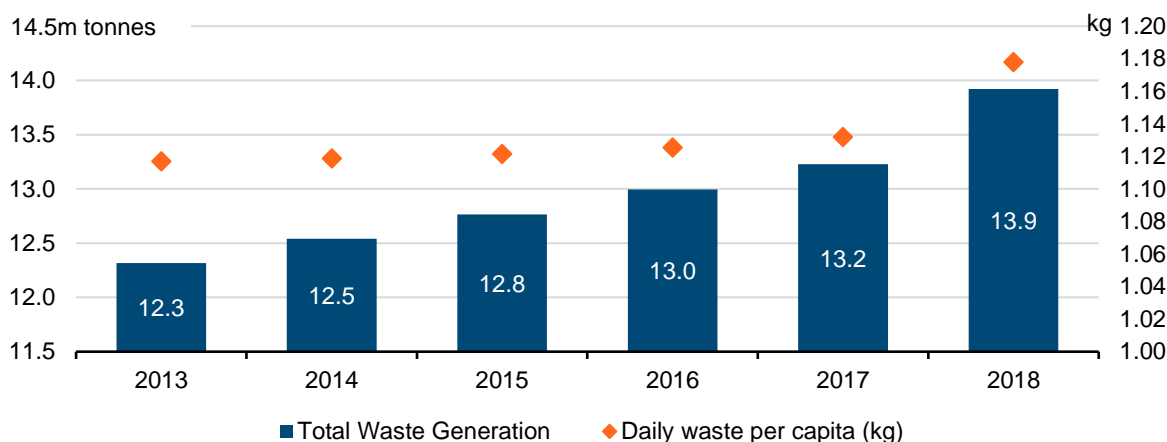
4. Low Environmental Awareness and Mentality among Malaysians

Micro behaviours can lead to macro outcomes. A country's environmental awareness and mentality can be proxied through factors such as waste generation and recycling rate. Based on Figure 6, Malaysia's waste generation has increased steadily throughout the years. According to SWCorp Malaysia, Malaysians generated 38,142 tonnes of waste daily in 2018²³. In per capita terms, there was a relatively large increase in daily waste generated per capita in 2018 compared to previous years at 1.18kg. A representative from SWCorp Malaysia also said the latest statistics showed that plastic was 20% of total waste²⁴. This is shocking, since there was increased effort globally to raise awareness on generating less waste in the past decade.

²³ Chu (2019)

²⁴ Noor Azlina (2018)

Figure 6: Waste Generation in Malaysia, 2012–2018

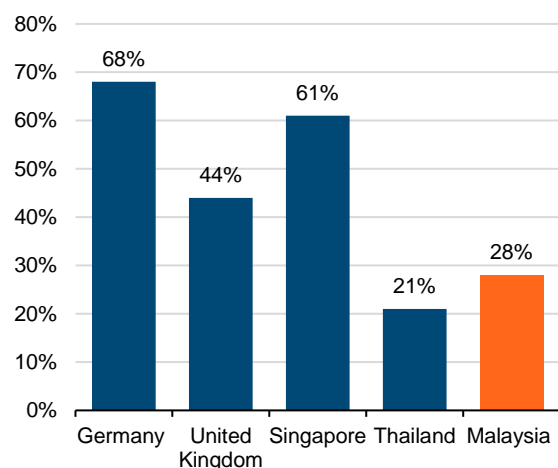


Source: Noor Azlina (2018), Chu (2019), DOS (2019) and authors' calculations

Note: Total waste generation include waste from households, industry, commercial and institutions.

Although the total recycling rate in Malaysia has been increasing yearly, the rate is still quite low compared to other developed countries at 28% (Figure 7), where a recycling rate of 30% is targeted to be achieved by 2020²⁵. It is worth noting that based on Figure 8, the recycling rate of plastic is less than half of the total recycling rate for all the years selected. Unless there is an increased awareness of the problems around plastic waste and the importance of “reuse, reduce and recycle”, it will be difficult to lessen our waste and achieve a satisfactory recycling rate.

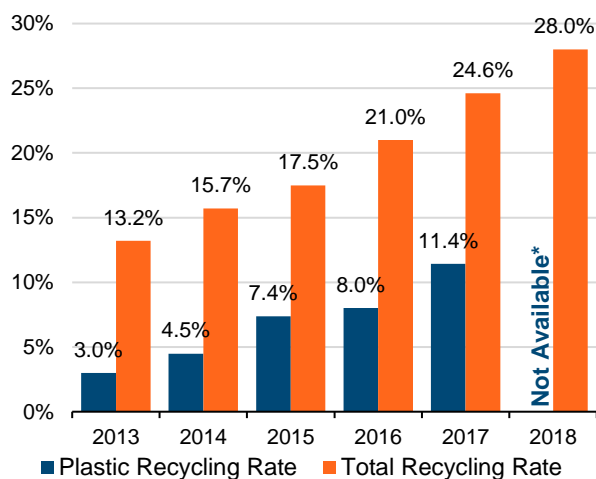
Figure 7: Recycling Rate of Selected Countries, 2017



Source: OECD (2019), MEWR (2018), Vassanadumrongdee et al. (2018)

*Note: Due to lack of data availability, figure for Thailand is only available for 2016.

Figure 8: Recycling Rate in Malaysia, 2013-2018



Source: SWCorp Malaysia (2018), Chu (2019) & author's calculations

*Note: Plastic Recycling Rate in 2018 is not available due to a lack of data.

Plastic Straws – Stealing the Limelight

In recent times, large-scale campaigns on reducing plastic straws consumption have been prominent. Given the broad range of issues surrounding plastic waste highlighted above, focusing on plastic straws are not only inadequate, but also draws attention away from other solutions that are needed.

The move to reduce the use of plastic straws was possibly ignited by the 2015 viral video of a 4-inch plastic straw stuck inside the nostrils of a male Oliver Ridley turtle. Today, many international corporations in Malaysia such as Starbucks and McDonalds are slowly phasing out the use of plastic straws²⁶. As an alternative, metal and paper straws are slowly introduced as alternatives to plastic straws.

However, studies have shown that plastic straws only make up 0.03% of total plastic waste in the oceans²⁷. If we follow this logic, we can remove every single straw on the face of this Earth and still be left with 99% of ocean plastic waste. In fact, there are a myriad of plastic sources which ends up in our oceans. Other than the common plastic bags which everyone is aware of, disposed fishing nets contribute to approximately 46% of the Great Pacific Garbage Patch's plastic waste²⁸, and approximately 640,000 tonnes of fishing gear are either abandoned, lost or discarded in the oceans²⁹. Otherwise known as “ghost gear”, there is no official registry for these nets. Fishermen can get rid of the nets without getting apprehended. While disposing fishing gear can be intentional or unintentional (due to bad weather)³⁰, it does not mitigate the harm to our oceans. Since fishing nets are made up of non-biodegradable material such as nylon³¹, fragments of the microplastic may end up in the oceans, ultimately being ingested by fish and ending up in our food chain.

The Action Bias – Shifting Our Mentality

The action bias³² is very relevant to our plastic crisis. Laws are enacted to reduce plastic bag consumption; more research are ongoing on improving technology to recycle our plastic waste. This implies that actions are carried out to try and solve the plastic problem.

However, if we look beyond the tip of the iceberg, the root of this issue is our own consumption and production of plastic. The only way to reduce plastic waste in Malaysia and the world is to simply use less plastic. All other “environmental friendlier” alternatives to plastic will not solve the root of problem—it will only dampen the extent of the damage. For example, biodegradable plastic, which is

²⁶ Gibbens (2019)

²⁷ Borenstein (2018)

²⁸ Loria (2018)

²⁹ FAO (2018), Macfadyen et al. (2009)

³⁰ Macfadyen et al. (2009)

³¹ Oxvig et al. (2007)

³² This phenomenon occurs when social norms tend to favour doing something over doing nothing (action over inaction). It is a subconscious behaviour of most people. For example, if a child has poor grades, parents tend to send their kid to a tuition centre or ensure the kid locks in more revision hours daily.

mainly produced using starch and cellulose³³, is still classified as plastic. In fact, a study has shown that a biodegradable plastic bag remained intact after being buried in soil for 3 years³⁴. If there is a lack of proper recycling technology to recycle biodegradable plastic, it will still end up in landfills and oceans³⁵. Instead of decomposing, biodegradable plastic may fragment into smaller particles known as microplastic. This means there is a risk that people may consume the microplastic, exposing them to health hazards³⁶.

Paper straws do not fare that well either. These alternatives to their plastic counterparts require 4 times more energy to recycle compared to plastic straws³⁷. This means that paper production releases more greenhouse gases to the atmosphere than plastic. Besides, if the straw is contaminated with food residue, chances are they will be rejected by recycling companies and ultimately end up in landfills or the ocean.

Box Article: Worms Could Be Nature's Possible Answer to Plastic

The larvae of *Galleria mellonella*, also known as the honeycomb moth and *Tenebrio molitor* Linnaeus — commonly recognised as the mealworm may provide a solution to reduce the amount of plastic waste. Recent studies have shown that these two larvae have certain enzymes and bacteria in their gut that digests polyethylene and polystyrene respectively.

However, these worms could only digest plastic at a very slow rate (100 honeycomb moth larvae could only degrade 92mg of plastic in a day while mealworms only ate about 40mg of Styrofoam in the same duration).

Studies have proved that this may be a possible option to tackle plastic waste, but further research will be needed to see if it is a viable option or not.

Source: Yang et al. (2014) and Yang et al. (2015)

Since young, children are taught the crucial waste management concepts, known as the 3Rs—“Reduce”, “Reuse” and “Recycle”. While there is much emphasis on the latter, there is insufficient attention on the reduce and reuse aspects.

We are constantly formulating and researching ground-breaking methods to improve our recycling capabilities. This proved to be rather futile as the global recycling system is in tatters. It's time we take a step back and evaluate our actions. Instead of spending millions of dollars on recycling research, we should try the cheapest and most effective way—reduce our individual plastic consumption.

³³ Gross et al. (2002)

³⁴ Napper et al. (2019)

³⁵ According to Jacqueline McGlade, chief scientist at the UN Environment Programme, a temperature of 50 degrees Celsius is required to break down biodegradable plastic. Source: Vaughan (2016)

³⁶ Ecology Center (2017)

³⁷ Get Green Now (2019)

Sometimes, not doing anything is better than doing many things. It is time we go against the action bias, at least for this case.

Conclusion

Malaysians must be more aware of the problem that we are currently facing. Recycling rates have improved but it is still insufficient to keep up with the increased waste generation and imports of plastic waste. To mitigate this problem, laws such as pollution charges on plastic bags and bans on plastic straws were introduced in the past few years. MESTECC's roadmap to eradicate single-use plastic bags is currently underway. If this programme is well-enforced, it would be crucial for Malaysia to become a more environmentally sustainable country without the detrimental effects of single-use plastic.

While strict laws and enforcement may be effective in the short run, the environmental awareness is what matters in the long run. There should be a stronger emphasis on reducing and reusing plastic than merely recycling. If we reduce and reuse, inevitably there is a lesser need to recycle.

Plastic waste is indeed a pressing issue and every individual in Malaysia is responsible to stop it from exacerbating. We should reduce and aim to ultimately eradicate single-use plastic in our daily lives as a first step for a cleaner, safer and better Malaysia.

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