

The Role of Design in Promoting Sustainable Behaviour

A Possible Future for Hong Kong's Recycling System



SD5173 Capstone Reflective Thesis

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Abstract

Recycling has been long believed to be one of the keys to tackle the man-made waste crisis. The concept encourages to make good use of resources that already exist, rather than constantly producing more (Lo, 2016). Not only such sustainable behavior allows minimization of waste, but also reduce environmental impact and space required in landfills. In addition, it is able to promote the idea of the once useless materials are now useful resources to generate new products, creating a continuous cycle, achieving the goal of circular economy.

Hong Kong, with its signature complex high-rise and high-density living environment, has been battling with the waste problem for the past few decades, various of strategies has been established to tackle the series of issue raised. The city's raise of economy, urbanization, and convenient waste disposal practice leads to a rapid increase of waste generation, putting pressure on its limited space landfills. The local authorities had made tremendous effort on spreading the awareness of household waste recycling through promotion, campaigns and education approach. However, the outcome of the three decades long investment is unsatisfied. The local municipal solid waste rate is raising steadily, where the waste recovery rate is decreasing continuously for the past years and are only at 29% in 2019 (EPD, 2020). The local recycling network exist, but it is unable to change citizen's unsustainable behaviour and penetrate waste categorisation to be a daily activity.

This study focuses on investigating the role of design in sustainable recycling behavior, aiming to propose a comprehensive household recycling system that suits best with Hong Kong local context, creating a better living environment for the future. Firstly, the system design and participants' human factors from recycle-as-culture countries has been reviewed and analyzed, where the social attitude and perception had than been compared to those of Hong Kong to

understand the limitation of current system that leads to the unsatisfactory recycling rate. Thirdly, identify the factors that influence human behaviour through investigating varies of cultural behaviour changing cases. Finally, propose possible future policies and design opportunities through using generated insights to encourage household recycling practise.

This study illustrates the significant of education and peer influence/pressure in shaping the society's attitude and perception towards waste recycling, affecting the actualisation of the sustainable behaviour. Start-them-young approach should be adopted where generation cycle are the ultimate goal that leads to the road of recycle-as-culture success. Moreover, the factors that influence human behaviour been discovered suggested that cultural factors should also be taken into consideration of future waste recycling system design. With the fast pace, convenient centred lifestyle and economically driven behaviour in Hong Kong, policies should be designed in parallel with these complex factor to encourage and enhance the willingness towards recycling.

Hong Kong citizen's environmental awareness is generally high (Xiao, 2017), however, due to the current ineffective system, it create barriers for potential recyclers. Creating a general negative attitude and limited action for environmental protection. To treasure the limited land resource, protect our mother nature, and provide a better living environment for our future generations, such attitude and unsustainable behaviour needs to be changed. Recycle should not be labelled as a behaviour done by environmentalist only, it is an ethically correct behaviour that should be practised by every individual in a daily basis. Together as a community, creating a better future.

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Section 1 Introduction

1.1 Introduction

Thanks to globalisation, technology advancement, and the rise of economy, global villager's quality of life and convenience of living has been enhanced. Yet the tremendous shift of our consumption and production pattern had been imposing an undue burden to our environment. While we are all enjoying the satisfaction bought by consuming, it also result in shorter product life span and increase usage of one-off products, leading to rapid generation of waste. A heavy price needs to be paid for our behaviour. From toxic release, to damaging the living environment of other species, waste disposal is clearly threatening our environment and our health.

Government authorities from both developed and developing countries had made the manmade crisis to be one of the important issue to tackle with (Lo, 2016). From incinerators, to landfills, to zero waste targets, wide range of strategies has been applied to manage the never-stopping waste generated from its citizens. However, it can be observed that the awareness or actual action towards environmental protection are limited. Trucks of waste are being generated continuously in a rapid pace, the adaptation towards a sustainable lifestyle is yet to be a trend.

The 3R's: reduce, reuse, and recycle concept has been around for years, widely believed to be the key to reduce waste generation and promote the concept of resource conservation (Lo & Siu, 2010). The waste hierarchy encourages people to make good use of resources that already exist, rather than continuously producing more. Among the three, recycle is the most popular practise. While the other two requires to shift daily habit, recycle is a sustainable behaviour that allow people to maintain their current consumption habit. Most importantly, it is able to promote the idea of the once useless materials are now treasures to generate new products, creating a continuous resource cycle, achieving the goal of circular economy.

1.2 Hong Kong waste management system: Its history and recent status

Hong Kong, one of the most densely populated city in the world, has been battling with the waste problem for the past few decades. With its limited land, high-rise and high-density housing were constructed around to contain the population density of around 17 thousand

people per square mile (World Population Review, n.d.). Similar to other countries or cities, Hong Kong also cannot escape the destiny of facing problems raised by the rapid increase of waste generation caused by urbanisation and economic growth. From placing more trash bins on public streets, to illegal littering penalty, various strategies has been established by the local government to tackle the series of issue raised, shaping the citizen's waste disposal habit and perception today.

Among all the waste management strategy, the 'Keep Hong Kong Clean' campaign needs to be the most significant one that formed Hong Kong citizen's perception towards waste disposal to be lowering health risk or keep clean and hygiene. Back at 1970s, the city scale public education and promotion campaign was launched to raise the local citizen's awareness towards public hygiene, aiming to improve the street's tidiness (Government Records Service, 2005). The campaign character litterbug *Lap Sap Chung* appeared in every corner of the city, educating that waste should be thrown in designated trash bins (Figure 1.1).

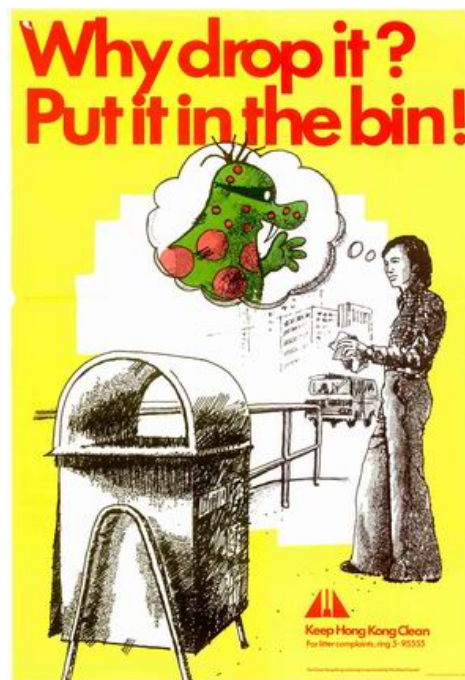


Figure 1.1 Promotion Posters from the 'Keep Hong Kong Clean' Campaign
(Source: Government Records Service, 2005)

However, the campaign also shift local's the perception towards waste and disposal behaviour. Phrases like 'troublesome' and 'terrible' were used to describe waste and can be found in widely known campaign songs, leading to a negative perception that waste are unhygienic and

disgusting that causes smell and attract pest, leading to untidiness of the city. Moreover, various of cleaning activities also leads to unconscious disposal behavior, that waste are unpleasant objects and should be thrown away immediately. Therefore, while such campaign had successfully turned Hong Kong to a clean city, the amount of waste been generated has also increased.

With the raise of economy together with the negative perception and unconscious disposal behavior, there is a tremendous increase of waste creation. According to the Environmental Protection Department (EPD), a daily average of 5,870 tonnes of municipal solid waste (MSW) has been disposed in the year of 1986, and the number had increased to 8,580 tonnes in 1997 (EPD, 1998), a steady increase per year. With landfill being the only waste management strategy at the time, it simply cannot digest large scale waste been generated.

Realising the incoming environmental crisis and land problem, a new waste disposal practise has to be introduced by the Hong Kong Government. By the end of 1998, the three coloured recycling system was introduced by the EDP (EPD, 2008). With the slogan ‘blue for paper, brown for plastic bottles, yellow for aluminum cans’, the voluntary basis recycling practice encourage citizens to bring recyclables to the nearest recycle bins. Source Separation of Domestic Waste program was then established in 2005, aiming to increase the recycling rate and expand the community recycling network to a city scale (EPD, 2008). The government encourages property management companies to include recycling facilities on every level of housing estate. As of today, around 2,356 housing estates and more than 700 villages provide the three colored recycling facilities to its residents, covering around 80% of the population (EDP, 2021). Other than the three recyclables, the category had also expanded for the past years, including rechargeable batteries and glass etc., where these recyclables would only be collected at designated locations. But, with decades of effort of spreading the awareness of waste separation through promotion, campaigns and education approach, the recycling rate in Hong Kong are unsatisfied. After reaching its peak at 52% in 2010, year by year the MSW recovery rate has been decreasing continuously and in the latest audit report, the recovery rate is only at 29% in 2019 (Figure 1.2), a decrease of around 45% after around a decade (EPD, 2011, 2020b). The issue is clear, while the local recycling network exist and the environmental awareness has been raised, the contribution and effort from local citizens or even the government is seemingly not enough.



Figure 1.2 Recyclables recovered from Municipal Solid Waste in 2000-2019
(Source: EDP, 2020a)

Recently, new goals have been set by the Environment Bureau (EB), aiming to achieve the vision of ‘Waste Reduction, Resources Circulation, Zero Landfill’. According to the *Waste Blueprint for Hong Kong 2035* (EB, 2021), the waste charging scheme would play a key role in Hong Kong’s future waste management strategy. With the upcoming policy, the authorities are targeting to reduce the MSW disposal per capita by 40-45% and increase the recycling rate to about 55%. A series of new approaches has been established to support the future disposal habit changing policy, such as the re-branding of recycling stations: Green Community and reverse vending machines etc. However, the effectiveness of the new policy is still unclear, as in some cities, not only both recycling and disposal rate has not improved, other problems like illegal disposal also surfaced (Xiao, 2017). With the ongoing trend of decreasing recycling rate and the unknown establishment date of the charging scheme, the goal achievement by 2035 seems to be very challenging.

Section 2 Significant of Problem – Why should we care about waste issue and practise recycle?

It is now clear that despite putting decades of effort to encourage its citizens to practise the sustainable behaviour, the recycling rate in Hong Kong are not optimistic at all. However, with years of the convenient waste disposal habit that had embedded in Hong Kong local citizen's daily life, why does the high disposal rate and low recycling rate demand an immediate attention? Three significant factors can be discussed and they are: impact to the eco-system, limited land resource, and duration required for decomposition.

2.1 Impact to the eco-system

All living organism that subsist on planet Earth are interconnected (National Geographic Society, 2012). One micro change within the system will ultimately influence all other living species. We humans had always been promoting the idea of creating a coexist living environment for us and the nature. However, in reality, all the actions that we have done is seemingly stepping over the line.

Marine pollution is mainly caused by irresponsible waste disposal during marine activities, or leaked out from our waste management system. Within all the ocean waste, over 80% are plastics (IUCN, 2018). According to Oceana (n.d.), there are more than 17.6 billion pounds of plastics flown into the ocean annually, and if current dispose rate continue, by 2050, our ocean would contain more plastics than fishes. The huge amount of external material inflow would not only destroy the marine life's living environment, but the lives of more than 700 kinds of marine species are being threatened (Iacurci, 2015). Floating microplastics are being mistaken as food by seabirds, sealions being wrapped by fish nests, the phenomenon had become so common that the related photos or videos are not shocking anymore.

The tragic doesn't stop here. The consequence are now slowly creeping back to the culprit, humans. At one of the experiments conducted by the Medical University of Vienna (Schwabl et al., 2019), microplastics were discovered at samples of human stool from eight countries. Meaning that the seafood we consume contain plastics and there is a high chance that it is running in our own digesting system right now. Little by little, the toxic compound in these

microplastics would accumulate within our body, finally affecting our immune system, nervous system, and the most severe, cancer (Washington Post, 2019).

2.2 Limited land resource

Landfill and waste-to-energy incinerator are the two waste management strategies adopted by the Hong Kong Government to deal with the overwhelming amount of waste. However, while both strategies are able to deal with the current waste disposal practise effectively, it cannot be ignored that they both require notable land resources (EPD, 2016), and when such strategy are applied to Hong Kong, where land resource are limited and precious, the future are not optimistic at all with the current on-going increase disposal rate.

Although incinerator are able to decrease the volume of disposed waste and generate energy resource during processing, the ultimate goal of such facility is only to procrastinate the use of space in landfill. These volume-decreased-waste would be still be sent to the landfill after all. Bit by bit the landfill will ultimately be full at some point, and that a new one would be needed. One after another, only more landfills would be constructed in the far future to meet the demand of waste disposal (Xiao, 2017) and with the limited land, these facilities would only get closer and closer to the general public, which is not welcomed due to the unpleasant smell and potential health risk from released landfill gas.

Therefore, while both strategies are able to deal with the current waste disposal practise effectively, they are not sustainable solutions (Lo, 2016). There are only limited land in Hong Kong to contain the continuous in-coming resources.

2.3 Duration required for decomposition

Decomposition, also known as ‘nature recycle’ is a process of breaking down dead species into simpler organic material (Trees of life, 2021). It plays a very important role in the natural habitat, as it helps to clear away species that occupy physical space. Manmade material also decompose, however the time period required are way longer.

Taking the material that are gaining extensive attention, plastic as an example. The material can be commonly found in our daily lives and are favoured by manufacturers due to its low

cost, high production flexibility and durability. Yet, it is the material's durability that made its afterlife very challenging to manage (United Nation, 2017). Plastic products can take up to 1,000 years to be decomposed, and even it does, it doesn't mean that it would vanish. Microplastics, would still remain and there are still no scientific proof from current technology that these little pieces can be decomposed further (National Geographic Society, 2020). Thus, it is believed that almost every pieces of plastic been produced ever, still remain on our planet in some form or shape (United Nation, 2017). Not to mention other materials like glass, that are believed to require millions of years, or the worse, styrofoam that would not decompose at all.

We are producing, consuming, and disposing way faster than the planet can digest for us. While natural organic waste would only take a few weeks to be decomposed, manmade material varies from a few hundred years to a million years, or even some, would not technically vanish from our planet. In connection with the previous factor, these waste that we dispose unconsciously every day are occupying a space in our planet in a long term or forever.

2.4 Summary of section

It is not hard to realise that the above three factors are future related, meaning that our own children or grandchildren would be the key victim of our irresponsible behaviour. Imagine in the near future, mankind could only trust manmade food substitutes as all natural food resources contain toxic components. Higher health risk due to long term toxic air inhale. Minimum number of animals survive as most of them would extinct from their polluted living environment or toxic contained in their food, There would be less and less surface area for ocean, forest, and mountains, as more land are needed for the increase population and waste disposal infrastructure. Soon or later, our mother planet earth would become a garbage-strewn wasteland that is not suitable for mankind to live anymore.

Section 3 Aims and Objectives of Study

The waste disposal practise in Hong Kong requires an immediate change, it's now or never. Not only to do good to our mother nature, but also prevent potential health risk and provide a better living environment for our future generation. Every minute of delay would only equals to more trucks of recyclables poured into the landfill, occupying more physical space, needing another millions of years to decompose. Recycling have to be one of the key element to promote a sustainable waste management system. Not only it allows waste reduction to save up space for the landfill, but it also give impetus to the concept of circular economy, reusing the already exist resources infinitely to limit the need for raw materials.

While the role of design is to 'shape a better future', it inspired the research question: What are the role of design in shaping a possible future for promoting a sustainable recycling behaviour in Hong Kong? The aim of this thesis is to propose a possible future policies and design opportunities from a designer perspective that facilitate the promotion of sustainable behaviour in the Hong Kong. Below are the list of objectives to facilitate the achievement of the aim:

- I. Review and explore into the development of waste management system and recycling practise in Hong Kong
- II. Review and explore into the development of waste management system and recycling practise of recycle-as-culture countries or cities
- III. Understand the perception of Hong Kong citizens towards recycling, and the limitation, drawbacks, and challenges of the current system
- IV. Review and explore into cases that have successfully shift large population behaviour
- V. Suggest possible future policies, design opportunities to shift unsustainable behaviour and promote waste recycling in Hong Kong

Section 4 Waste Management and Recycling Practise in other Countries or Cities

Waste issue is a globally shared issue faced by all developing and developed countries. While different approaches are adapted to tackle the crisis, a same goal is shared: to minimize waste and promote a national recycling culture. However, after decades of effort, while some has successfully lower the disposal rate significantly and are taking another step forward to promote zero waste lifestyle, some are still making limited progress, or even worse.

In this section, three countries or cities that have successfully promote recycle-as-culture has been selected to study, and they are: Kamikatsu town, from Japan, South Korea, and Sweden. These three cases has been selected as they all have their own unique and world leading recycle network that leads them to the success of today despite their culture, lifestyle, and housing type differences. In order to generate further insights, an analysis has been done to the cases through using three research tools. POEMS framework (criteria including people, objects, environment, messages, and services/systems) are first used to understand the basics of established recycling network of each (Full analytical framework can be found in Appendix A). Then, a value web has been done to recognise the stakeholders involved, and understand their relationship through identifying the value flow between. Finally a human factor analysis (criteria including social, emotional, cultural, and cognitive) has been done to understand the internal and external factors that influence recycling behaviour (Full analytical framework can be found in Appendix B).

Through identifying the similarities between the cases, a model can then be generated, allow an understanding of key factors that brought the three cities or countries shifting from unsustainable behaviour to the current success. By then, through comparison, problems and limitation of Hong Kong's recycling system can be identified.

4.1 Kamikatsu Town, Japan: The Zero waste town

Kamikatsu, zero waste town of Japan, have the mission to achieve zero waste by the year of 2020. Meaning that every single piece of waste generated in town would be recycled, or given a second life through reuse (Steffen, 2019). While other countries are able to establish recycle-as-culture with the support from economic-incentives or illegal punishment, Kamikatsu town does not. Around 1,500 local citizens would voluntarily bring their own recyclables to the

central collection station and segregate into the given 45 types as a weekly routine. The result of the campaign has been significant. As of 2020, the non-organic recycling rate of Kamikatsu town had reached 80% (Garfield, 2017).

Back in the days, there is no well-developed waste management system in town, local residents would treat their own trash either by simply open incineration or dump in nature. Certainly, such disposal behaviour caused a lot of problems (Stories, 2015). In the late 1990s, natural habitat was affected and a lot of health issues had raise, alarming the local government that an alternative waste management strategy is needed, and this is where the Zero Waste Academy was raised. During early establishment, only a few pioneers are willing to participate the new system that require more effort, yet, after a few attempts, they realise it wasn't as challenging as expected (nippon.com, 2020). Then, the behaviour spread around and ultimately all locals take part, turning it into a community activity and signature of Kamikatsu town at present.

It cannot be denied that the collectivism culture of Japan plays an important role in Kamikatsu town's success. Japanese have high obedience on given rules and would feel uncomfortable to be out-group, allowing the new strategy to be accepted quickly. Yet, the trust built by the Academy through well-established infrastructure and system transparency cannot be ignored.

Classifying waste into 45 types seems to be horrifying, therefore specialist would facilitate on material segregation (Stories, 2015). Moreover, there is a reason behind such detailed classification. The more detailed the materials are being sorted, the less fee are required to be paid for collection and some recycling companies would even pay for the 'good quality' recyclables. Income or expanse labels are included beside each container, allowing the local residents to understand the money transaction between the Academy and the recycling companies. Other than the labels, signs with both simple text and illustration are also included, aiming to educate residents on what are the materials collected for and find the activity to be more significant (Garfield, 2017). Furthermore, the collection station are designed to be an open space area offering a total transparent recycling process. Locals are able to observe the collection process by recycling companies, trusting that the recyclables would be in good hands.

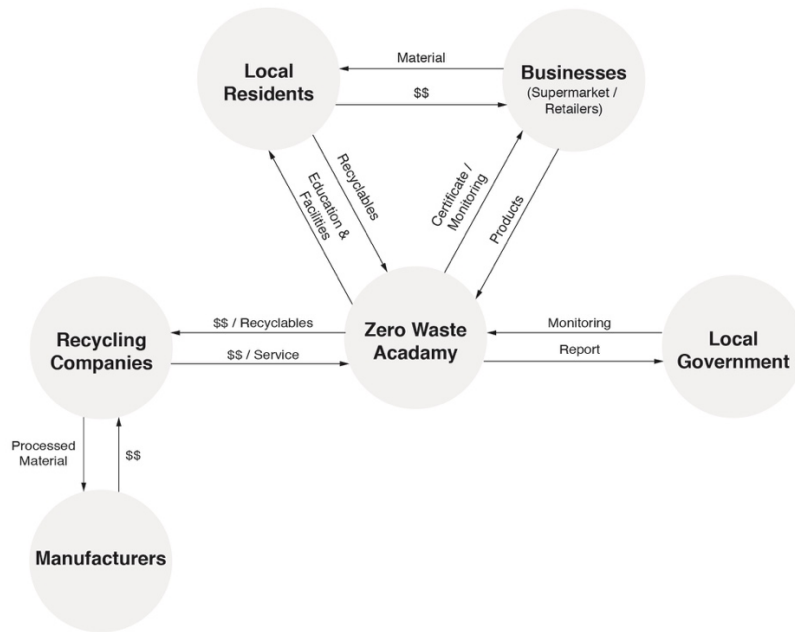


Figure 4.1 Value web of Kamikatsu town, Japan's waste recycling system

Another key that leads Kamikatsu town's waste recycling system to its success has to be related to their simple value web (Figure 4.1). All of the main stakeholders involved in the recycling practice in town are directly relate to the Zero Waste Academy, allowing a more direct management system and provide a transparent communication platform.

4.2 South Korea: The only country in Asia being the top 5 of recycling countries

The Republic of Korea, similar to Hong Kong, are well known by its rapid economic growth. But very different from Hong Kong, South Korea is able to establish a successful recycling culture. They are the only country from Asia that are able to become one of top 5 recycling countries (Parker, 2020). The volume-based waste charging scheme, and illegal disposal report-reward system established is able to encourage recycle behaviour, minimizing the amount of waste being generated. As of today, South Korea's non-organic recycling rate is over 50%, while food waste recycling is 95% (LegCo, 2013b; Broom, 2019).

In the early 1990s, due to economy take-off, the consumption habit of South Korea's citizens has shifted tremendously, leading to the amount of waste being disposed rapidly raised. To deal with the continue over-load waste, the South Korean Government initiatively planned to build 9 incinerators to meet the demand. However, the local citizens refuse the initiative due to

NIMBY syndrome, leading to social conflict as a result (Lo, 2016). With the social pressure, an alternative solution is required to manage the on-going issue, and this is where the volume-based waste charging scheme established in 1995 came in, which changed the citizen's behaviour.

Under the volume-based waste charging scheme, local residents are required to purchase and use designated trash bags where recyclables are disposed at specific collection point free of charge. Such policy design encourage waste categorisation for recycling and raise environmental awareness. Moreover, to avoid illegal disposal behaviour such as dispose at inappropriate locations, other than heavy penalty, the government also launched the illegal disposal report-reward system, where citizen would be rewarded a fraction of the penalty by reporting on any illegal behaviour. The result of illegal penalty and peer pressure approach has been significant, successfully shaping the recycling culture of today.

The complexity of South Korea's value web (Figure 4.2) is understandable due to the large population size required to be managed. Moreover, it can be noticed that the recyclables from each residential area are directly managed by a recycling manager, who are in charge of monitoring the classification done by residents. Such management system not only make sure the recyclables are in good quality, but the second life of recyclables are guaranteed.

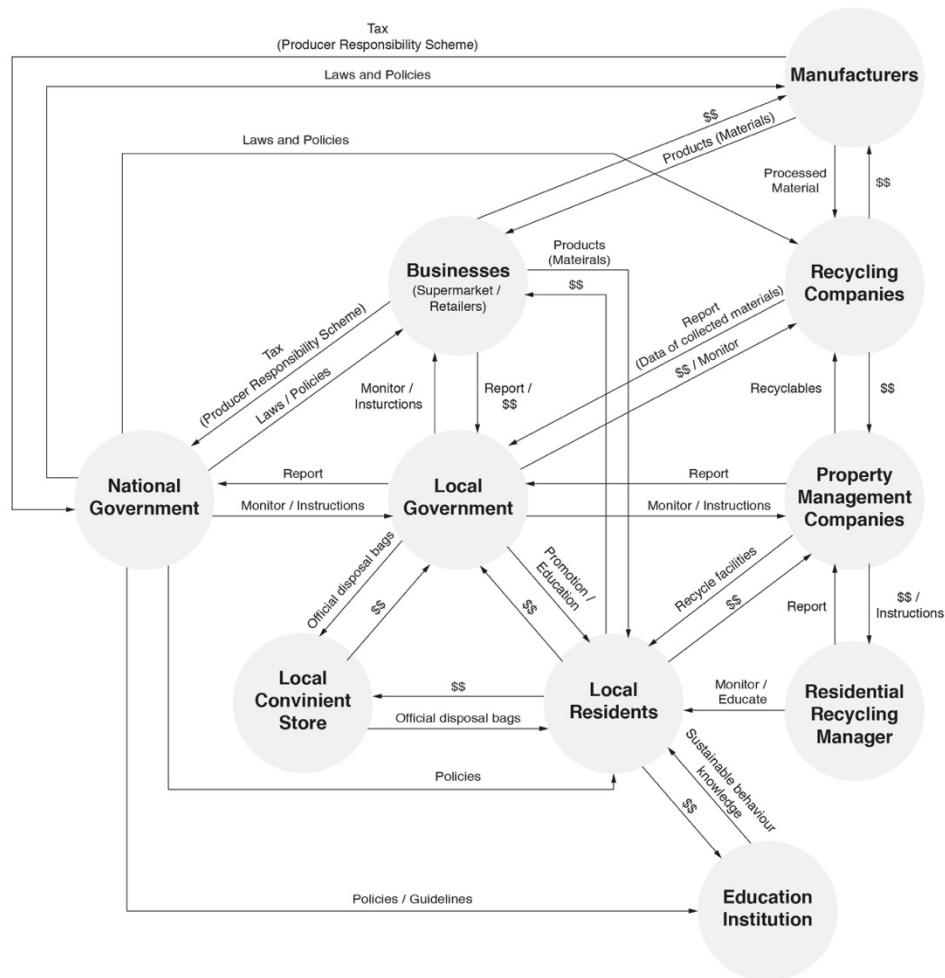


Figure 4.2 Value web of South Korea's waste recycling system

Three keys that allow South Korea to establish recycle-as-culture can be identified. First, user constraints. Through economic-incentives approach, the volume-based waste charging scheme constraint citizens from continuing their unsustainable behavior, alternatively encourage waste separation practice. Secondly, system transparency. Collection points in South Korea are an open space area, allowing residents to observe the collection process done by recycling companies. Lastly, peer pressure. Surveillance from CCTV cameras, recycling manager, and other residents made the illegal disposal behavior very difficult to perform. Leading to everyone to be very self-discipline on legal recycling initiative to avoid illegal punishment and being look down upon.

4.3 Sweden: The most sustainable country

Well known of being the most sustainable country, Sweden takes their waste management to an extreme. The Government of Sweden set a vision to achieve zero waste society by the year of 2020 to tackle the rapid increase disposal rate caused by urbanisation and raise of economy (Nyström, 2018). To realise the vision, various strategies like waste charging and separation scheme has been established to encourage sustainable behaviour. At present, Sweden's waste reuse rate had reached 99%, where 48% are recycled and 51% of non-recyclables were sent to waste-to-energy incinerator, providing over 40% of the country's capital, Stockholm's energy (LegCo, 2013a). Sweden's own waste management was done so precisely that they even have to import waste from nearby countries for energy generation.

During early establishment of the waste charging and separation scheme, disposal supervisors are hired to report and charge illegal behaviour, intending to motivate its citizens on waste categorization. However, such surveillance policy are not welcomed by the Swedish. With the social pressure, the Government of Sweden realise that raising the awareness of waste categorisation since young would be a more sustainable solution in compare to illegal threats (Mauborgne & Kim, 2018). From learning waste categorization, to concepts of green economy, the start-them-young approach begin since kindergarten, where different level of study courses related to sustainable development are integrated as a part of student's learning journey (Borg et al., 2017). Such strategy not only educate children on the know-how, but also an understanding towards the benefits of such effort. By then, children could influence other family members, than, from parents to children, a generational cycle would be created in a long term. It is clearly not an immediate solution, but a national recycling culture is guaranteed.

Below is the value web of Sweden's recycling system (Figure 4.3). While the value flow is complex, the whole recycling network is very efficient. Noticed that the recycling companies are the ones in charge of all recycling facilities, such system allow the recycling companies to get their hands on to recyclables directly, resulting in an effective and trustable system.

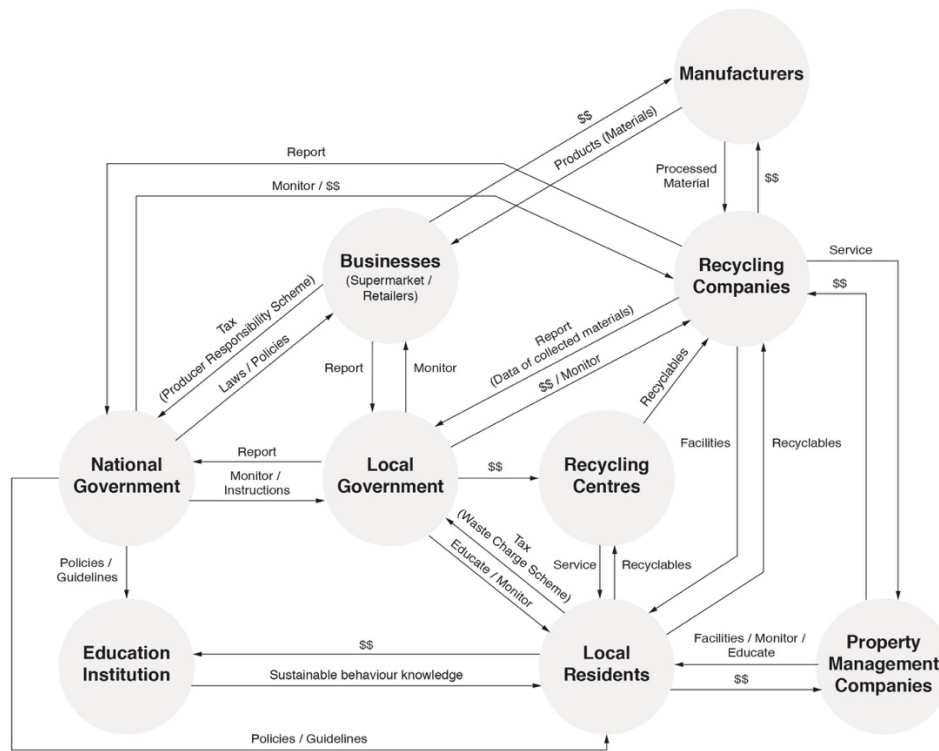


Figure 4.3 Value web of Sweden's waste recycling system

Other than education motioned above, there are another three keys that allow the sustainable behavior to be a part of Sweden's culture. First, well established infrastructure. The design of public recycling bins are well considered to stimulate national recycling practice. Two openings with different level of height can be found on each bin (Figure 4.4). Such universal design encourages people from all life stages to participate without any obstruction.



Figure 4.4 Well considered recycling bin design from Sweden that allow people from all life stages to participate in the activity (Source: Lantz, 2011)

Also, reverse vending machines that refund the deposit paid while purchasing beverages can be found everywhere, together with economic incentives the convenient access encourage its citizens to recycle after empty bottle (Brown, 2018). Secondly, system transparency. Similar to the above two cases, all recycle facilities are located in public space area where the collection process can be easily observed by citizens. Moreover, in relation to the education factor, all citizens know well about the destination of recyclables and the benefits behind, leading to a believe towards their own action and trust towards the system (Borg et al., 2017). Last but not least, peer pressure. Waste categorization in Sweden are foreseen to be a daily activity, such national culture not only pushes its own citizens, but also immigrants or even tourist to participate in the activity.

4.4 Insight from cases: Factors to promote sustainable recycle behaviour

From the above, it can be noticed that a well-considered waste management system plays an important role in raising environmental awareness and promote recycling practise (Lo, 2016). Despite a few differences, similarities between the three cases can be noticed. A model of three factors to promote sustainable recycle behaviour (Figure 4.5) can be generated through the noticed similarities and they are: Policy & Legislation, Education (institution/promotion), and Infrastructures.

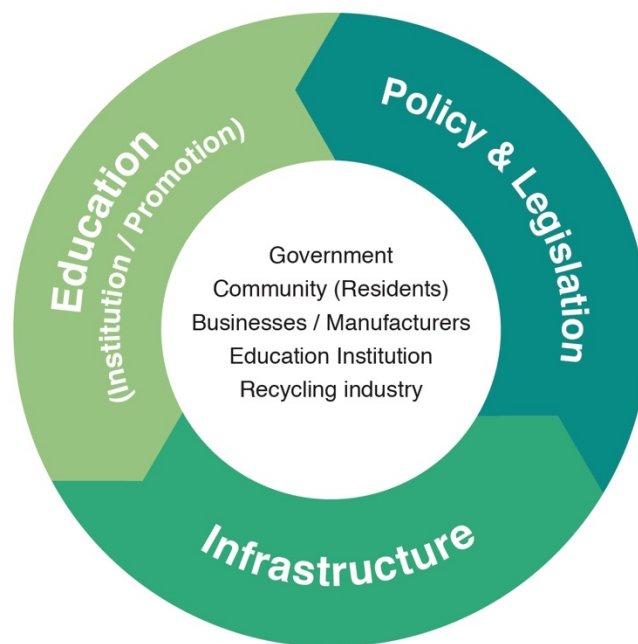


Figure 4.5 Factors to promote sustainable recycling behaviour

4.4.1 Policy & Legislation

Well-designed policies and legislations constrains individuals to behave in a desired way through making the previous act more difficult or impossible to do (Xiao, 2017), leading the new behaviour to become a habit. It can be divided into two types, one targeting towards citizens and another targeting towards businesses or manufacturers. Waste charging scheme are the most direct strategy to encourage waste reduction, where its effectiveness can be noticed through both cases of Sweden and South Korea. Most individuals are economically driven, the pay-as-you-throw approach can encourage waste minimization and recycling behaviour. Also, illegal penalty and surveillance system can be established to reduce illegal behaviour. Moreover, taking reference from Sweden, policies like deposit return scheme is another beneficial method to encourage recycling practise.

On the other hand, policies that target businesses or manufacturers is also crucial as they are the ones who provide the source of waste through products' material selection or packaging design. Producer responsibility scheme that require businesses and manufacturers to pay for the waste management fee not only encourage a consideration towards the product's afterlife, but also involve in encouraging sustainable behaviour to their customers. Moreover, packaging restrictions should also be launched to constraint types material been used, for example eliminate materials that cannot be recycled, or using easily peeled off stickers are compulsory. All designs should be done from the perspective of convenient recycling for both citizens and recycling companies.

4.4.2 Education (Institution/Promotion)

Education on recycling has been heavily emphasized by the Government of Sweden and can also be noticed in the two other cases. Although it is not an immediate solution, but the result are significant. The start-them-young approach supported by well-designed study course allow children to build up waste categorization as habit and to influence others. The key here is to create a generation cycle that naturally pass on the sustainable behaviour. Furthermore, information like destination of recyclables, what are they for, and how much has been collected can be promoted through illustrations on recycling facilities, or social media etc. Such system transparency that allow citizens to understand the outcome of their effort is important, not only

to motivate recycling behaviour, but also build up trust, leading to a continuous recycling behaviour.

4.4.3 Infrastructure

A well-developed recycling network is an important foundation that support both factors above. Any slight inconvenience or annoyance raised by the location or design of recycling facilities could lead to demotivation. Minimizing the distance between citizens and collection point increase the willingness of recycling (Lo, 2016), therefore setting up collection facilities or reverse vending machine all around the community, especially near the residential area can motivate more recycling participation. Moreover, taking reference from Sweden, the design of recycling facilities needs to be well considered. A universal design is guaranteed to encourage all citizens to be a part of the community activity.

4.5 Summary of Section

Through the above three essential factors and the effort from all stakeholders involved, the three cases had successfully promote recycling as a part of their own culture. It can be noticed that the concept of recycling from the above cases had already been developed as an ethically correct behaviour and are practised daily among the community, the ones who do not participate are the prominent one. Also, successful education and promotion can allow citizens to feel satisfied by waste minimization, or even enjoy the waste categorization process.

Due to the culture, lifestyle, and housing type differences, it is sure that Hong Kong cannot simply just copy and paste the policy and infrastructure design from the above cases. However, the insights generated allows an comparison on how the effectiveness of current Hong Kong waste management and recycling system can be improved.

Section 5 Challenges & Limitation of current Hong Kong recycling system

Previously in section 1.2, it is clear that the result of Hong Kong's waste minimization are unsatisfied. Achieving the goal of increasing the recycling rate to 55% by 2035, is very not on track. Similar to Sweden, the Hong Kong Government had been using the education approach to promote waste separation, however while the local's environmental awareness had been raised, most still continue to dispose without recycling (Xiao, 2017).

5.1 Discovering of reasons behind the unsatisfied Hong Kong recycling system

To better justify the reason behind the cause of the dissatisfied phenomenon, an analyse has been done towards the Hong Kong waste recycling management system through using the factors to promote sustainable recycle behaviour discovered in section 4.4. Five interviews with local citizens also been conducted to allow an understanding of the local's perspective and attitude towards the system.

5.1.1 Policy & Legislation

1. Voluntary basis
 - a. Current recycling practice in Hong Kong are in voluntary basis, meaning that no matter you participate or not there are no rewards or penalty. Being a financially driven society, there are lack of motivation to encourage participation, leading to only a few recyclers
 - b. Recycle management require more cost, and while recycling is not a must, most of the business would not participate
2. Loose monitoring system with no penalty
 - a. No surveillance system is located near most recycling bins and that irresponsible behaviour would not have any penalty, leading to the commonly seen un-clean recyclables or miss-categorize
 - b. The EDP only monitor recycling bins through reported numbers, no random inspections or spot checks would be carried, leading to fake recycling done by contract cleaners

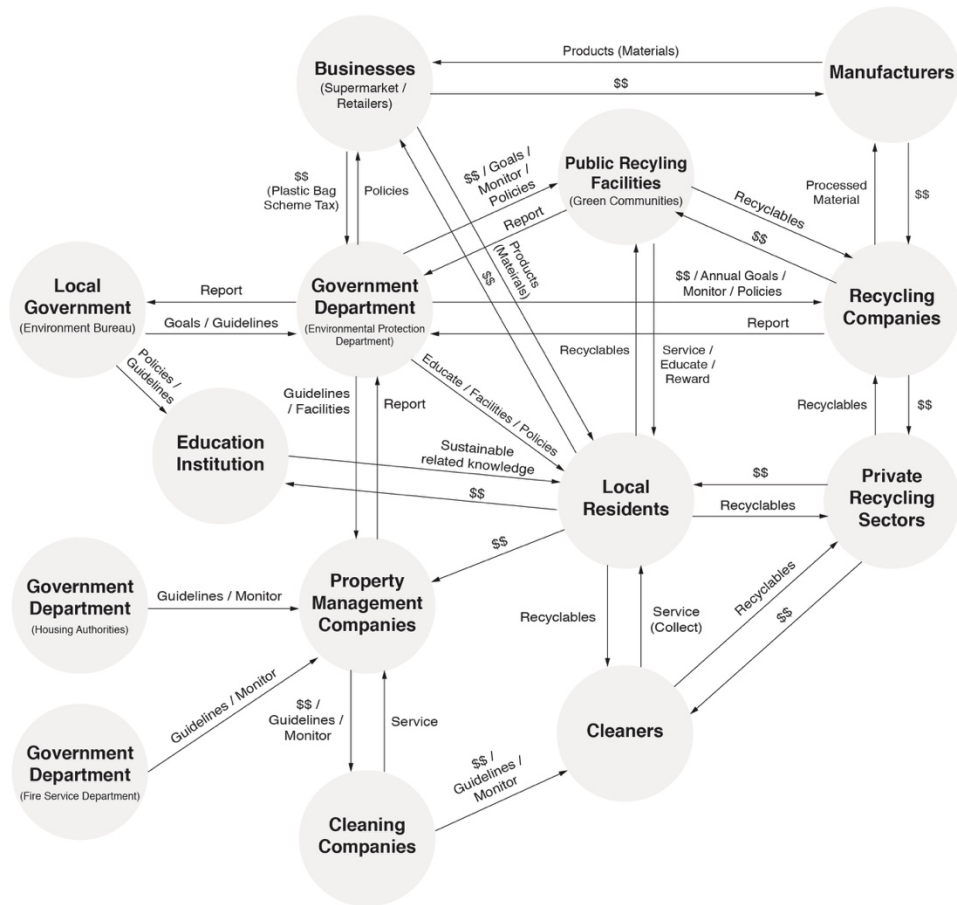


Figure 5.1 Value Web of Hong Kong's waste recycling system

3. Complex value web (Figure 5.1)

- a. Very different from other three cases discussed in section 4, the value web of Hong Kong is different. Recycle bins are managed by cleaners. Meaning that another layer has been added to the recycle flow (Figure 5.2), increasing the change of fake recycling

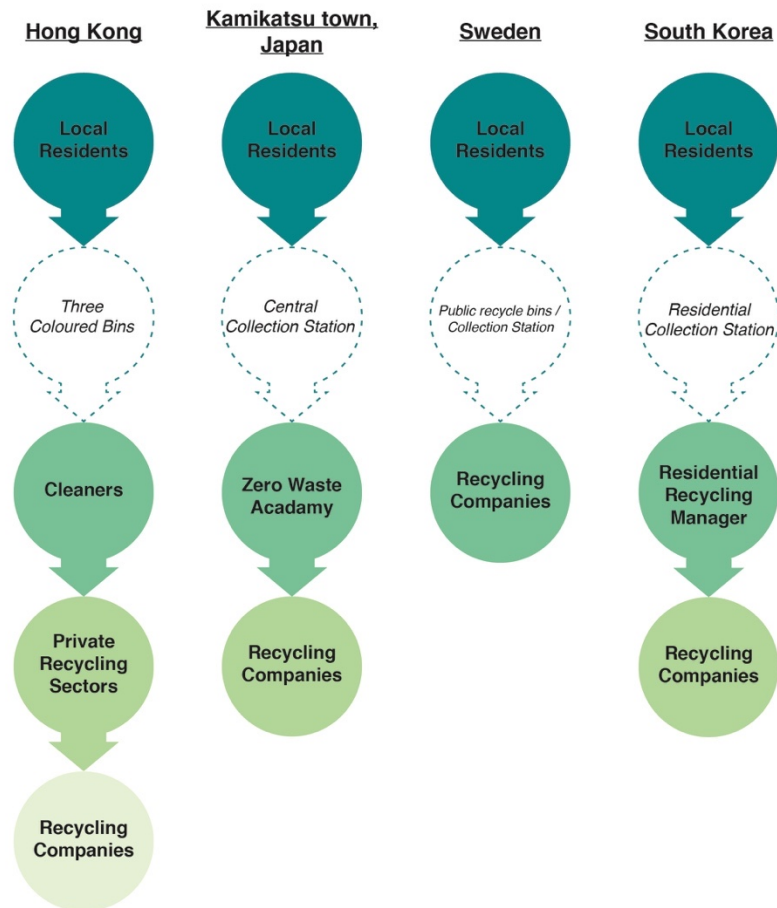


Figure 5.2 Comparison of recycle flow between Hong Kong and other three cases' recycling system

4. Convenient waste disposal practise

- a. Current household waste disposal practise in Hong Kong suites well with the fast pace and convenient lifestyle of local citizens, where waste of all types can be gathered to be disposed. While recycling requires extra effort, time, and space and that it is not a must, people would not participate

5.1.2 Infrastructure

1. Recycle bin design

- a. Current public recycle bins are poorly managed and designed, it can be easily damaged due to material selection and are not convenient for locals to use (require to push open and have a high chance of contacting the usually uncleaned bin)

2. Location of recycle bin

- a. According to the EPD, trash bin has to be located near the recycle bin to allow citizens to throw away non-recyclables if needed. While such policy have its own principle, recycle bins are often been treated as ashtrays or trash bins. Dark marks from cigarettes or organic wastes can always be noticed, creating barrier for potential recyclers
- b. Placing recycle bins near the trash bin promotes a negative perception towards recyclables being ‘waste’, ‘rubbish’, or ‘non-hygiene’

5.1.3 Education (Institution/Promotion)

1. Non-compulsory study course

- a. Environmental education in Hong Kong are adopted through cross-curricular approach (Education Bureau, 2016), meaning that it is only an additional study course rather than being a compulsory. Such course design lowered the chance of developing recycling as habit and an understanding of the benefits behind the sustainable behaviour

2. Lack of system transparency

- a. Limited promotion regarding the destination of recyclables or the amount been collected from each station or residential area

3. Limited promotion channel

- a. Traditional channels like television ads or posters are still the main promotion platform for sustainable behaviour, where most teenagers or young adults cannot be reached

5.1.4 Local’s perspective and attitude towards the system

The status of the Hong Kong recycling system is clear, that it had failed to achieve, not one, but all three factors that are essential in leading the city to promote a recycling culture. The current existing system seem to be done to appreciate local environmental groups and a show-off to its citizens (A. Y. Lo & Liu, 2018). Such failure not only create barriers for the potential recyclers, but also leads to a general negative attitude towards the recycling system. In current policies, recycle are not compulsory, leading to a stereotype that it would only be done by the elderly or the poor who are seeking financial benefits, or environmentalists who are passion

about protecting the environment. Moreover, due to the commonly known fake recycling phenomenon, most local residents lose faith towards the system, they would rather dispose the recyclables, despite feeling guilty or have high level of environmental awareness. Most importantly, with Hong Kong being a society that are seeking fast pace and convenient lifestyle, the act of recycling and current system design are obviously not align with the city's own culture.

5.2 Summary of Section

There is an urgent need that the waste recycling system in Hong Kong require to be redesigned. Not only a new recycling network that is more effective, but also a system that can regain the faith and trust towards the recycling from the local citizens.

Section 6 Human Behaviour Changing Case Studies

The future of Hong Kong waste management policy require a more careful consideration on influencing its local citizens to change their unsustainable behaviour. To provide a comprehensive design for the possible future of Hong Kong recycling system, other than the factors to promote sustainable recycle behaviour identified in section 4, an understanding towards the factors that influence human behaviour is also necessary.

In this section, three cases that have experienced a successful national behaviour change has been selected to be investigated, and they are: octopus card in Hong Kong, e-payment in Mainland China, and cycling culture in the Netherlands. Non-sustainable behaviour changing cases has been selected as it allows an understanding of the factors that influence human behaviour from another perspective.

6.1 Hong Kong: Octopus Card – Hongkonger’s daily necessity

Octopus Card, a smart contactless payment card, are deeply embedded in Hong Kong’s local culture (Gao, 2017). From public transportation, to dining, the payment system has been widely used locally. Currently, around 36 millions cards are circulating on the market, penetrating 98% of local population (Octopus Holdings Limited, n.d.-a).

Initially, the launch of Octopus Card are to improve the convenience of public transportation payment (Octopus Holdings Limited, n.d.-b). During the pre-octopus card days, different types of payment method were adopted by the public transport industry. Common stored value ticket is widely used in railway systems, where passengers are required to purchase a new ticket in frequent basis. For both bus and ferry, coins are paid during each travel. In 1993, MTR Corporation Limited have the vision of a unified payment system that can be more rapid and convenient, this is where the contactless smartcard technology: Octopus Card was raised. Below are a summary of factors that allow the smartcard to become local’s daily necessity.

Convenience

- Octopus Card only require 0.3 secs for payment
- Unified payment system, one card for all public transportation

- Previous payment systems require passengers to take out either physical tickets or coins, were the new contactless technology allow passengers to pay while keeping the card inside their own wallet or bags
- Can use for a life-time after ownership, only require to add value, do not have to purchase new ones after negative value

User Constraints (up-down)

- The widely used common stored value ticket are banned shortly after the new payment system was launched, passengers who refuse to use the new system are require to annoyingly purchase single travelling ticket during every travel

Economic Incentives

- Allow a maximum HK\$35 negative value during the last travelling route
- 10% off discount for each travel were provided during early establishment

6.2 Mainland China: E-payment – Wallet in your Smartphone

While cash and credit card are still popular payment methods in other countries, Mainland China had already took another step forward and embraced the new normal: contactless mobile payment. Alipay and WeChat pay are the two market leaders, penetrating around 90% of the local market (Devanesan, 2020). By simply scanning the system generated QR code with consumer's smartphone, transaction could be done in seconds. Both platforms has successfully developed a user ecosystem surrounding the daily lives of the local users.

With Alipay initially launched aiming to solve the security issues during e-commerce transactions, and WeChat pay aiming to enhance social interaction (IT Consultis, 2017), how does both third-party payment service grown to the stage of today, where the local citizens are willing to leave cash or bank cards behind and shift to the QR code payment system? Below are a summary of factors.

Economic Incentives

- Benefits of either discounts or coupons are provided by both platforms during early establishment to attract user adaptation

- Alipay: 10% off discount during every transaction with designated retails
- WeChat pay: Red pocket cash or coupon give away events

Contextual

- High smartphone adoption rate and maturely developed mobile market
 - Leading to more lifestyle applications on both payment platform can be developed
- Both e-payment platforms are connected to a highly adopted application, where trust towards both brand has already been built, allow an easy user adaptation
 - WeChat pay are related to the popular instant messaging software, WeChat
 - Alipay are related to the popular e-commerce platform, Taobao

User Constraints (down-down)

- Discounts are only provide on e-payment, motivating users to adapt the payment service

Convenience

- Only require users to add bank cards to the account once and smartphone become your wallet, allow users to leave their home only with their smartphone
- Do not require users to search for cash and wait for change

6.3 Netherlands: Cycling culture – Cycling capital of the world

Netherlands, are well known for their cycling culture. In today's society, the transportation method are so common, that the amount of bikes being used are over the country's population. A population of around 17 million, 23 million bikes can be found around every corner of the country, only 19% of the population owned and use vehicles (BicycleDutch, 2019). Behind the culture, a series of historical events had lead the country to the state of today.

Back in 1960s, due to the rise of economy and vehicle's mass production, a rapid increase usage of vehicles were on the road of Netherlands, leading to the cycling rate dropped from 80% to lower than 20% by early 1970s (Dhruv Rathee, 2020). However, due to poor road planning, an increase rate of road accidents occurred. More than 400 children were killed by vehicles. Realising how detrimental vehicles are, the 'Stop de Kindermood' (stop murdering

children) social movement started to conduct (van der Zee, 2020), where local communities promote the use of bikes rather than vehicles. Instead of criticizing, the Government of the Netherlands listen to the citizen's voices, and with the engaging oil crisis approaches in 1973, the Government took the opportunity to encourage its local citizens to use bikes instead of vehicles, starting the revolutionary transportation culture. Other than the historical event, below are a summary of factors that allow the transportation method to become the signature of the country.

Economic Incentives

- Free parkings are provided for bikes, where high cost of parking fee are required for vehicles
- Cost and maintenance fee for bikes are way lower than vehicles under policy and legislations

Convenience: Provided through well planned Infrastructure

- Cycling network had been well-planned by the government, allowing citizens able to travel, no matter how far by cycling
- Bike parking facilities are built all around the country to support the free parking policy

User Constraints (up-down)

- Car-free Sundays at 1970s (Lalor, 2019)
 - o Launched by the government due to oil crisis, citizens can only commute by public transport, on foot, or bikes
- Bike come first policies. Regulation and policy are established to restrict the drivers, allowing bikes to be more convenient. For example:
 - o Vehicles are required to drive slower while being among bikes
 - o Gradually blocking more areas to be vehicle free

Contextual: Historical events

- Generally neutral attitude towards vehicle due to pass experience of historical events

6.4 Insight from cases: Factors that influence human behaviour

The three cases above are significant in terms of influencing a huge population behaviour change. Despite the differences between the background story, industry, or social context, a pattern of similarities can be noticed through the analysed factors. A model of factors that influence human behaviour has been identified (Figure 6.1) and they are: user constraints, motivation, contextual, and cultural.

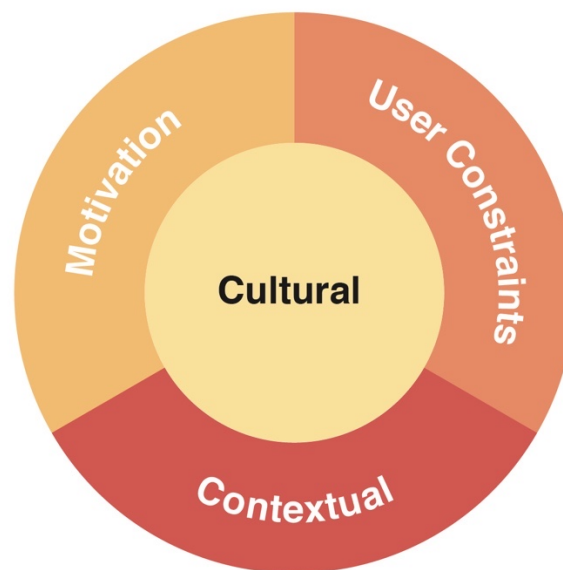


Figure 6.1 Factors that influence human behaviour

6.4.1 User Constraints

User constraints enable individuals to behave in a certain way as according to the given policies or infrastructures. Two approaches can be identified and they are: forceful approach and persuasive approach. The forceful approach restrict individuals through tough tactics. By eliminating the original system, people are forced to behave in a certain way. Taking the octopus card case as an example, the originally used common stored value ticket are banned, forcing passengers to shift to the new payment system. Such strong approach might cause dislikes, yet people would eventually get used to the new habit. On the other hand, the persuasive approach are to change behaviour indirectly. Unlike the forceful approach, the original system still exist, yet it is made to be more complex or annoying to do so, such as more expensive or inconvenient so that individuals would change behaviour naturally. Taking the cycling culture in Netherlands as an example, private vehicles can still be driven, however,

with the policy design, they are required to drive slower among bikes and lots of areas prohibit vehicles, softly pushing its citizens to ride bikes more often.

6.4.2 Motivation

The motivation factor allow individuals to be more willing to change and except the new system. Being a financially driven society, this factor mainly involve economic-initiatives. Referencing from both octopus card and mobile e-payment case, discounts, rewards, or cash were given during early establishment to attract higher adaptation rate. Loyalty programmes could then be designed through give-away approach to encourage continuous usage of services or programmes. Moreover, pricing strategy like requiring individuals to pay more for previous system while the new are cheaper or for free, can also encourage change of behaviour. Taking the cycling culture case as an example, parking fee for vehicles are intentionally pricier while bikes are for free, it encourages local citizens to save money through riding bikes. Although money-related strategy seems to be shallow, yet it is the most effective way to influence human behaviours.

6.4.3 Contextual

Contextual factor relates to the support given to the behaviour change, well established infrastructures allow individuals to experience the new policy or system conveniently. From the above cases, more usage scenario has been established to allow smoother and richer user experience. Octopus card can be used in all public transportation, bike paths constructed to allow citizens to travel everywhere through cycling. Correspondingly, limited or deficient infrastructures are likely to cause frustration from individuals, leading to unwillingness to change.

6.4.4 Cultural

Cultural factors are heavily embedded in the society, where certain behaviour and perceptions can hardly change. It can be noticed that the success of influencing local's behaviour from the above cases cannot do without the alignment with their own culture. Octopus card suits Hongkongese's fast pace lifestyle, mobile e-payment suits the highly adopted smartphones in the China market, and that cycling are the most common transportation method prior to the

introduction of vehicles. Therefore, while requesting the general public to shift to a desired behaviour, the general principle of the new designed systems have to take society’s culture in consideration, allowing the locals to be more open to changes.

6.5 Summary of Section

The above identified factors can be used to allow effective behavior change. However, careful consideration is required, that a mismanagement would lead to annoyance and demotivation towards change. Furthermore, a similarity can be noticed between the suggested model above with Lockton’s (2013) model of approaches to influence user behaviour (Figure 6.2), where the ‘user constraints’, ‘motivation’, and ‘contextual’ factors are similar to the three approaches proposed by the scholar, and the ‘cultural’ factor are newly discovered. The new factor are suggested to be included as according to the analysis of above cases, the ‘cultural’ factor is the backbone of the above three cases in encouraging change and allow individual to be more open to changes.

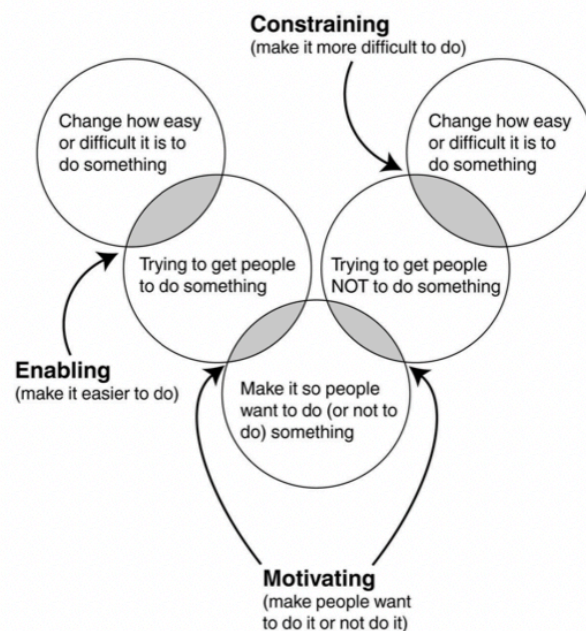


Figure 6.2 Lockton’s (2013) model of approaches to influence user behaviour

Section 7 Possible Future of Hong Kong Recycling System

Citizens of Hong Kong had lose their faith towards the local recycling system due to various of reasons discussed in section 5. Therefore, to rebuild trust and encourage recycling, not only waste charging policy needs to be established, a new recycling system that align with Hong Kong's local culture and unique living environment is required.

A design framework has been generated to facilitate the ideation process through using insights discovered in previous sections. Significant factors that are discovered from the social and emotion criteria from the three recycle-as-culture case's recycle system human factor analyses has been used to force combination with culture and cognitive criteria of Hong Kong. These variables has been selected, as they could take balance between Hong Kong's local culture and the key activities or attitude that are ideal to establish a recycling culture. Full ideation framework can be found in Appendix C&D.

Taking consideration of Hong Kong citizen's lifestyle, high-rise and high-density housing type and to guarantee the quality and destination of recyclables, the Front Door Recyclable Collection System under the waste charging policy could be a possible future of Hong Kong household recycling system. Each household are only required to place their clean-recyclables at their door front at designated days. Recycle specialist from Green Communities of each district (recycling stations managed by the EPD) would be responsible for collection and categorisation. Guidelines related to recyclables types and steps for clean recycle would be given, where miss-treated recyclables would not be collected with warnings and penalty would be charged for continuous miss-behaviour. Cost of such service would be included in the property management fee. A monthly report would then be published by the Green Communities regarding the amount been collected and the destination of recyclables. Factors that influence human behaviour (Figure 6.1) discussed in section 6, that leads to the benefits of the ideal recycling system are as below.

User Constraints

- The proposed system run under waste charging policy. Through making the original waste disposal practise more expensive, it encourage citizens to participate in recycling
- Refuse collection policy, where miss-treated recyclables would not be collected with warnings or penalty, forcing residents to clean-recycle

- Only one collection day per week, meaning that recyclables are to be kept indoors for few days, motivating residents to clean recyclables to avoid any unpleasant smell or pests

Motivation

- Psychological Factors
 - o Eco-Satisfaction, would feel being a part of a community where every household is contributing on an activity that is doing good to the environment
- Peer Pressure
 - o Most household would place recyclables at door front during collection day, motivating the non-recyclers to participate to avoid being judged
 - o Motivate clean-recycle to avoid being look down upon by recyclables being refused to collect
- System Transparency
 - o Trust building through the monthly report published by the Green Communities in regards to the amount and destination of recyclables been collected
 - o Collection process can be observed by residents, making sure the recyclables are on safe hands
- Economic-Initiative
 - o The service fee would be included in property management fee no matter residents recycle or not, encourage participation to avoid feeling deficit

Contextual

- Guidelines with clear instructions would be given to avoid miss-treatment

Cultural

- Fast-Pace lifestyle & Convenient as priority
 - o Only require placing recyclables at door front, where detailed categorizing would be done by the specialist
- Hygiene Sensitive
 - o Motivate clean-recycle to avoid any unpleasant smell or pest
 - o Do not have to touch and have contact with any recycling facilities
- Economically-Driven

- Encourage participation, as service fee would be included in property management fee no matter the residents participate or not

Certainly, the above proposed waste recycling system require a lot of investment and human resource, yet, it is one of the most suitable system for Hong Kong’s living environment and lifestyle while ensuring the quality of recyclables other than surveillance or high technology waste collection tunnels. Also, the benefits of the new system can be noticed from the new value web below (Figure 7.1).

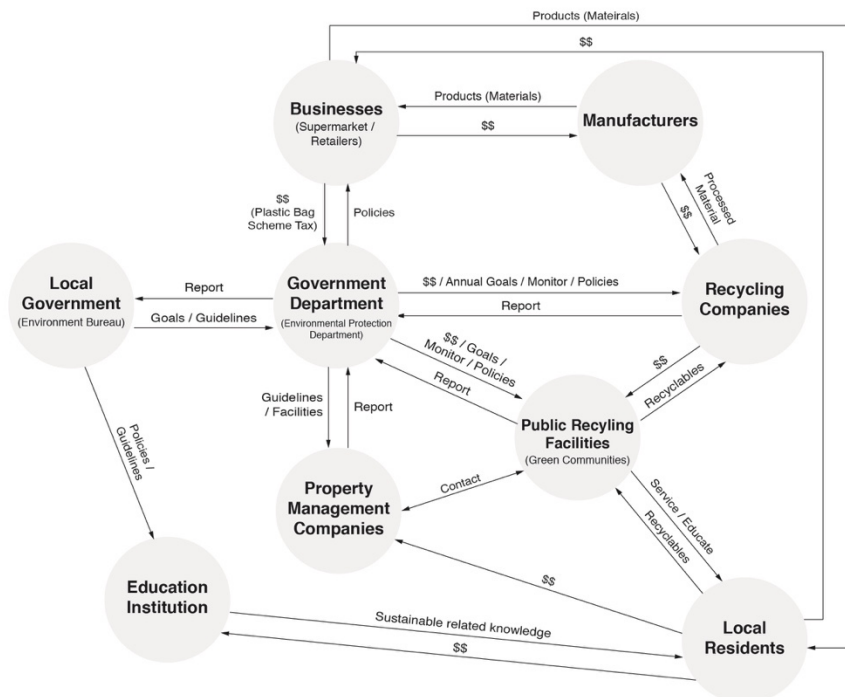


Figure 7.1 Value Web of proposed Hong Kong’s waste recycling system

Compared to the original one (Figure 5.1), the value web for the proposed recycling system are way simpler. While all recyclables would be collected directly by the Green Communities, one less level of recycle flow would be required (Figure 7.2), allow a more centralized and direct management of recyclables.

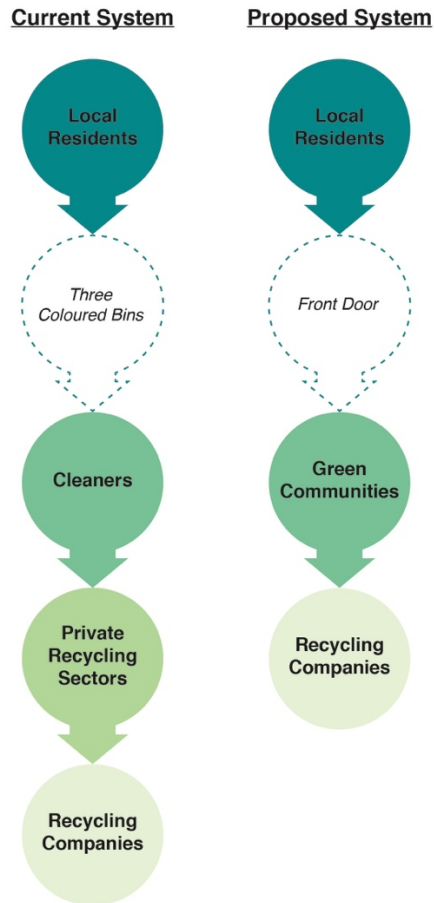


Figure 7.2 Comparison of recycle flow between current and proposed recycling system of Hong Kong

Furthermore, according to the factors to promote sustainable recycling behaviour discovered in section 4 (Figure 4.5), the above proposed system only plays a small role, where other elements should also be established to promote an all-rounded recycling network.

Other than the waste charging scheme which is targeting towards citizens, producer responsibility scheme that target towards businesses or manufacturers should expand to all consumer products, especially plastics, as current only limit to a few. Packaging material guide should be launched to restrict the use of material and force to include material indication symbols for easier recycling. Reverse collection vending machine should be located at all popular beverage selling locations like convenient stores or sports centers to motivate out-of-household recycling. Moreover, sustainable behaviour and development should be listed as compulsory study course instead of the current voluntary approach, allowing recycle to be developed as a habit since young and understand the benefits of sustainable lifestyle.

Section 8 Conclusion

Not only Hong Kong, waste disposal problem is a global manmade crisis. Due to urbanisation and rise of economy, consumer's consumption ability has increased leading to shorter product life span. The rapid increase of solid waste generation is an unavoidable problem faced by all countries. Such issue has to be acknowledged by every consumer as the consequence of our current lifestyle are tremendous. Not only our limited land resource cannot digest the large-scale waste, we are now also destroying our mother nature through murdering other species, and killing ourselves by the material we produced. Therefore, waste management strategy has to be carefully consider and planning by every government authorities. Recycling is certainly one of the key, not only it can reduce waste, but also a sustainable behaviour that allow the realisation of a circular economy society.

8.1 Overview of Research

The research questions raised in section 3 can be answered. Design plays an important role in changing unsustainable behaviour, perception and attitude through well considered recycling network, allowing the sustainable behaviour to become a daily habit.

A model of factors to promote the sustainable recycling behaviour (Figure 4.5) has first been identified through the study of three countries or cities that had successfully promote recycle-as-culture. The finding suggested that policy and legislations, education, and infrastructure are compulsory elements within a recycling network, where efforts from all stakeholders are indispensable. The model had than been used to analyse the limitation of Hong Kong's recycling system, and interviews has been conducted to understand public's perception. The findings indicates that it is not practical by only encouraging recycling through voluntary basis without any forceful policies and strict monitoring system, and with the extra layer of recycle flow, it increases the chance of fake and un-clean recycling. Such ineffective system had also wiped out the willingness of potential recyclers by the current lack of motivation and infrastructure support. Furthermore, a model of factors that influence human behaviour (Figure 6.1) has been identified through studying three cases that experienced a successful national behaviour change. The findings suggested that user constraints, motivation, contextual, and

cultural are the keys to shift human behaviour and careful consideration are required, mismanagement of one single factor would lead to annoyance and demotivation.

A design framework has than be developed through using the insights generated, acting as a guideline to come up with possible design that align factors to establish recycling behaviour with the local's culture. The Front Door Recyclable Collection System under the waste charging scheme has been suggested to be Hong Kong's possible future recycling system, recommending that recycling collection can be done directly at the front door of households by the Green communities specialist staff. The effectiveness of proposed idea were enhanced through using the four factors that influence human behaviour. Moreover, other policies and legislation had also been suggested to allow a more comprehensive recycling network.

There is no doubt that a lot of human resources are required to be invested during early establishment of new systems to educate citizens and monitor recyclables. The road to success is not simple at all. Another decade might be required to shift the public's attitude, rebuild trust and ultimately allow recycling to be the small city's culture. Hong Kong had already fallen behind, yet, it's never too late to take actual action. In order to treasure the limited land resource and to provide a better living environment for our future generation, such painful and costly investments are worth it to create a better future for Hong Kong.

8.2 Limitation of Study

The aim of the thesis mentioned in section 3 has been achieved, however, limitations of the used research method and outcome justification can be noticed.

While the insights of waste recycling system in Hong Kong are generated through using both first and secondary research, the three cases investigated in section 4 rely on secondary. First hand research like interviews could be conducted to understand the local citizen's actual perception and emotion towards their recycling system rather than observing through information presented online. Moreover, other than the locals, interview with cleaning companies or cleaners could also be conducted to understand the challenges and limitation of current recycling system of Hong Kong from a service provider point of view, allow a more comprehensive understanding of the ineffective system. Furthermore, although the proposed

design recommendation took both models (Figure 4.5&6.1) realised in this paper in practise, yet, such visionary proposal are only talk on paper, simple surveys could be done with the stakeholders involved in the Hong Kong recycling system to understand their opinion and recommendation to allow further justification.

8.3 Possible future studies

Further studies can be done to develop a more comprehensive recycling system under the unique culture and complex living environment of Hong Kong. While this study mainly focuses on shifting behavior and perception towards waste categorization, further research could be done to investigate the effects on recycling behavior by different housing types, such as private, public housings or even village houses. Moreover, with income inequality being one of the long-lived social issue, socio-economic factors could also be investigated to understand its influence towards the sustainable behavior.

Section 9 Appendix

Appendix A: POEMS analysis of Hong Kong & the three successful cases

Case	People	Objects	Environment	Messages	Services / Systems
<p>Hong Kong Waste management (Recycling) System</p>	<p>Hong Kong Government - Environmental Protection Department (EPD)</p> <ul style="list-style-type: none"> Monitoring the whole recycling system in Hong Kong Publish environmental goals for HK Establish related policies and recommend facilities Communicate with related stakeholders Provide recycling facilities <p>Housing Authorities / Fire Service Department</p> <ul style="list-style-type: none"> Establish policies for recycling facilities location at housing estates <p>Property Management Companies</p> <ul style="list-style-type: none"> Provide facilities for residents Monitor contracted cleaners <p>Recyclable Collector Companies / Green communities</p> <ul style="list-style-type: none"> Support, facilitate and educate residents on categorizing materials Some are Sponsored by the government and operated by NGOs <p>Recycling Companies</p> <ul style="list-style-type: none"> Own processing facilities 	<p>3 Coloured Recycling bins</p> <ul style="list-style-type: none"> 'Blue for paper, yellow for aluminium cans and brown for plastic bottles' Illustrations are included on each bin for indication Used in properties and public locations Have different designs in different locations (as according to the stakeholders who manage the bins) Openings are designed to be suitable for collecting different types of materials Located beside the trash bin (policies), therefore are mostly considered also as trash bin <p>Reverse Vending Machine</p> <ul style="list-style-type: none"> Collect plastic bottles through Bar code indication Users would be able to receive \$0.1 in return 	<p>Public recycling facilities (Housing Estates)</p> <ul style="list-style-type: none"> Located as according to the property management company (3-coloured bins) Located on every floor / ground floor On trust base (Cleaning company) <p>Public recycling facilities (Public Locations)</p> <ul style="list-style-type: none"> Located on streets, government owned facilities Mainly three coloured bin and glass collection bins No monitoring system and on trust base (Cleaning company) Would located beside trash bins <p>Green Community Recycling Stores</p> <ul style="list-style-type: none"> Convenient store like interior design (8 types of materials) Located around the 18 districts Specifically designed facilities to collect materials A more welcoming environment (bright and clean) Monitoring system - Have staff on duty to facilitate and monitor the materials been collected Aim to encourage more people to recycle <p>Traditional recycling stores</p>	<p>Government slogans</p> <ul style="list-style-type: none"> 'Blue for paper, yellow for aluminium cans and brown for plastic bottles' Using colour indications to education residents Make recycling easier <p>Dump less. Save more, Recycle right</p> <ul style="list-style-type: none"> Co-relate to the upcoming waste charge policy, aiming to achieve zero waste <p>New recycling facilities - Green Community</p> <ul style="list-style-type: none"> The government are making new move to encourage recycling behaviour Environment + facilities = aiming to build trust from residents <p>Public Recycling facilities</p> <ul style="list-style-type: none"> Usually are full with trash and polluted materials 'Fake Recycling' discovered by press 	<p>Public Recycling System</p> <ul style="list-style-type: none"> Mostly collecting 3-4 types of materials with facilitation of recycle bins Collected by contract cleaning companies and handing over to recycling companies <p>Green Communities (NGOs)</p> <ul style="list-style-type: none"> Facilitate and educate residents to recycle correctly Loyalty Programmes: GREEN\$ Electronic Participation Incentive Scheme Would hold eco-friendly workshops from time to time <p>Private Recycling Sectors</p> <ul style="list-style-type: none"> Facilitate and educate residents to recycle correctly <p>Reverse Vending Machine Pilot Scheme</p> <ul style="list-style-type: none"> Economic Initiative = encourage people to recycle their own plastic bottles = high recyclable rate

	<ul style="list-style-type: none"> Collect recyclables from collectors, would than process to raw materials <p>Cleaning Companies (Cleaners)</p> <ul style="list-style-type: none"> Contract with the Government or property management companies, the ones who manage recyclables from public facilities Would only follow given instructions / as according to own perception <p>Local residents</p> <ul style="list-style-type: none"> Voluntary bases, done by personal preference The ones who separate and provide materials from own daily waste <p>Supermarkets / Retail / Manufacturers</p> <ul style="list-style-type: none"> Provide packaged products to residents The ones who decide the whole product life 		<ul style="list-style-type: none"> Less welcoming environment (messy and dirty) Seems to only receive large amount of recyclables Seems to only work with property or business companies <p>Private Recycling Sectors</p> <ul style="list-style-type: none"> Voluntarily hold by local residents Appear / hold due to the loss of trust towards government facilities (3-coloured bins) Monitoring system - Have staff on duty to facilitate and monitor the recyclables Community interaction <p>At home recycling</p> <ul style="list-style-type: none"> No fixed method, resident who recycle would have their own settings 		
<p>Kamikatsu Town, Japan Waste management (Recycling) System</p>	<p>Local Government</p> <ul style="list-style-type: none"> Initiate the zero waste project Monitor and support the Zero Waste Academy <p>Zero Waste Academy</p> <ul style="list-style-type: none"> Provide facilities to local residents (Waste Collection Station + Free cycling shop) Daily running of the station (Point reward scheme, material destination, income and expenses, establish rules) Provide support, facilitate and educate residents on recyclable categorization 	<p>Collection containers (Recyclables)</p> <ul style="list-style-type: none"> Signs with both illustrations and simple text are included to indicate the type of material been collected Income or expanse labels are included beside each container to allow residents know which type of material would generate income and which are paid to be collected Material indication tools are included to facilitate resident and staff to categories materials (e.g. magnets to indicate tin cans) 	<p>Waste Collection Station</p> <ul style="list-style-type: none"> Recyclable collection point in town, require residents to bring recyclables by their own Include containers for each material type with clear indication Monitoring system - Have staff on duty to facilitate and monitor material categorization Community interaction, where local residents would take the chance to chit-chat with staff or local residents Point of motivation - Clear indication of where the material 	<p>Vision: Achieve zero waste by 2020</p> <ul style="list-style-type: none"> Limited waste management facilities are provided in town, a motivation to recycle and reuse materials as much as possible Promoted through: <ol style="list-style-type: none"> Door-to-door communication WOM = influence by local pioneers Spread all over the world through press coverage <p>Waste Collection station</p> <ul style="list-style-type: none"> Recyclable material are clean, that they are precious resources 	<p>Waste Collection station</p> <ul style="list-style-type: none"> Require residents to bring recyclables to the collection station, which than require themselves to categorize (with staff facilitation when needed) Collected materials would then be hand over to recycling companies directly Gift Exchange scheme <ol style="list-style-type: none"> Recyclables that are able to generate income would be included in the gift exchange scheme, where residents could collect points and exchange groceries <p>Free Cycling shop</p>

	<ul style="list-style-type: none"> Promote the zero waste vision to media, leaders and tourist from other countries 'Zero Waste Certification', a certificate issue to businesses who follow the given zero waste criteria <p>Businesses (Supermarket / Retailers / Manufacturers)</p> <ul style="list-style-type: none"> Provide packaged products to residents and the ones who designed the whole product life Change product packaging strategy as according to the lifestyle of local residents <p>Local Residents</p> <ul style="list-style-type: none"> The ones who would separate and provide materials from own daily waste according to the 45 types Voluntary bases, yet with years of establishment, waste recycling practise has become a daily habit Due to the change of lifestyle, are more aware of the product they use <p>Recycling Companies</p> <ul style="list-style-type: none"> Collect recyclables from the collection station Some would pay for the material while some would charge for collection 	<p>Processing Machine</p> <ul style="list-style-type: none"> Simple processing machine are included for simple material processing to minimise space used <p>Free-cycling / Up-cycling objects</p> <ul style="list-style-type: none"> Unwanted objects / products that are still in good shape Would be shared among local residents 	<p>would go and how much would be earned and spent</p> <p>Free Cycling shop</p> <ul style="list-style-type: none"> Invisible Interaction between residents Give out something you don't need to others and take away anything you want Treasure hunt experience, search for surprises <p>Individual home categorizing</p> <ul style="list-style-type: none"> Usually would have different trays or bags to throw in different types of material Would do simple categorize at home before heading to the collection point 	<ul style="list-style-type: none"> Classifying material as detailed as possible = less processing needed later on = resources with higher value = generate income Clean recycling = everyone's own responsibility Clear indication on destination of every material = building trust that the material are guaranteed to be in good hands 	<ul style="list-style-type: none"> Self-discipline in and out system A space that allow residents to leave anything that they don't need and take away anything they like
<p>South Korea Waste management (Recycling) System</p>	<p>National Government</p> <ul style="list-style-type: none"> Establish policies Monitor the result / action of each local cities <p>Local Government</p> <ul style="list-style-type: none"> Provide facilities needed to support the system (e.g. Recycling facilities / Disposal bags) 	<p>Paid Waste disposal bags</p> <ul style="list-style-type: none"> Designed specifically for each residential area Can be purchased at local convenient store Printed with the city's local information for identification 	<p>Waste Separation Area (Residential Areas)</p> <ul style="list-style-type: none"> Located near residential areas as according to the arrangement of property management company Require residents to bring and categorize their recyclables on their own 	<p>Thrown waste would be charged while recyclables are free</p> <ul style="list-style-type: none"> Recycle as much as possible to pay less for thrown waste Motivated to purchase less packaged products <p>Monitoring system + Report System</p>	<p>Waste Charging System - Bags</p> <ul style="list-style-type: none"> Thrown waste would be charged by paying for specifically used plastic bags Recyclables are free and do not have any specific bags for disposal <p>Public Recycling System</p> <ul style="list-style-type: none"> Collecting in a specific time and date in specific location (as

	<ul style="list-style-type: none"> • Communicate with related stakeholders / related authorities • Monitor the local waste management system and result • Educate local resident on enhancing their awareness of waste management <p>Local Residents</p> <ul style="list-style-type: none"> • Categorize waste resources as according to given policies • Dispose recyclables as according to the given timetable • Establish their own recycling system at home • Monitor other residents, would report if necessary <p>Property Management Companies</p> <ul style="list-style-type: none"> • Provide waste management facilities • Provide waste collection information to residents (what time and where should the waste be disposed) <p>Residential Recycling monitor manager</p> <ul style="list-style-type: none"> • Monitor / Facilitate / Sort out the recyclables, making sure the recycling are done correctly <p>Local convenient Store</p> <ul style="list-style-type: none"> • Provide and sale disposal bags to residents <p>Businesses (Supermarket / Retailers / Manufacturers)</p> <ul style="list-style-type: none"> • Follow the given packaging rules and policies • Provide packaged products / material to residents • The ones who designed the whole product life 	<p>Private recycling containers</p> <ul style="list-style-type: none"> • To better categorize and sort out materials at home, residents would usually purchase containers for convenience 	<ul style="list-style-type: none"> • With illustrations and signs to direct residents while categorizing • Would only collect in specific time and date • Facilities / System in different residential areas would be different (Containers vary from Plastic bags / Bins / Mesh) • With monitoring system (CCTV / manager / other residents) <p>Public Spaces (Designed Street location)</p> <ul style="list-style-type: none"> • Only require residents / stores to locate trash on the street during specific time (mainly night time) • Recycling truck and staff would collect the recyclables • Residents' behaviour would be monitored by CCTV to indicate any inappropriate behaviour • Inappropriately disposed waste would be refused to collect by staff (leave on the street) <p>Special Recyclable Location</p> <ul style="list-style-type: none"> • Unique recyclable material like light bulbs / medical waste would have specific collection points <p>Individual home categorizing</p> <ul style="list-style-type: none"> • Mainly would do simple categorizing at home before heading to the collection point • Do not have specific way to do so, would be done as according to resident's own habit 	<ul style="list-style-type: none"> • Have to dispose waste legally so that won't be charged by authorities • Motivated to be monitoring each other on waste disposal behaviour (peer pressure) 	<p>according to own residential area) and are then collected by recycling companies</p> <p>Resident's own collection system</p> <ul style="list-style-type: none"> • Tools (trays / Bags) are bought by resident to develop their own home recycling collection system • No specific method, can do as according to resident's own habit or convenience <p>Illegal report reward system</p> <ul style="list-style-type: none"> • Would charge illegal disposal practise through monitoring system (CCTV) or reported by other residents • Could also observe other's disposal behaviour and would report if necessarily
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	<ul style="list-style-type: none"> Highly influenced by market reaction (customer / sales) <p>Recycling Companies</p> <ul style="list-style-type: none"> Own processing facilities Collect recyclables, would than process to raw materials and sold to manufacturers 				
<p>Sweden Waste management (Recycling) System</p>	<p>Notional Government</p> <ul style="list-style-type: none"> Establish policies and environmental rules Monitor the result / action of each local cities Invest into waste management technology, aiming to further improve the whole system to achieve the 'zero waste' and 'circular economy' goal <p>Local Government</p> <ul style="list-style-type: none"> Provide suitable facilities in residential areas to support recycling activities Communicate with related stakeholders / related authorities Monitor the local waste management system and result Education local residents <p>Local Residents</p> <ul style="list-style-type: none"> Categorize waste resources as according to given policies Establish own recycling system at home Self-discipline on clean recycling Need first to pay extra if purchase plastic bottles / Metal Cans <p>Education Department</p> <ul style="list-style-type: none"> Education next generation on waste management <ol style="list-style-type: none"> Visit relevant facilities / integrate relevant knowledge into courses 	<p>Food Waste Paper bags</p> <ul style="list-style-type: none"> Free paper bags provided to local citizens for food waste Biodegradable paper with strong sealed design (prevent unpleasant smell) <p>Public recycling bins</p> <ul style="list-style-type: none"> Located near local residential area Designed to be suitable for all ages and disable to use (openings with different levels) Designed to be lift up by large trucks directly Signs and illustrations are included for indicating the types of material being collected Shape of each opening are specifically, acting as a guide for material indication <p>Reverse Vending Machine</p> <ul style="list-style-type: none"> Located in all supermarkets, or near drink vending machines Collect plastic bottles / Cans through Bar code indication Users would be able to refund their 'deposit' receive 1 crown in return <p>At home recycling bins</p> <ul style="list-style-type: none"> Standardize design for each household to adopt (6 slots (bins) in the drawer under the sink) 	<p>Recycling bins (located near residential area)</p> <ul style="list-style-type: none"> Located in public space, near residential area Residents would throw in recyclable materials as according to the given category Strict monitoring system - CCTV, in case any mis-dispose behaviour, residents would also monitor each other Clear instructions and illustrations are included to direct residents to categorize in the correct way Clean recycling = no smell / pest <p>Recycling centres</p> <ul style="list-style-type: none"> Only open during weekends Open space area, designed for residents to drive or rent trucks to bring larger scale waste / recyclables Staff are there to facilitate categorizing and manage material Huge cargos and compression tool are set up to collect each type of material and minimise their sizes <p>Individual home categorizing</p> <ul style="list-style-type: none"> Collecting bins are located inside the Kitchen table's drawer, with 6 small bin 	<p>Zero Waste Society Goals</p> <ul style="list-style-type: none"> The country's to be achieved goal Should be more aware of the material of purchased products More policies would be established to further limit the amount of waste mainly from business retail <p>Recycling = Ethically correct behaviour</p> <ul style="list-style-type: none"> That it is our own responsibility and should be done by everyone Waste resources are useful to produce energy, benefitting the energy consumption of their own country <p>Clean recycling public facilities</p> <ul style="list-style-type: none"> Clean recycling = everyone's responsibility That recyclables should not be full of pest or with unpleasant smell, but are useful resources 	<p>Recycling system</p> <ul style="list-style-type: none"> Require residents to bring recyclables to collection bins and categorize Recyclables would then be collected by recycling companies <p>Reverse Vending Machine</p> <ul style="list-style-type: none"> Economic Initiative = encourage people to recycle their own plastic bottles or metal can after empty bottle <p>Waste charging system</p> <ul style="list-style-type: none"> Charged as according to the weight or included in property management fee (tax) <p>Education System</p> <ul style="list-style-type: none"> Road to success highly rely on the education which let kids to learn about waste management since young age and build up as habit Understand the benefits behind the sustainable lifestyle

	<p>2. Let them understand the benefits of such waste disposal system (e.g. reuse for energy production)</p> <p>Property Management Companies</p> <ul style="list-style-type: none"> • Provide waste management facilities • Monitor resident's waste management behaviour • Provide food waste bags (free) <p>Businesses (Supermarket / Retailers / Manufacturers)</p> <ul style="list-style-type: none"> • Provide discount coupons after residents return their empty bottles or cans to the reverse machine • Provide packaged products to residents • Following the given packaging rules and policies • The ones who designed the whole product life <p>Recycling Companies</p> <ul style="list-style-type: none"> • Own recyclable processing facilities • Process recyclables and sold to manufacturers <p>Recycling centres</p> <ul style="list-style-type: none"> • Collect large scale recyclables (e.g. Furniture / Electronics etc.) 	<ul style="list-style-type: none"> • Designed according to local policy, allow easy and simple categorize at home 	<ul style="list-style-type: none"> • Residents are to categorize first at home before heading off to dispose <p>Supermarkets - Reverse Vending Machine</p> <ul style="list-style-type: none"> • A location convenient for residents to go to (while purchasing everyday groceries) 		
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Appendix B: Human Factor analysis of Hong Kong and the three successful cases

Case	Social	Emotional	Cultural	Cognitive
<p>Hong Kong Waste management (Recycling) System</p>	<p>Recycling = Economic Activity</p> <ul style="list-style-type: none"> • See it as an income generative activity • Recycling are only been done by the poor and elderlies <p>Trademark = Environmentalist</p> <ul style="list-style-type: none"> • Recycling would only be done by people who love or care about the environment • Some would find it crazy to do so • Would see them as unsanitary (avoid them) <p>Fake Recycling</p> <ul style="list-style-type: none"> • Little trust towards public recycling facilities due to previous news on fake recycling • Limited system transparency, recyclers would not know the destination of materials <p>Social Face</p> <ul style="list-style-type: none"> • Care about how others would perceive and would be motivated if certain action are 'cool' or 'look good', while recycling are perceived not to be • Recycle = collect waste <p>Low awareness of waste responsibility</p> <ul style="list-style-type: none"> • Would not care if it don't bother me • No penalty or changing scheme = no restrictions, would not care about waste creation 	<p>Annoying (ma-fan)</p> <ul style="list-style-type: none"> • Throwing away waste are so convenient where recyclables require to wash and clean (extra time and effort) • Requires to carry to the collection point, sometimes does not locate on the same floor = need to carry around • Have to divide into a lot of categories (at least 3) <p>Need time to manage / Extra effort / space</p> <ul style="list-style-type: none"> • Life have been so busy, managing recyclables requires extra time/ effort to do so, reducing time to rest • Small scaled home may not have enough space to store up recyclables <p>Waste / Bins = Dirty / Unsanitary</p> <ul style="list-style-type: none"> • Sensitive to unsanitary objects, especially around trash bin • Even though recyclable are clean, would see them as unsanitary resources / waste <p>Recycling = Environmentally friendly?</p> <ul style="list-style-type: none"> • Would questions about the behaviour as extra water or energy are required to process the recycling activity <p>Questionable System (fake recycling)</p> <ul style="list-style-type: none"> • Not sure if the material would be treated or managed on good hands, or just end up at the landfill 	<p>Over-Consumption</p> <ul style="list-style-type: none"> • Well-developed city with variety of resources and citizens with high disposal income, leading to over purchasing products that didn't necessary needed • Too convenient to get resources, leading to not treasuring resource around them • Just purchase if want, would not consider the afterlife (convenient as key) <p>Fast-Pace lifestyle</p> <ul style="list-style-type: none"> • Everything needs to be convenient and fast, that if something block the way would feel uncomfortable and annoyed <p>Keep the city clean (waste = throw)</p> <ul style="list-style-type: none"> • Due to local history, residents have been taught to throw everything into the trash bin (which is located everywhere), making it TOO convenient for citizens to dispose waste <p>Hygiene Sensitive</p> <ul style="list-style-type: none"> • Due to historical events like SARS and COVID-19, locals are really sensitive to hygiene and waste are seen as unsanitised product <p>Convenient waste management</p> <ul style="list-style-type: none"> • Waste management in Hong Kong are very convenient only require residents to collect waste together and throw away without any charge or penalty • Would not be motivated to produce or consume less (would not think twice before doing) • Feel annoyed if extra process is needed (while recycle require extra effort and time) • Don't have any motivation to recycle 	<p>Economic-Sensitive</p> <ul style="list-style-type: none"> • Are financially driven, without any charging / penalty or rewards, citizens would not be motivated or aware of their own action <p>Quitter</p> <ul style="list-style-type: none"> • Would be aware of policy or penalty in a short term due to curiosity, but actions are not guaranteed in a long term (e.g. Plastic bag charging scheme) <p>Not my responsibility</p> <ul style="list-style-type: none"> • Waste should be managed by others, but not me • Dispose to recycling bin = done my part of the job, recyclables ended up at landfill are the responsibility of the cleaning companies or the cleaners

<p>Kamikatsu, Japan Zero Waste Town</p>	<p>Community Activity</p> <ul style="list-style-type: none"> • That everyone should contribute to make a better living environment <p>Normal and usual activity</p> <ul style="list-style-type: none"> • Would not stereotype and feel ashamed of doing so • The activity are only a normal in life which is done everyday <p>Signature / The pride of their own town</p> <ul style="list-style-type: none"> • Are doing the correct activity to do our environment better 	<p>Shift from Annoying → Used to / Neutral</p> <ul style="list-style-type: none"> • While previous waste management system are simple and quick, the new approach require mores time / space to manage • Yet, after residents started, they actually find it not as challenging and difficult, just need time to get used to the new method • Now: Get used to the whole system and would be aware of products been purchased <p>Satisfied</p> <ul style="list-style-type: none"> • Feel satisfied on able to prevent recyclable / reusable resources dispose to the landfill • With the hard-work of the whole community, they are able to reach a high recycling rate <p>Excited / Looking forward</p> <ul style="list-style-type: none"> • As the recycling station allow residents to interact with each other, they do look forward going the centre for social interaction <p>Trust the system</p> <ul style="list-style-type: none"> • With clear indication what the material would become / where the material would go / how much is paid or earned from the material, it build trust from the residents to the collection point that the waste is going to be treated in good hands 	<p>Collectivism</p> <ul style="list-style-type: none"> • Willing to take action on benefitting the whole community / environment • 'While others are doing it, I should do too' • Don't like to be out-group <p>Follow the given rules</p> <ul style="list-style-type: none"> • Would be ashamed to make a mistake as it require others to do your part of the job • Would obey the clean recycling rules, and would not throw any polluted recyclables <p>Travelling with own cars</p> <ul style="list-style-type: none"> • While the town only contain small population with land owned by every resident, their daily transportation are done by their own vehicles • Allowing residents to carry around the large amount of recyclables without any huge problem <p>Categorizing Waste = Apart of culture</p> <ul style="list-style-type: none"> • A normal daily activity that would be done • Been fully and well educated that it is a correct way to do so • Would feel guilty if not doing it correctly (been judged / being look down upon) 	<p>Believe in the outcome of their action</p> <ul style="list-style-type: none"> • With the high recycling rate and success, and seeing the change of their town's environment, local residents believe that their new lifestyle are making a change <p>Environmental Sensitive = Aware of products been purchased</p> <ul style="list-style-type: none"> • As the more packaging / material the product have = more work for the residents to separate material = purchase less packaged products <p>Normal Daily Activity</p> <ul style="list-style-type: none"> • Long history of establishment + practise = would feel normal of doing so
<p>South Korea Waste management (Recycling) System</p>	<p>Community Activity</p> <ul style="list-style-type: none"> • That everyone should follow the given rule and policies to do better to the environment • Recycle = national effort <p>Normal and usual activity (Ethically correct behaviour)</p> <ul style="list-style-type: none"> • Would not stereotype and feel ashamed of recycling, cause everyone does it • Already used to cleaning and managing their own waste, it is only a normal activity done everyday 	<p>Neutral</p> <ul style="list-style-type: none"> • Recycling = daily activity • Would not judge others who are carrying recyclables around • Everyone is doing it, would feel weird if not doing so (don't like to be out-group) <p>Trust the given system</p> <ul style="list-style-type: none"> • Could see recycle company's staff collecting the materials directly from the facilities or the street • Knows well where the material would go 	<p>Waste disposal system</p> <ul style="list-style-type: none"> • Already require to carry waste to another location (out of the apartment) to dispose, where recyclables are in a similar approach <p>Limited disposal bin on the street</p> <ul style="list-style-type: none"> • Allow citizens to understand that generated waste should be managed by their own <p>Categorizing Waste = Apart of culture</p> <ul style="list-style-type: none"> • A normal daily activity that would be done by every citizens • Been fully and well educated that it is a correct way to do so 	<p>Normal Daily Activity / Habit</p> <ul style="list-style-type: none"> • Had already established for generations, such waste disposal activity are already embedded deeply in Korean's behaviour <p>Economic-Sensitive</p> <ul style="list-style-type: none"> • In order not to pay high waste disposal charge, residents are motivated to produce less non-recyclable waste <p>High awareness of products / materials been purchased</p>

	<p>Look down upon ones who did not do</p> <ul style="list-style-type: none"> • Had been embedded deeply in the country's culture, that if someone did it incorrectly / did not do so, would be looked down by others 	<p>Passionate (esp. elderlies / management)</p> <ul style="list-style-type: none"> • Would strictly monitor how others are doing and would scold or educate the ones who did not do so / done wrong • To lower the expense on waste bags, would be highly aware of what they purchase / dispose away 	<ul style="list-style-type: none"> • Would feel guilty if not doing it correctly (been judged / look down upon) • Generational Cycle <ol style="list-style-type: none"> 1. Parents / Elderly teach kids 2. Kids learn from school and guide parents / elderly 	<ul style="list-style-type: none"> • More packaging / material in the product = more work for the residents to separate material = purchase less packaged products <p>Believe in the outcome of their action</p> <ul style="list-style-type: none"> • With the high recycling rate and success, local residents believe that their sustainable lifestyle are doing good to the environment
<p>Sweden Waste management (Recycling) System</p>	<p>Recycling = Ethically correct behaviour</p> <ul style="list-style-type: none"> • Waste categorizing is the correct activity to perform and that it should be everyone's responsibility <p>Normal and usual activity</p> <ul style="list-style-type: none"> • Would not stereotype others or feel ashamed of doing so • Everyone's home should have their own designed system to support own household recycling activity • Already used to cleaning and managing their own waste, it is only a normal activity done every single day <p>Judge the ones who did not follow</p> <ul style="list-style-type: none"> • Had been embedded deeply in the country's culture, that if someone did it incorrectly, would be looked down by others 	<p>Neutral</p> <ul style="list-style-type: none"> • The habit had already been developed to a normal daily activity, that residents feel neutral of doing so • Would not feel a shamed and others won't judge while carry material around (would immediately know that they are going to recycle / refund deposit) • Everyone around are doing it <p>Enjoying the moment</p> <ul style="list-style-type: none"> • Disposing waste are a part of their schedule that they are willing to spend time to carry waste to the designated location to recycle • Know well that the disposed waste would bring benefit to them (generate energy), motivating them to do so <p>Trust</p> <ul style="list-style-type: none"> • Well educated and understand on where the collected material would go, would not question about such action or the system 	<p>Second Hand Products > Luxury products</p> <ul style="list-style-type: none"> • Second hand shops are popular and that citizens (esp. younger generations) prefer second hand rather than luxury products • Able to purchase good condition products in a lower pricing <p>Categorizing Waste = Apart of culture</p> <ul style="list-style-type: none"> • An effort of a decade from the government, local residents, businesses and recycling companies (national effort) • A normal daily activity that would be done everyday • Been fully and well educated that it is a correct way to do so • Would feel guilty if not doing it correctly (been judged) • Facility for waste categorizing in the kitchen of every household, do not require extra bin / trays to carry • Generational Cycle <ol style="list-style-type: none"> 1. Parents / Elderly teach kids 2. Kids learn from school and guide parents / elderly <p>Raise of Zero Waste Shop</p> <ul style="list-style-type: none"> • Promote and raise awareness of zero waste lifestyle 	<p>Normal Daily Activity / Habit</p> <ul style="list-style-type: none"> • Deeply penetrated in resident's daily live, would unconsciously categorize waste <p>Economic-Sensitive</p> <ul style="list-style-type: none"> • In order not to pay high priced waste disposal charge, residents are motivated to produce less waste and recycle more • Recycle plastic bottles and cans to get refund of deposit <p>Aware of products / materials been purchased</p> <ul style="list-style-type: none"> • More packaging / material the product have = more work for the residents to separate material = purchase less packaged products • More payment is needed for materials that are not recyclable • Preference towards second hand products <p>Believe in the outcome of their action</p> <ul style="list-style-type: none"> • Well known for the most sustainable country, that they believe their action would bring more benefit to their own country and themselves

Appendix C: Ideation Framework – Social versus Cultural & Cognitive Factor

		Social Factor		
		Community Activity	Ethically Correct Behaviour	Peer Pressure
Cultural Factor	Over Consumption	<p>Zero waste life competition</p> <ul style="list-style-type: none"> • Competition conduct between each household, by comparing the amount of trash generated • The less waste generated the better • Winner would have high-priced reward 	<p>Waste disposal machine (RFID)</p> <ul style="list-style-type: none"> • Able to know the amount of waste been disposed by each household by the authorities (big data) • Report would be sent to each household to inform their disposal amount • Charts can be included for comparisons between households (to know they are doing good or doing worse) <p>Packaging Policy - Consequence</p> <ul style="list-style-type: none"> • Similar to the local cigarette packaging policy, show the consequence caused by plastic products to the environment 	<p>Packaging Policy</p> <ul style="list-style-type: none"> • Constraining businesses on the material used for packaging by policy • E.g. Stickers needs to be easily peeled off / paper wraps can be easily taken off • E.g. Eliminate new types of plastics or materials that yet have recycling technology <p>Refuse Purchase policy</p> <ul style="list-style-type: none"> • Encourage consumers to refuse purchase over-packaged products, putting pressure on businesses to re-think their packaging <p>Consumption Receipts</p> <ul style="list-style-type: none"> • On every receipt, include a section to inform the consumers that the possible amount of waste been created with the products they purchased
	Fast-Pace Lifestyle	<p>Residential Recycling centre</p> <ul style="list-style-type: none"> • Construct a recycling centre in every residential area / housing estates • Property management are to hire recycling managers, who are in charge of monitoring the centre • Residents are only required to pass over their recyclables to the centre staff <p>Weekly mobile recycling station</p> <ul style="list-style-type: none"> • In charge by local Green Communities, a weekly event hold inside the residential area at specific date and time • Require residents to bring own recyclables in a weekly basis 	<p>Less trash bin on the street</p> <ul style="list-style-type: none"> • Raise the awareness of own responsibility on managing own waste • Making the original system more difficult to perform • Think twice before disposing 	
	Hygiene Sensitive		<p>Water fountains</p> <ul style="list-style-type: none"> • Located beside each recycling stations to allow residents to clean their containers before recycling if haven't done so • Educate that recyclables have to be clean for recycling 	<p>Clean-recycling monitor</p> <ul style="list-style-type: none"> • A staff responsible for monitoring the recyclables on every recycling station • Would educate and monitor on the recyclables been collected

			Recycling bins with sensors <ul style="list-style-type: none"> High tech recycling bins, when users input their recyclables, sensors could detect whether the recyclables are clean or not Unclean containers would not be collected / give warnings 	<ul style="list-style-type: none"> Able to refuse collect materials that are not cleaned Give warnings or penalty to miss-behaviour recyclers
	Convenient as Priority	Recycling Stations at every living area / office buildings / MTR Stations <ul style="list-style-type: none"> Making it as convenient as possible, would be able to recycle through passing by stations Reverse vending machine <ul style="list-style-type: none"> Located at all convenient store / beside drink vending machine / sports centres Allow users to recycle their own bottle / cans after drinking 		
	Economically Driven	Recycle Competition <ul style="list-style-type: none"> Can be hold between residential areas regarding the amount of recyclables been collected (versus household waste) Rewards would be given to the winners to did best 	Waste Charging system <ul style="list-style-type: none"> A policy or an education system that everyone should be responsible for their own waste Consumer - responsibility Tax <ul style="list-style-type: none"> Would charge extra while purchasing certain products, but would return the fund if the user return the material 	Community Penalty System <ul style="list-style-type: none"> Instead of single household charging system, if any one mis-dispose / recycle materials, penalty would be given to the whole floor Putting pressure on everyone to monitor each other on waste disposal (peer pressure system) Report Reward System <ul style="list-style-type: none"> Residents could report on illegal waste disposal, where reward would be given if successful (\$\$)
Cognitive Factor	Quitter		Eco-guilt - Disposal Report <ul style="list-style-type: none"> Inform the amount of waste been disposed by each household through monthly report / even the amount that they could have been recycled Make the non-recyclers feel guilty and participate (peer pressure) 	Weekly / Monthly Report <ul style="list-style-type: none"> Report on the amount recycled / the amount been stopped to be disposed to the landfill (social media / messages / notices) Everyone is doing it = you have to do so
	Not my Responsibility	Monthly Comparison (Green communities) <ul style="list-style-type: none"> A monthly report of comparison between materials been collected by each Green community Know which community is doing better/great and which area needs improvements 	Registered waste disposal system <ul style="list-style-type: none"> Only allow to use coded trash bags which are able to identify the disposed household (QR codes) Penalty would be given if mis-dispose or allow the authorities to provide education if needed 	Waste Disposal detector <ul style="list-style-type: none"> Monitor the disposed waste, while waste bags including recyclables would not be received Waste Disposal monitor machine/ CCTV <ul style="list-style-type: none"> Would know who mis-dispose waste and receive penalty Monitor / educate the recycling process done by residents

Appendix D: Ideation Framework – Emotional versus Cultural & Cognitive Factor

		Emotional Factor				
		Neutral	Satisfied	Enjoy the Moment	Looking Forward	Trust
Cultural Factor	Over Consumption					
	Fast-Pace Lifestyle	Bin instructions <ul style="list-style-type: none"> Using colour / shape of openings / clear instructions to indicate the material being collected Acting as a direct guide to users to categories recycle as quick as possible 	Material indication machine <ul style="list-style-type: none"> The 3 coloured bins are not required, the machine would naturally indicated the material type and pass it to the correct bin accordingly 			Recycling Report <ul style="list-style-type: none"> The amount of recyclables of the whole residential area would be announced through posting notice at the lift Allowing all residents who know the data been collected + where the material had gone to
	Hygiene Sensitive	Open bin design <ul style="list-style-type: none"> Bins are designed so that users don't have to touch anything to throw in recyclables Automatic Door recycle bins <ul style="list-style-type: none"> Automatically opened after sensing the user coming close 	RFID collection system <ul style="list-style-type: none"> Recycle RFID cards are provided to every household Require users to tap their cards before putting in recyclables, during the process the user don't have to touch anything 			Specifically designed household recycling bin <ul style="list-style-type: none"> Designed and provided by the government, specifically used for waste categorization at home
	Convenient as Priority	Material indication policy <ul style="list-style-type: none"> Require all packaging to indicate the material been used Allow recyclers / residents to indicate the material type easily (for recycling) Include instructions on how to treat material before recycling Recycling label / Icon <ul style="list-style-type: none"> An official designed label / icon, to indicate which packaging can be recycled Citizens can know which packaging to recycle by 	Household recycling tunnel <ul style="list-style-type: none"> A recycling tunnel are installed at every household which connect to a centralize collection Would than provide reward / response after detecting the recyclables are correct or not RFID Residential Recycle system <ul style="list-style-type: none"> Located at all floors of residential area with the three coloured recycling bins 	Household Recycling APP system <ul style="list-style-type: none"> Used and apply to all RFID recycling points, that an account could be used by all members of the household APP would than record the amount of recyclables / warning been received 	Front door Recyclable Collection day <ul style="list-style-type: none"> Property management have to collaborate with recycling company, where materials would be collected in a specific time and date Residents are only to require to place materials in front of their doors 	Website / APP system <ul style="list-style-type: none"> Allow residents to log-in and know the recycling report + amount Check-in where the material had been to (tracking system)

		simply seeing the icon / label	<ul style="list-style-type: none"> • Connect to a centralized collection point at the basement of building • Require residents to tap their own household RFID card in order to open the bin, photos would be taken during each dispose for future tracking • Rewards would be given accordingly (points) 			
	Economically Driven			Throw in - Verified - Reward <ul style="list-style-type: none"> • Every time the user recycle materials, cash / points would be given, acting as a praise that they are doing a correct action 	Reward System <ul style="list-style-type: none"> • Cash / Rewards like groceries can be given to recyclers, a behaviour motivation Lucky Draw events <ul style="list-style-type: none"> • Tokens could be given after recycling, that it would be for a monthly high priced lucky draw events Tax Free - Recycling <ul style="list-style-type: none"> • Connected to RFID system, the amount of recyclables been collected can be tax free (for the waste charge) 	
Cognitive Factor	Quitter					QR code tracking system <ul style="list-style-type: none"> • Would be generated every-time materials are collected, allow residents to track down the material been collected (similar to delivery tracking system)
	Not my Responsibility					

Appendix E: Interview Questions

Waste Management Habit

1. How did your family manage waste?
2. How often would your family dispose waste?
3. Describe your residential area's waste disposal management system

Recycling Habit

1. Did your living area provide any recycling facilities? Where?
2. Do your family / yourself have recycling habit?
 1. Describe your family's own recycling system / habit.
 2. How often would your family recycle?
3. What kind of material do your family mainly recycle?
 1. Do you 'clean recycle'?
4. What is your opinion about public recycling facilities? (at public spaces)
5. Any reasons why would your family recycle / not recycle? (Motivation)

Perception towards Recycling

1. What comes to mind when thinking about 'recycling'?
2. Any thoughts on the current Hong Kong recycling system?
 1. What are your thoughts on the new Green Community Recycling Stores?
3. Do you think that recycling is a sustainable behaviour to help the environment?

View on future policies / Motivation

1. Do you agree on the household waste charring scheme?
 1. Do you think that it could motivate you to recycle more?
2. Current Green community provide loyalty programme, would it motivate you to recycle?

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