S/N	Speaker	Question	Answer
1	Mr Nicholas Kolesch, Vice President, Projects of the Alliance to End Plastic Waste	How many of Alliance's projects is/are located in Singapore? In your opinion, what are the main challenges for more projects in Singapore?	We have two ongoing projects in Singapore: 1) with Nanyang Technological University (NTU - https://blogs.ntu.edu.sg/nisth/2020/12/04/ntu-alliance-accelerating-creativity-excellence-ace-thematic-grant-call-on-ending-plastic-waste-signing-ceremony/) under their Accelerating Creativity & Excellence (ACE) Grant Call to identify and fund novel and innovative solutions to the plastic waste challenge. We are in the process of selecting finalists from more than 20 submissions. 2) We are also running the End Plastic Waste Innovation Platform with Plug & Play in Singapore (https://www.plugandplaytechcenter.com/end-plastic-waste/) with the first round held in 2020 and the next round in September this year. We are exploring other project opportunities in Singapore as well. Regarding the second part of your question, the Alliance has established a National Task Group in Singapore to identify how we can support the transitions planned in Singapore, many of which we heard about today in the presentation from NEA. We don't necessarily see any challenges around identifying more projects, more how we can contribute to the ongoing initiatives leveraging the support from our members across the plastics value chain. The key challenge in general for Singapore will be the transition from a highly efficient waste-to-energy system to waste segregation, allowing for the extraction of plastic waste from MSW before it goes to the incinerator.
2		Looking at the map of where the projects are, is there any reason why there is a pretty significant concentration in the ASEAN region?	Yes, we have brought our primary focus to the geographies where there is highest plastic leakage to the environment. Countries in South and Southeast Asia have the highest leakage and need investment in waste management infrastructure which the Alliance is supporting.
3	Ms Audrey Chua, Principal Engineer, Producer Responsibility Department (PRD), National Environment Agency	Will NEA look into the ISO standards for the 3R plans to be submitted as part of SG MPR?	NEA currently has no plans to develop an ISO standard for 3R plans. To support companies in their journey towards adopting sustainable waste management practices, the Singapore Manufacturing Federation has partnered NEA to introduce a new industry-led programme called the Packaging Partnership Programme (PPP). PPP was officially launched on 24 Mar 2021. The PPP is a joint capability programme that will support companies in fulfilling their new obligations under the Mandatory Packaging Reporting framework from 1 Jan 2021 as well as enable the exchange of best practices in sustainable packaging waste management.
4		Singapore had previously rolled out several green initiatives but there has been slow progress. What would be put in place for Green Plan 2030 to accelerate and ensure the desired outcomes?	An ambitious target was set under the Zero Waste Masterplan to reduce the amount of waste sent to landfill per capita per day by 30% by 2030. This is on top of the existing target to achieve a 70% overall recycling rate by 2030. Under the Singapore Green Plan 2030, NEA will frontload our efforts and achieve a 20 per cent reduction in waste-to-landfill per capita per day by 2026, with the goal of reaching 30 per cent by 2030.
5		How "much" of the waste that is segregated by waste management companies locally are being recycled mechanically?	In 2019, 37,000 tonnes of plastics were recycled. While a small portion of this was mechanically recycled locally, the majority was exported for recycling. Some of these plastics were sorted by the Materials Recovery Facilities (MRFs) operated by some of the waste collectors.
6		Is Singapore's collection rate sufficient to support operations for both mechanical & chemical recycling plant? What is being done to boost the collection?	NEA is studying the feasibility and design of a pilot plastic recovery facility that will take in domestic waste which are collected from household and trade premises, and sort and recover plastics to be further treated in chemical recycling plants, as well as mechanical recycling plants. NEA will also put in place an Extended Producer Responsibility (EPR) framework for managing packaging waste no later than 2025. The EPR will help aggregate packaging waste including plastics for recycling. The first phase of the EPR, the Deposit Refund Scheme [working name subject to changes] for beverage containers will be implemented in 2023.
7		What's the feasibility of chemical recycling (polymer decomposition using chemicals) in Singapore?	NEA remains open to working with industry players who would like to collaborate with the govt on chemical recycling. If the study of the plastic recovery facility proves that recovering plastics from waste is feasible and economically viable, there will be greater assurance of plastic feedstock available for chemical recycling. This will help drive the development of the chemical recycling value chain.
8		What is the plan for mechanical recycling of PP and PE locally?	A common constraint highlighted by the industry is securing sufficient plastic feedstock for recycling. NEA will put in place an Extended Producer Responsibility (EPR) framework for managing packaging waste no later than 2025. The EPR will help aggregate packaging waste including PE and PP plastics for mechanical recycling.
9		We have existing infrastructure to support chem pyrolysis and advanced recycling in our crackers and polymers plants. Is this something that NEA could facilitate?	We are open to working with industry players who have existing chemical recycling technologies and solutions. Please feel free to contact NEA to share more about your company's capabilities.
10	Mr Bala Ramani, Head of Consulting, APAC, ICIS	SG's plastic recycling rate of 4% is very Low. What is your view for PET recycling to boost recycling rates here?	Yes, prospects for PET recycling will be further enhanced by the upcoming Deposit return scheme proposed from 2022. However, we are a higher cost location as compared to our regional peers. Hence, given the limited scale and pricing, PET recycling to flakes for fibres/textile is likely to struggle to justify Economics & Investment returns. Hence, Recycling PET to Food grade RPET pellets would yield higher value making the investment more viable and attractive proposition for Singapore. However, limited domestic consumption would also mean that we need to look at the regional market opportunity in SEA
11		What do you mean by Bottle to Bottle plant in Vietnam?	This refers to used waste plastic bottles recycled back to produce plastic feedstock for making bottles again.
12	Mr Marc Schmidt, Managing Director & Partner, Lead for Societal Impact in Southeast Asia and Asia-Pacific, The Boston Consulting Group & Mr Arun Rajamani, Partner, Lead for Circularity in Southeast Asia, The Boston Consulting Group	What are challenges of scaling up mechanical recycling plants?	Mechanical recycling plants require clean plastic waste streams to run. While it is easy to get small quantities of this waste stream, collecting very large amounts to scale and make big plants can be tricky. The process of plastic collection and then cleaning/ sorting tends to be a very fragmented step of the value chain. Also, you may not find enough volumes of waste in one location, so you would have to transport this across distances which tends to make it more expensive. So while mechanical recycling plants are easy to set-up (low complexity, low capex), scaling to large plants is limited by inability to get large volumes of economically available waste streams
13		In terms of environmental impact, wouldn't sending of waste streams to other countries (e.g. SEA) for sorting, then ship elsewhere for chem recycling create additional carbon footprints, resource loss, etc	Yes, indeed this could be an issue. More importantly there is also an issue of supply chain control and that things don't end up in the recycling plant but on a landfill (at best) in the low cost country? I think a tight circular loop across geographies can make sense as long as we manage carbon emissions and create scale. With decarbonization in logistics, creating scale in specific strategic locations will become more viable. However, need to also consider that many environmentalists have complained about this practice of Western world dumping plastic waste in SEA. Sorting plastic tends to be a very labor intensive process, and hence western world find it cheaper to outsource to low labor cost countries. But countries like China have already banned import of plastics waste and I think SEA may also follow suit. Recently, there has been political challenges where countries like Philippines have tried to send back to Canada plastic waste. With improved technologies in sorting in the west, and increasing labor costs in Asia, we might also see reduce plastic flow going forward
14		Whats the trend towards chemical recycling / bioplastics in APAC? And how will it affect the existing packaging supply chain?	Companies in APAC have been slow on the chemical recycling front. Most of the leading companies in this area are from Europe (BASF, Borealis) and US (ExxonMobil). This is partly driven by the fact that APAC has lesser environmental restrictions compared to west and cost of labor in APAC is much lower than West. The lower labor cost makes mechanical recycling more attractive than chemical recycling in APAC. However, it is just a matter of time when APAC accelerates adoption in this area as many chemical countries are already exploring investments.
15		China is the biggest plastic consumer in the world and usually a very impactful influencer not just in Asia market but global market too. On waste management, China is more inclined towards degradable/biodegradable plastics as waste management solution. This direction seems slightly different from the western developed countries' standpoint, where circular/recycle is the main theme. In macro perspective, both approaches are under the same theme of going green and managing waste. However in details, is in fact a slightly different direction. Base on BCG's research, what's your opinion on this? Which is more sustainable trend in the near future?	That is indeed a very good observation. Our view is there is no silver bullet here. Countries/ companies will have to think holistically of all available options - renewable feedstocks, bio-degrarable plastics, recycling/ circular economy technologies. But I guess each country/ company may have some advantages in certain elements of the chain and may prioritize that. For example, Brazil/ Braskem had tried to leverage access to sugar-cane/ ethanol to look at renewable feedstocks. Europe - in absence of advantaged feedstocks, have focussed more on recycling solutions. To add on to Arun's comments, which I'm fully aligned with is the topic of existing production infrastructure and with that a tendency to support existing value chain in US and Europe and the opportunity to build new value chains based on different products in the new production and demand centers in China, South East Asia and India.
16	Ms Karina Cady, Investment and Operations Director, Circulate Capital	With the majority of the plastics being sent to landfill or incineration plants, how and why are there still plastic wastes ending up in the oceans?	If it helps for Q2, depends what geography this is in reference to. However for Singapore the plastics not sent for recycling are currently sent for incineration, and the ash blocks sent onwards for landfill. Plastic waste occurs in Singapore's environment due to direct littering as well as accumulation of ocean plastic waste. N-Parks and NEA have transparency publically available data on these issues. If this is in reference to SEA more broadly, for many ASEAN markets the waste management infrastructure has been unable to keep pace with the level of waste generated both domestically and internationally. In some of these markets over 60% of plastic waste is uncollected and either ends up in open dumpsites or open burning. Of the waste that is collected, a substantial proportion (>20%) does not make it into landfills. Over 80% of plastic that is received by recycling companies operating in SEA have been collected by the informal sector (waste pickers). Despite the increasing awareness across the region of the problems associated with plastic waste management, much more investment and collaboration amongst all different stakeholders is needed to build efficient waste management and recycling infrastructure and circular value chains.
17	Mr Ian Ong, Senior Associate, AlphaBeta	What were the main areas of differences between your waste flow assessment vs. that of NEAs? (DTW and ICW streams)?	A key difference is that our assessment is meant to be a rapid diagnostic using both plastic waste generation data from companies and various macro-economic indicators to identify the major economic sectors contributing to plastic waste generation - by volume and polymer type. It is envisioned that this approach would be replicable to other markets regionally. The NEA's assessment is (likely) based on in-depth field work and surveys, which is a more comprehensive approach to understanding plastic waste generation in Singapore.
18		Pryrolysis is not new. it needs sorted and "clean" feedstock. it needs to reach certain scale. What is the its future snapshot if putting it in a "degree of selectivity" vs "size of feedstock"	The yield of pyrolysis is very highly dependent on the quality of stream. For example with HDPE/ LDPE you can get up to 80% liquids (fuel) yield. But if you have PET, your yield may drop to as low as 30%. So definitely being very selective in stream will have a big impact on the economics. But scale/ size is also important. There is a large fixed cost related to the plant/ investment and to defray the fixed costs we may need high volumes/ throughput. So in some sense need both. Although, I would say "degree of selectivity" is probably more critical.