

**2021 WRITTEN REPORT**  
**FUTURE TRENDS (CAT 10)**  
**GROUP 10-11**

### Challenge 1 (Pollution due to increased waste generated by PPE, masks, etc.):

COVID-19 has resulted in an increased amount of discarded biomedical waste such as Personal Protective Equipment (PPE), masks and gloves. These biomedical wastes are generated due to the need for protecting frontline workers battling the virus, and for the general public to avoid contracting the virus. This will cause an increase in waste, and in such will affect the environment. Some waste will eventually rot, but not all, and in the process it may smell, or generate methane gas, which is explosive and contributes to the greenhouse effect.

Leachate (water that has percolated through a solid and leached out some of the constituents) produced as waste decomposes may cause pollution. Badly-managed landfill sites may attract vermin or cause litter. For instance, Wuhan in China produced more than 240 metric tons of medical wastes every day during the time of the outbreak (Saadat et al., 2020), which is almost 190 m tonnes higher than the normal time (Zambrano-Monserrate et al., 2020).

### Challenge 2 (Change of lifestyles in the new normal leading to more

### waste and less recycling):

Covid-19 influenced people's lifestyles. For example, with more working from home since the Circuit Breaker, many took to online deliveries and takeaways. Increased waste can be generated by more styrofoam boxes and disposable cutlery being used due to people buying takeaway more frequently. People also recycle less during COVID-19, as can be seen in our survey results on the next slide. Similarly to the previous challenge, this will also lead to more waste, and some waste like styrofoam boxes, if they go into the sea, can be ingested by marine wildlife and cause them to die, as they may mistake plastic bags and styrofoam boxes which we use when buying takeaway for food. People recycling less also adds to this problem. But, due to the pandemic many countries postponed the waste recycling activities to reduce the transmission of viral infection. For instance, USA restricted recycling programs in many cities (nearly 46%), as the government worried about the risk of COVID-19 spreading in recycling facilities (Somani et al., 2020). The United Kingdom, Italy, and other European countries also prohibited infected residents from sorting their waste (Zambrano-Monserrate et al., 2020).

### Challenge 3 (Internal displacement of people):

Due to the COVID-19 pandemic, it has resulted in the internal displacement of a huge number of people. These people are wary of contracting the virus, and were also greatly affected by the economic downturn. Virtually every analysis of the environmental impact of displaced persons cites negative and positive impacts on flora and fauna, energy and heating sources, water bodies, soil quality, environmental sanitation and a variety of infrastructure among the most affected environmental issues. From 30 March to 18 July, the International Organization for Migration's (IOM) Displacement Tracking Matrix (DTM) recorded over 10,000 people moving due to

COVID-19, most typically related to fears of contracting the virus and the impact of the outbreak on services and the worsening economic crisis.

#### Challenge 4:

Soil and water ecosystems may be affected by the increased use of cleaning products, such as hand sanitisers and disinfectants used to curtail the spread of the virus during the pandemic. With the surging number of such products, some of it may be haphazardly discharged in areas with flora and fauna like forests or even water bodies such as lakes, rivers and oceans. This will also lead to more hazardous waste that may harm the environment. Animals in the forest or the sea could ingest these waste products and cause them to die. It could also pollute the waters which is detrimental to aquatic life. Alcohol containing products spilled in the water are toxic to aquatic fauna and spill in soil may also pollute the groundwater (Mahmood et al. 2020). Soaps are the oldest known detergents. Discharged detergents cause foam in water bodies. Foam is produced due to lowered surface tension of water by soaps and other detergents (Bowers 1952).

#### Challenge 5:

COVID-19 has generated a lot of medical waste, in the form of masks, PPE, and gloves, as well as other medical waste, which has been acknowledged by the MSE and many other research studies. These medical wastes contain dangerous viruses which can lead to more outbreaks, if not disposed of properly, especially if treatment plants are overloaded due to the increased waste they have to process. The biomedical waste (BMW) generation from COVID-19 patients is increasing throughout the world. India is producing approximately 550 tons of biomedical waste (BMW) per annum which are treated by only 198 Common Bio-Medical Waste Treatment Facilities (CBMWTFs) and

225 captive incinerators (Singh et al. 2019; Yadav et al. 2020). It has been reported that during the present epidemic in Wuhan, China, the city produced 240 tons of additional medical waste per day (Ranjan et al. 2020; Yu et al. 2020; Zambrano-Monserrate et al. 2020).

## **UNDERLYING PROBLEM**

Given that the environment has been severely affected by COVID-19 due to factors like water pollution, increased waste, and the decreasing health of the environment in general, how might we mitigate and solve these impacts so that we can take COVID-19 as an opportunity to act on climate change?

## **Solutions**

### **Solution 1:**

The government could introduce measures to ensure biohazardous waste will be disposed of properly, so that in the near future, waste like PPE can be properly disposed of to prevent them from being vectors of transmission of COVID-19. For example, it can be made compulsory for all hospitals to follow proper protocols to dispose of their biohazardous waste, and the government could also set up designated rubbish bins for commonly used biomedical waste like masks, which can be properly disposed of separately from other waste. This prevents masks from going into water bodies which prevents marine animals from mistaking these plastics as food. Existing operational protocols for HWM and municipal solid waste (MSW) management should be continued for SARS-CoV-2 waste, with specific precautionary measures, adjustments and

arrangements applied to reduce any potential risk of SARS-CoV-2 infection due to the improper waste management process.(Sarawut Sangkham, Oct 8 2020, NCBI)

### **Solution 2:**

Now that the COVID-19 situation in Singapore and other countries has started to slow down, the government and the world can start to advocate reusable 3-ply masks for the general public to use in non-high risk settings, as it still protects us while not generating too much waste, which is becoming a huge issue due to the amount of disposable masks people are using now. Reusable masks look fashionable, are environmentally friendly, and can still provide sufficient protection from COVID-19, for the general public. The government can incentivise the public to use reusable masks by spreading the message about how it is as safe to use and offers as much protection as surgical masks, and can also make use of social media to spread these messages, be it through instagram posts, or facebook posts.

### **Solution 3:**

The government could implement a simple reward system. For example, the more recycled materials you dispose of into a designated area around the city, the more credits you would earn. These credits can be used for benefits such as discounts off necessities at supermarkets, or even free gifts such as reusable masks. This way, the amount of recycled materials would not only increase, but people would refrain from buying more disposable masks, and instead recycle more to earn more credits, and in turn earn more reusable masks or other rewards. In a 2014 survey, 41% of respondents said that money or rewards were the most effective way to get them to recycle. Take-back systems, such as deposits on cans and bottles, have proven effective in some contexts.(Delmas, 2019)

#### **Solution 4:**

The government could place more emphasis on proper waste disposal in schools and in the working sector. Students could be more educated on the drastic impacts Covid-19 has left on the environment through an increased amount of talks and presentations during assemblies. In the working sector, the workers who help clear waste could be highlighted and identified as important jobs by increasing their pay and providing them with healthcare and insurance, as currently the average age of a cleaner in Singapore is 60, which shows that young people do not find this job important and rewarding enough for them. If the public perception of cleaners is changed, then more resources can be dedicated to making sure waste is disposed of properly without affecting the marine environment and thus reducing pollution. But what we badly need is waste charging legislation coupled with public education. That will motivate everyone to cut waste, reuse and recycle(Lau,4 Nov 2014. South China Morning Post)

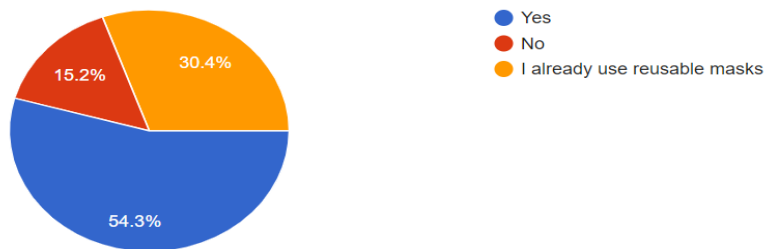
#### **Solution 5:**

Given the COVID-19 pandemic, we can host a virtual roadshow, or even create a YouTube channel. We can partner up with organisations to create a simulation to show the people the impacts of the extra waste generated by COVID-19, and the impacts of the extra plastic generated which cannot be recycled. By using animations which provide clear and concise imagery to the public, we can create a scenario where the world is overflowing with plastic waste. By using that as motivation, they will reduce the amount of waste they produce, and ultimately reduce pollution in the world as the message about the true impacts of waste spreads.(Sharma et al., 2020)

## Research findings

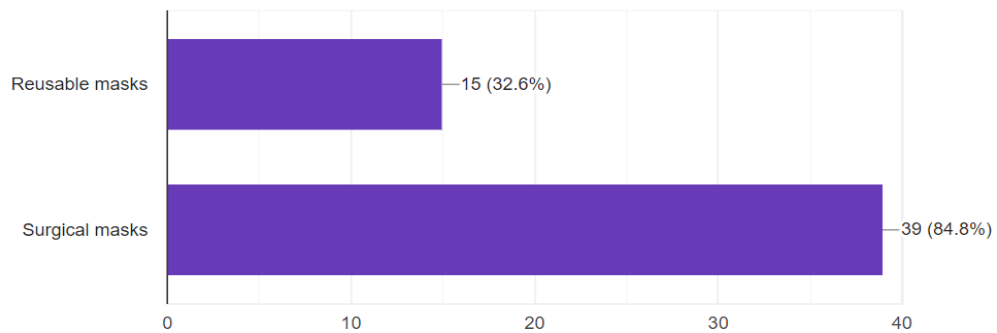
If you use surgical masks, if we told you that the rate at which we are generating plastic waste caused by using surgical masks will severely pollute the environment, would you consider using reusable instead?

46 responses



Do you use reusable or surgical masks?

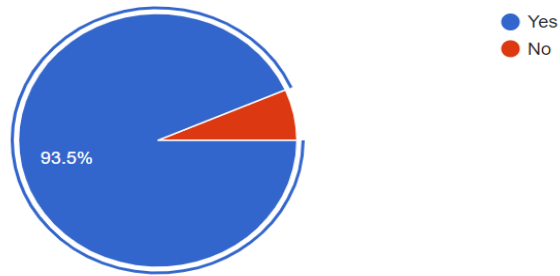
46 responses





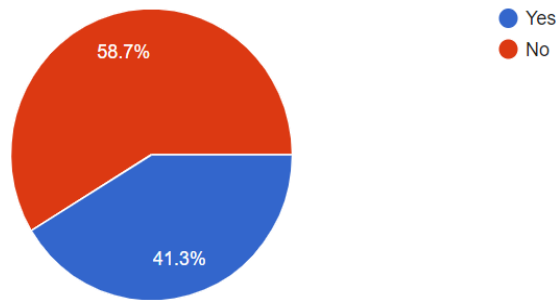
If you could redeem supermarket vouchers by recycling items which can be recycled, would you recycle more?

46 responses



Would you attend a virtual roadshow about the impacts of surgical masks on the environment?

46 responses



## Decision Matrix

	<b>Lowest cost</b> (2)	<b>Most imaginative</b> (1)	<b>Most easily understood</b> (3)	<b>Most lasting effects</b> (4)	<b>Most readily accepted by the public</b> (5)
<b>Solution 1: Proper waste disposal</b>	6	2	3	16	5
<b>Solution 2: Advocate for reusable masks</b>	8	3	15	12	20
<b>Solution 3: Reward system for recycling</b>	2	4	6	8	25
<b>Solution 4: Education about waste disposal</b>	4	1	12	20	15

<b>Solution 5: Virtual Roadshow</b>	<b>10</b>	<b>5</b>	<b>9</b>	<b>4</b>	<b>10</b>
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## Action Plan



## Potential obstacles to our action plan:

- Insufficient backing from government and sponsors
- Maintenance and cleanliness of the designated recycling areas
- Lack of publicity

## How will we overcome these obstacles?

- Request advocacy and a testimonial from the MSE (also fund our project)
- Request permission to paste posters to generate publicity on notice boards around HDB blocks and CCs
- Mechanics to maintain the recycling machines every three months
- We can also invite students to work on cleaning up the recycling areas as a

community project (can also earn VIA hours)

- Would also influence the children from young to keep their surroundings clean and reduce litter

## **Justification of our action plan**

- To promote waste minimisation, some LGs have recently changed the way they charge for community waste services. For example, the Town of Cambridge provides free recycling bins, charges an additional annual fee for green waste bins and a reduced annual fee for smaller general waste bins via their Max Recovery Campaign. The town has seen a 43% increase in recycled waste collected in that period
- This shows that when given monetary benefits, people tend to recycle more.
- NEA has experimented with reverse vending machines with a similar concept to our action plan, but our vending machines aim to collect more than just plastic bottles and instead collect all types of recyclables, and pay users according to weight, as well as offering more lucrative rewards for recycling to encourage people to recycle more. The initiative of reverse vending machines by the NEA has seen some results, but we believe our concept will make it even better.
- The NEA noted that since the launch of the “reverse” vending machines last October, more than 2.4 million plastic bottles and aluminium cans have been collected.