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Challenges of Mask Pollutants to Our Environment During COVID-19 Pandemic Period

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Abstract

Bago is one of the Divisions in Myanmar and Bago River is a river of Southern Myanmar. The City Market is situated on the river banks in Bago Division and there are a lot of pollutants along the Bago River. Most of the waste including Municipal wastewater is ending in rivers in most Divisions of Myanmar and some wastes are being burnt and thus air pollution has become one of the threats to the Environment of Myanmar. Plastic bags and disposable cups are the main problems of waste pollution in Bago River. Before COVID-19, there is no mask pollutant in Bago River and during the first waste and second wave of COVID-19, wastes of single-use masks can be found there. Organic waste can be easily destroyed naturally, however, plastic wastes and mask wastes can sustain for many years to kill aquatic animals directly and humans, avifaunae and wildlife animals indirectly. Myanmar is still poor in techniques to restore its environment, causing by pollutions and deforestations like as developed countries. This study expresses the waste pollutants in Bago River and Bago City during the COVID-19 pandemic period. Average 156 Tons of rubbish are ending up every month in Bago River. During the study period, nearly 50,000 masks were placed at the bank of Bago River and some percentages of waste masks were floating on Bago River. In a week, there are 288 Tons of rubbishes in Bago City.

Keywords

Bago River, Waste Pollution, Plastic Bags, Mask Pollutants, Rubbishes

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1. Introduction

Plastic pollution is a global problem and scientists are still finding the best solution to stop plastic pollutions in the world [1]. Unfortunately, our world has faced the global pandemic disease known as COVID-19. To decrease the spreading of COVID-19, people must use masks and face- shields. Vietnamese must use the masks last few years ago because of the air pollution index of their country [33]. While COVID-19

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pandemic challenges to our world, masks are massively used world widely like as Vietnam. Generally, Coronavirus face masks can take 450 years to degrade and most of them end up in seas and oceans [2]. Nevertheless, people are necessary to prevent infections of COVID-19 and thus it cannot be unavoidable to use masks. At the first wave of COVID-19, most of the people in Myanmar could stay home and they did not go outside without vital works [3, 4]. However, the people of Myanmar could not stay home at the second wave of COVID-19 and they must try to reduce their loss of Business and thus mask pollutants was observed at that time. Due to poor knowledge of environmental conservation, most people of Myanmar threw mask waves along the roads. Not only masks but also gloves pose a risk of entanglement, entrapment and ingestion, which are the main environmental impacts of pollutions [3-7]. Birds, especially seagulls died of entangling in masks world widely [5]. During the COVID-19 pandemic period, PPE litters such as single-use masks, single-use gloves and also cloth masks have been observed in terrestrial, and marine ecosystems and they are threatening wildlife animals, aquatic animals and avifauna [5, 32]. PPE litters of hospitals are burnt by private municipal companies in Myanmar. The masks which are used by the public can be founded in their environment. 65% of masks were found in terrestrial and the left 35% ended up in rivers, seas and oceans according to this research. As of February 2020, China has increased the production of medical masks in numbers of 14.8 million daily [8]. Most of these face mask wastes contain either polypropylene and/ or polyethylene, polyurethane, polystyrene, polycarbonate, polyacrylonitrile which can also cause plastic or microplastic pollution as plastic material in our environment [9, 36]. When plastic materials and masks are burnt some toxic gases emerge to be air pollution and to enhance the suffering of many diseases to human beings and animals [1, 10, 11, 23-27]. The wastes of the masks are increased across the world but people cannot strictly follow the appropriate disposal methods for the used masks [8] and especially, by burning wastes of masks, air pollutions rates of Myanmar eventually increased and this is adding mask wastes in the environment, which end up in the streets, even main roads of cities and landfills. When the mask wastes are ending up in rivers, seas and oceans, it is also possible to poison the marine animals which ingest them and it may destroy marine animals directly, or weaken them, rendering them more vulnerable to other threats, interfering with impaired reproduction, growth and development of young animals like as plastic wastes [8, 12-15]. Moreover, aquatic fauna can also cause entanglement, which leads to dying as birds [8, 19-22]. Furthermore, medical wastes also promote significantly global plastic pollutions and those wastes might be hazardous or radioactive [16]. This study emphasizes waste pollution in Bago River and Bago City, Bago Division, Myanmar.

2. Materials and Methods

2.1. Materials

In this study, mask wastes and other wastes were used to estimate the pollution index of Bago River and Bago City.

2.2. Study Area

The study place was chosen in Bago City, Bago Division, Myanmar, in Southeast Asia continent, its coordinates are 10.5034° N, 122.9663° E. This research emphasized Bago River, its coordinates are 17.3214° N and 96.4822° E to find mask pollutant rates.

2.3. Study Period

The study period lasted from May 2020 to April 2021.

2.4. Method

The point count method was used in the study area. The Bago City Market which is situated along Bago river has three garbage accumulations and those marked as points and used masks were counted per week during the study period. Four quarters along Bago River were chosen to study their waste pollutant rates because people who live in these three regions litter their wastes to Bago River. Collected data were entered into micro-soft excel for calculations and analysis. Data is presented in the following section using photographs, tables, graphs and histograms. And then the data of the two study areas were compared and discussed.

3. Results

Figure 1 shows the population of Bago City. In Bago, the private municipal company has accepted the responsibility to clean up Bago City Regions since September 2019. They take 4 times a week to carry the wastes of Bago City and the total number of 217318 people litter 288 Tons per week.

This study was compared with Bago City and Southern Zyne Quarter to analyze waste pollutants. People of Southern Zyne Quarter litter their wastes to Bago River and they have used to accumulate their waste along the Bago River. Their wastes have 9.243 Tons per week. This rate is 3.2% of the whole Bago City. Figure 2 shows a comparison of the population between Bago City and Southern Zyne Quarter to assess waste pollutant index according to population.

This study was compared with Bago City and Northern Zyne Quarter to analyze waste pollutants. People of Northern Zyne Quarter litter their wastes to Bago River and they have used to accumulate their waste along the Bago River. Their wastes have 6.354 Tons per week. This rate is 2.1% of the whole Bago City. Figure 3 shows the comparison of the population

between Bago City and Northern Zyne Quarter to assess waste pollutant index according to population.

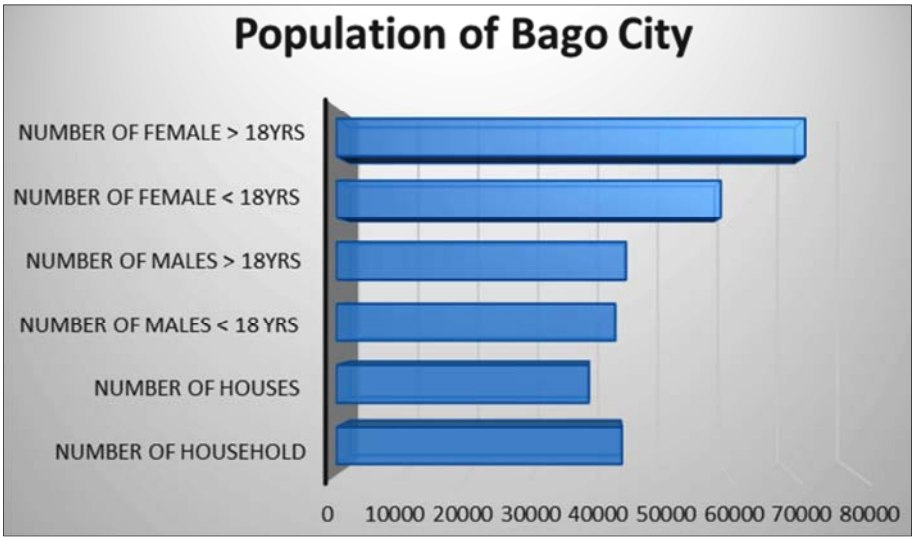

Figure 1. Population of Bago City.

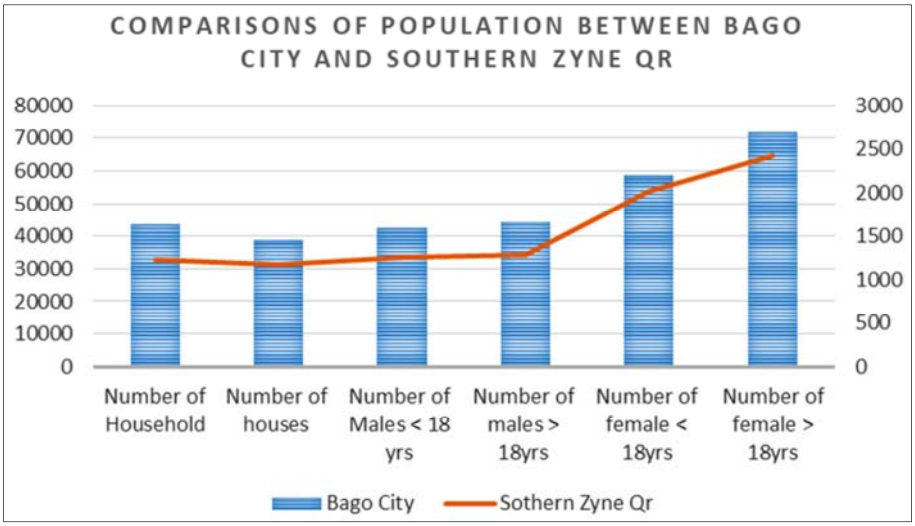

Figure 2. Population comparison between Bago City and Southern Zyne Quarter.

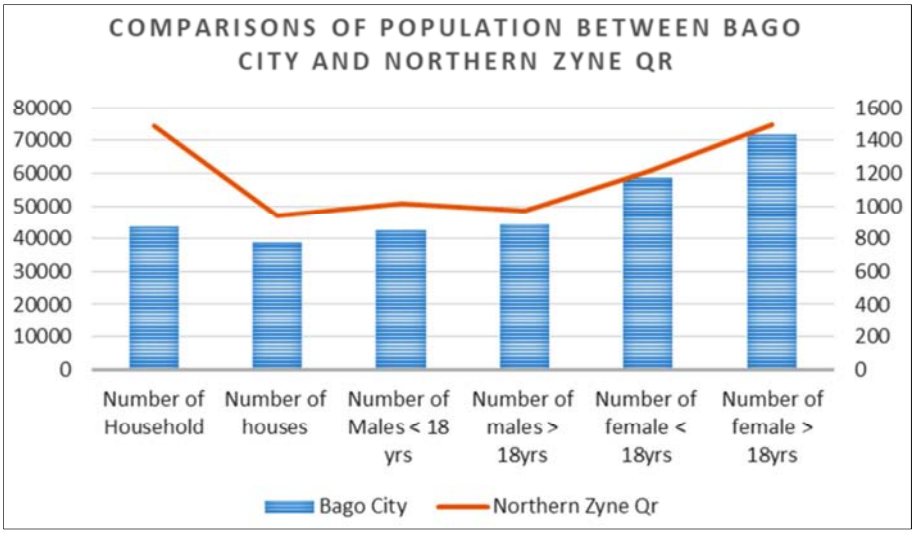

Figure 3. Population comparison between Bago City and Northern Zyne Quarter.

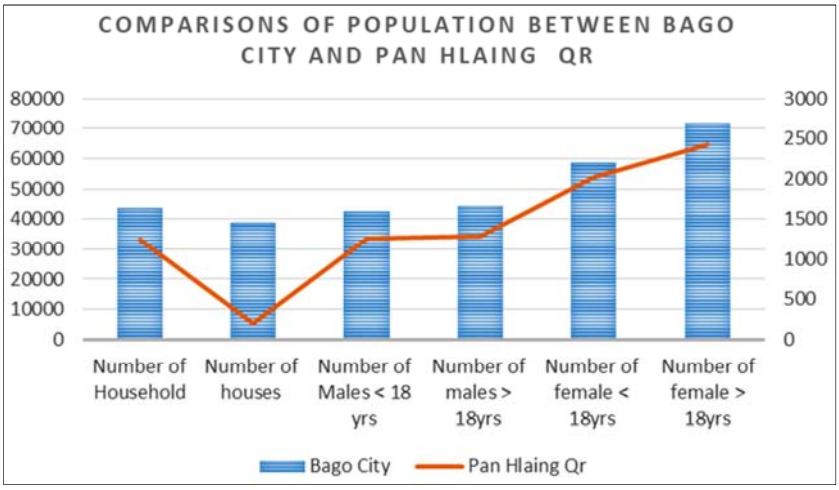

Figure 4. Population comparison between Bago City and Pan Hlaing Quarter.

This study was compared with Bago City and Pan Hlaing Quarter to analyze waste pollutants. People of Pan Hlaing Quarter litter their wastes to Bago River and they have used to accumulate their waste along the Bago River. Their wastes have 9.243 Tons per week. This rate is 3.2% of the whole Bago City. Figure 4 shows the comparison of the population between Bago City and Pan Hlaing Quarter to assess waste pollutant index according to population.

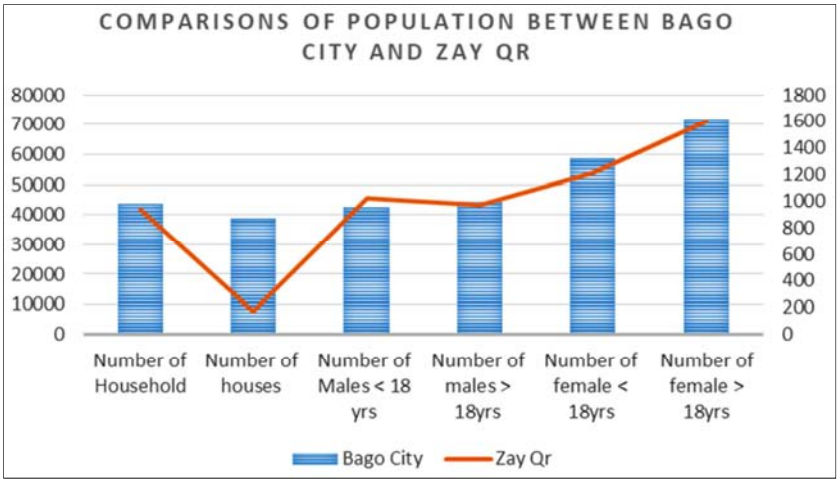

Figure 5. Population comparison between Bago City and Zay Quarter.

This study was compared with Bago City and Zay Quarter to analyze waste pollutants. People of Zay Quarter litter their wastes to Bago River and they have used to accumulate their waste along the Bago River. Their wastes have 6.43 Tons per week. This rate is 2.2% of the whole Bago City. Figure 5 shows the comparison of the population between Bago City and Zay Quarter to assess waste pollutant index according to population.

Table 1. Numbers of mask wastes generated by each quarter (Number/ month) from May to October in 2020.

Categories	May	June	July	August	September	October
Southern Zyne Qr	321	453	422	121	188	173
Northern Zyne Qr	121	582	385	238	293	118
Pan Hlaing Qr	801	2338	2389	1754	1743	1754
Zar Qr	728	2513	1512	1250	902	1012

Table 2. Numbers of mask wastes generated by each quarter (Number/ month) from November in 2020 to April 2021.

Categories	November	December	January	February	March	April
Southern Zyne Qr	2696	3273	428	58	72	278
Northern Zyne Qr	3250	3873	995	72	87	125
Pan Hlaing Qr	3375	3478	1643	721	1420	915
Zar Qr	3385	4200	1578	456	870	879

Tables 1 and 2 show the numbers of mask wastes from four quarters of Bago City which litter their wastes to Bago River. The researchers collected mask wastes and litter them systematically in waste bins and the researchers observed that most of the people, who live in these four quarters litter their wastes to the Bago River.

Figure 6. The photos represent garbage dump along the Bago River.

In figure 6, a lot of wastes accumulate along the Bago River can be seen at those three points. These garbage dumps have been seen for the last few years ago. When the water level of Bago Rivers rose, the wastes were ending up in the Bago River. In 2020, the private municipal company of Bago City and NIVA (Norwegian Institute for Water Research) cooperated to clean up along Bago Riverbank and underwater of Bago River. Unfortunately, the processes of cleaning up and restoration could not implement because of the global pandemic COVID-19.

Figure 7. Used masks in The Bago River.

Figure 8. Wastes along the bank of Bago River.

In Figure 7, the used mask is floating along the river and figure 8 shows mask wastes along the Bago Riverbank. Finally, they will end up in rivers, seas and oceans and they are been very difficult to degrade. The mask wastes and plastic debris will transform into microplastic and they will threaten aquatic animals and these disadvantages can be studied from many scientists' valuable researches.

Figure 9 shows the numbers of mask wastes generated by three study places during the study period. By the data of this research, the people of Bago wore more masks at the first wave of COVID-19 than at the second wave of COVID-19. However, they wore masks while the number of COVID-19 patients was increasing and most of the people have stopped wearing masks since January 2021. At the first wave of

COVID-19, most of the people of Bago City did not wear masks.

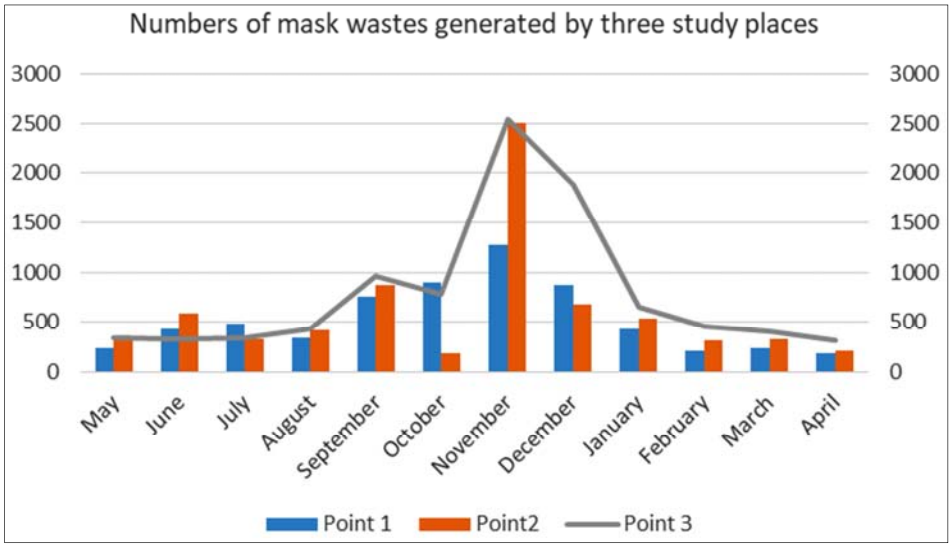

Figure 9. Numbers of mask wastes generated by three study places (Number/ month) from May in 2020 to April 2021.

Figure 10. Disposable wastes along the Bago River.

People of many countries have used disposable cups and boxes instead of plastic bags and plastic cups. This way is not the best solution to stop plastic pollution and those disposable wastes will also transform into microplastic debris and they are too difficult to degrade. Along the Bago River and its bank, a lot of disposable wastes can be found. In figure 10, disposable wastes can be seen in the Bago River and its bank.

Figure 11. The rest rubbishes whilst left on the Bago River Bridge.

Despite enacting the law of the Ministry of Environment preventing waste littering to rivers, people cannot strictly follow this law and they are still littering their wastes to the river. Figure 11 shows the rest rubbishes on the Bago River Bridge while people littered their wastes in the river. During the study period, the researchers found bags of rubbishes there.

In figure 12, pigeons died after entangling in the single used mask. At the study time, the same bad process of birds was founded in many places. COVID-19 litters impact on animal life dreadfully and they are challenging to our environment as plastic pollution.

Figure 12. Pigeon entangled in a single used mask.

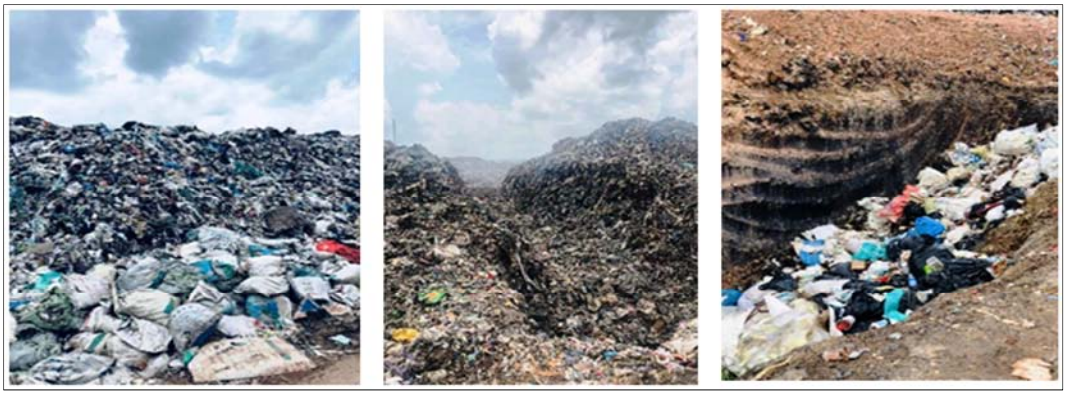

Figure 13. The place which collects wastes of Bago City.

Bago municipal Department has handed over to the private municipal company to clean up Bago city and every household has settled for taking their wastes from that company staffs since September 2019. The wastes of Bago City are accumulated at Sin Phyu Kwin Quarter and the area of this rubbish storing place is 16 acres. In that area, there are 35 garbage dumps with a height of 15 feet. Hospital wastes have been placed by digging and then they have been burnt. The company workers collect the wastes of Bago City four times a week and there are 228 Tons of wastes per week in Bago. There is no way to destroy the wastes systematically and wastes accumulate more and more. In figure 13, rubbish dumps at Sin Phyu Kwin rubbish storing place can be seen.

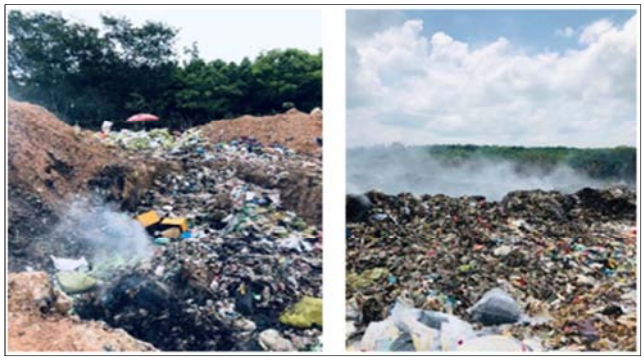

Figure 14. Cleaning up wastes by burning.

Some wastes of Bago City, especially, hospital waves have been burnt at Sin Phyu Kwin's rubbish storing place (figure 14). Burning wastes can support to air pollution rates of the surrounding. Nonetheless, just only burning can supply to decrease the number of wastes of Bago City and the responding company of Bago is trying to reduce the disadvantages of burning wastes and to find the best techniques to clean up Bago City and Bago River by cooperating with foreign countries.

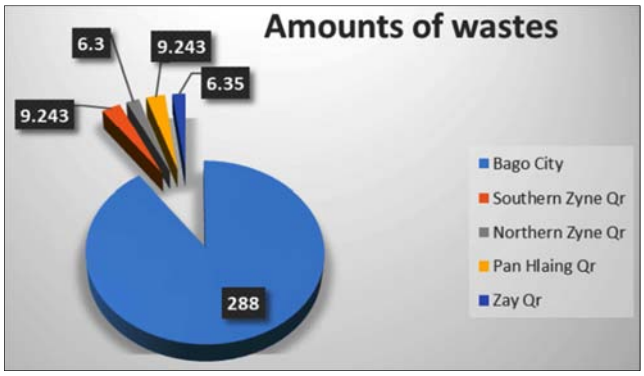

Figure 15. Amounts of wastes generated by Bago City in a week.

Figure 15 shows amounts of wastes per week in the whole Bago City and three quarters in which 50% of their wastes throw to Bago River. Average 156 Tons of wastes are ending up in Bago River.

4. Discussion

In this study, wastes of Bago City and waste pollutants in Bago River were emphasized. People of Myanmar have much knowledge in Environmental conservation, however, they don't still use their knowledge to sustain their healthy environment and they don't want to abandon their comfort zones and their old behaviors. The Bago waste project started in 2019 to restore Bago City and Bago River and it aimed to build capital in Myanmar to tackle (plastic) waste pollution from domestic and small scale industrial sources. This project is linked to bilateral Myanmar- Norway Environmental Programs (2019-2023). Royal Norwegian Embassy in Yangon and NIVA funded this project and the other partners, MONRFEC, Bago Region Government, BCDC, Bago Municipal Department, MJT included in this project. Private municipal company of Bago and NIVA tried to sustain clean water levels in Bago River by picking up the wastes along the Bago Rivers and they had a plan to salvage old rubbishes, sinking underwater, from Bago River and re-planting some plants, trees and shrubs like as natural ecosystem surrounding [34]. Unfortunately, they delayed their projects because of the global COVID-19 pandemic and bad conditions of political status in Myanmar. Before 2019, the people of Bago Division faced water flooding. The Bago waste project installed a drainage system and concrete slab laid and they could remove the blocking wastes in drainages and proper disposal and drainage also reduced water flooding in Bago in 2020. This project also aims to identify sources of pollution and littering to the Bago River, run clean-up and reclamation in Bago Region and beyond [17, 28-31]. To stop waste littering in Bago River, Bago government is necessary to enact laws to sustain clean water and a healthy environment. The accumulations of rubbish dumps along Bago River are vital to moving the limited waste storing areas of Bago City before sinking into Bago River. When rubbishes are sinking into rivers, it will be massively difficult to pick up underwater rivers. By this research, a person can generate 1.3×10^{-3} Ton of general wastes. In some developed countries, the commonly used disinfection techniques for the management of hospital wastes are the pyrolysis technique and microwave technique [8, 35]. The main benefits of the microwave technique are comparatively lower energy and action temperature, limited heat loss, and less environmental burden without harmful residue during the disinfection phase [8, 18]. Despite using the modern technique in developed countries, Myanmar does not still have to use the modern technology because of insufficient budgets and poor technicians and Myanmar is essential to rehabilitate its economic, educational and social status by causing disadvantages of global COVID-19 pandemic and their bad political status. COVID-19 pandemic threatened not the only economy of our world but also an ecosystem of our environment. PPE litter of COVID-19 affects our environment for coming decades as micro-plastic pollutions in the marine ecosystem. Mask wastes on lands will threaten wildlife animals and even avifauna.

5. Conclusion

In Bago City, 1152 Tons of general wastes are generated per month. A person can generate 5.2×10^{-3} in a month. Averagely, 7 Tons of general wastes are sinking into Bago River every day due to four quarters and Bago City market. Mask wastes are placing in the streets of Bago and in Bago River to threaten animal life directly and human life indirectly and they have challenged the ecosystem of our environment. This study analyses the number of masks during the global COVID-19 pandemic period. Results will help to control general wastes and to litter wastes systematically without throwing them into rivers. People think that they are littering a few amounts of general wastes and their wastes cannot impact on waste pollutions in rivers and river water can destroy their wastes. They never observe water pollution and plastic pollution in rivers near them. They want to clean up rubbishes near them and they throw their wastes into the river not to see from their sights. People are necessary to participate to sustain a clean city with some environmental organizations and Government in Myanmar. If they don't litter their wastes to rivers, rubbishes on the lands are easy to destroy or carry to limited storage areas. Despite collecting mask wastes and general wastes by environmental volunteers and municipal workers in Bago, nearly 50,000 mask wastes were observed at the Bago Riverbank and floating used masks and disposable wastes were found in the flow of Bago River. To decrease environmental problems, people are vital to follow the enacted laws of government and to use their knowledge, getting from environmental campaigns and some media, in our environment. Mask wastes have challenged our environment and also plastic pollutions and thus, humans need to find the best ways to face their challenges and to disappear them ever after from our world. Before finding the best ways to solve pollution, humans need to throw their mask wastes and plastic wastes systematically.

Declaration

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