

# The Danger of Environmental Damage from Disposable Mask Waste During the Covid 19 Pandemic

## Study of Student Habits in Using a Mask and Alternative Solution

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### ABSTRACT

Abstract: The covid-19 outbreak has changed the structure of people's lifestyles. The obligation of health by wearing a mask is an obligation for everyone in every activity to protect themselves and others from the threat of covid-19 transmission. Changes in people's lifestyles by using masks turned out to cause new problems in the form of environmental threats from the waste of using disposable masks. The lack of understanding and awareness of how to manage the waste of used mask and environmental threats from mismanagement are interesting things to study. The findings in this study will provide basic knowledge about the contextual conditions of community behavior, especially students in using masks and the problems that arise from improper management. Based on these contextual conditions, this research is expected to help develop policies for waste control and management, especially among students and alternative solutions that are innovative in overcoming these problems.

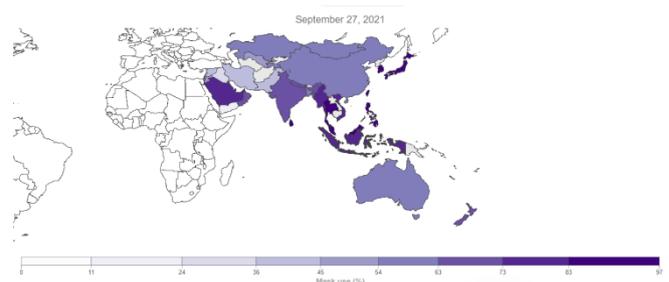
**Keywords:** *disposable mask, mask waste, student habits*

## 1. INTRODUCTION

The covid-19 outbreak has changed the structure of people's lifestyles. The obligation to follow health protocols by wearing a face mask is a must for anyone in every activity to protect themselves and others from the threat of covid-19 transmission. A scientific report released by the United States, Center for Disease Control and Prevention (CDC) 2020 recommends that everyone continues to wear a mask to block off virus-laden particles that may be emitted by an infected person.

The Center for Disease Control and Prevention (CDC) and the World Health Organization (WHO) initially only required masks for sick people, but around April 2021 the CDC issued guidelines on how to increase the effectiveness of the use of masks that can be applied by the public. Consistent use of masks in a good and right way and wearing a double mask, namely using a medical mask first and then being coated with a cloth mask has proven to be more effective in increasing

the effectiveness of masks to protect ourselves from covid-19. [1]



**Figure 1.** Percentage of Mask Usage [2]

The use of double masks not only increases the number of layers but also increases the tightness or firmness of the mask, but also makes the mask more suitable (fit) to the contours of our face. Research shows that using a mask in this way is able to filter out cough particles released by a person up to 85.4%. The use of medical masks can filter particles up to 56.1% while cloth masks filter particles by 51.4%.

The extensive use of face masks during the pandemic generated millions of tonnes of waste in a short period of time [3]. A study by the University of Southern Denmark estimates that 129 billion masks are thrown away every month. The Oceans Asia (2020) report, entitled "Covid-19 Facemasks & Marine Plastic Pollution", said it was estimated that in 2020 around 1.56 billion face masks ended up in the ocean. This amount is equivalent to 4,689 to 6,240 metric tons of pollution in the ocean.

Based on data compiled by LIPI (2021), the amount of hazardous and toxic waste (B3) in Indonesia, namely masks and personal protective equipment (PPE) during March to September 2020 reached 1,662.75 tons. The Lampung Provincial Environment Agency recorded that the covid-19 medical waste from March to May 2020 in Lampung reached 1.3 tons. [4]. The phenomenon of increasing the quantity of medical waste, especially masks, cannot be avoided. The lack of education to the public and the absence of governance for handling covid-19 medical waste in the household are factors causing the increase in the generation of medical mask waste in the residential environment.

Students have an important role in the campus area and in the surrounding community. Students are expected to be able to contribute their knowledge to the surrounding community. Because the community itself has a paradigm that students are a reflection of society in the future who have more educational values and are knowledgeable.

As human learners and part of society, students have a vital and comprehensive role so that the experts are grouped into three main functions, namely: agent of change, social control and iron stock. With this function, of course, it is inevitable that students have a big role to play in order to make the nation change for the better.

In the context of discussing the danger of environmental damage from disposable mask waste during the covid-19 pandemic, before moving on to the role of students, the portrait of students' understanding and behavior in managing the waste of the remaining masks is an interesting thing to study.

The findings in this study will provide basic knowledge about the contextual conditions of community behavior, especially students in using masks and the problems that arise from improper management and also solutions to overcome the danger of environmental damage from disposable mask waste during the covid-19 pandemic by students.

**2. RESEARCH METHODS**

This research was conducted through an online survey and literature study. An online survey was conducted to respondents, namely students from several

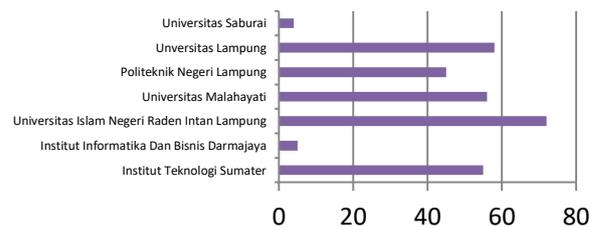
campuses in Lampung Province. The survey was conducted on 233 respondents in the span of one month. In the survey, the questions focused on the parameters: a) the habit of using masks; b) the type of mask used; c) duration of wearing masks in a day; d) the number of masks used in one week; e) the habit of disposing of mask waste; and f) understanding of how to dispose of mask waste. This survey aims to obtain information from students' habits in using masks so that researchers can identify the impact of these habits.

Then, the researcher also conducted a literature study according to the topic through scientific literature, online journals, policy reports, and various trusted online sources. Data collection is concentrated in the following categories: a) appeals for the benefits of using masks during the covid-19 pandemic; b) government policy on the use of masks; c) people's behavior in using masks during the covid-19 pandemic; d) medical waste during the covid-19 pandemic; e) public understanding of how to manage mask waste; and f) sustainability solutions to overcome the problem of mask waste.

**3. RESEARCH RESULTS AND DISCUSSION**

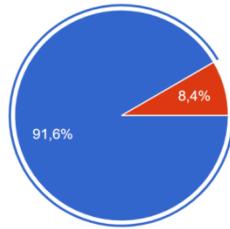
**3.1. Survey Result**

The pandemic conditions also increased the amount of medical waste such as masks, gloves, and other medical equipment. To get accurate information regarding the problem of mask waste during the COVID-19 pandemic, the researchers first took pictures of the habitual pattern of using masks through a survey of respondents. Respondents in this study amounted to 295 people with a percentage of 79.6% women and 30.4% men. Respondents are students from various campuses in Lampung Province.

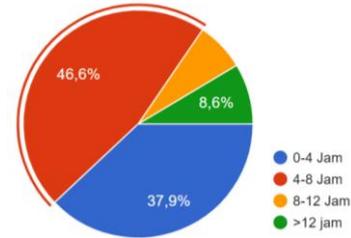


**Figure 2.** The Respondents College (Processed by Researchers, 2021)

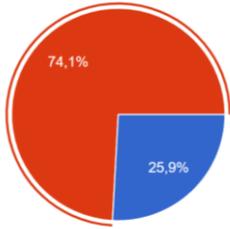
From the survey conducted, it is known that 91.6% of respondents use masks during their activities outside the home. Of this number, it is known that 74.1% chose to follow the advice issued by the WHO and the government, namely to use double masks, medical masks and cloth masks at the same time. The remaining 25.9% stated that they only used one mask.



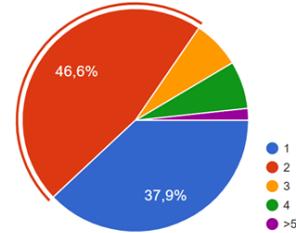
**Figure 3.** The Percentage of Masks Usage during Activities Outside the Home (Processed by Researchers, 2021)



**Figure 6.** Long of Masks Usage per Day Home (Processed by Researchers, 2021)

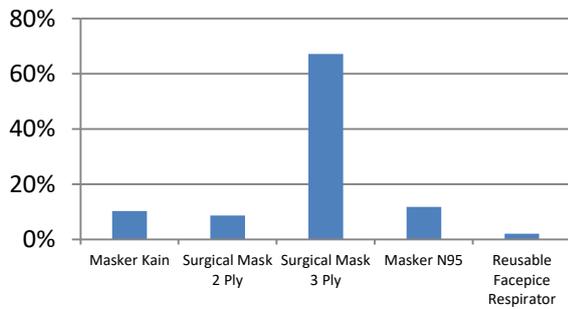


**Figure 4.** Percentage of Double Mask Usage (Processed by Researchers, 2021)



**Figure 7.** Amount of Mask Usage per Day Home (Processed by Researchers, 2021)

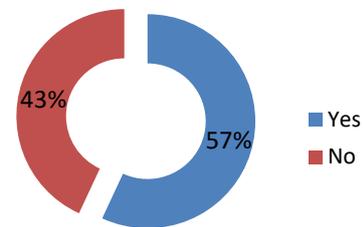
There are many types of masks circulating in the community and they vary with different levels of effectiveness. Based on the survey results, most of the respondents 67.20% chose to use a 3 Ply Surgical Mask type mask. The mask with the highest level of effectiveness of N95 ranks second with a percentage of 11.80% used by respondents. Cloth-type masks are also still quite in demand by 10.30% of respondents.



**Figure 5.** Types of Masks Used by Respondents (Processed by Researchers, 2021)

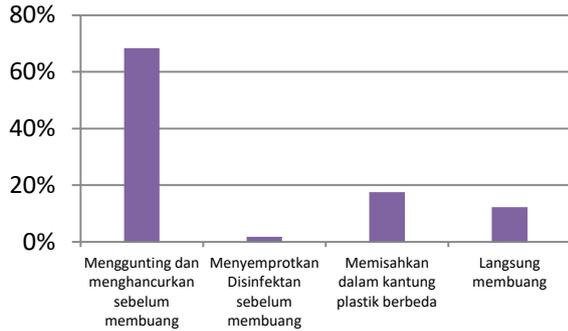
To be able to see the average amount of waste from masks produced during the COVID-19 pandemic, the researchers also surveyed the number and duration of masks used by respondents in a day. Figure 03 shows that most of the respondents use masks within a period of 0-4 hours and 4-8 hours per day. From the duration of use, the average amount of waste generated by respondents per day is 1 to 2 masks.

The government continues to encourage and socialize how to manage mask waste, especially disposable masks that are used, so that they remain safe and do not cause new problems. The survey results show that 56.9% of respondents are aware of the benefits, the remaining 43.1% are not yet.



**Figure 8.** Understanding of the Appeal to Manage Mask Waste (Processed by Researchers, 2021)

Based on the survey, actually 77.5% of respondents realized that the use of disposable masks can cause environmental damage and damage the ecosystem. This awareness is in line with the respondent's understanding of the risk of spreading the virus in the community through indiscriminate disposal of disposable mask waste. However, this awareness is quite contradictory to the habitual behavior of disposing of respondents' waste.



**Figure 9.** Behavior of Disposing Mask Waste (Processed by Researchers, 2021)

Referring to the survey results, it can be seen that the habits of respondents in managing mask waste are still quite varied, there are still 12.30% of respondents who are indifferent by disposing of mask waste directly.

**3.2. Environmental Damage Impacts from Disposable Mask**

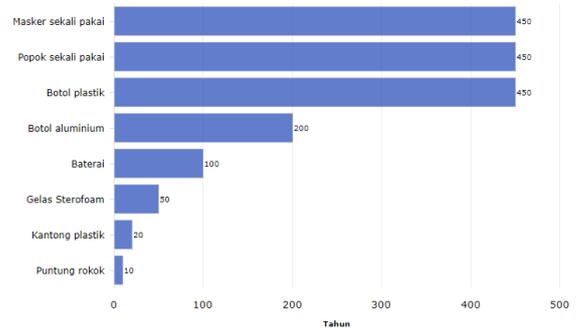
The dynamics of the covid-19 situation in Indonesia are still fluctuating and tend to continue to increase. The government has changed the paradigm of handling the covid-19 infectious disease from a curative and rehabilitative way to a public health approach that is preventive and promotive. Implementation prevention measures are carried out by socializing 3M behaviors (wearing masks, keeping distance and avoiding crowds, washing hands with soap and running water).

The call to use masks at the beginning of the covid-19 pandemic had triggered a shortage of medical masks because people flocked to buy medical masks. The price of medical masks became unreasonable, so the government issued a recommendation regarding the use of three-layer cloth masks for the general public. Cloth masks are not as effective as N95 masks or medical masks in warding off the Corona Virus. Cloth masks are only able to ward off viruses as much as 70% and must be washed immediately after use within 4 hours.

The soaring demand for masks in 2020 prompted the massive production of single-use masks. This increase occurred in line with the advice issued by the WHO to use masks during activities. China responded to this condition by producing masks on a large scale. In April 2020 the country reported that the daily production of single-use masks reached 450 million masks. 52 billion disposable face masks produced by 2020 (including N95 respirators and surgical masks). An estimated 1.6 billion of these masks end up in the oceans. This amount is equivalent to about 5,500 tons of plastic pollution [5].

Medical masks or disposable masks are mainly made of polypropylene, aka a type of plastic. Besides being practical, this three-layer mask is the choice of many people because it has a bacterial filter and has a better ability to pass air. Disposable masks can take up to 450

years to decompose. The length of time it takes to decompose is a concern for various parties if not managed properly.



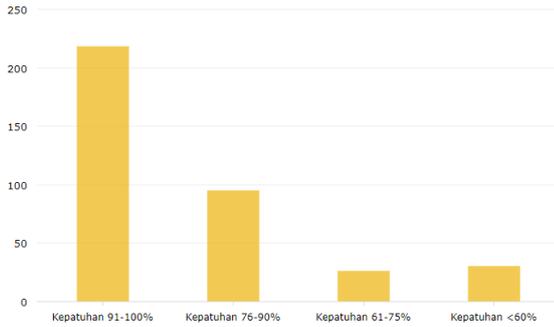
**Figure 10.** Time for Garbage to Decompose

Mask waste that are still intact roam the environment because they are not handled properly. This mask waste can be carried into rivers and seas and cause water pollution. In Mediterranean waters these disposable masks even float like jellyfish. Waste of used masks can also ensnare animals, even causing death for them. There are also cases where animals think that the used masks are food. If they don't die from choking, the masks that escape will fill their stomachs, reduce food intake, cause the animal to starve, and eventually die [6].



**Figure 11.** Source [7]

The survey conducted by the covid-19 Task Force for the period 27 September-3 October 2021 showed that the level of public compliance in wearing masks was quite high. The high level of community compliance in wearing masks shows a positive thing. However, the use of disposable masks raises concerns among various groups if it is not accompanied by proper understanding and management.



**Figure 12.** Community Compliance Level Wearing Masks [8]

Based on the results of a survey conducted by researchers (figure 03), the results are in line with the survey conducted by the covid-19 task force above. The data shows that respondents have a high level of compliance to use masks. In addition, the survey results also show that respondents have sufficient understanding of how to manage disposable mask waste, but this understanding is not accompanied by awareness to sort and dispose of the waste according to the tips and methods recommended by the government.

The government has tried to disseminate tips and how to manage used mask waste. Quoted from the page of the covid-19 task force, it was emphasized that medical mask waste can be managed in two ways, namely disinfection so that there is no virus in it to avoid potential transmission and changing its shape so that it cannot be misused by irresponsible parties.



**Figure 13.** Flayer How to Manage Used Mask Waste [9]

The spokesman for the covid-19 Handling Task Force in the press release agenda for the development of the handling of covid-19 stated that the presence of medical mask waste from the community is currently a big obstacle. The government must have standards and

locations for medical waste disposal that are safe for the community and the environment. Waste management during the handling of covid-19 in Indonesia is regulated in Circular of the Minister of Environment and Forestry Number: SE.02/PSLB/PLB.3/3/2020 concerning the management of infectious waste or hazardous and toxic waste (B3) and household waste from handling covid-19. The waste are classified into 3 categories, namely:

**Table 1.** The waste are classified [10]

Categories	Description
<b>Infectious waste originating from health care facilities (B3)</b>	Waste originating from health care facilities can be managed by exterminating it, using an incinerator with a temperature of 800 degrees Celsius, especially during this pandemic. Alternative culling via cement kiln is also possible.
<b>Infectious waste from ODP originating from households</b> (Household waste, with covid-19 cases)	This waste is categorized as B3 due to contamination with viruses. So, the handling can be done like category B3.
<b>Household waste and similar household waste</b> (Household waste, excluding Covid-19 cases)	Medical waste sourced from households. Usually used for everyday purposes such as masks. Disposable medical masks that are used daily by the public fall into this category.

Regarding the management of medical waste, it has been regulated in the Regulation of the Minister of the Environment Number: P56/Menlhk - Setjen/2015 concerning Procedures and Technical Requirements for the Management of Hazardous and Toxic Waste from Health Facilities. Other regulations, namely the Minister of Health and the Decree of the Minister of Health of the Republic of Indonesia Number: HK.01.07/MENKES/537/2020 concerning Guidelines for the Management of Medical Waste for Health Service Facilities and Waste from Isolation or Independent Quarantine Activities in the Community in Handling Coronavirus Disease 2019 (covid-19) . Medical waste from households, as regulated in Law 8 of 2008 concerning waste is managed by the local government. However, due to the pandemic period there was medical waste such as masks, PPE and the like, the mechanism was continued with the mechanism of Law

Number 32 of 2009 concerning environmental protection. The main concern of the current covid-19 task force is to make appropriate policies for the management of community covid-19 waste involving the Ministry of Environment and the Ministry of Health.

Medical waste, especially masks, are often found in household waste during the pandemic. This phenomenon can become a new problem for the community, government and affected parties. The impact that will be faced due to the failure to manage covid-19 mask waste will cause environmental pollution, damage ecosystems, increase the generation of abandoned medical waste, misuse of used masks, and can increase the risk of spreading covid-19 infection in the community. Various recycling technology concepts are offered, especially for domestic waste masks (non-health facilities). The LIPI Biotechnology Research Center said that for simple handling of mask waste, you can use alcohol or disinfectant liquid, or heat it at 70°C for 45 minutes and then separate it from other waste and then throw it in the trash [11].

### **3.3 Solution Offered**

Based on a survey conducted on students from several campuses in Lampung Province, it can be seen that students as representatives of intelligent society have good waste management habits, but it is undeniable that there are still others who have not managed their waste properly, so efforts are needed to improve this.

Synergy in solving the mask waste problem is the key in solving this problem. Students, who are often described as intellectuals and agents of change, are required to have awareness, sensitivity, and concern for a better life. The intelligent ideas and innovations of a student as a result of critical thinking are able to change the paradigm that develops in a community group and make it more focused according to common interests.

Campaign programs can increase knowledge, shape attitudes, change people's behavior to carry out environmental management [12]. In simple terms, public campaigns aim to build and increase public awareness, especially the target audience. Campaigns that are carried out can influence the views and opinions of the public [13].

Along with the development of internet technology, more and more people in Indonesia use the internet and have social media [14]. Social Media makes communication patterns between users more interactive, this can be observed from social media platforms such as Instagram, Facebook, Twitter and others. Each user is easier to exchange information and participate in publications (Malik, 2017). Social media such as Instagram can stimulate followers' attention, generate

interest to find out more, desire to participate, and participate in campaign activities organized and invite others [15].

Conventional campaign patterns are not completely abandoned and are still quite popular, but amid the current technological developments, campaigns through social media are becoming more effective and efficient. Through interesting and creative content, students can convey campaign educational messages.

## **4. CONCLUSION**

The covid-19 pandemic will cause new environmental problems that can reduce the quality of the environment. Environmental conditions are considered important because the quality of the environment will directly affect the quality of human life. Environmental problems that arise due to the indiscriminate understanding and management of mask waste must be resolved.

The campaign on the management of innovative used mask waste by students is an alternative solution to reduce the high negative impact of this.

## **AUTHORS' CONTRIBUTIONS**

The study of the dangers of environmental damage from disposable mask waste through a survey of the habit of managing mask waste maps the student's habits as representatives of the community in managing mask waste.

This study is expected to be able to provide a separate discourse in environmental conservation efforts through effective, efficient, and innovative campaign education. In addition, this research will give birth to similar research that has novelty in the academic field.

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