

Strong Waste Administration: Impacts of the Pandemic

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Abstract

Pandemic COVID-19 has sparked worldwide alarm and sparked social and economic worries, all of which will have an impact on the environment. As part of this ongoing natural experiment, the present study examines how various developed and developing nations process and dispose of municipal solid waste (MSW). Research papers from a variety of fields, government and multinational agency publications, as well as news articles all contributed to the compilation of the material in this document. Despite the fact that little is known about MSW management during pandemics, this study proposes a worldwide paradigm for MSW management during the COVID-19 epidemic and evaluates many elements of MSW management. On the subject of waste treatment and disposal, we'll discuss the impact of increased medical waste on the current system. When the present pandemic is over and the cleanup begins, waste management will be difficult, but not impossible. The research provides recommendations for the treatment and disposal of MSW as well as the scope of future effort to achieve sustainable waste management.

Introduction

SARS-CoV-2 is the third coronavirus to develop in the previous two decades, following the SARS-Cov-1 epidemic in 2002 and the Middle East respiratory syndrome coronavirus (MERS-CoV) outbreak in 2012. (1). COVID-19 (coronavirus disease 2019) has been confirmed in 3,677,165 confirmed positive cases globally at the time of this publication. Hundreds of thousands of individuals have been placed under quarantine throughout the world in an effort to cut down on the spread of disease (2). The coronavirus epidemic has prompted some nations to implement job creation initiatives aimed at combating unemployment. At a time when many people find it difficult to think about possible negative repercussions, it is critical to keep in mind that climate change is another serious danger to human prosperity. Using COVID-19 rehabilitation initiatives to support the climate change agenda is a strategic opportunity to transition to a more sustainable future after COVID-19.

We believe that the digital divide is not just a matter of having or not having access to digital technology, but also a matter of being

able to use it in meaningful social activities and reap the rewards of doing so. Young people must be able to make educated judgments about how to use digital technology in their daily lives in a meaningful way. The digital gap also extends to the design and development of such technologies, we argue. All aspects of our lives are being affected by digital transformation, which is "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies," and it's not just in the workplace anymore. As it pertains to children and their fundamental education, the COVID-19 epidemic has piqued our curiosity. There has to be a critical and proactive approach to digital technology by the younger generation, rather than simply accepting the present state of affairs as it now stands. Large and medium-sized Chinese cities had a 30.00 percent decrease in MSW waste during the illness epidemic, according to press announcements from China's State Council's joint preventive and

control mechanism on March 11. The production of infectious and noninfectious medical waste, on the other hand, has expanded dramatically (+370.00 percent) in Hubei Province.

MSW usage during the COVID-19 outbreak, on the other hand, is mostly unknown. COVID-19's influence on waste and wastewater service sectors was examined. This study reveals that medical facilities' non-hazardous waste offers a risk of disease transmission (3). Therefore, a comprehensive analysis into MSW management during pandemics is required, which addresses all aspects of this problem and provides a foundation for future research. Studying waste management techniques in developed and developing countries during the COVID-19 epidemic was done. The emphasis of the inquiry is on the impact of the COVID-19 epidemic on existing MSW management practices, which is being examined. Risk mitigation approaches for MSW management are examined in this research because of the potential for SARS-CoV-2 transmission in decentralized waste management and integration with current systems. Pandemic stress on MSW management systems has been well-documented in developed and developing countries, and this study contributes to that body of knowledge by looking at how governments have responded to that stress.

2. MSW management approaches across the world during the pandemic of COVID-19

2.1 Municipal waste generation and governments' responses

In more ways than one, the COVID-19 situation has impacted the business (4). It's easy to see how food producers in the U.S. have been hit hard by the shutdown of significant institutions such as schools or restaurants. It was in response to this public health hazard that the US Environmental

Protection Agency (EPA) issued rules for food waste recycling and sustainable management. At first, the instructor made an effort to make the school day's timetable consistent with regular schooling. A few weeks later, several changes were made, such as two fifth-grade instructors working together as a team and dividing the online class burden among themselves. Food inspectors were engaged in the distribution of food products to restaurants, grocery stores, and others impacted by the outbreak. Food delivery apps, for example, have made it possible for the government to reach residents in both urban and rural areas, allowing it to better manage food supplies and minimize food waste.

Municipal waste management practices, such as personnel health and safety precautions, limits on garbage treatment, and general waste operations, are now being examined in the light of the current coronavirus outbreak. Authorities have taken a number of steps to deal with the issue of managing MSW during the epidemic. Many people in Austria have been told that they must reduce their waste generation and sort it as much as possible because of this outbreak. In the early phases of the epidemic, a set of guidelines for locals to follow was devised to protect the health and safety of inhabitants (5).

When it came to communicating with their students, the public school's special educator relied heavily on WhatsApp. Every two weeks, teachers will send home a 15-day lesson plan with short tasks and activities. A weekly meeting with the child's parents or caregivers guarantees that all of the child's obligations and activities are being monitored. Student/parent pairs meet weekly through WhatsApp video with educators to check on progress, offer short interventions and address any challenges. The meetings are held weekly online. For parents who don't have access to WhatsApp or who don't

utilize it, text messages and phone calls are used. Prior to the phone or video conference, the parent and student must agree on a day and time for the meeting to take place.

Waste management guidelines have been issued by the European Commission in the wake of the coronavirus epidemic. To provide proper waste management services, the text stresses the importance of separate collection and recycling in conformity with EU regulations. MSW management services have an important role in preventing the spread of infectious diseases, but they are rarely emphasized in public health emergency communication.

2.2 Treatment and disposal of MSW prior to the pandemic in developed and emerging nations

Waste treatment and disposal facilities had previously been built in industrialized countries ahead of the COVID-19 conference. Estimates show that 25% of MSW generated in the United States is recycled, 10% composted, and 10% burned for electricity (12.70 percent). More over half of the country's municipal solid waste (MSW) is recycled, a high rate when compared to the recycling rates of other wealthy nations. Changes in MSW management services in developed nations like Japan and Europe because to the Covid-19 outbreak. MSW management services were employed by Indians and Malaysians during the COVID-19 epidemic, although rising countries like Brazil and Indonesia did not.

Landfills and other disposal sites account for more than 95% of the MSW generated in nations like Indonesia, Brazil, China, and India. About 60% to 70% of trash is carried to landfills in Indonesia, while the rest is either thrown in rivers or burnt, or handled by the community on its own (6). Municipal landfills in Brazil disposed approximately

58% of the city's solid waste, according to an energy and economic research. Indian towns produce more than 70% of their garbage on the ground, according to a report on MSW land disposal environmental sustainability analyses (7). When there is so much waste to dispose of in a country like China, incineration is the most common option. There is still a substantial amount of MSW that is disposed of in landfills, despite China's MSW incineration capacity growing from 15,000 tons per day in 2003 to 231,600 tons per day in 2015.

3. Factors affecting the spread of SARS-CoV-2 via the treatment of MSW

Even though COVID-19 is transmitted biologically, there are also social and urban characteristics that can have a significant impact on the breakouts in huge numbers. When handling SARS-CoV-2-infected products, proper disinfection and preventative measures must be taken into consideration. Because of this, poor management of municipal solid waste (MSW) might have an impact on the spread of the illness in metropolitan areas and comparable settings.

3.1 Survival time of the virus on surfaces

The COVID-19 virus can be spread in two ways: by inhalation and through direct contact. An infected person's coughing or sneezing might release small droplets of air. An infected person's immediate environment can potentially be a source of transmission since droplets might land on surfaces that are still contaminated. SARS-CoV-1 and SARS-CoV-2 viral life spans were compared in aerosols and on common surfaces. ' All of the test surfaces, including cardboard, steel and plastic, were tested for seven days at 21 to 23°C and 40% humidity for the incubation of viruses. An aerosolization experiment was carried out in a revolving drum at a temperature of 21-23°C and 65% RH (8). Researchers found that human coronaviruses may infect

inanimate objects including metal, glass, and plastic for up to nine days.

3.2 Population density

Per square kilometer, a city's population density is measured (9). Personnel who handle garbage from healthcare institutions and residences where COVID-19 has been confirmed will be at risk of infection if any probable source of infection is found on rubbish collected during the COVID-19 epidemic. It is likely that COVID-19 would spread more easily if there were a greater number of people in close proximity, broader contact networks, and poorer standards of cleanliness. Reducing infection rates is one way to slow the spread of the disease. Population density is critical to controlling contact rates, which in turn affects the effectiveness of an outbreak-control approach.

3.3 Socio economic conditions

As a result of the COVID-19 outbreak, no two people have been affected the same way. Informal businesses play a significant role in waste recycling and material recovery, according to studies published in the Journal of Environmental Management in countries like Mali and the Philippines. There may be an informal sector in MSW management if waste management services are provided by individuals, families, and private micro-enterprises that are not formally regulated by the government.

People who operate in the informal sector recycling rubbish do so in areas with abysmal sanitation and hygiene conditions. The impoverished, the elderly, and those with disabilities are among the social groups worst hit by the pandemic's effects. If the epidemic occurs, they are at danger of contracting the disease.

4. MSW management system affected by COVID-19 epidemic

4.1 MSW services under stress as medical and residential waste volumes soar

In order for medical waste to be properly disposed of, it must first be sterilized to eradicate any leftover microorganisms (10). For the most part, medical waste treatment facilities are constructed with a steady-state composition in mind. An individual's health and societal acceptance all influence the treatment alternatives available to him or her. A rise in waste volume might destabilize systems designed to handle steady-state conditions. Disposing non-hazardous medical waste follows conventional solid waste management guidelines. India, among other countries, has urged that during the COVID-19 pandemic, medical facilities and households with positive cases of the virus dispose of general solid waste according to the local custom of doing so.

As the number of confirmed cases of COVID-19 rose, so did the volume of medical waste carrying it (11). For this reason, the Asian Development Bank recommended China to expand its waste management infrastructure to tackle illnesses such as COVID-19 and others that are spreading throughout the country because the country's medical transport and garbage disposal systems are already overloaded. Addition of non-infectious medical waste increases pressure on the present MSW management system. To avoid additional pollution, present treatment and disposal systems must be overloaded. According to Spain's guideline, waste generated by cement plants may be co-incinerated. A temporary modification in disposal licenses was granted by the Norwegian government as a response to an increase in medical waste (and permission to transport garbage abroad). Singapore's public garbage collection services (PWCs) have been affected by staff shortages throughout the circuit breaker period, which begins on 1 June 2020 and ends on 31 December 2019. Alternate-day rubbish

collection has been implemented as a temporary solution at some landed properties and housing development board properties by PWCs.

COVID-19 has been thwarted in this pandemic by a variety of methods including social isolation, employment from home, returning children to their parents' homes, and the use of remote education (12). In response to these actions, consumers have shown an increased interest in home delivery online shopping.

4.2. Waste recycling

There are both institutional and informal businesses in developing countries that support waste recycling. Informal workers face threats to their health and well-being, while nations engaged in waste processing are able to protect their citizens during the current coronavirus pandemic. Reiterating best practices for waste handling and cleanliness can help to ensure that workers aren't exposed to harmful materials.

5. Possibilities for long-term management of municipal solid waste (MSW) in the wake of COVID-19

Whenever the "rules of the game" may be renegotiated or altered, it signifies that everything is open for negotiation or revision. Municipal waste management systems in countries impacted by the current coronavirus outbreak are being examined, showing the shortcomings and presenting opportunities to build a long-term waste management strategy.

5.1. Waste collection and recycling

To avoid the spread of disease, cities and provinces have implemented social distancing measures, lockdowns, and restricted access. Waste management efforts are exacerbated by pandemics because of a mismatch between limited rubbish collection and increased waste production. Due to the COVID-19 situation, it is imperative to prioritize the management of municipal solid waste (MSW) (13). For the scheduled

online session, parents had to make sure their child got up on time, washed, and ate breakfast in order to be prepared. The student must be able to easily access all of the relevant materials. Even more difficult was getting the kid to sit at a table and gaze at a laptop screen in order to follow the educator's directions. At home, students face a wide range of distractions. For many students, seeing their instructors for the first time in weeks was a nice surprise. With only a two-week time frame planned for the lockdown, online learning didn't commence until many weeks after it had been imposed. Most schools didn't implement an online education plan until after the program was expanded. The parents and children who were able to maintain their routines even during the lockdown performed better.

5.2. Temporary waste storage and reduction site

In the TWSRS, trash and debris may be held until ultimate disposal, which makes it stand out from other disposal options. It is possible to minimize the amount of trash stored by the use of grinding and screening (14). The US Federal Emergency Management Agency (FEMA) recommends the establishment of temporary waste storage and reduction sites between trash production sites and final disposal locations (FEMA). These capabilities are useful for a variety of reasons. Delivering garbage to the TWSRS from the point of origin serves as a buffer and provides extra space. There are several jobs that TWSRS may be used for in order to decrease waste and prepare it for recycling, such as sorting, shredding, or chipping. As a final option, they can be used as temporary trash holding facilities until the ultimate disposal can be completed. Natural disasters necessitate the establishment of temporary storage and processing facilities. People and vehicles are arranged in a way that makes it easier to store and handle trash. Because of these pre-treatment facilities, the

volume of waste that must be treated and disposed of may be greatly decreased. In the wake of natural catastrophes like earthquakes, floods, and hurricanes, temporary waste storage and recycling facilities have been investigated. Sustainable waste management from pandemics need infrastructure like this one in terms of the environment and economics.

5.3 Options for long-term disposal of municipal solid waste (MSW)

Waste disposal is a problem that arose both during and immediately following the COVID-19 outbreak and will continue to do so. It's possible to handle large amounts of rubbish using thermal treatment (waste to energy) and an energy recovery facility. According to a number of studies, thermal conversion technologies can minimize the amount of waste produced by up to 95%. Additional advantages include hygienization (waste is destroyed at 850°C), mineralization, and immobilization of hazardous substances in thermal treatment systems that are currently in use today (15). A simple plant design may not be sufficient for recycling and recovery in developing countries because of the wide range of waste that they produce. As a result, landfills and open dump sites account for a significant part of rubbish generated. Underdeveloped countries are not as likely to adopt waste-to-energy technology, according to the analysis.

5.4 Revamping disaster waste management plan

Disaster-related waste management is time-consuming and expensive since it involves a large variety of stakeholders. For the most part, disaster waste management policies now in existence focus on dealing with debris generated by natural calamities such as earthquakes and flooding. Biological disasters necessitate the use of a variety of treatment approaches, infrastructure,

automated treatment and collection design, logistics, safety and regulatory factors.

6. Conclusions and future outlook

Public health officials must immediately address municipal solid waste management in the wake of the COVID-19 pandemic as well as in the years to come. Both affluent and developing countries used natural trials, such as the COVID-19 pandemic, to evaluate waste management strategies. MSW management methods were examined in light of the COVID-19 epidemic, which resulted in a wide range of waste kinds. SARS-CoV-2 transmission risk-mitigating strategies, such as decentralized waste management and integration with existing systems, such as those used to handle MSW, were considered at this meeting. They were able to learn everything from how to use a computer to how to use Zoom and conduct online sessions in a week. Smartphones and tablets allowed the public school teacher to carry out her duties while traveling. They had to deal with pupils who didn't have regular access to the kinds of instructional supplies that both teachers depended on, such flash cards, puzzles, and building blocks. Parents couldn't buy or mail these items to their children because most businesses were closed during the lockdown. Instructors who were already stretched to their limits were given the duty of coming up with new and creative solutions to this problem. When it comes to their pupils' education and well-being, educators who work with special needs children and instructors in general demonstrate amazing patience and resilience during this pandemic.

Long-term MSW management during the COVID-19 epidemic will benefit from this research, which sets the framework for further investigation. Waste features and quantities must be examined in more depth. These conditions are necessary for the development of waste management and

disposal facilities. Decentralized solutions, such as those used in decentralized waste management, must be examined for their economic, environmental, and social viability during public health emergencies. Temporary storage and reduction facilities, their cost implications, and the availability of employees for employment during such epidemics must all be carefully analyzed. Automated waste management can assure the continuity of MSW management services and preserve the safety of those involved during lockdowns. In view of the COVID-19 outbreak's considerable dangers to the global population, governments must likewise adjust their practices.

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