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Transforming the Pandemic into a gateway for zeroing waste-related emissions at the University of Colombo, Sri Lanka

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Abstract. The University of Colombo (UoC) has turned the Covid-19 pandemic into a win-win situation by adopting new measures to overcome limitations the pandemic has brought in while improving its overall waste management. It has incorporated a paperless system by conducting academic work online, including applying for new courses, distributing e-learning material and submitting assignments. Every lecture, meeting, and function has been held virtually, eliminating food, paper, plastic and decoration waste. Students now study from home and employees have been reporting to work according to rosters, reducing food and office waste generation significantly. The employees now adhere to the pre- and newly included post-pandemic environmental guidelines, litterless lunches, and have been provided with shuttle services for safer commuting, leading to lower greenhouse gas emissions. Identifying the potential environmental damage through improper disposal, using reusable masks is being promoted through regular online awareness programmes; eco-friendly sanitizers are used instead of liquid soap, which consumes water and generates wastewater. Although the amount of waste generated during the pandemic is low, the UoC-owned Waste Storage Center continues to function with waste segregation and recycling, and the composting facility is currently expanding its production. The waste reduction has also caused lowered waste-related greenhouse gas emissions.

Keyword:
Waste Management, Paperless System, Guidelines, Waste Storage Center, Segregation and Recycling

1. Introduction

The University of Colombo (UoC), the oldest and the highest performing higher educational institute in Sri Lanka, was established in 1942, by merging Ceylon Medical College established in 1870 and the Ceylon University College established in 1921 [University of Colombo, 2021]. Since then, the university has provided the best education and acted accountable for fortifying its graduates and the whole university community to fulfil their societal and environmental responsibilities. Leading the way to a sustainable realm, the UoC officially initiated its green journey in 2017, by establishing a dedicated central body named Center for Environmental Initiatives (CEI) for achieving environmental and sustainable development. The green movement of the university, guided by the initiatives of the CEI, is highly influencing, progressive and growing as a crucial element in every part of the university system.

The spread of the Covid-19 virus in Sri Lanka, which started slowly and grew unexpectedly since the report of one patient in early 2020, has hampered the smooth functioning of the university. Therefore, the university administration modified all operations to overcome the new barriers or restrictions in executing annual academic plans and other objects. They urged high note decisions to prevent spreading the pandemic by enacting mandatory percepts for prompt implementation. Most importantly, the green commitments remained unchanged, even when continuing mainstream academic operations needed transformation. Moreover, newly incorporated adjustments have only strengthened the university's green approach.

2. Green initiatives amidst the Covid-19 pandemic

2.1. Working from Home

The UoC has 24,071 registered students except for the ones who enroll in studies online and 2,731 employees. Therefore, maximally 26,802 people used to come to the university premises per day before the pandemic. Considering the prevailing situation in the country, the university administration decided to make all the students continue their studies online from their homes to avoid the spread of the pandemic, reducing the number of people entering the university premises daily by 89.8%. Also, only one-third of the university staff was allowed to report to work in person per day to maintain social distancing in compliance with the state regulations, while the others were required to continue working online from their homes.

In 2019, organic, paper, polythene/plastic, and mixed waste generation of the university were 295,130.26 kg, 41,848 kg, 32888.6 kg and 4879. 8 kg and, the per capita waste generation were 11.01 kg, 1.56 kg, 1.23 kg and 0.60 kg, respectively. Since the beginning of 2020, the restrictions imposed against health risks have significantly reduced the number of individuals staying in the university per day. Therefore, the pandemic has positively influenced the waste management within the university premises by reducing the waste generation approximately by more than 90%, compared to the year 2019. Moreover, it has reduced the university's carbon footprint by lessening food and paper waste, water consumption, electricity consumption and minimized environmental pollution and transport-related emissions including the greenhouse gas emissions.

2.2. Conducting university gatherings virtually

Provided that the integrative decision making and regular gatherings for administrative, academic and cultural determinations are essential for the progressive functioning of the university, it was imperative to conduct all those events on time as usual. The ultimate resolution was to arrange the events online, connecting participants using electronic media, together with web conferencing platforms such as Zoom and Google Meets, and social networks such as YouTube and Facebook.

The university owns a campus, a school, nine faculties with 56 Academic Departments, 7 Institutes, and 8 Centres and several Units and Cells. Moreover, it has 07 student unions and 26 registered student societies and offers 530 subjects under various postgraduate-, undergraduate-, diploma- and certificate level courses. Therefore, numerous lectures, meetings, celebrations and functions were frequently held before the pandemic situation. These events needed sophisticated auditoriums having sufficient capacity, thermal comfort, illumination, cleanliness and sanitary facilities in the past. Participants used to travel from different places to the venue of the function to attend physically. The students were usually given learning materials for lectures, and participants utilized stationary for meetings. The halls where inauguration ceremonies, orientation programs, celebrations of important days, religious and cultural events, awareness programs and discussion forums were conducted demanded decorations. Attendees were served with refreshments and provided with leaflets, booklets, and files.

However, the virtual events replaced actual events weighing social distancing since the initial phase of the pandemic. This replacement benefited environmental sustainability as the virtual events require only electronic media, internet connection and access to the relevant web conferencing platforms or social networks. Thereby, this newly incorporated practice eliminates many sources of environmental pollution such as water consumption, organic, paper, plastic/polythene waste, and transportation (Figure 1).
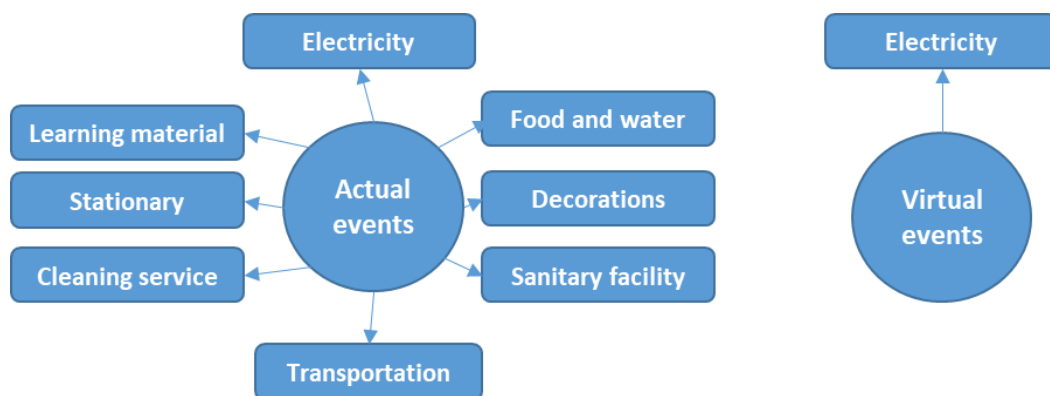

Figure 1. Sources of environmental pollution from actual events vs. virtual events

2.3. Introducing new Environmental Guidelines

Even though the institution has been moving forward with many changes due to the pandemic, there has been no reverse in pre-existing commitments in environmental conservation. However, it was decided to consolidate the green approach to amplify the progression. As a result, launching a proper set of guidelines as a written document to be followed by the UoC community was perceived as a comprehensive resolution to upgrade the environmental performance. Such guidelines provide the direction to individuals and

the university community as a whole, to determine if any planned activities are congruent with the university's green policy. On the other hand, it was necessary to integrate any new possible eco-friendly practice/s based on pandemic related alterations imposed to the entire university system. Therefore, considering all the above concerns, the CEI prepared a set of guidelines and improved it by addressing constructive suggestions made by the university administration and faculty representatives from academic and non-academic staff during the discussions held on the same.

The final version of the university`s environmental and sustainability guidelines comprises 131 instructions covering six different areas of environmental management: management of energy, water, waste, biodiversity of the premises, transportation and enhancing environmental consciousness among the internal and external bodies (Figure 2).
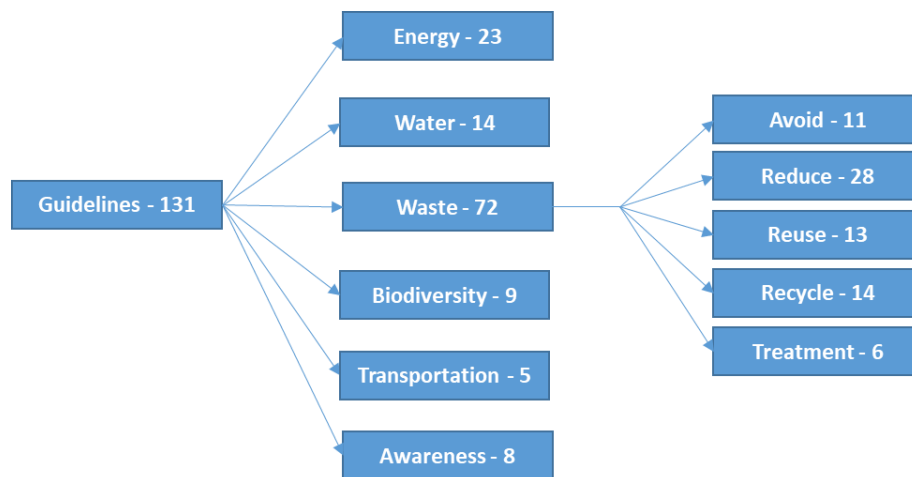

Figure 2. The number of instructions given under separate sections of the newly-developed environmental and sustainability guidelines of the university

The guidelines introduced innovative action such as promoting litterless lunches and shifting to a paperless system, which have been highly progressive, especially with the influence of the pandemic. Also, the university urged providing shuttle services to the staff for safer commuting.

2.3.1. Practicing litterless lunches

Organic waste generation mainly comprises food waste and yard waste of the campus premises. Nevertheless, as stated at the beginning of the section 2, organic waste generation during the pandemic has been lower by more than 90% of that in the year 2019. However, the instructions given in the guidelines intend to minimize the remaining 10% of the possible organic waste generation and are applicable for the post-pandemic period as well.

The staff who report to work according to rosters are not allowed to dine in university canteens. Instead, they should bring meals in a reusable food-grade lunch box and carry a reusable water bottle for personal usage. They should take back the remaining food waste home. Also, hydration stations are put in place to refill the water bottles. Even though the concept of litterless lunches was incorporated as a safety precaution blocking the spread of the Covid-19 virus, it seems to have positively contributed to further reduction of organic

waste accumulation on campus premises. Overall, the emissions associated with any food waste that ends up in landfill sites has been significantly reduced, making it only ~1 percent compared to 2019.

2.3.2. Adopting a paperless system

A paperless office can be described as any working environment with eliminated or minimized paper usage. Those offices substitute paper with electronic means such as the utility of computers, data storage devices, properly developed databases and data mining tools [Iseaaena and Yoon, 2016]. However, the innovative advancement of technology and prompt technological upgrades within universities do not solely lessen paper consumption as expected. Instead, the accumulation of paper has increased in large amounts due to generating hard copies in bulk repetitively and unnecessarily with the ease that the electronic devices have made. Besides, universities are one of the highest paper consumer organizations in the world [Raez and Hussain, 2007]. Therefore, a more solid plan is needed, which comprises strategies for employing electronic means interactively with guidelines to develop positive behavioural disciplines.

The UoC has settled in more conventional office practices for a long time, and in particular, there are shortcomings in funding for sudden innovations and prompt technological updates. Therefore, it is challenging to transform some of the processes immediately, as expected. The same has been true for the paperless system as well. However, having to go beyond the usual working mode by introducing innovative practices against existing health risks has created an excellent opportunity for a paperless university.

The UoC staff, who report to work during the pandemic, are mostly restricted to their own working space, without any travel to other divisions/departments for communication or any other purpose, to maintain the social distancing. This move prevented handing over any letter/s or document/s to other departments lessening the demand for printing out large amounts of paper. Besides, it has saved electricity and ink needed for printing. Likewise, many such actions, which were newly incorporated against the spread of the Covid-19 virus, induced the university to adopt a paperless system.

The university administration decided to stop issuing hard copies of invoices. Candidates from anywhere can register for new courses online. Electronic mails and telephone calls mediate the communication within the premises instead of circulating hard copies of letters. The application process and interviews for the existing study programs including those for postgraduates, have been conducted online. The students are provided with e-learning materials such as videos, audio, PDFs, presentation slides and references available on the web, and they should submit assignments online as soft copies. All the announcements are shared among the UoC community through e-mails. These safety precautions have solely cut off a large amount of paper need in the university. Therefore, continuing these progressive actions for a paperless system is expected even after the pandemic situation is gone.

Figure 3 depicts instructions for managing paper usage, addressing how to avoid, reduce, reuse and recycle paper. However, the inclusion of these new guidelines for paper usage intends to manage the unavoidable minimal paper usage sustainably and should be followed by everyone within the university during the pandemic and are applicable for the post pandemic phase.
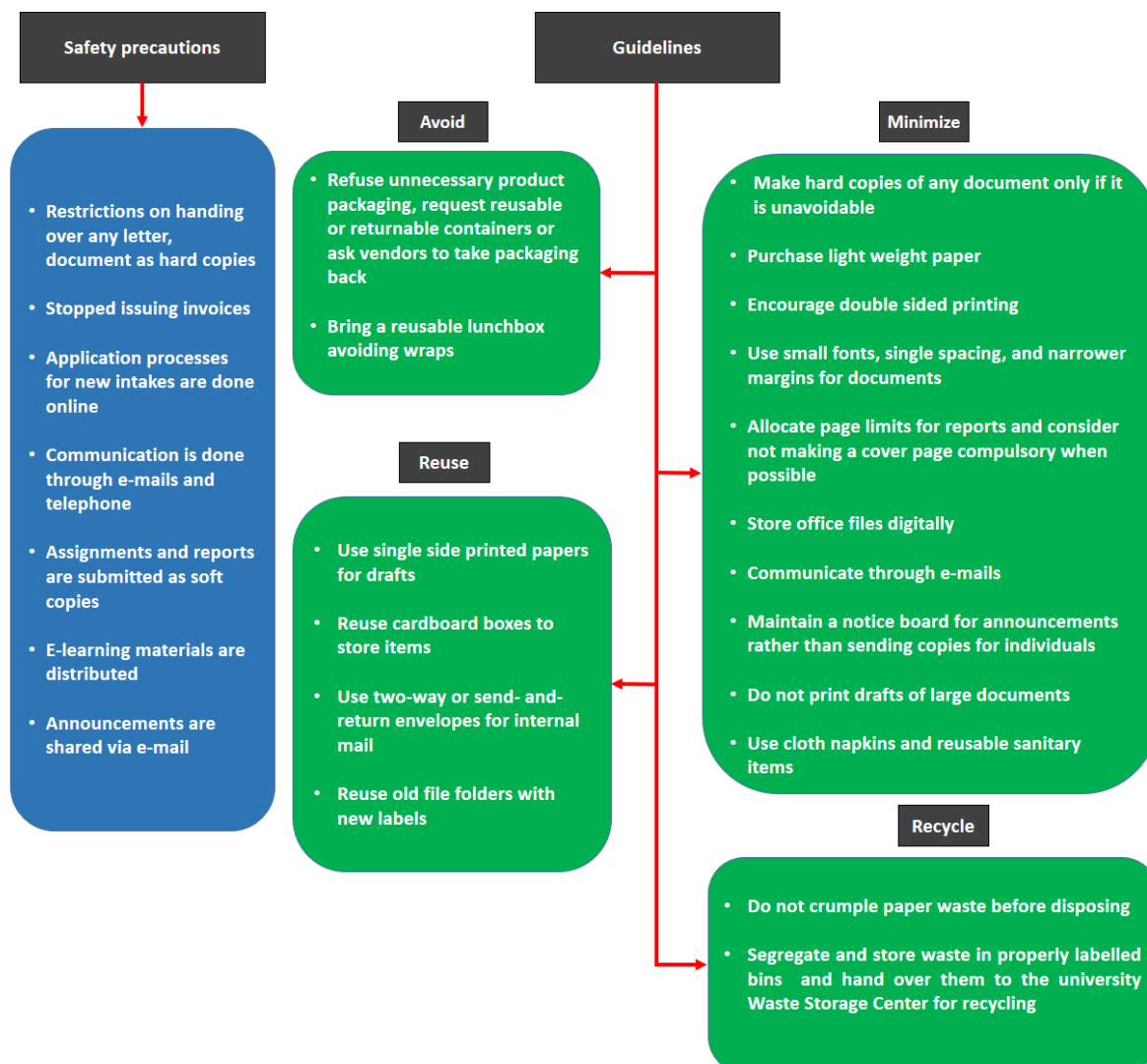
Figure 3. Safety precautions imposed during the pandemic, which reduce the paper usage vs. guidelines introduced for managing paper during and post-pandemic period

2.3.3. Commencing green transportation modes

Transportation is an active contributor to greenhouse gas Emissions (GHGs). Thus, the increasing demand for transportation has become a problem as it causes traffic congestion, parking shortages, and more importantly, pollutes the environment, triggers ozone depletion, intensifies climate change and contributes to declining biodiversity [Banister et al., 2011; Morris, 2009]. As a responsible institution towards protecting the environment, the UoC has been keen on providing transportation for the staff, which minimizes single-occupancy vehicles while promoting green transportation modes.

As per the decisions made, only one-third of the staff should report to work in person during the pandemic. Also, safer commuting should be affirmed to them to minimize the risk of transmitting the Coronavirus. Therefore, the university administration decided to commence shuttle services appropriating five vehicles for five different routes through which most staff travel to the university. Even though this mission is still in its initial phase, it has got 258 registered users, and has the capacity for commuting approximately 28% of

the staff to work during the pandemic for daily travel between the university and home. This initiative is expected to be further expanded in the future.

2.4. Strengthening the recyclable waste management

The former system of managing recyclable waste of the university remained the same, though the amount of waste generated during the pandemic is considerably low. The Central Environmental Authority, Sri Lanka, collaborated with the UoC to establish a Waste Storage Center (WSC) in 2017, which possesses separate compartments to store plastic, paper, glass, metal and e-waste disposed of by the university. Recyclable waste in the university premises is collected and stored in the WSC until recyclers take them away for recycling. That is the usual way of handling all the recyclable waste in the university since 2017. The process includes segregating waste into separate bins as organic, paper, plastic, metal and e-waste, storing them in the WSC and sending them for recycling. It was decided to continue this process even during the pandemic, as it was successful and established well with the janitorial plans. However, new guidelines have been introduced to encourage disposing of paper in good condition without much crumpling and cleaning glass before disposal. Also, reusable masks and eco-friendly sanitizers (instead of soap, as soap consumes a high amount of water and discharges harmful wastewater into the environment) have been promoted.

2.5. Expanding the composting facilities

Composting facilities are already available in certain faculties and institutes of the university. The latest composting facility was established during the pandemic, in the Faculty of Arts. Leaf litter is collected in ~15-20 waste bags per day at the Faculty of Arts. The janitorial service spends approximately 6,000 LKR per month for these bags, and the faculty lacks sophisticated space to store them until the Municipal Council collects them. Besides, the process involves transportation and labour costs and relevant indirect Carbon emissions. Moreover, the faculty purchases fertilizers and compost from outside to use for plants on the premises. Most importantly, collecting waste bags by the Municipal Council was delayed as the number of labourers working during the pandemic has been low. Therefore, the faculty was searching for a solution to manage its organic waste. On the other hand, the accumulation of organic waste at landfill sites is a source of disease transmittance, emissions of GHGs, soil pollution and contaminating surface- and groundwater resources [Seng et al., 2013]. Therefore, it was decided to commence a composting project using the leaflitter and food waste of the Faculty of Arts, as a greener solution, based on the above concerns.

Since the canteen waste is not available during the pandemic, only the leaflitter of the premises was used for composting. The process involves two simple steps: shredding the leaf litter using a mill and letting them ferment with the microbial activity; doing regular digging and turning up the pile. The process took only two months to produce the first pile of compost and the Faculty of Arts managed to fertilize the plants within their premises by only using the first file of compost they produced. As the process has been very successful, the Faculty of Arts expects to increase the input of organic waste with the collaboration of the Faculty of Management and Finance and the Faculty of Law. Also, there is a plan to sell excess amounts of compost produced to outside vendors after fertilizing plants of the university. The UoC expects to expand the existing composting facilities to incorporate any other faculties/institutes where composting of the organic waste is still not in practice.

2.6. Enhancing the green cover

As a metropolitan university situated in the commercial capital, the UoC strives to enhance the university's greenery. Despite having ~40% green cover, the university launched four new projects to transform ground spaces into green patches during the pandemic.

On two acres, a botanical garden with medicinal flora has been established. It contains 111 flora belonging to 21 trees -, 18 bush-, 9 small plants -, and 05 vine varieties. An orchard with under-utilized fruit trees has been created at the Faculty of Education. There are 55 Lilly Pilly and Guava plants in the garden. Twenty trees have been planted marginally on the university sportsground, including Rose Apple, Rambai, and Ceylon Olive. In addition, 100 trees have been planted along the roadside of the Faculty of Technology. The flora used in roadside planting include Golden Shower, White Marudah, Trincomalee Wood, Lansone, and Santol.

3. Summary/ Concluding Remarks

The revised actions adopted in compliance with the health restrictions against the Covid-19 pandemic provided an excellent opportunity for the UoC to fine-tune its green strategy. The university continues functioning with less than 10% of its daily entrants, minimizing waste generation, energy usage, and water consumption. Replacing actual gatherings with virtual events has lowered electricity, water, paper, and stationery use, eliminated decoration waste, and minimized transportation needs. Furthermore, it has minimized staff requirement including the cleaning crew, environmental pollution, and overall greenhouse gas emissions. The overall emissions due to open dumping of food waste at landfill sites was ~1 percent in 2020 compared to 2019. The administration developed a new tool, a set of guidelines with 131 environmental guidelines, to persuade the UoC community to be accountable for the institution's green policy. Promoting litterless lunches, transitioning to a paperless system, and establishing shuttle services for safer commuting are all long-awaited and promising efforts that came into practice in light of the pandemic-related health restrictions. The new composting facility at the Faculty of Arts has drastically reduced the organic waste and provided adequate fertilizer for the faculty's greenery. Four new projects have been launched to expand the green cover to offset the university's carbon emissions and enhance biodiversity. With the experience of many progressive initiatives during the pandemic, the UoC hopes to continue these adopted measures while incorporating potential improvements. There are plans to further expand the composting facilities, green cover and increase the renewable energy production and consumption in the future.

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