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Impact of COVID-19 on plastic waste management in Los Angeles

Executive Summary

Around the world, the COVID-19 pandemic resulted in immense changes to modern waste management systems. As the pandemic proliferated throughout 2020, both medical waste and residential solid waste increased significantly. With increased demand for household products, takeout dining, and personal protective equipment (PPE), the pandemic also increased generation of plastic and particularly single-use plastic waste. Consequently, many of the existing environmental problems related to plastic generation, disposal, and management were exacerbated.[1]

Yet, when it comes to the negative environmental impacts of plastic, the writing was already on the wall before 2020. Coupled with the inadequacy of our recycling systems, policies aimed at reducing plastic waste and pollution have not been adequate to cull the ever increasing rate of plastic going into our environment, and particularly our oceans. Despite our well-intentioned recycling habits, plastic's life cycle is still largely linear; most plastic waste goes either to a landfill or into the environment, and almost all new plastic comes from fossil fuels. While plastic has served an important role in moving our civilization forward, the negative externalities of global plastic consumption are significant and growing. Stronger, more coordinated efforts must be taken to address these externalities in both the public and private sectors.

Although the pandemic intensified an already persistent plastic problem, it also proved our civilization is capable of monumental adaptation to benefit the health and wellbeing of our communities. Focusing on this potential bright side, this adaptability can be harnessed by building owners to implement new technologies and policies to curtail plastic consumption. After examining the environmental issues around plastic, this paper will explore how to reduce plastic consumption in the context of commercial buildings, the largest generation category of plastic waste in California. While office employees largely work from home until a vaccine is distributed, a unique opportunity is presented in early 2021 to retrofit buildings to reduce employees' plastic consumption and waste. We will focus on one of the most impactful categories of plastic waste, food-related plastic, exploring some example policies around reusing materials. Finally, we'll illustrate how a building owner could put these policies in action through the lens of Community-Based Social Marketing, a robust environmental behavior change framework.

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Table of Contents

Section 1: What makes plastic unsustainable?

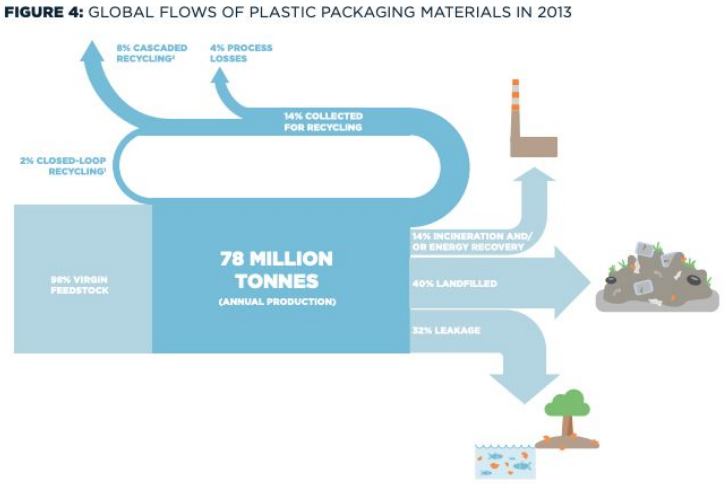
Plastic is everywhere

Fundamentally, the unsustainability of plastic stems from how integral plastic is to the function of our society and economy. After plastic was first invented by John Wesley Hyatt in 1869 (back then it was called a "synthetic polymer"), its use quickly proliferated in manufacturing because it was not dependent on scarce natural resources, cheap to produce, lightweight, durable, and extremely versatile. Some even argue that the invention of plastic helped to hurdle us into a new industrial economy and middle class consumerist culture that continues to this day.[2] As it turns out, plastics are now woven into almost every system of our society, including manufacturing, food, transportation, medicine, electronics, and infrastructure, not to mention most of the clothing on our backs. Nearly every industry is now dependent on plastic, and attempting to avoid it entirely is virtually impossible.

The dark side of plastics

Despite the usefulness of plastic to our society, the dark side of plastic emerges when one begins to grasp the implications of its largely linear life cycle. Whereas 33% of aluminum [3] and 66% of paper is recycled [4] in the U.S., less than 9% of plastic is recycled.[5] Globally, only 2% of plastic is closed-loop recycled, meaning it is recycled into a product of similar quality.[6] Where does the remaining plastic end up? About 40% is dumped into landfills, 14% is incinerated, and a striking 32% is "leaked" into the environment (See Figure X).[6] Given 6.3 billion tons of plastic waste have been produced since 1950[7] and plastic takes about 400 years to naturally decompose[8], unsurprisingly this 30% has a significant impact on our environment and economies that depend on the health and aesthetic value of natural systems.

Figure 1. Global flows of plastic packaging materials in 2013



Environmental impacts

Marine ecosystems

Plastic comprises 80% of ocean litter,[7] and each year, around 8 million tons of plastic are dumped into our oceans; this is equivalent to the weight of nine Golden Gate Bridges.[9] At the current rate of demand for plastic, this amount is expected to double by 2030 and quadruple by 2050.[6] Plastic litter has a profound impact on wildlife, with scientists reporting that millions of birds, fish, and other marine animals are killed every year from plastic pollution. As reported by National Geographic, starvation and entanglement are the two primary causes of plastic-related wildlife death.[8] According to NOAA, plastic comprises most of the litter found in Southern California coastal habitats, and a third of Southern California's sea floor is littered with plastic trash (source). More recently, it was discovered that plastics break down (not to be confused with decompose) into tiny pieces known as *microplastics*. Microplastics have been found in aquatic species, our drinking water supplies, and even floating in the air. The human health and environmental implications of microplastics are still not fully understood.[7]

Greenhouse gas emissions

The production of plastic also makes a significant impact on global fossil fuel consumption, and by extension, greenhouse gas emissions. Producing plastic is inherently carbon intensive because plastics are primarily derived from petroleum that needs several rounds of processing to eventually become a plastic product.[8] Global plastic production accounts for approximately 6% of total oil consumption on earth.[6] As the plastic industry grows, this percentage is expected to jump to 20% by 2050[6], accounting for about 17% of the global carbon budget.[10] Despite public pressure on the plastics industry to take responsibility for plastic pollution, a 2020 Reuters survey of the largest oil and chemical companies (e.g., Chevron, Dow, Exxon) indicated this industry only plans on investing around $2 billion dollars to reduce plastic waste in the next five years.[7] This investment is a drop in the bucket compared to the $400 billion dollars the industry plans on spending over the next five years to expand and build virgin plastic facilities.[11]

Economic impacts

As plastic continues to accumulate in our environment, there are also negative economic implications related to degradation of natural systems (i.e., loss of natural capital), tourism revenue, and plastic litter removal. Valuing Plastic estimated plastic pollution accounts for over 13 billion dollars (USD) in damage to marine ecosystems every year.[12] Correspondingly, plastic pollution also negatively impacts the productivity of commercial fisheries and fish stocks available for human consumption.[13] As more studies are published illustrating how toxic plastic-based chemicals make their way into fish destined for our dinner plates, it is likely the public will increasingly avoid eating fish due to fear of contamination[13], further negatively impacting fishing industries. Because litter degrades the aesthetic value of beaches, plastic pollution can also directly impact revenue to the coastal tourism industry, including restaurants, hotels, and outdoor recreation vendors.[13] Here in California, $420 million dollars is spent each year to clean up litter (mostly plastic) in streets, parks, storm drains, and waterways.[15]

Single use plastics

Given the myriad of plastics' negative externalities, many have pointed the finger at *single use plastics*, plastics meant to be used just once before disposal. These items include plastic bags, utensils, drink bottles, and packaging, among other products. Single use plastics make up about 40% of all plastics produced each year.[8] Plastic packaging (e.g., take out containers, cling wrap, drink bottles) alone accounts for 26% and is the single largest category of plastic produced by volume.[6] As they are quickly used and transformed into waste, plastic packaging makes up nearly half of plastic waste globally[16] and comprises the vast majority of waste collected from coastal clean-ups.[6]

As public pressure has intensified to address plastic pollution in recent years, several laws banning or managing single-use plastics have been proposed and implemented throughout the U.S. As of 2020, eight U.S. states (California, Connecticut, Delaware, Hawaii, Maine, New York, Oregon, and Vermont) have legislation banning or limiting use of single-use plastic bags. At the federal level, U.S. Senator Tom Udall and U.S. Representative Alan Lowenthal introduced the *Break Free From Plastic Pollution Act* in February, 2020. While still awaiting legislative action, this policy is designed to phase out single-use plastic bags, utensils, and foodware and would require plastic producers to bear some of the plastic pollution management and recycling costs. [26] In California, lawmakers recently approved the *California Circular Economy and Plastic Pollution Reduction Act* (AB 1080). If signed into law, it would require 75% of single-use plastics to be reduced, recycled, or composted by 2032.[15]

Why recycling isn't enough to manage plastic pollution

Despite policies discouraging use of single-use plastics, these policies alone are not enough to counteract our flawed plastic recycling systems. Although the recycling symbol appears on most plastic products, recall that only 9% of plastic is recycled worldwide. This low recycling rate is due to a combination of both technological and economic factors.

Technological factors

Consider the fact that current plastic recycling technology is limited such that a plastic product can only be recycled two to three times before its quality is too low to be made into a new product[17]; less than 1% of plastics produced between 1950 and 2015 were recycled more than once.[18] Moreover, despite the fact most plastics are recyclable, many Material Recovery Facilities (MRFs) will not recover and recycle single-use plastic products due to difficulty in sorting and the high likelihood that products are contaminated with food residue.[32] According to UCLA's extensive 2020 report on plastic waste, out of the 7 categories of recyclable plastic resins, "only High-Density Polyethylene (HDPE, Code 2) and Polyethylene Terephthalate (PET, Code 1) bottles are currently commonly recycled in Los Angeles County".[32] For the most part, plastic resin types 3, 4, 6, and 7 (e.g., cosmetic containers, yogurt containers, cups, utensils) go directly to the landfill in Los Angeles County.[32]

Economic factors

Beyond these technological barriers, with the collection, sorting, and processing involved, recycled plastic ends up costing significantly more than creating a new product with virgin material.[17] Recycled plastic became even more expensive when officials in China announced they would largely stop buying plastic waste from the U.S in January, 2018. Since then, other Asian countries have similarly reduced their imports of U.S. plastic waste. Between 2017 and 2019, U.S. plastic exports decreased by about half, from 750,000 tons to 375,000 tons.[19] This alone has reduced the economic viability of recycling plastic such that many recycling companies in the U.S. have either raised their prices significantly (up to 4 times) or ended recycling programs entirely.[28] According to the UCLA Luskin Center for Innovation, multiple recycling centers and MRFs in Los Angeles County have closed since this market shift occurred in 2018.[32] These factors coupled with low landfill costs result in the reality that it is simply cheaper to dump most plastic waste in a landfill rather than recycle it.[32]

Section 2: How has COVID-19 exacerbated these issues?

General impacts

Throughout the world, COVID-19 caused an overall increase in demand for plastic, including single use plastics (e.g., take out containers, packaging for online orders) and plastics used to manufacture medical equipment and personal protective equipment (PPE) (e.g., gloves, masks, gowns).[7] In just two months of the pandemic, the U.S. created an entire year's worth of medical waste.[7] Mandated lockdowns and work from home policies caused a substantial increase in residential solid and recycling waste; between March and April 2020, when the pandemic hit the U.S., the Solid Waste Association of North America observed a 20% increase in residential waste.[20] Reflecting the increase in single-use plastic use due to the pandemic, changes in the types of plastic pollution were also observed. At an annual October coastal clean up event in Los Angeles, volunteers reported collecting higher levels of PPE, take out containers, and plastic bags, with most of the plastic trash being food-related.[21]

Recycling

Though COVID-19 resulted in an overall increase in use of plastic, and especially single-use plastic, a corresponding increase in plastic recycling was not observed. This can largely be attributed to the drop in oil prices triggered by the pandemic, resulting in the lowest virgin plastic prices seen in decades.[7] As production costs dropped for virgin plastic, producing recycled plastic became even less economically viable; recycled plastic bottles now cost up to 93% more to produce than those made from virgin plastic.[7] Consequently, demand for recycled plastic plummeted worldwide, even for the most recycled categories of reclaimed plastic (i.e., PET (#1) and HDPE (#2)).[20] Officials at Resource Recycling Systems, a sustainability and recycling consulting firm, reported that between January and June of 2020, nearly 150 recycling programs in the U.S. were suspended and many were cut altogether due to COVID-19,[22] adding insult to injury to an already struggling recycling industry.[19] In many cases, U.S. recycling programs were also suspended due to fears that recycling center employees would contract COVID-19 either from contaminated recycled materials or working in close proximity to one another.[22]

Suspension of plastic policies due to hygiene concerns

Along a similar vein is the controversial topic of suspending plastic bag ban policies to reduce COVID-19 transmission risk to essential workers. Given evidence that most reusable bags are rarely washed [23] and COVID-19 can survive on surfaces for multiple days,[7] many elected officials were initially urged to temporarily suspend or delay the implementation of plastic bag ban policies to protect retail and grocery workers. Altogether, throughout U.S. states and municipalities, 17 plastic bag ban or fee policies were delayed, 39 plastic bag ban or fee policies were suspended (including the state of California), and 16 policies were implemented banning reusable bags.[34] Unsurprisingly, the Plastics Industry Association (PIA) took advantage of this moment in a letter to the U.S. Department of Health and Human Services reinstating previous arguments that reusable bags present a high risk of disease spread and framing single-use plastics as the safest choice.[32]

However, critics were quick to point out there was no evidence that single-use plastic bags were less likely to spread COVID-19 than reusable alternatives.[23] A subsequent study published in the Journal of Environmental Science and Technology echoed this sentiment, stating that the research cited in the PIA letter did not examine COVID-19 and rather, available evidence suggested reusable grocery bags presented a very small risk of COVID-19 transmission compared to human-to-human contact via respiratory droplets.[24] Moreover, over 125 health experts around the world signed a statement in June, 2020 that reusable items can be similarly hygienic if they are washed and/or disinfected before use.[33] Furthermore, some experts have questioned the plastic industry's underlying assumption that single-use plastic bags are always the most sanitary option. In an article published in Waste Dive, Dr. Kate O'Neil from the University of California Berkeley stated that in comparison to sterile gloves and masks used in a doctor's office, single-use plastic bags are not held to the same hygienic standards and thus cannot be assumed to be sterile.[25]

Section 3: Is there a bright side of COVID-19 when it comes to plastic management?

Unequivocally, the COVID-19 pandemic created an even more unsustainable plastic management landscape. Concerns around hygiene and virus transmission helped single-use plastics proliferate, and dropping oil prices further hampered the recycling industry's ability to reclaim existing plastic products. While this is discouraging, the COVID-19 pandemic also proved our society is capable of quickly and dramatically shifting our systems and everyday behaviors for the greater good and health of our communities. Could this momentum be channeled towards other altruistic behaviors? With employees not returning to the office until the spring or summer of 2021, we believe the COVID-19 pandemic presents a unique opportunity for sustainability managers to implement new plastic management policies in their commercial buildings that reduce employees' plastic consumption. Given many employees will have spent nearly a year away from the office environment to remain socially distanced, they may be more amenable to policy changes when they return to the office.

Our focus? Food-related plastic waste in commercial buildings

According to 2018 CalRecycle data, the commercial sector (2,370,710 tons/year) in California generates 60% more plastic waste than the residential sector (1,500,580 tons/year).[30] We will focus on food-related plastic waste generated in commercial buildings based on analysis conducted by UCLA which found that "reusable food service ware in place of disposable options has the greatest potential to reduce the negative impacts associated with plastic waste in Los Angeles County".[32]

In their 2020 report, the UCLA Luskin Center for Innovation analyzed various plastic alternatives related to food service ware and found reusable alternatives (customer and vendor owned) presented the greatest cost savings for businesses while reaping the biggest environmental benefits via reduced ecological harm and greenhouse gas emissions. For instance, while a disposable coffee cup is typically only used once before disposal, a reusable coffee cup can be washed and reused thousands of times. According to their analyses, this is also the case for reusable water bottles, food clamshells, travel mugs, and utensils. As dishwashers become more energy and water efficient and the energy grid is decarbonized, the lifetime impacts of reusables will likely be continually reduced compared to disposables over time. In terms of cost savings for businesses and individuals, there is an initial upfront investment in the reusable items and the infrastructure needed to clean them, but over time, businesses generally save money by removing the recurring cost of disposable items and reducing their waste processing and litter clean up costs. However, despite the upfront investment in reusables, many businesses break even in the first year and subsequently save thousands of dollars per year. Yet, there are some limitations to this approach including concerns around health codes and lack of space to implement dishwashing infrastructure.[32]

What could plastic-related food waste reduction policies look like?

The approach to implementing a reusable policy will greatly depend on the type and size of the business or office space. Smaller businesses, for example, may only have the capacity to install a dishwasher onsite, while larger businesses with a food court or food vendors would need to dedicate an entire room and hire staff for cleaning dishware.

Some examples of reusable policies include:

Coffee and beverages:

- Replace plastic pod based coffee machines with drip coffee or espresso machines that do not generate single-use plastic waste. Similarly, replace tea bags with bulk tea containers and reusable tea strainers that can be washed on site.
- Remove disposable water cups, and instead encourage employees to bring their own cup or provide reusable cups to wash onsite with a dishwasher. Make sure to provide employees with filtered water onsite to discourage use of bottled water.

- Encourage employees to bring a travel coffee cup to use for purchasing coffee or beverages outside the office. The employer could also provide a number of travel mugs and drink tumblers to allow employees to use at their convenience or rent out for free at the front desk.

Dishware:

- Install a dishwasher/sink and provide reusable dishware and utensils to employees.
- For take out containers from food vendors onsite, implement a reusable take out container system where all vendors are given the same containers and employees can drop off dirty containers at a common drop off box. Similarly, these could also be encouraged to be used among employees who leave the office to purchase a meal at a restaurant and have leftovers. To avoid theft, businesses could implement a system where containers are numbered and checked out at the front desk; alternatively, customers could be charged an upfront cost of the container which would be automatically refunded when the container was returned.
- Similar to the take out containers, reusable bags could be provided to employees or rented out at the front desk.
- In food courts, replace all disposable single-use plastic utensils and dishware with reusable items; implement a dish cleaning system on site. If employees want to take food to their desk or offsite, offer reusable utensil sets for purchase when customers pay for their meal or provide a reusable set to each employee for their desk area specifically.

Food products:

- Eliminate vending machines for dry foods (crackers, cereal, chips etc.) and replace with bulk food dispensers and small plates and bowls employees could use and put in the dishwasher.

Community-Based Social Marketing Approach

However, while many of these policies sound simple enough, actually getting people to consistently adopt them is a completely separate task. Changing human behaviors around established habits is notoriously difficult, especially when the dominant culture and infrastructure consistently reinforce the unsustainable behavior. While a business has the advantage of being able to set up a controlled, customized system around reducing plastic waste, most of the forces that determine human behavior are largely out of the businesses control if they want to implement a voluntary policy. Thus, when implementing policies to address plastic waste, it behooves businesses to use evidence-based approaches based on environmental behavior change science. With this in mind, we'll conclude the paper with an introduction to Community-Based Social Marketing (CBSM), an evidence-based approach to environmental behavior change, and how we'd apply it to an example policy from above.

CBSM is a tried and tested environmental behavior change framework that, when applied, can greatly increase the likelihood of success of any environmental behavior-based policy. CBSM has been successfully applied to encourage people to reduce their energy and water consumption, increase land use conservation practices on farms, increase use of public transportation, and increase recycling and

composting rates. The framework is uniquely robust as it draws from many effective approaches gleaned from different arenas of behavior change research, including social norms, commitments, targeted messaging, social diffusion and more.[31]

Because food-related plastic waste has the most potential to reduce plastic waste in LA County (cite UCLA report), we will apply the CBSM framework to a reusable take out container policy. Overall, this policy would aim to reduce single-use plastic waste related to take out clamshells. The voluntary policy would encourage workers to bring their own reusable container to work.

There are five main steps to implementing the CBSM framework:

1) Select behavior you want to change
2) Identify barriers and benefits of selected behavior
3) Develop strategies to change behavior
4) Pilot CBSM strategy
5) Fully implement and evaluate CBSM framework

Step 1: Select behavior

The first step to utilizing the CBSM framework is to select the behavior you want to change. One should have a few things in mind when choosing a behavior and subsequent policy to change that behavior. Ideally, the selected behavior should make a large environmental impact, have a high likelihood of adoption, and should currently occur at a low rate (if people are already doing it, what's the point?). Additionally, one should identify the end-state behavior, that is, the behavior that ultimately will create the environmental impact. In the case of our reusable container policy, the end-state behavior would be employees actually using the reusable containers; employees bringing them to work does not necessarily ensure employees will use them.

Step 2: Identify barriers and benefits

After selecting the behavior, the second step to using CBSM is to identify the barriers and benefits of people using a reusable food container. Sustainability managers may want to start by observing employees to understand if there are differences between people who already use reusable containers and those who do not. For instance, are women more likely to use them than men? After observation, conducting separate focus groups with these distinct groups can help get a sense of what underlies someone's choice to use a reusable versus disposable container. For those that already use reusable containers, try to understand what values, beliefs, and attitudes are unique to this group. Is this group more aware of the environmental issues around plastic pollution? Do they hold environmentalism as a core value? What benefits do these employees find from reusable containers? For the group that doesn't currently use reusable containers, managers should try to understand what benefits they find from disposable containers. Are disposables simply more convenient than reusables? Additionally, try to identify what barriers could exist for the group that doesn't use reusable containers. Do they believe reusable containers are unsanitary? Are they unaware that disposable takeout clamshells are not commonly recycled? Using both focus groups and a representative survey, sustainability managers

should aim to find out 1) what is beneficial about reusable containers and 2) What is challenging about using reusable containers.

Step 3: Develop behavior change strategies

After identifying benefits and barriers to using reusable containers, the next step is to develop strategies to increase the benefits of reusable containers and decrease the barriers to using reusable containers. Science-back behavior change strategies commonly implemented in the CBSM framework include: commitments, social norms, social diffusion, prompts, messaging, incentives, and convenience. See figure X below on how these strategies can be applied to our example around reusable containers.

1) Commitments
   How do they work?
   - When people commit to something small (e.g., signing a petition to support plastic reduction policies at the office) they are more likely to agree to a larger request (e.g., regularly bringing and using reusable containers at work). By committing to a small request, a person may label themselves as someone who cares about plastic pollution and thus will subsequently act more sustainably to align their actions with their identity.

   Example of how to use:
   - Ask employees to sign a petition around the topic of plastic pollution. After some time, ask employees to replace their use of disposable containers with reusable containers.

2) Social norms
   How do they work?
   - As social beings, humans are motivated by the beliefs and behaviors of those around us. When we learn that a behavior is socially unacceptable, we are less likely to do that behavior. When we learn that a behavior is very uncommon, we are less likely to engage in that behavior.

   Example of how to use:
   - In an email to employees around reusable container policy, start with a statement such as “In a survey of your coworkers, 90% of respondents indicated they would support a reusable container policy at work to decrease our company’s plastic waste”
   - Avoid communicating that the undesirable behavior is very common as this would have an unintended effect. For example, if the goal is to increase use of reusable containers, it would be not an effective strategy to communicate that 90% of employees use disposable containers.

3) Social diffusion
   How does it work?

- Similar to social norms, social diffusion describes humans' tendency to behave similar to people around them, such as neighbors, friends, and coworkers.

Example of how to use:

- Before implementing reusable container policy, identify a person in each department that is either already using reusable containers or is more likely to adopt this behavior compared to their coworkers. Ask this person to make a commitment to continue this behavior and openly talk with their coworkers about the importance of using reusable containers. Ideally this would be a person who is in contact with many of their coworkers on a weekly basis.

4) Prompts

How do they work?

- Many times, people fail to engage in environmental behaviors because they simply forget. Reminding people about the behavior in strategic locations can increase adoption of the behavior.

Example of how to use:

- Give employees magnets to place on their fridge and stickers to place inside their car and desk that remind them to pack their reusable container. Similarly, the employer could install signs in the employee parking lot to remind employees to bring containers inside.
- All stickers/signs should be concise, visually appealing, and focused only on the targeted behavior.

5) Messaging campaign

How do they work?

- Creative, strategic messaging around an environmental issue and related behavior can increase awareness around the behavior, change attitudes around the behavior, and increase subsequent adoption of the behavior.
- No matter what the delivery method (e.g., sign, email, workshop), messaging should be attention grabbing, concise, focused around the targeted behavior, and tailored to the audience's values, beliefs, and attitudes.
- Photographs, illustrations, and videos are more effective than text in quickly and vividly delivering a message.

Examples of how to use:

To grab attention:

- If conducting a workshop, begin with a brief but vivid video on the impact of plastic on marine wildlife.

- If using a sign or email, start with a compelling question or statement, such as “Did you know 30% of plastic waste ends up in the environment?” or “Each year, 9 Golden Gate Bridges worth of plastic are dumped into our oceans”

To align with existing beliefs:

- If many workers hold a false belief that disposable containers are recycled at high rates, it could be helpful to counter this belief with the fact that these containers are usually not recycled, and instead go into the environment or a landfill.

Other ways to increase effectiveness of message:

- Put the message in context of a story
- Use credible sources
- Incorporate rhyming or alliteration to increase message recall

6) Incentives

How do they work?

- Incentives provide additional benefits to those who engage in the behavior.
- To be effective, incentives should be visible and close to where the targeted behavior occurs.

Examples of how to use:

- Have employees report each time they use their reusable container and regularly reward floors or departments who most frequently bring a reusable container with a prize (e.g., pizza, a day off etc).

7) Convenience

How does it work?

- The more convenient a behavior is, the more likely someone is to do it.

Examples of how to use:

- Provide reusable takeout containers to all employees for use at work or create a rental system where employees can rent and return containers for free at the front desk.

Conclusion

Particularly for single-use plastics, it is evident that modern plastic waste management systems are not sustainable long term. As our consumption of plastic has increased, efforts toward a circular plastic economy have not yet been realized. Due to both technological and economic limitations, only 9% of plastic waste is recycled. Instead, most of our plastic waste either goes to the landfill or is "leaked" into the environment. Once in the environment, plastic waste wreaks havoc on marine ecosystems which has subsequent negative societal and economic impacts.

The COVID-19 pandemic worsened many of these problems by not only increasing demand for single-use plastics, but hindering the functionality of systems in place to reduce the environmental impacts of plastic waste. Several laws aimed at reducing single-use plastics were suspended or repealed, dropping oil prices further reduced the viability of the recycled plastic market, and many recycling centers shut down due to fears of virus transmission.

Yet, the COVID-19 pandemic also showed our society is capable of swift adaptation when needed. Focusing on this bright side, we maintain the pandemic presents a unique opportunity for commercial building owners to put new, more effective, plastic reduction policies in place as office employees continue to work from home in the early months of 2021. This discussion is centered around reduction of food-related plastic, a category of plastic that is most littered and least recycled. Instead of focusing on recycling, we emphasize policies on reuse, a more environmentally beneficial and less financially costly avenue for building owners. Lastly, we illustrate an example policy through the lens of Community-based Social Marketing, a science-based environmental behavior change protocol.

References

1. Sarkodie, S. A., & Owusu, P. A. (2020). Impact of COVID-19 pandemic on waste management. *Environment, development and sustainability*, 1–10. Advance online publication. https://doi.org/10.1007/s10668-020-00956-y

2. Freinkel, S. (2011, May 29). A brief history of plastic's conquest of the world. *Scientific American*. Retrieved from https://www.scientificamerican.com/article/a-brief-history-of-plastic-world-conquest/

3. United States Environmental Protection Agency (2020, October 07). *Aluminum: Material-specific data*. Retrieved from https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/aluminum-material-specific-data

4. United States Environmental Protection Agency (2019, November 13). *Paper and Paperboard: Material-Specific Data*. Retrieved from https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/paper-and-paperboard-material-specific-data

5. United States Environmental Protection Agency (2020, September 10). *Plastics: Material-specific data*. Retrieved from https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/plastics-material-specific-data

6. Ellen MacArthur Foundation (2017). *The new plastics economy: Rethinking the future of plastics & catalysing action*. Retrieved from http://www.ellenmacarthurfoundation.org/publications

7. Brock, J. (2020, October 05). The plastic pandemic: COVID-19 trashed the recycling dream. *Reuters*. Retrieved from https://www.reuters.com/investigates/special-report/health-coronavirus-plastic-recycling/

8. Parker, L. (2019, June 07). The world's plastic pollution crisis explained. *National Geographic*. Retrieved from https://www.nationalgeographic.com/environment/habitats/plastic-pollution/

9. How heavy is 8,000,000 tons? (n.d.). Retrieved from http://www.bluebulbprojects.com/MeasureOfThings/results.php?amt=8000000

10. University of California - Santa Barbara. (2019, April 15). Plastic's carbon footprint: Researchers conduct first global assessment of the life cycle greenhouse gas emissions from plastics. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2019/04/190415144004.htm

11. Carbon Tracker Initiative (2020, November 30). *The future's not in plastics: Why plastics demand won't rescue the oil sector.* Retrieved from https://carbontracker.org/reports/the-futures-not-in-plastics/

12. United Nations Environment Programme (2014, June 23). *Plastic waste causes financial damage of US$13 billion to marine ecosystems each year as concern grows over microplastics*. Retrieved from https://www.unenvironment.org/news-and-stories/press-release/plastic-waste-causes-financial-damage-us13-billion-marine-ecosystems

13. Beaumont, N.J., Aanesen, M., Austen, M.C., Börger, T., Clark, J.R., Cole, M., Hooper, T., Lindeque, P.K., Pascoe, C., & Wyles, K.J. (2019). Global ecological, social and economic impacts of marine plastic. *Marine Pollution Bulletin,142*. pp. 189-195, ISSN 0025-326X, https://doi.org/10.1016/j.marpolbul.2019.03.022.

14. California Ocean Protection Council and National Oceanic & Atmospheric Administration Marine Debris Program. (2018). *California Ocean Litter Prevention Strategy: Addressing Marine Debris from Source to Sea.* Retrieved from http://www.opc.ca.gov/webmaster/_media_library/2018/06/2018_CA_OceanLitterStrategy.pdf

15. Single-Use Packaging and Products, Senate Bill 54/ Assembly Bill 1080 (2019). Retrieved from https://docs.wixstatic.com/ugd/ad724e_b48e54d3887448b7945954625fa198d1.pdf

16. United Nations Environment Programme (2018). *Single-use plastics: A roadmap for sustainability*. Retrieved from https://www.unenvironment.org/resources/report/single-use-plastics-roadmap-sustainability

17. Sullivan, L. (2020, September 11). How big oil misled the public into believing plastic would be recycled. *NPR*. Retrieved from https://www.c.org/2020/09/11/897692090/how-big-oil-misled-the-public-into-believing-plastic-would-be-recycled

18. Geyer, R., Jambeck, J.R.,& Law, K.L. (2017). Production, use, and fate of all plastics ever made. *Science Advances, 3* (7). Retrieved from https://advances.sciencemag.org/content/3/7/e1700782

19. O'Neill, K. (2020, June 24). As more developing countries reject plastic waste exports, wealthy nations seek solutions at home. *The Conversation*. Retrieved from https://theconversation.com/as-more-developing-countries-reject-plastic-waste-exports-wealthy-nations-seek-solutions-at-home-117163

20. Love, B. J., & Rieland, J. (2020, September 06). COVID-19 is laying waste to many US recycling programs. *The Conversation*. Retrieved from https://theconversation.com/covid-19-is-laying-waste-to-many-us-recycling-programs-139733

21. Wigglesworth, A. (2020, October 09). How the coronavirus is changing L.A. County's waste stream. *LA Times.* Retrieved from https://www.latimes.com/california/story/2020-10-09/how-coronavirus-is-changing-l-a-countys-waste-stream

22. Bothwell, L. (2020, June 15). Lessons from Republic & RRS on operations during COVID-19. *Waste 360*. Retrieved from https://www.waste360.com/recycling/lessons-republic-rrs-operations-during-covid-19

23. Nemo, L. (2020, April 02). Single-use plastic bag supporters cite coronavirus risks in reviving sanitation concerns over reusables. *Wastedive*. Retrieved from https://www.wastedive.com/news/coronavirus-single-use-plastic-bag-reusables-health/575353/

24. Hale, R. C., & Song, B. (2020). Single-use plastics and COVID-19: Scientific evidence and environmental regulations. *Environmental Science & Technology, 54*(12), 7034-7036. doi:10.1021/acs.est.0c02269

25. Vann, K. (2020, March 25). COVID-19 puts BYO coffee cups on hold, but sanitized reusable systems could fill the void. *Wastedive*. Retrieved from https://www.wastedive.com/news/byo-coffe-cup-reusables-coronavirus-covid-19-/574817/

26. Break Free From Plastic Pollution Act of 2020, H.R. 5845 (2020). https://www.congress.gov/bill/116th-congress/house-bill/5845

27. Coffee, D., Faigen, M., & Milani, J. L., & Richardson, C. (2020, January). *Plastic waste in Los Angeles County: Impacts, recyclability, and the potential for alternatives in the food service sector.* UCLA Luskin Center for Innovation. Retrieved 2020, from https://innovation.luskin.ucla.edu/wpcontent/uploads/2020/02/Plastic_Waste_in_LA_County.pdf

28. Corkery, M. (2019, March 16). As costs skyrocket, more U.S. cities stop recycling. *New York Times*. Retrievedfrom https://www.nytimes.com/2019/03/16/business/local-recycling-costs.html?auth=login-email

29. Moore, S., Sutula, M., Von Bitner, T., Lattin, G., & Schiff, K. (2016). *Southern California bight 2013 regional monitoring program: Volume III. Trash and marine debris.* Southern California Coastal Water Research Project (SCCWRP) Technical Report 928. ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/928_B13_Debris.pdf

30. CalRecycle (2018). *Disposal-Facility-Based Characterization of Solid Waste in California*. Retrieved from https://www2.calrecycle.ca.gov/Publications/Details/1666

31. McKenzie-Mohr, D. (2014). *Fostering sustainable behavior: An introduction to community-based social marketing*. Gabriola Island, BC: New Society.

32. Radoszeweski, T (2020, March 18). Plastics Industry Association COVID-19 letter. *Politico*. Retrieved from https://www.politico.com/states/f/?id=00000171-0d87-d270-a773-6fdfcc4d0000

33. Greenpeace (2020, June 16). *Over 125 health experts sign onto statement on the safety of reusables during COVID-19*. https://www.greenpeace.org/usa/research/100-health-experts-sign-onto-safety-of-reusables-statement/

34. Product Stewardship Institute (2020, December 17). *COVID-19 Impacts on U.S. Plastics Policy, as of 12-17-20*. Retrieved from https://docs.google.com/spreadsheets/d/1IETKLGGxOp25I1Wi-Bkw1ZmdCHKesjz-AEjbcroi4Vw/edit#gid=0