

Stakeholder Engagement in Pro-Sustainable Actions within Municipalities

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Single-use or disposable plastics have become common use throughout the world leading to their accumulation in landfills and polluting the environment. It is estimated that about 300 million tons of plastic waste is being produced every year with about 60 percent of plastics produced since the 1950s ending up in landfills or the natural environment (UNEP, 2018). With the human race's continuing reliance on plastics, it is projected that 12 billion tons of plastic will be in landfills and the environment by 2050 (Plastic Soup Foundation, 2018). Biodegradable bioplastics, such as polyhydroxybutyrate (PHB), offer a sustainable alternative to petroleum-based plastics. They are natural byproducts of facilitated degradation of these synthetic plastics, such as styrene, through metabolic mechanisms found in microorganisms like *E. coli* (Kourmentza et al., 2017).

However, in order for this engineering device to be effective, a market for this product is needed in order for plastic producing companies to adopt it and the creation of an infrastructure to support it. A study indicates that misconceptions about what makes bioplastics positive lead to unstable positive attitudes, which leads to negative misconceptions and misuses of bioplastics, such as littering (Zwicker et al., 2021). Fostering stakeholder (e.g., individual citizens, green technologies like composting facilities) involvement in pro-sustainable actions like recycling and composting can help engage and inform the public on green technologies like bioplastics and foster proper use and efficiency of such processes. Thus, the focus of the STS topic is to investigate how a municipality involves (or disregards) certain stakeholders in their development of pro-sustainable actions to identify how it promotes and supports pro-sustainable behaviors like recycling (Wamsler, 2017). The area of focus will be on the communities of the City of Chicago, Illinois, due to their terrible recycling rates despite their ongoing efforts to improve their waste

and recycling infrastructure and their long history of environmental injustices in its southern and western communities as a result of past racist urban policies (Laurence, 2020; Numbers, 2020).

Investigating Stakeholder Engagement in Waste Infrastructures

A framework proposed by Christine Wamsler (2017) provides a guide in investigating municipal development of pro-sustainable action and its attempts in co-production through stakeholder involvement (e.g., future research and policy recommendations) to foster continuous and transformative adaptation processes. It examines the why and how different stakeholders are involved (or excluded) in the development of municipal strategies and how it is reflected in process outcomes (Wamsler, 2017). The focus of this research paper is to investigate the extent to which municipalities engage their internal and external stakeholders (e.g., individual citizens, proximity to the decision-making body, staff, outstanding individuals) to provide insight into how stakeholder engagement affects the outcomes of pro-sustainable actions and its process. The process timeline is illustrated by Wamsler in 4 main parts: (1) the trigger (i.e., the context), (2) the starting point / set-up (i.e., organizational and regulatory set-up, responsibilities, resources, goals), (3) development (i.e., assessing risks and knowledge, identifying and selecting adaptation options, and designing), and (4) the output (i.e., measures and strategies). This framework allows for assessment and comparison of developing adaptation and their outcomes with respect to the issue of collaborative governance arrangements.

Bioplastics Need for Stakeholder Engagement and Proper Infrastructure Support

According to market data compiled by European Bioplastics in cooperation with the nova-Institute, global bioplastics are expected to increase from around 2.11 million tons in 2020 to approximately 2.87 million tons in 2025 (EUBIO, 2021). Such growth can be attributed to bioplastics being promoted as solutions to the problems posed by non-degradable petroleum-

based plastics, such as polluting the environment via greenhouse gas emissions during its production and leaching of plastic into the environment at their end-of-life stages (European Environment Agency, 2021). Despite bioplastics being told to be more advantageous with characteristics similar to conventional petroleum-based plastics, it was estimated from 1950 to 2019 that bioplastics only take up one percent of the 368 million tons of plastic produced annually (EUBIO, 2021). Furthermore, the type of bioplastic (e.g., biodegradable, compostable, and/or biobased) determines its end-of-life treatment, such as being disposed in an industrial compost facility, a home composter, soil or fresh water, and/or a plastics recycling facility (European Environment Agency, 2021). With the diversity of what constitutes a bioplastic and the facilities needed to manage their disposal, it leads to the question of how much stakeholders understand the term bioplastics and its characteristics, and what waste infrastructure is needed to support their end-of-life management.

A study generated in Australia investigated how much the public knew, what they knew, and their perceptions were about bioplastics. Their results discovered that their perception of bioplastics were positive but their knowledge about them was low. This led to a discovery of potential issues related to the role that governments and local councils play in driving the development of waste management standards for bioplastics, such as what bioplastics are deemed 'recyclable' (Dilkes-Hoffman et al., 2019). Furthermore, a study found that misconceptions about bioplastics could end up being harmful, such as all bioplastics being automatically biodegradable, whereas that is not always the case. They indicate that such misconceptions about what makes bioplastics positive lead to unstable positive attitudes, which leads to negative misconceptions and misuses of bioplastics, such as littering (Zwicker et al., 2021). Thus, investigating how municipalities engage stakeholders in developing pro-sustainable

actions can provide insight on how to properly inform and engage stakeholders (e.g. individuals, green technologies like composting facilities) in promoting proper pro-sustainable behaviors and increasing the effectiveness of biopolymers in current waste infrastructures.

Recycling and Waste Infrastructure in Chicago

The City of Chicago located near Lake Michigan in Illinois has had a long history of dealing with waste disposal. Illinois started improving its recycling program in 1992 via its “Blue Bag” program, which was part of the Solid Waste Management Plan. This initiative recycled waste in a small selection of low-density residential areas of Chicago. However, the process to collect and remove the recyclables in the blue bags was expensive and inefficient, eventually resulting in many of the blue bags going straight into landfills in the early 2000s, highlighting the lack of infrastructure to support a workable recycling system (Jonquil, 2008). The newest and ongoing recycling reform that started in 2005 as a pilot program, officially replacing the Blue Bag program beginning in 2007, and being implemented city-wide in 2013 is the “Blue Cart” program (Hopkins, 2018; RecycleReminders, 2022). The aim of this program was to provide bi-weekly, single-stream recycling services to single-family homes and multi-unit buildings to reduce the need for landfills, lower disposal costs, and reduce pollution (Braff, 2022).

Despite this newest recycling reform, the recycling rates were at a relatively low 8 to 9 percent in 2020 with similar rates in 2021, lagging behind peer cities and national averages (Department of Streets and Sanitation, 2022a; Laurence, 2020). For example, the second lowest rate in 2018 was Houston’s at 17 percent, which is nearly double that of Chicago’s 9 percent (Department of Streets and Sanitation, 2022b; Hopkins, 2018). Using Chicago’s Blue Cart program as a case study, stakeholder involvement throughout the program’s process timeline will

be investigated to determine the impact of the involvement (or disregard) of stakeholders to help inform how to properly engage stakeholders in the creation of a recycling infrastructure that can support the inclusion of bioplastics.

Chicago's Blue Cart Recycling Program

Following Wamsler's process timeline, the trigger for the Blue Cart recycling program is to provide single-stream recycling collection for all single-family homes and multi-unit buildings with four units or less and to mediate the failed Blue Bag recycling program established in 1992 and the low recycling rates exhibited by the City (Braff, 2022; RecycleReminders, 2022). Multi-unit buildings with five or more units are handled by a private waste hauler and are not serviced by this program.

Internal Stakeholder Incentives, Biases, and Disputes

In step 1 of the process timeline (i.e., starting point or setup) of the Blue Cart program is dividing Chicago into manageable service areas to allocate recycling collection to private haulers, whom may be deemed as major internal stakeholders of the program. As of 2018, the Blue Cart program divides Chicago into six service areas and allocated the residential recycling collection of four zones to two private companies (Texas-based Waste Management, Inc. and SIMS Metal Management) and two zones located on the City's North and Southwest Side to the City's Department of Streets and Sanitation (DSS). Waste Management, Inc. manages three zones while SIMS Metal Management subcontracts its collection work of one zone to Lakeshore Recycling Systems (LRS). The contracts with the private haulers require them to file monthly reports with the City detailing where recycling is taken, how much contaminated material are in the bins that aren't caught at the curb and must be sorted out at recycling centers, and how much taxpayer money is being rerouted to subcontractors.

The company, Waste Management, Inc., had been responsible for collecting recycling from half of the City's regions since 2021. However, claims were made that this stakeholder had a potential conflicting incentive of diverting more waste towards landfills due to the company's ownership of said landfills. A report in 2018 by the Better Government Association supports this claim by discovering that Waste Management, Inc. diverted a higher number of recycling carts to landfills by labelling them as "contaminated" (Wetli, 2021). From 2014 to 2018, the company was shown to mark bins as contaminated twenty times more frequently than the other crews combined and accounted for nearly 90 percent of all recycling bins diverted to garbage dumps (Hopkins, 2018). Additionally, in 2019, the four areas serviced by Waste Management and LRS each received at least 1,477 complaints about missed service (i.e., missed pick-up of Blue Carts) compared to 249 complaints in the City's North zone managed by DSS (Hopkins, 2018).

Some City officials claim that these contaminated bins are an insignificant fraction compared to the greater than half-million tons of recyclable waste diverted from landfills since 2011. On the other hand, residential households claim that the company was inappropriately tagging them and needed to be educated on what is deemed as "contamination" (Hopkins, 2018). City officials also suggested that it may be due to their more aggressive education campaign, which is a claim disputed by its competitor, LRS.

Regardless of the reason for the high marking of Blue Carts as contaminated, the lack of central management of these internal stakeholders was a major factor leading to these contamination disputes. Chicago is the only major City that gives private haulers the sole discretion on deciding which of the recycling is diverted to landfills in comparison to the common practice of using municipal collection crews and fining residents for chronic contaminations. For example, San Jose with one of the nation's highest recycling rates at nearly

80 percent hires private contractors to pick up recycling and have private crews that sort out contaminants from recyclables or give residents another chance to do it themselves (Hopkins, 2018). Additionally, the lack of determining standards on what is deemed as “contamination” as well as high complaints of missed services led to an increase in the diversion of recyclables to landfills, resulting in the low recycling rates seen prior to 2018 of less than 10 percent (Department of Streets and Sanitation, 2022b; Hopkins, 2018).

The lack of proper management can also be seen in the City’s inability to properly collect data pertaining to the required monthly reports by the private haulers. This was highlighted by the DSS acknowledging it lacked the rest of the files of the mandatory reports dating back to 2011 for the other private haulers other than LRS (Hopkins, 2018). This restricted the City from properly investigating the reason for the large diversion of recyclables to landfills; thus inhibiting the City’s ability to properly address and resolve the complaints from external stakeholders (i.e., residential households).

Measures and Strategies to Mitigate Contamination Disputes

The output or measures and strategies created in response to the contamination disputes voiced by the external stakeholders and to reduce the diversion of Blue Carts to landfills led to a new contract with the LRS in 2021. The City contracted them to collect residential recycling in four of the six recycling regions to help make significant improvements to the Blue Cart Program. LRS possesses a single-stream recycling facility that can sort out cardboard, mixed-paper, glass, steel, other metals, and plastics. This contract is expected to take effect on June 7, 2021 and to run through June 2024. The president of the Chicago Recycling Coalition claims that LRS’s centrality on recycling, as opposed to other companies usually trash and landfill-centric increases its potential in helping to improve Chicago’s recycling program (Wetli, 2021). To

increase their reliability and potential as an aid to Chicago's recycling infrastructure, the new contract with LRS also states that it plans to recycle carts with less than 50 percent contamination to ensure more waste is being recycled.

Environmental Injustices Lead to Neglect of Minority Stakeholders

The City of Chicago has been an ongoing scene for environmental justice advocates. Although known for their multiculturalism, it has also been the site for ongoing discrimination and segregation. Its past history of racist policies and oppressive redlining led to highly segregated environments leading to environmental harms. In 2016, the City was one of the most segregated regions in the United States (US) with White Americans as the largest racial group accounting for 54 percent of the population (Numbers, 2020). A majority of the white population resides in the North side of the City, whereas the African American and Hispanic population reside on the south and west sides and southwest sides of the City, respectively.

The purpose of redlining is to not only keep out minorities out of affluent white neighborhoods, but also effectively devalue their wealth and opportunities to avoid financial hardships. This has led to environmental injustices, defined by Coursey, Geer, Hagerbaumer, Hammond, & Mendelsohn as the idea that "low-income and minority communities have been exposed much more to environmental hazards than affluent, white communities" (Coursey et al., 1994). These redlined areas exhibit decreased land value, which led to the encouragement for the construction of heavily polluting infrastructures, such as site highways, warehousing, and industry, alongside the disadvantaged residents and public housing projects (Climate-XChange, 2021). As such, many of the areas located on the south and west sides of Chicago became hot spots for pollution. For example, the Calumet River located in Chicago's 10th ward in Southeast Chicago is heavily lined with industrial facilities and is a major site of toxic industrial pollution.

In 2021, neighborhoods surrounding this area was in the 95th percentile for diesel emissions, 90th for hazardous waste, and 80th for air pollution (Climate-XChange, 2021). This has led to many other case studies in Chicagoan communities investigating these environmental injustices, such as the Little Village, which is a Latino neighborhood known to have increased health risks as a result of coal pollution (Mulvihill, 2020).

This brings forth the idea that pro-environmental claims sometimes exclude stakeholders, such as those in marginalized communities. For example, a woman part of such communities claims that her complaints or her voicing her concerns to the Environmental Protection Agency (EPA) were useless due to the EPA stating that the impact the industry had on such communities was not part of their jurisdiction. This also brings forth that the City of Chicago did not focus on working with such communities, but rather on working with academic institutions and regulating industry (Mulvihill, 2020).

2021 City of Chicago Waste Strategy

Another measure that can be seen as a response to addressing the recycling and environmental justice concerns was the development of a study to evaluate, assess, document, and update the various aspects of waste in Chicago in a plan named “2021 City of Chicago Waste Strategy” (Wetli, 2021). The City of Chicago partnered with Delta Institute, a well-respected 501c3 nonprofit specializing in municipal solid waste management, to create this report. It is comprised of multiple reports and assessments, such as an Existing Conditions Report, Waste Characterization and Generation Update Report, a Peer City Analysis, and Materials Management Strategies (Mayor’s Press Office, 2021). The report details more than 63 strategic recommendations to help address waste management with 12 being prioritized by the City in 2021 and 2022. The recommended strategies were developed through the collaboration of

more than 90 different City representatives and stakeholders from numerous municipal departments, nonprofits, universities, community groups, and individuals (Delta Institute, 2021).

The goal of this study was to produce a comprehensive waste and material's management plan to decrease waste disposal and its associated negative environmental impacts, reduce cost and increase efficiency, maximize economic investment and workforce development opportunities, and address social and environmental justice inequities. The main stakeholder that made the decision to partner with this institution was the City of Chicago Office of the Mayor. This governmental body directs policy, sets administration priorities, coordinates activities among City departments and sister agencies, and liaises with other governments and cities. It also ensures that other departments and City employees deliver effective and efficient services. Through this description alone, one may argue the lack of consideration of smaller stakeholders, such as Chicago communities and small businesses (Delta Institute, 2021).

The stakeholder responsible for assessing risks and knowledge and designing solutions are those residing in the Delta Institute. As mentioned previously, more than 90 different stakeholders worked on the formation of the report. A few of individuals working on the report come from large institutions, such as the Chicago Department of Public Health and the DSS, to environmental organizations, such as Illinois Sustainable Technology Center and Organix recycling. There are also individuals from other nonprofits, such as The Waste Shed and Plant Chicago. The main purpose was to review current waste and recycling data, programs, policies, and infrastructure, analyze best practices and programs in peer cities, and engage stakeholders throughout all sectors from the private sector to Chicago neighborhoods. Important stakeholders involved in Chicago's waste management was listed in the Existing Conditions Report of this case study as five different groups: Chicago Stakeholders, Cook and County and Chicagoland

Region Organizations, State of Illinois, and National Organizations, with Chicago Stakeholders sub-divided into three subgroups (Non-City Agencies, Nonprofit Organizations, and Academic Institutions) (Delta Institute, 2021).

Despite the diversity of external stakeholders in the development of the plan, the plan raises the concern of lacking set goals, targets, and deadlines for their priorities. In a Chicago Waste Progress Update on their short-term priorities, seven out of the eleven priorities listed are in progress with the rest being on hold. Most of the concerns to the lack of progress is the difficulty in the discussion between governmental groups and other institutions in applying the solutions (Delta Institute, 2021). The priorities include performing a policy review and exploration of existing materials management ordinances to determine opportunities for new potential legislation, increasing opportunities for community interventions by providing new programs and educational opportunities for residents to engage with the materials management system, and to strengthen internal operations by increasing efficiency across departments and improve waste diversion in the City (Haley, 2021).

Inclusion of Bioplastics in Current Waste Infrastructures

With the difficulty of the City of Chicago in managing and maintaining their current waste and recycling infrastructure, the introduction of bioplastics into such an economy would result in their benefits and advantages as being obsolete. As seen in Chicago's Blue Cart program, the City faced many difficulties in managing the recycling process to reduce diversion of recyclables into landfills. Some bioplastics require special facilities to be composted or recycled in, which would be difficult to establish if the bioplastics are unlikely to reach proper facilities to be disposed of. Additionally, the speculation of the lack of education and standardization in both internal and external stakeholders on when a recyclable is deemed as

“contaminated” as a contributor to the poor recycling rates brings about the concern on educating stakeholders on how to properly dispose of bioplastics at their end-of-life phases.

The City of Chicago also brings forward concerns of introducing pro-sustainable actions to minority communities that face environmental injustices. As result of past racist policies and industrial practices, minority communities in the City face environmental injustices, such as industrial pollution. As such, these communities tend to be excluded from pro-environmental claims and effects made by pro-sustainable actions, such as bioplastics, like bringing less harm to the environment, when the current communities do not exhibit the ability to sustain it.

Despite the lack of potential of efficiently implementing bioplastics in current waste infrastructures that lack proper management and stakeholder engagement, the City of Chicago highlights important factors to consider to implement pro-sustainable actions. It is important to consider societal issues in conjunction with environmental issues and to determine set goals and targets to achieve certain priorities. Furthermore, it is important to acknowledge and consider potential biases and incentives in both internal and external stakeholder groups to be able to properly handle and address them in order to create a proper infrastructure that will support a circular economy for bioplastics.

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