

# **Sustainable Waste Management in Bangalore, India: A Case Study of Environmental Support Group's Interventions**

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## **Introduction**

At first glance, India seems to be a mystical, spiritual place brimming with spiritual enlightenment and “exotic” spices and foods. However, this is only a power construct perpetuated by Western views and the spread of vastly under-informed facts. In fact, India perhaps encapsulated the same degree of diversity as the world itself, containing a multitude of different traditions, religions, and languages, sometimes even between neighboring villages. It is for this reason that day-to-day issues become problematic, especially considering India’s relatively young age and its internal struggle between developing industrially with a centralized government, and developing locally with decentralized, village-focused structures of power and governing. Due to India’s current post-colonial rule state, and rapidly developed/developing economy, consumerist and capitalist shifts have centralized many civic infrastructures such as waste management and roadway management.

India’s diverse past is reflected in its modern struggles, perhaps especially in Bangalore. Bangalore has experienced rapid, unmediated, disjointed growth, leaving little room for new developments and technological advancements to be implemented. Attempts to retrofit newer technologies have been met with issues such as lack of adequate space and the “NIMBY,” or “not in my backyard,” mentality by many local residents. This, again, is reflective of the consumerist capitalist ideals left behind by colonial rule. The recent introduction of plastics and tetra-packs, and the idea that these things are “western,” and should be embraced, has led to an overabundance of waste lining the streets and sidewalks.

Another interesting point to make in Bangalore’s development is that Bangalore originally became infamous as a software and information technology city. As more and more technology companies began expanding into Bangalore, they brought with them capital in the

form of money and manpower, as well as western ideas and notions. Anantharaman (2014) states that Bangalore's middle and upper classes, perhaps the most susceptible to Western ideals, contribute mainly to the waste management problem in Bangalore. In addition, Anantharaman (2014) believed that education and behavioral reforms should be at the forefront of solving the waste management crisis in Bangalore. Perhaps the first thing any newcomer to Bangalore will notice is these piles of garbage, often set aflame, to make room for more garbage to be dumped. In fact, Bangalore produces, on average, 3,000 tonnes of waste per day.

While civic authorities have failed to address this infrastructural issue, a number of civil society groups are leading the campaign to make the city clean. An important leader among civil society groups is the Environmental Support Group. Located in Banashankari II Stage, Bangalore, Environmental Support Group has worked diligently with the Bruhat Bangalore Mahanagara Palike (BBMP), the city's body of government dealing with civic infrastructures, as well as other NGO's, since the early 1990's to bring about change in the state of waste management in Bangalore. Through their campaign on waste segregation and better working wages for waste pickers, they have brought a new conversation of waste management in the city. My research explores the work of this organization and:

1. How has Bangalore's history of rapid urbanization affected waste management systems in Bangalore, if at all?
2. How can sustainable waste management practices be introduced in this mega city through decentralized processes especially through people's participation and civil society engagement?

Through Environmental Support Group's interventions, Bangalore has seen a dramatic increase in awareness and knowledge of waste management issues in Bangalore, and Environmental

Support Group is still working persistently to create more meaningful, impactful, intentional strides in the field of waste management. Through efforts in the form of educational reforms, public posters, commercials, trips to schools, and even Public Interest Litigation cases, Environmental Support Group has created meaningful change in the field of sustainable waste management.

## **Literature Review**

### ***NEW MIDDLE CLASS AND CULTURE OF WASTE PRODUCTION***

Anantharaman (2014) argues that due to India's nature as a globalizing country, it is experiencing much of the West's influence with little of the West's failsafe measures.

Intensifying resource usage across the nation is leading to increased ecological harm, and

Anantharaman (2014) argues that a critical analysis of modern Indian culture with an emphasis on questioning its westernization is necessary to ensure sustainability and stability.

Anantharaman (2014) also weaves together the issues of sustainable waste management, class/caste, and increasing consumerism and westernization, especially among the city's middle- and upper-class members, by critically assessing waste production among these populations and gauging how effective various methods towards sustainable waste management have been.

Anantharaman (2014) details suggestions on how the residents, domestic helpers, and hired waste management workers can embrace eco-friendly attitudes and policies to bring sustainable waste management into the city of Bangalore by utilizing case studies on residential waste management, and institutionalized waste management (and its flaws and benefits).

Bangalore exists at the intersections of consumption, urbanization, and globalization. The middle class of Bangalore has a unique set of behaviors and consumption patterns that make

them susceptible to Western ideas and practices. This, combined with Bangalore's perceived lack of infrastructure, leads to an overabundance of municipal solid waste. In order to more sustainably manage waste, Anantharaman (2014) argues that behavioral changes are at the forefront of the battle. This has been executed extremely well by Environmental Support Group, through their efforts to educate the public and to form ward committees to further enforce proper, sustainable behaviors.

### ***WASTE PROBLEM IN BANGALORE AND IN INDIA***

Bangalore's problems with regards to waste management are not unlike other Indian cities' problems. Annepu (2012) compiled information for two years, and detailed current waste management systems in India, their effects on public/environmental health, and further, proposes new sustainable waste management systems. This report also catalogues the hierarchy of sustainable waste management, details the status of current waste handling practices in India, and takes into consideration public health/safety, water pollution, soil pollution, and climate change.

Annepu (2012) suggests a holistic approach to waste management: solve current problems utilizing social science and natural science tools, while working towards prevention of further complications in the future. In the past, waste was never an issue because everything used in India came from the earth and was fairly bio-degradable. In addition, people would use every bit of a resource before throwing out any inert materials. With the advent of plastics and the view of plastic as a "western ideal," municipal solid waste has greatly increased but the recycling and dry waste management practices in India have not developed as rapidly as consumption patterns.

As Annepu (2012) suggests, India has four options: 1) Address solid waste management as an overall issue, 2) Reduce municipal solid waste's impact on the environment and on public

health, 3) Reduce consumption, and/or 4) be more economically feasible with production and waste management practices. Any of these options would likely prove extremely useful.

Chanakya (2008) identifies multiple causes of Nitrogen emissions in the city of Bangalore, mostly stemming from sewage systems, decentralized soak pits, septic tanks, and open defecation. Chanakya (2008) then proposes how to better manage these Nitrogen sources. Chanakya (2008) extensively critiques contemporary waste management and propose new ideas on how to more sustainably manage waste in Bangalore, namely how to manage waste better with regards to water purity and security. Water purity and security is perhaps the greatest concern when discussing waste management, because improper waste management is a large contributor to water pollution, and especially in larger cities, becomes a pertinent concern (Chanakya, 2008).

According to Chanakya (2008), three main ways of better managing human-produced waste are proposed. 1) Move the waste to sewage or soak pits, where they may be anaerobically digested and utilized afterwards in various fertilizers, 2) transported out of the city for the purpose of composting, and then to fertilizers, and/or 3) deposited in open, arid spaces where they may be dried and ingested by “micro-fauna/flora subsequently.” Utilizing this waste in fertilizers can help greatly increase crop yields and reduce strains on local farmers, and even tribal peoples who survive mainly off of kitchen gardens (Chanakya, 2008).

Many Indian cities have completely retrofitted their waste management systems, with great success. Singh (2015) highlights the successes that some Indian cities have had with overhauling their waste management systems and implementing new procedures, regulations, and infrastructure related to sanitation and waste management. Singh (2015) largely details modern views of waste management and in elaborating on current ideas. In addition, Singh

(2015) analyzes and critiques modern waste management techniques in Bangalore and in India as a whole (including door-to-door collection and segregation), and looks at policies and regulations regarding waste management.

Door-to-door collection and segregation, as well as decentralized waste management systems, have been especially effective in the case studies conducted by Singh (2015). Some wards even managed to achieve zero-waste, and zero-landfill, status (Singh, 2015). When the ward committees (or comparable entities) are effective and efficient in their educational efforts and the actual waste management, the cities/villages benefitted greatly (Singh, 2015). These efforts are being mirrored by Environmental Support Group and their efforts towards creating truly sustainable wards and ward committees.

Waste management is more than advanced technologies and energy production; education, legislation, and the social/cultural side of the issue also need to be taken into account. Tripathy (2015) details various regulations that should be put in place in India, in order to get a better handle on solid waste management. Tripathy (2015) goes through various types of waste, looks at how they're currently handled, and suggests improved ways of handling these types of waste. This is useful in generating ideas for moving forward with sustainable waste management in India. For example, improved methods for biometanization, composting, and other green energy methods that help convert inert waste into usable energy.

The framework for waste management regulation is based in sustainable development and in holding the source accountable for any consequences. However, in practice, these precautions are usually disregarded on a local level and are only implemented on a corporate level. For example, regulations are in place to limit emissions and control water/air/soil pollution

in industries, but local waste management, although in possession of various regulations, usually is mismanaged or undermanaged (Tripathy, 2015).

New movements towards corporate responsibility have made way for newer regulations at local levels, but this movement will only be successful following successful education and information dissemination efforts.

### ***ENVIRONMENTAL, SOCIAL, ECONOMIC, AND HEALTH IMPACTS***

Improper waste management can, and has, led to great environmental, social, economic, and public health disasters. Annepu (2015) recounts 4 different strikes/outbreaks related to improper solid waste management in India – Vilappilsala, Kerala; Bangalore, Karnataka; Kolkata, West Bengal; and Srinagar, Jammu & Kashmir. Due to improper waste management in Thiruvananthapuram, the state capital of Kerala, waste generated in Thiruvananthapuram is dumped at a site in Vilappilsala Village. Respiratory illnesses have increased due to this improper waste management, and water purity has plummeted. As a result, the President of Vilappilsala Village went on a hunger strike against the Mayor of Thiruvananthapuram (Annepu, 2015).

A similar issue in Bangalore led to the municipal commissioner of the city being replaced to specifically address the mismanagement of municipal solid waste. In another similar situation regarding improper solid waste management, Kolkata, the state capital of West Bengal, experienced a Dengue Fever outbreak. This is likely due to rainwater accumulating in non-biodegradable waste, providing a nesting ground for mosquitos. This makes mosquito-transmitted diseases much more prevalent and likely to happen (Annepu, 2015).

Improper waste management doesn't just lead to insect infestations; stray dogs, an issue across many developing countries, is only exacerbated by improper waste management. In Srinagar, the summer capital of the state of Jammu & Kashmir, the stray dog population has increased, correlated with an increase in roadside trash, an important food source for these stray dogs (Annepu, 2015).

Improper municipal solid waste management can lead to innumerable public health issues, many of which will lead to a "domino effect" and will snowball into each other, creating massive public health issues. Public protests have been moderately effective, but large-scale overhauls of the waste management systems across India will be required before significant headway can be made. Education and decentralization have proven effective in the past (Annepu, 2015).

### ***CITIZENS' ISSUES***

Waste management is as much a city's issue as a citizen's issue. The people's ways of thinking and behaving adequately reflects the values and culture of both their city/village, and by extension, their nation; regardless of the layers of culture, growth, and history. Devadula et al. (2015) accurately details the evolution of sustainable thinking, and then applies it to modern day sustainable waste management. By conducting a literature review on available literature, and then conducting real-life surveys in South Indian cities, Devadula et al. (2015) combines an international framework with an Indian perspective, and proposes a technological approach, using technology to innovate within the home and begin sustainable waste management at one of its largest sources. For example, Devadula et al. (2015) proposes utilizing less water-intensive toilets, and improving sewage transportation methods, this reducing the issue in homes and on a

societal scale. This is important research, because it specifically targets Bangalore. Bangalore generates 3000 tonnes of waste per day, 70% of which is organic; by restructuring the waste management system from every aspect – including the household – organic waste and non-organic waste can be significantly reduced. This waste generation is extremely indicative of the western patterns of consumption perpetuated by consumerism and capitalism (Devadula et al., 2015; Anantharaman, 2014).

Caste also comes into play when discussing waste management in India. George (2014) recounts a journalist's experiences exploring how caste and waste management are intertwined, mostly by examining Dalit occupations with relation to waste management and removing human excrement. George (2014) precisely analyzes how caste structures have hindered the evolution of sustainable waste management in India. According to George (2014), we must first restructure caste's role with relation to waste management. By legitimizing and incentivizing this work, dignity and humanity will be restored to the job and the caste, and waste management at that level will greatly improve. Due to casteism in the past, certain castes, specifically those that work with waste, are looked down upon in society. They are seen as lower than the lowest because they work with trash and human/animal waste, which dehumanizes both that caste and those jobs. This dehumanization, coupled with rampant consumerism and capitalism, leads the Indian middle and upper classes to see waste management as a problem for the "other" to deal with (George, 2014).

However, it is also important to note that caste structures have already changed in much of urban India. As foreign trade and economics become more and more relevant, the idea of class vs. caste has begun to emerge. Although both still play large roles, urban Indians are often placed in a societal hierarchy based on economic class (wealth, income, etc.) rather than traditional caste (based on traditional Hindu beliefs). With this advent, the intersections of class, caste, and

technology add the unique burden to certain individuals in urban India of having to navigate their caste being subverted by their class, yet still having to survive with or without technology depending on the situation (George, 2014).

Waste management, citizens' issues, and casteism, also tie into environmental concerns. Nagendra (2012) successfully established an introductory structure as to how and why sustainable waste management is important. By cataloguing "A Tale of Two Lakes," the story of how damming lakes/rivers in and around Bangalore has led to increased water shortages and has instigate water pollution, Nagendra (2012) analyzes the effects of unsustainable waste management and launch into citizens' rights movements with regards to water and waste.

Although Environmental Support Group primarily works with waste management legislation, much of their work has focused around lakes and water bodies, as these are greatly affected by improper waste management. Lakes in Bangalore have undergone much pollution in recent years, which has greatly affected the migration and reproductive patterns of local species of birds and reptiles that live in/near these lakes.

## **Research Questions**

In order to guide the framework of my independent field research project, I focused on the following questions when conducting my literary research and when structuring my interviews :

1. What are current sustainable interventions with regards to waste management that are currently happening in Bangalore?
2. How has Bangalore's history of rapid urbanization affected waste management systems in Bangalore, if at all?

3. What societal and/or developmental challenges face waste management in Bangalore, both with regards to conventional and sustainable waste management?
4. How does waste management, or lack thereof, affect natural resources in and around Bangalore, such as water, soil, air, etc.?
5. How can sustainable waste management address societal and developmental concerns moving forward?

By focusing on sustainable interventions, the history of conventional waste management, structural issues, and resource management, I hope to collect a holistic representation of data combining the natural and social sciences.

## **Methodology**

To understand sustainable waste management practices, I decided to study the problem and interventions through the work of a leading civil society advocacy group. Environmental Support Group. The organization is a legal advocacy group, litigates on behalf of poor citizens who are disproportionately impacted with environmental harms—especially those living near landfill sites, or those who are waste pickers etc. They also work with the municipal government to bring new regulations on waste management- such as the institution of ward committees. Govern their legal and civil society engagement, ESG seemed to be the perfect case study.

I interned with Environmental Support Group for 2.5 weeks. This internship involved close examination of some of their programs such as the formation and maintenance of ward committees, and their public interest litigation suits in the fields of waste management and green spaces in Bangalore. During this time, I assisted in interviews with dry waste collection centers, bulk generators, and the ward coordinator for Ward 182 in Bangalore. Additionally, I also

interviewed three senior members of Environmental Support Group – Leo Saldhana, Bhargavi Rao, and Shashikala Iyer – about waste management in Bangalore, ESG’s interventions, and where they see ESG’s interventions going in the future.

Some questions I asked include:

1. How did you/ESG develop the ward committees for waste management? Why did only some wards participate?
2. Do citizens mobilize themselves to organize for sustainable waste management? If so, how? How do you work in terms of building community partnership?
3. How would you assess ESG’s role in bringing a conversation on segregated waste management in Bangalore?
4. What will be the biggest challenge to sustainable waste management moving forward?
5. What has been the biggest *success* with sustainable waste management in Bangalore, either directly or indirectly involving ESG’s efforts?
6. Who benefits from the current state of waste management in Bangalore? Who suffers?
7. What is your personal assessment of waste management issues in Urban India and how similar or different are Bangalore’s issues?

## **Analysis/Discussion**

### *Waste Management and Structural Inequalities In Bangalore*

The history of waste management in Bangalore is laden with corruption and greed. Before Environmental Support Group’s public interest litigations were heard, waste was a commodity in Bangalore; private contractors that managed the waste didn’t do a good job yet got paid large sums of money, and only took waste from inside the city to the outskirts of the city.

This heavily impacted communities near these landfills, who still continue to suffer to this day (Rao, 2016). In fact, even still today, waste is dumped in/around communities without the wherewithal to fend for themselves (Saldhana, 2016). More often than not, wealthier communities are “cleaner,” while poorer communities are where the landfills are located (Saldhana, 2016). Even the solid waste workers are not safe from harm, as they often work without health safety materials and are treated unfairly by employers and contractors by means of delayed paychecks and restricted/minimal health benefits (Iyer, 2016).

However, in order for these structural conditions to improve, much work remains to be done. First and foremost, ward committees need to organize more intentionally and efficiently to properly manage their waste. This will resolve both waste management issues and urban governance issues (Iyer, 2016; Rao, 2016; Saldhana, 2016). In addition, the Bruhat Bangalore Mahanagara Palike needs to assure that there are dry waste collection centers and composting units that are accessible to all wards. The benefits should reach all of the city, such as providing compost for community gardens, kitchen gardens, plant life lining streets, etc., in part so that wards feel a sense of pride and continue to pursue sustainable waste management (Rao, 2016).

In the past, the policy environment in Bangalore was fairly restrictive; it was hard to get things passed as a concerned citizen, and those in power only seemed to be concerned with remaining in power (Saldhana, 2016). However, more recently, people have begun to realize that waste management is an issue that affects everyone regardless of caste, class, or gender. Most major policy changes as of late have been centered on recycling and producer responsibility (Rao, 2016). Hopefully this pattern of consumer responsibility and producer responsibility will continue to create a truly sustainable waste management system in Bangalore.

## *An Overview of Environmental Support Group*

Located in Banashankari II Stage, Bangalore, India, Environmental Support Group formally originated in 1998 as a public interest litigation group focusing on environmental and social justice. Public interest litigation is the use of legal action to benefit minorities or other such groups, which may not be able to defend themselves, or to benefit the common good or the public interest. Keeping these directives in mind, Environmental Support Group specifically focuses on environmental rights and social justice. Environmental Support Group has done much work in the past with Pourakarmikas, a lower-caste group that works in waste management and segregation.

Environmental Support Group initially became involved in the solid waste management issue in the mid-1990's, when a representative from Mavallipura approached Environmental Support Group and asked for help to fight against a landfill nearby which was polluting the village's water, soil, and air. Environmental Support Group conducted a groundwater analysis, determined that the landfill's toxins were leaching into the groundwater, and thus began their public interest litigations into fighting for environmental rights with regards to waste management (Iyer, 2016). A few years later, in 1999, Environmental Support Group began working with the U.N. Development Board, in which the Indian state government was searching for non-governmental organizations to help bring awareness to waste management issues. As a result, Environmental Support Group began working with solid waste workers such as rag pickers and pourakarmikas, training them on how to segregate waste and educating them on their rights as workers (Rao, 2016).

Environmental Support Group's main idea is that "resource recovery must become a praxis and not an afterthought" (Saldhana, 2016). By doing this, Environmental Support Group

can help to ensure the health and safety of those in Bangalore for generations to come. In addition, by recovering resources first and making it a priority, maximum resources are recovered, meaning maximum resources can be utilized for energy generation, composting, or other waste management initiatives. When resource recovery is an afterthought, not every resource is recovered. In addition, as an afterthought, it is hard to retrofit waste collection methods; as a praxis, these methods are designed with resource recovery in mind.

Since its origin, Environmental Support Group has worked diligently on remedying the current state of waste management in Bangalore. Environmental Support Group was at the forefront in the fight to establish wards and ward committees, and continues to support these initiatives today by continuing to educate the public on waste segregation and why wards are important.

### *Creation/Implementation of Wards and Ward Committees:*

Environmental Support Group initially began establishing ward committees as a result of a Karnataka High Court ruling, because the High Court realized that without decentralization of power and the establishment of ward committees, greed and corruption would continue to run rampant.

In fact, all of the Environmental Support Group members that I interviewed independently stated that greed, among other issues such as ineffective leadership and poor resource distribution, plays a large part in why ward committees have had some successes but not as many as originally foreseen (Iyer, 2016; Rao, 2016; Saldhana, 2016). Although wards may seem to work in theory, in practice, there are no solidified rules for ward committees to follow;

there are 18 functions of wards, including fire management, waste management, and lake management, but there are no concrete protocols as of yet (Saldhana, 2016).

One of the main tenants of effective sustainable waste management, in Environmental Support Group's eyes, is the decentralization of power among municipal solid waste collectors and processors. Environmental Support Group believes that decentralization will be the most effective methods, because centralized waste management is inherently flawed in Bangalore. In the past, one organization controlling all of the waste would rarely pick up the waste, and when they did, it would just be shuffled from one place to the next. A decentralized system, where the responsibility to manage waste is ultimately in the people's hands, puts the responsibility on them, thus ensuring that waste is managed effectively. As a result, 198 municipal wards were created. Each ward is charged with managing their own waste to the greatest extent possible, meaning that each ward must process their wet (food), dry, and bio-medical/hazardous waste on its own, before disposing of it in the most efficient way possible. Dry waste collection centers exist in most wards to separate out dry waste into categories such as plastics, glass, metal, etc., which either become recycled or sent with the rest of the inert materials to landfills. Wet waste is to be composted or to undergo biomethanization in an attempt to provide Bangalore with "greener" energy. This idea of waste management allows for waste to be recycled into something useful. Inert dry waste is disposed of safely, while some dry waste can be recycled, and wet waste can be used for recycling. By separating waste at the source, waste is managed and processed more effectively, as shown by Singh (2015). When villages and cities "buy in" to the decentralized waste management system, resource recovery and "green energy" generation greatly increase.

However, there is a small deal of controversy and perplexity surrounding dry waste collection centers. In an interview with one dry waste collection center, the Environmental Support Team and I learned that even though that particular dry waste collection center was situated in Badmanavhanagar, it was the designated collection center for Hosakere Halli. More often than not, dry waste collection centers are not situated in the ward that they serve, making it difficult for the dry waste to reach its designated collection center.

Various different organizations run these dry waste collection centers, ranging from non-governmental organizations to the BBMP (Bruhat Bangalore Mahanagara Palike, the governmental organization responsible for civic infrastructures in Bangalore) to private organizations. Depending on which organization is training you, you may or may not be equipped with adequate knowledge to segregate materials, and you may not even be given proper health and safety equipment such as gloves or protective eyewear. At a second dry waste collection center, the workers did not possess health and safety equipment, and dealt with biomedical waste that was improperly segregated into dry waste. Wards and their results work in theory, but much regulatory work remains to be done in ensuring high efficiency and worker safety.

Despite these challenges, citizen mobilization is one of the only approaches that has been successful. Through education from Environmental Support Group and other similar organizations, citizens become aware of the issues facing their community and are encouraged, and inspired, to take action. The current project is working with Bangalore's Pollution Control board to develop a program to educate wards on how to limit their carbon footprints and reduce pollution in and around Bangalore (Rao, 2016; Saldhana, 2016).

The longer that the ward system is in place, the more that the public is beginning to realize that the issue of waste management is a *ward* issue, not a *city* issue. Due to Environmental Support Group's outreach, there has been a tremendous increase in citizen participation in waste segregation and ward committee activity; however, at the same time, some people still don't understand ward committee functions or why they exist in the first place (Rao, 2016). Since ward's are in control, they move at their own pace. Oftentimes, ward activity is correlated to income. Wards with higher incomes often have more free time with which to civically engage with their community (Iyer, 2016).

At present, it seems like ward committees have come a long way from where they began, and certainly have greatly improved the state of waste management in Bangalore, but a great deal of work remains to be done. Largely, this work resides in the segregation of waste in residential and bulk generators. One of Environmental Support Group's largest initiatives has been the campaign to begin segregating waste in Bangalore.

Ward committees are essentially epitome of decentralized waste management. By putting the power in the individuals' hands, the issue becomes their own. Centralized waste management in Bangalore, in the past, has been highly ineffective; rampant greed and corruption made the process inefficient and at times detrimental to Bangalore as a whole (Saldhana, 2016). By having decentralized waste management, with some oversight from the BBMP and assistance from NGO's, education and door-to-door collection are slowly becoming more and more streamlined, and as waste management methods continue to improve, and cultural norms and values shift away from a culture of consumerism and capitalism, waste management issues, and by extension, water/soil/air in Bangalore will slowly begin to improve.

## Waste Segregation In Bangalore

One of the main functions of wards is to make the segregation and subsequent processing of waste much more manageable and efficient throughout Bangalore. Although the idea has been around for a few years, Environmental Support Group gave waste segregation the final push it needed to become mandatory across Bangalore (Saldhana, 2016). As the push for waste segregation has increased, the BBMP and the Pollution Control Board have both endorsed the program and have made plenty of efforts to allow for segregation of waste city-wide (Iyer, 2016). In a city in Northern India, Environmental Support Group actually demonstrated how waste segregation can be a successful and useful tool to mitigate improper waste management using a ground-up approach. By breaking down a complex problem into manageable pieces (creating ward committees) and situating them all together with the tools to combat it (education and waste segregation), people begin to understand the issues and why/how those issues impact them (Saldhana, 2016).

In fact, the reason that Environmental Support Group garnered so much attention for waste segregation was because Environmental Support Group was instrumental in the shutting down of the Mavallipura landfill, mentioned earlier. With the land, air, and water within and surrounding Mavallipura being so contaminated, Environmental Support Group was successful in shutting down the Mavallipura landfill and bringing attention to this quite pressing issue.

Perhaps the largest benefit to segregating waste at the source is the potential to provide power to the city, and compost to local farmers. Dry waste is often recycled, and bio-medical and hazardous wastes are treated or disposed of in the proper channels (i.e. landfills or conversion to usable products), yet wet waste is an interesting subject. About 4 biomethanization plants exist across the city, in which wet waste is used to produce methane gas and power the city (Ward 182

Coordinator, 2016). Additionally, some wet waste is composted and used in local farms. This truly epitomizes the idea of sustainable waste management. Use all of the material that you can, and with what is left, convert into something useful; avoid creating inter waste.

In addition, by incentivizing composting at the source for homes and businesses, and by promoting community composting units, Environmental Support Group and other local non-governmental organizations have made it exceedingly easy to give back to your community and support local food sources. This incentive is a small rebate offered by the Bruhat Bangalore Mahanagara Palike and is extended for advance property tax payment, which has been a popular practice among residents in Bangalore. Again, my decentralizing waste management, Environmental Support Group has played a major role in reducing the burden on the Bruhat Bangalore Mahanagara Palike's waste management system, and has created an incentive to manage waste more sustainably (Saldhana et al., 2012).

## **Urban Waste Management Moving Forward**

Urban waste management is a dynamic and evolving force in today's world. In developing nations, such as India, sustainable waste management will become key in maintaining and preserving economic and environmental stability. Much of this waste management revolution will happen within the government and among those working in this sector.

Encouraging private enterprises to enter into the solid waste management sector, and act as linkages between the public and private worlds may encourage efficiency and create employment opportunities, but these developments must be considered through a lens that incorporates all social structures and positions (Ahmed & Ali, 2004). Currently, public agencies

engaged with solid waste management typically operate under strict laws and are somewhat limited in what they can change policy-wise (Ahmed & Ali, 2004). Additionally, much of the public sector's work regarding solid waste management includes street sweeping, and manually handling waste and cleaning drains, and as a result, labor unions often hold large amounts of power over these operations (Ahmed & Ali, 2004).

Perhaps a middle-ground is a "Private-Public Partnership," (PPP) in which governmental bodies and private companies simultaneously assume responsibility for services to the public (Ahmed & Ali, 2004). These PPP's allow for access to finances and technology, as well as larger pools of knowledge and resources, as well as a "social responsibility," and job generation in these fields (Ahmed & Ali, 2004). Partnerships between private and public organizations are not necessarily the easiest to achieve; Ahmed & Ali (2004) suggest four condition that allow for strong PPP's: First, a positive social culture that encourages leadership and community organizing; Second, an attainable and realistic goal that is accessible to, and beneficial to, community members, public organizations, and the private sector, that utilizes these groups' strengths while mitigating their weaknesses; Third, interest in these goals originating from outside companies that will benefit from realizing this goal; and Fourth, continuity with regards to following through with policies and being adaptable to challenging situations. All of this is easier said than done, but with intentional planning, can be accomplished. When considering developing countries, such as India, public sectors are likely more inclined to PPP's; they offer cheaper SWM costs, and the private sector largely benefits from expansion and a channel through which they can gauge community needs and values (Ahmed & Ali, 2004).

It is important to consider local contexts when examining solid waste management from an outside perspective. Moving forward with urban waste management, waste pickers, which are

not always visibly present in some “Western” waste management systems, are important stakeholders in some “Eastern” waste management systems. Many waste pickers make their livings recovering and selling materials which then go on to become many important technological goods that run the world’s economy.

Solid waste management is a challenge in many urban areas especially considering increased rates of waste production and rising populations, which places additional stress on municipal budgets (Guerrero et al., 2013). In solving this issue, three elements need to be considered: 1) stakeholders such as NGO’s, service users, and both the informal and private sector; 2) features of the flow of materials that allow for both waste production and management; and 3) the final disposal of waste in a given community (Guerrero et al., 2013). Some of the factors that may influence these elements are education level, income, race, class, gender, and public desire to participate in programs that focus on recycling and sustainable waste management (Guerrero et al., 2013).

With regards to recycling, it has been observed that many communities with strong recycling habits have these trends stemming from altruistic practices and/or stricter regulations on the practice (Guerrero et al., 2013), showing that many people would be willing to recycle if the benefits are explained to them, backed up with legal actions explained if people wish to abstain from recycle. On the flip-side, municipalities with poor financial support for such initiatives tend to see less desirable results with regards to sustainable waste management, and often lead initiatives that end up failing (Guerrero et al., 2013). Part of the reason for failures in both the public and private sectors may be public disinterest, or lack of education, on this topic. It has been seen that many citizens consider waste management the duties of governmental bodies, rather than their own responsibility in their homes (Guerrero et al., 2013).

Those who work in waste collection/waste picking also have high stakes in the waste management sector (Schienberg & Anschutz, 2006). These people exist in cities worldwide, including New York, Bangkok, and Bangalore, and help to spur production of goods and services in manufacturing (Schienberg & Anschutz, 2006). Schienberg & Anschutz (2006) suggest looking at waste pickers through a systems approach, focusing on the benefits that modernization can provide, and legitimizing the roles of waste pickers in the manufacturing and industrial processes. This would primarily be done through EMT – Ecological Modernization Theory – which is essentially the theory that modern day processes should become more environmentally friendly and integrated with nature (Schienberg & Anschutz, 2006). EMT is based on five general principles: 1) progressive policy changes that incorporate scientific and technological evidence, 2) increased importance of environmental and ecological economic drivers, 3) decentralizing power in this regard so that local organizations can meet the needs that they are more acutely aware of, 4) opening up the political realm to other civil organizations so that a greater consensus may be reached, and 5) changing mindsets from radical issues to radical solutions, for example, changing the train of thought from “this city produces too much waste,” to, “these are the factors that induce increased waste generation, how can we fix them” (Schienberg & Anschutz, 2006).

Specifically in developing nations, waste pickers play an integral role in waste processing and management; in fact, it is estimated that Kolkata, India, has approximately 50,000 semi-formal waste pickers working (Schienberg & Anschutz, 2006). Given the waste systems of developing nations, many waste pickers in these areas suffer from poor living conditions, environmental hazards such as stray and diseased animals, as well as biomedical hazards such as healthcare waste, fecal matter, and other toxic substances (Schienberg & Anschutz, 2006). Outside of physical health issues, waste pickers also face societal and economic problems. In

India, “dalits” (“untouchables”) are historically waste pickers through the caste system, and the “dirtiness” of handling waste has led to a sentiment against waste pickers (Schienberg & Anschutz, 2006).

Through modernization, waste pickers may become obsolete or a necessity – if landfills become advanced enough to no longer need waste pickers, their labor is no longer needed, and there will be that many more people searching for jobs in other sectors (Schienberg & Anschutz, 2006). In order to benefit waste pickers and legitimize their trade, while still improving the waste management systems, one might look to Belo Horizonte, Brazil, which promoted waste pickers to higher social statuses by placing them in positions of power in recycling plants, which also saved the city money and resources (Schienberg & Anschutz, 2006). This system helps to legitimize waste pickers and simultaneously improves the city’s infrastructure, economically and environmentally.

Sustainable waste management cannot be attained through single forces alone – it will require the combined efforts of the public and private sectors, NGO’s governmental bodies, and those who work directly with waste. Through integrated processes, it may be possible for waste pickers to be elevated to higher social statuses, for cities’ environments to be preserved, and for their economies to be bolstered.

## **Conclusion**

True sustainability, while seemingly a pipe dream, is attainable only through complete cooperation at all levels of government. From the ground-up, decentralization approach, this means that ward committees in Bangalore must begin to operate together, and must take care of their own waste. At the same time, the Bruhat Bangalore Mahanagara Palike must fully support

wards and ward committees, and do their best to ensure both producer and consumer responsibility. Moving forward, the biggest challenge will likely be changing the culture surrounding waste in Bangalore. The influx of consumerist culture, coupled with one-time use items such as soda and water bottles, plates, utensils, etc., as well as tetra-packs, lead to grave accumulations of waste.

With the interventions of Environmental Support Group, Bangalore has been improving its waste management policies for the past few decades. The formation of wards and ward committees has greatly improved the condition of waste in Bangalore, and although much remains to be done, there is also much to be proud of.

Much research remains to be done into the successes of segregating waste. How much waste is segregated properly? Do bulk generators follow the guidelines set out for them, which are different from residential and other generators? What is the reason more people are not more supportive, or more aware, of the waste management issues affecting Bangalore? These questions, and more, must be answered and critically envisioned before more work can be done towards truly sustainable waste management.

Although Environmental Support Group and I worked well together, there were shortcomings and gaps in my research. For example, since I needed about a week to get caught up on the current state of affairs surrounding waste management in Bangalore, that only left about another week to conduct field research. Given more time, I likely would have been able to complete Environmental Support Group's original goal of helping to profile one of the wards with my co-intern, Sara Carson. In addition, although this independent field research paper is a case study of Environmental Support Group, it likely would have been insightful to reach out to other non-governmental organizations working in waste management to see their points of view.

For future research on this topic, it might be astute to work with Pourakarmikas and/or rag pickers, and to visit a biomethanization plant, a composting center, or perhaps even a high-ranking official from the Bruhat Bangalore Mahanagara Palike, to learn about their opinions on this topic.

Keeping all of these shortcomings in mind, there are still themes/lessons to be learned from this study. First, “sustainable” waste management is somewhat of a misnomer; if you’re generating waste in the first place, can it truly be sustainable? What’s important moving forward is minimizing the waste generated and the impact that that waste has on the environment. Critically analyzing consumerist and capitalist cultures is necessary in order to manage waste more sustainably, and the solution to waste management isn’t rooted solely in science or engineering; new, more efficient waste treatment facilities will certainly be of great assistance to the issue, but a holistic approach incorporating STEM and social science is necessary. As Environmental Support Group has shown, educating and involving the community can have affirmative impacts, and are a model for cities with similar issues..

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