A New Future For Miami’s Waste

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Miami, Arizona is only a city of 2,153 people according to the 2016 ACS 5-Year Population Estimate (United States Census Bureau, 2018), but they are facing a big problem: their landfill is quickly running out of space. This is important because, at the moment, Miami and several other wastewater treatment plants within the Central Arizona Government region have one disposal option for waste by-product and that is landfiling it at a Solid Waste Disposal Facility that is approved to receive that kind of waste. The wastewater treatment plant byproduct is too wet for use in its current state so around 1,772 wet tons per year are landfilled according to the city and an additional 91.5 tons per year of green waste is also landfilled. The goal of this project was to come up with a process to utilize Miami’s wastewater treatment plant byproduct and green waste. There were three options considered for this project that included building a new wastewater treatment plant, upgrading the current plant, or creating a composting program. The best course of action for Miami to take would be to develop a program that utilizes the local wastewater treatment plants’ biosolids product and combine that with green waste from the community to create compost that can then be used in other ways around the community. From there, background research of what would be needed to create a composting program was done which included researching: cost of equipment, cost of receiving waste streams (both composting and green waste streams), cost of the compost process, and cost of compost storage. Suggestions were made for each subsection on what the best route would be and the final portion of the project focused on how this new composting program could be marketed to the Miami community with research on marketing strategies and similar case studies to back up our recommendations.
The first option for a solution would involve the creation of a new wastewater treatment plant in the Central Arizona Government region. By constructing a new facility, the overall output of biosolid material would notably increase. This increase in quantity would alleviate concerns among the community that there aren’t be enough biosolid materials available to assist with large infrastructure projects. With an expanded capability for biosolids to be used in larger scale projects, the overall demand for affordable biosolid materials could see a substantial increase. This new facility may increase the general output of biosolid production, but the process of construction would be highly-expensive, and could potentially lead to issues involving jurisdictional authority. This is because the location chosen for the new facility could intersect with other CAG regional powers, which could severely complicate the project as a whole.

The next option provides an alternative plan to creating an entirely new facility where certain upgrades could be made to the current treatment plant in Miami to increase the plant’s composting capabilities. These upgrades have a wide range of investment costs, ranging from low-cost “Aerated Windrow Composting” to higher-end “in-vessel” methods. In addition to technological improvements, this action plan would focus on improving the plant’s storage capabilities, in order to increase facility’s overall effectiveness at storing biosolid material. Improving infrastructure and technology at the current Wastewater Treatment Plant would certainly help improve the facility’s output of biosolids, but the cost associated with buying new equipment would also make this solution an expensive one.

The third option would be the creation of a composting program, involving the mixed use of “Green Waste” and Class A biosolids. This particular mix of compost, according this paper’s estimates, could be sold for roughly $10-20 per ton. In addition, green waste and biosolid compost could be marketed as a sustainable alternative to traditional compost. If the
transformation of biosolids can become more transactional in nature the overall cost to the town of Miami could be offset by a substantial degree.

First, let’s start off with understanding what waste-streams really are and how the city of Miami, Arizona will benefit from it. Waste-streams are the flow of solid waste (biosolids or green-waste) throughout the community from businesses, homes, and manufacturing plants. This comes from a form of recycling and can also come from a source of differential types of disposals, such as landfills or burned substances. Some refer to this as residential waste streams or recyclable waste streams depending on how you acquired the waste and how you are going to process it for future uses such as land application or landfill disposal (MiMi Environment, 2018). Since these biosolids will be used for land applications, there are strict regulatory laws the facilities have to abide by including state (ADEQ) and Federal EPA (Clean Water Act and Safe Drinking Water Act) and in order to meet compliance, the biosolids have to be tested with Grade A standards for land applications. This is crucial if the biosolids are going to be used for planting and fertilizing. Utilizing these waste streams to Miami’s full advantage would be best in the composting method, which is cost efficient and helps improve the stigma of biosolid application. By applying the composting method, will lower landfill disposal and help promote a green waste recycling program in the city of Miami, to become more sustainable and reduce the costs of outsourcing. Since the city of Miami is a community that consists of farmers and mining companies, they could use biosolids, which is rich in nutrients and helps remediate the land stripped by mining or use as a natural fertilizer. To successfully build a compost center for the biosolids it’s best to break down the costs of equipment to efficiently process the biosolids. The composting strategies that would be best for Miami’s environment is: in-vessel composting,
aerated static composting and aerated (turned) windrow composting. Each method implements
different costs in equipment and procedures.

In-vessel composting induces high capital cost and moderate energy. When using the in-
vessel method, it give you several techniques in which it can be carried out in composting
reactors such as: vertical plug-flow, horizontal plug-flow and agitated bin (Environmental
Protection Agency, 2000). However, it can be more costly than other methods; since it is more
mechanized it requires equipment maintenance (EPA, 2000). The heavy equipment can run from
$35,000 to $100,000 depending on the make and model of the machine while also keeping in
mind the maintenance and fuel costs. Costs can vary when using in-vessel method, the annual
operation and maintenance can be between $100-280 per ton of dry biosolids processed (EPA,
2000). The Capital costs of in-vessel systems range from $33-83,000/day metric or $30-
75,000/dry ton; other costs for equipment operation and maintenance can range from $150--
200/dry ton. The selling price can range from $5-10/cubic yard or $10-20/ton (EPA, 2002).

Aerated static composting consists of moderate capital cost, requires moderate energy but
has a high weather effect. This method is most effective in warm, arid climate which is perfect
for Miami. Shelter may be needed for this process in order to reduce water from evaporating.
Proper ventilation is required because air flow is what makes it turn, however this might be
difficult if aeration is limited. Due to this, this method may require significant costs in order to
properly manage and obtain the equipment, such as: blowers, pipes, sensors and fans (EPA,
2018). A compost turner varies from prices; Backhus compost turner can run about $315,000 and
a Wildcat FX700 turner can go for $15,000. The Costs associated with Aerated Static systems
can range from $33,000/dry metric or $30,000/dry ton. Other costs when keeping up with
operation and maintenance can costs around $150/dry ton; the selling price can go for $5-10/cubic yard or $10-20/ton (EPA, 2002).

Aerated windrow composting is shown to have the lowest capital cost and utilize low energy. This method is best used for large volumes, generated from the entire community. This process utilizes organic waste into rows of long piles, which are called windrows. The ideal size piles are usually eight feet in length and 14 to 16 feet in width; this size makes it ideal due to the fact that it generates enough heat and maintains temperature, and the small size is efficient for oxygen to flow to the windrow’s core (EPA, 2018b). Although this is a great method, it does require a lot of land and can release malodor, which then contributes to the costs of maintenance and proper processing methods. This method can hold sufficient yield amounts of compost which in turn can be low-cost. However, if there is no conveyor system, there might be high operations costs with loading. Based on a 40,000 ton/year facility the capital costs of a windrow system can vary in costs, for instance if the facility is to be covered it would cost around $1.50-75/dry metric. For a windrow compost, cost per dry ton is around $14-22. The Windrow Turner can go for $220,000 and other electrical equipment can go for around $400,000. Another system you would have to consider is the stormwater system which can cost around $300,000. Other equipment involving this system is the front end loader that can costs around $198,000; Grading can costs around $82,500 and the leachate system can go as high as $100,000. When purchasing these types of equipment you also have to include the operation and maintenance, that can range from around $473,000 annually (Van Haaren, 2009).

The cost of receiving this waste streams can vary, in perspective you have to take into account the operations you are utilizing. The average cost of wastewater treated is around $0.11/cubic meter. Currently estimates in Arizona on transportation in biosolids are high, when
considering 200 tons of biosolids are transported to the landfill. So in association it may run about $47/ton which is $9,000 to $10,000 every trip. When considering these numbers, it seems that Miami could utilize these biosolids within their own community to cut down on the costs and instead build on their economy by implementing in a composting facility. Also, when receiving waste streams you have to take into consideration the backend of the operation, which are laborers, storage costs, equipment operators and the management team. This will help to make sure that the receiving process is within compliance of regulations. Costs associated with this are: laborers which can range from $40-57,000/yr; storage costs from $4,500 for a 3,000 gal tank or $9,500 for a 12,000 gal tank; equipment operators at $46-62,000/yr salary; management at $52-110,000/yr salary (Van Haaren, 2009). This will all depend on size of the facility.

Cost of storage depends on the type of system used, how large the processing facility will be, and size of the community. The cost varies when considering policies, zoning, type of infrastructure, and the type of compost quality. For example, using the windrow method (which is cost efficient), “this cost model is typically for a site with ideal site conditions, so that no extra preparation, in terms of grading, is needed before the construction starts. According to Gore-Tex” (Van Haaren, 2009). For a 40,000 ton/year Gore cover composting plant costs to take into consideration are site work which can costs around $150,000; also the buildings which range around $500,000. Also, it is wise to work in the legal fees into the budget which can costs around $200,000. The Gore cover system can reach up to $2,250,000 (Van Haaren, 2009).

The second half of our project was centered on the marketing aspect of the new potential composting program for Miami. The goal of the marketing program was to reduce the stigma of a biosolids product while informing the general Miami public about a new green waste program. However, creating an entirely new program can come with challenges because “in today’s world
‘the struggle to gain attention is not limited to those with large populations and large marketing budgets’” (Avraham & Daugherty, 2009), it can be tough even in a city the size of Miami. This section of our work was centered around case studies, analysis of possible marketing strategies, and formulating a plan of action utilizing methods that could work well for Miami. The end goal is a multi-pronged approach to effectively market the program and reduce the negative stigma associated with the biosolid component through increased education. It’s important to note that “the perception of cities, and the mental image held of them, became active components of economic success or failure” (Avraham & Daugherty, 2009) and for the case studies mentioned next, experienced success with positive public image and program success when implementing similar compost programs as the one that is hoped for Miami.

Our first examination of a successful marketing strategies of biosolids began in Tacoma, Washington. Established in 1991, the company TAGRO, short for “Tacoma Grow”, have had customers using TAGRO Mix on their gardens and lawns for decades. Awarded the U.S. Environmental Protection Agency’s highest rating for use in landscaping, vegetable gardens and indoor container gardens products, TAGRO products focuses on lawn and garden landscaping that help to reuse community resources (City of Tacoma, 2017b). Instead of stockpiling the dry biosolids in a landfill, the City of Tacoma transfers the bio solids from the treatment plant into TAGRO products for local homeowners use indoor or outdoor gardens and landscaping. The award winning TAGRO Mix is a blend of fifty percent biosolids, twenty-five percent screened sand and sawdust that helps supplements the regular soil used around trees, shrubs and flowerbeds. TAGRO products are made of class A biosolids that are environmentally safe and sound to return both nutrients and organic matter to the ground (City of Tacoma, 2017b). Tacoma also has a portion of their website to promote its program TAGRO and publicize its
products. Tacoma’s marketing program centers on consistent and responsible advertising to build brand credibility and audience reception while reducing the stigma of usage of biosolids. The people within the TAGRO program provide presentations and demonstration all over the city to inform audiences of their products and benefits. The City of Tacoma offers an Enviro-Challenger program for high-quality environmental science lessons for classrooms grades 2nd-8th, to teach science and social responsibility. The Environmental Services Department produced EnviroShorts video series on the City’s website that explains how our resources are reclaimed and put to a different use. Tours of the WWTP processes allow for community group members and students to provide first-hand knowledge of the practices (City of Tacoma, 2017a). The website feature gives thorough explanations, presentations, and information that support local communities and schools understand biosolids. Team Tacoma Grow also provides local presentations to K-12 schools in the city to educate students. Similar approaches as Tacoma, Washington would benefit Miami, Arizona by providing realistic information and demonstrations on the City’s website and at local events.

Another leader in the human-waste fertilizer industry is native to the Twin Cities region, known as MinneGrow 5-4-0, which has made a product favorable to the public by adjusting the components that are inherit to the biosolids system and using them as marketing tools on the public. The product comes from a fertilizer company called SFS Fertilizer in Meadow, Minnesota. The Twin Cities are observing increased demand and therefore production of this product, especially after the New England Fertilizer Company, NEFCO, “signed an exclusive contract with SFS Fertilizer for purchasing all Class A biosolids product (MinneGrow 5-4-0) generated from the Blue Lake Wastewater Treatment Plant at the NEFCO facility in Shakopee, Minnesota” (New England Fertilizer Company, 2018) which has skyrocketed production of the
product. The benefits experienced from this contract has substantially influenced SFS Fertilizer production by receiving support from a powerful business partner that is involved in multiple biosolid companies across the country such as Florida and Massachusetts, which is an example of the beneficial connections that NEFCO provides and shows the diversity of their project partners as well. NEFCO is credible business partner within the biosolid industry and it is suggested to search for credible project partners to gain traction within the community for E-waste in Miami, Arizona. One of the most vital aspects about the success of this product is the marketed affordability and sustainability of this product has been effective to the consumers of the Twin Cities. Educating the public over the benefits of E-waste will reduce the stigma that is sincerely originating from lack of knowledge and understanding of the product. There are plenty of benefits from this product, for instance in the capture process, “flammable methane is captured early in the treatment process and used to dry the material later and by recycling the methane cuts natural gas use by 75 percent, saving about $500,000 a year” (Shaw, 2015).

Another way MinneGrow has been able to maneuver the stigma associated with human waste being unsanitary is creating a product that is 100% germ free. This defeats the stigma associated traditionally with human waste and frees the product from the past roadblocks that halted the popularity of human waste fertilizer in the past. E-waste ought to be the cleanest and germ-free product in order to be effective in a market that has only been known as otherwise to defeat the stigma associated with it. A contributing factor for the lower prices is by producing locally, the transportation costs are minimized, therefore it would be wise for this project to pursue a similar approach to avoid expensive transportation costs. Maintaining the image of affordability and cleanliness has been the support of the MinneGrow success which has influenced investment by stable businesses like NEFCO. It would be advised that Miami, Arizona take into account this
successful production biosolid fertilizer to improve their chances of success that are sustainable but help elevate the product to a higher standard because of the precautionary measures taken currently to make E-waste more desirable in more ways than just one.

It is no surprise that “leaders of countries, regions and cities realized that a positive place image, combined with a successful marketing mix, is a powerful tool in competing for resources and other finance-related activities” (Avraham & Daugherty, 2009) and the same concept can be applied to smaller initiatives. This is why a multi-pronged approach would be the best course of action for Miami to take with a composting program in order to effectively market the program to a wide audience and at the same time reduce the stigma associated with the use of biosolids through increased awareness and education. The multi-pronged marketing strategy includes creating a brand, utilizing the community and possible partnerships, use of direct mailing, digital options like e-newsletters and social media, along with holding information panels throughout the process. There are many marketing strategies out there, but these ones were chosen because they would best fit Miami’s situation and have had success being utilized in the case studies mentioned previously in the paper.

Creating a brand for the composting program is one of key components to make it successful and “the strategy of branding attempts to place a fresh and unique image in the minds of the audience” (Avraham & Daugherty, 2009). This is done “by first identifying the place’s unique selling proposition (USP) and then creating a message that promotes and reinforces the USP as an image” (Avraham & Daugherty, 2009) which the community members of Miami can get behind and creates a story instead of it just being another city program. There is normally a stigma attached to biosolids and “overcoming such an image can be difficult as people don’t quickly put aside their preconceptions, however erroneous they may be” (Avraham & Daugherty,
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2009), but creating a brand will allow community members to learn more about the product and the process and be able to break down that stigma.

Miami has plenty of outreach options like local businesses and schools that can be ideal locations for physical community engagement. Schools can be a wonderful tool to educate the younger generations directly on this new product. Once the students have gained a supportive attitude to the product, this information will be reciprocated to other individuals they interact within the community such as different age groups. While this product has an educating factor tied into its success, it is only natural to use the education services in the community to promote a sustainable and affordable option to maximize the wellbeing of the community. Schools and colleges are locations teeming with opportunity and education, therefore the marketing of E-waste would not be a stranger to this practice. Businesses can be utilized as well as a tool to distribute knowledge about the product. Businesses within Miami have consumers that are regular attendees and trust the business they are exchanging goods and services with so partnering with them allows the program to “use the positive image of another place without having to build its own from scratch” (Avraham & Daugherty, 2009). If a business that is trusted promotes our product to the consumer, it is more likely the customer will take the advice of the vendor to trust the product and “re-think their previous conceptions of the unfamiliar [product]” (Avraham & Daugherty, 2009). This does require an incentive for the business like a discount on the product or another form of payment. Throughout this process, it will encourage the public to become educated on the product, whether they agree with the stigma or not.

Direct mailing is a traditional method that is highly effective for marketing and passing along information that could alter the opinions towards biosolids. By direct mailing, it is easier to specify the documents according to the demographic being marketed to. For instance, there is
different dialogue used for a high school student compared to a retired member of the community, and in order to gain community support, this must be taken into account. Different audiences can be communicated to in different ways and in order to exclude anyone, this method must be utilized so the community reaps the benefits as a whole and not just a specific group. There are also tools to market to certain demographics more effectively, such as “Every Door Direct Mail is an online service that uses demographic data to help business mailers make sure their marketing messages reach the right customers in a select neighborhood, city or ZIP Code” and also provides discounts to commercial mailers (United States Postal Service, 2018). The benefits of USPS are to not be avoided and E-waste “must take advantage of the postal rates the USPS offers” (Egelhoff, 2018). This would be a formidable approach for the E-waste team to apply to Miami because direct mailing will provide a basis of data for the marketers to refer to so informed marketing decisions can be implemented in the future to the demographics that are not being reached or receptive of the product. It is advised to pursue this marketing strategy first to have concrete data over Miami and then use the data gathered to pursue other marketing strategies based off this knowledge. Direct mailing can also be used to market the physical engagement opportunities to Miami and a chance to add personality and life to a product that will engage consumers while in the comfort of their homes.

Utilizing digital marketing through the use of e-newsletters, social media presence, and creating a website or webpage will be useful because “the main advantage of digital marketing is that a targeted audience can be reached in a cost-effective and measurable way” (Invest Northern Ireland, 2018). Not only can the information reach a targeted audience, but digital marketing assets can also be highly personalized. E-newsletters would allow community members to stay up to date with the composting program and could be the first place where they hear about
special promotions and news and contain direct links to the source. Creating a webpage or website that is connected to the city’s main website would allow people to easily be able to find information on the program and act as a home base for all things related to the composting program like contact information, frequently asked questions, and informational articles to name a few examples. Lastly, having a presence on various social media platforms like Facebook or Instagram can act as a place for more fun and informal content along with promoting the compost program. Digital marketing “lets you create engaging campaigns using different types of rich media content. On the internet these campaigns can gain social currency - being passed from user to user and becoming viral” (INI, 2018) and increasing exposure for the program overall.

Information panels are another effective strategy used to market products and ideas that allows the community to physically interact with the vendors and provides a personable interaction that allows vendors and consumers to voice their opinions openly. For the vendors, this allows clear and explicit detail to be provided about the product, such as the affordability, cleanliness, and accessibility associated with human waste. The physical interaction provides an unique opportunity to directly answer questions associated with the product and to eliminate the stigma associated with human waste. The information panels can be executed in any public setting, but the most appropriate location for educating citizens about a product could be at a community center, schools, or other city designated buildings that promote an educating and safe atmosphere. Providing incentives to attend the information panels is vital as well to attract all audiences such as basic incentives like free food and beverages, entertaining incentives such as a respected member of the community to come to the panel, or business-related incentives such as a discount on the product upon arrival to the panel. The information panel can also be used as an
opportunity to not only express the cost effectiveness and the sustainability of the product, but also why the product is better than competitors. For example, at the information panel, there can be physical comparisons between one fertilizer and the biosolid fertilizer to provide a visual to consumers the quality of this product. This method can only strengthen the pitch of the product to the community and how the quality of the product ought to impede the stigma. Even a panel expressing the similarities between cow manure fertilizer and biosolids are and how dangerous and disgusting cow manure can be could be an opportunity to open the minds of the consumers of Miami. A physical opportunity should not be wasted.

Miami is approaching a pivotal moment of transformation to pursue a sustainable product that is plentiful and provides numerous benefits that will be reciprocated on a community level to each individual. The town’s desire to pursue a project to utilize Miami’s wastewater treatment plant byproduct and green waste has come to a few suggestions which has been the development of a composting material derived from biosolids that can be used repeatedly in the community for a variety of projects. Once approaching that conclusion, the pursuit of background research to create a composting program was ensued which included researching: cost of equipment, cost of receiving waste streams (both composting and green waste streams), cost of the compost process, and cost of compost storage. After a breakdown of the cost analysis of the production of biosolids were addressed, the next issue to tackle has been the stigma and the execution of marketing E-waste. This allowed the researchers to formulate an informed and educated response over the best course of action for the E-waste team in Miami, which includes a variety of marketing techniques that can be applicable to a diverse number of recipients. Each of the strategies provides a different form of representation and opportunity for the E-waste team to analyze and execute based on their specific preferences on how to market to Miami.
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