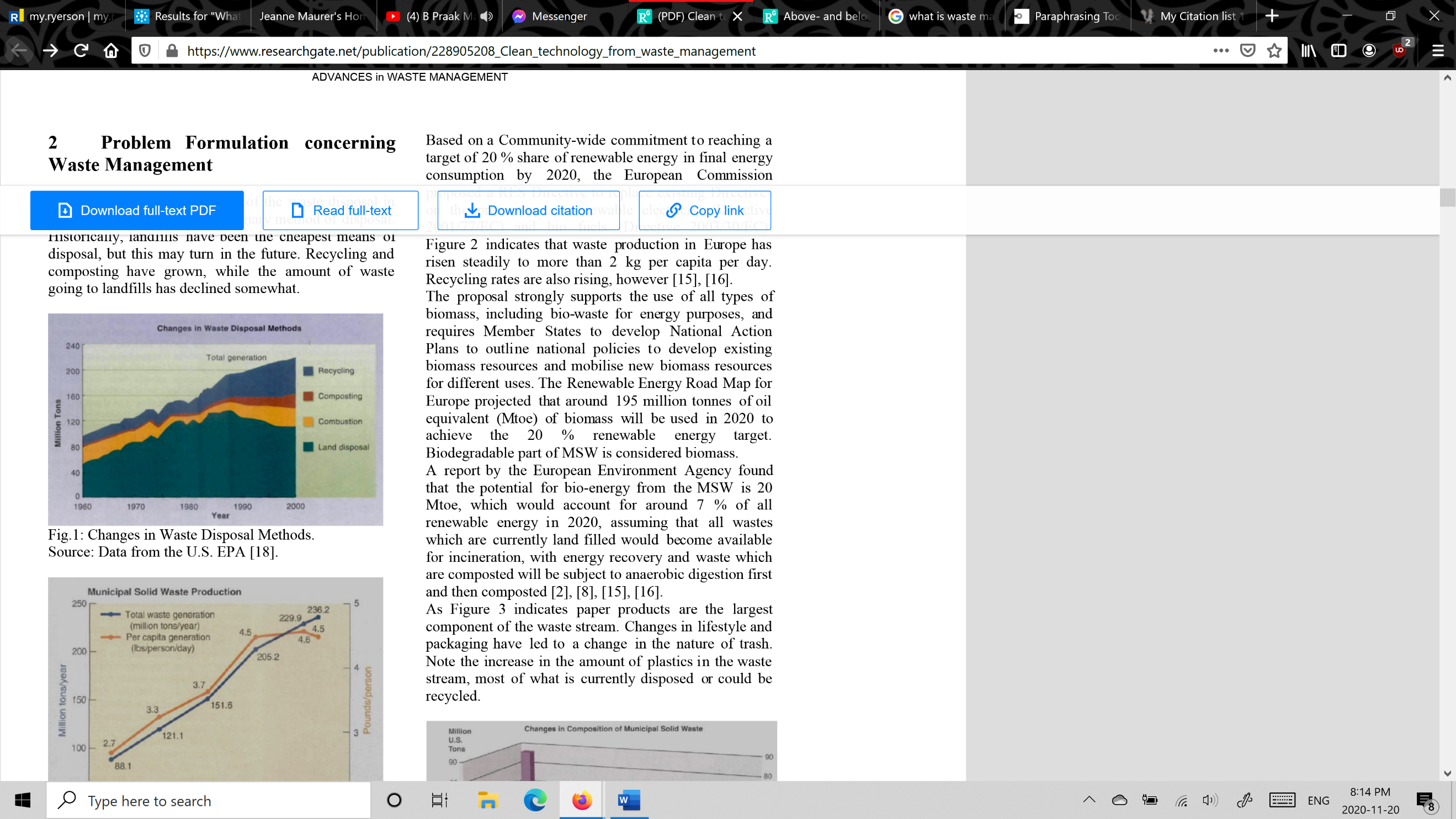
**Brief Explanation of Technology:**

**What is the technology?**

 The technology which is selected for the final project of CGEO702 is Waste Management Technology. What is Waste Management? In simple words, waste management is the collection, transport, preparing, reusing or removal, and monitoring of waste materials (IOANA, 2010).Waste Management differs in methods between the urban and rural areas, for residential and industrial producers. Management of non-hazardous residential and institutional waste in well developed cities come under the local government authorities (IOANA, 2010).Over the years, even though after the technologies being introduced, the primary method of disposal is still landfill (IOANA, 2010). Figure 1 illustrates, how the trends of Waste Disposal have changed over time and that due to the technological/alternate methods being introduced in the society, the recycling and compositing have grown, where as the amount of waste going to landfills has declined over time.

**Figure 1: Changes in Waste Disposal Methods  
Source: Data from the U.S. EPA[2]**

However, as the time passed by, the ways of disposing of wastes have changed too (IOANA, 2010). Comparing it to the history, the preferred means of disposable was to simply dump solid wastes outside of the city or town limits (IOANA, 2010). Over time, the lakes and river started to pollute due to the dump in the nearby wetlands, which led to creating ideas for different waste management technologies. As more waste management technologies were introduced and environment and quality of life was considered, many changes happened in the techniques (IOANA, 2010). Dumping and open burning of dump is no longer encouraged from an environmental and health perspective (IOANA, 2010). Essentially five techniques are used: (1) landfills, (2) incineration, (3) source reduction, (4) compositing and (5) recycling (IOANA, 2010).

We chose this technology because although this technology saves the waste from going into our rivers or lakes and keeps the city away from the waste and dumps, this technology also affects the Canadian environmental conditions and plays a very vital role in contributing for global warming (Newton, 2018). For instance, Landfills help keep the cities and districts clean, no presence of landfill will leave the citizen with only the option of dumping the waste in vacant spots which is unhealthy for humans and the environment. However, landfills are basically used to bury the organic materials, as they organic materials decompose, they tend to release methane and carbon dioxide, which are greenhouse gases and contribute greatly to the process of global warming (Newton, 2018).

Living in the 21st Century, technology have taken a huge jump with many advancements in different aspects of technology. The five waste management technologies discussed before are affecting the environment and disturbing the environment in great ratio. For instance, Landfill methodology of waste management technology is producing methane which leads to process of global warming (Newton, 2018).However, now environmental Canada is doing its best to get rid of methane. Orgaworld is considered to be a Netherlands-based company which handles around 300,000 tonnes of organic waste every year (). Innovative technology from this company helps maintain a methane free environment resulting in less global warming. Odour is also considered be an important issue when considering waste management as it harms the environment. In order to prevent that, ammonia is extracted using advanced technologies and then sold to agricultural communities. This can be considered very good for the environment as if agricultural communities are improved then there will be a clean and better atmosphere. The process of Incineration includes burning of plastics and other materials which creates emissions that contain toxins such as dioxins, mercury, and furans, that contribute to climate change (Suzuki, 2013). However, one of the most common topics amongst the clean energy discussion is incomplete without the topic of ‘recycling’. Without any doubt, recycling does help a lot waste management technologies as it converts the waste product into reusable material (Rinkesh. 2015). Some of the advantages of recycling includes; it minimizes pollution, protects the environment, reduces global warming, conserves natural resources, reduces the amount of waste in landfill sites, and ensures sustainable use of resources (Rinkesh, 2015). With some advantages comes disadvantages too. Recycling decreases the durability of the product, sometimes the product are processed in a complete different establishment, even though recycling plays a bigger role in reducing the rate of pollution in the upcoming years, the process has not being embraced widely (Rinkesh, 2015). Recyling is also not done properly in Ontario households and about “60% of materials put in blue boxes is recycled” which is because of the fact that home sorting is not done perfectly(). An innovation in recycling introduced by the Commitee is an optical sorter which scans different types of polymer and reduces number of hand motions. This results in putting same type of plastic that can be sold(). I personally think is a very good achievement practiced as it allows plastic to be used in a very sustainable manner and if a lot of plastic would be kept together then it would be easy to reuse them in a effective manner.

The upcoming technologies for waste management have enhanced and comparing it to the previous techniques, it will change the game. The article of ‘The 6 Most Innovative Waste Technology Systems’ by Sara Cifani outlines the different smart technologies which are either introduced or yet to be introduced. One of the technologies is, ‘Monitor Waste with OnePlus Systems’, this is basically an ultrasonic trash can sensor that will let you know how full your waste container is at all times, the Wasteforce Platform allows you to easily monitor the capacity of your container from anywhere and this way it will help your business or organization track your waste (Cifani, 2018). In addition, the product ‘Streamline Trash Pickups with Ecube Labs’, they have created the bins which are designed to hold up to 8 times more garbage compared to non-compacting bins, which will eventually reduce the collection frequency up to 80 percent (Cifani, 2018). These waste management technologies will help the community, as they will help you with either keeping track of your waste produced or by compositing it which will also help the climate change by keeping the individuals up to date.

**Analysis through Ursula’s Franklin’s Framework**

Technologies are meant to be built in such ways that could be used in the social, economic, political and holds the potential of changing the way the real-world works. Linking the waste management technologies to the criteria of Ursula Franklin will help us classify the nature of redemptive technologies to analyze the waste management technologies of smart bins such as the ‘Streamline trash Pickups with Ecube Labs’. The fifth criteria ‘maximize gain or minimize disaster'. This technology satisfies the criteria as it promotes both, increase the gain and minimizes the disaster, the way these smart bins work is that when the trash is being disposed in them, the AI sensors measures it capacity, and then the compactor compresses the rubbish and measures the compacted trash resistance. This way the compactor basically enables more space for garbage and that will effect the landfills and looking upon the bigger picture, the process in landfills and incineration process will decrease which will cause less production of harmful gases for the climate. Globally, the leading countries are known to pollute the environment the most, compared to the developing countries and this technology will help both by helping the leading countries to dispose of their waste more efficiently and helping the climate. This technology will showcase how a small technology can impact the world and climate change. The leading and the developing countries are still following the procedure of Landfills which have proven to be one of the worst waste management ideologies. This technology will promote compacting of waste and that will include getting rid of the landfills. Moreover, the wetlands and landfills are made away from the cities but that does not mean that people do not live nearby. The air quality gets worst eventually, and which is not fair to the poor, as getting rid of landfills with the help of this technology will promote justice as it is the first criterion of the framework for the technology to be redemptive.

The framework also requires redemptive technology to restore reciprocity, the smart bins process is restorative, because it will increase the space of garbage which will restore the cleanliness in the streets and enables more garbage capacity. The third category of the framework is ‘confer divisible or indivisible benefits’, which enables to help the community in large scale compared to only effecting only some people. Smart waste management technology will help in the betterment of the waste management method which will make the environment a better place for us and the upcoming generations as it is a very crucial thing.

This technology favours people over machines as it is made due to the concern of the well-being of the people and the safety of climate change, by making it less harmful by burning the waste in the previous decades, so the technology favours the people over machine. This satisfies the fourth criterion of Franklin’s framework requirement for redemptive technology. The smart bin technology also includes arrangement of waste with the help of sensors to measure which waste is recycle worthy and that will help in conservation as it will help recycle waste, which promotes the sixth criterion of Franklin’s criteria which is to favour conservation over waste. The very last criteria of Franklin’s framework include ‘favour the reversible over irreversible’. As the waste is been sorted in these bins, the technology favours the reversible as it will help recycle the waste which is an example of reversible. The smart bins will be a great technology indeed, we have witnessed ourselves even though the malls have three different bins, one for recycling, one just for plastic, the other for can and the third for other waste, people still tend to throw it in in whichever bin not realising how they really matter. With this technology, the bin will be able to detect the waste and sort them in specific bins which will be helpful for the waste management team when they get rid of the waste, as the waste will already be sorted.

**Is the Technology Redemptive?**

From the technology being analyzed through different criterion of the Ursula Franklin framework, it is clear to conclude that this technology not only helps the climate change but in the long run will improve the way of life. Furthermore, this technology aims to work on the betterment of the human life, such as making the whole environment clean, recycling the waste which can be used in order for creating new product, which might not be as durable but will be re-useable. The smart bins technology will be an efficient way of waste management technologies and will reduce the pollution level caused by the landfills and incineration process. The smart bins will also help the waste to compost which is a much better exercise compared to burning of the waste or dumps. However, the smart bins will also provide with odorless and they are easy to install, which means that it can be used and installed by absolutely everyone which makes it user friendly and instead of focusing on specific audience, it has a large audience. After careful analysis, and using Ursula Franklin’s framework of classifying the nature of redemptive technologies, this technology is redemptive, as it brings equality, fairness and social justice globally, as compared to other technologies such as landfills and incineration process which for sure does the work but harms the environment in many different ways. This bin must be implied within the big cities as they are the leading waste producers all around the world and as analyzed the landfills and incineration process creates the gases which are contributing to global warming. So the smart bins and composting technology not only keeps the cities clean and pollution less, but also help the environment and maintain the climate change making it better or at least slowing down the rate of the world in rising pollution levels.

**GPI ANALYSIS:**

The Genuine Progress Indicator (GPI) is a metric used to measure the economic growth of an economy (Maurer, 2020). For many years the Gross Domestic Product (GDP) was considered as the correct way of measuring the countries economy. The GDP is the value of how much a country has produced in that year (Kelly, 1995). However, the GPI is different from GDP as it not only calculates the consumption and production like GDP but it also takes in the value of housework, and the voluntary sector; it subtracts estimates for things such as accidents, pollution and depletion of non-renewable resources, and the increment between the rich-poor gap and the social costs this brings (Kelly, 1995). In simple words, the benefit of GPI is that it nets both the positive and negative outcomes of an economic growth to check whether the imposed social decision, or economy has been benefiting to all the people or not.

The Smart bins technology have helped tremendously after the government have installed around 30 bins in the city of Leeds, with the help of Smart Bins app, the government knows how the garbage can fill up slowly compared to the days when the city was not in lockdown, as people are avoiding subways and buses due to rising in the cases, where as the government building bins are filling up quickly as the officials are working during these lockdown times (Ringuet, 2020). So with the help of the app, the government can keep track of the waste being produced and the significant actions needed to be taken in order to reduce the pollution, the bins also compost the waste which makes it easier for the government to handle them. This will benefit by keeping the city clean, which will boost the human and environment relationship. This will potentially decrease the pollution levels and then the GPI measurement will be calculated based upon that. Also with the help of app, the government can monitor which areas need more bins and which areas need the smart bins to be removed, which will not only help the small business to plan well where the business should be depending upon more people (Ringuet, 2020). This whole technology will make the relationship between the environment and people more powerful as people will be benefitting from it in numerous ways, whereas the government can implement policies after analysis the data. Therefore, this technology is fair and generates social justice. It will be of best interest for people and the government and will also increase the overall GPI of the country.

**Conclusion: Should it be Adapted**

In conclusion, it can be said that after applying Ursula Franklin criteria of analyzing redemptive technologies combined with GPI will lead to technologies which will benefit the environment in a drastic manner. However, if the two tools are combined it will result in a robust ecological decision-making framework which will reduce the cost of resource depletion, ozone depletion etc. If smart bin apps are introduced to the government then waste will be kept in check which will result in a cleaner atmosphere. There are numerous other ways to reduce and recycle other waste. It is our job as a society to introduce these methods to the government which will help decrease pollution. Introduction of this app will result in an overall increase in the GPI of Canada.

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