A sustainability assessment review of the Highland Creek Wastewater Treatment Plant (HCTP) Biosolids management Class Environmental Assessment (2016): *sustainable assessment leverage points analysis*.

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Abstract

This research paper examines sustainable methods used to assess potential and current waste management policies, plans, projects, and programs. The Highland Creek Wastewater Treatment Plant Class B environmental assessment serves as a case study. This investigation is achieved by utilizing strategic EA methodology alongside Gibson's sustainability assessment protocol. The idea is to seek valuable knowledge that can be applied as a guide in order to integrate and align waste management processes in its entirety more closely to greater goals of sustainable development. Integration (social, economic and environmental factors), strategic management and environmental assessments serve as the bedrock for achieving sustainable waste management strategies and practices that are more adaptable to any contextual uniqueness. These three pillars are embodied within the methodology of strategic EA. Most current waste management practices and plans are designed in an attempt to enhance cohesion within these systems however, cohesion is usually limited to the recovery of nutrients, materials, and energy from waste streams which are hardware components. Hard component recovery is aimed at reducing landfill disposals of waste and improving recyclable content. Although this is necessary, issues arise when credit is awarded to increased waste diversion rates (evident in the report on data retrieved by statistic Canada on disposal and diversion of waste showing increases by provinces and territories between the years 2012-2014) while these may be masking overall rise in waste generation (this is in references to the “D” grade on municipal waste generation given to Canada by OECD report in- State of waste management in Canada : Giroux environmental Consulting 2014).

In response many developed countries like Canada have made significant attempts to adopt mechanisms that address article 12 Kyoto Protocol on the Clean Development Mechanism (CDM) (Shrestha & Timilsina 2002) by designing policies and plans such as Waste Action Plan and the very ambitious Zero Waste management hierarchy of 2014 amongst others (CD4CDM, Malawi). These are aimed at providing specific and targeted depth to 3Rs strategy (reduce, reuse and recycle) by placing emphasis on all participants involved in the waste production and management such as, policymakers, industry, and individuals (stakeholders). Solutions such as policies designed to enable the best and lowest use of materials by encouraging activities and investments that promote the preferred hierarchy of reduction as well as solutions intended to assist in developing a guide that will promote the development of systems and products designed to advance a zero waste policy are being implemented in Canada (Giroux environmental Consulting 2014).

Although these are well intended and acknowledgment should be awarded for waste diversion gains, In order for there to be a corresponding and significant decrease in waste generation there needs to be improvements within the methodology delivering on plans, policies, programs, and practices. Improvements in the areas of connectedness, integration, strategic management, stakeholder involvement and environmental assessments are integral to sustainable waste management.

Foreword

This Research Paper addresses the following 2 learning components 1) strategic environmental assessments and 2) waste management. Through my research, coursework and field study I fulfilled all 2 learning objectives outlined in my plan of study.

1. Strategic environmental assessment: To gain knowledge about the practical applications of SEA in real life scenarios

I was able to gain a well-rounded knowledge of strategic EA principles and its framework. Knowledge of strategic environmental assessment was critical to the success of this plan of study as it served as a base that set the format for examining waste management practices. Authors like Lawrence, D. P. (2013) and Nilsson, M., & Dalkmann, H, Partidario, M. R helped in my problem definition and assisted in forming my theoretical framework by experiencing contemporary challenges of strategic EA in their work. Literature in sustainable development have also been crucial in setting the stage for my problem definition and in the literature review portion of this research work. It set the baseline upon which evaluations of current strategic assessment and sustainable assessment initiatives (Gibsons) have been defined. Authors such as Gibson, Meadows, D. H, Monday, J. L, Nilsson, M., & Dalkmann, H, Pearse, P. H and Pearce, D., Barbier, E., & Markandya, A to mention a few have been critical to the development of this idea. The HCTP Biosolids Class B EA served as a real-life scenario where strategic EA principles had been applied.

2. Waste management: To gain a clearer understanding of how waste management projects can better meet the goals of sustainable development.

I conducted an extensive literature review on production and its linear directional practice that takes raw materials and converts it into manufactured goods and consumables. I further supported this paradigm by exploring works by Giddings, B., Hopwood, B., & O'Brien, G, Allen, J, Ekström, K. M, Kurpnick, A.,A. Alberini, M. Cropper, N. Simon, B. O'Brien, R. Goeree and M. Heintzelman to establish a neo=liberal capitalist system propagating unsustainable development behavior. Along the entire process from resource extraction to production and post-consumption waste is generated. The management of waste is complicated and this is expressed in my evaluation of the Highland Creek Wastewater Biosolid Treatment Plant Class B environmental assessment. In my research, authors like Wilson, D, Rada, E. C, Hogland, W., & Stenis, J, helped formulate suggestions of effective mechanisms and strategies to deliver efficient waste management policies and practices that feed into the ultimate desire of sustainable development. The province of Ontario and other scenarios/experiences like the Ashbridges Bay Treatment Plant also provided such adequate information on sustainable waste policy and strategies and factual implementation processes.

Acknowledgement

I would like to appreciate my supervisor, Peter Mulvihill (Prof) for enduring with me through my ups and down during this period. Thank you for your support encouragement and guidance. You are a great teacher. You never for one day gave up on me. Your wisdom, knowledge, years of experience, ability to put at ease and to motivate has allowed me to produce this work. Most of all thank you for your patience. To my POS advisor Ellie Perkins (Prof) –thank you for your support and genuine concern and care beyond this project. The number of times you listened, encouraged and advice is invaluable. Your quick and easy descriptions and passion for clarity helped me focus on what matters. To Liette Gilbert MRP, I cannot say thank you enough. You and the entire panel that understood what was good for me before I did, your commitment to the welfare of your students can only be rewarded with a lifetime of happiness. To Teresa, in the office of the FES, your endurance has been tested by me and you have proven to be so kind. Thank you for your patience when I asked the same questions without end. To my family- my husband Calistus Korinjoh, my sons David and Benjamin Korinjoh thank you for your sacrifices, your love, and encouragement.

Dedication

This work is dedicated to all those who live off of and next to huge refuse dumps they never participated in creating but has stolen their present and threatens to steal their future.

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Overview

Waste Management is essential to environmental protection. The fundamentals of waste management rest on two pillars, less consumption of overall natural resources and emission reductions, upon which waste management initiatives, programs, policies, and practices are designed. More specifically, this includes waste diversion and reduction programs as well as waste to energy initiatives.

In Canada, upstream strategic approaches to waste management at the federal, provincial and municipal levels are relatively weak. These initiatives, action plans, and policies tend to fall short of meeting environmental protection and sustainable development goals and objectives. Although these strategies cannot be faulted for appropriateness there is a need for greater collaboration between government, industry, and stakeholders' necessary to achieve and maintain sustainable development goals. To foster a holistic and sustainable agenda enabling a healthy environment, it is important to identify and implement plans, projects, policies, and practices, driven by upstream sustainable strategies that protect the environment. Surprisingly, Canada has relatively little experience with upstream higher-level approaches to environmental management. For instance, the waste management sector in Ontario places emphasis on downstream environmental assessments (EA) of master plans and projects via Class EAs, therefore missing vital opportunities for a more strategic sustainable solution to waste management (VanNijnatten & Broadman 2009). Public education and outreach strategies have also dominated the Canadian environmental policy arena over the years for instance VCR (voluntary climate registry) and Federal and provincial climate change strategies. The effectiveness of these strategies is debatable, however, their influence on municipal waste diversion rates suggests that they can be useful. On the contrary, some professional's draw other conclusions based on the failure of the voluntary instrument in the 90's. They are of the opinion that the integration of a wide range of available tools organized in a comprehensive regime along the lines of sustainable development is essential to achieving significant waste reduction figures and not just waste diversion rates. The apparent unwillingness of the Canadian government to embrace a more comprehensive package of a combination of potentially effective instruments may hinder much-needed change in economic structure and social behavior vitally needed in waste management. This lackluster approach may be rooted in political factors where certain policy instruments are preferred due to pressures from non-governmental entities, public opinion, international trade influences and federal and provincial relations. These pressures deflect decisions away from the most effective approach but rather to a more politically accepted position made along the path of least resistance, therefore, discouraging innovation and relevant transformation needed in the economy and social behavior (VanNijnatten & Broadman 2009).

The term solid waste is robust, existing within it various types of unwanted-hazardous and non-hazardous material, sewage sludge, industrial sewage garbage, trash, wastewater, and rubbish. It describes various types of materials that have at one time been of value but at the present holds little to none for humans and therefore needs to be gotten rid of. Waste management developed from and for different purposes. Health concerns, public distaste, political motives and economic and environmental uncertainty. The pressure to management waste today is drawn from the ideology of sustainable development. Development and survival of standard of living and quality of life depend almost in totality on sustainable development where waste management is key to resource utility reduction and material reuse, recovery, and re-engineering. The main underlying purpose of waste management is to reduce dumping of waste in to the earth while sustainable waste management goes further by discouraging waste created by using multiple tools such as policy creation, regulatory instruments, innovations and technological advancement and a host of others alongside public education and outreach. In addition to these other sustainable waste management strategies

can include voluntary instruments with incentives to effectively and efficiently manage the entire line from goods generation; consumer consumption mentality and post product management/after use management. This makes the entire management line convoluted. Management, therefore, presents a bag of issues as most products today are. Intricate, complex problems like waste and its management require strategic thinking. Setting a framework that incorporates guidelines when deciding on various projects that will affect sustainable development is essential to the success of human's longevity or continued existence on the earth. Strategic EA embodies a host of approaches and concepts available within its processes that allow for the integration of individual environmental assessments at an early stage suitable for guiding various plans, policies, and programs to help lay the groundwork for sustainable development. Strategic environmental assessment guided by Gibson's sustainable assessments is a framework that incorporates structures able to redirect waste management to achieve sustainable waste management goals and objectives.

1 Introduction

Waste management decisions are often times initiated at municipal levels of governments without considering the weight of the resulting national issues and without considering the responsibility the waste sector bears on global sustainability and development. These decision making bubbles void of necessary influences are equally true for other sectors especially the economy. However, decisions about the economy are made on a global scale determined by the internationally accepted ideology of capitalism with total disregard or little regard at all to the environment. The intertwining of the terms "development" and "growth" in Pearce, et al,(2013) validates the singular narrative to growth which is the physical expansion of space resulting from organized development which requires constant material inflow for production. This particular understanding of growth/development requires constant consumption of the earth's resources resulting in the depletion of earth's natural stock capital. The processes involved in development alters the quality of soil, air, water and the ecosystem. These altered states eventually diminishes ecosystem service capacity, which is the ability for the environment to absorb and recycle waste and provide a healthy living space able to support life. These scenarios call for an urgent need to put a stop to the constant deployment of natural resources used to satisfy consumers' insatiable wants and their exponential desires. Dennis, L Meadows- *Limits to Growth,* supports this argument by explaining- the unsustainable pattern of continuous exploration of natural resources in a finite world will eventually lead to decline and in the long run exhaustion of available resources needed to support life.

Giddings, B et Al (2002) argues like Adam M (2003) about the direction modern societies are going. Giddings reflected on the behavior of growth in cities today. Since the industrial era, policies are created to foster growth in the economy, where the economy is viewed as a separate entity, apart from the environment and human society. Both Giddings et al (2002) and Adam M (2003) stress on the interconnectedness and dependency all sectors of the living system have on each other (society, environment, and the economy). There can be no louder echo from both writers about how much the economy is dependent on the other sectors for sustenance. This idea is also reflected in more recent work such as Welford, R. (2013). *Hijacking environmentalism: corporate responses to sustainable development*, where Welford explains "the more growth the more problems appear". Welford recognizes how ecosystems and primal cultures have been negatively altered and in some cases completely annihilated by aggressive human development and the creation of institutions that fosters these growth patterns. According to Welford, R (2013), Giddings et al (2002) and Meadows, D. (1972), the result of this selfish re-organisation of resources to serve capitalist systems can be felt and seen in the massive deforestation, extinction rates, and contamination of water supplies, increase in natural disasters, public health decline, and eventually the creation of tonnes of waste.

In more recent years there is evidence of contemporary nuances in waste generation. Capitalism amongst other things has over the years influenced social behavior. In the last couple decades, there has been an increasing link between consumer identities and consumption. The term

"symbolic consumption" depicts consumer behavioral change described by the accelerated pace of consumption which in turn causes further increase in the production of consumables (Ekström, K. M. 2014). Products are barely used if indeed at all and then thrown away for color and fashion inadequacies. Others are disposed of as repairs seem futile because new ones are more affordable and updated. The increase in consumption has led to an increase in waste and hence an interest in waste management (Ekström, K. M. 2014).

Other more traditional instigators of interest in waste management are rising environmental and health concerns. Public health crisis as far back as the beginning of the post-industrial era and more recently evidential understanding of the imminent demise of planet earth has led to the clamor for the management of waste along the entire chain of production that is, from production stages through consumption and disposal (Ekstrom, K.M. 2014). This is to say, waste management programs, plan, and policies are being designed in such a way as to foster resource reduction in production and encourage recycling, remanufacturing and eventually energy recovery from waste. For any waste management plan policy or program to be successful, it needs to be based on a strategic, integrated, sustainable long-term framework that has the capacity to comprehensively address the entire process based upon the concept of sustainability (Wilson, D. C. 2007).

Ekstrom (2017) further describes the success of any sustainable waste management plan or program having to rely heavily on a structure that encourages multi-disciplinary dialogue, facilitates the processes between the multi-faceted dimensions found within waste production as well as accommodates consumer reorientation programs alongside technology, innovation, and government policy. Strategic EA is a tool that embodies connectedness, integration, and holistic approaches. Strategic EA can serve as a go-to tool, guiding the design of a sustainable waste management plan that can be assessed, monitored and adjusted accordingly to ensure that it is positively contributing to sustainable development.

Strategic EA has an existing framework based on sustainable principles. This framework further enhances the assessments of plans, programs, and policies (including those within waste management) to meet the overall sustainable development goals described in the Brundtland report launched in 1988. The report has so far initiated a major cultural and policy shift in development, emphasizing links between ecology and economics (United Nations Commission on Sustainable development: Framing sustainable development- the Brundtland report 20 years on, 2007)

There are several ways in which strategic EA supports the sustainable development of plans, programs, and policies (PPPs), however, it can be traced along two trajectories. The first is methodological- process oriented, while the second is along institutional and learning change (White, L., & Noble, B. F. (2013). The benefit of a strategic EA (SEA) methodology to the larger environmental policy and planning system can be found within its decision support framework. As well, SEA possesses a range of assessment tools that aid decision making based on sustainability concepts (Nilsson & Dalkmann, 2001). Both methodologies are comparable to components found in the pillars of waste management. Firstly, the physical or hardware component comprising of waste collection services, environmental protection, and resource management. While the second pillar is governance strategies based on sound pro-active policies (example: Waste Action Plan), inclusivity (stakeholder contributions) and financial effectiveness (service and activity affordability). Both waste management components represent the goals of strategic EA on a more specific, micro-level while strategic EA methodologies are macro generalist approaches. The platform strategic EA framework provides is essential to the success of waste management, while sustainable waste management, in turn, feeds into the overall objective of strategic EA.

Challenges affecting the implementation of strategic EA and its benefits according to a feedback acquired from a host of specialist who discussed during a workshop held at the Canadian Environmental Assessment Agency (2004), stems from a lack of awareness. The significance attached to strategic EA by central agencies especially in Canada has been lackluster, to say the least. Other inadequacies such as standards and

best practice issues can be addressed but pale in comparison to the lack of push and desire to implement and utilize strategic EA (VanNijnatten & Broadman 2009). This has resulted in a weak approach to strategic EA in Canada. Interestingly, more recently Environment Canada is strengthening strategic EAs by fully integrating it into their decision-making process while setting it completely apart from environmental impact assessments (EIA). The Highland Creek Wastewater Treatment Plan (2016) expansion In Ontario Canada is a case in point where strategic EA was used to assess the viability of the upgrades to the facility to meet sustainable development goals of pollution reduction and environmental protection (City of Toronto, 2016). This research paper discusses waste management in relation to strategic environmental assessments and Gibson's sustainability assessment criteria for the purpose of shifting attention from end-of-pipe treatments towards optimal resource utilization and long-term reliability (Balkema et al., 2006). This is an attempt to make a contribution towards a more desirable and durable future for the present and upcoming generations. The onerous goal of both strategic EA and Gibson's sustainability assessments is to influence decision making by using sustainability centered criteria to justify options and to weigh trade-offs. The scope of this paper is limited to influencing decision making and less on trade-off practices. The HCTP class EA will be used as a case study to identify strategic environmental and sustainability assessment leverage points to encourage sustainable waste management.

2 Project Methodology

Documents sourced from credible websites and publications will be analyzed to establish the current state of waste management strategies and policies in Canada. Federal and municipal government websites will be accessed while government-funded research and other credible organizations websites will be examined for relevant supporting information which will assist in developing a current waste management scenario in Canada and specifically in the province of Ontario.

A key question I hope to answer is whether strategic EA process can be used as a blueprint upon which waste management plans, programs, and policies processes can benefit from. For this assessment, document reviews on strategic EA purpose, advantages and limitations will be studied. Following will be a review of processes and methods for sustainability assessments based upon Gibson's sustainability principles. This will be done to assess appropriateness of strategic EA as a tool suitable to foster sustainable development goals and objectives

A review of a current strategic environmental waste management process will be done in order to identify gaps that need to be addressed so to encourage greater cohesion fostering sustainable development approaches to waste management.

A study of the Highland Creek Wastewater Treatment Plant (HCTP) Biosolids management Class Environmental Assessment (2016) will be reviewed. The idea is to identify areas of opportunity and match them up with appropriate approaches identified in the strategic EA process to enhance the waste management process and align it more closely with meeting sustainability agenda.

All of the research methods chosen are secondary. However, the entire paper is based on peer-reviewed documents that establish gaps between theoretical ideology and practical experience. Work has already been done to establish this gap. Also, strategic EA has been identified by scholars and practitioners both within Canada and outside as a high-level tool necessary to encourage the consideration of the environment in all aspects of the decision making before implementation. Research lies in the assessment of strategic EA as an ideal sustainable tool using Gibson's sustainable principle (integrity, sufficiency and opportunity, equity, efficiency, democracy and civility (Stincchombe & Gibson 2001) that waste management process could be modelled after in the hope of closely connecting waste management to sustainable development's goals and objectives. The theoretical framework adopted is guided by strategic EA which has an inbuilt quality that allows for the assessments of set targets needed to confirm achievable goals and objectives set out by plans, programs, and policies. These weights are organized around sustainable principles and for the purpose of this research paper, the guiding framework is based on Gibsons's (2006) sustainability principles. This theoretical framework allows for the engagement of two conflicting conventional ideologies of development and ecology and extending

these in a manner that balances objectives of social, cultural, economic, environmental and political spheres in a sustainable way that potentially considers inter and intragenerational equity (Gibson 2006)

3 Problem definition- *Canada and waste management*

Canada has been described as having a poor record when compared to other OECD (organization for economic Co-operative Development) countries ranking 17 out of 17 (Giroux 2014). In 2014 a report written by Giroux Environmental Consulting identified areas of opportunity in Canada's waste policy framework. In general, the reports highlight opportunities for more effective collaboration between the ICI (Industrial Commercial and Institutional) sectors as well as governments (recycling councils) and stakeholders (large retailers) involved. Other opportunities can be harnessed by improving the content strategy within actions, policies, programs, and plans where tangible targets can be set to encourage upstream changes in an attempt to reduce overall waste generation. Performance-based regulations like EPR (Extended Producer Responsibility) is a case in point.

Despite the poor ranking Canada has made significant attempts to adopt mechanisms that address article 12 Kyoto Protocol on the Clean Development Mechanism (CDM) by designing (Shrestha & Timilsina 2002) policies and plans such as implementing the Waste Action Plan and very importantly the very ambitious Zero waste management hierarchy of 2014 amongst others (CD4CDM, Malawi). Such efforts are aimed at providing specific and targeted depth to 3Rs strategy (reduce, reuse and recycle) by placing emphasis on all audiences which include, policymakers, industry, and individuals participating in waste production and management. Solutions such as policies designed to enable the best and lowest use of materials by encouraging activities and investments that promote the preferred hierarchy of reduction, all the way to solutions intended to assist in developing a guide that will promote the development of systems or products that will advance a zero waste definition are currently being implemented in Canada (Giroux, 2014). However, there seems to be a disparity between the theory of policy on paper and substantive outcomes. This is evident when looking at the difference between waste diversion and waste generation. Data retrieved from statistic Canada between the years 2008-2010 (Statistics Canada 2013 waste management industry survey) on waste diversion rate when compared to the article on waste management by Bogner et al (2007) it is observed that there is a corresponding increase in the waste generation between the same periods. This may depict a scenario where acclaim is given to increase the rate of diversion without recognizing the corresponding increase in waste generation. The report on *State of Waste Management in Canada* (2014) by Giroux Consulting summarizes opportunities to harmonize waste diversion and waste generation. These suggestions lie within a strategic arena by relying on the federal government to implement programs like extended producer responsibility (EPR). For instance, the government may restrict mercury-containing products and harmonize approaches to developing EPR programs. The report further emphasized the harmonization of homogenous material for easy recycling processing.

The complexity in the area of waste generation and its management requires a comprehensive and integrated strategy in order to enable sustainable waste management plans, policies and projects support sustainable development. Waste generation is closely linked to population, urbanization, and affluence (Bogner et al 2007), these factors greatly increase management complexity. The challenge witnessed in the management of waste today is undoubtedly that of the dominant neo-liberal paradigm plaguing the political sphere by influencing policies and ideologies to accommodate growth across most sectors. The concerning factor here is the unbounded nature of the problems created by political decisions made within contained geographic spaces that cause trans-boundary issues. These local decisions have led to environmental justice issues, environmental degradation, water/soil and air pollution, habitat loss and a host of other rippling/accumulative effects reaching far beyond the boundaries within which they were made (Noble B. 2010). For instance, policies designed to encourage industrialization and

globalization inevitably causes an increase in air pollution consequently stimulating global warming and its related accumulative effects (Bogner et al, 2007). Accumulated or rippling negative effects are generally adverse to socio-economic stability and ecological functions and more often than not may inevitably raise public concern that could lead to some sort of protest or revolt.

Presently, most countries have tools like environmental impact assessments (EIA) to deal with project-based impacts. However, the methods suggested to address the negative impacts such as mitigation, rectification and/or compensation are for the most part the default whilst, avoidance of such projects are encumbered by burdensome bureaucratic systems (Noble B. 2010). Furthermore, predicting project impacts on human environments are complex and uncertain and to a large extent not done well (Gonzalea, A. et. al. 2015). In most cases, the structure of environmental Impact assessments (EIA) empowers the proponent with control over the mitigation of impacts leaving this method to some extent questionable (Noble, B. 2010).

Strategic EA was established to address some of these limitations. It is a deliberate intervention, comprehensively designed, to engage scenarios with multiple variables such as those found in waste generation and waste management that may impact decision processes. Variables like higher levels of complexity and interconnectedness, high level of significance, a high degree of probability, frequent and long-lasting broad spatial scale effects as well as intense/severe levels of change (Noble B. 2010) are accommodated within the framework of strategic EA. Noble, F. Bram (2010), suggests that strategic EA objectives are to integrate the environment into higher order decision making processes with the ambition to encourage holistic analysis of policy, plans and projects (PPP) before developments are proposed. Early considerations of PPP's are a proactive approach, done in a manner where appropriate alternatives are assessed against the preferred attainable end/ends. Importantly, strategic EA deploys a system component methodology allowing for the involvements of industry, commerce, and institution as well as the participation of as many stakeholder groups as are involved and the general public.

Waste management and the Canadian experience

> "Waste can be considered as a resource out of place and if managed properly can provide material or energy in useful forms"
> (Jayasinghe, et al 2013)

What initiated, waste management in the past was the reality that health and safety were directly linked to waste and waste management. In the ninth century, public health concern was a key driver leading up to the formalization of a waste collection system. Even today health is still a major determinant of waste management considering that per capita waste generation has increased by 22% from as recent as between 1980-1997 alone (OECD, 2001). However, other distresses of equal importance are environmental protection and economic sustenance (Wilson. D.C. 2007). Derived from these are drivers initiating and sustaining waste management- public awareness and institutional responsibility concerns. This has triggered a shift in the management of waste from an end –of- pipe solutions to a more holistic resource management approach (Wilson. D.C. 2007).

These environmental concerns stem from potential or actual pollution. Humans have for a long time regarded the environment as a sink for most activities that involve the production of waste. Materials were released into the air, waterways or in landfills where they were allowed to dilute and disperse (White, et al 2012). This worked for a while when communities sizes were small and the exploitation of natural resource was limited due to the lack of technology. Resources were scarce so people reused and repaired products while, using organic waste to grow plants and feed livestock (White, et al, 2007). Waste generation was small hence, emitting low levels of pollution, where natural biological and geochemical processes could break down and absorb the waste without tipping the delicate environmental conditions (White, et al 2012).

However, as population increased, simultaneous commerce activities has equally risen and hence resulting pollution levels. Emissions have increased exponentially and threaten the fragile environmental conditions leading to changes in the quality of the environment and to some extent quality of life for most vulnerable people today and possibly a lot more in the future (White, et al 2012). Apart from these big environmental concerns such as climate change and global warming that have instigated international level agitation over waste and waste management proposals, others are more locally oriented concerns. Communities grumble over the siting of new waste treatment facilities, landfilled sites generating unwanted gases or the risk of groundwater pollution from leachate (white, et al 2012). Local attitudes towards waste management have produced some unhealthy behaviors such as the NIMBY (not in my own backyard) or the BANANA (Build Absolutely Nothing, Anytime, Near Anybody). As understandable as this is, it ignores the collective responsibility every individual has towards waste management (White, et al 2012). Although waste management activities may improve efficiency and effectiveness, thereby reducing pollution by utilizing end-of-pipe solutions like treatment and disposal these still have environmental impacts in and of themselves. This suggests that there is a need for a more strategic waste management approach to be adopted.

Further reasons for strategic solutions lies in as basic a discussion on what is waste. Before addressing the nature of waste it is important to stress how controversial the term waste is for both political and academic reasons. This could range from legal definitions by the government and cooperate establishments to the definition of waste as its value to society. However, what is known is urbanization; economic growth and industrialization have led to the increase in solid and hazardous waste generation and inevitability, health issues, pollution of air, water and land. Another aspect is the current inefficient and ineffective waste management approach that has encouraged upsurges in greenhouses gases, toxic material release and unfortunately, loss of non-renewable natural resource (United Nation, 2010). In 1972 Meadows et al in the publication *Limits to Growth* argued that the earth finite resources may in the future fail to sustain demand by the growing economic need. As well the sequel publication, *Beyond the Limits to Growth*, establishes the urgency with which raw materials are consumed and at an irreplaceable rate. (White et al 2012).

This backdrop helps to establish the reason for the data on waste generation by the World Bank in the online PDF on *Waste Generation* in the article on *Urban Development Series-Knowledge* Papers 2010. Currently, the global trend of Municipal waste is approximately 1.3 billion tonnes per year, with at least 1.2 kg allocated to each person per day. Suffice it to say that, the countries with a larger urban population generate a higher per capita of waste. By 2025, this increase will double to 2.2 billion tonnes; while per person will be 1.45Kg. Hidden within these statistics are a host of components such as types of waste generated, care of waste and which part of the world generates more and which countries have put in mechanisms to address waste management, and what they are and which countries are choosing to trade waste and where is it going. Notwithstanding, these statistic helps to establish that waste generation problems are a global issue and would definitely require joint efforts to tackle, under the canopy of sustainable waste management. Sustainable waste management requires two-fold action plan:

1) The conservation of resources - would lead to the dematerialization of production hence minimise/reduce waste generation.
2) The recovery of material or energy from waste for reuse - this should slow down the exhaustion of renewable and non-renewable resources, hence reducing renewables consumption to a rate where it can be replenished.

(White et al 2012)

According to Caroline Hand in her book on *Waste management: the new legislative climate*, the legal definition of waste established by the European Union (EU) and revised by Waste Framework Directive 75/442/EEC waste is “any substance or object which the holder discards, or

intends to or is required to discard". The clause here is regardless of the value to the next user of the discarded product; once it is discarded it is deemed as waste by law and therefore, are subject to controls such as licensing (Hand, 2006). However, it should be noted that the definition of waste is an ever-evolving discussion and open to a lot of interpretations. Recently, results from some court cases have made the definition more inclusive. Waste can now include soil contaminated by unintentional spills. This is in addition to the following existing material

- Household waste
- Commercial waste
- Industrial waste
- Gaseous emissions
- Radioactive waste
- Waste from mining and quarrying
- Natural, non-dangerous agricultural material-manure
- Wastewater.

(Hand, 2006)

White et al 2012 describe waste as "a by-product of human activities" typically containing the same material as useful products, differing simply by its lack of value. Therefore, the simple restoration of its value should restore its usefulness and hence ceases to be waste. However, as noted above by Carolina Hand, the legislation makes it difficult to re-establish value. White et al further classifies wastes by physical state (solid, liquid gaseous), by material (glass, paper), by properties (combustible, compostable, and recyclable), by origin (industrial, domestic, commercial, agricultural) and finally by safety (hazardous or non-hazardous).

In general waste management involves landfills, incineration, treatment and composting plants, recycling.

However, with a new mandate towards sustainable waste management, this former system is progressively working alongside a more holistic approach - Pollution Prevention and Controlled regime covering all types of industries (Hand 2006). This regime is principled upon the need to protect the environment by minimizing polluting emissions (air, water, and land), maximizing good waste management practices and importantly, the conservation of resources regulated by the Environmental Agency. The overall objective for the governments or the political redress in positionality is to set out the strategy for sustainable development by breaking the link between economic growth and environmental impact of waste. This is in the hopes of protecting human health and environment by producing less waste and using what is waste as resourcefully as possible (Hand 2006).

Traditional waste management practices are heavily based on direct government regulation widely referred to as command and control. This is a regulatory approach were local authorities set environmental standards or targets. Polluters are required to honor the set target threatened by penalties (Pearce & Turner 1993). An example of such targets are the recycling standards set by some industrial countries in the 90's It was designed in the hopes of gradually increasing recycling participation with the intention of reducing waste generation. For instance with regards to recycling:

Canada	National Packaging Protocol adopted in 1990, aims to reduce packaging in the MSW by 20% (from 1988 levels) by 1992, and by 50% by the year 2000.
France	50% recycling target (undated), either involving materials recycling rather than energy production
Germany	64% recycling target by 1995, bias towards materials recycling rather than energy production

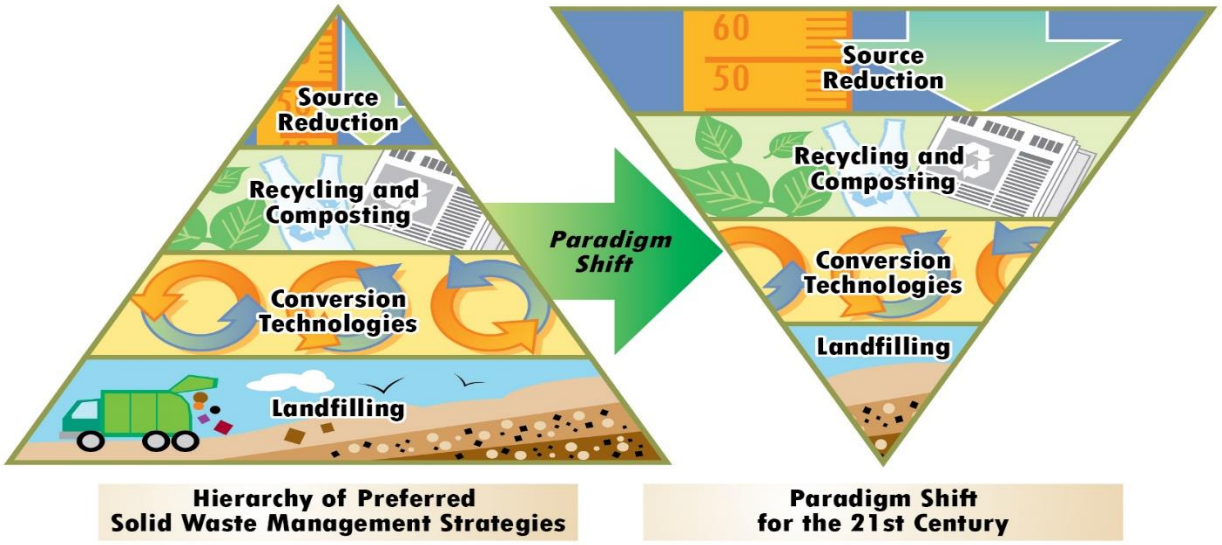
(Pearce & Turner 1993)

However, database limitations due to information deficiencies, the utilization of improper systems stemming from a piecemeal approach and the lack of economic cost-benefit thinking (pricing of externalities) has affected perspective target setting (Pearce & Turner 1993). Alter, H. (1991), *The future course of solid waste management in the US*. Waste Management and Research 9: 3-20, agrees with this perspective as his analysis reveals, even at utmost efficiency, recycling target of 25% are unobtainable. This could be based upon the analysis found within the EU document on the EU Policy: *The Story Behind The Strategy,* stating, the amount of waste generated depends on a wide complex range of evolving factors. Waste generation depends upon levels of economic activities, demographic change, technological innovation, lifestyle as well as patterns of production and consumption. Therefore, waste prevention targets cannot be in isolation of production and resource policy (EU: waste policy)

It is notable to say at this juncture that, severing the link between the economic growth and environmental impact of waste will be difficult. According to El Haggar, S. 2010 in *Sustainable industrial design and waste management: cradle-to-cradle for sustainable development,* the stumbling block between industry (development) and environmental protection is cost and return. Pollution control and prevention and treatment are determined as costly, burdensome and impede development.

Therefore, any widely acceptable and successful solution should be comprehensive, applicable to both developed and developing countries, must contain economic benefits, employ the use of current technology and most importantly be socially and environmentally contextually situated (El, Haggar, 2010). To achieve the above criteria, El, Haggar (2010) identifies the need for an integrated waste management (IWM) system, comprising of multiple techniques and management practices. McDougall, F. R., et al (2008), in the publication- *Integrated solid waste management: a life cycle inventory*, echoed the same sentiments of a comprehensive, integrated waste management system with the same criteria, however, goes further to express that although the objective is to attain total quality improvement (economic and environmental sustainability), achieving this is not possible but suggested that continual improvements to the system and processes should be embarked upon. Other literature, such as USEPA 1989 publication *The Solid Waste Dilemma: An Agenda for Action,* projects the hierarchy for waste management based upon reduction, recycling, combustion, and landfill. While others focus on prevention, source reduction, and reuse. Yet others categorize waste management practices into source prevention and source reduction.

Nevertheless, unlike the traditional waste management hierarchy of reduce, reuse, recycle, recovery, treatment, and disposal, the latest literature on integrated waste management practice has a general consensus on prevention and control of waste generation from production processes to waste recovery and energy practices. It is very important at this point, after assessing traditional waste management interventions to say, they lack an economic perspective, where the cost to the environment is not considered and where that burden might lie.



Waste policy emanated from the problems and scandals related to waste handling in the 1970s and 80s that could have led to human health and environmental issues. For instance, the Seveso Waste Shipment Scandal: In 1983 41 barrels of dioxin waste turned up in Northern France traced to a chemical plant in Seveso Italy where a chemical accident had occurred in 1976 resulting in toxic chemical waste (EU: Waste Policy). This jolted member states to begin taking national measures to control and manage waste. This led up to the Waste framework directive and Hazardous waste directive (1975) and later the Waste Shipment Regulation. These legislative formed the basis for structured waste management regulation within the EU. It developed definitions for waste, and how waste should be handled and treated at the minimal environmental expense.

However, the 1980s saw a tightening of these regulations in industrialized countries which made hazardous waste handling costs and other avenues of waste disposal were employed- the shipping of hazardous waste to developing countries known as "toxic trading". Upon discovery and a notable international outcry, enactment of a multilateral environmental agreement called the Basel Convention was passed. The convention addressed controls over waste movement, hazardous waste minimisation, cleaner production and a ban on discharging waste into water bodies. It, however, failed to include parameters to guiding emission of various waste management practices such as incineration, landfills, and recycling. This weakened the ability for this policy to fully meet its objectives and so by 2000 and 2001 the Waste Incineration Directive and the Landfill Directives were adopted providing set standards for air and water pollution.

Prior to this, the Integrated Pollution and Prevention Control (IPPC) Directive was adopted in 1996 to provide permits to tackle pollution from industrial and agricultural facilities. In that same year, the Waste Strategy Commission from the EU was mandated to improve the management of waste with emphasis on recycling, reuse, and energy recovery (EU: Waste Policy). The Commission came up with the:

- Strengthening of the notion of waste hierarchy
- Stressing of the polluter pay principle on waste
- Development the concept of priority waste streams

The commission identified some waste streams were practices had led to high level of environmental pollution or where the difficulty in organizing recycling funding diminished efforts on environmental health. This led to the legislation on packaging and packaging waste, end-of-life vehicles and the electrical and electronic equipment (EU: Waste Policy).

Waste policy in Canada Ontario has thus far been a combination of both voluntary compliance and regulatory directives. In the early 1960 soft drink companies for economic purposes initiated the switch from glass refillable to non-refillable cans claiming they were safer and more convenient and less expensive for retailers as they don't have to collect and process. The rippling effect instigating public and government concern was the increase in the garbage (CIELAP 2008). As a result, the government (Via the Ministry of Environment- MOE), pressured by local environmental groups to protect the environment and the health of people revised the environmental protection act to accommodate the phasing out of non-refillable containers over 5 years starting July 1997. The soft drink companies lobbied government claiming that this would bring about job loss and closure of capital facilities (CIELAP, 2008). The government caved in and responded by saying, only 75% of soft drink containers need to be re-fillable of which industry never attained (CIELAP, 2008). The decline of refillable brought about the landfill crisis in the 80's. In reaction to this, a number of companies came together to form the Recycling Support Council and willing to contribute 1 million dollars to support provinces to launch the publicly funded curbside system. The intention was to influence government to amend soft drink regulation (CIELAP, 2008). Although, this was supported by some environmental groups, however, soft drink companies and their alleys

advocated for and won in favor of the deposit-refund system further strengthened by the Canadian Industry Packaging Industry Initiative (CIELAP, 2000).

Following this, the government in the 1980s, after convening a multi-stakeholder discussion came up with Regulation 340 and 352 under the Environmental Protection Act in the support of recycling while ensuring that re-fillable' continue to be sold. These regulations suggested the use of curbside recycling to achieve the desired 50% recyclables by soft drink companies by 1988. Responding to this, the Soft Drinks Association set up the Ontario Multi-Material Recycling Incorporation funded to the tune of 20 million dollars to promote the Blue Box System (CIELAP, 2008). The acceptance of the Blue Box increased while the refillable regulation declined. Between 1994 and 2000, the Ministry of Environment (MOE) announced waste diversion targets and the established the Waste Reduction Action Plan (WRAP) which included the initiatives promoting waste diversion and 3Rs-Reduce, Reuse and Recycle (CIELAP, 2008). The overall objectives of WRAP:

- Waste audits and reduction plans
- Recycling and composting municipal waste
- Industrial, institutional and commercial waste separation program
- Packaging Audit and packaging reduction work plan.

(CIELAP, 2008)

The Waste Diversion Act was enacted in 2002 in an attempt to promote the 3Rs by developing, operating and implementing waste diversion programs (CIELAP, 2008).

Looking at both EU and Ontario Waste policy development some similarities can be drawn such as waste diversion with the use of the 3Rs and the inclusion of industry, institution and commercial sectors with schemes like the EPR. This is not to say that somethings cannot be learned from the EU and Canada. For instance, the Canadian Centre for Policy Alternatives (CCPA) supports waste management initiatives that tend towards zero waste policies through resource depletion and waste regeneration. The CCPA favored the closed loop system discussed as one of the EU policies as well as the hierarchical waste management program starting with eliminating to recycle. Others are the Recycling Partnership, poised to improve relations between public and private institutions with regards to recycling. These are voluntary initiative that fills in the gap where government maybe lacking or yet to takeover (The Recycling Partnership web-based). On the other, hand, the EU could take an example from Ontario to forge less regulatory relations, but build confidence in the ability of the locals to be involved voluntarily. This could cost less and encourage personal habit change (CCPA).

4 Strategic environmental assessment: *Policy, waste management, and the Canadian Strategy*

The Canadian environmental policy context has over the years been relatively limited by the government's approach to the selection and choice of policy instruments employed. In the 90's voluntary instruments dominated the environmental approach, however, most government policy context lays within regulatory instruments and at instances fiscal instruments like subsidies. The use of single policy instruments or a simple combination of instruments has also strongly framed the Canadian policy arena in an attempt at forward thinking. The explanation for this emanates from "political unwillingness to streamline discussions on policy selections based on rational considerations of effectiveness, efficiency and fairness as it relates to stated political goals" (VanNijnatten & Broadman,2009). Other possible factors are

international trade regulations that bind Canadian actors, public opinion, and even federal-provincial relationships. The resulting effects direct decisions further away from the most effective and reliable compilation of policy instruments that meet the desired end which is sustainability. This is not to say that there are no successes with simple combinations of tools or the use of conventional instruments as they may be very appropriate and effective when employed with vigor. For instance, the reduction of emissions of specific pollutants by certain manufactures has been the focus of narrow policy instruments. Nevertheless, what Canadian governments have not done is, seek more enhanced and systemic policy outcomes reliant on a more innovative, integrated and ambitious regime of instruments like for instance California's approach to energy efficiency. California is an example where the end goal is beyond efficiency performance of individual products but is an effort to achieve long-term structural changes to allow for the state's economy and society to sustain energy efficiency while reducing reliance on unsustainable energy resources (VanNijnatten & Broadman, 2009).

The Canadian Environmental Assessment and Review Process of 1973 witnessed the birth of environmental impact assessments where individual projects are evaluated in order to implement solutions and monitor project compliance. Bram and Gunn in their article Strategic Environmental Assessment edited by Kevin Hanna (2012) discuss the evolutionary changes in the Canadian idea of environmental management. They emphasize a shift from the end goal of individual project assessment to a growing interest in the implications of decisions and actions above project level. The overall desire is to affect decisions and actions in such a way as to make project development more consistent with broader environmental goals and desired future outcomes. Therefore there needs to be more strategy in environmental assessments designed to accommodate sources of environmental impacts and the drivers of environmental change.

The need for strategic environmental assessments can be traced along 2 paths. First, the need to promote the development of plans, projects, and policies that are sensitive to the environment by developing a framework consisting of guidelines that navigate decisions and actions towards broader environmental sustainable goals. The second is the understanding that project/individual environmental assessments are not entirely capable of considering non-project impacts, cumulative impacts, and most possible alternatives. Strategic EA is a process whereby a planning framework and decision-making environment is designed within which environmental effects of PPPs are addressed in a broader comprehensive context and at a much earlier stage (Harriman & Noble, 2008). Strategic EA is characterized by having a more decision centered procedural focus and is motivated by a desire to integrate substantive environmental concerns and priorities into decision making as well. The relationship strategic EA has with decision making ranges from fully integrated, partially or fully separate as in the case of Canada. Nevertheless, strategic EAs relationship with decision making makes it highly political and this may speak to the reasons why many professionals are not keen on exploring more of its usefulness when considering that EIA already exists. This political struggle and lackluster approach by professionals may place barriers to the achievement of economic restructure and social behavioral change (VanNijnatten & Broadman, 2009). Strategic EA tries to address this by using a range of procedural initiatives. First, early formulation of procedures emphasizing rigor, rationality, formality and technical analysis. Second, deploying lower levels of spatial planning while utilizing elements of a rational-technical approaches (VanNijnatten & Broadman, 2009). Although these are more goals driven they tend to employ longer time span and cover broader spatial boundaries. This makes its decision-making process strategic, adaptive and interconnected. From a procedural point of view, SEA is broadly acknowledged to be iterative, integrative, adaptive, highly valued in uncertainties, precautious and context driven. This enables SEA to be proactive in ameliorating the problems in policy making formulation with regards to decisions making. SEA seeks to make the process more transparent, inclusive, and collaborative, informed and substantiated.

The substantive purpose of the SEA is driven by the expectations of the outcome. If it is based on a specific issue like ecological concerns then it is limited to that scope. If the outcomes concern a combination of issues like economic, social environmental, ecological cumulative effects and so on then the scope equally broadens. It can even go further to include holistic environmental concerns and those of sustainability and progress towards it (Lawrence, 2013). To achieve greater sustainable outcomes, SEA models its methodology around the types of question asked at the strategic levels of assessments and not just a matter of extending EIA methodology upstream. Verheem and Tonk (2000) described SEA methodology as "one concept, multiple forms". However, Noble (2009), talks about a trend if followed facilitates the development of an effective SEA methodology.

Effective SEA methodology must –

- *accommodate a wide range of interests and options. It must be able to balance competing and conflicting goals simultaneously. This involves using varied sources of information (scientific and non-scientific) for the purpose of aiding decision making by clarifying problems and presenting well-assessed alternatives there consequences and positives.*
- *have a high level of integration. There is multiple stakeholder interests in SEA problems and a range of disciplines involved in solving them and therefore requires a high degree of integration of disciplines and interests.*
- *be adaptive and flexible to employ various techniques and methods. As the process advances the methods and techniques utilized at a certain level of decision making may differ from the next.*
- *have a structured approach. Although SEA is to be flexible some professionals believe that some structure makes it more acceptable and more appealing. It allows for systematic identification of PPP choice and most importantly united interpretation principles. It also allows for reassessment under a varied set of scenarios. It ensures that output is based on a specific set of decision rules. It allows for explicit analysis of trade-offs and a proper sensitivity analysis can be undertaken (Hanna, 2009).*

The relationship between SEA and sustainability exist within the principles and methodologies employed by SEA. And as well the overall purpose and desired outcome of the SEA where it specifically addresses current and future PPPs against broader visions and sets of goals beyond the present foster this relationship. Sustainable development as described by the Brundtland Report is "development able to meet the needs of the present generation without compromising the future generations' ability to meet their own needs. SEA's holistic, higher order incorporation of environmental social and economic factors of present and proposed developments encompasses this ideology. However, there is a need to be specific as discussed earlier, the scope of an SEA and the need and set desired outcomes may limit the sustainability underlay of the SEA. Therefore, sustainability agenda has to be purposely and clearly interjected into SEA process and procedure and methodology. In order to make sure SEA is aligned closely with sustainability it is necessary to

- Develop an SEA framework to support decision making for sustainability
- Set sustainability objectives
- Integrate sustainability criteria into PPP development
- Promote sustainability outcomes through institutional learning

(White & Noble 2012)

In Canada progress has been made with regards to SEA. As of 2010 the Federal Sustainability Development Strategy, the government decided to include FSDS environmental considerations into its decision-making process. It was decided that SEA will be used as a vehicle to allow for such fusion. By 2011 all FSDS department had confirmed to have included in their procedures SEA processes so certain degrees. It is important to have the vehicle but it is also very important to design properly the goods to be delivered. Sustainability is the good that SEA needs to carry for any process to truly be strategic (Environment and Climate Change Canada—sustainable Development FSDS)

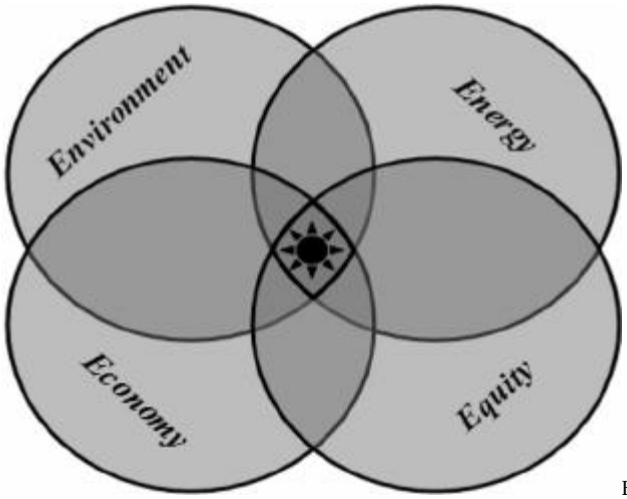
5 Promoting sustainable development- *Gibson sustainability criteria an assessment tool*

In order to realize the goals of sustainability, it is necessary to consider sustainability assessments as a decision making strategy. Sustainability assessments can be described as a tool that guides decision making or influences decision making in a manner that promotes

- *Equity- justice and fairness (inter/intrageneration), interspecies equity (stewardship of humans over nature for non-human), geographical equity (global responsibility) and procedural equity (participatory)*
- *Dynamics-in a world that society and the environment is in constant flux with high uncertainties and risks there needs to be an element of precaution*
- *Integration-reconciling environmental concerns with developmental needs*
- *Normativity-ultimately sustainable development is a social construct decided by the way we chose to live now and how we decide to live for the future (Gibson, 2006)*

It is essential at this juncture to discuss the debate on sustainable development and its effectiveness. Most professionals agree with the writings of Gibson's (2006) about the gap between theory/words on sustainable development and its implementation/deeds. In theory, most professionals believe it to be doable however the breadth of sustainable development – its holistic and multi-dimensional nature yields a host of uncertainties and risks thereby magnifying this already very complex assessment and measurement process. For the purpose of less being more this definition of sustainable assessment is to the point - sustainable assessment is any process that directs decision making towards sustainable development (Wass et al). Gibson (2006) gives a more meaty definition for the purpose of understanding the inherent problems within it. Sustainable assessments are:

Sustainability by Gibson: natural systems and social systems thrive and survive indefinitely



Euston and Gibson (1995)

- Processes aimed at contributing to the understanding of sustainability and their contextual interpretations
- Processes that integrate sustainability agenda into decision-making processes by identifying and assessing sustainability impacts
- Processes that encourage sustainability objectives and goals

These definitions emanate the purpose of sustainable assessment, however, allows for clarity in problem areas.

- Information gathering –challenge: collation and interpretation
- Participation debate and deliberation-challenge: information interpretation
- Social learning-challenge: information

The bedrock of challenges found within sustainability assessments according to Gibson (2006) lies in the vague nature of what are contributions to sustainability. While contributions to sustainability are a set of agreeable purposes, however, to concretize outcomes there need to be specifications or core criteria for evaluation that will lead to decisions that will establish net gains as the basic objective. Gibson (2006) further stresses that core criterion for evaluations which gives sustainability functionality hence validation are developed by addressing questions of significance. That is what is judged to be a positive or a significantly negative effect. In addition to questions of significance are what purpose defines the scope of the study, what defines a reasonable alternative, who are the participants involved and what details of effects should be examined. Other questions should include what proposal can be accepted having defined what trade-offs and compromises are equally acceptable and under what conditions. What provision is made regarding monitoring, enforcement, and adaptations? Answering these questions assists in developing a basic evaluation and decision making schedule that allows for closer ties to contributions to sustainability (Gibson 2006). The resulting answers will help in designing a generic set of evaluations and decision criteria. When designing sustainability assessments, integration is key to a successful outcome. Evaluations and criteria must consider the integration of links between social, economy and ecological context. In addition to utilizing generic evaluations and criteria, it is vital to

include contextual circumstances specific to the project to enhance sustainability prospects. Integration is also necessary to support the fusion of prioritizing between municipal, provincial and federal government and the future generations. It also showcases the best alternative and areas for improvements in any option. These strategies involving questions pertaining to significance and integration methodology will help to clarify the general understanding of what contributions to sustainability entails. Below is an example of Gibson, Robert B., (January 26, 2006) sustainability criteria and questions designed to allow stakeholders mine information that can help guide decisions.

Table 1

Core areas for sustainability assessment	Criteria	Questions guiding sustainable decisions
Socio-ecological system integrity	Enhance relationship between human and ecological systems to ensure biophysical system are able to support life continuously	How do human activities affect ecological systems? How can threats to ecological system integrity and viability be reduced?
Livelihood sufficiency & prospects	Ensure equity among people and communities and the ability to seek better quality of life without compromise to the future generations	What are the key prerequisites for a good quality of life for all? Whose needs are being considered with respect to diversity?
Intergenerational equity	Ensure that effective and sufficient choices are made for all involved and in all aspects of life with as little as possible damage to sufficiency and opportunities	How can we build sustainable livelihoods for all as well as how can we increase the power to choose a sustainable way of life? How can the focus shift away from growth/material intensive activities to improving quality of life with less material input?
Intergenerational equity	Ensure that choices of current actions and opportunities are made consciously not to jeopardize those of the futures	How can current exploitation rates and resulting pressures on the ecological system be reversed so to allow for the survival of the future generation? How can a system be built in such a way as to maintain the integrity of the ecological system for today and the future?
Resource maintenance and efficiency	Provide a broader base of sustainable livelihood by reducing threats to long-term integrity of the socio-economic system by reducing resource extraction and waste	How can we do more with fewer resources (remanufacturing, recycling, reuse and reduce. Innovation and technology, end-user responsibility etc), thereby ensuring economic development with little to no harm to the environment? How can the systems of the economy change to ensure efficiency gains, policy instruments and government intervention?
Socio-ecological civility and good governance	Ensure the inclusion of sustainability concerns throughout discussions and decision-making practices	How can we encourage conscious choices and decisions that promote sustainable development? How can we design structures capable of integrating complex intertwining and dynamic conditions? How do we develop a process that fosters inclusion and the involvement of all stakeholders?

Precaution and adaptations	Ensure the use of precautionary principle to avoid uncertainty and poorly assessed risks and irreversible damage	How do we react to information about risks to social and ecological systems crucial to life? How can we design developments in a manner that is adaptable, diverse, reversible and flexible where there is a high level of uncertainty? How can broad comprehensive instrument options be chosen to reduce uncertainties and negative impacts? How can the process allow for back up alternatives where there are perceived complications? How can effective monitoring and responses be established?
Immediate and long-term integration	To ensure the application of sustainable principles to seek mutually supportive benefits and multiple gains	How can efficiency, equity ecological integrity and civility be sold as positive gains in achieving sustainability? How can immediate compromises or trade-offs be avoided unless they promise future benefits/gains?

Gibsons (2006) goes further to explain, for context-specific considerations, that sustainability assessments can draw from a variety of sources of information in order to set and answer questions designed to encourage sustainable outcomes. For instance

- Existing policies and planning documents related to and from all levels of government.
- Considerations from prior assessment or similar processes
- Earlier deliberations on the case or outcomes
- Other sources of local information

This basic sustainability criterion can be used or restructured for specific context purposes reinforced by questions asked that reflect project objectives. Reference and questions can be generated from major cases and context issues. The integration of major case and context sustainability issues along the generic sustainability core issues allows for the greater possibility of sustainability decisions being made.

6 A sustainability assessment review of the Highland Creek Wastewater Treatment Plant (HCTP) Biosolids management Class Environmental Assessment (2016): sustainable assessment leverage points analysis.

6.1 Background Issues: *The Highland Creek Wastewater Treatment Plant (City Of Toronto)*

The HCTP began operating in 1956 and was designed to treat 18 million liters of bio-solid wastewater generated from Scarborough and Toronto municipalities. It serves an area of 15,250 hectares and a connected population of 450,000 people. In 1954 both cities collaborated to construct this facility located at the mouth of Highland Creek at 51 Beech Grove in the Scarborough community of West Hill (City of

Toronto: HCTP EA Study report, 2016). The HCTP is one of four such plants operated by the City of Toronto. The plant operates using conventional sludge treatment processes and discharges effluent in Lake Ontario. The resulting sludge is anaerobically decomposed, dehydrated and the bio-solids produced are incinerated. HCTP has 2 multiple hearths incinerated. The generated ash is hauled off to the City's Green Lane Landfill after 12 months storage period on-site. These multiple hearths have been in operation since the 70's and between the year 2005 and 2006, they were seen to be in disrepair due to age. The ministry of environment (MOE) sent a communique requiring the City of Toronto undertake expediently necessary repairs. These repairs were to begin in 2007 and roundup by 2016 (City of Toronto: HCTP EA study report, 2016).

Parallel to these events in 2003, the commissioner of Works and Emergency Services had been permitted to award consulting services for the preparation of Biosolids and Residual Master Plan (BRMP). In 2005 this was awarded and by 2009 BRMP's for Ashbridges Bay, Humber and North Toronto were concluded and approved. The HCTP was however approved under the clause that HCPT staff had to report to Public Works and Infrastructure (PWI) committee on the options and strategies on how to improve emissions control beyond what was determined by the BRMP and by regulation (City of Toronto: HCTP EA study report, 2016). In 2010 the PWI committee suggested staff examine the possibility of bio-solid truck haulage via a future shoreline road and rail transportation and as well as look at constructing facilities required for bio-solids transport. Between March and November 2011, considerations had been given for the replacement of the existing multiple hearths incinerators with new modern fluidized bed incinerators that have advanced scrubbing technology (City of Toronto: HCTP EA study report, 2016). This advice was to improve the elimination of air contaminants, reduce long-term cost and other environmental impacts. Surprisingly this direction was not adopted immediately, as the standing committee instructed staff to implement Beneficial Use as the primary strategy. To this effect, a Schedule B Class Environmental Assessment to identify problems/opportunities and examine feasible bio-solid management alternatives was approved in 2013. May 2016 was the year the Municipal Schedule B Class Environmental Assessment was completed and came to this conclusion- in addition to the do-nothing alternative, they biosolid transportation off-site for beneficial use alternative and the On-site pelletizer and transportation off-site for beneficial use approach should be abandoned for the preferred fluidised bed incinerators with ash management which also entails transporting dehydrated pellets off-site (City of Toronto: HCTP EA study report, 2016).

6.2 Municipal Class Environmental Assessment Process

Ontario Environmental Assessment Snapshot

In 1975 Ontario government passed the Environmental Assessment (EA) Act to examine the environmental impact of activities prior to government funds approval. Originally this act was contained within government establishments such as ministries, authorities, agencies, and municipalities. In the private sector, Individual EAs are prepared for large-scale complex projects that may have the potential for significant environmental effects. These require the approval of the Ministry of Environment and Climate Change approval (Government of Ontario Environmental Assessment Act). In 1987 the Municipal Engineers Association (MEA) prepared the first Municipal Class Environmental Assessment in accordance with the Ontario Environmental Assessment Act for municipal road projects and municipal water and wastewater projects. Class EA process methodology was revised for municipal road projects and municipal water and wastewater projects in the 2000's to accommodate minor improvements as needed while maintaining the core substance of the process. A major amendment to be noted is this:

- Regardless of the preapproval of new projects scheduled A+, the public must be advised prior to implementation
- If projects scheduled A- environmental impacts are not significant then projects are pre-approved,
- Projects scheduled C generally includes EAs for construction of new facilities and major expansions.

- Projects scheduled B, class EAs, generally operate within the criteria of improvements and minor expansions to existing facilities (MCEA, 2015), under this falls the HCTP Environmental Assessment.

(City of Toronto: HCTP EA study report, 2016)

The section "Municipal Class EA" within the term Municipal Schedule B Class Environmental Assessment, allows for the planning of municipal infrastructure utilizing an approved method that protects the environment. Any development undertaken to provide municipal services must be done in a timely, costly effective, economical and in an environmentally responsible manner. It also provides a streamlined easy guide for planning and implementation of infrastructure projects. It is very flexible as it can be tailored to meet various environmental settings, stakeholder interests, and unique project requirements (City of Toronto: HCTP EA study report, 2016). Most importantly the Class EA process provides a decision-making framework enabling data to be processed in a manner that provides the best possible information to be debated by decision makers (MCEA). Information provided to decision makers in addition to the contextual scenario, problems, and opportunities include potential alternatives (solutions) and their effects, cost efficiency, effectiveness to meet objectives and environmental concerns (these alternatives usually includes the "do nothing" alternative) (MCEA).

The success of every municipal class EA relies heavily on a framework that is inclusive. The ability for the public, interest groups and other stakeholders to engage in the process during the early planning phases and at multiple avenues is essential to gain public acceptance (MCEA). A major portion of the class EA is the alternative evaluation process. Alternative selection generally comprises of the following elements (City of Toronto: HCTP EA study report, 2016);

- consideration of environmental effects of all alternatives on the environment
- the methodical evaluation process
- observable decision-making
- public and review agency consultation and input in the evaluation
- collation of public and stakeholder comments. Prior to the final stage, all comments should be documented and implemented at this point (MCEA)

6.3 Specific sustainability criteria for the Highland Creek Wastewater Treatment Plant Class EA

The potential effects of the HCTP project depend most specifically on the nature of project design and implementation. However, from a sustainability perspective, as the project has been approved, many of the lasting effects of this limited project span may linger forming the foundation for livelihood viability and wellbeing well after it has ended (Rahayu, N., & Yudoko, G, 2012). These lasting effects will be determined in part by project implementation proponents, municipal regulators and service providers, national economic and environmental policy formulations and a host of other players and activities that contribute in one way or another to the negative and positive and accumulative effects (Rahayu, N., & Yudoko, G, 2012). In order to merge the project specific areas of sustainable assessment with generic ones in abide to avoid missing big common issues, there need to be overall guiding questions that assist in developing a rubric framing subsequent work. For example-what are significant issues of concern that deserve greater examination or is of greater concern to all? What are the core sustainability requirements for this case? What specific criteria should guide decisions when negotiating trade-offs? When undertaking an SA it is important to remember that this is an objective led process where the focus is less on changes to the existing bottom line but to improve in the direction of greater sustainability. Questions should also include, what improvements are most important and how much improvements should be expected?

To begin with and for greater and significant coverage it is imperative to discuss implications to and choices of the present and future people and communities residing in the area of concern -Scarborough community.

Another vital issue as expressed by the (Gibson 2006) and echoed by the Parkdale-High Park Councillor Gord Perk in an interview by Scarborough mirror newspaper (March 01, 2016) about the HCTP class EA preferred alternative is the need to consider broader environmental effects of the project or any project when an opportunity to do so presents itself. This means goingbeyond the immediate community issues. For instance what are the benefits or problems of trucking approximately 1.5 truckloads of sewage through the immediate community daily for the purpose of 'beneficial use (farms and the like)" versus the implications of incinerating 1.4 wet tons of waste daily considering the management and effects of the resulting ash to the Canadian sustainability goals and objectives found within climate change agenda (HCTP class EA executive summary 2016)? This will help to clarify what is possible and what is desirable. This will entail a comparative analysis and evaluation of possible alternatives at both the local level and national/international levels. Comprehensive and demanding criteria for all alternatives are crucial.

6.4 Sustainability issues within the scope of project-HCTP and immediate environment

This section covers question about concerns within the local area of the project (Gibson, Robert B., January 26, 2006) Table 2

Core area of sustainability	Criteria	Questions guiding sustainable decisions
Ecosystem and traditional activities	Ecosystem resilience and continuation of community activities and value of property in areas	What are the possibilities/likelihood of lasting damage to ecosystem resilience and continuation of community activities? How completely will residual waste be removed from the community and how quickly can the environment be restored in the case of an accident?
Community wellbeing	Maintenance of livelihood security, diversity of opportunity, physical health, distribution of employment a cultural preservation and evolutions	What are the negative and positive effects of the various alternatives of the HCTP new developments be on community wellbeing? Will the community be abler or less able to cope with new opportunities and stresses in the future? What would the community look like without the project or if the choice of another alternative is decided upon?
Equity	Fairness and just distribution of benefits and risks to values components of the ecology socio-economic environment in the community of the project area	Is the equitability of this project more or less while the project is operating or is it more or less and how, if the no option alternative is followed? Is the project likely to leave future generations with better options or prospects than if another option was taken off if the plant was just closed down?
Resource access use and efficiency	Efficiency of energy and material use	What is the efficiency in relation to reduction in damage by each alternative? What is the benefit of the use of material and energy used in performing the activities in the plant? What is the percentage of reduction in or unnecessary residuals and discharge of waste? How effectively will

		resources and energy and materials be maximised? Is the community going to be more sustainable implementing the alternatives (beneficial use versus incineration)?
Capacity to deal with expected demands	Community capacity and local governance structure	What does the alternative require or demand of the capacity of the community and local government institutions to deal with anticipated problems? In what ways do the community and local governance structures need to be developed to handle unexpected issues?
Scale and time components	Long-term advantages and disadvantages	What are the benefits or problems over time to the local communities? How can benefits be reinforced to encourage long-lasting effects? How may the negative impacts be reinforced as well perpetuating constant and accumulative effects and what trade-offs are unavoidable?

6.5 Sustainability issues beyond the scope of the area

This section covers questions about how alternatives will affect or be influenced by territorial/provincial, national and international issues.

Table 3

Core area of sustainability	Criteria	Questions guiding sustainable decisions
Biophysical systems and human concerns	Continued ecological habits (migratory) and human activity dependency	How do the alternatives reinforce continued ecological system existence and how does it position Canada to positively influence climate change?
Equity	Equitable distribution of risks and benefits	Is this distribution more or less equitable per alternatives? Are the alternatives going to benefit Canadians in the future?
Socio-economic wellbeing and livelihood	Alternatives feasibility	Are the resources needed to implement alternatives needed more now than in the future? What are the possible stresses or possibilities about each alternative in the future and is the region and Canada able to cope?
Resource efficiency use and access	Efficiency of energy and material use	What is the effect over time of the alternative with regards to energy and material used in the region and Canada? What are the efficiencies needed to increase the viability of all alternatives? Do alternatives demonstrate significant utilization of resources to increase efficiency?
Capacity to deal with expected demands	Regional and national governance structure	What is expected of the regional and national governments to deal with issues arising from the alternatives? How adequate

		are current capacities and what is demanded of resources and time to increase capacity? How are the region and nation prepared to deal with issues resulting from the pressures of alternatives?
Scale and time components	Long-term advantages and disadvantages	What are the benefits or problems over time to the region and nation? How can benefits be reinforced to encourage long-lasting effects? How may the negative impacts be reinforced as well perpetuating constant and accumulative effects and what trade-offs are unavoidable?
Interaction among effects	Accumulative effects on governing structures	How does the positive and negative effect be reinforced over time? How do the governing structures respond to limit or mitigate reinforcing negative effects and what trade-offs are unavoidable?

Gibson, Robert B., (January 26, 2006)

a, Analysis

To better determine from the HCTP Class EA how the sustainable assessment was done and if at all and to what extent a simulation of a sustainability assessment (SA) was carried out is to first recognize the overall outcome of the SA process. This will help to pinpoint areas of accomplishment within the document that can support the idea that to some extent the outcomes of the HCTP results meet up to sustainable assessment objectives. According to Gibson (2006), the SA process is to align presented material towards sustainable objectives including regional and national perspectives in a manner that is easily understood by all stakeholders. That is:

- To assist in knowing whether the project is and/or to what extent it is necessary
- To determine per alternatives significant effects in relation to sustainability objectives
- To determine opportunities and perils and what must be put in places to enhance or mitigate them
- To assist in understanding what trade-offs are acceptable and unacceptable in relation to sustainability objectives
- To bring to light other options that may be on the table for consideration in addition to those to be considered
- To gain a consensus on terms and conditions on alternative acceptability
- To prepare all parties involved to reinforce positive gains while limiting or discouraging negative ones

The results from the HCTP class EA highlighted the option of fluidized incinerator beds as the preferred option championed by 17 communities in the areas even after it was determined by professionals prior to this EA that the best option is the Beneficial Use option. The provincial government has listened to community's outcry about trafficking sludge and dry pallets through a portion of the community to get to Highway 401 determined to undermine this EA and has thus supported the public in their win. Considering the accomplishments presented above:

- Was material about all options presented to stakeholders in a manner the can understand? Yes, according to the stakeholder forum and their commitment to pressure the government to change the course of actions there was enough material understood by community stakeholders. According to the class EA, there was a review of existing biosolid management program and features of the study area documenting needs, criteria and problems and opportunities

- Were decision maker presented with the necessity of the project – the age of the incinerator and the need for it to be changed (first repairs for 10 years extension, the need to increase capacity for operation and all options to do so)? Yes, the community had been living alongside the plant for over 4 decades. Over time they witnessed and were part of the decision to implement centralized plants making the HCTP one of four centralized solid waste facilities. They were properly informed and invited to participate in proceedings and consultations. Comments and ideas were given during the 30 days public review period.

- Were decision makers presented all alternatives and their significant effects in relation to sustainable objectives? A long list of biosolid alternatives was presented. A shorter list of feasible alternatives was identified by a screening process based on a set of must meet criteria. A comparative analysis was also used considering health, social, economic, community and environmental factors

- Did the EA present opportunities and perils of alternatives and what must be put in place to enhance or mitigate them? The EA document highlighted the best way to transport biosolids from HCTP using transportation mode and route analysis considering environmental and regulatory requirements and associated social and economic impacts. Further analysis was done to determine design, operating requirements, and cost. Additional assessments were done to support decision making –health impact assessment and financial decision making model

Gibson, Robert B., (January 26, 2006) & Gibson R, B (2013)

Although the document does not have a detailed sustainability assessment it does to some extent contain the idea of it. The HCTP EA document section ES.4 project decision-making process shows the utilization of the multi-criteria analysis. The purpose was for a comparative systematic analysis of weighted indicators so to identify and deliver the most appropriate alternatives based on the study criteria of:

- Public health protection
- Minimization of impact to the environment
- Minimization to impact to the community
- Minimization of cost

The idea behind using a multi-criteria analysis (MCA) is to formulate a general assessment methodology built on a multi-objective optimisation of a complete set of sustainability indicators that can weigh trade-offs when deciding on wastewater system treatments (Balkema et al., 2002). MCA for wastewater is based on mass and energy balances providing indications of material use, emissions, land requirement, and cost. The HCTP class EA document contains supporting documents such as the HIA, facility requirements such as noise and emission control, management approaches such as contingency and operating requirements such as staffing. Other supporting information is cost, impacts and community feedback. As seen in the document this information helped to form a multi-dimensional set of sustainability indicators which is essential to sustainability assessments and would feed into identifying the most suitable alternative

- Alternative 1: Incineration (fluidized bed incinerators) with ash management
- Alternative 2: Biosolid (digested and dewatered) hauled off-site for further management
- Alternative 3: On-site palletization and off-site distribution of pelletized products (farms)

(HCTP class EA executive summary 2016)

To help evaluate whether the idea of a sustainable assessment was more than superficial is to use the above information to answer the following questions

- Was a general assessment methodology used that builds on multi-objective optimisation? The multi-criteria analysis likened to a system analysis focused on the comparison of all alternatives and used a multi-dimensional set of sustainability indicators. The idea behind this is to encourage alternatives that are integrated in their application approach. That is a combination of methods in the best way to produces the best results when considering the sustainable project outcome. (Balkema et al., 2006)

- Was this evaluation limited to the process of waste management and its technicalities or defined by the integrated assessment of the whole chain of activities both inputs and outputs necessary for its existence and sustenance? The assessment leading up to the choice of these 3 alternatives took into consideration whole processes feeding into wastewater treatment system at the HCTP. The evaluation of this 3 alternatives also and to a large extent considered the various assessment of impacts and at a later stage integrated them into the main EA document. However, when considering the political clamor which influenced this EA process there has been more than likely a watering down of the authenticity of the case for true sustainability.

- Apart from socio-cultural, economic and environmental indicators giving regard to the efficiency of alternatives, were functional indicators determining the effectiveness of alternatives used? Functional indicators can be defined as the minimum technical requirements of an alternative (Balkema et al., 2002). Considerations of alternatives include

    - Adaptability-extending capacity
    - Robustness- ability to cope with uncertainty
    - Durability- lifespan
    - Maintenance and reliability- sensitivity of the system to malfunctioning

    (Balkema et al., 2006)

Functional factors were not discussed amongst other factors in the study review of the HCPT class EA. This could be due to the fact that they could be viewed as constraints and may require a second look at not so politically correct alternatives. Further down the document factors affecting the reliability of management options are considered although in a rudimentary manner. Just 2 to 3 sentences are dedicated to the reliability of alternatives and based mainly on wastewater process management rather than the responsibility of the integrated system within which the HCTP is embedded. For alternative 2 and 3 responsibility of reliability is shifted on the contractor handling the pellets and no further insight is added. The third or preferred alternative considers again facility redundancy limiting functional indicators to the process and not the whole event. It references redundancy as the ability for the treatment process to continue while part of the facility is shut off for maintenance purposes. The risk of fires is of huge concern as there have been incidences of that happening where drying facilities overheat. The suggested solution was that newer facilities have safer technologies which were not mentioned going forward. Demand for pellets is not significant however still higher than production. Going by the experience with the Ashbridges Bay Treatment Plant increase pellet availability would, in the long run, reduce demand for pellets land application. The document also predicts that plans should be concretized in the event there be a shutdown of the facility. No further directive was added to that effect.

These answers support the idea that a sustainable assessment was to some extent considered. However, whether the material included in the EA contains greater sustainable objectives and knowledge about broader issues is in question. This thought is supported by the decision of the EA to support the fluidized bed incinerator while neglecting the beneficial use options of transporting pellets to farms. The end objective is to reuse or and mitigate or offset environmental perils and the beneficial use, over time offsets perils. On the other hand, political pressure has led to the choice of incinerators to satisfy immediate, local desires over long-term future gains.

7 Leverage points to encourage sustainable assessments of waste management

Problem number one: sustainability goals/ weighting in Environmental Assessments measure environmental responses and tend to deviate from identifying a more robust, long-term approach to sustainable development found in economic, institutional and social aspects (Upadhyay et al.: 2014).

Opportunity: Goals and weighting should be designed to enable ranking to identify the best sustainable option. Goals and weighting should describe direct sustainable goals available under specific projects that fit into municipal set sustainable objectives all the way to the federal level as much as possible. This will assist in guiding the selection process towards a more desired end which is to fit under the cover of sustainability.

7.1, A- Leverage points review of HCTP Schedule B Biosolids Management Class EA

The table of summary in the Class EA document score and rankings of Biosolids Management alternatives for the HCTP clearly displays the goals and weighting section as describing environmental responses of possible effects. This validates the existence of problem number one. The document talks about the protection of public health, minimizing impacts to the environment, minimizing community impacts and the last goal and weight are to minimize cost (HCTP Class EA, 2016). These are valid issues, however, maybe better suited as sustainable key performance indicators rather than the project goals and weights. The National Waste Management Strategy in South Africa (2011) described sustainable goals and weights for waste management out of which indicators can describe and measure environmental responses of possible effects and eventually rank and score. Below are sustainable indicators:

- Secure ecologically sustainable development, while promoting justifiable economic and social development
- Avoid and minimize the generation of waste
- Reducing, reusing, recycling and recovering waste
- Promoting and ensuring the effective delivery of waste services
- Treating and safely disposing of waste as a last resort
- Remediating land where contamination presents a significant risk of harm to the environment

(National Waste Management Strategy in South Africa, 2011)

The document further describes process goals and objectives

- Achieving integrated waste management planning
- Sound budget and financial management for waste service
- Adequate staffing and capacity for management
- Effective compliance with and enforcement of waste regulation
- Effective monitoring and reporting on performance with waste functions
- Ensure that people are aware of the impact of waste on their health, well-being and the environment.

(National Waste Management Strategy in South Africa, 2011)

Together these goals and objectives create a holistic opportunity to address waste management on a strategic, sustainable and on a long-term inter/intrageneration level. It allows for and engages within itself deep discourse regarding any waste assessment process, making sure that the overall sustainable objectives are non-tradable, better negotiated while disseminating information in a balanced and equitable manner for the purpose of effective, sustainable decision making.

Problem number two: Sustainability assessments are done on an individual basis for economic, social and ecological and other specific aspects. These assessments are done using various methods and techniques designed according to identified specific government policies mandated and

administered by relevant ministries. Discipline-specific professionals are engaged to define objectives and outcomes, gather, process and analyze data and draw conclusions. These documents are then passed on to the larger team to be integrated into the entire Class EA process (HCTP Class EA, 2016)). The problems arise from the multiple approaches/frameworks used to identify issues and opportunities, the varied process approaches and late integration of these aspects. This suffers the entire EA process for time, effort and finances and most importantly bears more weight on efforts towards balancing, compromising and making trade-offs which otherwise may have been unnecessary (Gibson, B. Robert 2006).

Opportunity: synchronization and integration of goals, objectives, and processes of all supporting assessment identified as critical to its success earlier on in the EA process. The assimilation of a working framework encourages early and bilateral relationships of all individual impact assessments by:

- Increasing understanding amongst professionals, enabling cohesive methods processes framework and techniques with agreed goals to attain.
- Assessments, criteria, indicators, targets, and rating can also be harmonized so that integrated evaluation processes can be made much quicker, positively influencing timelines and reducing financial burdens.
- Most importantly reducing unnecessary trade-offs and increasing the possibility of attaining the greatest level of sustainability.

7.2, B- Leverage points review of HCTP Schedule B Biosolids management Class EA

The project methodology section of the document listed the various steps undertaken to achieve HCTP Class EA. Among these are

- To develop information on design and operating requirements, impact and cost with input from Air quality impact assessments and noise analysis for shortlisted alternatives. This information would then be used to in the preparation of the Health Impact Assessment (HIA) and the final decision-making model to confirm the preferred alternative (HCTP Class EA, 2016)

- Conduct an HIA to evaluate the potential impacts of all alternatives on health and wellness of the community and the distribution of potential impacts on populations within scope. The HIA is to inform the Class EA and the decision-making process (HCTP Class EA, 2016)

The overall Class EA stage diagram clearly displays in phase 2 of the document (that is the identification and evaluation of alternative solutions to determine preferred option), the inclusion of results from the Health Impact Assessments (HIA) to assist in identifying the best alternative just before the Class EA report is compiled, produced and reviewed by the public.

Following this -Project Decision-Making process depicts the use of the multi-criteria analysis (MCA) for the project. A standard weighted summation form of the MCA was selected to allow for a systematic, rational and reproducible comparison and ranking of the HCPT to identify alternatives suitable for the study criteria (HCTP Class EA, 2016).

Further along this same stage of the class EA, information was deduced from within the Class EA study to influence the decision-making process. Areas, where information was gathered from, are focused studies such as:

- Health Impact Assessment
- Human Health Risk Assessment
- Cumulative Air Impact Assessment
- Noise Impact Assessment
- Traffic Route Assessment

b. Analysis

The importance of specific or individual assessment feeding into the Class EA process to assist in decision making is of vital importance to achieving a more holistic sustainable outcome. This was established by its inclusion in the methodology of the Class EA. However, the point of infusion of individual assessment into Class EA is contestable. As writers like Singh et al.: 2012 reported saying, the course action. Whatever the degree of sway the HIA may have had leading up to the fluidized bed incinerators option, could have been due to excessive compromise, trade-offs or balancing that may have derailed a preferable option. The HIA report concluded that the modern fluidized bed incinerator was anticipated to result in the highest release of air pollutants. When pellets are mixed with soil, the dust and resulting produce are at higher risk of exposure to pollutants compared to the other two alternatives. While the other two alternatives have a high-risk factor during the transportation of pellets. Overall, all three alternatives do not have a significant impact on human health (HIA, 2015). It is important to detail that all three alternatives require transportation and no matter which is selected, recommended solutions mitigating odor releases, safety during transportation and noise control have to be implemented. For instance, pellet transport vehicles must be washed prior to leaving the facility to significantly control the issue pertaining to odor releases. Also, travel paths of less resistance are targeted for use with regards to haulage of pellets. Also, the preferred the route suggested was done on the basis of low car volume. The portion of this route that raises concerns is the Coronation Drive in the community of West Hill with higher vehicles/ truck usage. This problem was overcome by allowing the noise of other vehicles counter pellet truck noises making it less obvious (HIA, 2015). Regardless of the fact that transportation issues plagued all three alternatives and adequate solutions were recommended, the HIA still concluded that the alternative-modern fluidized bed incinerators (carrying the highest risk of pollution to the environment and society) is the preferred alternative. This recommendation was forwarded to the Class EA for input towards the written report to be displayed for public viewing (HIA, 2015).

The HIA was compiled under the tenets of the Toronto Public Health (TPH) framework developed in 2008 to measure potential impacts on humans. Although the framework was adapted to suit the specifics of the EA, the HIA documents failed to detail what exact analytical tool was used in rating alternatives. However, upon examination, the assessment was made by comparison. On the other hand, the Class EA project decision-making process utilized a weighted multi-criteria analysis. This was to allow for a more comprehensive, systematic, rational, reproducible comparison and ranking that may present new alternatives and to suggest the alternative that best meets this study criterion.

The standard weighted summation form of MCA was used to assess after the collation of various individual assessment and used to score or rank alternatives for HCTP Biosolids Management Class EA after the submission of individual assessments. Standards and criteria ranking are not known to be synchronized across the board concerning the development of these assessments. This reduces the effectiveness of the process to a chaotic set of criteria, indicators, scores, and ranking. The difference in value may cause unknown discrepancies, or result in multiple debates and high level of compromise

8 Conclusion

Planning for sustainable waste management projects is being exacerbated by certain factors. Urbanization, population growth, industrialization and increase living standards with little emphasis on quality of life are amongst the topmost culprits (Macdonald et al., 2006). Areas of focus to improve planning for sustainable development lies in tracing steps backward from project desired outcomes heavily based on community input to what can support sustainable development in terms of policies. Benefits of sustainable waste management that covers most facility and community desires range from reduction in waste disposal costs, reduced need for additional landfill capacity, reduction in noise pollution

reduction in energy consumption, increased economic productivity to more general and maybe even political ambitions like improvement in corporate reporting and green credential for business and reduction of greenhouse gases from landfills and resource consumption reduction (Macdonald et al., 2006). The beauty in developing this benefits/outcome is that it helps to understand through back casting what is needed to be in place to ensure these benefits are met or at the least move communities and projects closer to sustainable waste management (Rahayu, N., & Yudoko, G. 2012). In this case, the desired future rests on the solid yet flexible strategic environmental assessments. The reason the HCTP class EA was done was to meet the desired end of sustainable development in waste management. If Canadas', Provincial and Municipal governments should endeavor to design more strategic policies to encourage sustainable development then sustainability planning for the waste industry will most likely follow along the same lines. Common goals will include sustainable development objectives where industries and manufactures will take responsibility for what they produce and consumers what the buy. The decisions will be influenced more by seeking answers to question about constraints to sustainability per alternatives and implementation objects overall. Strategic assessments are social processes involving public participation and political judgment with a science interface therefore strategic EA brings together these positions in terms of choices and decision best suited for a project. One hand these positions can come together to enhance the process of delivering on desired future outcomes and on another be the gangrene that systematically produces mutations of sustainable development objectives found in plans projects and policies. In the case of the HCTP class, EA, the majority of the communities and multiple political figures praised the process and the recommended alternative, the fluidized bed incinerators. It is obvious that a more rational sustainable oriented alternative was overridden for a more politically acceptable solution. For political purposes, after all, it cannot be denied that the process to deliver the best sustainable choice was not implemented. Prior to the HCTP class EA there was a decision by experts in the field of study and the relevant departments to implement an alternative better suited to sustainable development- On-site pelletization and off-site distribution of pelletized products (farms), beneficial use. Public dissatisfaction and political ambitions made more sense and therefore strategic EA was utilized as a tool to deliver a particular objective. This in addition to others is one of the factors strategic EA and its potentials have not gained the much need support from some professionals. The top-down approach of designing policies using the parameters of sustainable development within which project choice is bound is the beginnings of basic adjustments that need to be made for backcasting to thrive in waste management. Every policy irrespective of sector coverage should be tested using strategic environmental assessment and sustainable assessment to determine its sustainability viability before approval for administration.

The sustainable assessment opportunities in this paper and strategic environmental assessment leverage points have their solutions rooted in the foundations of the processes and procedures of any meaningful assessment. The foundations or framework on which waste management principles are structured should be integrated comprehensively and prescriptively to reduce ambiguity. There needs to be a definite sustainable agenda and defined sustainability indicators that will limit the use and degradation of resources and at the same time avoid the export of problems through space and time (Balkema et al., 2006). Relating this to waste management is where it supports the goals and objectives of sustainable development. The sustainable waste management policy should be designed to encourage assessment to be done in a manner that:

- Assess waste management sustainability goal and objective and not just environmental impacts of actions.
- Allows for early integration and interaction between processes and ad-hoc processes. This will propagate early bilateral synchronization or synthesis of goals, objectives, methodologies, criteria, indicators ranking and score weights. Most importantly the integration and adoption of the one framework across the board (Pichtel, 2006).

- That enables strategic assessment frameworks to be utilized. This will serve as a base upon which an integrated sustainable waste management framework can be mapped out to address leverage points discussed in this paper. (Pichtel, 2005)

- That includes functional indicators based on the effectiveness of the project this may counter to some measure political influences hampering the shift to sustainable waste management. (Balkema et al., 2006)

9 Reference

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Tables

Table 1 Significant sustainable criteria and questions Gibson (2006)

Table 2 Sustainability issues within the scope of project-HCTP and immediate environment

Table 3 Sustainability issues beyond the scope of the area