Just imagine!

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A world where we've transformed our attitudes, behaviours and daily practices with waste. A world where we as a society and as individuals accept that we need a sustainable environment, free from contamination and free from pollution; where Government accepts that waste management must have an equal standing in service delivery; where everyone is educated on waste management; no food or organic waste to landfill; no e-waste to landfill; no storage of hazardous waste; separation-at-source is strongly encouraged and widely implemented.

But how do we get there with the tools at our disposal? The Integrated Waste Management Plan's (IWMP's) we develop must be revolutionary but also realistic and implementable to assist waste management planning and promote the development of more coherent and appropriate planning practices across South Africa, in compliance with the requirements of relevant legislation. These IWMPs play a key role in achieving sustainable waste management and ensuring a safe environment.

The growth and development of a city or metropolitan is a key influential area for ensuring infrastructure and service delivery requirements are planned for in advance to meet the demand forecast. Solid waste management is one service delivery area that seems to be lagging behind and noticeably when one visits a city, one observes the inefficient collection of waste and the unsustainable management of waste via the disposal and treatment of waste, and it becomes evident that the planning and management coupled with attitude is absent. In the current era, the progression of a city and the growth of the population require the municipal solid waste (MSW) infrastructure or facilities planning, waste composition analysis and projections, technical assessment of MSW, spatial mapping and identification through land use zoning, socio-economic modelling, compliance and legal requirements to satisfy the Municipal finance requirements and capital planning, and reviewing the urban development framework. The planning process for MSW management requires an integrated approach in the city and requires a cross collaborative approach amongst the stakeholders.

The inability to manage MSW consists of failures in the following areas:

- Inadequate services
- Inadequate financing
- Inadequate environmental controls
- Poor institutional structure
- Inadequate understanding of complex systems
- Inadequate sanitation

MSW planning needs to be incorporated into the city development and service framework to ensure there is adequate infrastructure in place for the future. The advanced planning process should align to the needs analysis which should identify a list of priority projects for MSW management in the city. As the socio-economic circumstances of individuals and families change, so does the waste composition profile change as well which influences the planning requirements in all the attributes for sustainable waste management. The global drive to reduce waste to landfill directly impacts on the MSW planning as diversion of waste indicates a shift towards sustainable solutions for a city.

The diversion of waste forces officials to consider alternative strategies and waste disposal methods in the planning stages. This approach necessitates the assessment of more environmentally acceptable technologies and treatment methods which could lead to the potential use of waste or the by –product as a source of energy for specific use in the city. For the MSW planning to follow this direction, provision of quality and reliable data from waste generation and disposal rates, socio-economic data and spatial data needs to

be available. Unreliable data could prove to be a hindrance in adequately formulating a strategy for MSW. In developing countries, a large amount of the attributes listed above are limited or non –existent. This paper examines the approach towards MSW planning and the key attributes as experienced on current projects that are required to make the planning for MSW successful and sustainable in a developing country.

1. INTRODUCTION

Waste Management is a challenge in most municipalities in South Africa. This is a growing trend and continues to be an issue for the Public and Municipal Officials rising cost, limited revenue and seeking alternative “fit for purpose” solutions continues to challenge municipalities on rendering an effective successful and sustainable waste service.

Progressive city development does place pressures on service delivery and solid management is an area that is often affected by this. The lack of service, poor service or non-existent service or infrastructure creates sustainability and health concerns for communities and authorities. In particular urban centres or metropoles are the ones that face these challenges as they are often the economic centres. The metropoles become a magnet for job creation, housing, industrial development; and in some cases tourism (Ogawa, H; 2011). The critical point that arises is what factors contribute and make solid waste management successful in a city? Whilst many municipalities in the developing countries have progressively rapid population growth, the question arises as to whether governments have planned accordingly to cater for this.

For solid waste management to be successful and sustainable, the vision, the assembly of thoughts and ideas need to be shared as common to make it work. The two key words, “successful and sustainable” in the phrase raise the point of definition in the solid waste management perspective:

Successful:	The collection, treatment, disposal and overall management of solid waste has been achieved.
Sustainable:	The management of solid waste satisfy the economic, social and environmental factors.

“Successful and Sustainable” can be achieved however it requires an integrated approach. Wilson, et. Al; 2013 describes it as bringing all the processes together that would make it all well.

2. CHALLENGES

To unpack some of these challenges facing municipalities and their officials are not limited to but include:

- No integrated waste planning for the city. Past and future trends and dynamics are considered;
- Waste management knowledge, understanding waste in the larger context, training, institutional and technical ability;
- No waste management capacity in the municipal management team to direct and take ownership of decisions, often see this service area absent or incorporated into other service areas;
- Financial constraints, no access to adequate funding, Grants or donor funding. Poor financial planning by the municipal officials often lead to waste infrastructure initiatives not being planned for in the right period or at all, not seen as a priority;
- Poorly –advised by advisors on the best solution. Limited solutions explored forcing municipalities to use traditional approaches;
- Failure to apply “back to basics” approach as the decision makers have not acknowledged that simple cost effective solutions are what is required to close the waste management challenges in local municipalities;
- Promoting cost efficiencies is over looked. Emphasis in this area could greatly improve operational and delivery objectives;

- Health, safety and environmental challenges are not sufficiently addressed in the rendering of waste management activities e.g. litter and scavenging on landfills in the local municipalities is an enormous challenge as well as an exceptional risk thereby compromising operations, livelihoods of scavengers and a safe environment.

The key attributes for successful and sustainable solid waste management is listed in Table 1.

Table 1: Attributes for successful and sustainable solid waste management

Attributes	Considerations
Waste collection	Frequency, does it happen often?
Route planning	Is the route planned, optimized?
Spatial analysis	Is the municipal solid waste spatially analysed to effectively route the collection of solid waste?
Infrastructure	Do you have enough and the right type of infrastructure for your waste management need? Is this infrastructure maintained? Does the infrastructure need an upgrade?
Fleet management	Do you have the right type of fleet? Is the fleet maintained? Is the fleet 'fit for purpose"?
Resourcing	Are you adequately resourced? Correct skill base?
Institutional requirements	Are you prescribing to the legislative and/or institutional frameworks?
Waste characterization	Do you know what the municipal waste profile within the municipal boundary is?
Socio economic model	Do you know the socio-economic factors that influence solid waste generation? (households size, cultural patterns, education, personal attitudes)
Integrated planning	Do you have an approved and implemented waste management plan?
Solid waste data	Is the waste data in existence per waste category and valid?
Future city spatial development framework	Have you aligned the waste service to the future spatial development framework?

3. STRATEGY AND PLANNING

No optimal planning or strategy is carried out to understand the current needs versus the future needs of the city. Many cities in developing countries do not have suitable decision making tools or baseline data to assist them establishing an integrated waste management service. In some instances, cities do not have a waste management strategy (WMS) or an integrated waste management plan (IWMP).These documents normally provide baseline direction for the city for waste management. Figure 1 outlines the various aspects that will be assessed and addressed through this WMS, Figure 2 describe the planning process around waste activities at municipal level for both local and district municipalities.

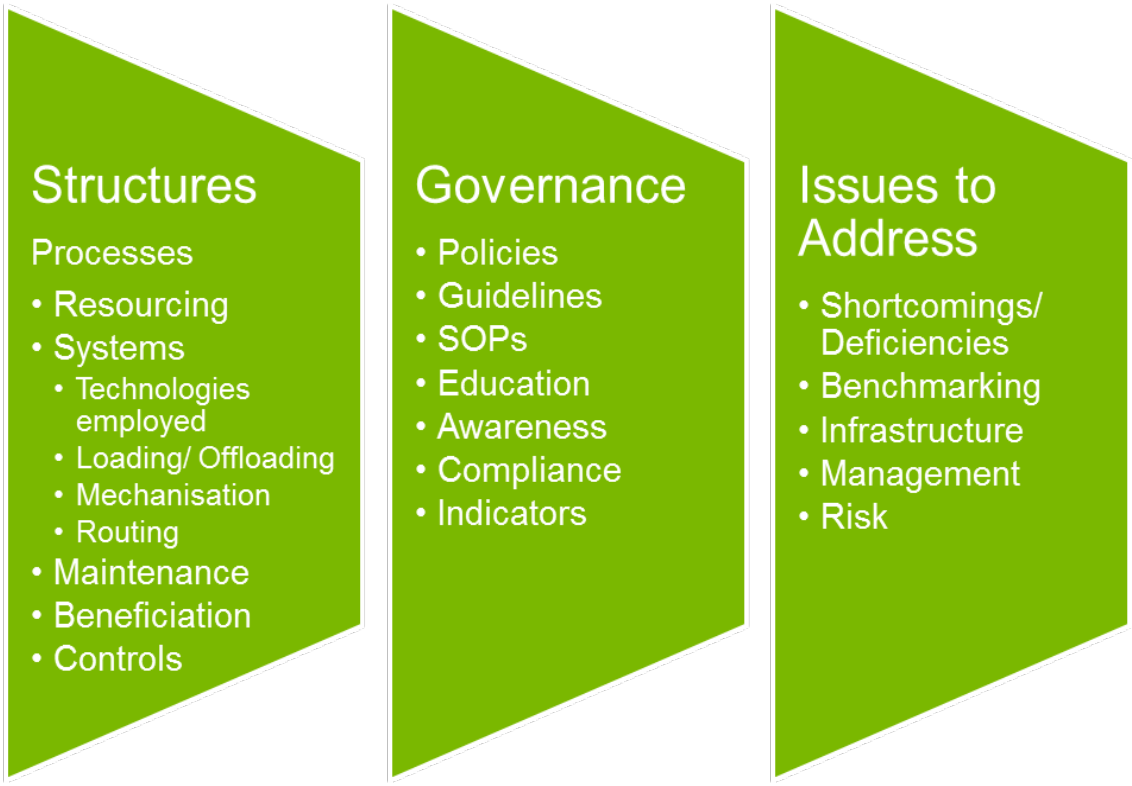

Figure 1: Focus of Waste Management Strategy

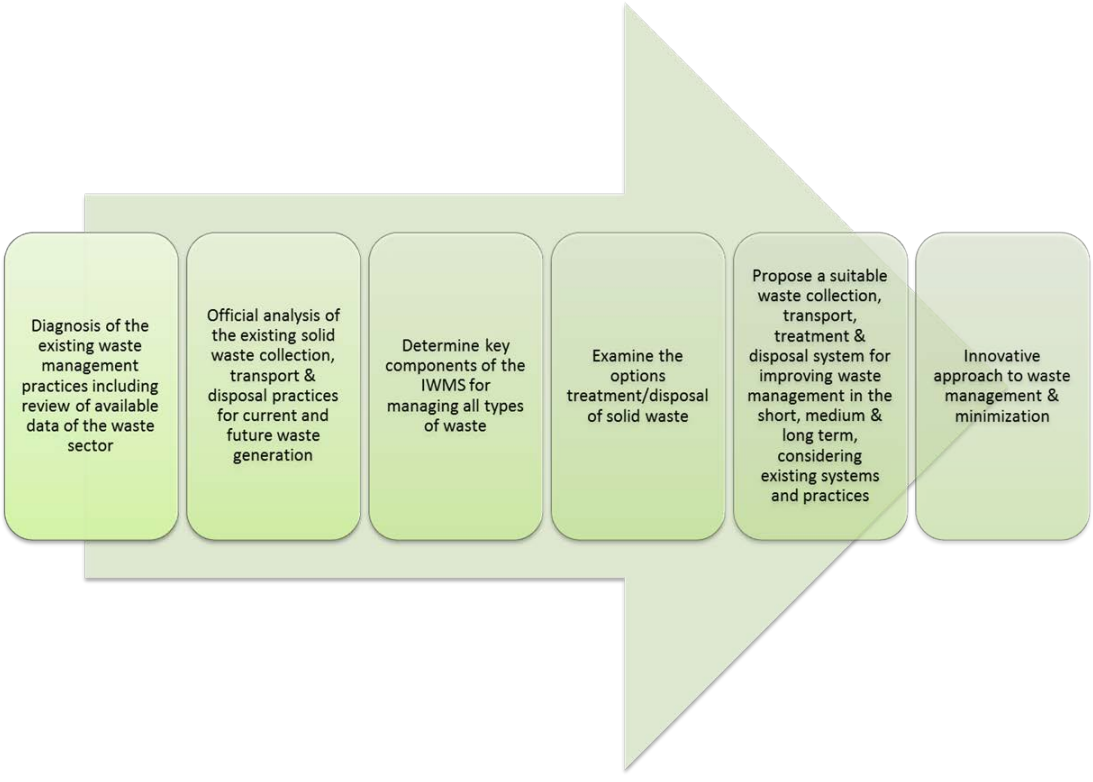

Figure 2: Planning

Poor and inadequate waste management knowledge, understanding waste in the larger context, training, institutional and technical ability and awareness underpin waste management officials ability to implement the integrated waste management service. Due to the scarce skills in waste management and particularly at municipal level, you will often find inappropriate persons taking charge of the waste department or leading the waste program. The poor background in waste management know–how further impacts on the operations which has an effect on the utilization of waste management resources, managing the

environmental compliance requirements and planning of daily operations.

A WMS should therefore be developed to assist the municipalities and in the minimisation of waste volumes generated, with an ultimate reduction of waste volumes disposed to landfill. The WMS requires co-operative effort from the city and waste generators. Figure 3 outlines the need for a WMS.

Figure 3: Need for a Waste Management Strategy

4. INTEGRATED SUSTAINABLE WASTE MANAGEMENT

Providing integrated sustainable waste management services in municipalities can prove to be a challenge with collection, disposal and treatment of waste. National governments should commit them selves to provide a basic waste service with access to basic services in rural areas. Households in these areas specifically discard of waste into open fields in an uncontrolled way often as a result of no adequate waste infrastructure in place. Municipalities don't often invest in these areas mainly owing to access and waste streams primarily being organic. Burning of waste is common practice in these areas and increases the risk of health and safety issues.

Failure to apply "back to basics" approach as the decision makers have not acknowledged that simple cost effective solutions are what is required to close waste management activities in local municipalities.

Promoting cost efficiencies is over looked. Labour, logistics (transport), and maintenance are cost drivers in waste management. Transport cost contribute a large portion of the cost associated with waste management and the long distances to transport waste to landfills continues to be questioned as to whether having landfills built at such long distances is feasible or does exercising the right to explore all cost effective alternatives have a suitable cost benefit. Therefore municipalities should look holisticaly at waste mangement in terms of integrated sustainable waste management.

An Integrated waste management system has three major dimensions Figure 4 refers:

- Stakeholders involved in waste management;
- The (practical and technical) elements of the waste system; and
- The aspects of the local context that should be taken into account when assessing and planning a waste management system.

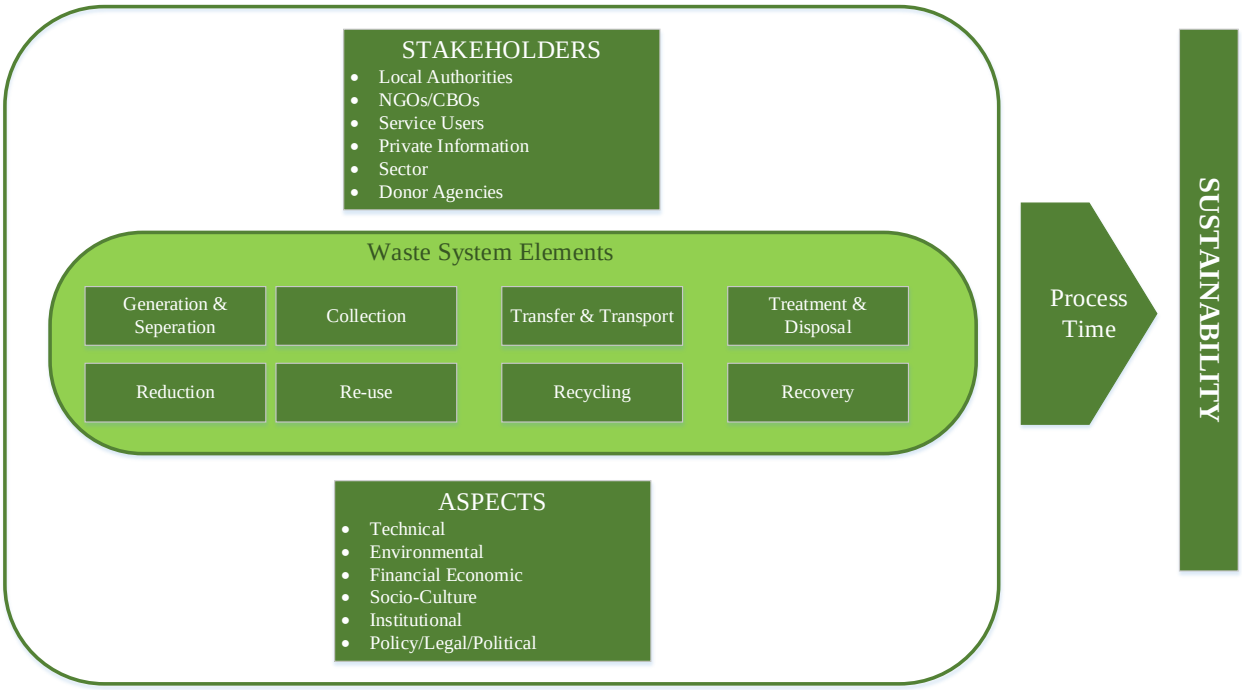

Figure 4: Integrated Waste Management System

5. SUSTAINABLE DEVELOPMENT CHARACTERISTICS

Recycling reduces the need for virgin resources and using recycled content in manufacturing new products conserves energy. The energy required in the manufacture of products from recycled materials is substantially less than the energy required if the same product was manufactured from virgin materials. In addition, products made from recycled content forgo the pollution or environmental degradation that would occur during the harvest of virgin materials. Recycling products at the end of their first life cycle maximizes and fully realizes the benefit of the initial harvest of virgin resources.

6. CRITICAL SUCCESS FACTORS

- Mandatory recycling and composting legislation for municipalities.
- The city's programs must be inclusive to provide a high level of recycling and composting services to all communities including small and rural communities.
- The waste management model must be a closed-loop system that includes the collection of materials through to the manufacture of new products.
- Commitment by municipalities and sufficient funding should be committed to implement the collection and sorting of materials, develop infrastructure, and provide incentives to develop markets.
- Integrated community engagement strategy with phased implementation of recoverable material.
- Extensive education and communications program.

7. FINANCIAL COSTS AND FUNDING SOURCES

Financial constraints, deficits in revenue (amongst smaller municipalities), no access to adequate funding, grants or donor funding are some of the financial challenges facing municipalities. Poor financial planning by municipal officials often leads to waste infrastructure not being planned for in the correct financial period or not planned at all. In some cases, waste infrastructure is not seen as a priority.

Funding for recycling and composting programs is primarily through municipal property taxes. To implement a sustainable and successful waste management system and get the community involved an incentive program should be implemented.

8. TOWARDS SUSTAINABLE SOLID WASTE MANAGEMENT SYSTEMS

Strengthening inter-sectoral partnerships supports a long-term vision of the goals of waste management. This goal is to achieve sustainable solid waste management systems which are stable over time, and which are beneficial to the society, the economy and the environment. In this context it is useful to review the normal progression of motivations for setting up solid waste management systems.

Environmental Sustainability

- Sustainability will be attainable if MSW is transformed into a closed-cycle system.
- Implement waste hierarchy principles by minimizing resource extraction at the beginning of the production cycle and final disposal at the end of the cycle.
- Support and promote clean technology, together with the prevention or avoidance of unnecessary waste production.
- Treat waste and recyclables as close to the source of generation as possible.

Institutional Sustainability

- The municipal government must retain ultimate control and be ultimately accountable for the functioning of the waste management service, specifically related to the following roles and functions:
    - the democratically managed spending of taxpayers' money in relation to the performance of role players in the solid waste management system; and
    - the control and protection of the environmental health of the city and its citizens.
- Decentralization of tasks should be accompanied by a decentralization of powers and resources.
- An adequate legislative and regulatory framework, with appropriate compliance and enforcement mechanisms.

Financial and Economic Sustainability

- Full-cost accounting, combined with the implementation of cost-based fee collection systems is a more sustainable approach than reliance on donor financing or international lending.
- Fee systems, which aim to achieve full-cost recovery should be introduced.

Social Sustainability

- MSW should be provided to all the citizens within a city, regardless of income, ethnic group, or social status. Informal waste collection and handling is often driven by poverty.
- Improvement of living conditions for the poor needs to be addressed. .

9. COMMUNITY BASED ORGANIZATIONS (CBO'S)

Through implementing CBO's in underdeveloped countries successful and sustainable MSW will be achieved. The community and its representatives have a direct interest in waste management, as residents, service users and tax payers. Communities in the low-income areas generally receive minimal or no services which include MSW. Therefore communities can take the initiative to organize themselves into CBO's, with the goal of self-help and improving their living conditions. Such CBO's should receive external assistance in the form of technical and/or financial aid from the city. CBO's may also take a role in the actual provision of services, including operations and maintenance, and even in the construction of facilities.

The benefits and advantages resulting from CBO participation are listed below. Potential benefits to a successful and sustainable MSW system include:

- The contribution to problem-solving at the local level, e.g. by setting up and supporting primary waste collection schemes.
- Experimentation with innovations at neighbourhood level and within the informal sector.
- Mobilization of citizens and enhancing their participation in MSW.
- Promotion of environmental awareness.
- Provision of environmental health education.
- Provision of waste removal services to underserved, marginalized, or hardly accessible areas.

Social benefits include:

- Support for the poorer groups in the society, the low-income communities as well as the waste pickers, with technical assistance and advocacy.
- The provision of countervailing power.
- The stimulation of income-generating activities among the urban poor.
- The strengthening of organizational capacities of communities and informal individuals and entrepreneurs.

10. ACTIONS

Key Action area	Principle goal	Supplementary goal
Financial Management	To improve the cost management of MSW in the city and the enhancement of cost recovery in relation to an affordable sustainable solid waste system for all citizens.	• To gain insight into the costs and possible revenues of the current MSW and to disseminate the results to relevant municipal personnel • To develop financial mechanisms for involving the private and community sector • To encourage recycling as a means of achieving enhanced cost recovery
Legal and Institutional Constraints	To create a legal framework for enabling sustainable MSW	• To facilitate the creation of sustainable, legally protected partnerships between municipal governments, the informal private sector, and the formal sector on a legal basis • To create the possibility of democratic control and participation in decision making by the residents of communities, together with a decentralised budgeting process for community residents to participate in financing the solid waste management system in their area.

Education for Sustainable SWM	To raise the level of awareness as to the complexity of solid waste management	• To provide information on waste management program in information and orientation sessions. • To conduct staff training for key groups • To implement ongoing campaigns, workshops, and other educational efforts • To create a waste management committee. • To communicate progress and efforts to the city and users.
Partnership Development	To enable the development of consultative and cooperative processes between all the actors in the solid waste management system, in order that their activities be coordinated to create an optimal sustainable solid waste management system.	• To facilitate the formation of cooperatives, unions, guilds, and other organizational institutions
Solid Waste and Recycling Technology		• To promote and develop appropriate technology. • To improve existing informal waste collection and recycling activities in terms of occupational health, but also concerning environmental pollution • To promote the use of recovered materials in the production of useful and needed products and services.
Capacity Building in the (Formal and Informal) Private and Community Sector	To support the formal and informal private sector in becoming capable of serving as partners for municipal governments and to extend collection services to all areas	• To improve formal private sector performance • To enhance and develop strategies for enabling private contracting • To improve informal sector performance • To encourage recognition of informal sector activities. • To support primary waste collection systems and to deliver adequate waste collection services to low, middle and high-income areas • To raise awareness within the city and the general public on waste needs and services

11. CONCLUSIONS

The achievement and success of the implementing integrated waste management is largely dependent on the planning process and identifying and meeting specific requirements. The upskilling of staff needs attention and equally the education of officials and waste officers will need to be included as part of the planning. Training of waste officers in the current legislation and the requirements there off are equally important to successfully implementing the right solutions in the municipalities.Obtaining the correct technical advice and support is another solution to overcome the challenges in making the right decisions, expertise will be able to provide direction and guidance in this regard. Waste officers need to thoroughly evaluate the “needs” and demand requirements for wasteservices and specific types of waste infrastrcture.

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