# THE CHALLENGES IN THE ROLL-OUT OF HOUSEHOLD HAZARDOUS WASTE DROP-OFFS IN THE CITY OF CAPE TOWN

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ABSTRACT
Household hazardous waste (HHW) forms < 2-3% segment of residential household waste. The HHW generally consists of empty/near empty containers that held cleaning chemicals; used batteries; old paints; spent solvents to clean paint brushes; agricultural remedy/ pesticides waste; mixed chemicals from swimming pool and household maintenance; odd pieces of non-friable asbestos cement waste; used electronic waste; used compact fluorescent tubes (CFL's) and fluorescent tubes; used oils, etc.
Although a municipality is not mandated to provide and/or manage a hazardous waste system in South Africa, the City of Cape Town recognizes its social and environmental responsibility which is aligned to the National Environmental Management Act (NEMA) principles such as duty of care, prevention of pollution and cradle to grave, mechanisms legislated to ensure waste and in this case, HHW does not negatively impact human health and the environment. The position of the City as a service provider and disposal authority for general residential and low to moderate hazardous industrial-, commercial- and business wastes is reflected in the City Integrated Waste Management Plan (IWMP).
There has been a constant stream of public enquiries for suitable facilities to dispose Household Hazardous Waste (HHW). This paper outlines the progress the City has made with respect to fulfilling this need initially at a pilot level, clearly delineate the approach as to how the respective waste streams will be dealt with and share experience on the challenges that have been encountered during the process. Investigations, findings and progress in this regard will be presented which may assist other Municipalities to adopt similar strategies.

KEYWORDS
Household hazardous waste, poison, old paints, NEM:WA, old asbestos pots and sheets.

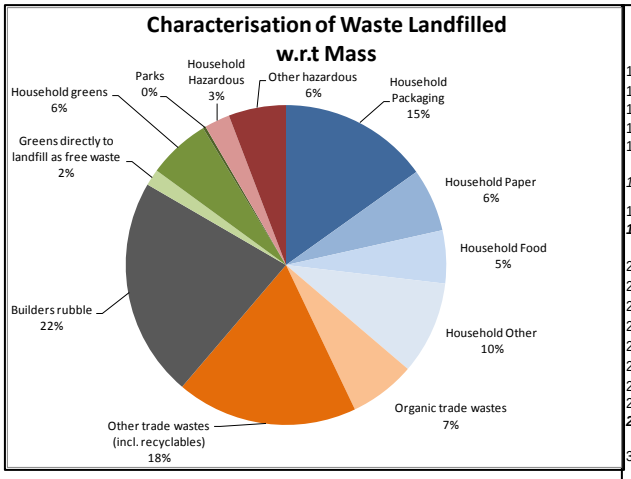
## 1. INTRODUCTION

### 1.1 Background

One of the biggest challenges of modern society is to cope and manage continuous change. Waste Management in South Africa is becoming more complex with spiralling technological advancements, biological and chemical product development and accessibility of these products by all, which ultimately ends up as new complex household hazardous waste streams. Household hazardous waste (HHW), waste generated at a household level, is classified as Hazardous in terms of the Waste Classification Regulations. This type of waste includes CFL bulbs, electronic waste (such as computers), batteries, paints and solvents and is usually deposited in the domestic refuse stream and therefore ends up on landfill sites that are not designed or permitted as hazardous waste facilities. It should therefore be separated into a separate stream for reuse, treatment or proper disposal.

Improper disposal of household hazardous wastes such as pouring them down the drain, on the ground, into storm sewers, or in some cases putting them out co-mingled with household waste is a major challenge for Waste Management Officers. The dangers of such disposal methods might not be immediately obvious, but improper disposal of these wastes can pollute the environment and pose a threat to human health. In City of

Cape Town the HHW stream has grown to the extent that it currently constitutes almost 3% of the total waste stream by mass.




| | | July 2008 - June 2009 (Tons) | % of Total generated | % of Total landfilled |
|---|---|---|---|---|
| 1.1 | General waste landfilled to Mun. sites [1] | 1,162,311 | 38.4% | 52.5% |
| 1.2 | Hazardous landfilled to Mun. sites [1] | 66,203 | 2.2% | 3.0% |
| 1.3 | Rubble and Greens landfilled to Mun sites | 375,025 | 12.4% | 17.0% |
| 1.3.1 | Free Waste arriving at Mun. sites [1] | *439,219* | | |
| 1.3.2 | Less rubble and greens diverted (items 2.2 & 2.4) | *-64,194* | | |
| *1.4* | *Subtotal to Municipal landfill* | *1,603,539* | *52.9%* | *72.5%* |
| 1.5 | Add for Private Site [3] | 608,500 | 20.1% | 27.5% |
| ***1.6*** | ***Total landfilled*** | ***2,212,039*** | ***73.0%*** | ***100.0%*** |
| 2.1 | Chipping of greens at drop-offs [2] | 63,247 | 2.1% | |
| 2.2 | Chipping of greens at landfills [2] | 4,419 | 0.1% | |
| 2.3 | Composting [2] | 8,147 | 0.3% | |
| 2.4 | Builders Rubble Crushed (not landfilled) [2] | 59,775 | 2.0% | |
| 2.4 | Builders rubble reuse by demolition contractors [4] | 355,206 * | 11.7% | |
| 2.4 | Household recycleables [2] | 11,232 | 0.4% | |
| 2.5 | Industrial recycleables [5] | 198,000 * | 6.5% | |
| 2.6 | Wastewater sludge to land, compost or pellets | 118,347 | 3.9% | |
| ***2.7*** | ***Total waste diverted from landfill*** | ***818,373*** | ***27.0%*** | |
| 3 | **Total Waste Generated** | **3,030,412** | ***100.0%*** | |

[1] Raw weighbridge data from CoCT (20/5/2010)
[2] Information from CoCT - A Davison (11/5/2010)
[3] Information from Mike Pienaar, Wasteman, 20/7/2010
[4] Based on Ingerop 2006, reduced by 25% to account for downturn in economy. This fraction is subject to high variability.
[5] City of Cape Town IWMP (2003). More recent information not available without an extensive investigation. Questionaires to industry not returned. However, it corresponds well with the Recycling Action Group figure of 192,000 tons/yr (Mar 2010)

**Figure 1: Characterisation of Waste Landfilled in terms of mass (tons )(2008/2009)**

## 2. CHANGING LEGISLATIVE CONTEXT

The national pre-1989 waste and hazardous waste activities were mainly focussed on health impacts and the possibility of water and soil pollution. The key legislation at the time was *The National Health Act, Act 63 of 1977, The Nuclear Energy Act 131 of 1993*; *The National Water Act, Act 54 of 1956*; and *The Medicines and Related Substances Control Act, Act 101 of 1965*. This however changed through the enactment of the *Environment Conservation Act, Act 73 of 1989* (ECA) with the supplementary *Minimum Requirements for Waste Disposal by Landfill*, including the *Minimum Requirements of Handling, Classification and Disposal of Hazardous Waste, 2nd Edition, 1998*, which paved the way for waste legislation. Similarly the handling of asbestos in construction and demolition was controlled in terms of the asbestos regulations in Schedule 43 of the *Occupational Health and Safety Act, Act 85 of 1993* (OSHA), whilst the disposal of asbestos waste was addressed and controlled in terms of section 20(1) of ECA.

The *Municipal Systems Act, Act 32 of 2000*, provides for Municipalities to ensure a safe, healthy and sustainable environment, and that the rights of individuals as enshrined in Section 24 of the Constitution are protected.

## 3. EXTENDED PRODUCER RESPONSIBILITY

The *National Waste Management Strategy of 2011* recognizes numerous challenges facing **w**aste management in South Africa including the complexity of waste stream which again directly affects the complexity of its management, which is compounded by the mixing of hazardous wastes with general waste and provides to address them through a broader plan. The main challenges pertaining to municipalities include:

- Increased volumes of waste generated through a rapid growing population and economy, which puts pressure on waste management facilities.
- Increased complexity of waste streams because of urbanisation and industrialisation.
- Improvement of safe disposal of all waste streams through the availability of compliant landfills and hazardous waste management facilities.
- Ensuring Producer responsibility initiatives in which industry takes responsibility for the lifecycle of products that they produce. Industries to manage the products once they become waste by establishing methods and funding mechanisms, and target setting for re-use, recycling or recovery in their respective Industry WMP's.

- Declaration of Mandatory Extended Producer Responsibility (EPR) where Industry WMP's are ineffective and the Minister wishes to determine how certain waste streams are to be managed

The *National Waste Management Strategy* states that "A fundamental change in waste disposal practices will be supported by the development of a national recycling infrastructure through partnerships among the various role-players. The infrastructure will enable separation at source of organic waste, hazardous waste and clean recyclable waste, and the collection of particular waste types that contaminate general household waste through specialised infrastructure. The responsibility of different role players for providing the recycling infrastructure for management of the different waste streams is set out in the following table."

Table 1: Responsibility of different role players for providing recycling infrastructure for different waste streams

| **Role players' contribution to re-use, recycling and recovery of waste Role** | **General Waste** | **Organic Waste** | **Recyclables (paper, plastic, metal, glass and tyres)** | **Hazardous (batteries, solvents, CFLs etc.)** |
|---|---|---|---|---|
| **Advocacy and education** | Municipality | Municipality (with national and provincial support) | Industry in partnership with municipality | Industry |
| **Providing bins at source or take back facilities** | Municipality | Municipality | Municipality to provide additional bins at source, Industry to provide accessible take back facilities | Industry |
| **Collecting waste** | Municipality | Municipality | SMEs supported by industry | Industry |
| **Processing waste** | Municipality | Municipality | MRFs run by SMEs and supported by industry | Industry |
| **Dispose of waste** | Municipality (landfill) | Municipality (composting facility) | No disposal as per set targets | Industry |

## 4. MUNICIPAL OBLIGATION

It is evident from leading legislation that all stakeholders must accept co-responsibility for minimising the waste footprint and impact on the environment; hence a well regulated, formalised waste sector will improve the efficiency of the overall economy. Regrettably this is a major area of concern to municipalities, as EPR involvement in the management of HHW streams is mostly non-existent or insignificant, which compounds the challenge to manage increased volumes of problematic HHW.

The City of Cape Town is not mandated to provide and/or manage a household hazardous waste system, but recognizes its environmental responsibility and statutory obligation in terms of relevant legislation. This social and environmental responsibility is aligned to the *National Environmental Management Act* (NEMA) on principles of duty of care, prevention of pollution, cradle to grave mechanisms, and to ensure waste and in this case, HHW does not negatively impact on human health and the environment. To give effect to the challenge City of Cape Town provided its commitment in the 2$^{nd}$ Generation IWM Plan, which aligns with directives per Section12 of NEM:WA namely that a municipality must formulate such plan as a means of minimizing waste disposal, providing services, preserving natural resources and extending the use of landfill sites, and protecting the health and the environment.

City of Cape Town recognized the requirement set by NEM:WA (NEM:WA Act 59 of 2008) that waste minimisation should be considered by municipalities in addition to municipal services such as cleaning, collection and disposal to landfill and also to develop efficient, effective, sustainable and affordable Alternative Service Delivery mechanisms for waste management. In April 2011 City of Cape Town adopted recommendations of a Municipal Systems Act, Act 32 of 2000 (MSA), SECTION 78(3) Assessment on Alternative Service Delivery Options. This assessment was needed to place the City in a position to make an informed decision as to the most appropriate mechanisms for the Solid Waste Management Department to meet new legislative requirements and to reduce waste and divert waste from landfill.

## 5. MSA SECTION 78(3) FINDINGS ON HHW

The accurate measurement of the quantities of household hazardous waste in the City of Cape Town's waste stream is very difficult, but based on the Gibb waste characterisation (Gibb, 2008) data indicated that household hazardous waste made up approximately 6% of the formal household waste stream only (not total landfilled waste stream). The 2008/2009 amount of household hazardous waste landfilled was estimated at 40 704 t/yr. At *status quo* Assessment it was found that:

- There was insufficient information to accurately quantify the amount of household hazardous waste being landfilled.
- There was no specific strategy in place by the City to divert household hazardous waste.
- There were no City facilities, as yet, providing an alternative outlet for the public to take household hazardous waste to due to licensing requirements and the liability risk

Since the true effectiveness of any diversion system cannot not be determined until it is piloted, it was proposed that, in terms of the obligations of the MSA, NEM:WA and then *Draft Waste Classification and Management Regulations*, the City should investigate piloting a HHW project offering households a municipal service whereby household hazardous substances and special wastes (such as pesticides, pharmaceutical wastes, batteries, fluorescent tubes, electronic wastes, etc.) may be taken to selected drop-off sites for collection and disposal. Two options were considered, namely a Full Service to receive all types of household hazardous waste including paints, solvents and other chemicals and/or a Limited Service to receive only the common and easily handled hazardous wastes (i.e. CFL's, batteries and e-waste). It was furthermore recognized that the former will require a scientifically trained operator to handle and sort the wastes to avoid dangerous reactions between wastes and the latter a less skilled operator.

A total of 6 household hazardous waste facilities were recommended, namely 3 drop off sites (Coastal Park Landfill site, Kraaifontein Integrated Waste Management Facility (KIWMF) and Athlone Refuse Transfer Station (RTS)) for full service and 3 drop-off sites (in residential areas) for limited service. These options were modelled and the direct and indirect costs per ton of HHW diverted was between R2 900–R3 500/t. Given that direct cost constitutes additional costs to collect from site and additional costs to process, whilst indirect costs constitutes avoided disposal costs, decrease in revenue from disposal, savings in planned expansions of landfills. The net additional cost to City of Cape Town was estimated at R47m–R50m per annum with an estimated 16 300 tons or 11 900 $m^3$ of HHW diverted.
It was confirmed that:

- the implementation of a HHW service would result in minimal airspace saving or benefit, but be costly to the City,
- the service still be provided because of changing legislative requirements,
- it be an interim approach and that Council must ultimately ensure that Extended Producer Responsibility supports and takes responsibility for the diversion of HHW from landfill,
- Council should develop a policy and ultimately a strategy, to manage HHW.

## 6. ALTERNATIVES AND CASE STUDIES IN THE WESTERN CAPE

### 6.1 Alternatives

Consideration were given to the following alternative methods of diverting HHW, but were found not necessarily feasible:

- Rely on retail stores to divert household hazardous waste: Low diversion rates although efforts need be supported. Risk of proper control of the facility and danger of mixing incompatible wastes. Except awareness will not have a noticeable cost to City.
- Mobile drop-off units: Rotational deployment, the effectiveness is not possible to assess
- Collection of HHW with dry recyclables: Manual sorting, health concerns, breakages and contamination.
- Separate monthly HHW collection by specialist: Extremely costly for the amount of waste collected.

6.2 Case Studies

The Western Cape has since had two known HHW case studies.

Stellenbosch Municipality – A trial HHW collection was done by Stellenbosch municipality, DANIDA and Western Cape Department of Environment and Development Planning (DEA&DP) during March 2008. It was advertised as an open day for free disposal of any HHW. A temporary HHW drop-off point was established at a central location. All HHW collected on the said day were sorted on site, and disposed by a contractor at a registered landfill site. Published results are available, but reported that the yield was low caused by a very low turnout by the public. (Eddie Hanekom, 2009)

Overstrand project - Two HHW drop-off areas for the public were respectively established at MRF's in Hermanus and Kleinmond. The project is operational since December 2008 years and provides interesting learning.
The two drop-off areas at the MRF's in Hermanus and Kleinmond required special security after the contents of the HHW containers were initially tampered with. The two drop-off areas are now fully secured and fenced
No Health Care Risk Waste (HCRW) or old medicines are accepted.
Six commercial size wheelie bins (770 l) tagged with stickers identifying the content are provider in a roofed area. The lids are fitted with locks. After the initial peak, the trickle has slowed down significantly. The waste is removed and disposed by a contractor. (van Taak, 20012/3)

7. CITY CAPE TOWN PILOT PROJECTS

Both the case studies significantly informed the approach the City endeavoured into. The agreed model for the City of Cape Town was the provision of HHW drop-off facilities per the MSA Section 78(3) recommendations and subsequent 2nd Generation IWMP commitment. The biggest risks in structuring our approach related to Public Awareness and Education (including Public Participation) and the uncertainty of initial disposal quantities. Since the success of the project relies heavily on awareness regarding future illegality of disposal of certain household items in the domestic waste stream and the correct handling of HHW by the public, a comprehensive Public Awareness and Education implementation plan was required which also provided for continued evaluation, compliance and effectiveness monitoring. Key negatives aspects of the proposal such as potential health concerns to the public, reluctance to travel to drop-off's and carbon emission inefficiency resulting from public taking numerous trips to a drop-off's were identified and for inclusion in the stakeholder engagement roll-out.

Neither the estimate in the MSA Section 78(3) assessment nor the Overstrand (van Taak, 20012/3) learning provided reliable estimates towards quantifying the expected initial and short term cost in operating the site. It is considered most properties have stockpiled their own HHW over time and would hence be keen to dispose of the same for free. This uncertainty which is strengthened by the Overstrand (van Taak, 20012/3) experience strongly indicated on funding requirements exceeding budget. Further research resulted in no reliable estimates, hence the abovementioned risk of budget overspend almost shelved the City of Cape Town HHW project.

The cost of removing and treating this waste is high and should ideally be shared by the manufacturing/chemical industries through Industry IWM Plans.

7.1 Kraaifontein Integrated Waste Management Facility

This site, which hosts a Refuse Transfer Station, a Material Recovery Facility, Garden greens chipping operations and a Drop-off area was the ideal choice for the City of Cape Town first HHW pilot. The drop-off area on the site was well planned, secured and considered a good infra-structural site. It has sufficient space for the intended HHW operations to run concurrent with the existing drop-off activities. Five roofed epoxy-coated cages with lockable doors were set aside for the planned operations.

Following the choice of the preferred facility, an internal agreement was reached to outsource the total specialised service, namely the operational management required for full time oversight, onsite handling, storage and safe disposal. The skill-set required is outside the City's current functionality, hence it was agreed that the management of operations through a well-structured contract will allow the City to better control and to ensure compliance. Due to the nature of operations and complexity of decision making the

City of Cape Town would only consider a suitably qualified competent person, with relevant proven experience to handle the operations.

To comply with applicable legislation the temporary storage facilities at the HHW area could not exceed a maximum of 35 $m^3$ for a maximum 90 days unless a licence has been issued for such an activity at the facility. The tender document specifies that all hazardous waste accepted at the site will need to be documented, categorised into the various fractions, then treated/recycled or transported to a treatment/hazardous disposal waste site by the private contractor. Records of all material accepted, stored, recycled and or disposed is required for auditing and compliance. The HHW should be sorted and be disposed of/recycled as follows:

- Household Batteries by thee-waste recyclers
- Ink cartridges by thee-waste recyclers
- Car batteries in a dedicated battery recycling plant
- Motor oil and oil containers as per Rose Foundation
- Used cooking oil by the bio-fuel industry
- E-waste by the e-waste recyclers
- Solvents by the solvent recyclers
- Paints by Specialist disposal companies
- Pesticides by Specialist disposal companies
- CFL's by Specialist disposal companies

Key provisions in the tender included a focus on the administration, acceptance, handling, packaging, storage, beneficiation, treatment and final disposal of such HHW wastes. Variables in the total scope of the activity such as HHW types, quantities, steadiness of the supply stream and final disposal cost are however extremely difficult to define.

The tender provided clear directives for the contractor towards minimum acceptable criteria for onsite management such as:

- The use of the 5 existing covered cages, current infrastructure at KIWMF, water and electricity supply, security services and weighbridge at the main gate.
- On-site mini laboratory to test basic pH, flashpoints, etc.
- All HHW to be classified according to NEM:WA Global Harmonised System.
- No storage of HHW (including used oils) of more than 30 $m^3$ at any time on the area allocated to the contactor.
- No storage of any product more than 7 days.
- No mixing or blending of HHW as it constitutes treatment under NEM:WA.
- Non-acceptance of explosive, spontaneously flammable HHW or compresses gas cylinders, etc.
- Beneficiation of HHW by the contractor to take preference over treatment and over final disposal.
- All HCRW or scheduled pharmaceuticals will not be accepted or disposed off.
- Contractor to pre-develop an electronic/software system to record all activities; to present reports on waste types and mass, residential address/public name/ID number/Business Partner number, vehicle registration and applicable NEM:WA classification as well as totals for beneficiation, treatment and/or final disposal on request either daily, weekly and/or monthly.

The contractor per the Conditions of Contract is furthermore considered the competent person on site and responsible to:

- Demarcate the operational area, secure and fence the immediate HHW operational area for the safe and secure acceptance, handling and storage of material.
- Provide suitable containers for individual HHW type storage, re-packing, and mechanisms to lift onto vehicles as well as transport of HHW for beneficiation, treatment or final disposal.
- Provide own staff adequately trained in hazardous chemical management, OSH and Health & Safety.
- Provide personal protective equipment and clothing, stocked First Aid room plus fire-fighting equipment.
- Ensure emergency responsiveness at all hours.
- Ensure strict recording and reporting.

Although municipal tenders are based on value for money, in this tender maximum emphases were placed on the proven experience of the contractor. Strict functionality criteria were included to evaluate experience of similar work, proven records, availability of fleet, suitably qualified and trained staff, knowledge of and registration within applicable Acts and City of Cape Town by-laws.

A temporary hold was placed on the tender based on the potential risk embedded in future contract cost.

7.2 Athlone Refuse Transfer Station

To negate implicit risk of an over spend, a totally new approach was followed by securing a HHW drop-off at ARTS. The key differences relate to a reduction in scale, monthly cost thresholds and ring-fencing of target areas. Instead of a free for all approach, the ARTS HHW drop-off starts on a small scale and progressively expands subject to participation rates and availability of budget. Learning from this approach will inform the temporary hold on the roll-out of Kraaifontein HHW Drop-off.

Athlone Refuse Transfer Station (ARTS) is centrally located in a high-density residential area. No infrastructure currently exists at ARTS for use as a HHW drop-off except for a small piece of unused land within the perimeter fence of the waste facility. This unutilised land was previously used as a general waste drop-off and has a separate entrance from the access road towards the main gate.

The first phase of the project provided for infrastructure development. The infrastructure being non-existing allowed for the design of low cost modular units as receptacles for the different HHW types, which the City of Cape Town custom designed. The specifications of these modular units included corrosive resistant material coatings per special waste type such as for acid-handling container, individual ventilation and a central opening in a gradually sloped floor. This design allowed for managed and contained run-off in the event of spills and rinses. Surface water would enter a corrosive resistant drainage system and flow into a hazardous waste underground capture tank where the dilution of the spills and level of the tank be controlled. The design provided for access to and the removal of effluent by a vacuum tanker for chemical treatment at a H:H waste facility when required. The units are all facing in the same direction, which allows the public to park at the open-end of each individual container, to offload their HHW and drive out at the same gate.

Although the same strict criteria and rules discussed under Section 3.1 Kraaifontein Integrated Waste Management Facility will apply to the said site, the extent of operations would be at a smaller scale.

The key differences in the tender approach are to manipulate future expenditure through an outcome based approach. The monthly expend in the tender is capped as well as the total adjudicated amount (R4m/annum). The number of residents allowed to participate will start from a few and growing larger based on monthly operational cost versus monthly-cap and total budget amounts. A few residential areas were pre-selected to which the service will be offered. Only material delivered by residents from these areas will be accepted on proof of identity and address. Athlone Refuse Transfer Station (ARTS) is centrally located in high-density residential areas ranging from informal, sub-economic, economic and upper-market. In essence the choice of ARTS would allow additional learnings towards:

- Custom designing and costing of a facility.
- Volumes generated per economy/income status of residential areas.
- Participation rates per residential area.
- Initial cost per residential area economy/income status and participation rates.
- Short to medium term growth and or decline.

The real benefit in this approach is that the model could be implemented in a modular approach in other areas throughout the City of Cape Town based on the sample data per economy/income status of residential areas, projected participation rates, cash flows and budget requirements. This pilot project would hence validate or waylay assumptions on the generation per capita per annum as well as on the actual participation of residents from different areas.

8. CONCLUSION

The management of HHW in South Africa is a growing challenge to municipalities. Very few case studies are available from work done on a municipal level, which is understandable as The National Waste Management Strategy indicates a preferred high-level of EPR and Industry involvement through Industry WMP's. Although

municipalities are not mandated to provide and/or manage hazardous waste systems in South Africa, there are social and environmental responsibilities such as duty of care, prevention of pollution and cradle to grave mechanisms legislated to ensure waste and in this case, HHW does not negatively impact human health and the environment.

The management of such a specialised facility should be given to a competent person, whilst the municipality remain the authority through continued auditing and compliance monitoring. Participation rates a, HHW types and volumes is an unknown factor, which could easily result in over expenditure. Well-structured tenders can alleviate challenges such as managing expectation and limiting financial risks.

Proper planning and effective waste management has important economic and social impacts in addition to environmental benefits.

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