

A comparative analysis of communal waste collection options for Mafikeng city council

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Abstract

This study examined the method of communal waste collection (CWC) practiced in Mafikeng city. It noted that a number of malpractices at CWC points have resulted in undesirable socio-economic impacts, which have prompted the need for the adoption of a new method of practice. The study proposed an alternative method and developed projected income statements, which were evaluated to determine whether to accept or reject the proposed method. All evaluations were in favour of adopting the proposed method. It was therefore the unequivocal recommendation of this study to reject the current method of CWC and accept the proposed method.

Keywords: cash inflow, projected income statements.

1 Introduction

The city of Mafikeng is located in Mafikeng Local Municipality (MLM) in the North West (NW) province of South Africa. According to MLM [1], it covers about 25% of the 3703 sq. km of the municipality. Over the years, the population of Mafikeng has steadily increased. Available statistics indicate that the population increased from 43395 in 1996 to 47887 in 2001, while the number of households increased from 11679 to 15921 during the same period (Statistics South Africa; [2] and [3]). From these statistics, it was computed that between 1996 and 2001, the population and number of households in Mafikeng city increased at a rate of about 2% and 7% per year, respectively.

The city is administered by the Mafikeng City Council (MCC) which provides its residents with municipal services such as waste removal, street lighting, water, electricity, sewerage services and storm water drainage (Statistics



South Africa [3]). Kadama [4] notes that MCC was the only urban authority that provided both curb-side and communal waste removal services in the NW province. Curb-side collection was limited to domestic waste while CWC points were intended for garden waste only. The decision to provide a CWC service was taken in 2000 in consideration of the high numbers of low income residents in the Mmabatho and Montshioa areas who, due to lack of means to deliver their garden waste to landfills, resorted to littering. According to MCC [5], there are about 90 CWC points and 110 skips in the city. However, Kadama [4] observes that CWC points were not only used for the intended purpose of garden waste collection but were also wrongfully used as dumpsites for domestic waste, commercial waste from enterprises such as guesthouses operating in residential areas, building rubble and even dead pets. These malpractices continue to date (Van Wyk [6]). As a result, Mafikeng city experiences the following problems associated with communal waste collection that were identified in Kadama [4]:

1. Waste at CWC points, resulting from over-filled skips and littering is an aesthetic nuisance.
2. There is air pollution due to obnoxious and pungent odours that emanate from putrefying waste.
3. Neighbourhoods are infested with flies, rats and other pests that breed in the skips.
4. There is littering caused by scavengers as they rummage through the waste in the skips.
5. There is littering caused by wind from both stationery and in-transit skips.

These problems have negative socio-economic effects on residents. As a result, residents regularly vent their frustrations, especially due to the decline in property value, in both print and electronic media (Van Wyk [6]). In this respect, Mafikeng residents give credence to Zeiss [7] who argues that nuisance impacts from waste facilities can aggravate community resistance because odour, noise and visual impacts trigger more serious concerns about impacts on community health, image and property values.

Kadama [4] also notes that due to littering and other malpractices at CWC points, MCC had to acquire or hire tractor loader back-hoes (TLBs), tipper trucks and labourers to clean up after waste removal. These interventions, which had not been anticipated and as such were not budgeted for, have dire consequences for the city's scarce resources. In Kadama [4], it also emerged that the city's bye-laws on littering were outdated and ineffective under present circumstances and, worse still, the city council lacked resources to arrest and charge transgressors in courts of law. Clearly, the maintenance of operations at CWC has a debilitating effect on the city's meagre resources and the department of waste management should welcome viable solutions to this problem.

1.1 Problem statement

From the above observations, it is clear that the current practice of waste disposal at CWC points in Mafikeng city is unsustainable as it creates an unhealthy



environment, is an aesthetic nuisance, reduces property value and depletes the city council's scarce resources which could have been utilised for other pressing priorities. To crown it all, there is no hope for relief if the *status quo* persists since the existing bye-laws are ineffective and the city council lacks the wherewithal to implement the bye-laws even if these were amended. There is therefore an urgent need to adopt an alternative method of practice at CWC points in Mafikeng otherwise the malpractices will continue with impunity.

1.2 Aim and purpose of the study

The aim of the study was to apply capital budgeting techniques to justify the selection of an alternative method of practice at CWC points that is sustainable and complies with the city council's environmental management obligations. The purpose of the study was to highlight the unsustainable practice at CWC points in Mafikeng and advocate a sustainable alternative. The study addressed the following questions:

1. Was the CWC practice in Mafikeng sustainable?
2. Would it make economic sense to adopt the proposed method of practice at CWC points?

1.3 The objectives of the paper

The objectives were to:

1. Propose an alternative method of practice at CWC points that would be evaluated in comparison with the current method.
2. Develop projected operating cash inflows of the two methods under comparison.
3. Determine the payback period of each method.
4. Determine the annual incremental cash inflows if the proposed method were to be adopted.

2 Methodology

The study proposed the adoption of CWC points whose design would include the following features:

1. A concrete paved floor.
2. A ramp with a cantilever from which waste would be thrown into a skip placed on ground level.
3. A covered roof.
4. Chain link perimeter fence to enclose the facility and a lockable gate to limit after-hours access.

Each CWC point would be manned by an operator. Estimates of labour and material to construct one CWC point were obtained from GD Glad Designs in Mafikeng.



The study viewed the CWC points as capital investments that were under consideration by the council in 2010 and the payback capital budgeting technique was applied to make a decision on which method to accept. The current method of CWC was evaluated as Investment 1 while the proposed method was evaluated as Investment 2. Data on prices of vehicles, fuel consumption and maintenance costs were obtained through quotations from suppliers and enquiries from a logistics management firm. Data were also collected in a self-administered interview with the manager of the city's municipal waste services. In determining the cash flow projections, the following assumptions and estimates were made:

1. Vehicle maintenance costs in the first year of operation were estimated to be 5% of the cost price of the vehicle.
2. Each vehicle consumed 60l of fuel per day.
3. There were 20 working days each month.
4. Vehicle maintenance costs increased annually by 12% to account for inflation and age.
5. All other expenses increased annually at a rate of 8% to account for inflation.
6. Each household would pay a CWC tariff of R10 in the first year which would increase by 8% annually.
7. In the period of the assessment, the population and number of households in Mafikeng would continue to increase annually at the rate of 2% and 7% respectively.

Given that there were 15921 households in Mafikeng in 2001 and assuming the annual increment to be 7%, equation (1) was used to compute the number of households in the city in 2010.

$$HH_2 = HH_1(1 + r)^n \quad (1)$$

where:

- HH_1 : Number of households in 2001
 HH_2 : Number of households in 2010
 r : Annual incremental rate
 n : Period in years

Equation (1) was applied to determine the number of households in Mafikeng in 2010.

$$HH_2 = 15921(1 + 0.07)^9$$

$$HH_2 = 29270$$

The number of households in Mafikeng in 2010 was computed to be 29270.

Equation (2) from Garrison and Noreen [7] was applied to compute the payback period for Investments 1 and 2.

$$\text{Payback period} = \frac{\text{Investment required}}{\text{Net annual cash inflow}} \quad (2)$$

3 Presentation of results

Available data was used to develop cash flow projections for Investments 1 and 2 which are presented in Tables 1 and 2.



Table 1: Annual income statement for Investment 1 projected for 10 years.

	1	2	3	4	5	6	7	8	9	10
Revenue	0	0	0	0						
Less Expenses	6592368	1950458	21125480	24667826	26656685	28806504	31130384	33642496	36358180	39294032
Capital equipment	6592368									
Skips (110)	1100000									
Skip loaders (5)	3250000									
TLB (3)	1023000									
Tipppers (3)	1219368									
Salaries and wages:	18469440	19946995	21542755	23266175	25127469	27137667	29308680	31653375	34185644	36920496
Drivers skip loaders (5)	5227200	5645376	6097006	6584767	7111548	7680472	8294909	8958502	9675182	10449197
Drivers TLB (3)	3136320	3387226	3658204	3950860	4266929	4608283	4976946	5375101	5805109	6269518
Drivers tipppers (3)	3136320	3387226	3658204	3950860	4266929	4608283	4976946	5375101	5805109	6269518
Labourers (10)	6969600	7527168	8129341	8779689	9482064	10240629	11059879	11944670	12900243	13932263
Vehicle expenses	1081018	1178485	1285066	1401651	1529216	1668838	1821703	1989122	2172535	2373536
Fuel and lubrication	806400	870912	940585	1015832	1097098	1184866	1279655	1382028	1492590	1611997
Vehicle maintenance	274618	307573	344481	385819	432117	483971	542048	607094	679945	761538
Net profit	-6592368	-26142826	-70096127	-94763953	-121420638	-150227143	-181357526	-215000022	-251358202	-290652234

Table 2: Annual income statements for Investment 2 projected for 10 years.

	1	2	3	4	5	6	7	8	9	10
Revenue	0	3512400	3793392	4096863	4424612	4778581	5573737	6019636	6501207	7021304
Less Expenses	0	2049936	2213931	2391045	2582329	2788915	3012029	3513230	3794288	4097832
Capital items	1950485									
Skips (15)	150000									
Skip loaders (1)	650000									
Build 15CWC points	1150485									
Salaries and wages:	1916640	2069971	2235569	2414414	2607568	2816173	3041467	3284784	3547567	3831372
Drivers skip loaders (2)	174240	188179	203234	219492	237052	256016	276497	298617	322506	348307
Labourers (30)	1742400	1881792	2032335	2194922	2370516	2560157	2764970	2986167	3225061	3483066
Vehicle expenses	133296	143960	155476	167915	181348	195856	211524	228446	246722	266459
Fuel and lubrication	100800	108864	117573	126979	137137	148108	159957	172753	186574	201500
Vehicle maintenance	32496	35096	37903	40936	44210	47747	51567	55692	60148	64960
Net profit	-1950485	1091440	2797258	4639542	6629208	8778047	11098794	13605200	16312119	19235591



Table 3: Incremental cash inflows for Investments 1 and 2.

Year	Investment 2	Investment 1	Incremental
0	-1950485	-6592368	4641883
1	-488021	-26142826	25654805
2	1091440	-47268306	48359746
3	2797258	-70096127	72893385
4	4639542	-94763953	99403495
5	6629208	-121420638	128049846
6	8778047	-150227143	159005190
7	11098794	-181357526	192456320
8	13605200	-215000022	228605222
9	16312119	-251358202	267670321
10	19235591	-290652234	309887825

Information from the cash flow projections was used to develop the incremental cash inflows of Investment 1 and 2 that are presented in Table 3.

Equation (2) was applied to compute the payback period for the investments. Results showed that the payback period for Investment 1 approximated to negative infinity since the cash inflows exponentially decreased in value. The payback period for Investment 2 was computed to be 1.2 years.

4 Discussion

The findings of this study were evaluated on two bases:

1. Firstly, the investments were considered to be mutually exclusive alternatives and were evaluated on the basis of accept the best alternative and reject the other. The decision to accept or reject was based on results of cash flow analyses and the payback period.
2. Secondly, the Investment 2 was evaluated to determine whether it would be a viable replacement for Investment 1. The decision whether to accept Investment 2 as a viable alternative was taken based on the analysis of incremental cash inflows.

An analysis of the income statement projections of Investments 1 and 2 is graphically illustrated in Figure 1.

From Figure 1, it is evident that Investment 1 would be a liability to the city as it consumes resources without generating profits throughout the period of assessment. On the other hand, it is evident that Investment 2 would start generating profit at the beginning of the second year and the profit would steadily increase on an annual basis up to the 10th year of the projection. Based on this assessment, it was deemed appropriate to reject Investment 1 and accept Investment 2.



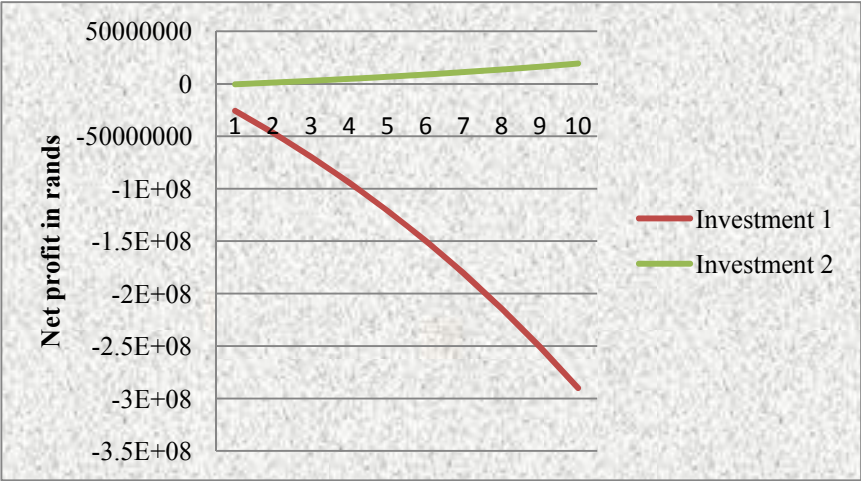


Figure 1: Investments' cash flows projected for 10 years.

Garrison and Noreen [7] define payback as the period taken for an investment to recoup its initial capital outlay from the revenue it generates. They assert that the shorter the payback period, the more desirable the investment. The payback period for Investment 1 approximates to negative infinity. This implies that Investment 1 was incapable of generating profit and would be an ever increasing burden to the city. Conversely, Investment 2 had a short payback period of 1.2 years. On the basis of this assessment, it was deemed logical to reject Investment 1 and accept Investment 2.

Incremental operating cash inflow assessments are helpful when making decisions on whether to replace one mode of operation with another (Gitman [9]). Incremental cash inflows may be positive, negative or zero. A positive value indicates that it may be worthwhile to change the method of operation; a zero value indicates that there will be no value added by adopting the new method of operation and a negative value indicates that change of operations will negatively impact on the organisation. An analysis of the incremental operating cash inflows of Investments 1 and 2 is illustrated in Figure 2.

From Figure 2 it is observable that the incremental operating cash inflows for Investments 1 and 2 are positive throughout the period of projection. It is also observable that the incremental inflows exponentially increase as time progresses. This indicates that replacing Investment 1 with Investment 2 would add value to the operations of the city and the benefits would progressively increase in value.

For purposes of frugality, this study proposed a basic design for adoption at the CWC points. However, the exponential incremental operating cash inflows realised in this study suggest that the benefits accruing from the selection of Investment 2 would afford the city council the luxury of high tech sophistication at CWC points such as mechanised hoppers to compact and direct waste into

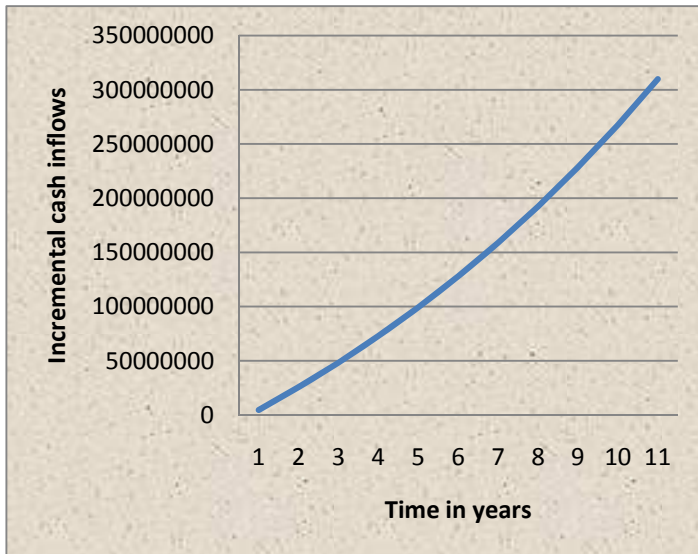


Figure 2: Incremental cash inflows for Investments 1 and 2.

skips and closed circuit television cameras (CCTV) to monitor malpractices at CWC points and other littering hotspots. Instalation of compacting hoppers at CWC points would reduce the trips by trucks to landfills thereby lowering transport and vehicle maintenance costs. Evidence provided by CCTVs would result in higher success rates in littering related prosecution. Also, through cooperative governance initiatives, evidence from CCTVs would prove essential in the fight against crime in the city.

5 Conclusion

The study evaluated Investments 1 and 2 based on the criteria outlined in section 4. In all instances the verdict was in favour of adopting Investment 2 rather than 1. On the basis of the decisions arrived at in this study, it was deemed prudent that MCC should replace the present method of CWC with the one proposed in this study.

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