Financial and Economic Issues in Integrated Sustainable Waste Management

Tools for Decision-makers
Experiences from the Urban Waste Expertise Programme
(1995-2001)

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Series editor:
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Cover photos:
Photo 1: Women separating broken glass, India – *Photo: ©WASTE, Arnold van de Klundert*
Photo 2: Donkey cart on its way to the compost plant in Moqattam, Egypt – *Photo: ©WASTE, Mounir Bushra*
Photo 3: Man collecting household waste, India – *Photo: ©WASTE, Esha Shah*

Financial and Economic Issues in Integrated Sustainable Waste Management is part of a set of five Tools for Decision-makers. The other four documents cover:

- Integrated Sustainable Waste Management - the Concept
- Community Partnerships in Integrated Sustainable Waste Management
- Micro- and Small Enterprises in Integrated Sustainable Waste Management
- The Organic Waste Flow in Integrated Sustainable Waste Management

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Gouda, May 2001

Arnold van de Klundert
UWEP Programme director

Table of contents

Chapter 1. **Why Does a Decision-maker Need to Know about Financial and Economic Issues?**

This document with tools is designed to help decision-makers use financial and economic instruments to make responsible and informed decisions about Integrated Sustainable Waste Management (ISWM).

1.1 What is Integrated Sustainable Waste Management (ISWM)?

Integrated Sustainable Waste Management is a concept that has been articulated and refined in the Urban Waste Expertise Programme (UWEP) after more than 15 years' work.

WASTE has developed ISWM (see Figure 1):
1) As an *analytic framework* for understanding waste management systems
2) As an *assessment methodology* for predicting feasibility and sustainability
3) As a *description* of an urban development process

This document focuses on the financial and economic aspects of ISWM. Although economics is universally considered important in determining feasibility, there is often a lack of understanding of how the economics and finance of waste management works.

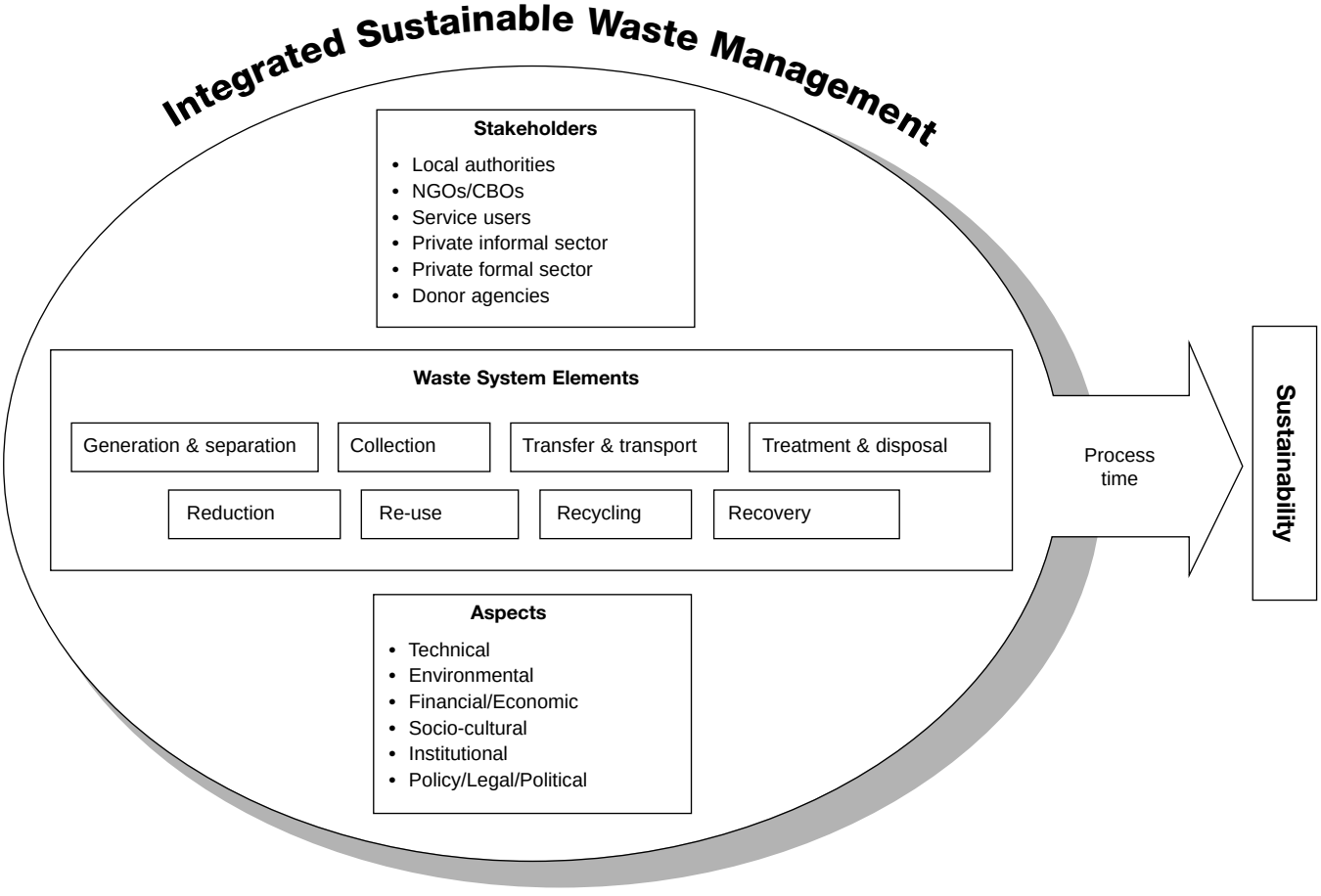


Figure 1. The ISWM model

1.2 Typical dilemmas for the economic and financial aspects of ISWM

1.2.1 My environmental inspectorate says I must close the dump in 6 months, what does this mean for me?

From an ISWM perspective, the main question turns on the cost of disposal. How is the landfill managed and who pays for that management? Is there a tipping fee and does everyone pay? How do they pay - collection fee, tax or general subsidy?

If you need a new landfill, it is almost certain that disposal costs will rise - probably by 100% to 1,000%.

What else could you do? You could join a regional landfill initiative. The costs will still go up, but economies of scale are better. On the other hand transport costs may rise. Alternative options (such as recycling and composting) may be a preferable local option.

1.2.2 My city is under pressure to start a recycling programme. Will it earn money?

In ISWM, it is important to investigate what is already being recycled and to cooperate with existing stakeholders.

Existing recycling may not be obvious and is often part of the informal sector: it may include collecting cardboard from shops and/or buying bottles and cans from households. If you do not build on existing initiatives, a new programme may displace informal recyclers and can flood the market with low-grade materials. This may result in fewer materials being recovered. An ISWM approach would be to analyse the existing market and look for elements that are not effective. The policies or incentives can then focus on these elements. These interventions are described in greater detail in Chapters 3 and 5.

1.2.3 A foreign embassy wants to donate compactor trucks to my city. Should I accept?

Compactor trucks are expensive to operate and maintain. Their main advantage is that they compress waste, if it is compressible. But in most countries in the South, the waste contains more than 50% organic and dense inert materials, which are not compressible. These materials are so wet that compression creates leachate, which is squeezed out onto the streets. Dust and grit damage the compaction mechanism, necessitating frequent repairs and replacement parts, probably imported.

The decision is in part dependent on how much money can be committed to operating costs. Even though you may not have to pay the capital costs (since it is a donation), the operating costs may be too high. In other words, costs per household or per ton may be higher for the donated vehicles than they would be for a simpler, locally purchased alternative.

1.2.4 My city is under financial pressure for full-cost recovery. Waste collection coverage is 35% and the household payment rate is 22%. What should I do?

The first question to ask is how costs are currently covered. In many cities, it is not possible to say what are the full costs of solid waste management. Sometimes this is because budgets are mixed: public works department also happens to pay for the municipal secretary's salary or for street repair, parking, etc.

If coverage is only 35%, then 65% of the waste is not being managed at all, and is being dumped, inflicting health or environmental costs. Increasing coverage will solve some of these problems, but bring new costs. However, following an analysis of the system's efficiency, it may be possible to increase services without increasing costs, through productivity gains.

If the payment rate is 22% (meaning only 22% of the households pay for waste service), there may be a problem not with ability to pay, but with satisfaction of reliability or quality of service. It may be that community committees who agree on fees and services are composed of men, while it is their wives who take out the garbage and pay out of the household budget. The women may prefer a different type, schedule or level of service.

Chapter 2. **Where Does the Money Come from in ISWM?**

2.1 What is waste?

Waste is something that is no longer useful or wanted.

For governments, waste is a responsibility, because if they do not manage the waste, it creates problems. Waste obstructs the streets, makes children and animals sick, makes tourists unwilling to pass, disrupts traffic and pollutes water courses.

The people or businesses who discard the waste (the generators) pay for its management, either for:

- Someone to take it from their houses or businesses
- Someone to provide deposition points
- Someone to empty out their latrines
- Someone to sweep their streets

All of these are forms of removal. That is, the payments made for waste management are payments to remove something that is perceived as dirty, taboo, disgusting or dangerous.

In some cases the generators pay through their taxes – and may not know how much they pay for removal – and in some cases where there is no removal they do not pay at all.

2.1.1 Who pays when no-one pays?

When no-one pays and waste is not removed, the problems affect the community, directly and indirectly. In economic terms these effects are called 'negative externalities'. They are ways in which the failures in the waste system negatively affect the external world.

Usually it is the poor who pay for these negative externalities. They share common resources and are exposed to the waste.

Poor people bear the negative externalities of waste by:
- Having dumps near their homes
- Grazing their animals on contaminated land
- Getting their water from contaminated sources
- Having latrines rather than sewers

Photo 1. Dump site near a house in Batangas Bay, the Philippines.

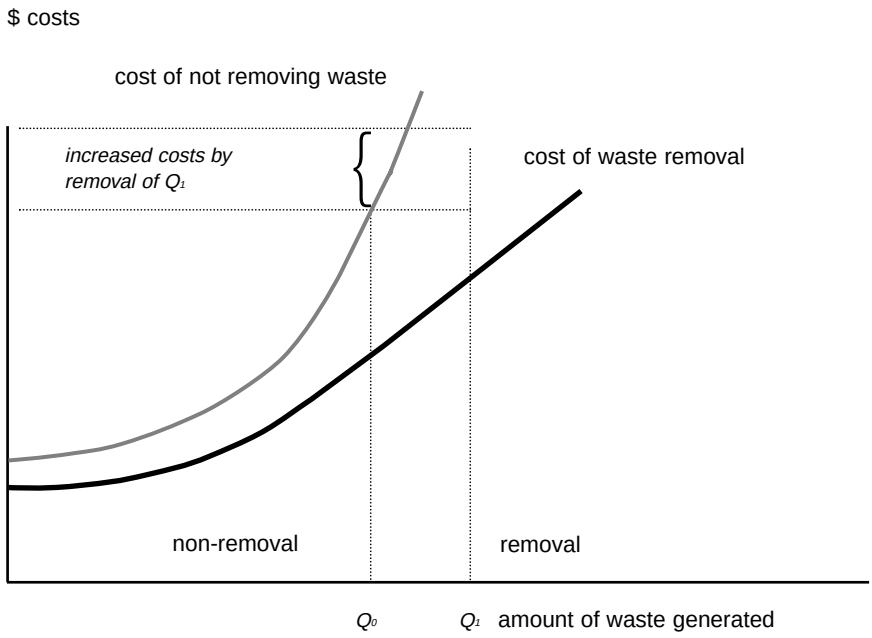
Photo: ©WASTE, Lex Hemelaar

2.1.2 The Government – payer of last resort

When the waste is out of sight – or when people have paid all they can – the government is the payer of last resort. Governments pay for waste services when there is an emergency or when the negative consequences (that is, the costs) of ignoring the problem become so acute that they cannot avoid it. In economic terms, this is when the value of the negative externalities is so high that they interfere with other areas of social and economic life.

Figure 2 shows that the cost of removing waste will eventually become lower than the costs of caring for waste-produced illnesses and environmental damages. According to this argument, the government will choose to pay the costs of non removal up to Q_0 amount of waste, when it will switch to paying for removal of the waste, since this will be cheaper.

At a high enough level, the government can say: if I pay for waste disposal to be environmentally sound over here, then I will pay less for fighting childhood diseases over there. This is called 'internalising the externalities' and it occurs when the view of the whole system is large enough that things that were 'external' to it are now seen as being internal.



Cost of not removing waste = we define this as the sum of the costs of all environmental and health externalities that are caused by waste not removed. Extreme example of high costs of waste not removed are health emergency situations such as the recent bubonic plague in India.

Figure 2. Cost of not removing waste

Figure created by Reka Soos and Rogier Marchand, September 2000

2.1.3 Donor governments

The exception is that sometimes donor governments from the North are willing to pay for parts of a waste management system. But they are usually willing to pay for only certain things, under certain conditions.

Capital equipment

Donors may be willing to pay for capital equipment like trucks or treatment plants. Usually then they will pay for machines or supplies produced in their countries and these are not necessarily the right choice. The capital cost of equipment is not always the largest cost. For example: a landfill costs more to operate than it does to purchase supplies and construct. Compactor trucks have high operating costs and an incinerator requires supplementary fuel, which most cities in the South cannot afford.

Planning

Donor governments are sometimes willing to pay for planning for a waste system or for consulting services. Again, this usually means that they are paying their own consultants to work on your problems.

2.1.4 Core concept: waste management will always cost something to someone

Waste management has a cost. If this cost is not explicit, someone (probably the poorest and weakest) is paying for them at some level. It is better to pay explicitly and to know the costs.

Chapter 3. **Materials Economics or is there 'Gold in the Garbage'?**

Waste is composed of materials and products that have been disposed of because someone believed them to have no value.

But materials in the waste stream often do have some value. This residual value remains, and can be extracted or captured through recovery processes. Poor people who live with waste are expert at identifying and extracting this value. This process of recovering residual value and some of its implications for decision-making, are the subject of this chapter.

3.1 Materials recovery: targeting residual or potential value

Anyone recycling – from landfill waste pickers to directors of a paper mill – is extracting residual or potential value from waste materials.

3.1.1 What is a commodity?

A commodity is anything that can be sold. Some commodities have such well-recognised value that they are traded internationally.

In many cases materials that are extracted from waste are also recognised commodities: they have internationally recognised standards or specifications and they are traded for international prices. This is most common with waste paper and scrap metals.

3.1.2 Materials recovery: an example of conserving value added

When something is thrown away, only its immediate value is gone. For example, a used glass bottle no longer has value as a **package**. But it has value as a container – other liquids can be stored in it. In our terms, it still has value-added as a product: the investment that went into blowing the glass is still preserved in the bottle.

If that bottle breaks, its value added as a **container** is gone. But the pieces are still glass. And they have become glass through a complex process of blending and refining sand, soda ash and lime. The glass pieces still have value added – and that value added can be captured if the glass fragments are collected, decontaminated and directed to a glass recycling process.

Core concept: value added

Commodities have value if someone is willing to pay a price for them, or if they are recognised as being important or useful without having a price. This value is built up out of the history of the item and the materials from which it is made.

At the base is what is called 'resource value'. Certain kinds of materials are useful and in the economy they are priced. Minerals like iron ore or wood are considered resources, but their value in the ground is low: they require a lot of processing before they become automobiles or cooking pots or cardboard cartons.

At each step in the manufacturing or production process, there are inputs of labour, energy or materials – which transform the resource into something with increased value: an iron bar; an alloy; a sheet of steel, a lantern, an iron railing. The difference in value is called 'value added'. It is the main source of residual value of materials from the waste stream.

3.1.3 Product value

Items retain product value when they are partially broken or deteriorated but can still be used for the purpose for which they were produced. Examples: shoes, toys; pots and pans; dishes; clothes; furniture; tools, bottles.

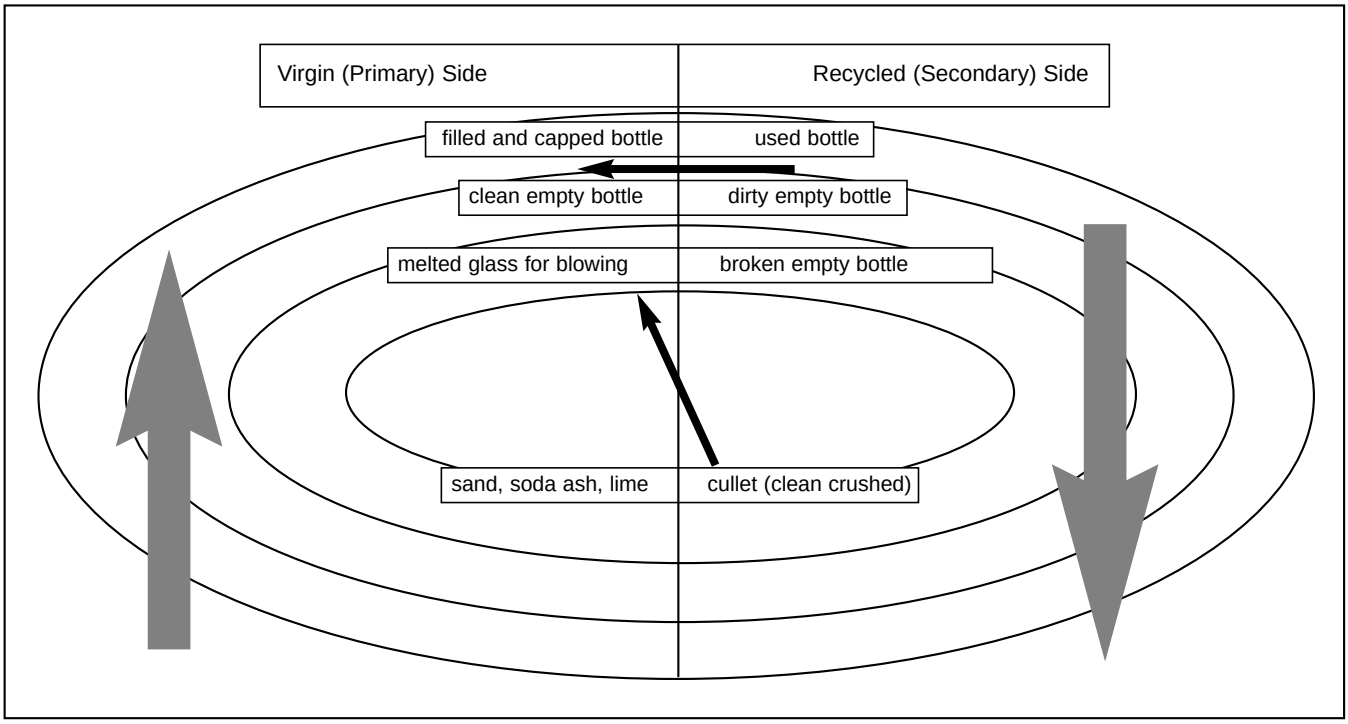


Figure 3. Conserving value added

Figure created by Anne Scheinberg and Reka Soos, September 2000

3.1.4 Parts value

Parts value stays with items which no longer function, but contain parts that can be salvaged and used or sold. Examples include bicycle wheels, automobile parts or tyres and legs or frames of furniture.

3.1.5 Material reuse value

Items like metal oil cans, which are a good material basis for making other products having nothing to do with the original use, have material reuse value. Oil cans are used for making stoves, lamps, lanterns and the like, because they are made of sheet aluminium alloy which is flexible, easy to cut, resistant to heat and useful for other applications.

3.1.6 Material value

Material value depends on the nature of the material itself. Organic waste has value as a mixture of carbon and nitrogen that can be turned into compost. Glass has value that can be captured by using it in new products, or crushing it and using it as a cleaning abrasive.

3.1.7 Feedstock or international commodities value

This is the level referred to by most as ‘recycling’. Materials like metals, glass and paper have recognised commodity values in their so-called secondary (recycled) form. Waste paper is a commodity – and in many places as many as 35 grades of waste paper are recognised as commodities with established prices for buying and selling.

3.1.8 Bulk value

Sometimes even an item with no commodities or material value can have bulk value and can be used for something useful. This is the case with very dirty broken glass, low quality compost, or ash which can be used for unpaved roads, erosion control and land reclamation.

It is usually the government who finds uses for these materials and they are not usually willing to pay for them. But if the government participates in the recovery programme, the bulk value of the materials offsets – or compensates for – the costs of participation.

3.1.9 Energy value

Some materials such as waste tyres have energy value, which can be recovered by burning, although this can be a source of pollution.

3.1.10 Waste pickers: in search of value

Dump pickers and itinerant waste buyers (see Figure 4) seek materials that have at least one of these listed kinds of value left in them.

Photo 2. Waste pickers separating coconut shells to be used for rope and mat making from mixed waste at dump site, Calcutta - India.

Photo: ©WASTE, Jan van Uden

3.2 Informal sector hierarchies

The commodities or recycling sector is characterised by hierarchies of marketing entities, which are shown graphically in Figure 4.

3.2.1 Waste pickers and itinerant waste buyers: the only real alchemists

At the bottom of the hierarchy are experts extracting the commodity value from the materials in waste. These alchemists are informal sector recyclers: the ones on the front lines who handle waste materials, extract their value added and thus recover the commodity value.

At the lowest end, there is the individual landfill or dumpsite waste picker or itinerant waste buyer. A waste picker is someone who works as an individual or family member and extracts valuable items or materials from mixed waste after it has been discarded.

The financial-economic characteristic of the waste picker is that he or she is capturing a material at the point at which it has a zero or negative value to the disposer (but it must have some retained value added). The waste picker invests the only resource over which she or he has control, her or his own labour. Often this process involves family members who are not paid individually. The family house or compound may serve as the physical premises for sorting, storing or processing the materials.

Also at the bottom of the hierarchy, but with slightly more economic power, is the itinerant waste buyer, an individual who goes door-to-door and purchases materials. The itinerant waste buyer invests labour and capital – in the form of a cart or other means of transportation – and also pays a small amount of money or goods in barter for waste materials. Itinerant waste buyers are most likely to collect metals, paper and cardboard, bottles or textiles.

Waste pickers and itinerant waste buyers sort materials, burn off labels; remove caps and lids and flatten cans. They add value by aggregating materials until they have accumulated a commercially interesting quantity. Then they transport the materials to a junk shop and sell them into the global commodities market.

3.2.2 Junk shop: the boundary between formal and informal sector

The term ‘junk shop’ refers to a range of small to medium-sized businesses at the boundary of the informal and formal sector. A junk shop buys materials from waste pickers, itinerant waste buyers and generators. The junk shop makes money by aggregating and upgrading materials, to the point that they can be sold as industrial commodities. The price that the junk shop can command from buyers is based on higher quantities (meaning lower transaction costs for the buyer), and recognised material grades and specifications, many of which are set internationally. The aggregation of materials also adds value, allowing materials to be transported efficiently.

Some specialised buyers at the junk shop level take the materials and use them for small-scale manufacturing. These buyers add more value and produce end products, not industrial feedstocks. These producers may have much more flexibility over the prices they pay, since they are producing directly for consumer demand. Examples of this include businesses that cut and re-form inner tubes and tyres to make gaskets, car parts, and water carriers; and businesses that snip cans to make lanterns or toys.

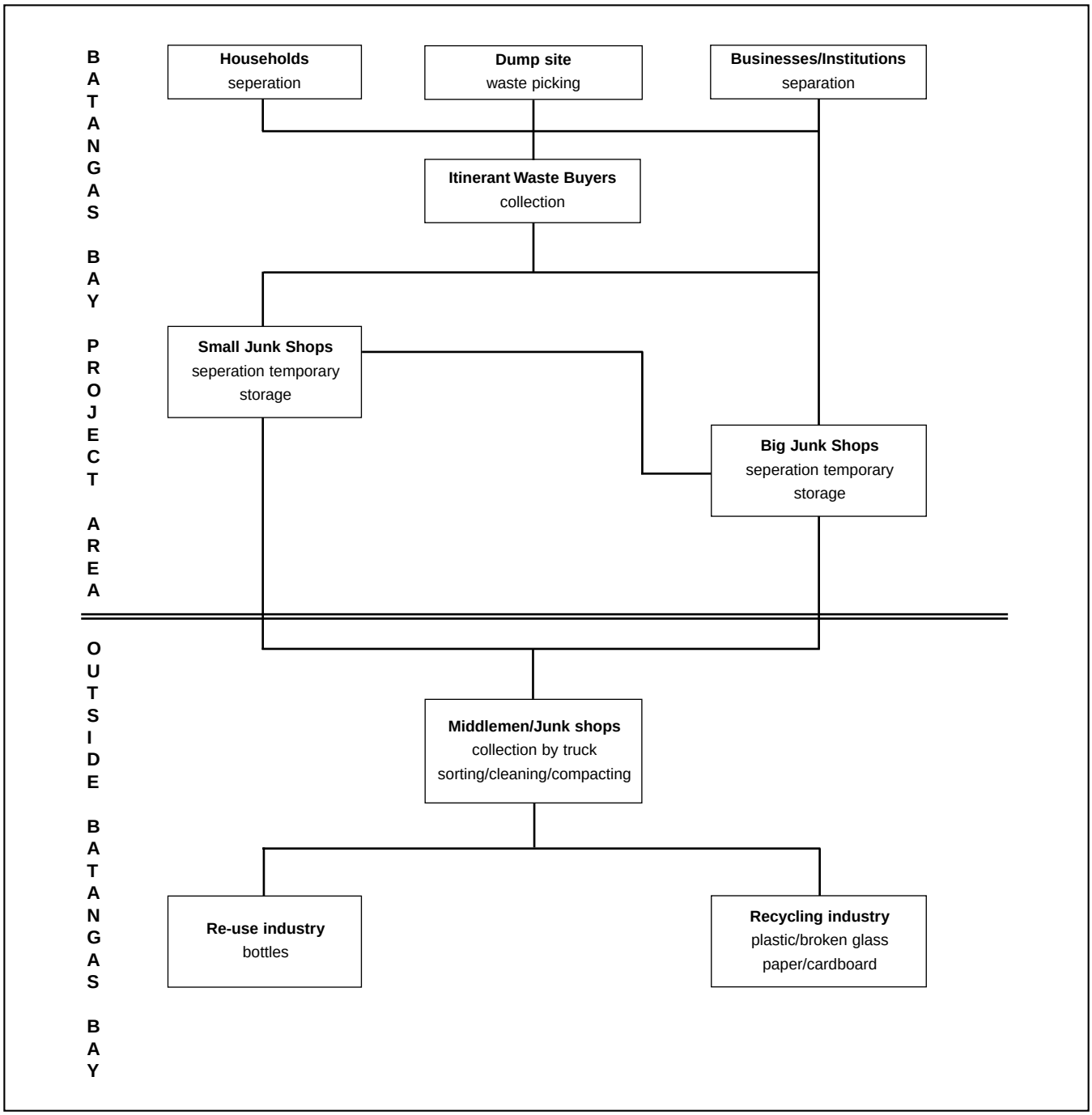


Figure 4. Informal sector hierarchies

Source: Rogier Marchand, Marketing of Solid Waste Services in Bauan, the Philippines. WASTE, 1998

3.2.3 Intermediaries, processors and brokers

Above the level of the junk shop or small producer is the **intermediate processor**. These businesses process tons per day, rather than kilos. They receive and pay for materials from junk shops, but also buy directly from large industrial, commercial and institutional generators. Intermediate processing as an activity is usually combined with two other marketing activities, **brokering** and **exporting**. A broker trades materials by telephone – he does not move materials to his own premises, but buys them from the seller, arranges transport to another location and sells them. An exporter does the same but transports across international borders.

Intermediate processors are **commodities traders** and they make money speculating on the variation in global commodities prices. Commodities trading is risky, since prices for industrial commodities are subject to large and sudden fluctuations.

Photo 3. Drying of cleaned plastic bags in Bangkok, Thailand.

Photo: ©WASTE, Arnold van de Klundert

Commodities traders buffer themselves from losses by buying from junk shops at the lowest possible prices. But commodities trading is also very competitive, so a junk shop may choose to sell elsewhere for a higher price.

Intermediates sometimes strengthen their position as buyers by providing equipment or credit to junk shops, and using this to lock the junk shops into an exclusive agreement. In effect, they invest a small amount of capital to create monopoly arrangements. Intermediates are frequently seen as exploitative, because they pay low prices to waste pickers, itinerant waste buyers and junk shops, but sell at much higher prices to end users. Part of this price differential is the cost of adding or conserving value. But there are two other parts: a buffer against risk and profit.

3.2.4 End-users and product pricing

At the top of the hierarchy are the end-user industries - factories which use recycled or secondary materials as industrial feedstocks. The prices they pay depend on the tension between the prices that their end products can command, and the commodity prices traded globally. The secondary materials market appears to have a reverse demand curve. Usually, the larger the quantity of a product, the lower the price for each unit. But with secondary materials, larger volumes command higher per-unit prices. Processing and transport have distinct, rather large economies of scale, and if these are not reached or exceeded, the marginal value of the materials is not sufficient to make it worthwhile to sell them. For small quantities, transaction costs (checking the quality, arranging transport, paying the seller) wipe out any profit.

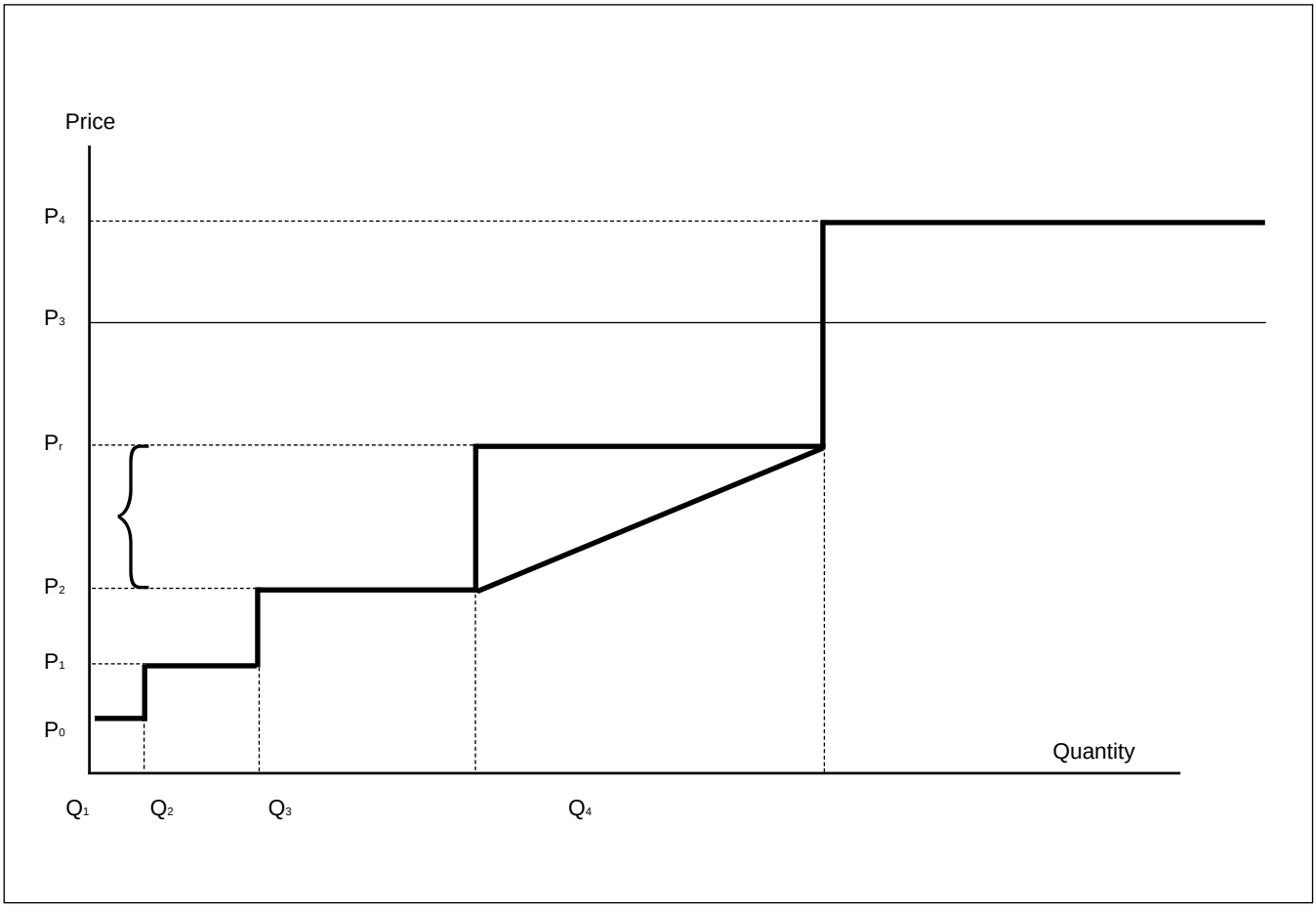


Figure 5. Price and quantity for secondary materials

Figure created by Reka Soos and Rogier Marchand, September 2000

Figure 5 shows Q (quantity) on the horizontal axis and P (price) on the vertical axis. It depicts the price paid for quantity of material in the secondary market. There are two peculiarities about the graph: (1) the price of the secondary material increases with the quantity and (2) the price is dependent on the bulk of the product, there is no incremental value for the product of the secondary market.

There is one **exception** to the second peculiarity, when the secondary material is between price ranges 2 and 3 and quantities 2 and 3. In this case the material may be recycled and in this case each unit of demand has its own value, the demand curve is a straight line in this segment.

- P_4 **(feedstock-value)** corresponds to quantities of tens and hundreds of tonnes of secondary material
- P_3 **(materials value)** corresponds to quantity Q_3, tens of tonnes of secondary material
- P_r see exception above
- P_2 **(material reuse value)** corresponds to Q_2, tonnes of secondary material

3.2.5 The global commodities marketplace

The commodities market is a global marketplace. A dump picker sells metal cans to a junk shop, whose prices are determined by the international commodities marketplace. Sometimes information passes electronically through listed pricing, at others it comes out in bids or offers to buy materials, that is, communication between traders.

Chapter 4. **The Urban Waste Service Sector**

This section addresses the economic and financial aspects of the urban waste service sector. Service means work on urban waste management that is paid for in time or some other measure, such as per household or per street kilometre. This is different from the recycling sector, where it is materials that are paid for by the kilo or the ton.

4.1 Where does the money come from and what is it for?

Recycling businesses can operate independently, in the so-called 'free market' because most of their money comes from retained or conserved value added. In the urban waste service sector, this is not true. The only source of money is payments for removal of different kinds of wastes or in some cases money paid for cleaning. One might say that all environmental services are paid for removing or mitigating negative environmental externalities. There may be differences depending on whether the removal is paid for directly or indirectly, that is, by people or entities who realise they have a direct benefit, or by people or entities who may enjoy the benefit but do not feel sufficiently directly responsible for it to be willing to pay[1].

4.1.1 Who are the direct beneficiaries?

Direct beneficiaries of urban waste services include:

1. Generators of waste, who have the waste removed.
2. Residents of a community, who enjoy cleaner streets and improved surroundings.
3. Households whose latrines are emptied.
4. Businesses which can operate more efficiently.
5. Users of parks and green spaces who can enjoy the amenity.
6. Neighbourhood residents who are exposed to fewer diseases and whose animals are less at risk.
7. In some circumstances, the operators of the services themselves, whose financial profile improves as more attention is dedicated to urban services.

Not all direct beneficiaries can be identified by where they live or what they receive. Only in the case where the household or business receives individual service is it possible to speak of a 'client' for the service. In the case of green space management and street sweeping, the beneficiary is an undefined or diffuse group.

In most countries in the South, even the direct beneficiaries may not necessarily agree on the value of the service, nor are they all willing to pay to the same degree. In economic terms, there is **insufficient information** about the value to the customer in the market of waste collection services and this results in a **market failure**. One reason for market failure could be that the market is immature; another could be that waste collection for a long time was considered to be a (semi-)public service and that people are accustomed to be 'free riders' for this service, which they take for granted or assume that someone else will pay for.

4.1.2 Who are the indirect beneficiaries?

The indirect beneficiaries are a much larger, more diffuse group, and include:

1. All residents, whose waters are uncontaminated and who enjoy clean streets.
2. The government, which is charged with the responsibility for the services, since cleaner cities make answering their other responsibilities easier.
3. Businesses, for whom the investment or business climate improves with cleaner cities.
4. National and regional governments responsible for environmental health in cities.
5. Citizens of the country, whose economic affairs are linked to the economic situation in the cities.
6. Industries who use recyclable and compostable materials, to the extent that improved urban services raise rates of recycling and composting.
7. Donors representing other national governments, who experience some of the negative externalities, see an economic benefit in promoting the expertise and business of their own nationals or have value-based or political reasons for wanting to intervene.

[1] Economists call this second class of indirect beneficiaries the 'free riders'.

4.1.3 Using negative externalities to finance environmental services

Urban environmental and waste services are in the business of improving or mitigating negative environmental externalities. The money available to pay for these services is the amount that all of the beneficiaries, combined, are willing to invest in mitigating environmental externalities. In order to know how much this is in **real money**, it is necessary to quantify negative externalities. The techniques for this are beyond the scope of this document, but it is useful to understand something of the process.

When quantifying and evaluating negative environmental and health externalities, the value of the service is in principle related to the **dis-value** of the negative effect it resolves.

Negative environmental externalities

Negative environmental externalities include situations characterised by: polluted water, air contaminated by burning garbage and littered ground. Usually, the value assigned to the negative externality is an estimate of the damage or of the cost of restoration. So in the case of polluted water, the 'value' of the pollution can be approximated by estimating the cost to build a treatment plant and treat the water.

Negative health externalities

Evaluating health externalities requires that the city must first know how many people and animals are harmed by the garbage. Since the people most likely to get sick are the poorest and most vulnerable, and since they often also have poor diet and unhealthy living conditions, this effect can only be quantified generally (except when there is an epidemic of waste- or waterborne disease). So placing a value on avoiding cholera is a way of assigning value to the negative health externality of dirty water.

Negative effects on urban development, tourism and trade

The second-level negative effects of having a dirty city are calculated through estimating the *opportunity costs* of losing tourism, business and investment in the local economy. Calculating these is hypothetical, and involves imagining what might have occurred if the streets were not littered or the air were cleaner; and how much better tourism or the economy would be under those circumstances[2]. The best hope for doing this is usually to compare the economic situation of the city with a similar city that is cleaner, and to attribute the difference in tourism or economic activity to the improved environment there. This technique is called 'contingent valuation'.

The concept of *'producer responsibility'*

One promising way of assigning value to negative externalities is being applied in the European Union and is being widely studied and applied in countries in the South. The concept of **producer responsibility** assigns to the manufacturers of products and packages the obligation to manage these materials in an environmentally sound way once their useful life is at an end.

In practice, this means measuring and/or estimating the quantity of waste coming from a large producer and assigning a value to each item – based on how much it should cost to dispose of it properly. The producer has responsibility for either creating the safe disposal opportunity (the German and Dutch model) or for paying someone else to provide that opportunity (the French and Province of Ontario, Canada model).

Producer responsibility is important because it recruits a new set of influential actors with deep pockets into the area of urban cleansing. So far it has been successful in countries in the North, but there is an increasing interest on the part of countries in Eastern Europe and in the South to investigate this approach and one plastic bag initiative in India has made some progress in this direction[3].

[2] There are some techniques for approximating this using return rates: how many tourists actually return.

[3] The government of the State of Kerala has banned plastic bags, in order to protect a new composting facility.

4.2 Environmental services: varieties of removal

With few exceptions, environmental services mean removing waste.

4.2.1 Primary and secondary waste collection

Primary collection, the process of passing from house to house or business to business, and collecting waste, is a **service to households or individuals.** The waste may be kept indoors and handed directly to the collector or set out for collection by the **generator**. In **primary collection**, there are three different kinds of service involved:

1. Movement along a route to pass all collection points
2. Collection of the waste from each point and putting it into the container or vehicle
3. Transport to the point of disposal (or transfer or secondary collection)

Photo 4. Dumping organic waste at a secondary collection point in a street, Calcutta - India

Photo: ©WASTE, Jan van Uden

Secondary collection

Secondary collection is a service to the group or community, or to the group of small collectors. A secondary collection point is a container or site where a small collector can discharge hand cart contents without having to go to a dump or landfill.
Secondary collection points serve as community transfer stations and may also be used to create a two-tiered collection system for marginal areas or urban slums where a collection vehicle cannot pass.

4.2.2 Economics of collection

The main service unit for collection is the collection point and this is the way most collection systems are paid for. Fees are charged per household or per address, and the transport and transfer costs are included in this (or paid on their behalf by the government from tax revenues). In countries in the North, the waste collection sector has successfully managed to include the cost of safe disposal into the price charged for waste collection - for three reasons:

1. National, regional and local laws and regulations require this.
2. The people are more aware of the problems of unsafe disposal.
3. Although the costs are higher in absolute terms, they are lower in relation to household income, so people have an ability to pay for them.

Elements of collection cost
The elements of collection cost include:
Time for the workers to service the collection point, and associated time for the route and transport.
Number of collection points, since each requires the vehicle to stop, taking time.
Distance to cover on the route and to the disposal point, since this is one part of the calculation of how much energy is used in travel and transport.
Volume of the waste set out at each collection point, in relation to the volume of the collection vehicle, as a limiting factor on how may generators can be served before leaving for transport.
Weight of the waste, since this contributes to the amount of energy used per unit of distance covered.

In mathematical terms, each of these are variables and efficient collection depends on optimising all the variables at the same time. Some of these variables are independent, so they can change without changing the other variables. Some are dependent, which means that if you change one variable, at least one other also changes – usually by a predictable amount.

Time and number of collection points are dependent on each other, being related through average time to service each point (whether there is any waste there or not). The combined time-number variable is independent of distance and of volume and weight of the waste.

Distance is independent of all other variables. Volume and weight are dependent on each other, and are related through a specific volume to weight ratio of the waste itself, which is also referred to as the **specific density** of the waste. Sometimes the word **quantity** is used to refer to this joint weight-volume variable, which is also independent of time-number and of distance.

4.2.3 Choosing effective collection strategies

In most developing and transitional countries, the most expensive element of collection is fuel. Imported parts are next; depreciation, that is, a financial reserve for the replacement value of equipment, is a third important cost factor. Labour in countries in Eastern Europe and in the South is relatively inexpensive, paid in local currency and labourers are usually not compensated extra for longer hours. Using labour to unload a vehicle in these circumstances is not a bad choice, especially if a motorised vehicle is turned off during unloading.

To maximise fuel efficiency, it is important to analyse the reasons that fuel is needed and to see when it is wasted. Fuel or animal muscle energy, is needed following the route and for transport to secondary collection or disposal, but it is not needed much during the actual process of collection. A motorised vehicle with a motor running during collection is wasting fuel and money. An appropriate, sustainable motorised vehicle is as easy as possible to load, to minimise wasted time during collection and it is also easy to turn off and on.

Photo 5. Waste collectors at a transfer point in Lima, Peru
Photo: ©WASTE, IPES

When looked at this way, dump trucks are not very good vehicles for collection (but widely used) since they consume a lot of fuel and loading is inefficient, with workers having to throw bags or baskets of waste over their heads. Vehicles like tractors with wagons work well in less dense areas, since they are easy to load and fairly narrow, but in densely populated areas, animal or human traction is probably preferable for primary collection.

Amount or volume of waste is the primary factor in **choosing the collection vehicle**, but density of the waste is also important. If the waste includes high volumes of dense, wet organic materials, compactors are a problem, since their mechanisms will force leachate onto the streets. There is also little benefit to using compaction vehicles when the waste stream contains high volumes of sand, dust and grit, since these are already as dense as possible. In general, compactors are not a good choice for cities in the South.

Photo 6. Street sweepers (members of a micro enterprise) with their hand cart in the district of Miraflores in Lima, Peru
Photo: ©WASTE, IPES

In general, light vehicles with a low bed (for easy loading) and high sides work best. The cattle trucks used in Costa Rica are excellent collection vehicles and high-sided horse and donkey carts also work well.

4.2.4 Street sweeping and litter control

Street sweeping is a service to the community or to the city as a whole. Most varieties of street sweeping and litter control fall into one of two basic categories: sweeping by hand and mechanical sweeping. Sweeping by hand is the norm in all except central business districts of the largest cities in the South and also in most medium- and small-sized cities in the countries in transition.
Manual street sweepers are usually paid by the day or for the distance or area they sweep.

4.2.5 Pit sludge collection, latrine pit emptying and pit sludge disposal, septage collection and transfer

Unlike household waste collection, which in many places is considered to be the responsibility of the municipality, the collection of human waste is usually considered to be a purely household expense[4]. Pit sludge collection, latrine pit emptying and pit sludge disposal are **direct services to households**. In cities where the sewer grid does not extend to all districts or in towns and villages where there is no sewerage at all, faecal waste accumulates in latrine pits, and is diluted with water in septic tanks and soak pits. Payment for emptying or pumping is both on a volume and a point-of-service basis. Households consider it a one-time expense, rather than a regular monthly budget item.

Latrines have to be emptied when full, and when it is necessary, this takes priority over other expenditures. This competition with other household priorities causes late decisions, a pit overflowing in the public road evokes social pressure which eventually increases priority. Meanwhile the neighbourhood has been exposed to the health risk of the overflowing pit. Thus while the **benefit is individual**, the **harm caused by failing to use the service causes a community disbenefit**.

4.2.6 Industrial and commercial cleaning

A final environmental service is commercial cleaning – another form of removal. Cleaning is usually **a service to an individual business (or household)**. Here, payment is usually a flat fee (based on the amount of person-hours estimated to be needed to complete the job).

This is a relatively non-transparent mode of payment. Depending on the ability of the cleaning organisation to negotiate, this may leverage substantial amounts of unpaid work onto the cleaning organisation or its workers, who are likely to be from the most vulnerable levels of the society. For example, a private contractor in Nairobi, Kenya, contracts to clean government buildings even when it appears that the fixed price offered in the tender is too low to cover the actual costs. The difference is made up by the workers themselves. They must work until the job is finished, even if it takes more than the normal working day.

[4] Poor people like the option of emptying a small volume at low expense, even if the per volume rate is much higher. This ‘cup of sugar’ effect was one of the interesting findings in the MAPET research (Tanzania, 1988-1994). Consequently the demand of emptying is frequent, and so is the overflow-health risk-social pressure sequence. Frequent emptying of small volumes results in two characteristics for the emptying pit latrines in low-income neighbourhoods:

- Only the top layer of fresh liquids is emptied, for which pumping is technically easier (viscosity, pumping head).
- The settled sludge in the sometimes deep pits is never removed, and can never again be removed. The large pit has turned into a small vault.

Chapter 5. **Cost and Price**

This section reviews in a more general way the costs of urban waste activities, both commodities- and services-based, and discusses how they are priced.

5.1 Unit of work: a key financial and economic concept

A **unit of work** is the building block of a cost analysis and the basis for pricing. Identifying the unit of work requires analysing the activity and understanding the critical steps in assigning value.

5.1.1 Weight and volume in commodities-based activity

Commodities-based activity is the easiest case: the unit of work or the unit of value is the quantity of the commodity or material. The quantity is measured by its weight, in kilos or tons.

There are two exceptions. In some recycling activities, especially of complex industrial or consumer products or durable goods, the unit of work is the product itself. This may be the case, for example, with vehicle tyres or white or brown goods[5]. In many countries in the South it is also the case with glass bottles or certain kinds of metal containers: in Batangas Bay in the Philippines, recognised prices are paid for about 10 different kinds of glass bottles, identified by the products they were originally filled with. Also car batteries with different number of cathodes have different value in the Philippines. Volume is hardly ever the unit of work in waste recovery activities, although it may be a limiting factor on value when there is significant transportation involved.

5.1.2 Why tons of waste are not always the right unit

Tons are widely assumed to be the correct unit for measuring waste removal activities, but in contrast to recycling, this is not always correct. Excluding all recycling and recovery activities, for which weight is important, we can see that the weight of waste is important in only three sub-activities of urban waste services:

1. At the point of loading: when workers (or a mechanical lift system) lift a waste set-out into a vehicle or when the waste is discharged.
2. During transport, since the use of fuel (or muscle energy in the case of animal traction) is related to the weight of the load.
3. If the method of disposal involves pre-processing, composting or incineration, since these are all **mass-based** processes.

In all other aspects of urban waste services, other units of work are more important, and represent a more accurate measure in terms of analysing costs and establishing prices.

5.1.3 Unit of work for landfilling or dumping

In most countries in the South, the universal disposal method is one or another variety of dumping: either open dumping or land burial, or the modernised versions of land burial in a controlled landfill. The unit of value in a landfill is not the mass of the waste, but its **volume**, since this is related to the amount of land that must be used and the depth to which it must be excavated.

Why do modern landfills have scales, if weight is not important?

Weight is an absolute measure of mass and with a scale, it is easy to measure. In contrast, volume is a changeable measure of mass: if the waste is compressed more, its weight stays the same, but its volume changes[6]. So modern waste management facilities have scales as a consistent, practical way of measuring waste. In most cases, city engineers have established a **conversion factor** that relates measured weight to the estimated volume of waste. For countries in the South, the usual number is from 3.0 - 3.5 cubic metres per ton of waste.

[5] White goods are kitchen appliances: washing machines, refrigerators, conventional stoves. Brown goods is a new term introduced for electronic devices, many with cathode ray tubes: computers, stereos, radios, televisions, cash registers, and the like.

[6] The weight can change a lot if the waste is wet, but this cannot be easily avoided.

5.1.4 Other kinds of service units for collection and street sweeping

Volume is also one possible service unit for collection and street sweeping, as the volume of the vehicle or the container is the limiting factor on the efficiency of the collection. But it is not the real measure of the work done.
In collection, the principle unit of work is the **number of households, businesses** or **generators** that are served, sometimes called the **number of subscribers** or the **number of connections**. These are units that can be easily measured and which, moreover, can be used to indicate effectiveness or coverage of the collection system. Studies suggest that the amount of time spent during collection has more to do with the number of places the collector must stop, rather than the specific amount of waste set out by each subscriber. The other reason to use the number of subscribers as the main unit of service is that this is the way payment is organised and with this method, prices can be established per connection. It is important to note that some connections may be for more than one family or business, when the buildings are contiguous or are occupied by more than one nuclear family.

In most cities in the South, waste collection does not only involve picking up the individual set-outs from subscribers, but involves cleaning piles of waste from the street. Street sweepers add their sweepings to these piles or remove them. So a second important measure of the amount of work that a collector must do is the **distance** they cover, expressed as the **length of the route**, measured in curb metres or curb kilometres (in street sweeping, in cities where there are a lot of public plazas and squares, this is sometimes translated to the **area of a district or zone**). Distance and area are easily measured and have a direct relation to service cost. For the municipal government or private collectors, which must divide the city into routes or zones, this is also an important unit. We can say that the length of the route and the number of households to be served, determines the **fixed cost** of the collection. To cover the route, there is a minimum amount of time, fuel and wear-and-tear on the vehicle, which will be used every collection or sweeping day.

In collection, **weight** and **volume** function as **constraints** on the system, rather than as units of work. The volume of waste determines when the vehicle has to stop collecting from houses and leave the route to go to transport the collected material to the dumping point. The weight determines how much fuel is used in this transport. Both of these are **secondary factors** in determining the cost; neither is the primary unit of work. While the route is fixed, weight and volume represent **variable costs** to the collection or street sweeping: when there is more waste, vehicles take more trips and use more time and fuel.

5.1.5 Service units for latrine and septic tank emptying

The service units for emptying these facilities are universally the household or service point. In some cases the volume of the unit to be emptied are factors in determining cost and setting price. In this, the emptying entity takes the risk that there will be unforeseen factors that take more time to remove the materials.

Pit emptying can be available in a combination of three formats:

- The informal (illegal, socially rejected, politically denied) traditional emptying, working with buckets and spades, and on-site burying of the emptied sludge in the road reserve, in vacant space, in the yard or even in the earth floor of the dwelling.
- The service of conventional vacuum tanker trucks, which can be municipal, institutional or private working for the consumer market. Conventional vacuum tankers are designed for long haul to a disposal site outside the built up area (comparable to the solid waste long haul for disposal at a landfill).
- The small volume mechanised collection, which can range from a hand pump with a hand, donkey or horse driven tank cart, to an engine driven pump on a tractor-trailer combination or a specially designed mini-tanker. Small volume in pit sludge collection is equivalent to short haul, and appropriate for burying on-site or on vacant land, disposal in sewage mains, for operation in the vicinity of decentralised disposal and treatment facilities and for transfer to long haul tankers (comparable to primary-secondary collection in solid waste).

In small volume collection services one tank load is the unit for calculating and controlling the output. The tank load volumes differ per type of traction and short haul range:

- Hand cart: 0.2 m^3 drum, short haul range 0.5 km
- Donkey cart: 3 x 0.2 m^3 drums or 0.5 m3 tank, short haul range 1.5 km
- Horse cart, tractor-trailer or mini-tanker: 1 m^3 tank, short haul range 3 km

For small volume handcarts there is a minimum of 3 tank loads to be commissioned per service, otherwise it does not pay to shift the equipment to the customer.

5.1.6 Service units in green space maintenance and industrial cleaning

Even though they are also services, green space management and industrial cleaning differ fundamentally in their service units: from disposal on the one hand and collection and street sweeping on the other. In maintenance and cleaning, the most useful and accurate measure of work is **time**, expressed in person days or person hours. There is a weak relationship with the size of the areas cleaned, but the character of the area and its condition on any day have more influence than the area itself: a large grassy area may be easier to clean than a small area of dirt.

5.2 Costs and cost recovery

Establishing the cost of a service or of extracting and processing a quantity of recyclable material is the basis for sound economic functioning of a business or a public service activity. This may seem obvious, but in many cases micro and small-sized entrepreneurs function for a long time without knowing precisely (or at all) their actual costs. They accept city government prices or simply charge the **going rate**. When the costs are not known, the prices do not reflect full costs and they almost certainly include no margins for profit or for contingencies. In this situation, the families or businesses which are paying for the activity are not paying the full cost – and someone else is paying, whether they choose to or not.

International financial institutions have put a lot of emphasis on the concept of **full cost recovery**, which requires clients or beneficiaries to pay all the costs of the service they receive. The underlying assumption is that governments are the ones providing the service and they lose money because they do not collect the full cost of the service in fees, but make up the difference in taxes. Since the goal of much international financial policy is to reduce taxes and reduce the role of government by open or closed bidding of private businesses, these businesses are invited to do the job on behalf of the government. Thus it becomes important for public works and sanitation departments to be able to analyse their costs and assess fees that cover them.

In fact, this is equally as important to the private sector, especially to micro and small enterprises in the South. When a micro or small enterprise fails to get its costs right, it is usually the entrepreneur or his family that pay the difference – with their time, health and sometimes their lives.

In Bamako, Mali, the casualties of incomplete cost analysis are donkeys and small business owners who have to pay to replace the donkeys. In this case, the cost of transporting waste to secondary collection is not included in the price paid by the clients, so the carts are overloaded and the donkeys usually die in less than a year of service.

This example is interesting for another reason. In most discussions of full cost recovery, the principle is that the direct clients must pay the entire cost of the service or that all the costs must be included in the price. But there are many kinds of beneficiaries of waste and recycling activities, who are not direct clients. The municipal government is not only an indirect beneficiary, it is also a **representative of** and a **proxy for** all of them, and its function is to protect their interests. Under the principle that **all beneficiaries contribute** (the **ABC principle**), the municipality must pay the cost share of the indirect beneficiaries.

One of the reasons that donkeys die in Bamako is that the municipal and communal governments do not pay their share of the cost – that is, the share paid on behalf of all indirect beneficiaries. In fact, the government pays nothing and it also fails to do its share, which is providing and servicing secondary collection points.

5.2.1 Unit costs: the key to pricing

The unit of work – of materials or of service – is the key to pricing in waste management systems. Prices based on the correct unit of work are sustainable, since there is a clear, transparent, and direct relation between the work done and the money paid. In recycling, prices are set per ton or per kilo. In well-designed waste collection systems, they are set per household, NOT per ton of waste collected.

5.2.2 Components of cost

What goes into determining a unit cost are a number of different kinds of costs, described briefly in the following table. In some cases two kinds of costs overlap, for example many operating costs are variable, but not all variable costs are related to operations.

Type of Cost	Explanation	Examples
Fixed cost	Have to be paid whether the business is active or inactive, include obligatory payments to owners or directors, if the business is structured that way. Are sometimes called the cost to be in business or in the case of a disposal facility, the capacity cost.	• For collection: the vehicle; the fuel needed every day to cover the route, whether or not any waste is set out. • For street sweeping: the cost of the brooms and containers for putting the sweepings; and the cost of secondary collection points so the sweepers can dispose of the sweepings. • For a landfill: the cost of the land, building the road into the landfill. • Fencing, entry gate, staff to check the incoming vehicles for all businesses: the cost of: - An office or place of business - Book-keeper or accountant - The salary paid to the director or leader - Permits or licenses to do business
Capital cost	• A special variety of fixed costs for purchase of the **capital equipment** • By definition one-time costs. May include special start-up costs, which can be **capitalised**, that is, included in the capital cost.	Equipment, land, buildings, factories and technology needed at the beginning of doing business. Design, architecture and engineering, legal fees, and the physical process of building and equipping the facility.
Depreciation and amortisation	The process of calculating the **expected useful life** of equipment or facilities, and spreading the replacement cost over the useful life, to create a reserve to pay for replacement. In real life terms, capital equipment **depreciates** in value each year, and the amount of the depreciation is based on the relationship between the capital cost and the expected useful life. So a donkey cart costing $450 when it is purchased, depreciates $150 the first year, at the end of which it is worth $300. At the end of the third year, it is considered **fully depreciated** and its value is considered to be null.	• For motorised vehicles, five or seven years • For facilities like an incinerator, 20 or 30 years is normal. • A landfill will be assigned a life based on the estimation of the volume of waste it can take and how long it will take that waste to accumulate. • For a donkey in Bamako, the expected useful life, according the experience of the collectors, is one year or less, while the donkey cart can last up to three years. • In Costa Rica, the cattle trucks that are used by MSE collectors have a useful life of seven to ten years, depending on maintenance.
Financial cost	• The cost of capital • Financial cost is important because even if you do not actually borrow money, the amounts that you tie up in equipment may gain or lose value based on interest rates and the cost of borrowing. • The basis of analyses of **net present value**, a way of calculating the value of money today, not spent until next year.	• The amount of money that you pay in order to borrow money to invest in equipment.
Variable cost	• Directly related to the actual work done. When there is no work, there are no variable costs.	The cost of putting each kilo of waste into the truck. The fixed cost includes stopping at every house to see if there is waste. If you have to stop for 20 seconds to see if there is waste, and if in these 20 seconds you can also empty one basket into the truck, then your fixed cost covers the cost of emptying one basket. If there are two baskets, then you may have to spend an additional 10 seconds, and this is the variable cost of the quantity of waste.

Type of Cost	Explanation	Examples
Marginal cost	The cost of adding one more element to the system. Marginal costs are important when you are trying to do more work for the same cost or when you are under pressure to keep your prices low. If you understand marginal cost pricing, it is sometimes possible to increase your profitability by adding more service units, without raising prices per unit.	If you are paying a fixed salary for the driver of the truck to collect the waste for eight hours, then each additional household you collect within the eight hours is included and does not cost anything extra. However, if you are obliged to pay overtime of $5 for one hour or any fraction thereof, then the first household after the end of the eight hours has a marginal cost of the whole $5 for one whole hour of overtime. The second household after the end of the eight hours splits that cost, so each of the two households has a marginal cost of $2.50. If you can collect from 25 households in that one hour of overtime, the marginal cost per household is $0.
Average cost	• Average cost pricing adds up all the fixed costs in the system and spreads this evenly over all the units in the system. Then it adds the variable costs per each unit. In this way a picture of the average costs can be built up, that can serve as the basis for cost analysis.	• Truck, driver, dispatcher, office, maintenance and parts, added up and divided by the number of households that this truck can service in a week or a month, to get the weekly or monthly average fixed cost. • Then the average amount of waste per household must be added, to know how much fuel that household contributes to the use on the route (the marginal cost of the weight of the waste).
Operating cost	• Includes both variable and fixed components. An operating cost is any cost which cannot be capitalised, that is, which is an **ongoing, repetitive or continuous cost of doing business.** Operating costs can be both fixed and variable	The operating cost of most recycling and service operations includes: • Salaries for the workers • Rent (a fixed cost) • Utilities such as electricity or water (partly fixed and partly variable) • Transaction costs for promotion, advertising, contracting (also partly fixed and partly variable) • Fuel and/or fodder (variable) • Preventive maintenance (fixed) • Repairs (variable) • Subscriptions to the newspaper or a cable TV service (fixed) • Accounting and legal fees (both)
Indirect and hidden cost	UWEP case studies consistently found that micro and small waste enterprises operate using production factors for which no costs were calculated or even recognised. The ability of the small entrepreneur to mobilise uncosted resources appears to be an important component of his or her commercial viability. At the same time, the fact that these costs remain unanalysed – we will use the term ‘hidden’ – universally leads these entrepreneurs to set their prices below the survival rate for the business. **Indirect costs** affect the recycling or service activity without having anything directly to do with it. **Hidden costs** are costs of doing business which are not made explicit. Hidden costs are important because they are unrecognised and in many cases not explicit, yet without them the service or activity cannot function.	In Bamako, the fact that a recent municipal ordinance prohibits donkey carts from travelling on or crossing major roads represents a significant indirect cost, as it requires either a much longer route to the disposal area, or a bribe to the policeman on duty, or the payment of the official fine. In La Ceiba, Honduras, the fact that the municipal government does not maintain the road into the dump represents a risk to the vehicle tires – and an indirect cost of maintenance. The use of the family’s compound for sorting metal cans is a **hidden capital cost**: the livelihood is dependent on this, but the ‘business’ does not pay for it and it is not included in any cost or price calculation. In fact, the family is making a **hidden subsidy** of the business. • Women of the family washing the glass bottles without getting paid for the activity is a **hidden labour cost or a hidden labour subsidy.**

Type of Cost	Explanation	Examples
Indirect and hidden cost	As a result, the removal of a hidden subsidy from a business can cause the business to fail without anyone understanding what has changed.	• A divorce which takes unpaid women and children away from a recycling business may cause that business to close. Removal of tacit patronage from an influential community member may cause a cleaning business to lose clients.

Table 1. Types of costs

5.3 Prices for services

If the world were completely logical, the cost of a service or a commodity might be the same as the price. But in our imperfect world, these two things – while related – are not the same.

5.3.1 A price is not the same as a cost

Price measures the amount of money the buyer is willing to pay (value to the buyer) and the cost plus the desired or required margins for the producer. Firms are in business to realise profit and customers buy products to receive the value the product gives them. In the private sector, **Price = Total Cost + Profit Margin**.

In urban waste services, the municipal government or local authority usually sets the price for the service. They consider many things when establishing the price – including how much they believe people will pay or how much political pressure they are willing to take when they set the price high. They do not usually include profit margin and sometimes they also fail to include an allowance for unexpected or contingency expenses. The actual cost of the service is – strangely enough – not usually the main determining factor in setting price. For example, in many cities in the South there is an accepted price for waste removal, established by the council, **even when the service is provided by a private contractor and sometimes without the council knowing anything at all about the actual cost to provide the service.**

This is an example of market failure, caused by the disconnection between government policies and market forces. Consumers need to be informed; service providers need to know what their costs are; the market needs to know what clients are willing and able to pay.

5.3.2 Price elasticity and willingness to pay

A key concept in setting prices is the idea of **price elasticity** – how flexible people are in their need for a product or service and how much they are **willing to pay** for it. Water is an example of something that has a very high price elasticity: people need water to live – and so they are willing to pay nearly anything for water. In recent years, municipalities have begun to look at the concept of **willingness to pay** in a more organised manner and have made some surveys of the client base to find out what they are willing to pay for a reliable service.

Willingness to pay in Tingloy, the Philippines

In 1998, a willingness to pay study in Tingloy, the Philippines, confirmed the hypothesis that most people are willing to pay just under 1% of their monthly income in solid waste fees (Marchand 1997). In other documents, the internationally accepted benchmark for willingness to pay is between 0.7% and 2.5% of monthly income. This is true even for the very poor and residents of marginal areas and squatter settlements (Cointreau-Levine 1994, Pfammatter and Schertenlieb 1996).

5.3.3 Prices for materials: a buyers' market

In the area of materials recovery, prices are set in the international commodities marketplace and individual actors have little ability to influence those prices. This is a demand-driven marketplace, which means that there is little attention paid to the interests of the suppliers to cover their costs of extraction and processing.

5.3.4 What goes into setting fees and prices for urban waste services?

A fee is what someone must actually pay for a service. A fee is a special case of price, since many things go into a fee other than the cost of the service. A fee for a service is one step removed: it is a calculation which includes cost and price information, but may also incorporate policy goals or introduce a cross-subsidy – where certain services which can support higher fees actually raise money to support others which cannot pay their own way.

A short guide to setting fees

Step 1, Analysing the costs
The first element in a fee is the full cost of the service. Unless there is a good reason not to include them, this includes amortised capital costs, operating costs, indirect costs and hidden costs. All of these costs need to be calculated for the same time interval – usually a year – and then you need to divide them up to get the same costs calculated per month.

Step 2, Separating fixed and variable costs
When all of these costs are calculated, it is useful to organise them into fixed and variable costs. When this was done in Bamako, Mali, it became obvious that one of the large fixed costs was the payment of salaries to the owners – who were not involved in the daily work of actual collection.

Step 3, Allocating fixed costs among users or units of work
Then the fixed costs need to be divided among the different units of work – tons or cubic yards for some services, kilos or pieces for recycling, households or street kilometres for collection and cleaning. So if a city has 60,000 curb metres of streets to be swept and the fixed costs of the division of street sweeping are $2400.00 per year, the fixed costs are $0.40 per metre.

This sounds simple, but it can also involve many policy decisions. Do all users pay the same fraction of the fixed costs? Do families or businesses with higher incomes pay more, and if so, how do you determine which ones are in which categories. Do businesses as a whole pay half of the fixed costs? Are the streets in some parts of the city wider, so a curb metre actually means more work in some places than in others? These are examples of the kind of questions that need to be addressed in setting fees.

Step 4, Analysing variable costs
Analysing variable costs is more complex than the analysis of fixed costs and will often require some field investigation. For collection services, a time and motion study will tell you, out of eight hours spent on a route, how many hours are actually spent in collecting from houses, how many are spent travelling the route itself and how many are spent leaving the route to discharge the waste. Weight and volume analyses also tell you how full the truck cart is when it leaves the route and approximately what it weighs or how many kilos or tons it is carrying. Using this information you can build up the variable costs on a per-connection basis or calculate them on a per-ton, per-cubic metre or per-kilometre basis. These variable costs are added to the fixed costs to get the full cost per work unit.

Step 5, Assessing willingness to pay or what the market will bear
At some point in your fee-setting process, you need to establish what the market will bear. In general, municipal authorities have strong opinions about this – which often turn out to be too conservative or to underestimate the value of the service. The tendency of municipalities – and especially of elected councils who are worried about the next election – is to set the fees too low and to subsidise the uncovered costs either through general taxes or by exploiting the contractor.

Mode of payment also has an important influence on willingness to pay and on actual payment rates. For example, in most cities in Latin America (and many in Europe and the US as well), residents pay a fee for waste disposal and sewerage which is included in their water bill. The water bill may also include a fee for the fire department and street illumination. If you do not pay your water bill, you will be cut off from your water supply.

If there is a current fee level, the payment rate may give you some indication of price elasticity. If payment levels are low, probably the fee is too high (and maybe the service level is also too high). If payment levels are high, probably the system could stand an increase, particularly a differential one where wealthier clients pay more per unit of work than poorer ones.

However, payment rates are also the way that people 'vote' with their wallets. Payment rates may be low because people do not agree with the system, even though they would be willing to pay more if it worked better.

Step 6, Modelling demand as potential income
Once you have an idea of what the market will bear, you can model the potential income of the system. Establish a range of fees and using a spread sheet, model how many low-income, medium-income and high-income ratepayers the system could have. You can do some sensitivity analysis using different assumptions about payment rates: if only half of the people pay the expected rate, how much money will the system generate per year? If the higher-income areas pay at the rate of 80% and the lower-income areas at the rate of 50%, what will be the total income of the system?

Step 7, Comparing the results
If you find that your projected system income, based on willingness to pay, is likely to cover your costs, you can proceed to setting a fee. If the two are out of balance, you need to see whether there is some way to lower the costs or, more precisely, to shift costs from fixed into variable. If the fixed costs are a large part of the total, this is particularly important. Then you need to see how to optimise the system's financial performance so that the costs per unit of work decrease enough for the projected income to cover them.

Step 8, Introducing policy considerations
Once you know the full costs per work unit and have some idea of what the income can cover, you are in the position to decide whether you have a potential surplus, which can be used to subsidise other operations or whether there is a shortfall, which has to be covered somehow.

5.3.5 Using fees to create incentives and disincentives

Fees can also be used to influence waste-related behaviour and this is becoming increasingly popular as a policy measure in countries in the North, where the waste generation per capita is growing rapidly. The concept of **pay per bag** or **volume-based pricing** is used in the North to encourage household and business generators to make use of recycling and composting options, so that they have less waste to throw away. In order to use the disposal system, clients have to buy special bags or special trash tags to pre-pay for disposal. At least one private contractor in Nairobi, Kenya, also uses a pre-paid bag system for residential waste clients. In the North there are also fees for disposing of certain durable goods, based on the difficulty of collecting them and/or disposing them safely. Washing machines, car batteries, tyres and refrigerators are examples of paying per item disposed.

The principle behind this use of fees is to make ordinary disposal more expensive and to push people to use alternatives. This only works when the alternatives are easily accessible and the clients know how to use them. When there is no convenient recycling system, raising fees can result in an increase in unpaid disposal or illegal dumping.

5.3.6 Profit, reserve and contingency

Finally, a fee may need to add some percentage of the costs to create a margin. One such purpose is to provide a **profit** for the authority or the private contractor. Or the fee may include a **surcharge** – an extra amount on top of the regular fee – to build up a reserve fund for an expected new investment – such as a new landfill. The fee may include an extra amount as a **contingency** – in case something goes wrong.

5.4 Economy of scale: getting the right number of units in the system

Units of work – both tons for recycling and the more complex options for services – are important in terms of the concept of **economy of scale**. This means that the combination of system elements do the optimal amount of work – no wasted capacity, but also no overwork of any of the system parts (including humans and animals) so that they break down.

5.4.1 The basic collection unit: 1 vehicle route day

Waste collection – whether with animal traction or with a large compactor truck and at a variety of scales in between these two extremes – has a basic economy of scale at the level of the number of connections which can be serviced by one vehicle in one day, times the number of work days in a week, divided by the frequency of collection. While the actual numbers vary by type of

vehicle, number of workers, type of housing and demographics and waste generation rate (measured in kilos disposed of per person or per household per day), there is in each country and city a range of connections which establishes the economy of scale. In developed countries outside of major cities, using compactor trucks, it is 500 – 900 connections per vehicle per work day. With donkey carts or pushcarts, the number is probably 200 – 300. In Central and Eastern Europe, using rotary compactors, it is 300 – 650 per vehicle per day. Collection systems that have less than this will be more expensive than necessary, while those which surpass this risk breakdown or are operating on the marginal costs of some parts of the system.

Similarly, the basic scale for street sweeping is the area that one sweeper – or one group of sweepers if they work in groups – can clean in one work day.

5.4.2 Economy of scale in recycling processing

In recycling, the economy of scale depends on the distance to market and how materials are transported. For paper, the economy of scale is usually based on the number of tons of baled paper that can be transported in the available vehicles. Economy of scale in recycling is important because it usually coincides with the minimum quantity that an intermediate will buy at a globally determined price. In Batangas, the recycling cooperative has found that their economy of scale for being able to sell at good prices is between five and ten tons per month.

Whatever the economy of scale is, your system is better off if you know it and you are able to approximate achieving it in your operations.

Chapter 6. **Economic and Financial Tools and Policy Interventions**

6.1 Justification for policy interventions: connections between the recycling sector and the formal waste management system

One of the key economic issues in waste management is attributing value to the work of the recycling sector. This value is based on two distinct, but interrelated effects of recycling: **volume reduction** and **avoided disposal cost**. Both concepts are critical when it comes to interventions and policy measures.

6.1.1 Where can the effect of recycling be measured?

The economic effects of recycling can be measured at two points in the disposal process: at the point of collection (primary or secondary) of waste and at the point of disposal. The easiest measure of effect is volume, but weight is also useful. However, measuring weight requires a scale and this is not always available. The term that is usually used as the basis for calculating the effect of recycling on the waste stream is *volume reduction*.

6.1.2 Volume reduction

One of the main economic and logistical effects of recycling is to remove materials from the waste stream. This translates to removing volume and weight. That is, materials that have large volumes are removed, making the waste more compact. Compactness is important when we remember that the main function of a formal waste management system is removal. Removal means transport; transport requires picking up the waste and putting it into a vehicle; and that vehicle has a finite volume for containing waste. When the vehicle is full, it must leave its route or its collection work and take the waste somewhere else. This takes time and money (for fuel or in the case of animal traction, energy that must be fed by fodder).

So decreasing the volume of waste before removal has economic value and this can actually be quantified – at two points in the waste management process. The first is in terms of **vehicle volume**. The second is at the point of disposal, where the waste uses up **volume in a landfill**.

6.1.3 Weight reduction

It is also important to quantify the weight, as this contributes to the cost of removal as well. Different materials have different weights and especially, different **specific densities** or **volume-to-weight ratios**. The density of some waste products like vegetable and fruit wastes or textiles is more or less fixed. The density of other materials, particularly containers, is highly variable –crushing cardboard or metal can reduce the volume significantly.

Calculating the value of recycling to a collection system requires knowledge of the **relationship of vehicle fuel or energy use to the weight of the load.**

6.1.4 Avoided cost

The ultimate goal of analysing the effect of recycling is to be able to calculate the **avoided cost** to the waste management system. This is a measure of the value of the recycling effort to the overall formal sector waste management system.

Avoided cost of collection

With a volume and weight estimate for the quantity of materials removed, one can calculate how much less effort the collection needs to make. This is a theoretical cost until the moment that the authorities or businesses in charge of collection actually **optimise the collection routes** to take advantage of the reduced weight and volume to be collected.

Avoided cost of disposal

The second task is assigning a value to the fact that the material recycled avoids taking up space in a landfill and therefore represents some kind of benefit to the disposal facility itself. In the case of a landfill, the volume of the removed materials is sufficient to estimate the avoided cost of disposal, since a landfill fills up by space. However, in many cities in the South, there is no actual or visible cost to landfill waste and in this case there can also be no value assigned to the avoided cost of disposal.

For most cities in the South, building a new landfill that meets modern environmental standards will be one of the largest capital costs they will ever have to make. It is at this point that the value of existing recycling initiatives becomes important. Modern landfills cost around US $500,000 per hectare to construct. The number of hectares is based on the amount of waste that will need to be landfilled during the expected life of the landfill, usually 20 years. So landfill costs are usually budgeted by a city in terms of the volume of waste that is expected to be disposed of each year for the projected life of the landfill.

In the cases where informal sector micro and small enterprises are already extracting waste without cost to the city, each cubic metre reduces the need for landfill space in the current budget year. So these micro and small enterprises are saving the city money and this can also translate into the number of years during which the landfill can be used.

6.2 Policy interventions to enhance waste picker effectiveness

In many situations, policy-makers look at recycling as a source of jobs – a somewhat optimistic view. If people want to be in the waste business, they are likely to enter it on their own, without benefit of a formal programme. So the panacea of economic development through recycling is unrealistic.

On the other hand, there is real retained value added in the waste stream, but most materials that are valuable and easily accessible are already removed. The materials left – in the South these include organic wastes, tyres, rigid and film plastics and organic materials – are there because the materials have no retained value added or because the waste pickers on their own cannot achieve an economy of scale to make recovery worthwhile.

While job creation potential is limited, there are policy interventions and approaches to strengthen the position of the existing recycling sector, from waste pickers at the bottom to the intermediates at the higher end. By **enhancing the marketability of recyclables** and **supporting the extraction process,** existing businesses can be strengthened and some new positions can be created at the margins. Improving the effectiveness of recycling and increasing marketing options can have some effect on local economic development: we are also talking about human dignity, recognition etc.

Some of these initiatives gain political and economic support through taking action to **quantify the activity of the informal sector and its value to the formal waste system**. As was discussed above, mostly this value is based on volume reduction and ultimately on avoided cost of disposal. Others are motivated by the wish for environmental improvement through increased recycling, or by concern for the social circumstances of the waste pickers and itinerant waste buyers, often from the poorest, most vulnerable strata of society. These interventions are classified and discussed in somewhat greater detail in the following sections.

6.2.1 Mechanisms to legitimise the informal sector

These interventions focus on legitimising and recognising the activities of the informal sector, protecting them from harassment and working to raise their social status. Successful initiatives fall into a number of categories:

1. Organisational and financial support and micro-credit programmes for the informal sector
2. Promotional campaigns
3. Strengthening markets and marketing agreements, especially for non-traditional materials
4. Assisting with extraction, through a combination of organising new source separation efforts, providing equipment and supplies and/or
5. Granting concessions or facilitating access that protects informal sector waste pickers from being removed from the landfill or other points of extraction.

A short overview of Linis Ganda as a case study in interventions to legitimise the informal sector

Linis Ganda is a comprehensive programme in the Philippines to 'enhance existing recycling efforts by assisting and organising junk shops and itinerant buyers'. The approach consists of the following:

- Improving and strengthening linkages between middle dealers and itinerant buyers and both the generators and buyers of recyclables
- Organising middle dealer and itinerant buyers into cooperatives to obtain recognition from the society
- Obtaining cheap credit from financial institutions to expand he middle dealers' working capital base
- Including non-customary post-consumer materials like scrap plastics, broken bottles and scrap plastics in the waste trade

The original concept was implemented at three levels:
Linis Ganda first mobilised women in 21 districts to separate post-consumer materials that they generally do no separate. Secondly they successfully negotiated with 10 junk shops in the area to buy both traditionally separated materials and the new materials, including providing these junk shops with wooden carts for their itinerant waste buyers [strengthening the markets and providing equipment]; they organized the itinerant waste buyers, gave them uniforms and identity cards that facilitated access to the wealthier neighbourhoods and renamed them 'Eco-Aides' [combines organisational and promotional support and protecting waste pickers from harassment]. They also work with junk shops and intermediates on diversifying their product mix to reduce risks of failure and they work with end-users and larger intermediates to promote better agreements and options for non-traditional materials [strengthening marketing agreements].

In the Linis Ganda case, these interventions were initiated by a private citizen, Mrs. Camacho, who created the links to the formal city government waste management structures, but they are also the type of interventions which are typical of governments which seek to support recycling and increase its economic and social performance.

Source: Lardinois and Furedy, 1999, pp. 56-61

6.2.2 Mechanisms to support prices

These mechanisms focus on supporting or raising prices for recyclables, using economic or institutional tools.

Umbrella purchase agreements

This is a general term for a facilitated marketing agreement. The local authority, its agent or non-governmental organisations make agreements with intermediates or end-users that give a large quantity price to small-quantity suppliers, as long as they sell under the same formal agreement. Often the initiating organisation agrees to do billing for all the suppliers or in some way **reduces the transaction costs for the buyers** so they can afford to give better prices.

Marketing cooperatives

A marketing cooperative is also a mechanism to leverage higher prices by combining small volumes, but it is several steps more institutionalised than an umbrella purchase agreement. Most cooperatives, like the one in Batangas Bay, the Philippines, have a warehouse or storage centre where their members actually bring the materials and store them. Some have their own transport vehicles or use combined purchasing power to negotiate favourable **hauling contracts** with transport companies or to be first priority for **back-haul opportunities** (filling a truck which has delivered new products and would otherwise return to its source company empty).

Cooperatives frequently also allow their members to get credit or loans or they use their fees to form a revolving credit or investment fund.

Fixed price contracts

A fixed price contract for recyclables is sometimes possible with an end-user industry and much more rarely with intermediates. The buyer commits to purchase a certain material at a fixed price for a specific period of time, usually one or two years. Fixed price contracts have minimum and maximum quantities attached, and include specifications for quality and grade of material and acceptable levels of contamination. A fixed price contract is particularly interesting to a municipal government starting source separation and recycling, and which wants an assured level of income.

Floor pricing

An alternative to fixed price contracts is floor pricing. In this case, the buyer agrees that the price will never fall below a certain level, so that the small sellers and/or public sector suppliers, always have a certain level of security in the price. In order to do this, the buyer usually lowers the prices for all products at all times and uses his or her extra margin in order to build up a reserve fund in case the real market price falls below the floor.

Tax and VAT waivers

While fixed and floor pricing are mechanisms that operate inside the recycling marketing system, tax waivers change the economic context in which recycling operates. Especially in countries where the VAT (value added tax) is high, a waiver of VAT sometimes can stimulate factories to use recycled materials in place of virgin equivalents, in effect raising the prices for the recycled materials by the amount of avoided VAT. There is a good reason for doing this; recycled materials come from products which have already paid VAT when they were new, so it should not be charged again when the value added is conserved for recycling. But this is sometimes a difficult point to make with the national tax authorities.

Structural impact of supporting prices

Supporting prices has the predictable effect of stimulating recycling: it provides an incentive for more people to extract more materials from the waste stream. This is the desirable effect: in economic terms, it increases the supply of materials that come to the market. But by stimulating the supply of materials, supporting prices risks depressing the real market price, creating a vicious circle where more price supports are necessary to maintain the market at a minimum level of operation. In order to avoid this, price support mechanisms need to be accompanied by market development activities, which seek to expand demand for recycled materials by replacing virgin (raw) materials with recycled materials.

6.2.3 Mechanisms to strengthen markets

Laissez-faire economists believe that a market exists and cannot be developed. But experience in countries in the North shows that this is not true: markets can be strengthened, developed, or manipulated through deliberate and focused (public-sector) interventions.

Market development initiatives

Classic market development is a combination of intuition, economics and engineering. When a material from the waste stream has no markets, it is possible to say that it is in structural over-supply. But this is a very general explanation and effective market development starts with an analysis of where the problem with marketing actually lies.

The case of passenger car tyres is a good example. In virtually every country, there is a problem with tyres. They are used in small quantities for various types of small-scale manufacturing, usually consisting of cutting the tyre or inner tube into new shapes, such as gaskets or shoe soles. Some are used as fencing and flotation devices. But the majority of tyres end up as waste.

Analysis of the tyre recycling problem

First, the price of a passenger car tyre is very low. This means that the potential for retained or conserved value added is also low, which in practical terms means that the price that the market will bear for sale of a retreaded tyre cannot cover the cost to recycle or retread the tyre. For larger truck or tractor tyres with higher prices, the value of the retreaded tyre can easily cover this cost and there is a lively market in commercial and agricultural retreads. **This is a price competition** problem.

Secondly, a tyre is a highly engineered item, which contains complex materials. While the material value added can technically be retained it is not useful for most other purposes. Also, extracting the polymers for their material value requires advanced technology and – again – costs more than the resulting product is worth. This is a **technical feasibility** problem.

Shredded and processed tyres have been used successfully in making road surfaces, particularly in inaccessible areas. Companies and government departments that are in charge of building roads are always under financial and time pressure, and they feel that they ‘cannot afford’ to experiment or to use a complex technique when a simple one will do. This is a combination of a **user knowledge** problem on the one hand and an **institutional feasibility** problem on the other.

Furthermore, public roads must meet strict engineering standards. The national standards organisations are conservative – they do not want to risk public health and safety if an experiment fails. One barrier to using shredded tyres in road construction is that the national standards organisations do not want to spend resources to perform the tests needed to approve this material for road construction. This is a **standards and specifications** problem.

Tyres have a high combustion value, and it is possible to burn them in an incinerator and recover energy, as steam used for heating or to turn turbines which make electricity. But to burn efficiently, the tyres must be cut into small pieces and the wire which strengthens them makes this technically a challenge. It is possible, but only with large and expensive cutting machines, which require about a million tyres a year in order to operate continuously and efficiently. And an incinerator to burn only tyres also requires a very large number. This is an **economy of scale** problem.

These problems relate to the fact that the price of the tyre does not compensate for its environmental impacts. This is a classic case in which producer responsibility could shift the balance and create new and affordable options for managing tyres.

Market development strategies in brief
A comprehensive market development strategy must consider all these problems and must also use creativity and innovation to stimulate the market. The following table gives some idea of how to think about market development.

Market Development Problem	**Approach**	**Example**
Price competition	Use avoided disposal costs to finance research and development; consider using price supports, put pressure on end-users.	Requiring newspapers to publish on recycled paper.
Technical feasibility	Use the municipality's own purchasing power to make a special order with recycled material as the feedstock.	Make a programme to replace all park benches with planks made from recycled plastic.
User knowledge	Give away the product for free for a limited time; get the most powerful users to agree to test the product, publicise the results.	Giving compost away to master gardeners and having a flower-growing competition.
Institutional feasibility	Involve the institutions themselves in the process of solving the problem; financially support the experimentation process; bring in counterparts from equivalent institutions with experience to talk to their peers.	Bring in engineers who have built roads using scrap tires and have them explain how it works and what the performance characteristics are.
Standards and specifications	Support a shift from *technology-based specifications* to **performance-based specifications**; work with standards engineers to find precedents and apply them.	Increasing the use of recycled paper in printing and writing involved a change from the specifications of what kind of pulp could be used to a brightness specification based on how the paper performed.
Economy of scale	Intervene to create an organisational or institutional basis for a larger-scale initiative, through an association of municipalities, a cooperative or the like. Also use government procurement to make large orders, which make it profitable for factories to experiment.	Marketing cooperatives, regional waste authorities, regional districts

Table 2. Market development to solve marketing problems

Government procurement
This strategy is based on the recognition that in most countries government is one of the biggest purchasers of many products. When a government requires its paper have some recycled content, paper suppliers know they must act to supply paper with this content.

Local government can also develop markets by using the materials itself and so providing an example of responsible behaviour.

Research & Development and technology transfer
A number of market development experiments have been based on research and development and technology transfer, from places where there has been success.

6.2.4 Mechanisms to facilitate or enhance extraction

This section includes a selection of financial and economic tools that facilitate or strengthen the extraction process by stimulating generators or recyclers.

Diversion credits
Diversion credits are **transfer payments based on the avoided cost of disposal**. They are usually paid by the authority charged with paying for waste management, to the entity which does the recycling. A common way of setting diversion credits is based on the disposal cost at a landfill or incinerator. The credit is almost always less than the full cost of disposal, often about half. Highly controversial in the Americas, this is standard European practice. In the Netherlands, for example, any non-profit “kringloopbedrijf” (recycling business) can seek payment for each ton it collects and recycles. This payment is usually less than the cost that the municipality would have had to pay for normal collection and disposal, but it is more than the pure market value of the materials.

Tipping fees
In cities with a moderate level of development (eg Costa Rica, Egypt and India) there is an understanding that dumping at a disposal facility must be paid for. The **tipping fee**, is usually paid by the businesses who transport the waste to the landfill, they pass it on to the generators in collection fees. In many places, tipping fees are far below the real cost to operate the landfill – and more importantly, they do not include the cost of amortisation and so do not contribute to a fund for the authority to replace it when full. But charging is an important step, since in most countries in the South the concept that it is necessary to pay seems strange.

Just having tipping fees and enforcing the requirement that collection companies pay them is an incentive for extracting materials from waste, since most fees are based on the weight or volume of the waste. The incentive works on the collectors themselves: if they know that they must pay, they are more likely to accept partnerships with informal recyclers who extract the materials or to be open to other kinds of extraction activities.

There is an ongoing debate about the relationship between tipping fees and illegal dumping. Certainly, high fees can increase illegal disposal, but in many situations the main motivator for illegal dumping is that there is no ‘right thing’ to do with that particular category of waste. In many cities, there is no legal disposal option for construction and demolition material – so people dump it in the woods, on roadsides and in ravines. If fees are applied fairly and enforced, waste generators can reduce the free rider syndrome – using peer pressure and sanctions.

Disposal surcharges
This is an amount added to the tipping fee to pay for something special – or to make disposal more expensive and encourage recycling. In economic terms it functions like an import tariff – artificially raising the price of disposal.

Equipment purchase or credit programmes
It is sometimes possible to increase the efficiency and effectiveness of recyclers by helping them get equipment or credit to purchase materials. Linis Ganda in the Philippines is an example of incorporating a small credit facility into an overall waste picker enhancement programme.

Facilitating pre-processing areas at landfills and recycling transfer stations
Moving economic incentives into more logistical considerations, extraction can be facilitated by creating pre-processing areas at landfills or transfer stations and offering concessions or contracts to recyclers to remove materials. In some National Association of Recyclers’ facilities in Colombia, the local recycling cooperative has the concession to operate the transfer station and remove recyclables. But any landfill where waste pickers work can be improved with a dumping area near the entry, away from the working face. Under this arrangement, the remaining waste must be moved into the active cell using a loader or bulldozer.

6.2.5 Mechanisms based on the concept of transferring negative externalities

Diversion credits
The concept of diversion credits can stimulate extraction of recoverables and/or of promotion of source separation. However, this is a strategy based on transferring the negative externality associated with disposal to the positive activity replacing it.

Permits, fees and licences
A classic set of economic instruments to transfer negative externalities include permits, fees, licences and tradable permits. By creating the opportunity for clients to pay for permits to dispose, fees for collection and disposal, and licences to move certain wastes, some of the cost to the environment can be recovered by the authority.

Polluter Pays programmes
A more direct way of managing the negative externality is PP ('Polluter Pays') programmes. These require the economic entity responsible for pollution to pay for its clean-up or to compensate those who are damaged. In practice the threat is more effective than the mechanism: once industry knows it is liable, it has a powerful incentive to improve.

6.3 Economic instruments to support the service sector

In this final section, we look at selected economic instruments that are particularly relevant in supporting the service sector and especially the MSE service sector.

6.3.1 Contracts, concessions and franchises

In many instances in the South, the urban waste service sector operates informally and lacks legitimisation from the municipal authority. This makes informal collectors vulnerable to political changes or donor-funded modernisation of the entire waste sector.

Fairness and transparency for both sides
To be sustainable, contracts, concessions and/or franchises must be fair, so that MSE service providers get paid for their work, but neither the municipality nor clients overpay.

Formalising the position of the informal sector
A key approach to protecting this sector is to formalise relations with the jurisdiction through executing contracts, concessions or franchises, which give collectors or street sweepers the legal right to operate. A great deal has been written about contracts, concessions and franchises (see, for example, Cointreau-Levine 1994, World Bank 1992, Haan, Coad and Lardinois 1998). But following are a few points about formal legal instruments.

The main point: economy of scale
One important, but seldom recognised, aspect of contracting or franchising is economy of scale. If, for example, franchise districts are too small for the collectors to achieve a reasonable economy of scale, the cost of the service – no matter who pays – will be high and then many clients may choose not to pay.

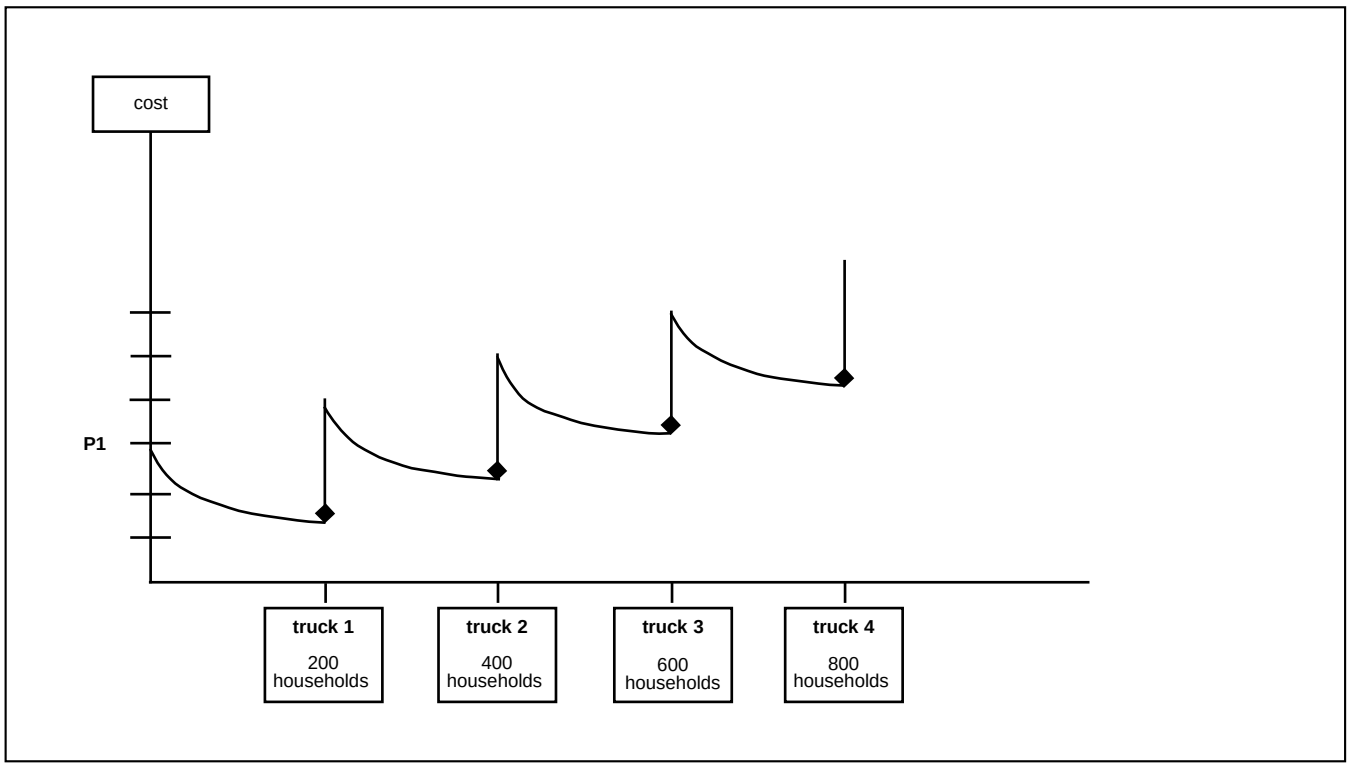


Figure 6. Collection economy of scale

Figure created by Reka Soos and Anne Scheinberg, September 2000

Explanation of Figure 6
The waste collected by the first household by the first truck will be P1. From there on, collecting waste from each additional household will cost less and less money. The minimum cost per unit of collection will occur when the truck is used at full capacity, at the 200th household.

To collect from the 201st household you would need an additional truck and you will find that your cost per unit sharply rises again. Now you have your first truck used at full capacity and your second truck almost empty. The pattern repeats for all additional trucks used. The bullets on the graph represent the cost efficient points, collection of maximum amount of waste while spending the least possible money.

The tricky part is that the collectors may not know their own optimal economy of scale and may quite happily sign a contract which will, in the long term, put them out of business. Or they may sign a contract or execute a franchise agreement based on the economy of scale for vehicles with animal traction and then get a tractor, which could improve the economics of the situation. But because they are locked into a concession agreement at a smaller scale, all benefits are lost.

In order to get the economy of scale right, it is recommended that someone in the contracting authority acquaint themselves with the existing collection infrastructure and determine the economy of scale at the current operative level. Then discuss with the providers what their plans would be if a franchise were awarded and make the franchise or contracting areas large enough to accommodate these plans. As a general rule, a waste collection zone with motorised vehicles should be not smaller than 2,000 connections per vehicle, larger if the collection is only once per week.

6.3.2 Support to analyse costs

Finally, there are strategies to assist micro and small enterprises (and the public sector) to analyse costs and set prices, which can support both the informal recycling and urban waste service sectors. Although methodologies are helpful, the main change is brought about in the **process**.

Some of this information is simply an introduction to standard accounting practices, but there is some specialised content that can help.

Fee methodologies
One approach to analytic support is to create fee-setting methods and to train municipal managers and authorities in their use. One key problem is that it does not usually reveal hidden costs, which are typical of informal sector activities.

Unpacking and revealing hidden subsidies
Some hidden subsidies are listed here:

Unpaid hours and family labour
Entrepreneurs work long hours. While they may succeed, this is usually done by working double or triple the normal work day. Entrepreneurs and their families are often involved in unpaid, unrecognised hours of work. When family members are women and children, they may work without access to the money that is earned.

Credit, cash flow and late payments
Another way that entrepreneurs provide hidden subsidies for their businesses is by using relatives or family members for credit, and to cover cash flow when clients pay late or not at all. Without these hidden subsidies, most micro and small enterprises could not operate.

Chapter 7. **Conclusion**

7.1 Financial and economic ideas are management tools

The theme of this document has been that a decision-maker charged with responsibilities for urban waste management needs to understand these financial and economic concepts in order to increase sustainability in the waste management system. Some of the key ideas, which have been discussed, include:

- Waste management is largely a process of removal.
- Waste generators pay for removal, and when they do not, the public health and environmental problems cause negative externalities. When these become large enough, the government will have to pay.
- The effects of negative externalities are worst for poor and vulnerable segments of urban society.
- There are significant differences between commodities and services in urban waste management. Recycling and reuse belong to the commodities sector; collection, street sweeping, green space management and emptying of latrines to the service sector. The units of work, strategies for pricing and types of policy interventions are quite different for commodities and services.
- Cost recovery depends on an analysis of real costs, combined with careful pricing. No-one benefits if the system is unfair to one or the other party, as this creates a lack of sustainability which will ultimately cause the system to fall apart.
- There are a number of interventions that can strengthen existing public and private sector waste management and recycling activities. In particular, recycling can be supported by a number of types of market interventions. In spite of this, recycling is not a panacea for job creation.

Until recently, there was not much thinking about the importance of financial and economic tools in waste management. It is experience such as WASTE has had in the Urban Waste Expertise Programme that has led to the concept of Integrated Sustainable Waste Management (ISWM). ISWM explicitly lists financial and economic aspects as one lens through which the waste system can be assessed, diagnosed, planned and monitored.

7.2 About the UWEP programme

The Urban Waste Expertise Programme was developed by WASTE, in the Netherlands, as a programme for support for small-scale innovations in urban waste management in the South. The programme has focused on producing information on solid waste initiatives taken by communities and the micro and small enterprise sector, and which test out and operationalise small-scale solutions in poor and marginal communities. From 1995 to 1998 the UWEP programme focused on gathering information and supporting what we have called ‘South-South technology transfer’. A number of publications came out of this period of research and documentation and some of them have been used in this document.

Since 1997, the UWEP programme has focused on applying this knowledge in four zones of intensive intervention. The programmatic approach in these zones includes at least these elements:

- Supporting and promoting community involvement through the facilitation of stakeholder platforms, with the community as an active partner in the development process.
- Analysis, documentation and legitimisation of informal micro and small enterprise sector initiatives in waste management, and active promotion of their recognition by the local authority.
- Support to cooperatives, business associations, micro and small enterprise groupings and the like which strengthen the position and negotiating power of this sector.
- Technical and strategic support to micro and small enterprise recycling and composting initiatives.

The UWEP programme has been able to connect and reinforce experiments and examples of sustainable waste management in countries of the South.

7.3 What is Integrated Sustainable Waste Management (ISWM)?

The diversity of experience within UWEP has had some surprising results, in particular, the realisation that the commonalities between urban waste problems and solutions are much stronger than the differences. This does not mean that generic solutions can be applied universally, but it does suggest that there are elements of a process of development which are common to widely differing situations. Experience within and outside the Urban Waste Expertise Programme indicates that ignoring these elements almost certainly leads to a failure of development or interventions, and while including them does not guarantee success, it does give a very good basis for development and increases the chance for positive outcomes.

UWEP staff have begun the process of abstracting, analysing and documenting these critical elements and this has produced a development framework which we are calling **Integrated Sustainable Waste Management** or **ISWM**. There is a separate document in this series, which explains ISWM in much greater detail, but we will summarise it here. ISWM is both an analytic tool and a development framework and we are using it as both.

ISWM is based on the recognition that waste management has a number of waste aspects and a number of system elements, and that these cross-cut each other in different ways. The waste elements are the traditionally recognised parts of a waste management system: collection; street sweeping and litter control; transfer and secondary collection; recycling; composting; disposal. The six waste aspects include: policy and institutional; social and cultural; organisational; economic and financial; environmental; and system performance or technical. Without saying too much more, this document with tools has been designed to explore the economic and financial aspects in detail. It has also touched on policy and institutional and system performance aspects.

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Financial and Economic Issues in Integrated Sustainable Waste Management focuses on helping decision-makers to use financial and economic instruments to make responsible and informed decisions about integrated sustainable waste management.

This document is part of a set of five Tools for Decision-makers. The other four documents cover:

- Integrated Sustainable Waste Management - the Concept
- Community Partnerships in Integrated Sustainable Waste Management
- Micro- and Small Enterprises in Integrated Sustainable Waste Management
- The Organic Waste Flow in Integrated Sustainable Waste Management

This series of *Tools for Decision-makers on Integrated Sustainable Waste Management* presents a unique approach to municipal waste management. Integrated Sustainable Waste Management is a concept, analytic framework and assessment that pays attention to aspects often neglected in conventional municipal waste management. Integrated Sustainable Waste Management covers institutional, social, environmental, technical and financial aspects, while emphasising the critical role that a variety of stakeholders - including waste pickers, women and micro- and small enterprises - play every day in waste management operations such as collection, treatment, reuse, recycling and prevention.

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