

Vehicles for primary collection of solid waste

Why is selecting the appropriate vehicle important?

- A large proportion of the cost of SWM is in collection; therefore, any economies that can be made here will have far-reaching consequences due to the large numbers of vehicles that will be needed.
- The vehicle chosen must be reliable, efficient and effective. Good solid waste management practices rely on the regular collection of waste. A poor service may result in a lack of support from the communities in which the schemes operate, and funding may be withdrawn, resulting in the collapse of the scheme.
- The primary collection scheme should be sustainable, hence the vehicle should be able to be maintained locally at an affordable cost.
- The vehicles that are used should provide a safe solution to solid waste collection for both the workers directly involved in their use and the local residents.

What is primary collection of solid waste?

Primary collection is often the first stage in the waste management system when external actors are employed. Primary storage is usually carried out solely by the waste generators. Primary collection is the term used for the house-to-house collection of waste. Frequently, this service is not available in low-income countries and the task is carried out by the waste generators, for example, by placing the waste in communal bins. However, increasingly micro-enterprises and community-based organisations are forming to carry out this task. This usually involves the transport of waste from the point of generation either to communal bins or transfer points, where other vehicles are then used in the secondary collection process.



Handcarts

Handcarts are frequently used in narrow streets which are inaccessible to motor vehicles. If well designed and used appropriately, they have a payload capacity (i.e. the quantity of waste that they can transport) of between 200-250kg. They have low capital and operational/maintenance costs and are noise and air pollution-free. However, they have a limited range of about 1km and are not suitable for very hilly areas or poorly surfaced roads.



Tricycles

'Ride on' tricycles are often used when the range desired is greater than that which can be achieved by handcarts. They normally travel quicker and, hence, have an increased range (2-3km). However, such tricycles are often pushed or pulled due to their heavy loads. The large wheel diameters reduce rolling resistance and allow the tricycles to operate on badly surfaced roads. The capacity of tricycles is generally less than that provided by handcarts.



Animal panniers

These are essentially bags or buckets carried over the back of the animal and can be used in areas which are particularly steep, or where the ground is unsuitable for wheeled vehicles. They have a limited capacity.



Animal carts

Animal carts have a similar range to tricycles but can carry larger loads. They have an advantage over motorised vehicles in that the cart itself requires little maintenance, most of which can easily be done within the local community. The technology involved is usually already operating in the area. They can cause traffic congestion but are generally suitable for low-income areas where traffic densities are low.



Small trucks

Small, motorised trucks can be used when the width of streets allows. They have a much larger range than manual and animal powered transport. However, problems may occur with maintenance of vehicles and the increased wear in using vehicles in a constant stop-start activity which they are not designed for. Motorised trucks tend to have both a higher capital cost and higher maintenance costs than the other modes of transportation discussed.

Motor tricycles

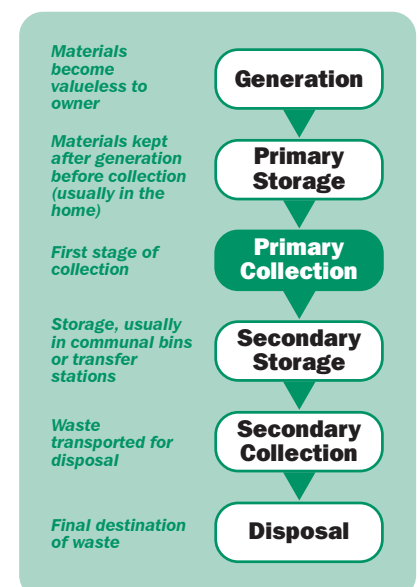
Many low-income country cities have a wealth of small two-stroke, three-wheeled vehicles. These have a range of approximately 10km but do not operate well on rough roads. They can have either open or closed bodies and tend to have a capacity of about 2m³. As with small trucks, they tend to have high operating and capital costs compared with other modes of transportation and are prone to breakdown.

What types of vehicles are involved?

In high-income countries, the primary collection of waste is a highly mechanised process using large collection vehicles. In these countries labour costs are high and are, hence, minimised in order to gain an optimum solution for waste collection. However, in low-income countries, labour costs are low and waste collection systems should be designed to maximise the labour input and reduce the cost of expensive vehicles. As a result, primary collection frequently uses manual or animal transport to carry waste to a transfer point, where the more expensive vehicles can then be used to carry waste longer distances to final disposal sites.

The vehicles involved in primary collection can be categorised into three distinct groups according to their power source. These groups are:

- **human-powered** — either handcarts or tricycles;
- **animal-powered** — either animal carts or panniers; and,
- **motorised** — small trucks or motor tricycles.



What must one consider when choosing a vehicle?

When choosing a vehicle for a particular situation, one must consider both the suitability of the vehicle for the activity in general (e.g. the primary collection of waste) and the suitability of the vehicle to be used in that particular location (e.g. in a small village in Nepal).

- **Range of operation** — Is it to be used only for house-to-house collection and short distances to transfer points, or is it likely to be used for longer distances?
- **Type of waste** — Is the waste very dense, corrosive, large size etc.? Waste left uncollected in the vehicle is likely to be corrosive to metal so it may be wise to construct the carrying tray of more durable material.
- **Quantity of waste to be transported** — The size of the vehicle will depend on both the waste generation rate and frequency of collection.
- **Characteristics of collection area** — Topography, state of road surface, density of housing and street plans e.g. corner radius are important considerations. There may be an impact of the vehicles on the local streets / road surfaces.
- **Capital cost** — How much is the initial financial outlay for the vehicles? Is this money available? If vehicles with higher capital costs are considered, will this result in an overall saving e.g. operational costs may be lower?
- **Operational costs** — How much will the vehicle cost to run, e.g. petrol, food and care of animals?
- **Maintenance** — Are parts and the skills needed for maintenance available locally? How frequently is maintenance likely to be required? What is the likely cost of maintaining the vehicle?
- **Previous experience** — Is there any previous experience in the use of vehicles for primary collection in the area? If previous projects have failed, find out why.

- **Ease of loading/unloading** — Try to minimise the time and contact at transfer. Consider the occupational health of workers. For example, waste should not be dumped on the ground at transfer; vehicle should have a low loading height (<1.5m).
- **Current practises** — What is the current system of SWM? The new vehicles must fit in with the existing system of transfer/secondary transport.
- **Current traffic density** — Need to ensure that the new vehicles will interact well with existing traffic conditions. For example, animal carts may cause congestion on roads busy with faster moving traffic.
- **Attitudes of the collectors** — The views of the collectors must be considered in order that the vehicle supplied is what is wanted and needed.

What are common problems with vehicles used in primary collection?

- **Corrosion.** Waste collected may be slightly corrosive and shorten the life of metal waste containers.
- **Wheels and bearings.** Wheels and bearings of primary collection vehicles are frequently not maintained adequately, and overloading of vehicles may place extra strain on these components.
- **Unloading.** Primary collection vehicles are frequently not designed with ease of loading/unloading in mind. This may cause delays at transfer.
- **Maintenance and repair.** If vehicles are not chosen appropriately, problems can occur with their maintenance and repair. For example, spare parts may not be available locally. If maintenance is difficult or expensive (or the importance of it not recognised), it is often neglected, resulting in problems of reliability and 'downtime' when the vehicle is off the road.
- **Parking space.** Primary collection vehicles need to be parked when they are not in use. This may be a problem in high-density areas.
- **Theft.** Some primary collection vehicles have detachable bins. If not secured properly, these bins may be stolen by collectors and used for other purposes.

Lessons learned

- **No universal 'ideal' solution.** The vehicle ideal for use in one situation may be totally inappropriate in another. It is often the case that different vehicles are not only suitable in different towns, but also in the different areas of a town.
- **Consultation.** The people who are to use the vehicles must be consulted about the particular features of the vehicle. It is important that the vehicles address the specific problems encountered by the collectors and that their opinions are taken into account.
- **Investigation.** The characteristics of the local area and its waste must be investigated.
- **Pilot projects.** It is wise to undertake a small pilot project using a prototype of the selected vehicle to highlight any problems before attempting a large-scale implementation of new vehicles.
- **Keep it simple.** Use the lowest level of technology possible in order to still obtain a good solution. The lower the reliance on technology, the less that there is to go wrong!

This note presents the synthesis of a knowledge review on 'Vehicles for Primary Collection of Solid Waste'. The research project aims to build capacities of government and non-government organisations in primary collection of solid waste. This note is written for organisations and individuals who in one way or another support the development of primary collection systems in low-income countries.

References / Further reading

UNCHS (1988), 'Refuse Collection Vehicles for Developing Countries'. United Nations Centre for Human Settlements (Habitat), Nairobi, Kenya.

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