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Solid Waste Management III

Padavisiripura

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1. Approach and Objective

This is the documentation of a brief exercise on developing a solid waste management (SWM) concept with the participation of the local stakeholders in Padavisiripura DS Division in Trincomalee District. The concept was developed in July 2003. It dates back to the preparations for the annual work plan and budget 2003 for the DS Division, which was jointly carried out by the Divisional Secretary and the IFSP management team in March 2003.

The main institution responsible for SWM, including collection, transport and disposal in Padavisiripura is the Pradeshiya Sabha. It has been unable, however, to carry out SWM within the area under its jurisdiction and maintaining acceptable standards in reducing the impact of solid waste on public health and the environment. A weak institutional framework due to the conflict situation and civil disturbances has further compounded the situation, lack of basic equipment and infrastructure such as transport and proper landfill sites and, poor public participation and collective attitude towards SWM as solely the responsibility of the Pradeshiya Sabha. As found in many other parts of the country, the lack of public participation and civic responsibility in handling solid waste have also resulted in depleting the resources of the Pradeshiya Sabha.

The present exercise was conducted by Synergetics Lanka through the Integrated Food Security Programme Trincomalee (IFSP) which is assisted by the German Technical Cooperation (GTZ) under the official Sri Lanka – German development cooperation. IFSP Trincomalee has been operating since 1998 in Trincomalee to support the conflict affected communities to regain their livelihoods. IFSP aims at improving the availability of, access to and use and utilisation of food and promotes a peaceful coexistence of the three communities. Support is provided for improving the village infrastructure and the production infrastructure in particular, enhancing village health care and nutrition, including water supply and sanitation, facilitating services and contributing to capacity building.

Since SWM is a key aspect in sanitation and health care, IFSP Trincomalee initiated an intensive stakeholder dialogue in 2001 and 2002 for a solid waste management strategy and an action plan for the town of Trincomalee, the outer suburbs (Gravets) as well as for the towns of Kantale and Muthur. The SWM concept and action plan received high recognition from Chief Secretary NEP, Department of Health Services, Urban Council Trincomalee and urban development Authority, Central Environment Authority, various provincial and national institutions, environment oriented NGOs, donor agencies and development projects.¹

The initiative of IFSP and DS Padavisiripura is a direct follow-up activity of the exercise that was done for Trincomalee, Kantale and Muthur. Its context is on dissemination and sharing of experience and lessons learnt and it applies the well-tested methodologies and tools developed and applied for strengthening local institutions and other stakeholders in SWM. The scope of the exercise for a solid waste management concept for Padavisiripura has been outlined in relation to the overall purpose, which is to enhance awareness for solid waste management and promote action. Considering the main socio-economic and physical characteristics of the Padavisiripura area, it was decided that the focus would be the following:

- Identifying the main solid waste streams including the main sources, types and the present methods of disposal of solid waste in the area and their impact on public health and environment
- Identifying alternative options for main waste streams with minimum impact on public health and environment
- Prioritising the alternative options based on the “urgency” due to the nature and scale of the impact of the present methods and on the feasibility and viability for implementation.

¹ Solid Waste Management II, IFSP Working Paper 48, February 2002

In view of the resources and time available, the exercise had initiated a process of engaging the main local stakeholders in a structured dialogue, rather than conducting a technical study. It must also be mentioned that while focusing on initiating a sustained dialogue and introducing concepts and strategies on SWM, the exercise did not include quantified data collection and analysis on technical and organisational aspects of SWM in the area.

Based on the approaches developed during the elaboration of the SWM concept for Trincomalee, Kantale and Muthur, the constraints and specific features in SWM in Padavisiripura were not viewed as 'technical problems'. They address to large extent economic, social and behavioural issues. These issues are best to be explored in a participatory approach than in a technical consultancy where specialists are formulating solutions to the problem, which the 'beneficiaries' then have to follow to achieve the predetermined results for success. As part of the participatory approach established by IFSP, the staff of institutional stakeholders such as the Divisional Secretariat, Pradeshiya Sabha, hospital and the overall public, represented by community leaders and market trader of the area together with the SWM consultancy team jointly carried out the main tasks.

2. SWM Concept for Padavisiripura

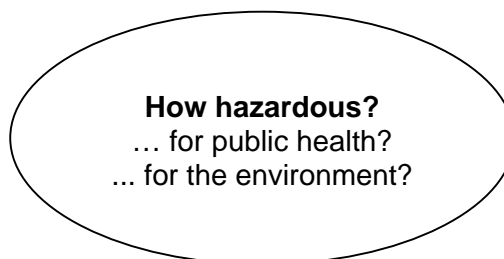
2.1 Process

The process of developing a SWM concept has to be understood in relation to the involvement of all stakeholders as outlined above. The term concept refers to developing options and / or alternatives that have to be taken as a whole than a collection of individual solutions to a specific set of problems, which are usually identified during the assignment. Emphasis is also on creating a sense of ownership of the SWM concept amongst the main stakeholders. A basic mechanism needs to be initiated for periodic reviewing and reformulating specific projects and strategies as the outcome based on the jointly developed SWM concept. In fact, the real measure of success of this assignment would be the extent to which the SWM concept is adopted by the main stakeholders in the area to guide the process of improvements in SWM.

During the formulation of the overall concept, a number of priority areas were jointly identified as urgent and feasible for immediate / early implementation. Preliminary proposals including approximate resource requirements and the identification of stakeholder action for their implementation were identified. The diagram below illustrates the basic issues to be addressed and decisions to be made in formulating a SWM concept.

SWM Concept

- | |
|--|
| <ul style="list-style-type: none">↳ What?
What waste material is produced?
↳ What to do with it?
What are the options? What option is presently implemented? What would be the preferred option?
↳ How to do it?
How can the implementation of the concept be achieved? How are / can activities be financed? Who would do what best? |
|--|





During workshops, which were held at the beginning and towards the end of the exercise the participants had plenty of opportunities to express their views and ideas.

All thoughts and arguments were visualised, structured and later summarised for the SWM concept.



The ideas and views were intensively discussed in sub-groups and presented to all participants during plenary sessions.

2.2 Present system of solid waste management

Any waste, not just toxic chemicals or polythene, even organic or residual waste in large quantities, cannot be just allowed to be mixed with the environment, i.e. soil and water. Even organic and other wastes in large quantities produce toxic liquids such as leachate (dark brown thick liquid coming out of waste) and toxic gases such as methane. In addition to these substances, depending on the composition of waste when they are just allowed to mix with each other and also with the outside environment, they lead to various chemical reactions emitting gases and chemicals into the environment. Burning this waste types also lead to similar results as it produces gases, noxious smokes and toxic chemicals that will be released to the environment.

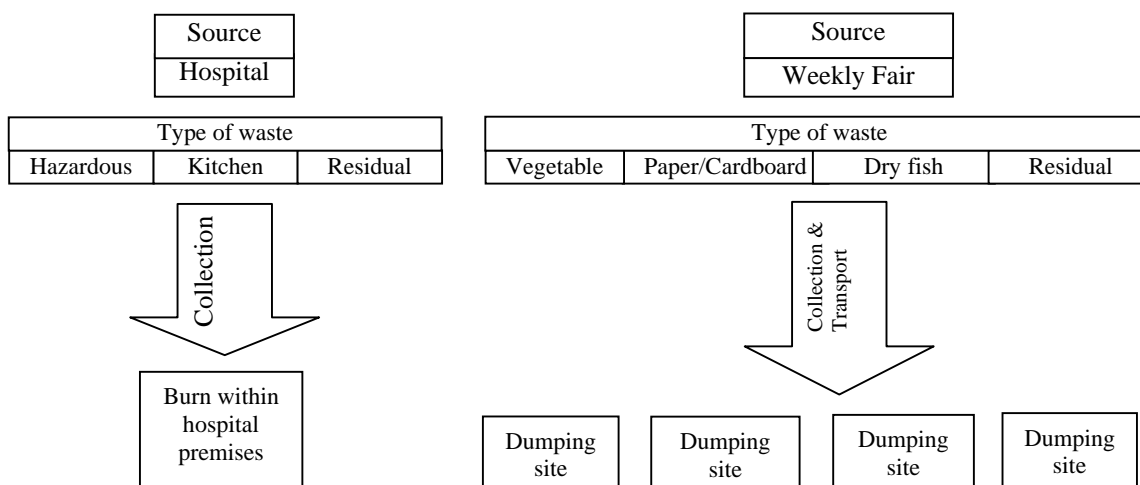
For example, uncontrolled dumping sites where all the waste is allowed to mix with each other attract animals and disease carriers that contribute to spreading of diseases in the neighbourhoods affecting public health. Leachate and toxic gases such as methane produced by waste degradation at these sites result in pollution of soil, surface and underground water bodies and also the atmosphere affecting both public health and environment.

Considering the impact of solid waste on public health and the environment, it must be pointed out that it is not just a few people but everybody who gets affected by solid waste problems in a locality. Therefore, every individual is a responsible stakeholder in solid waste management.

2.3 Waste streams

In managing solid waste, waste matters go through several stages between the original source and the final disposal. The most common steps are generation, storage, collection, transport and final disposal. This flow of waste from the source to the final disposal is called a waste stream. Waste generated at different sources may be eventually disposed through different methods. Similarly, different waste types of the same source have to be treated in different ways resulting in more than one waste stream.

The waste stream is illustrated through the following examples.



In the process of identifying improvements, which are required in solid waste management for the area, it is important to identify the present system of managing waste. This includes the main sources of waste, types and how they are presently handled and finally disposed.

During the field visits and at the preparatory meetings it was found that the main sources of solid waste in Padavisiripura were as follows:

- Weekly Fair (Pola)
- Hospital
- Sri Pura and Palugaswanguwa Market Centres
- Home plots

The table below shows main sources of waste with the (a) the waste types and (b) how they are presently disposed.

Main source	Waste types	How presently handled?
Weekly fair	Vegetable and dry fish waste	Vegetable waste is collected at the same place where it is sold, dumped into the drains or dumped close to the houses Fish waste is transported and buried in own plots by the fish vendors
	Cardboard and paper	
	Polythene bags	
	Fish waste	
	Cardboard covers	
Hospital	Kitchen Ash Vegetable waste Scraped coconut waste	Buried in pits within the hospital premises
	Dispensary Rejected medicine Expired injection / syringes Empty tin Empty bottle (plastic, glass) Empty boxes Polythene Paper	Empty tin and bottles are partly re-used or re-distributed Burn
	Injury room Cotton Plaster Gauze Paper Bottles	Burn
	Doctors' rooms Paper Polythene	Burn
	Wards Cloths Food waste Paper Polythene Gauze Cotton Saline bottles Syringes	Organic waste (bury in a pit) Saline bottles and syringes (burn) Other (bury)
	Maternity ward Cotton Sanitary towels Gorse Cloth pieces Placenta	Placenta (bury) Other (burn)
	Ambulance room Used tires and vehicle spare parts	Hand over to the office of the Deputy Director Provincial Health Services
	Official residence waste	Bury
	Mortuary waste	Bury
	MOH office Paper and polythene Thripasha bags Old letters	re-use, burn and / or bury Thripasha bags (sell) Old letters (to pack medicine)

Main source	Waste types	How presently handled?
	House garden Green leaves Animal waste Paper and polythene	Collect in a pit and burn partly used for dung dumped
Common Area (Bazaar)	Polythene & Paper pieces	Thrown away / left to hang around, no proper disposal
	Plastic Yoghurt cups Bottles Glass pieces	Small amount is handled by PS Left around, no proper disposal
	Vegetable waste	Thrown away / left to hang around, no proper disposal
	Human waste	No suitable place for disposal
	Coconut shells - king coconut	Some times collected by PS, mostly thrown away / left to hang around
	Cow dung	No disposal method

2.3.1 Sources of waste and composition

Visits were done to the two main market centres, namely Sripura and Palugaswanguwa, the weekly fair, hospital, service stations, waste and garbage dumping site and to some home plots in villages. It was observed that more than 80% of the solid waste produced is organic.

2.3.2 Waste collection service

The Padavisiripura Pradeshiya Sabha provides a collection service. One handcart with one labourer is deployed to collect waste from the two main market centres.

2.3.3 Waste disposal

Waste collected by the Divisional Secretariat is dumped at an uncontrolled open dumping site, which is located close to a neighbourhood in the village of Nugarukgama. This location is close to where the weekly fair is held. The total amount of waste collected does not exceed 300 kg per day.

Hospital waste is not collected by the Pradeshiya Sabha, but is transported and disposed within the hospital premises. The hazardous and toxic waste from wards and other waste from wards, kitchen and garden are dumped together in pits within the premises and burnt.

Almost all the waste produced by individual families is disposed within the premises, either buried or burnt. Little, if at all, is compost produced. In many cases individual, shop keepers and the general public burns their garbage in front of their houses or shops or dumps it at the road site.

The knowledge of the negative effects of critical waste and the awareness to separately treat e.g. glass, empty pesticide bottles, used batteries and polyethylene or to avoid burning of plastic material, batteries or old engine oil is almost non-existent.

The following photos show how waste is dealt with. The documentation underlines the need for urgent awareness creation and change of attitude and common practice.

Padavisiripura market



Vegetable waste is thrown away at the market. Vegetable waste could be composted and / or used as animal feed.

The large amount of vegetable waste also results in losses during transport, decreased quality and increased prices for the consumer.

A drainage at the Padavisiripura weekly market is filled with used polyethylene bags, empty king coconuts and all kind of garbage. A heap of bricks block the drain. Drainage systems are hardly maintained, unless in cases of urgency.

Blocked drainage is breeding grounds for mosquitoes and water borne diseases.

This is a case for the Public Health Inspector!



Spoiled potatoes from the market and other garbage are dumped at a road site

Padavisiripura hospital



Toxic and sharp waste stored in bucket (left) and in a safety box carton (right). Old cardboard paper and empty Triposha bags are stored in the office (left, right). Waste collection is highly disorganised.



Residual hospital waste is thrown in a pit for burning and / or burying. All kind of waste is mixed: polyethylene, cardboard, empty tins and bottles.

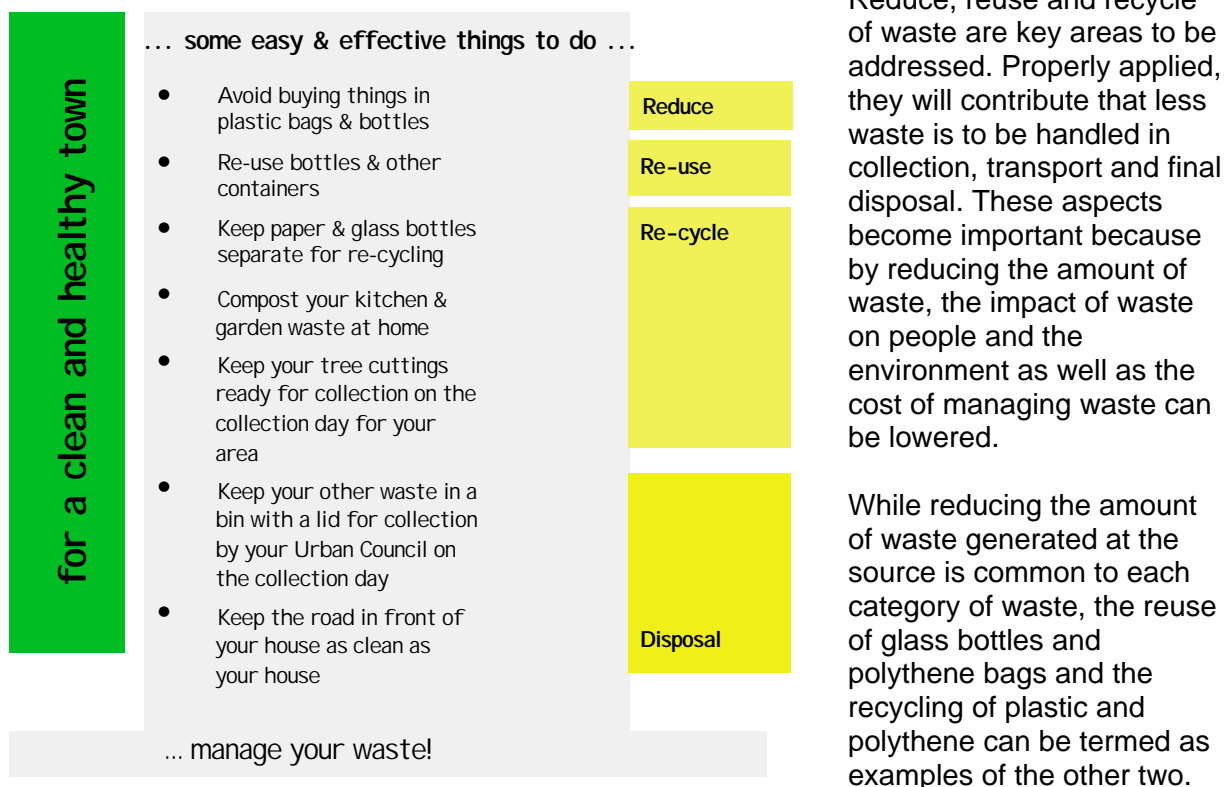
No separation is done for 'normal waste' and hazardous waste.

This way to throw away waste is harmful to the environment.

3. Towards Alternative Options for SWM

The present arrangements for SWM in Padavisiripura revealed a number of shortcomings, particularly in terms of their impact on public health and environment. During the workshops and during discussions with the public and staff from the Department of Health Services and the Divisional Secretary alternative options were identified. These options are taking the following two main aspects into account:

- How to adopt the '3 R method' in SWM, namely, **reduce, reuse and recycle**?
- How to reduce the impact on public health and environment?

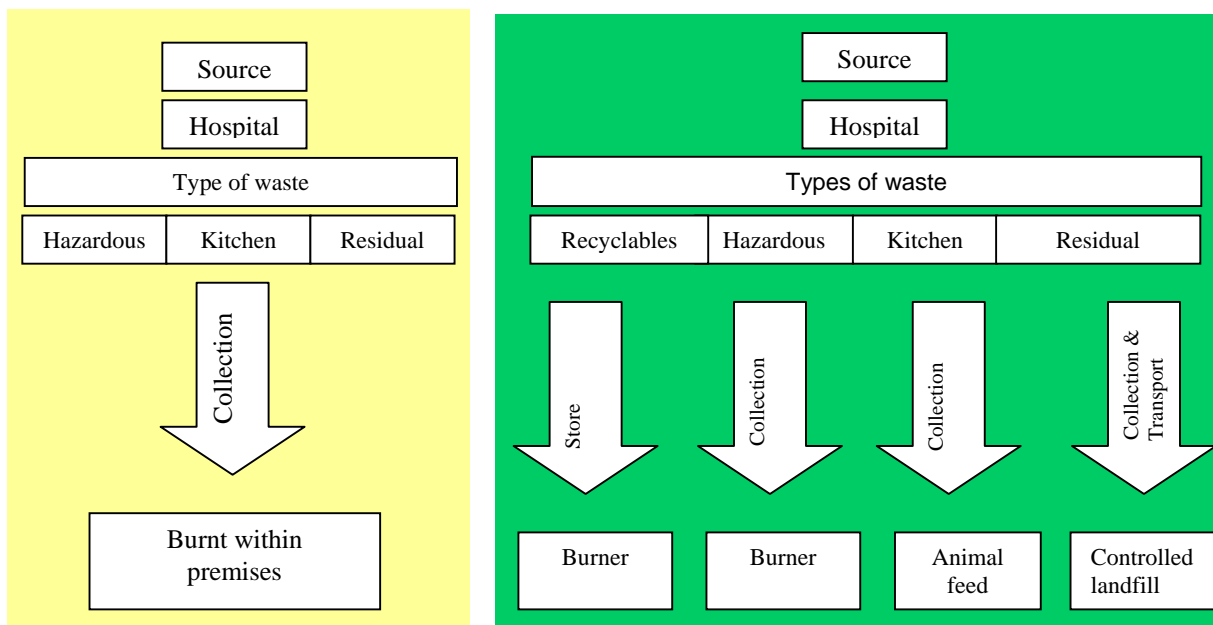


The extent to which the negative effect on public health and the environment is reduced is another important aspect. This can be further explained in terms of the main sources of waste in the area and the types of waste they generate.

The figure shows how the waste from the main sources has to be handled to ensure that the impact on public health and the environment is minimal in the area.

This **3-R method** shows that, it is important to separate different waste as early as possible in the waste stream in order to treat different types of waste in the most suitable manner, which will also reduce the negative effect on public health and the environment. Directing waste to separate waste streams is important.

For example, let us consider how the hospital waste is presently handled Padavisiripura and what would be the suitable options for managing segregated waste. The graph shows present and alternative streams for waste in the common areas in the hospital.



The suitable options for managing waste in terms of minimum impact on public health and the environment were identified based on the interviews with stakeholder and the workshop participants.

Source	Type	How presently handled?	Suitable options
Hospital	Kitchen Ash Vegetable waste Kitchen waste Scraped coconut waste	all dumped in pit	Animal food Compost Oil from scraped coconut waste
	Dispensary Rejected medicine containers Expired injection vials Empty tins Empty bottle (plastic, glass) Empty boxes Polythene Paper	all burnt	Recycling and reuse of containers, bottles after cleaning
	Injury room Cotton Plaster Gauze Paper Nylon Bottles	burnt and / or buried in pits	Recycling, reuse
	Doctors' rooms Paper Polythene	burnt	Recycling, reuse

Source	Type	How presently handled?	Suitable options
	Wards Cloth Food waste Paper Polythene Gauze Cotton Saline Bottle Syringes	Organic waste (bury in pit) Saline bottles and syringes (burn)	Burn completely all to be burnt in a furnace
	Maternity ward Cotton Sanitary towels Gorse Cloth pieces Placenta	Placenta (bury in pit) Other (bury)	Burn completely all to be burnt in a furnace
	Ambulance room Used tires & spare parts	Hand over to the office of the Deputy Director Provincial Health Services	
	Official residences Organic and inorganic waste	Bury	Composting, to be collected, disposed
	Mortuary waste	Bury	
	MOH office Paper and polythene Thripasha bags and old documents	Thripasha bags (sold) Old letters (to pack medicine) Other burn)	
	Garden Green leaves Animal waste Paper and polythene	Collect in a pit and burn	Composting, to be collected, disposed
Common Area (Bazaar)	Polythene & Paper pieces	Left to hang around	Recycling, reuse
	Plastic Yoghurt cups Bottles and glass pieces	Small amount is handled by PS	all for recycling and reuse
	Vegetable waste	Left to hang around	Animal feed; proper final disposal
	Human waste	No suitable place for disposal	Public toilets
	Coconut and king coconut shells	Some times collected by PS other times left to hang around	Use as fire wood
	Cow dung	No disposal method	Collect for dung

4. Alternative SWM Options for Padavisiripura

After identifying different waste streams and alternative options for waste management, two questions need to be addressed:

- What are the necessary steps for improvements?
- What inputs in managing wastes are required?)

It is obvious that the present SWM system in Padavisiripura is unorganised. SWM is also operated with limited resources, which may be an additional reason why it is ineffective. It is important to identify clear steps of 'production of SWM services' and 'stakeholder contribution' to optimise the alternative options for SWM, which were identified.

4.1 SWM is a service

SWM is a service to the town communities that has to be provided with human and material inputs. Services cost money. Labourers need to be employed, hand carts and two wheel tractors and trailed need to be deployed, collection points need to be established, the system has to be managed. Viewed in this context, it was possible to identify and highlight three aspects:

- The way, in which SWM is produced in the area, especially with the limited resources for such operations the Divisional Secretariat, Pradeshiya Sabha and the hospital have.
- How and what links the provision of SWM services have with other public dimensions such as public health and the environment?
- What are the underlying reasons for relative successes and drawbacks in the present SWM systems in the area?

Accepting that SWM is a service, it was possible to outline the activities for the different aspects of waste production and service provision for the present SWM jointly with all stakeholders.

WEEKLY FAIR	
Current activities	Present services
1. Sweeping of fair area	All the activities of the SWM service at weekly fair are produced by the local authority
2. Collection of waste at trading stalls and at the compound	
3. Transporting the waste to dumping site	

HOSPITAL	
Current activities	Present services
Pathogenic and toxic waste	The hospital staff produces all the activities of the SWM service at the hospital; there is no service provision from outside.
1. Collection in bins	
2. Burning/ burying	All waste is handled at the hospital premises.
Kitchen and garden waste	
1. Collection	
2. Burning/ burying	
Glass, bottles...	
1. Collection	
2. Washing & storing for reuse	
3. Burying (those not reused)	

COMMON AREAS (markets)	
Current activities	Present services
1. Sweeping of common area	All the activities of the SWM service at the common areas are produced by the local authority
2. Collection	
3. Transport waste to dumping site	

HOME PLOTS	
Current activities	Present services
1. Sweeping	In case people leave their waste, e.g. tree cuttings, dry leaves, cut banana stems, garbage parcels etc. outside their premises, service may occasionally be provided by the local authority
2. Collection	
3. Bury or burn	

It is quite obvious from the above scenarios; these service activities have to be 'produced', in order to carry out SWM. According to the present system, all these activities are produced by the local authority and hospital. The services are, however, absolutely inadequate to manage the waste in a manner that the negative effects on public health and the environment are at a minimum. It is therefore essential to identify and introduce alternative activities in the 'production' and provision of proper SWM services.

The current activities in handling waste as described in previous chapters and summarised above are perceived and experienced by all workshop participants and interview partners. Consequently, alternative activities for better SWM services in the different areas were jointly identified in cooperation with all stakeholders. The good options identified earlier and the practicability in activating them in the area were emphasised.

The suggestions for better services were as follows:

WEEKLY FAIR (...organic waste)	
Current activities	Alternative activities
1. Sweeping of fair area	1. Segregation of waste at trader's level
2. Collection	2. Collection of waste for animal feed
3. Carrying the waste to dumping site	3. Transport to animal owners

HOSPITAL	
Current activities	Alternative activities
Pathogenic and toxic waste	
1. Collection to bins	1. Collection in protected bins suitable for burning
2. Burning / burying	2. Carrying to a burner
	3. Burning in a properly constructed burner
Kitchen & garden waste	
1. Collection	1. Collection
2. Burning/ burying	2. Bury
Glass, bottles...	
1. Collection	1. Collection, cleaning,
2. Burying (some reused)	2. Sell for recycling
COMMON AREAS (...markets)	
Current activities	Alternative activities
1. Sweeping of common area	1. Store of waste in a bin
2. Collection	2. Collection by handcart
3. Transport waste to dumping site	3. Transport to final disposal site

HOME PLOTS	
Current activities	Alternative activities
1. Sweeping	1. Segregation of waste
2. Collection	2. Collection
3. Bury or burn	3. Bury

4.2 Stakeholder participation

In the process of identifying alternative options for sustainable SWM, stakeholder participation has to be given special emphasis. As the activities itself reveal, many of them require cooperation and participation between and amongst the public, market trader, shop keepers, officers from the Department of Health Services, Environment Authority and Divisional Secretariat.

For example, solid waste from the weekly fair has to be first sorted, stored and covered properly by the traders at the fair until the major component of the fair waste, the organic waste, is collected for animal feed by the animal farm owners. This not only reduces the steps of collecting and transporting the waste to the final disposal site by the local authority to a considerable extent, but also reduces the amount of waste coming to the final disposal site.

Similarly, as clearly shown in chapter 3, the responsible stakeholders need to carry out some of the key activities themselves. They need to contribute to reducing waste at the source of creating / or producing it by applying the '3-R method'. They also are responsible for arranging their waste for collection by local authority. In case collection services are not available, the stakeholders are responsible for safely disposing their waste in an environmentally friendly manner.

5. Prioritising SWM Problems for Immediate Action

The process of dialogue and joint discussion of the constraints of the present practices of handling solid waste resulted in the identification of suitable options for better SWM services. It was possible to prioritise alternative options in SWM for Padavisiripura. The priority areas that emerged through very pragmatic discussions amongst the stakeholders that were structured against the state of the art of SWM are summarised as follows:

- Weekly fair waste to be used as animal feed
- Burner for hospital waste needed
- Collection and transport to final disposal site to be organised
- Suitable final disposal site to be identified and prepared
- Refill of pesticide containers needed

The above SWM priority areas are discussed in detail in the following section. They address the next steps / activities for implementation, stakeholder participation and resources required for implementation.

5.1 Fair waste as animal feed

The major component of the waste generated at the weekly fair is organic waste, which mainly comprises of vegetable residues and dry fish refuse. Improvements for collection and

handling of waste were identified. Responsibilities were assigned to the respective stakeholders to implement the suggestions / initiatives.

Next steps	Stakeholder participation	Resources
Organise traders to sort vegetable and other waste and store them in a proper manner ready for collection	PS PHI, LDI	Bins / bags for the traders
Create awareness and organise animal farm owners to collect vegetable waste from fair	Farmers and livestock farmer organisations	Inputs from PHI and LDI

5.2 Burner for hospital

Apart from the pathogenic and toxic waste such as placenta and sharp waste, the remaining can be managed along with the solid waste generated in other sources. Plastic and glass bottles can be easily reused or recycled. The pathogenic and toxic waste was identified as the key issue that needs immediate action to prevent unsafe dumping. Hazardous waste has to be burnt in a properly constructed burner at adequate temperature to minimise the risk of infections.

Next steps	Stakeholder participation	Resources
Form an action group to build and operate the burner, involving the Department of Health services and the community through the hospital committee	Hospital committee	Burner Gas for operation

5.3 Collection and transport to the final disposal site

At present waste / garbage is collected by a single handcart available at the two market centres. This method is not efficient. It is proposed to introduce a second / additional handcart in order to have a separate one for the collection at each market centre. With the introduction of handcarts for collection, a system of trans-loading the waste from handcarts to a two-wheel tractor-trailer should be introduced.

It is further proposed those lightweight portable bins to be taken in the handcarts (2 sets of 4 bins per cart). This would enable SWM personnel with handcarts to transfer the waste collected after their house to house routes to the designated 'collecting points' for the tractor-trailer to pick up the larger amounts of waste and transport them to the disposal site, while the handcarts do their additional rounds. Such a system would also allow a smooth transfer of waste from handcarts to the tractor-trailer without spillage.

People's participation is expected in three areas:

- Minimising the amount of waste to be collected and transported by the PS by reducing waste generation and manage their own waste as much as possible. (e.g. home composting, recycling and reusing)
- Collecting residual waste in a proper manner and have it ready for the PS labourers to collect
- Coordinate with the PS's program for collection

The participants of the workshop suggested activities, stakeholder participation and required resources for establishing an improved collection and transport system for the area.

Next steps	Stakeholder participation	Resources
Use handcarts to collect waste to be brought to one collection point close to each of the two market centres	PS	2 handcarts 2 labourers
Option I: Procure a two-wheel tractor and a trailer for the PS for transporting waste to the final disposal site	PS DS	Tractor and trailer; fuel and periodic maintenance of tractor; wages for driver and labourer
Option II procure a trailer for the PS tractor and hire a two-wheel tractor for transporting waste to the final disposal site	PS DS	Trailer for tractor; periodic maintenance of tractor and trailer; wages for hiring tractor driver and labourer
Remark: for options I and II the market traders and the PS should jointly procure the equipment and form a 'company'	form a SWM service provider (company)	as above; service provider charges fee for operating SWM

5.4 Final disposal site

The present dumping site as mentioned in chapter 2, is neither located in a suitable area nor is it maintained by the PS in an environmentally acceptable manner. The proposed disposal site close to the 'Hotel Ela' is not a good option either since it is located in a low land area which is affected by floods in the rainy season, is surrounded by cultivated land and would prevent the cultivation of land in future.

Next steps	Stakeholder participation	Resources
Decide on a suitable land for the final disposal site according to specific criteria	PS	Guidelines for selection of controlled landfill sites

Guidelines / criteria for the selection and establishing of a controlled landfill sites are described in annex 3.

5.5 Refill pesticide containers

In the villages in Padavisiripura DS Division, waste is handled within the home plots. This has so far not created a major impact on public health or on the environment since the waste generated consists mainly of organic matter, which is easily degradable. The individual household plots are sufficiently large to bury garbage / waste. However, the discussions with the stakeholders revealed that the improper disposal of empty pesticide and herbicide bottles and containers within the home plots and in open fields has become a major public health and environmental threat.

The improper handling of empty pesticide bottle and containers is observed everywhere. Bottles and containers are thrown away. They are to be found in irrigation channels, streams and close to houses. Empty containers are even used to collect drinking water. There is no system in place to collect empty bottles and containers. Though awareness is propagated by the Departments of Agriculture and Health services, the knowledge and care of the general public is poor. The agri-business is almost non-active in this field.

Next steps	Stakeholder participation	Resources
Farmers' Organisations in associations with Dept. of Agriculture, Dept. of Health Services and Agri-business (pesticide trading companies incl. local shopkeepers): <ul style="list-style-type: none"> • create awareness and lobby for proper disposal • create facilities for collection and proper disposal 	FOs, Dept. of Agriculture, DOHS, private traders, Agri-business companies	Inputs from AI, PHI, FO; specialists from Agri-business