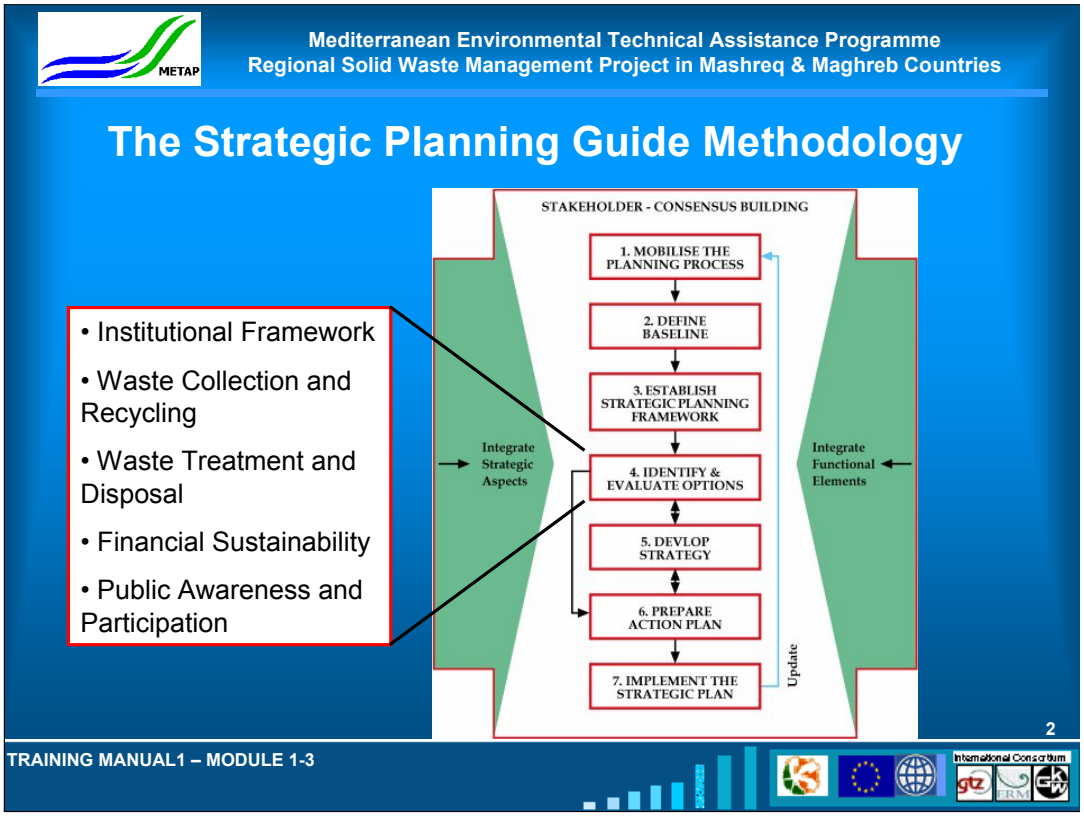
# TRAINING MANUAL 1
# INTEGRATED SOLID WASTE MANAGEMENT PLANNING

## Module 1-3: Identifying and Evaluating Options

**Prepared by the International Consortium**
**GTZ-ERM-GKW**




Step 4 can in many ways be regarded as the core of the planning process. Here, we are identifying and evaluating options required to address the key issues established in the Strategic Planning Framework.

The structure of this module is in line with that of the World Bank's Strategic Planning Guide. This is for ease of cross reference to the wealth of in depth material available from that source.

The module is therefore divided into five sub-steps:

Step 4a Institutional Framework

Step 4b Waste Collection and Recycling

Step 4c Waste Treatment and Disposal

Step 4d Financial Sustainability

Step 4e Public Awareness and Participation

The module will first identify some of the options available under each of these headings, and then look at some of the methods which may be used to evaluate them.

The subject is divided into these five areas as it helps to break-up the large amount of materials into smaller 'bit-sized' pieces. It must be remembered, however, that the subject is an integrated one, eg the waste collection and recycling system is inherently connected to the waste treatment and disposal system and cannot be considered in isolation.

The outcome of the Step 4 will feed into the preparation of the Strategy and Action Plan (discussed in *Module 5*).


To re-cap and expand on some of the issued raised in Module 1 – Overview, the following principles are emphasised.

**Institutional Framework**

In order to secure effective organisation and management, institutional responsibilities must be clearly defined, and institutions must be both sufficiently resourced and accountable for their performance. Opportunities for improving 'economies of scale' ie municipalities joining together to form larger operational units should be explored.

**Waste Collection and Recycling**

Collection and street cleaning represents the major cost item for a waste management system. Professional management is critical to efficiency and effectiveness. Systems need to be designed to meet the practical requirements of customers, and be compatible with local characteristics.

The capacity to recycle depends on the composition of the waste stream, the ability to extract the right quality materials, the level of public awareness and markets for recycled goods. Wherever possible, existing informal recycling systems must be built on. Policy support is essential to high levels of recycling performance. Engaging micro-enterprise and community involvement in both primary collection and recycling may be an effective strategy.

**Waste Treatment and Disposal**

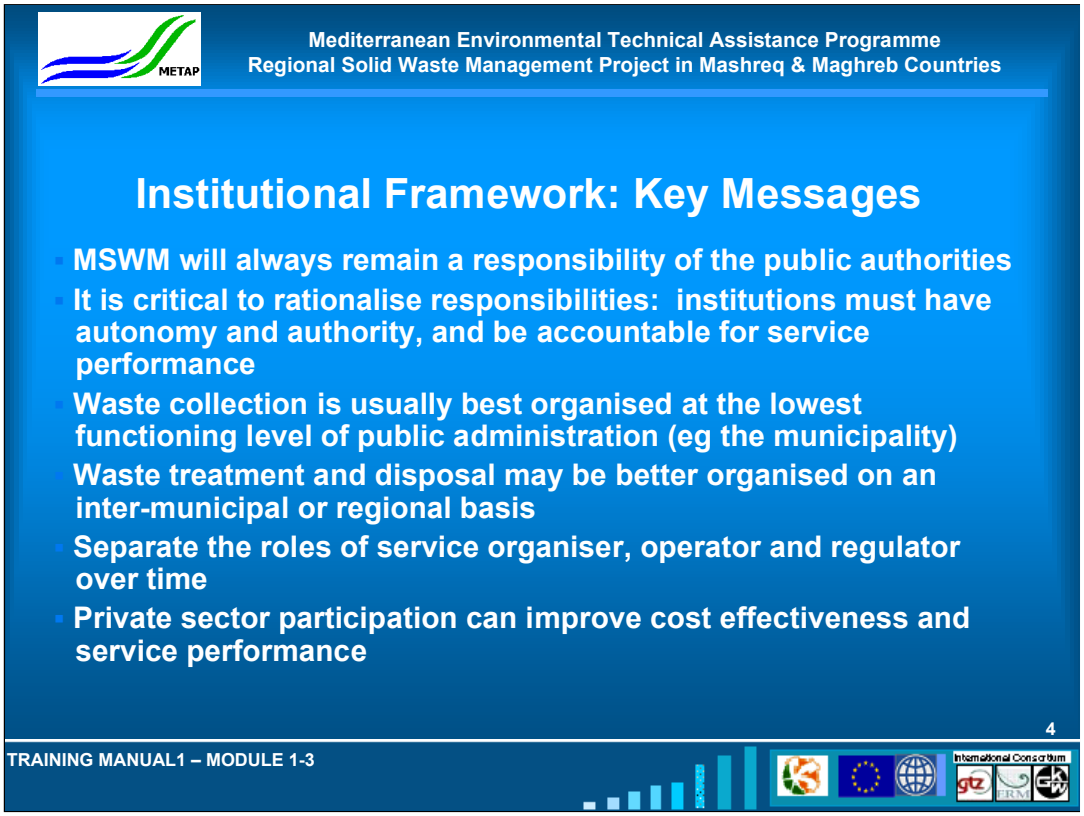
It is of primary concern to phase out uncontrolled dumping and to institute environmentally sound disposal practices. The focus should be on replacing open dumps, developing sanitary landfills and developing environmentally sound treatment methods as an alternative to final disposal. Integrated solutions combining landfill with composting, recycling and potentially other treatment systems will probably be the most favourable solution. Keep the waste hierarchy in mind.

**Financial Sustainability**

The financial sustainability of the new waste management system must be ensured. A financial policy framework based on sound financial and economic analysis of alternative options must be developed. The key focus is the need to collect a greater proportion of revenue from the 'customers' of the municipal waste service. The polluter-pays-principle must prevail.

**Public Awareness and Participation**

The most developed waste management systems are those in countries where there is a high level of public awareness and participation. The socio-cultural factors influencing how waste is discarded and attitudes to cleanliness and recycling are central. Creative approaches to raising the sensibility of the public to waste must be found, but any such campaign must be backed up with effective waste management systems.



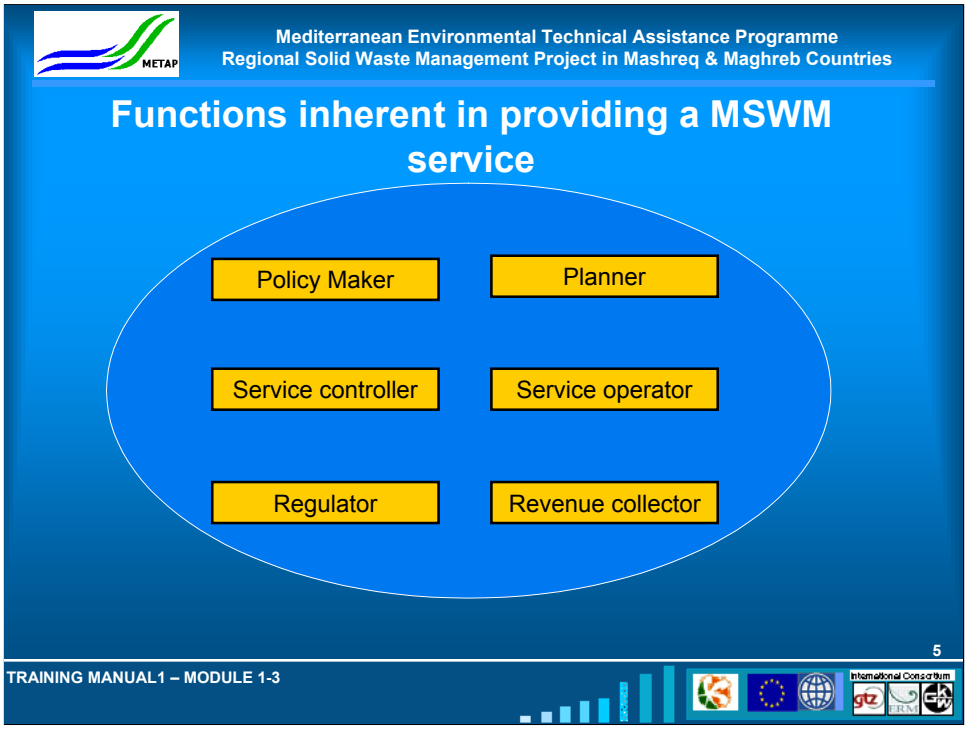

MSWM is essential to public health and environmental protection, and therefore the responsibility for ensuring provision of the service will always remain with the public authorities. One of the key features of MSWM, which makes it a challenging area of public policy, is that it exhibits the character of a 'common good'. As a common good, MSWM is an essential service that everyone has a right to. Collecting waste from one household/area benefits its neighbours, and failing to do so will place deteriorate neighbours quality of life.

It is of crucial importance to rationalise the roles and responsibilities of organisations involved in MSWM. Organisations need to have autonomy and authority if improvements are to be realised. There should also be single-source accountability and responsibility for poor performance.

Waste collection is usually best provided at the lowest appropriate level of municipal administration, but waste treatment and disposal may be best organised on a unified basis across the metropolitan area as a whole. Inter-municipal cooperation is thus essential

There are three major `functions' inherent within MSWM, the `Service organiser', `Operator' and `Regulator'. In order to create the right climate for improvement and development, the aim should be to rationalise and separate these distinct functions over time.

Private-sector participation in service delivery is one option for improving cost effectiveness. However, this depends on the three necessary conditions of competition, transparency and accountability MSWM organisations need to have the skills and resources to enable them to function properly. This will rely on sustained commitment to capacity building and institutional strengthening.




There are six distinct roles in providing a MSWM service.

**Policy maker:** Municipal SWM services take place within a policy framework which is generally established at national level, endorsed at the regional or local political level. At the local level, the policy makers within municipal government (ie politicians and senior civil servants) play a critical role in mobilising improvements to MSWM services.

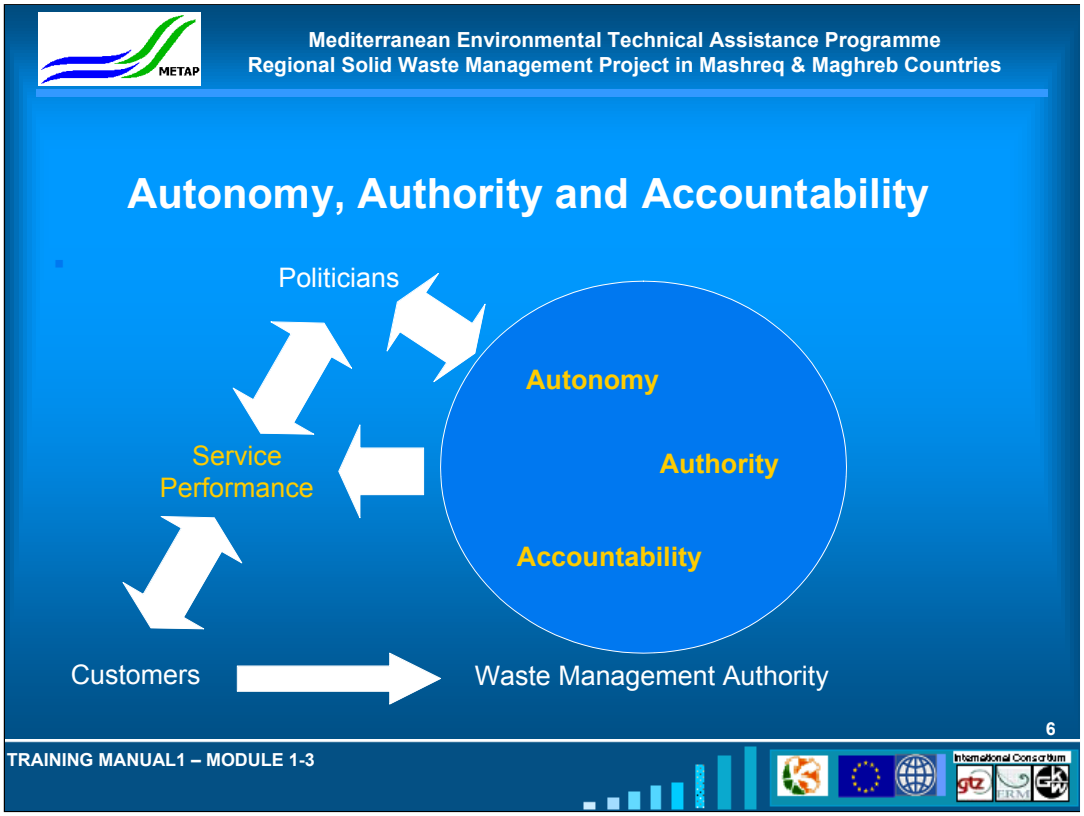
**Planner:** The planning function typically officially rests with planning departments within the municipal or regional government. The Strategic Planning Guide encourages this function to be taken up by a Steering Committee containing representatives of all key departments and other important stakeholder groups.

**Service controller:** The service controller function relates to the department which has the responsibility to ensure that a satisfactory service is provided, eg 'the Waste Management Authority', and that it meets the required standards of reliability, efficiency, customer relations and environmental protection. This is a vital function, which is often not clearly defined. Activities include defining standards of operations, agreeing these with the operator (potentially via a competitive tendering procedure), monitoring and enforcement.

**Service operator:** The service operator function relates to the authority, municipal company or private service provider who actually carries out the day-to-day operation of waste management services. Even where services are carried out in-house by the municipality, there is a strong argument for creating a separate service operations department, managerially independent but reporting to the service control department. Separation of these functions creates an opportunity to establish a service agreement, or contract under which the performance of the services is monitored and controlled.

**Regulator:** MSWM services need to meet certain environmental standards. Many countries have, or are in the process of, establishing independent environmental control institutions. They would typically, for example, be responsible for authorising and issuing permits to waste treatment/disposal facilities and for monitoring both the standards of design and construction, and of operation and maintenance, to ensure that proper standards of environmental control, as set out in the permit, are maintained during the operation of the ISWM facility. They would also police illegal waste disposal (dumping) at unlicensed facilities.

**Revenue Collector:** The municipality are typically responsible for paying for the overall MSWM service through its general revenues. However, revenue collection is often insufficient even to cover the costs of the existing service, never-mind paying for improved/extended services. It is likely that revenue will continue to need to be collected through indirect means, eg through property taxes, surcharges on other service bills eg electricity) or through transfers from regional or national government. However, there may be benefit in the service controller and/or service operator taking responsibility for collecting charges directly from users.




Waste management departments are often located at a low level in the municipal hierarchy. Waste management departments are typically under-resourced, under-staffed and under-motivated. This situation does not properly represent the true importance of the issue, remembering that MSWM is often the largest single item of expenditure in a municipality budget.

Improving MSWM can therefore be justifiably considered to be one of the most important areas for municipal governance reform. The slide presents three central principles which should guide this reform process.

Waste management departments should operate within a reasonable degree of autonomy. They should be provided with the resources necessary to do their job, including qualified staff. They should be provided with a clear mandate (including targets) and judged on a quarterly, biannual or annual basis for their performance against this mandate.

The managers responsible for MSWM should have the authority to control all the necessary functions for their organisation, and in return should take responsibility and accountability for discharging the roles of that organisation in a cost effective manner.

The fundamental judgement on whether the waste management department is operating effectively, and whether the managers should be replaced, is the quality of service performance. Developing indicators of service performance, eg cleanliness of streets, collection service coverage area, recycling and composting performance, environmental performance of waste disposal operations, number of complaints from the public etc, will help to provide an objective basis for this performance assessment.

Municipalities are often afraid to expose themselves to performance oriented management. Indeed the lack of ability to do this often results in a strong push towards private sector participation, as it is felt that an external body can be held to account for service performance more effectively. Whilst PSP may be a good approach to improving operations, there will always be a need for a publicly accountable waste management department to monitor these operations.


Collection and street sweeping together comprise the largest category of expenditure in most municipal budgets. Improving performance by 'doing more for your money' will allow resources to be diverted to expanding service coverage and improving waste disposal practices.

Every tonne extracted from the waste stream means that there is a tonne less that needs to be managed by the MSWM system. The most effective waste management systems are those that effectively combine high service standards with high rates of materials recovery and recycling.

There are many benefits associated with a functioning materials recovery system. The focus should be to support and build on the existing informal materials recovery sector.


There is always potential for improving the performance of waste collection services. Public sector-run services often suffer from a lack of internal pressure on improving effectiveness and efficiency; this is also the case for private sector services, especially when there are no real penalties likely to be incurred for poor performance.

Waste collection and street cleaning involves a large labour force as well as expensive vehicles and equipment. Professional management is therefore critical in this sector, in particular in relation to maintaining effective labour relations, workforce management and vehicle specification/management. Managers and supervisors must have detailed local knowledge and have a hands-on approach.

The most effective way of understanding your service providers' performance is to closely follow their operations. The performance of operations can be easily monitored by visual inspections of street cleanliness, regularity of picking up waste bins, and the standard of operations at waste treatment/disposal sites. Time and motion studies can be used to provide a snap-shot view of the efficiency of routes, productivity of staff/vehicles and areas where improvements can be made. A useful tool to help you carry out a time and motion study is provided in the Strategic Planning Guide – Annex4B.1.

The key is to continually search for productivity improvements. Typical opportunities include:

modify collection routes;

modernise the vehicle fleet and bins;

adjust working hours eg to carry out the majority of collections when there is minimal traffic;

reduce the number of collections per week (sometimes several collections are made per day in certain areas, and none in others) – test the effectiveness of collections, say, 2-3 times per week;

improve/streamline management structures to ensure clear lines of responsibility and reporting;

train staff, provide opportunities for professional development and boost their morale; and

introduce targets and incentives.

Introducing the private sector to certain areas of the city can have a dramatic effect on your understanding of what efficiency improvements are possible. Remember that the private sector works best in competitive market conditions, and must be monitored according to the same performance standards as the public sector operations. Look for ways of utilising the energy of community-based and informal sector in street cleaning or expanding operations to unserviced areas.

Finally, public awareness campaigns with anti-littering, anti-dumping or pro-recycling messages can help service providers provide a more effective service.


Recycling is viewed as the only waste management solution by many. Recycling strategies are often initiated as a reaction to public demand for a radical solution, and criticism of existing practices, but are often are not well thought through. The truth is that improving the performance of recycling systems is a complex and challenging subject, which is highly sensitive to fluctuations in the market value for different materials, both nationally and internationally.

In most countries there is an active informal recycling sector which operates on a purely market driven basis, without any government subsidy. When trying to improve recycling performance from the top down in a government inspired strategy, there is a great risk that in effect what is being attempted is the replacement of this efficient market driven system with a more cumbersome, bureaucratic one. The key is to build on the informal recycling sector system: try to build the recycling strategy on principles of increased productivity, market stability, and added value of products made from recycled material.

When was the last time you segregated your waste into different components? Or bought a product made of recycled material? The supply of clean, high quality recyclables into the system, and the availability of markets for products made from recycled material at the end of the system are the two most important influencing factors on the ability to improve recycling performance.


Policy support is essential to high levels of recycling. Much progress has been made in the last decade in Europe and elsewhere on implementing effective policy and legislation to drive levels of recycling upward.

The focus of these developments has been to establish systems of levying charges on producers, importers, packers, distributors and retailers of consumer products. Broadly termed 'producer responsibility', there are a range of different models which can be studied for their appropriateness to a specific country situation.

The Ecolef scheme in Tunisia provides an excellent regional model, and is worth studying in detail. In this scheme, revenue collected from producers is directed to a producer responsibility fund, managed by a national regulatory authority. This fund is then used to establish necessary recycling infrastructure and services, including local recycling centres where informal sector waste pickers can deliver the materials extracted from the waste stream and receive a payment according to the type, quality and weight of materials.

Producer responsibility schemes can also include systems of mandatory reporting of tonnages of packaging materials handled/manufactured by a specific company, and differential contributions depending on the nature of business, and the type of packaging materials used by that company. This can allow more fair and accurate apportionment of levies, although increases the complexity of regulation.


Phasing out dumping and replacement with controlled landfill is a priority. This approach should be complemented by the aim of moving waste management practices further up the waste management hierarchy.

With careful planning, design, construction and operation, landfill can be safe, cost-effective and environmentally acceptable. Landfill standards must be appropriate, and a step-by-step progression to high standards may be the best approach. Levels of MSW landfill operational budget and management expertise may be low, and therefore needs to be taken into account in the strategic plan.

Upgrading existing dump sites to controlled landfill standards is an important first step. Significant improvements can often be made at minimal cost. Upgrading existing sites will also demonstrate the municipalities' commitment to improved performance, and ease planning of new landfills.

Beware of 'magic solutions' being offered by waste treatment technology sales people. Do not become a testing ground for unproven technology, and make sure that any alternative technology proposal is thoroughly assessed before making decisions.

Significant potential exists for composting. Experience upto now has been that many composting initiatives are failing due to lack of professional management and attention to quality of product and marketing. Some good regional examples of successful compost production are available, in particular in Damascus, Syria.

Incineration may be appropriate in some locations. The technology is, however, associated with high construction and operations costs. Revenue potential from sale of electricity will only pay for a fraction of these costs.

It is worth considering the development of integrated waste management facilities combining sanitary landfill with recycling and composting.


Perhaps the most critical problem faced in attempting to introduce better MSW landfilling practices, are the additional costs likely to result. Current disposal costs by dumping are typically very low, and to many people (at least those who do not live near dump sites), final MSW disposal is `out of sight and out of mind', and therefore does not rank highly on their list of priorities as an issue requiring immediate attention.

Municipal engineers and planners facing severe constraints on the availability of land and localised public reaction to these dump sites typically however, consider it an important priority, but are faced with a lack of adequate operational budget.

Final disposal of MSW has its vicious circle. Because of its low priority, very little funds are provided to manage the site. As a result the site is usually a dump with all its negative implications and impacts. No one wants such a facility in his/her vicinity - creating the so-called NIMBY (Not In My Back Yard) syndrome. This makes siting of future landfills within reasonable distance from the city/town centre very difficult, pushing up transportation cost and leaving a far reduced financial balance for landfill management.

These same constraints have already been faced by countries in Europe and North

America in their attempts to increase landfill standards, the natural response was to develop standards gradually over time. The historical development of landfill standards over a period of 25 years is usefully illustrated in the form of a landfill stepladder.


At the RSWMP regional forum in Algeria, the following key determinants of success were agreed on by the participants.

Skill in producing compost product is essential;

Professional management is therefore critical;

Marketing can benefit from good links to trade bodies/unions/farmers co-operatives;

There is a need for a high demand for compost product and tested/demonstrated quality;

Source separation either before or at the compost facility is required;

Composting needs a strong policy priority – but a debate is required in formulating this policy as to whether it is a public service, economic/business activity, and the importance of combating desertification;

A degree of investment cost subsidy will be required;

Sale price of the compost vs cost of production must be balanced as far as possible;

There is a need to look carefully at the total costs, how the costs are distributed is a key issue;

Nowadays, modern technology/methods of composting which are cheaper and more efficient can be applied to reduce capital costs;

Combined landfill and composting can be a reasonable approach.


Waste treatment and disposal facilities may take several years to plan and implement. The various stages in this process are illustrated on the slide. The activities which need to be carried out within each of these stages are summarised below.

**Strategy:** initial political commitment, strategic need, environmental priorities, development alternatives, available financial resources.

**Action Plan**: site search, environmental scoping, public consultation, conceptual design, investment planning and affordability.

**Detailed Feasibility Study/Tendering:** environmental assessment, planning decision, specifications, financing, tender/contract documents, tendering, contract award.

**Construction**: detailed design, civil/structural works, supervision, commissioning

**Operation**: phased development, cellular operation (for landfill), operational controls, public relations, environmental monitoring.

**Closure/Aftercare (for landfill):** capping, restoration, monitoring, aftercare.


Detailed materials on financial and economical issues are provided in the Training Manual for Finance and Cost Recovery – within this series. The following provides a brief headline summary of some of the key issues to consider in the development of a Strategic Plan.

Strengthening the current financial management policy for MSWM services requires the design of a demand responsive set of services which are affordable and which are based on appropriate technology.

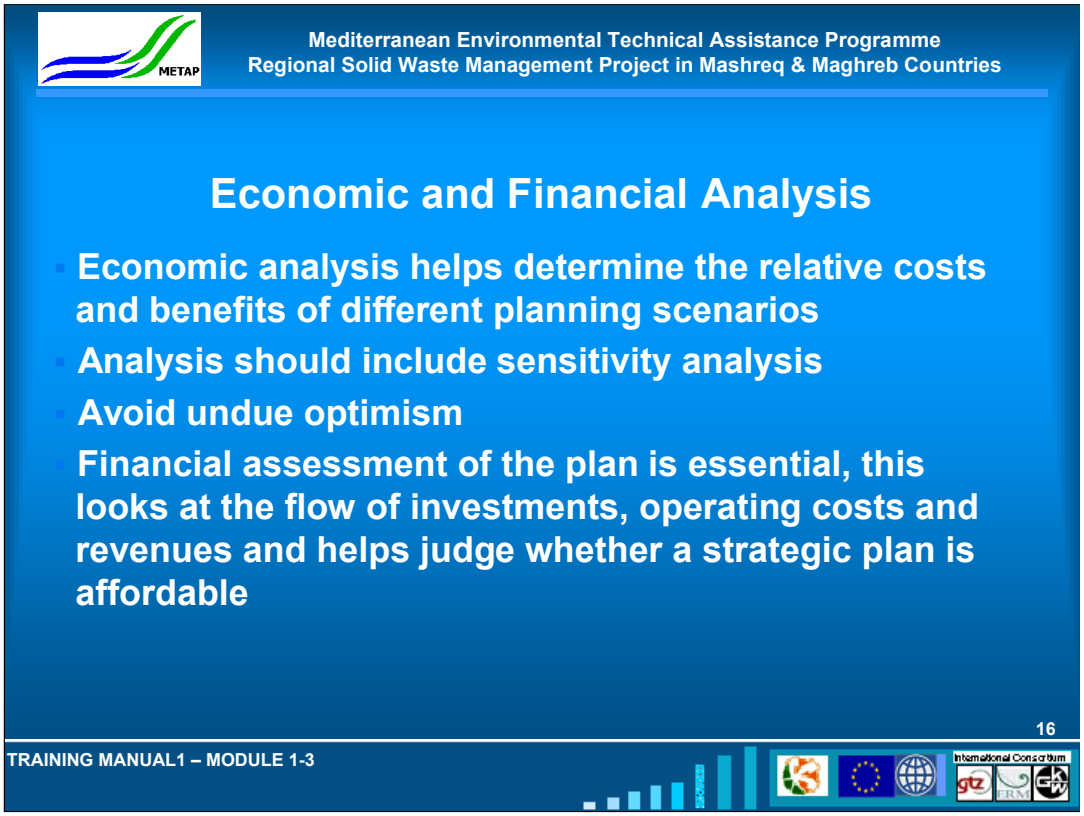
Responsibility and accountability for service quality and costs must be clearly focused within the management structure. A unified organisational structure should be adopted with separate cost and responsibility centres.

Increasing the cost-effectiveness of existing services ('doing more for your money') allows you to find new revenue sources to increase service quality and coverage.

Thorough planning for financing the recurrent costs of the strategy must be given equal if not greater weight than for financing investment costs. Service quality and cost-effectiveness can be improved only if performance indicators are available by which these can be measured.

Such performance indicators depend on the existence of proper financial and management accounting

The financial sustainability of MSWM services depends on the generation of sufficient revenue to cover equipment replacement and other long-term liabilities. A move from cash to 'accruals' accounting is essential.

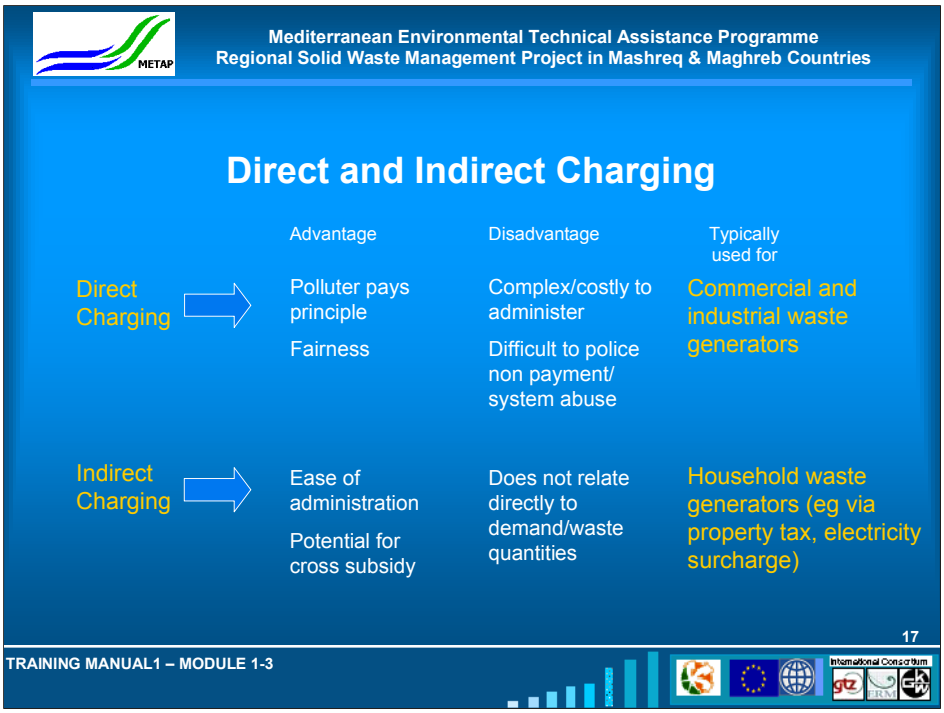



Municipal decision-makers need to be aware of the full economic and financial costs and benefits of the strategy and of its individual components

The sensitivity of the economic and financial analyses to key assumptions should always be examined. For example, what happens if the real revenues are only 50% of those predicted? Will this significantly impact on the ability to deliver services? A strategy of rolling out improved services over time as revenues allow may be appropriate.

A cost benefit or cost effectiveness analysis should be carried out to identify the economically preferred MSWM option. Undue optimism in the cost and benefit estimates should be avoided and all cost/benefit assumptions should be made explicit. Environmental and health benefits should be included where possible.

A detailed financial analysis should be carried out for the preferred project. This will help ensure that SWM system is financially sustainable in the long term.




The type of charging system to be introduced (or sustained) in a strategic plan is a fundamental issue which needs to be discussed. By involving across section of stakeholder groups, a good feeling can be gained as to the level and type of charging likely to be acceptable. In practice, the types of charging system available to a municipality will be centrally influenced by national legislation on municipal revenue collection. This slide briefly introduces the two main generic types of charging system for MSWM.

Direct charges relate to the level of demand for a service, and involve service users being charged directly for their use of the service (ie a bill for a specified amount of service potentially related to the quantity of waste generated by an individual premise).

The principal advantage of direct charges is that they relate directly to the level of demand placed on the service, and therefore conform to the 'user-pays' and 'polluter-pays' principles.

Disadvantages of direct charging systems are:

the difficulty in using withdrawal of service as a sanction to enforce payment;

the difficulty in sanctioning 'free-riders' ie those who use other peoples bins to avoid/reduce their payment

the cost and complexity of establishing and maintaining separate user-registers;

the limited scope for introducing a progressive element into the charge system (eg, cross-subsidies between rich and poor users);

the difficulty in measuring different levels of demand

Direct charges tend to be used more for commercial and industrial users than for domestic users. Some countries are experimenting with direct charges for domestic waste, where there amount charged depends on the volume or weight of waste collected. Examples use prepaid 'tagged' bags, or on-vehicle container weighing systems with bar-coded containers.

With indirect charges, three approaches are typically used: (1) for users to be charged the average cost of service, (2) for charges to be linked to the demand for another service, or (3) for charges to be linked to some kind of local government property tax.

The principle advantages of indirect user charges are:

administrative simplicity; convenience for customers; high potential collection ratios; the availability of sanctions for non-payment; revenue reliability and predictability; scope for cross subsidy; and scope to index the charge for inflation.

Indirect charging mechanisms tend to be used mostly for domestic MSWM customers, where the characteristics of demand are broadly similar, rather than for commercial and industrial users, where the characteristics are quite different.

The principle disadvantages of indirect user charges are:

related only indirectly to the level of demand for the service being provided;

depend on the linkages assumed between the demand for one service (eg, electricity or water) and the demand for the MSWM service;

is not strictly in accordance with the user-pays principle;

dependence on another agency to collect and administer the charge


Stakeholder awareness of SWM and environmental issues and their preparedness to participate in improvement of MSWM practices are closely linked.

The socio-cultural issues surrounding 'waste' and its management are complex. Each place has its own distinct culture, values and ways of doing things.

Major Objectives of Public Awareness and Education (PA&E) programmes for

SWM are to:

Inform the public of new waste management methods and requirements

Gain public support for MSWM initiatives

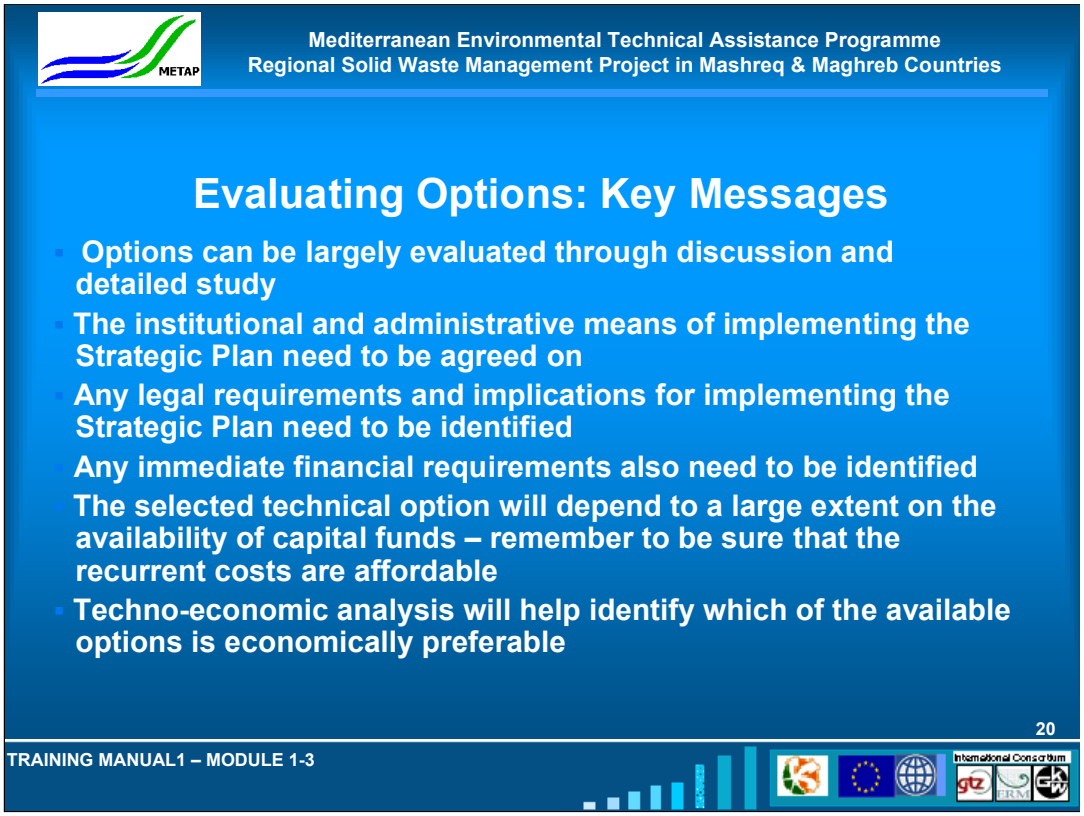
Improve the profile of MSWM


The high standards of waste management evident in Europe were not inspired from the top down by a policy initiative. The actions of environmental groups during the 1970s and 1980s led to a socio-cultural change, which has in turn resulted in policies, legislation, infrastructure and service being put in place to satisfy public demands, and protect the environment.

Environmental protection is now a major and thriving business. Most people have a desire to live in a clean environment, and are prepared to pay for environmental services as long as they believe that these services are being effectively provided, and the level of the cost is reasonable. Environmental protection is a fundamental part of the economy of all countries.

Most people support the principles of ISWM, but many do not feel empowered to make a difference. Turning ISWM principles into practice is a major challenge. New creative methods of capturing the imagination and the support of the public are required.

As a word of caution, it is important to never promise service improvements that you can not keep as the ensuing public cynicism can offset all the positive effects of public awareness and education campaigns.




Upto now in this Module, we have been presenting some of the options available for improving MSWM in five different categories. The presentations only touch on the issues, and do not go into much specific detail. This must be researched from peoples own initiative, and there is a vast amount of information and guidance available. No one person can be specialised in all aspects on MSWM – the subject covers an extremely broad spectrum of professional disciplines.

So, once options have been identified, how can they be evaluated? The simple answer is that discussion, debate and specialised study is required. One of the major purposes of Strategic Planning is to ensure that the right type of detailed work is carried out, and that time is not lost pursuing a specific, say, a technical solution which will not be acceptable to many of the key stakeholders. Strategic planning should provide a firm foundation for detailed location-specific work. This can be initiated during development of the action plan (see Module 5).

There is no particular magic or methodology to evaluating options. However the following points are highlighted for particular attention:

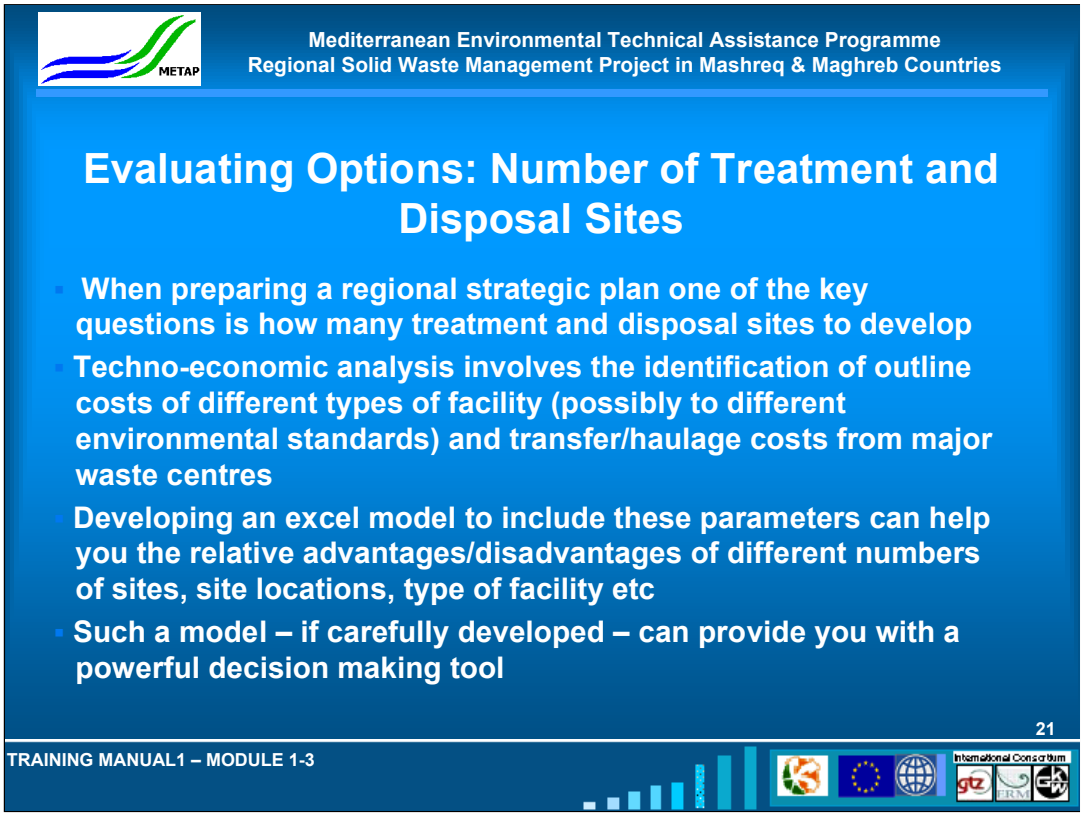
The institutional and administrative means of implementing the strategic plan need to be agreed;

Any legal requirements and implications for implementing the Strategic Plan need to be identified;

Any immediate financial requirements also need to be identified;

The selected technical options will depend to a large extent on the availability of capital funds – potential sources of funds need to be identified - and applications progressed. Remember to ensure that the recurrent costs are affordable;

Techno-economic analysis will help identify which of the available options is economically preferable.




One of the primary decisions that needs to be made in a strategic plan is how many waste treatment and disposal facilities need to be developed, and where the best locations for these facilities are. Module 6 deals with the identification of sites for ISWM facilities, and this Module looks briefly at how decisions can be made on the number of such facilities.

Given the high capital costs of many ISWM facilities, it is preferable to develop fewer, larger sites. In this way the financial resources and professional resources available to pay for construction and operations can be kept to a minimum.

However, there may be a strategic need for more than one facility to be built. This may be due to the quantity of waste being too large to be handled at one site, geographical and transport considerations, and also strategic issues.

Techno-economic analysis can be a powerful tool to assist in decision making. It involves the development of a cost/economic model to evaluate the economic impact of different possible development scenarios (possibly also including facilities which meet different environmental standards).

Information which will be required to construct such a model include indicative construction and operation costs of different types of ISWM facility, transport/haulage costs (preferably expressed as a cost per km), and haulage distances.

Referring back to Module 1, and the discussion on the historical technical-oriented approaches to waste management – such models are only a part of the solution, and should be used as an input to decision making.