

Government of the Republic of Macedonia

Waste Management Strategy of the Republic of Macedonia (2008 - 2020)

Skopje, March 2008

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On the basis of Article 16 paragraph 1 of the Law on Waste Management (Official Gazette of the Republic of Macedonia Nos. 68/04 and 107/07), the Government of the Republic of Macedonia, on the Session held on 11 March 2008 adopted,

WASTE MANAGEMENT STRATEGY OF THE REPUBLIC OF MACEDONIA (2008 - 2020)

EXECUTIVE SUMMARY

THE ROLE OF THE WASTE MANAGEMENT STRATEGY IN THE ENVIRONMENTAL POLICY OF MACEDONIA

General role of waste management strategy

The Waste Management Strategy reflects the national policy in waste management and represents the basis for preparation and implementation of an integrated and cost-effective waste management system. With this strategic document, the Republic of Macedonia defines the fundamental directions in waste management for the coming twelve year period (2008-2020), on the basis of recognition of serious impacts to the living and natural environment caused by improper waste management at present and in the past, and it determines the fundamental directions of the gradual waste management system set-up based on the hierarchy of the main principles of waste management and on the main principles of sustainable use of natural resources..

The Waste Management Strategy is a Government resolution, as an executive authority branch, and it predominantly represents the decisions of the Republic of Macedonia on the main environmental, economical and social goals, activities and measures towards mitigating the present environmental impacts and resolving the issues on waste management in the future. Harmonisation of legislation with the *acquis communautaire* as the inevitable process of the Macedonian approach towards membership of European Union represents only a useful tool in the establishment of an efficient and sustainable waste management system.

The Waste Management Strategy is a document on the aims and development of measures

- with the primary intention of overcoming the unacceptable environmental situation with regard to impacts of improper waste management on the air-, water-, soil- and natural environment as well as public health,
- with the follow-up intention to reach complete control over generated waste streams, to reduce the waste quantities and hazardous potential, to achieve the optimal material/energy recovery and final disposal of waste by means of the optimal and contemporary system of new infrastructure facilities and
- with the final intention to introduce cleaner production technologies and sustainable management of natural resources and waste, as well as to reduce emissions of greenhouse gases arising from waste.

Waste simultaneously possesses environmental and economic components. Waste is not only a generator of impacts to the environment, but may also be recovered and reused. All recovery phases of waste fractions usable for the production of new goods or energy represent the preservation of non-renewable natural resources. However, secondary raw material recovered from waste streams and

intended for material recycling and energy production need to find their market. But the prices of secondary raw materials recovered from wastes are not entirely left open to the free market, since they are subject to policy and goals set by society. Simultaneously, waste management represents in all process phases of collection, material and energy recovery a potential of new employment in service and production activities.

All members of a society shall take corresponding responsibility of waste because they appear as holders and producers of waste in three contradictory roles

- taking care of the quality of the environment, health and quality of life particularly for the coming generations on both a global and local level,
- generating waste and polluting the environment in daily activities and
- consuming of goods and services.

This is the reason a special status is given to waste issues and the success and efficiency of the implementation of the waste management strategy depends, beside the necessary capital investments and space related limitations, above all on the correct balance of legal, institutional, organisational, sociological and in particular economical/financial instruments.

A SHORT REVIEW AND AN ASSESSMENT OF THE CURRENT STATUS OF WASTE MANAGEMENT

Major problems of waste management and constrains in the Republic of Macedonia are present in almost all areas of the existing waste management system and in all relations in the society related to waste management: policy and legislative framework; organisation of institutions and human resources, cost recovery and financing of services and investments, stakeholder awareness and communications, all phases of technical management from collection to final disposal of waste, existence/remediation of environmental burdens, impact on public health and living/natural environment with the potential impact on the Macedonian economy.

The present waste management situation in Macedonia can be characterised as sub-standard with regard to human and financial resources, as well as insufficient and ineffective with regard to monitoring and enforcement, resulting in various dysfunctional systems in society and in many related negative effects on the environment and public health.

Waste management policy

Waste management is one of the most serious environmental issues in Macedonia. The general waste management policy with intention to overcome the current situation and to establish a sustainable waste management system was formed in the Law on Environment, in the National Environmental Programmes (NEAP 1996/2007), and in particular in the Law on Waste Management. The Law on Waste Management introduces new documents in waste management policy: Waste Management Strategy, National Waste Management Plan and Waste Management Programmes. Some policy initiatives in the NEAP (2007) are closely related to the projects of the Kyoto Protocol with regard to Clean Development Mechanisms. However, the present national policy setting and legislation are insufficient in a number of areas to comply with the requirements of the waste sector.

Current legal framework and transposition activities

The main national legislation regarding the waste management sector on a national level comprises only the Law on Waste Management, which is a cover regulation act and provides general rules applying to main issues on waste and on hazardous waste and on special waste streams; it also represents the legal basis for variety of secondary legislation, part of which is missing or is adopted on

the level of rulebooks or guidelines. The Law on Waste Management has important links to other Laws related to tasks and responsibilities regarding administrative, organisational and operational issues in waste management, in particular to the Law on the Environment, which includes basic stipulations on environmental permitting, EIA procedure and greenhouse gas emissions.

The current status of institutions and competent authorities

Tasks and responsibilities on the waste management field are in practice split among several institutions in the country, where certain overlapping can be observed among governmental institutions as well as between governmental and municipal institutions. Preparation, adoption and implementation of the main primary and secondary legislation shall be carried out jointly /in co-operation / through consultations /in agreement with other ministries, authorities, municipalities, production/service sector and other stakeholders, but it seems there is certain confusion over role and competency as well as a lack of communications and co-ordination.

Municipalities are formally responsible for extensive and demanding tasks related to waste management, but only a few of them have appointed the responsible divisions/persons in their administration structure and provided for adequate training.

Looking at tasks and obligations on the national and local level, all institutions inside MoEPP, other ministries, municipalities, and the production/service sector, which are responsible for carrying out the main tasks on waste management, have insufficient human resources, knowledge and experience to develop and implement all the relevant legislation, standards, instruments and investments to establish an integrated waste management system.

Stakeholder and general public awareness

There is a lack of an organised system for communications between MoEPP and other ministries, municipalities, industry and other stakeholders in the society to exchange information on waste management regarding plans, requirements and consequences of new regulations as well as to disseminate general information on waste issues.

The general level of understanding of the environmental and waste issues within Macedonia is low; actually, people are not aware of the risks and adverse effects of improper waste management on their health and on the living/natural environment. People are not aware of their role and responsibilities as producers of waste. On the other hand, public perceptions may manifest in strong opposition to any changes in the existing waste management practice; such perceptions are generally founded on genuine fears and concerns as well as on the insufficient level of information and on the lack of public access to information.

Economic issues

Sources for the cost recovery and financing of waste management operations are mainly direct charges for transport and disposal of waste. Fees for municipal waste management services are invoiced and collected directly by the public communal enterprises, they are based on flat rates that vary between municipalities, fee levels are low and the proportion of non-payers is frequently high. Flat rate fees for collection and disposal of commercial and industrial waste are charged by the public enterprises, mostly at higher tariffs than for the municipal solid waste.

These fees are invoiced and collected directly by the public communal enterprises as service providers and not by the municipalities, such a situation hinders higher participation of the private sector in waste collection activities.

Real costs of service delivery are not fully recovered and the regulation of the system does not enable the “polluter pay” principle to be enforced. The financial situation of public enterprises is getting worse, additionally due to the decline of the economy.

No raising fund on the State or municipalities level is present in order to start some tasks related to investment in new infrastructure; the preparation tasks which may lead to investments in the waste management infrastructure or in the remediation of hot-spots are carried out mainly by donor funds and by other international financial aids.

Environmental charges defined in the Law of Environment are not earmarked and thus become a part of the integral State's budget; collected charges may be used for the execution of waste management programs but in competition with other environmental programs.

Current waste streams and waste management practices

Collection, transport and landfill are the main methods for the final disposal of almost each of the waste fractions. An overview of the roughly estimated quantities of yearly-generated waste, including waste from mining, is shown in **Table 1**. Regarding quantities of generated municipal waste, one may expect waste quantities to rise by the rate of 1,7 % per year for 10 –12 years; changes of waste quantities from production/service/agriculture depend on the dynamics of economic development in the country.

Table 1: Estimated quantities of generated waste

Type of waste	Estimated quantity (t/year)
Municipal waste	420.000
Commercial waste (constituents similar to those in household waste)	150.000
Waste from healthcare institutions	1.000
Construction and demolition waste	500.000
Industrial non-hazardous waste	2.120.000
Industrial hazardous waste	77.500
Waste from mining	17.300.000
Agriculture waste – animal by-products	4.900.000
Agriculture waste – plant by-products	550.000
Used tyres	5000
Used mineral oils	8000
End-of-life vehicles	17.500
Used accumulators	3.500
Total	app. 26.000.000

Collection and transport of waste

Only approximately 70% of the population is involved in the public municipal waste collection system, which is performed by the public enterprises. Waste collection equipment and extent of services does not comply with the existing requirements. Collection of non-separated municipal and non-hazardous industrial waste, as well as non-separated non-hazardous and hazardous waste fractions is common practice. There are no officially licensed collectors and transporters of hazardous waste.

Scrap metals represent the biggest part of the collected recyclable materials. The extent of separate collections of other recyclable waste fractions depends only on the market conditions. Only those types of non-hazardous and hazardous waste are separated that can be sold. Separate collection is largely carried out by the informal sector.

There are no formal collection systems for construction and demolition waste as well as for the high-risk animal tissues from slaughterhouses and animal breeding farms.

The level of management of hazardous and other non-hazardous medical waste within the hospitals is generally low.

Treatment, recovery and recycling

The recovery and recycling activities for municipal waste are very limited and without any organised approach. Generally, the recovery of many types/grades of potentially recyclable materials is not financially viable under the prevailing conditions. Mostly the informal sector and private companies deal with collection and recycling of potentially recyclable materials such as metals, paper, plastics, car batteries and accumulators, waste oils etc. in scrap yards with potential impacts on the environment and public health.

The recycling market for plastic in Macedonia is underdeveloped. However, there is a well-established network of collectors and/or brokers, as well as a strong and stable market for recovered scrap metals.

A large part of the plant tissue produced in agriculture is reused in an environmentally sound manner. Manure generated by cattle and sheep is completely used for soil fertilisation. Composting and anaerobic digestion of organic waste are generally not in practice or the existing facilities are not in operation.

The largest volumes of hazardous waste are generated by the metallurgical industries and generally stored on non-compliant dumps on the companies' premises. The majority of hazardous waste oils generated in the production sector and in other activities are currently burned as fuels.

PCB oil containing transformers are suspected to be still in use in the energy supply system as well as generated in some other industries and products. However, there is no local laboratory to perform the necessary analyses of possible PCB/PCT sources in Macedonia.

Final disposal of waste

Available facilities and capacities for disposal of wastes are inadequate and current waste management practices contribute to the pollution of air, water resources and land as well as the risks for biodiversity, agricultural land and human health. Almost the only method for the final disposal of waste is deposition on landfills; only some hazardous waste from health institutions and some liquid hazardous waste are incinerated and co-incinerated, respectively.

Most of the ***municipal solid waste*** and other collected waste fractions are deposited of without any pre-treatment at municipal landfills; different types non-hazardous and hazardous waste such as used tyres, car accumulators, oily car components and other waste are disposed of at "wild" dumps. Landfills are operating without operational permits with only one exemption, without any of the techniques usually applied at landfills and without any regular monitoring with regard to impacts on the environment. There is no evidence on delivered waste and even no visual inspection regarding the characteristics of waste to be disposed of. Deposition of mixed hazardous and non-hazardous waste and burning on open air fire of the municipal waste, plant tissue waste and plastics represent the most serious risks and impacts on the environment. One third of the existing 51 landfills is categorised according to the assessment of their environmental risk to the highest risk class and they need priority closure or remediation.

The ***hazardous waste*** generated by Macedonian mining and processing industries faces severe problems: some process waste dumps are abandoned, little or no information is available on the history of the dump sites and their environmental impact, and the legal heritage is not clear. 16 major industrial areas and dumpsites are identified as "hot-spots" with regard to the detected impacts on the environment and regarding their high hazardous potential.

The management and disposal of animal tissues from slaughterhouses and animal breeding farms is currently burying it in holes in the ground on the farms in question or throwing it onto village dumpsites. In both situations, disposal takes place with little or no involvement and supervision by official veterinarians in a mainly uncontrolled manner and far from the required sanitary standards.

Final disposal of pesticide contaminated packaging and other specific agrochemical waste involves burning on open-air fires, or by dumping it together with municipal waste; residues of pesticide solutions are usually discharged into the water environment.

STRATEGIC CONSIDERATION AND GOALS OF WASTE MANAGEMENT

Strategic issues

The development of the Republic of Macedonia towards a sustainable waste management system will require further approximation of the national legislation with the EU one, changes in institutional organisation and in general waste management practice. Successful changes in waste management can be initiated by the Government by setting strategic objectives and goals of the contemporary waste management practice taking into account existing environmental damage and by using its legislative and regulatory power; but final success in practice can only be reached if all members of society understand the relationship between non-proper waste management and adverse effects on the environment and public health, if they become aware of their responsibilities, obligations and tasks in waste management, and if they are encouraged by organisational and in particular by economic measures.

Newly established infrastructure facilities shall represent the reliable technical basis for waste management operation, enable additional technological and spatial expansions and, as far as possible, retain a degree of operational flexibility.

Financing of the set-up of the new waste management system as well as of the remediation of environmental burdens shall be carefully considered. Coverage of capital investment costs and operational costs is an important factor for a country with 2 million inhabitants and with small streams of waste where the effect of economy of scale is especially exhibited regardless of the waste recovery, treatment or final disposal process.

Other specific issues of the waste management system are almost complete absence of the private sector, limited local markets for materials and products recovered from waste, no economic encouragement for investment in facilities for energy recovery of waste. The low living standard of the average population and difficult financial situation of the production sector represent another constraint to a faster approach of the full application of the “polluter pay” principle.

Substantial costs are needed for the necessary closure and/or reclamation activities of old or abandoned municipal and industrial dumpsites, in particular “hot-spots”. However, the system funds necessary for (co-)financing the remediation of some “hot-spots” in general is not available because of stopped production and unclear legal heritage.

Public perceptions of the waste management issues can be manifested as strong opposition to necessary changes of behaviour because of genuine fears and concerns, because of a lack of information and understanding or because of distrust of the new system solutions due to historical reasons. Fundamental strategic achievement regarding public perceptions of waste management shall be the qualitative shift in the understanding of the waste problem as a whole.

General strategic goals and objectives

Goals and objectives in the waste management strategy reflect the generally agreed *national policy* in waste management and represent the basis for preparation and implementation of an integrated and cost-effective waste management system, which means a tool to bring under control all generated waste streams, to decrease the quantities and hazardous potential of waste generated, to recover the material and energy value of waste, to assure environmentally acceptable final disposal, to prevent the formation of new environmental burdens to be solved by the coming generations and how to remediate existing environmental burdens that exhibit adverse impacts on the environment and public health.

Strategic goals shall be harmonised between all segments in the society and in main principles with requirements of the co-operating economic environment, i.e. EU countries. Harmonised goals and objectives of waste management shall be integrated into development plans at the national and local levels and in plans of the predominantly private owned production and service sectors.

Overall strategic goals and objectives shall reflect the commitments of all parts of Macedonian society with regard to the significant, equally important and closely interrelated changes in waste management:

- harmonisation of the *policy and legislation* on waste management regarding the political agreement in the society and requirements of the co-operating economic environment;
- establishment of effective *institutional and organisational arrangements* in all phases of implementation of the new integrated waste management system: planning, permitting, financing, operating and enforcement;
- strengthening *human resources* and capacity in the public and private sector involved in the establishment process of the waste management system, as well as encouragement and engagement of knowledge, technical know-how and economic potential available in the country;
- introduction of stable *financial resources* and adequate *economic mechanisms* to assure the full cost recovery of providing for the integrated waste management system according to the "polluter pays" principle and to the maximum effects regarding investment and operational activities;
- raising *public awareness* and *awareness of all stakeholders* in the society from the viewpoint of understanding their roles, responsibilities and obligations in the waste management process and in the protection of the environment in order to accept significant changes of the waste management practice from collection to the final disposal.
- establishing the *data collection/information system* on the sources, nature, quantities and fate of waste streams as well as on the facilities for material/energy recovery and final disposal of waste and assuring necessary public access;
- establishing the *contemporary technical waste management system* which takes into account different technical options regarding waste avoidance, lowering their hazardous potential and reduction at sources, material/energy recovery and utilisation of waste and safe final disposal of stabilised residues according to "best practicable environmental option" with the aim of preservation of non-renewable natural resources and minimal emissions and adverse effect of the waste treatment/disposal processes on the living and natural environment as well as on public health;
- application of *efficient and cost-effective techniques* for the management of segregated waste streams by means of private sector participation to achieve a 100% waste collection rate and optimal level for material/energy recovery of waste;
- introduction of *landfills for hazardous and non-hazardous waste* and other facilities for final disposal of waste compliant with contemporary standards to prevent the appearance of new environmental burdens;

- progressive *closing down and/or remediation of existing municipal dumpsites* and/or *industrial “hot-spots”* according to the inventory of environmental burdens and corresponding criteria that particularly take into account adverse effects and risks to the environment, future utilisation of physical space, costs of rehabilitation, and acceptability by the population

Main principles of waste management

Application of the *key principle on waste management*, i.e. waste management hierarchy, proximity principle, self-sufficiency, producer responsibility, polluter pays principle, the precautionary principle shall represent the basic support to the Macedonian policy to improve the present situation in waste management on the one side and to develop the rational and sustainable use of natural resources in the future on the other side.

Waste management, as an integral part of *sustainable management of natural resources* shall, together with the integrated product policy and with the integrated prevention and pollution control policy lead to the proactive integration of the resource-related environmental issues into other policies of the Macedonian society.

Reuse, recycling and material/energy recovery processes of waste fractions shall be encouraged in order to improve the use of resources and only unusable fractions shall be put to landfill. Proper management of biodegradable waste present in municipal waste and in waste from wastewater treatment, in agriculture waste and in waste from the food and beverage industry may significantly contribute to the reduction of greenhouse gas emissions. Such an approach means that every item of waste is seen not only as a source of pollution but also as a potential resource to be exploited and it shall result in de-coupling of economic growth and quantities of generated waste.

However, the Macedonian waste management policy shall incorporate some additional principles and obligations, in particular those related to the clear distinction and management of hazardous and non-hazardous waste, to encouragement of priority application of economic instruments in preference to legal instruments and to the establishment of the supervision/control systems regarding shipment of waste inside state territory and when hazardous waste crosses the state border regardless of intended management.

Strategic characteristics of the general waste management scheme

Basic principles for development of Macedonian waste management scheme

The application of basic waste management principles represents the basic framework for the gradual development of the general waste management scheme from sources of the generated waste to the final disposal of the treatment residues, taking into account the involvement of some temporary management measures and existing environmental burdens caused by improper waste management in the past.

Development of the waste management scheme applying basic waste management principles shall be mainly focused on the topics which are generally applicable in waste management, and simultaneously reflect the characteristics of the Republic of Macedonia: solving the waste problem at their sources, separate collection of waste streams, waste utilisation as a substitute of natural resources, rational network of treatment and disposal facilities, rationality of space management and preservation of natural and cultural heritage, landfill of the stabilised and low volume waste residues and remediation of environmental contaminated sites, i.e. “hot-spots”.

The principle of *solving waste problems at their source* means the direct or shared responsibility of the waste holder/generator for waste throughout its entire lifetime, to control and collect individual waste streams, to register their quantities and characteristics and to provide such treatment and disposal operations that are according to regulations, acceptable from the environmental and from the economic aspect. Additional responsibility is given to the manufacturers-waste generators, which are

only able to prevent the generation of the production waste, to recover the process energy from waste streams, to organise recovery/utilisation of end-of-life products and to minimise the quantities and hazardous potential of waste to be disposed of.

One of main priorities is to establish the system of *separate collection of waste* according to their hazardous characteristics, according to their point-source or dispersed-source generation and, according to intention of further management, which shall be acceptable from the environmental and economic aspect. Special priority attention shall be paid to the separation of hazardous and non-hazardous waste streams at source and to the separate final disposal of those streams. One of the first priorities also represent the involvement of municipal waste including waste from small services in the organised collection and disposal system for mixed residual waste.

A collection network with the intention to utilise valuable constituents of *end-of-life products* that is based on the “producer’s responsibility” principle, shall be organised by the manufacturers, importers, distributors and retailers of products and by the specialised service enterprises; some favourable and early effects may be expected regarding material/energy recovery of waste, lower waste quantities in landfills and employment at relatively low investment and operational costs.

As the waste may represent secondary raw material, sustainable waste management means an optimal utilisation of potential resource of *waste as a substitute for non-renewable natural resources* taking into account economic, environmental and social aspects. Such sustainable development may open the options for recycling of waste fractions separately collected at their sources, and for production of biogas and soil-like materials from different industrial, agricultural and even household sources. For a country with low natural energy resources renewable energy resources like waste wood, animal by-products, manure, sewage sludge and other types of biomass may become comparatively more and more important raw material for the production of gaseous, liquid and solid fuels from waste.

Establishment of a *rational network of waste treatment and disposal facilities* having the granted permits to carry out appointed waste management operations, is one of the main, priority and inevitable tasks of Macedonia in order to preserve and improve the quality of the environment and to assure the basis for its future economic development. In the first priority, the improved and new waste management infrastructure shall be established for collection and final disposal of *municipal solid waste* on the *regional level* which shall comprise more than 200.000 inhabitants in order to achieve the adequate economic thresholds for investment and operation of the municipal waste management facilities and acceptable prices for executed services.

Establishment of the network of new, improved or remediate *infrastructure facilities for hazardous waste management* has high priority in order to assure the safe treatment/final disposal of hazardous waste from industry, from health institutions and from animal breeding farms and slaughterhouses, as well as to recover some material/energy value of waste fractions where economically acceptable.

The network of the collection, storage and pre-treatment facilities for *special waste streams* shall be planned on the basis of results of feasibility studies where available markets for recyclable material and end-of-life products or for some of their fractions shall be taken into account, optionally within the country or in some of the neighbouring countries. Special waste stream and some end-of-life products may be managed mainly by small private enterprises under administrative permits for specific waste management operations

The territory of the Republic of Macedonia represents a national value and the basis for economic and social development of the country, it requires *rational and environmentally safe use of land* intended for agriculture, manufacturing activities and for settlements, as well as rational use and protection of water resources, soil as well as natural and cultural heritage. Waste management plants shall be placed in spite of controlled emissions in areas appointed for manufacturing activities at acceptable distances from settlements.

Landfill represents the most undesirable option in the waste management hierarchy but it is the unavoidable disposal option for the unusable part of generated waste or for waste residues after various recovery, recycling and treatment processes. Residual waste may disposed of in *landfills* only as *stabilised, non-reactive material* or it shall be pre-treated prior to landfill in order to stabilise the waste, to minimise the deposition volume and to reduce the mobility of harmful and hazardous

substances as well as their emissions by emissions to air and by leaching water out of the landfill facilities.

Remediation of contaminated sites – “hot-spots”, i.e. industrial contaminated areas and non-compliant municipal and industrial landfills, may significantly contribute to the reduction of negative impacts on human health, agricultural land, biodiversity and natural environment and not finally, on the quality of the food products on the Macedonian and other markets. The priority of closing and/or remediation of such environmental burdens depend on detected risks and/or on direct impacts on the water and soil environment and on the nearby placed settlements. A completely new system of the environmental liability involving legal, institutional and financial mechanisms shall be established to solve problems of the “hot-spots” remediation in the future.

Main characteristics of general waste management scheme

The general waste management scheme represents an outline of the basic interrelated technological - technical measures and introduce the basic principles of the more-phase development of the technical waste management system in Macedonia; the complex of technological and technical measures shall serve as an efficient tool in order to increase of the waste collection rate, to reduce the quantities and hazardous potential of waste at source, to increase the material/energy recovery of waste, to build new and reconstruct existing landfills for stabilised hazardous and non-hazardous waste residues according to contemporary standards and finally, to remediate the contaminated areas.

General ***management scheme for municipal waste*** means parallel and consecutive technical options covering the necessary measures from collection, storage, recovery of usable waste fractions and different treatment to the final disposal of stabilised, non-reactive waste residues.

Reduction of municipal waste quantities at source may be achieved fast and at low cost by encouraging the multiple use of the primary packaging, by the composting of household biowaste on gardens and by composting of green waste from public and private green surfaces.

Successful reduction of hazardous constituents in municipal waste depends mainly on the application of less hazardous constituents in products and packaging available on the market.

From the technical viewpoint, the main ***collection measures*** for the mixed municipal waste are collection by means of adequate collection vessels, waste transfer stations and collection vehicles, as well as by the organised collection system for bulky waste and appointed recyclable materials by performing kerbside collections or the “bring-system” option to accept waste fractions at new facilities, i.e. “recycling yards”.

The collection of some usable end-of-life products, like secondary and tertiary packaging, used tyres and end-of-life vehicles may be organised at low cost at markets, storage and distribution centres, tyre and car-repair services and authorised breaker’s yards, respectively, as well as by a specialised collection network mainly according to the “producer’s responsibility” principle.

Separate collection of municipal waste fractions shall be implemented with some retard in settlements with more than 50.000 habitants by means of organisation of kerbside collection, by distribution of “collection islands” in settlements or by “recycling yards”, which accept the appointed recyclable constituents.

A mechanical-biological treatment (MBT) plant seems to produce optimal quantities of waste fractions which may serve ***as substitutes for natural resources***: the secondary fuel for the appointed waste-to-energy plants, different metal fractions for recycling processes and residual heavier fraction intended for anaerobic biological treatment where biogas is produced and utilised for electricity and heat production. Stabilised residues from MBT processes may be disposed of as prepared artificial soil for general long-term remediation activities in highly polluted mining and industrial landfill areas.

Recovery, recycling and other kinds of *utilisation of end-of-life products* may be carried out on different technological levels regarding the specific characteristics of the products, available facilities for recovery, recycling and final disposal, and the economy of scale. Fractions recovered from end-of-life products may enter different recycling and final disposal processes, which shall be available in Macedonia or other countries.

Network of the municipal waste regional landfills which are built, equipped and in operation according to EU standards on landfill of waste shall correspond to the established waste management regions as the obligatory associations of communities for the common solving of municipal and other non-hazardous waste issues on the optimal economy of scale. Conceptual solutions regarding constructions and operations of the landfill facilities possessing environmental permits are based on possible re-constructions of existing landfills exhibiting medium and low risk to the environment in order to assure temporary disposal of waste and on construction of new landfills on new locations or by reconstruction of the existing low-risk landfills.

Among the *waste treatment facilities*, the mechanical biological treatment (MBT) plants for municipal waste, waste-to energy (W-t-E) plants and biogas production/utilisation plants may play important roles in approaching sustainable municipal waste management of the second development phase.

Municipal landfills that represent a high risk to the environment shall be closed down, by applying different *technical remediation measures* so as to mitigate any environmental impact.

The technical concept of the *healthcare waste management* is based on the strict separation of waste fractions according to different levels of risk and to calorific value. Final disposal may be carried out by the high efficient central incineration facility or by more disinfecting facilities and by the landfill of residues.

Construction/demolition waste may be utilised after pre-treatment in the same technical branch either as raw material or as additives, combustible fractions may be used for secondary fuels; unused residues shall be disposed of on mono-landfills. Asbestos, as a hazardous fraction of the construction/demolition waste, requires special techniques of collection, handling and final disposal.

Development of the *industrial non-hazardous and hazardous waste management* is strongly related to restructuring of the manufacturing, metallurgic, thermal-energetic and mining enterprises which are responsible for their waste. Expected results of industrial restructuring, in particular during the adapting to the IPPC directives, are efficient *measures of the waste minimisation at source*, i.e. more efficient utilisation of raw materials and energy, more intensive internal or external recycling of the production material streams, utilisation of less hazardous substances in manufacturing of products, immobilisation of hazardous substances in waste before landfill and strictly separate final disposal of hazardous and non-hazardous waste.

In spite of the application of efficient technical measures to reduce quantities and hazardous potential of waste from industry and thermal-energetic plants, *reconstruction and remediation of landfills* for hazardous and non-hazardous slag and ashes shall be carried out according to the contemporary standards on landfill of waste.

For *smaller hazardous waste generators*, a proper management system shall be established consisting mainly of collection and storage depots and of a central hazardous waste processing and disposal facility; for some hazardous waste fractions, incineration and/or co-incineration may be the feasible option, some, such as PCB waste, may only be exported for adequate treatment.

The management concept for *hazardous waste from mining processes* shall be made by means of the strategic consideration and guidelines related to the legislation on mining and based on assessments of risk and impact on the environment.

Proper ***management of by-products from agriculture*** and some related manufacturing activities, like animal manure, animal tissues and variety of plant tissues, is closely related to execution of the “good agriculture practice” and to the utilisation of such by-products as renewable energy sources. Special priority shall be given to an economic viable structure of separate collection of animal tissues belonging to the different risk classes, and an adequate network of treatment and disposal facilities of separated waste animal tissues shall be established, in particular rendering facility for high risk animal tissues (hazardous waste).

Proper collection, handling and final disposal of toxic agrochemical residues (insecticides, fungicides) and contaminated packaging shall be organised by means of a return system by the distribution, trade and production sector.

Continuous improper management of hazardous residues from metallurgical and chemical industry and thermal power plants resulted in ***industrial contaminated sites and landfills***. Applying ***criteria on hazardous properties*** of waste, contaminated areas are assigned as “hot-spots”; applying ***criteria*** on the local hydro-geological conditions and ***on the proven or potential contamination*** of the soil and water environment, the contaminated areas may be ranked as high risk, medium risk and low-risk “hot-spots”. Remediation projects of high priority shall be performed for the high risk hot-spots and for those for which funds may be raised; remediation technologies and technical design shall be chosen from the variety of available technical methods and adapted to the individual “hot-spot” and to the specific requirements of local environment.

MEASURES FOR IMPLEMENTATION OF WASTE MANAGEMENT STRATEGY

Establishment of the functional network of the collection, treatment and disposal facilities, is mainly determined by the dynamics of investments in waste management facilities, by economic and other measures which stimulate investments, and by measures which assure that the operation costs of the entire waste management sector are fully covered according to the “polluter pays principle”. However, the investment dynamics shall balance with the economic development of country and with the living standard of the population on the one hand and on the other with the costs of unfavourable scenarios and with long-term and linked environmental and economic consequences if the main issues regarding the waste management are not solved.

Successful operation of the technical waste management concept in practice depends on providing for full political consent and favourable conditions for implementation of the inter-linked key measures, i.e. waste management legislation, institutional and organisational measures together with the strengthening of human resources, economic measures, protection measures of the natural and cultural heritage, measures for raising stakeholders and public awareness regarding waste issues as well as encouragement of research and development activities.

Implementation of a sustainable waste management system is a gradual process, which however, involves the realisation of selected legal, institutional/organisational and in particular economic measures of high priority in order to reach the necessary progress in those areas, where implementation implies fundamental changes in various inter-linked social and economic activities.

Waste management legislation

The incorporation of the main rules, principles, obligations, allocation of responsibilities and proper operational structure on waste management aligned with *acquis communautaire* into the national legislation framework is one of the main tasks in order to overcome the problems related to the priority waste streams, in particular hazardous waste, and to stop environmental pollution caused by the current waste management practice, to establish the legal order and the new contemporary waste

management system in Macedonia and to successfully lead the Macedonian accession process towards EU integration. Waste management legislation shall be linked to the horizontal legislation regarding environmental issues and international treaties as well as to other related national legislation regarding general administrative procedures, investment constructions and physical planning, mining, economy and financing, local self-government, public enterprises and concessions.

Full incorporation of the Waste Framework Directive, Hazardous Waste Directive and Directive on Landfill of Waste into the national legislation framework shall be carried out within a short-term schedule and also implemented as the first priority. All these directives set the basic rules, principles and the structure for the proper operation of the general waste management system as well as the main rules and stipulations on landfill locations, constructions and permits, on landfill classification and on the corresponding acceptability of waste, on monitoring and on measures after the closure of a landfill. National legislation with regard to the landfill of waste shall also stipulate obligations and rules on the management of non-legal landfills and wild dumps as well on the remediation of the relatively high number of “hot spots”.

In parallel, general rules on the waste incineration/co-incineration, the limits on air emission and water discharges shall be regulated on the same regulation level in the legislation framework like obligations and rules regulating the landfill operation, and other main directives on the management of special waste streams shall be transposed into the national legislation framework.

To manage priority waste streams successfully and in a sustainable way, the priority of protection of public interest, i.e. environment, over the individual beneficiary shall be assured as well as the economic measures adequate for a specific waste stream, and obligations with regard to the “producer’s responsibility” principle and to the full cost recovery for waste management operations shall be developed and incorporated in the legislation; such stipulations shall be adopted by the legislative body and implemented in operation of the waste management system.

Institutional and organisational measures and roles of the main stakeholders for the implementation of waste management strategy

Strengthening of institutions on a national level

Institutional reorganisations and strengthening, additional and well trained human resources as well as good co-operation and harmonisation between sectors on the national level shall be required in order to implement the Waste Management Strategy, with regard to the legislative, institutional and organisational tasks, technical and economic/financial measures and public awareness projects, as required on the one hand, and with regard to the development and implementation of monitoring, supervision and enforcement mechanisms related to the operation of waste generators and waste management infrastructure facilities on a national and local level (municipal waste management in disposal facilities, industry, other waste generators) on the other hand.

The Waste Management Unit within the Administration for Environment of the MoEPP shall become the central agency for waste management with the constant organisational task to establish, develop and successfully implement the Macedonian waste management system by planning, permitting, registration and authorisation, data collection/handling/reporting, by preparation of tenders, technical and economical studies, by leading waste dumps closures and “hot-spots” remediation projects, as well by implementing EU-funded projects. With time, and in line with the competences, this Unit should be transformed into Waste Management Department.

The strengthened Integrated Pollution Prevention and Control under the Department for Industrial Pollution and Risk Management within the Administration of Environment shall have the key role in integrated environmental permitting concerning existing and new landfills and new facilities for non-hazardous and hazardous waste disposal. The control over the enforcement of integrated environmental permits and adjustment permits with adjustment plans shall represent basic tools in the

application of environmental protection in terms of waste management. Close link and cooperation shall be established with the Waste Management Unit and with the State Environmental Inspectorate.

The strengthened Public Relations Office of the MoEPP shall play the leading role in co-ordination tasks related to the rising of the public awareness and to contacts with waste generators regarding environmental issues.

The Environmental Inspectorate shall be generally responsible for monitoring/supervising/enforcement of the manufacturing and service sector with regard to the management of all types of waste, and the operation of the waste treatment/disposal facilities. The Environmental Inspectorate as an integral part of the MoEPP shall be organised on a national and regional level with established departments or units in order to achieve better rationalisation of work and human resources in this field.

By means of strengthening the human and technical capacity, the Environmental Information Centre shall increase the scope of data collection activities and assure reliable public information by sharing data collection activities with other authorised institutions and by processing and maintaining the central database on the waste issues.

Strengthening of institutions on a local level

Municipalities are in principle responsible to provide for the proper management and disposal of municipal waste on behalf of their inhabitants. By accepting the regional level of solving the municipal waste issues, municipalities shall appoint and train responsible persons for activities related of the establishment and operation of regional systems of the municipal waste management from the legal, organisational and financial viewpoint.

Regional municipal waste management companies (RMWMC) shall be established by the consortiums of municipalities with the consent and/or participation of the MoEPP and they shall take over the majority of responsibilities and tasks on planning, leading investments, public relations and on the organisation of other activities related to municipal waste management originally addressed to municipalities, and on organising municipal waste management and final disposal of residues on behalf of the joint municipalities and their inhabitants. Involvement of the private sector, through concession or public private partnership shall be encouraged as mechanism for provision of economically optimal solution that shall be also acceptable from environmental point of view.

Tasks, obligations and responsibilities of the manufacturing and business sector, inhabitants, non-governmental, educational and scientific institutions

Manufacturing and other business sectors, authorised public service enterprises and other waste management operators according to their licences and/or permits shall take technological and organisational measures for prevention, recovery and recycling of waste, ensure proper handling, monitoring and reporting on waste management by performing the own financial and organisational measures or establish the own organisational schemes for management of special waste streams by application of voluntary agreements or, engage the licensed service enterprise.

Inhabitants shall collect municipal waste fractions according to the municipality programmes; they shall contribute to the correct relations between executed services and payments for them and become the interested party regarding investment in new waste management facilities.

The main role of non-governmental organisations may be in lobbying on planning and environmental issues as well as in dissemination of a variety of environmental information. The main contribution of universities and other research institutions may be in the execution of technical and environmental research, analyses and applications as well as in the understanding and interpretations of different interrelated environmental parameters.

Economic measures

In order to promote the development of economical mass and energy efficiency, and their environmental efficiency, *economic measures* have to address all economically significant activities: consumption, processing, production and exploitation of natural resources. Economic measures can achieve positive effects in a country under the following conditions: known economic value of the environment, given limits of exploitation of natural resources, internalisation of external costs in products given on the market and implementation of the “polluter pay” principle.

Macedonia's long-term interests shall be to implement a policy of full cost recovery for all waste management facilities and services as rapidly as economic circumstances and political constraints would allow. Such a decision, built-in the strategic document represents a clear message to waste producers that the costs of management of their wastes in an environmentally sustainable manner shall be on the one side internalised in the market value of products, and on the other side this would encourage the waste producers to reduce the amount of wastes generated and to start taking measures to recover and recycle wastes.

Economic measures comprise three main elements of key importance for the future development and long-term sustainability of waste management services, i.e. cost recovery and financing waste investment and services, economic and financial instruments to regulate activities regarding reduction/recycling of waste and improvement of investment and service efficiency through competition and involvement of the private sector in the waste management system.

Cost recovery and financing investment and services

Consistent payment of fees by all stakeholders, i.e. by inhabitants and by the business sector, and assuring the necessary revenues represent the basis for new investments, for remediation of landfills and for all economical measures to be introduced in order to reduce the impact on the environment; recognising the current practice, consistent payments shall be achieved by overcoming many political, economical, institutional and organisational constraints in the society regarding waste management.

Important improvement of the execution of the fee payments may be done by reorganisation of collection and disposal services for municipal waste, in particular by establishment and by new organisational functions of the regional municipal waste management companies, by participation of the private sector and by the modified payment flows between main stakeholders “inhabitants - municipality - municipal waste management company & landfill facility – waste collection enterprises”.

The indirect mechanism for setting collecting/disposal fees for household waste may continue to be used; in the second development phase, fees for collection/treatment/landfill shall be preferably based on volume or weight for the municipal waste and exclusively based on weight for commercial and industrial non-hazardous waste.

To implement the waste management strategy, different financing options for investments may be applied; however, earmarked environmental taxes/charges related to the waste treatment and disposal shall generate a new, reliable and predictable revenue stream in order to assure the creditworthiness of the investor and realisation of appointed investment by (co)-financing in practice.

Transfers from the regular state- and municipality budgets shall be used mainly for the start-up of the waste management project and for the preparation activities of the priority investments.

Economic and financial instruments to regulate activities regarding reduction/ recycling of waste

The Republic of Macedonia shall introduce economically, financially and environmentally efficient economic/financial instruments, which are compatible with other legislation and which may generate a revenue stream, preferably earmarked for particular purposes related to waste management.

Economic disincentives, like charges/surcharges, shall be primarily introduced in order to induce changes in the behaviour of waste generators; economic incentives like different forms of subsidies shall be designed to provide for positive financial encouragement to manage waste in an environmentally sound and sustainable manner as well as to lower greenhouse gas emissions.

A cost-efficient and sustainable management system for special waste streams shall be established, managed and paid for by the manufacturing and trade sector according to the “producer responsibility” schemes with small involvement, intervention and control of the governmental institutions.

Involvement of private sector in the waste management system

Private sector participation in the waste management system shall be established as a partnership between the public and private sector for the purpose that public services and investments in the infrastructure can be provided and operated in the most economically efficient manner by means of the optimal exploitation of private sector skills and resources.

Substantial changes of the institutional and organisational arrangements regarding the relationships between “public authorities - public enterprises - private sector - existing/new infrastructure facilities” shall be carried out in order to separate waste management from other activities presently executed by public enterprises, to assure the delivery/recovery of cost of municipal waste management services, to enable the introduction of tendering and private investments in the waste management system.

The licensed private sector may be involved in waste management of institutional, medical, commercial and industrial waste management expecting high quality and efficient services.

Instruments of physical planning and protection of natural and cultural heritage

Physical planning on the national and local level regarding acceptable locations for waste management facilities shall take into account the topographic, geological, hydro-geological characteristics and current use of land, locations of the settlement expanding, ownership of land and identified sensitive areas regarding water resources and natural habitats. On a national and local level, environmentally sensitive areas shall be identified as important inputs in the preparation of physical plans.

Waste treatment and incineration facilities shall be placed on locations with the predominance of industrial, energy and transport facilities where no general limitations for technologies regarding the quality of living environment may be expected.

Locations for the landfill facilities shall be chosen primarily according to the criteria related to the characteristics and protection of the natural environment, to the ownership of land, to the prevailing utilisation of locations as well as to the economic and social effects. However, the priority shall be given to the location of existing or abandoned landfills of waste where reconstruction of a landfill may be economically acceptable and alternative utilisation may not be practicable, and where environmental criteria regarding landfill can be met, or new locations for landfills may be selected where environmental and economic criteria can be met in the frame of the social acceptance.

Locations selected according to the set criteria and intended for a new long-term function on the waste treatment/landfill facility shall be prepared and adopted as an integral part of physical plans on the

national and local level taking into account possible expansion of waste management operations on those locations in the future.

Stakeholder and public awareness and consultations

Waste represents a complex issue that, in modern societies, exceeds technical, economic and legal aspects. The main task of the waste management strategy, with regard to public awareness, is to achieve a fundamental shift in the understanding of waste problems as a whole and to announce inevitable policy and structural changes in the solid waste management sector by means of actively informed stakeholders, public participation and wide public support.

The tool available to aware all stakeholders in the society on waste issues and on the necessary changes regarding their waste management practice, is communication strategy, realised through the communication process or public awareness campaigns, respectively. The public awareness process shall, at each one of its steps, fulfil the following fundamental principles - correctness, truthfulness, and justifiability.

Public awareness campaigns in Macedonia applying the pro-active/positive approach shall be focused on the following core group of problems:

- stop environmental impacts due to improper, uncontrolled and non-legal dumping;
- improving reuse, recycling and recovery of waste;
- improve hazardous waste management;
- creation of an integrated and co-operative approach in waste management.

The Public Relations Office of the MoEPP shall provide for the implementation model based on the communication characteristics of different target groups in the society, i.e. project leaders, political public, expert public, media, local communities and general public, and organise the awareness campaign for all stakeholders, particularly for the affected target groups.

The Public Relations Office shall also lead the information campaigns to increase the awareness of the manufacturing and business sector on understanding, acceptance and co-operation in common attempts for the environmentally safe final disposal of hazardous and non-hazardous waste.

OUTLINE OF ACTION PLAN FOR IMPLEMENTATION OF THE WASTE MANAGEMENT STRATEGY

The achievement of strategic objectives set out towards overcoming present waste management problems and deficiencies shall require a broad scope of measures to be implemented continuously and over a long-term period of more than 20 years. The implementation plan of the waste management strategy reflects activities necessary to be realised in a shorter and relatively more predictable period of 12 years and considers three main topics:

- prioritisation of the interrelated measures and activities to change the present waste management practice;
- specific temporary measures/activities to enable more smooth transition to the functioning of a more contemporary waste management system;
- estimation of the necessary investments and other accompanying costs as well as short- and long-term benefits.

Priority measures and actions

Criteria for selection of the priority measures and actions are based on a model, which expresses the logical order for the implementation legal requirements on waste management:

- providing human resources and organisational structures;
- preparation of the policy and regulative documents and plans;
- preparation of technical and investment documentation;
- set up the support systems, particularly public awareness and financial support;
- realisation of investments in the basic infrastructure for waste management.

Effective elaboration of political/regulative tasks and setting-up of necessary institutions unavoidably go hand-to-hand with the adequate strengthening of human resources.

Legal framework for waste management and economic instruments

The full transposition of the EU directive regarding waste management shall be done in 3 years, however, the short-term, i.e. 1 year task is setting-up the general legal framework for waste management by transposition of the EU directives on waste, on hazardous waste and on landfill of waste as well as setting-up the general reporting system which represents "gentle" enforcement for each waste generator and a basis for elaboration of waste management plans, technical and investment documents, for supervising and inspection activities, for charging/surcharging inadequate management and final disposal of specific waste and for the introduction of some other economic instruments.

Implementation of the adopted basic legislation on waste management will inevitably affect the interests and competencies of all members of the society; the harmonisation of different interests in the society will be necessary and particularly important to assure the priority to protect public interest, i.e. the environment, over the individual beneficiary. Namely, the adopted legal basis shall assure predictable revenues and full cost recovery of the waste management operations, affect to the payment discipline, give the necessary signification to economic/financial instruments intended for the reduction/recovery/recycling of waste and enable the establishment of own funds for co-investments in the regional waste management facilities.

Adopted political decisions and legislative documents represent the "sine qua non" conditions for the establishment of a new contemporary waste management system.

Institutional set-up and activities

Preparation of policy, regulative, planning and technical/investment documents as well as the execution of a variety of registration/permitting/licensing and data collection/reporting procedures shall require, as high priority, substantial strengthening of the administrative, inspection and other institutions; new employment and training of staff shall be unavoidable in the first 5 years of the implementation of the waste management strategy.

Preparation of the priority policy and planning documents on establishment and operation of the new regional waste collection/treatment/disposal system of municipal and other non-hazardous waste, on the closure of wild and high risk dumps, on conditioning of some landfills and on construction of new landfills, on management of main hazardous and construction/demolition waste shall represent the central part of actions executed by the waste management unit/department in the first 5 years of the implementation of the waste management strategy. According to exhibited interests, preparation of the policy and planning documents on management of other special waste streams, biodegradable waste and on encouraging waste prevention, reuse and recycling, energy recovery and sustainable use of

renewable energy sources may overlap with activities in the first implementation phase or may be moved to the second part of the implementation period of the waste management strategy.

The Government, in particular MoEPP shall encourage political decisions and organise the establishment of new regional bodies - enterprises and institutions - to carry out the tasks leading towards a contemporary regional waste management system, and assist in the execution of key political, re-organisation, financial, public relation and other operational activities.

Priority tasks of the MoEPP and hazardous waste producers shall be the establishment of the central company for hazardous waste management, which may be intended primarily for smaller waste generators, as well as the start of negotiations with the main waste generators to elaborate the fastest, technically and economically feasible solutions for the final disposal of hazardous waste and for the remediation of "hot-spots".

Collection/recovery/recycling schemes of special waste streams according to the "producer's responsibility" principle and the voluntary agreement may substantially support reduction of the pressure to landfills and mitigation of risks to the environment.

Priority technical infrastructure

The elaboration of some technical and investment documents for the priority technical infrastructure and applications for financing may be initiated; the closing-down of wild and high risk landfills and successive constructions/re-constructions of the central waste management facilities – regional landfills are expected to be realised over a 9 year period.

Priority technical infrastructure for municipal and other non-hazardous waste management shall consist mainly of the waste collection and transfer equipment, of the up-graded existing landfills and / of the new contemporary built landfills for municipal and non-hazardous waste;

Technical infrastructure for dealing with inert, mainly construction and demolition waste, may be developed by giving the opportunity to the licensed private sector.

Short-term technical activities regarding hazardous waste management shall consist mostly of the separation of hazardous and non-hazardous waste fractions at source, on improved storage facilities and on elaboration of the technical and investment documentation regarding the new process technologies and remediation of "hot-spots". Investments in the technological process equipment and in the treatment/final disposal facilities of hazardous waste may be moved towards the second part of the implementation period for the waste management strategy.

Elaboration of corresponding technical and investment documentation for facilities intended for the management of special waste streams, for reduction of the disposed biodegradable waste, for energy recovery of waste and for its utilisation in energy production may become subjects of consideration after more detailed knowledge about the quantities and composition of waste streams. Investments in process facilities may be moved to the end or beyond the implementation period for the waste management strategy.

Establishment of the priority technical infrastructure for waste management from the collection to final disposal shall require intensive information and effective promotion activities in order to raise public awareness and awareness/co-operation of waste generators.

Specific temporary measures and activities

Some unavoidable temporary measures and activities enable a more smooth transition to the functioning of a more contemporary waste management. The acceptable complex of technical measures consists of an elaboration of conditioning plans for selected landfills, an elaboration of reconstruction projects and execution of reconstruction of selected landfills in order to overcome the shortage of landfill capacities by means of the temporary landfill of municipal waste. Such existing,

but reconstructed landfills shall accept municipal waste from different municipalities, which shall create the future waste management region and it shall be in operation under contemporary operational standards.

In the transition period, the substantial efforts of MoEPP, ME and waste generators shall be given to assure environmentally and financially acceptable temporary solutions for the final disposal of segregated hazardous fractions in a manner which exhibits the lowest achievable impact on the environment, at the presently available technical measures, and for mitigating adverse effects of “hot-spots” to environment.

Estimation of the necessary investments and benefits

The total capital/costs of transposition of the key EU directives related to waste issues into the Macedonian legislation framework and their full implementation are estimated at approximately 400 million €

In order to reach the main goals regarding the reduction of environmental impacts caused by waste as set in the waste management strategy, the priority investments in the transposition of legislation and in the basic municipal and hazardous waste infrastructure shall amount yearly to app. 1,5% of the GDP. More sophisticated technological facilities for the biotechnological and thermal treatment of waste shall require additional capital investments; those investments shall become unavoidable at the end or beyond the implementation time of the waste management strategy.

Implementation of the waste management strategy shall lead to major changes in the behaviour of all stakeholders regarding waste issues, in handling, treatment and disposal of waste in the country as well as to changes regarding material and energy recovery of waste and utilization of usable fractions. Realization of the main strategic goals regarding waste management shall lead to important benefits for the population and for the total society: reduced risks and impacts on drinking water resources, on air and soil and on public health, preserved and recovered eco-systems, habitats and natural environment, lower risks and pollution of water environment, soil and agricultural products, lower impact on global warming and sustainable management of natural resources by increased material and energy recovery and utilization of waste.

Outline of the action plan for implementation of the waste management strategy

To enable installation of environmentally sound basic technical infrastructures for municipal and hazardous waste management, there should be in place the proper accompanying legislative structure, institutional and organisational and other support structure as well as adequate financial resources. There could not be made any distinction as to what is more important, because all measures create conditions for the functioning of the technical infrastructures. Integral elements and all considered topics create a general structure of the waste management strategy implementation plan.

1. INTRODUCTORY PRESENTATION OF THE ROLE OF THE WASTE MANAGEMENT STRATEGY IN THE ENVIRONMENTAL POLICY OF MACEDONIA.

1.1 General Role of Waste Management Strategy

The strategy of the Republic of Macedonia regarding waste management

- shall determine the fundamental directions in waste management for the coming 12 year period (2008-2020) on the basis of recognition that serious impacts to the living and natural environment have been caused by the improper waste management at present and in the past;
- shall determine the fundamental directions of the gradual waste management system set-up in the coming period, based on the basic approach of the European Union to waste management where the capabilities of the economy shall be taken into account;
- shall determine the main principles of sustainable use of natural resources and waste management inclusive of the hierarchy of the main principles of waste management;
- shall direct the system of activities in the harmonisation of legislation with the *acquis communautaire* as the inevitable process of the Macedonian approach towards membership of the European Union;
- shall determine the responsibilities for waste, identify the significance and role of capital ownership as well as the roles and tasks of individual stakeholders in the society;
- shall determine the framework of activities regarding waste management as a part of the environmental, economic and social policy;
- shall set the main goals in the waste management system set-up for the 12 years period and beyond, reflecting urgent institutional, organisational, technical and economic measures to stop or mitigate environmental impacts caused by the present waste management on the one side and the gradual upgrading the contemporary waste management system by means of an optimal combination of mechanisms and instruments on the other side;
- shall present the estimation of cost to realise the strategic goals.

The strategy of the Republic of Macedonia on waste management does not deal with the issues of radioactive waste irrespective of its origin, with obsolete explosive devices and ammunition nor with the waste from mining activities, which are regulated by specific legislation. These categories of waste do not include any economic element related to the material or energy recovery of wastes and consequentially, sustainable use of natural resources, which characterise the management of wastes and waste products within the scope of this strategic document. Exemptions are only already disposed waste from mining as present environmental burdens, so-called “hot-spots” which cause environmental impacts on the environment and require specific remediation measures, and livestock waste which are all regulated by two complementary legislations: with the veterinary regulations on the management of animal by-products and with the environmental/waste regulations.

1.2 The role of the strategy for waste management within the policy of environmental protection

The Republic of Macedonia has prepared and adopted two main laws important for the regulation of overall waste management: the Law on Environment and the Law on Waste Management; certain waste management or closely related issues are covered by different provisions in other laws, in particular in the Law on Public Enterprises, the Law on Local Self-Government, the Law on Investment Construction, the Law on Concession Public Private Partnership and the Law on Physical and Urban Planning.

The Law on Environment introduces a series of fundamental principles and obligations of key significance in regulating and achieving the objectives of environmental protection in Macedonia. It represents a part of the legislative basis for some activities closely related to waste management, such as environmental audits and in particular environmental impact assessments, and is an important phase in the administrative procedure to obtain integral environmental permits and adjustment permits. The Law on Environment also introduces the preparation National Strategy for Sustainable Development for the purpose of harmonising economic development, social progress and environmental protection on a national level and it may represent some legal basis for the regulation of waste management activities in the field of mitigating climate changes, combating desertification and preventing drought effects and sustainable use of natural resources.

The Law on Waste Management provides the general rules applying to formulation and elaboration of the strategy, plans and programmes, to waste, in handling of waste, in particular to hazardous waste, to final disposal of waste like landfill and incineration/co-incineration, to import/export/transit of waste, to monitoring, data management and information system, to financing, to definition of competent authorities and supervision, and to punitive provisions.

The existing legal bases is partly in compliance with EU legislation, part of the secondary legislation and standards are still in the preparation phase, the administrative and enforcement institutions are still not strengthened to that level, which may provide the introduction of modernised and environmentally acceptable waste management. The style of waste management inherited from the previous period, still continues to be practised with the consequences of evident impact on the environment; additional contribution to environmental pollution is caused by non-legal and uncontrolled landfills.

The analysis of the general situation in waste management, urgent problems regarding waste in majority of local communities, in industry and services and evident environmental damage caused by different types of environmental burdens require the development of a strategy for waste management according to the stipulations of the Law on Waste Management. The Waste Management Strategy shall be most of all a **resolution of the Government**, as the executive authority branch in the Republic of Macedonia. It shall represent the **decisions** on the main environmental, economic and social goals, activities and measures towards resolving the issues of wastes, and it shall represent a clear basis for the preparation of the National Waste Management Action Programme.

Waste Management Strategy shall

- a) define the fundamental goals and objectives in waste management and determine the framework of waste management approaches as well as acceptable measures to stop or mitigate further impact of waste on the air-, water-, soil- and natural environment as well as public health.
- b) define the fundamental development of general measures in waste management to reduce the negative impact on the environment caused by waste from the production stage, via recovery and recycling processes to final disposal of residues from production and consumption.
- c) provide long-term solutions for
 - the decrease of quantities of all types of generated waste,
 - gradual decrease of the hazardous potential of waste themselves and as deposits in landfills,
 - control of waste streams generating on the Macedonian territory and passing the national borders in both directions,
 - optimal material and energy recovery of waste streams,
 - establishment of an optimal system of infra-structural facilities for the recovery/re-use and treatment of waste, and provision of safe, environmentally and economically acceptable final disposal, in particular landfill.
- d) provide for long-term efforts for
 - sustainable management with renewable and non-renewable natural resources and efficient utilisation from both an environmental and economic viewpoint,

- de-coupling of economic growth and generated waste quantities as far as possible,
 - introduction of cleaner technologies and use of environmentally less problematic substitutes.
- d) assess suitable options for
- financing capital investments in new or restored waste treatment and disposal facilities,
 - recovery of the fixed and variable part of operational costs for collection, processing and final disposal of waste.

Such an approach means that waste is seen not only as source of pollution to be reduced, but also as potential substitute source for non-renewable natural raw material.

However, all aims, objectives and measures in the waste management strategy shall take into consideration Macedonia's accessing to European integration, development of national economy, quality of living and natural environment and vulnerability of nature and natural resources.

The Waste Management Strategy concretises some fundamental principles of the Law on Waste Management, which are important for the harmonisation of Macedonian regulations with the EU *acquis communautaire* and sets the approach on how to stop or at least mitigate further environmental impact as a consequence of existing waste management. As supplements, the Strategy introduces the main principles of the 6th European Environmental Action Programme (2002 –2012) on the sustainable use of natural resources and waste management, however it takes into consideration the specific characteristics of the growing and relatively small size of the Macedonian economy, vulnerability of natural resources, in particular air, water and soil environment, and protection of natural and cultural heritage.

To make the main principles in waste management in Macedonia concrete, the basic characteristics of the management concept for the main waste streams are laid out and some general conceptual solutions for remediation of identified environmental burdens are introduced to mitigate the impacts, in particular on the water and soil environments. Regardless of the development stage, the sustainable concept of waste management suggests that the main and the most effective tasks begin at sources of the waste generation. However, such a waste management concept shall exhibit an important influence on the production processes and on the production and consumption economy, on the hazardous potential of by-products, end-of-life products and other types of wastes; it shall also influence social activities and acceptability of treatment and disposal facilities of waste of all process phases of waste management. Such influence grants a *special status to the waste issues*; the success and efficiency of the implementation of the waste management concept depend, beside the necessary capital investments and space related limitations, above all on the timeliness and correct balance of legal, institutional, organisational, sociological and in particular economic/financial instruments.

1.3 The role of the strategy for waste management within the relation of economic and environmental policy

By definition, waste are such material and objects set out in categories and listed in the list of waste belonging to categories that the holder discards, or intends or requires to discard. Responsibility of waste is on the holders of waste; but the holders are natural or legal persons who are in possession of waste and they appear as members of society in three contradictory roles simultaneously:

- a) taking care of the quality of the environment, health and quality of life particularly for the coming generations on a global and local level,
- b) generating waste and polluting the environment in daily activities and
- c) consuming of goods and services.

It becomes clear that waste is not only a generator of impacts on the environment, but may also be partly or totally reused; in such cases, the waste represents a secondary source for the production of new goods or energy. So, the issues of waste are simultaneously specific and complex and responsibility for the generated waste is distributed, as well as the obligations to cover the costs between these roles. This is the reason that waste management is regulated by waste management regulations from collection through recovery and utilisation of material and/or energy constituents of waste, and finally to the disposal of residues; however, these regulations regarding waste management, must be supported by the broad regulative measures in other sectors of society.

Waste may become an environmental burden only at the end of the production and consumption sequence, when the unusable residues have to be disposed of in a controlled manner. All recovery phases of waste fractions usable for the production of new goods or energy represent the preservation of non-renewable natural resources, which is one of the most important objectives of EU environmental programme documents and directives.

Waste can also cause the environmental impact due to their hazardous potential, which arises from the use of environmentally hazardous substances in the production process of the market product, or such substances are incorporated into the product itself. Due to the high potential of adverse environmental impacts, environmentally safe production and regulated hazardous waste management is of primary public interest.

The measures for decreasing the quantity of waste by means of internal closed cycles of material streams in the production, and by means of reducing the hazardous potential of production waste and end-of-life products, are by nature the issue of technological development. The measures generally require new investments in the restructuring of production processes and in the introduction of new technologies, which results in lower energy consumption in the production process and use of the produced goods as well as the use of new, less hazardous raw materials, which are friendlier to the environment.

On the other hand, the consumption sector requests new products and thus appears as the generator of production growth as well as of economic prosperity. Such a process generates new amounts of wastes and by-products and specific measures shall be introduced to recover the accessible, usable fraction of waste and to retain a more or less constant amount of unusable residues, which shall be finally disposed of.

Closing of material and energy streams inside production cycles and/or linking of specific waste fractions to other production processes may mean a way of lowering the quantities of waste intended for disposal and of improving the environmental and economic efficiency of individual enterprises. On the other hand, the systems of collection and technologies required for recovery/recycling of usable fractions of waste – secondary raw material - also offer the opportunity of new employment in various service or production activities.

Secondary raw material recovered from waste streams and intended for material recycling and energy production need to find their market. i.e. economically viable processing facilities. The ways of achieving economic viability and market competitiveness on the raw materials market depend on different factors. ***The prices of secondary raw materials recovered from wastes are not entirely left open to the free market, since they are subject to policy and goals set by society.*** Utilisation of waste fractions as raw materials proves economically attractive only if, at standardised quality requirements the adequate economic instruments for the specific waste stream are introduced by the State and the prices of these secondary raw materials can be offered at a competitive price. In spite the fact that waste can also figure as raw materials, i.e. market goods, their movement inside of state territory, and also across the borders or within the zones of free trade or internal markets, shall remain under control; secondary raw material still remains a "waste" and not classic market good.

Measures related to waste management have direct economic and environmental effects and bear significance for the technological and economic policies as well as for the consumption policy.

It is important to be aware that waste management always represents a cost; this cost can be lower only if the costs of the waste management process and further use of waste as secondary materials represent the reduction of waste disposal costs. Introduction of adequate economic instruments to balance the costs for the waste recovery/recycling and waste disposal costs shall be one of the main important tasks of the environmental and economic policy.

1.4. General content of strategic document on waste management

The waste management strategy shall reflect the **national policy** in waste management and represent the basis for preparation and implementation of an integrated and cost-effective waste management system. On the basis of the assessment of the current status of waste management and of related, for waste management relevant sectors, general and specific strategic issues on waste management in Macedonia are considered.

General strategic goals and objectives reflect the commitments of all parts of the Macedonian society to set-up a contemporary waste management system, which incorporates the main principles of waste management, fulfils some specificity of the Macedonian environment and requires significant changes in the whole society with regard to the gradual construction and operation of the new technical waste management system and with regard to the set of interrelated measures: policy and legislation, institutional and organisational arrangements, human resources and capacity, physical planning and environmental protection, financing and cost recovery, stakeholders' awareness, data collection and information system.

The outline of an action plan assesses the time limits necessary for full implementation of the waste management strategy and

- proposes the priority interrelated measures for an optimal start of the setting-up of a new waste management system,
- proposes temporary measures in order to overcome the existing situation on waste management and
- assesses the necessary costs and benefits of the implementation of the waste management strategy.

2. SHORT REVIEW AND ASSESSMENT OF THE CURRENT STATUS OF WASTE MANAGEMENT AND THE RELATED, FOR WASTE MANAGEMENT RELEVANT SECTORS IN MACEDONIA.

2.1 Waste management policy

Macedonian's top act, i.e. the Constitution of the Republic of Macedonia, provides that everyone has the right to a healthy living environment and duty to protect and improve the environment and nature. The State is therefore obliged to provide a healthy environment for its citizens.

Waste management is one of the most serious environmental issues in Macedonia. The general waste management policy was formed in the first National Environmental Programme (NAEP) in 1996, in order to overcome the current situation and to establish the sustainable waste management system. The Government has established a way forward with a framework in waste management through policy initiatives in NEAP, revised in 2006 (NEAP II), which incorporate, emulate or reach compliance with the EU requirements. Policy initiatives in the NEAP and in the Energy Efficiency Strategy are closely related to the implementation of the Clean Development Mechanisms projects of the Kyoto Protocol, which shall enable direct investments in order to simultaneously decrease greenhouse gas emissions and to contribute to the production of sustainable i.e. renewable energy; namely, the waste sector contributes not negligible 8-10% of the emitted CO₂-equivalents of the total greenhouse gas emission of Macedonia.

The general framework for the waste management policy is given in the Law on Waste Management, which provides the basis for the adoption of secondary legislation and introduces three main policy documents:

- the waste management strategy in order to define in particular long-term needs regarding waste management as well as the required legislative measures for implementation;
- a waste management plan assessing the current state and providing basic recommendations, activities and investments as well as resources and financial mechanisms in the process of waste management for the coming six year period;
- waste management programmes prepared for each year and adopted by MoEPP and by the local self-governments involved in the implementation phases of waste management;
- waste management programmes prepared for each of the three-year periods by the legal entities and natural persons involved in the implementation phases of waste management.

Regarding the political and expert document to be prepared according to the Law on waste management, the National Waste Management Plan (NWMP) was drafted in September 2005; the draft document was based on special studies related to all the main issues regarding current waste management in Macedonia.

However, in a number of areas the present national directions, policy setting and legislation are still insufficient to comply with the requirements of the waste sector. The National policy on waste management is not sufficiently developed, as the existing policy does not address all key areas of performance for waste management, there is no clear basis for determining priorities, performance requirements or targets, and the required standards for waste management remain difficult to implement and enforce.

2.2 Current legal framework and transposition activities

Macedonia is currently undergoing an intensive period of legislative development concerning waste management. At present, the main national legislation regarding the waste management sector comprises only the Law on Waste Management. However, this regulation significantly contributes to the approximation process in establishing a modern and comprehensive waste management system based on the main EU directives on waste and on hazardous waste. The Law on Waste Management as a cover regulation act provides general rules applying to the following issues: definitions and applicability regarding types of waste, strategy, plans and program formulation at different levels; waste management procedures and issuing permits; landfills; incineration and co-incineration of waste, import, export and transit of waste; monitoring, reporting, data management; supervision of competent authorities, punitive provisions; transitional and final provisions. However, it does not regulate the mining waste management and only partly the management with waste regularly covered by veterinary regulations. Transposition of the main EU directives on waste management into the Macedonian legislation framework is carried out by drafting and adopting obligations and rules with regard to hazardous waste, to waste oils, to packaging and packaging waste, to disposal of PCB/PCT and batteries and accumulators, to WEEE and ELV-s, for the purpose of providing the necessary legal basis for preparation, adoption and implementation of the secondary legislation. The main secondary legislation (rules, guidelines, standards) for issues defined in the Law on Waste Management shall be prepared to make the Law operative.

The Law on Waste management has important links to other legislation, in particular to the Law on Environment, which includes basic issues such as environmental permits, EIA procedure, and greenhouse gas emissions. It is also closely linked to the other regulations like Law on Organisation of the Organs of the State Administration, Law on Local Self Government, Law on Public Enterprises, Law on Physical and Urban Planning, Law on Investment Constructions, Law on Concessions and Public Private Partnership, Law on Public Procurement and draft Law on Water Management, which are all subject to consideration and amendments in the Government and Parliament.

2.3 Current status of institutions and competent authorities

The Competent Authority for preparing and adopting all legal instruments and to implement all waste related directives is MoEPP as the state administration responsible for environmental affairs. The competent authorities for carrying out inspection and other enforcement tasks are generally the State Inspection for Environment (MoEPP) and the Local Inspection Authorities (the City of Skopje and municipalities). Internal distribution of tasks and responsibilities within the MoEPP exists and is based on the present structure of the MoEPP; the only significant adaptation to the new tasks regarding waste management is the establishment of the new waste management department with a broad scope of responsibilities and activities: planning, adopting and implementation of standards and regimes on the management of various waste streams, monitoring, issuing permits for waste collectors, transporters, exporters and operators of waste management facilities. Preparation of the main primary and secondary legislation is carrying out and adopting jointly /in co-operation / through consultations /in agreement with other Ministries and authorities, but it seems there is confusion over the role and competency as well as a lack of communications and co-ordination.

Tasks and responsibilities on the waste management field are in practice split among several *institutions* in the State and many times, and certain overlapping can be observed among governmental institutions as well as between governmental and municipal institutions. There are also some missing activities like acquisition of reliable analyses on characteristics/constituents of waste or missing registration on waste handlers; such a situation renders any inspection difficult, record keeping, reporting and enforcement tasks for the proper national in a number of areas of HZW management in spite of registration of waste generators.

Regarding waste management issues, the Ministry of Economy (MoE) and MoEPP are responsible for common preparation of several regulations related to packaging and packaging waste and other end-of-life products. Inspection of the fulfilled requirements related to the products on the market is the obligation of the State Market Inspectorate (within MoE). The Ministry of Finance (MoF) plays an important role in decision making/taking and in implementation of available and effective financial/economic instruments and funds to encourage the development of waste management. The Ministry of Health (MoH) and MoEPP are also obliged to prepare and to adopt regulations as well as to inspect the implementation of medical waste management and the management of poisons; there is no clear share of responsibilities regarding inspection of medical waste issues. Collection, treatment and final disposal of animal by-products and survey on active substances for plant protection are the responsibility of the Ministry of Agriculture and Forestry (MoAF). The Ministry of Transport and Communication (MoTC) is responsible for licensing of collectors / transporters of municipal solid waste and hazardous waste and it also holds responsibility for public utilities supervision through the State Communal Inspectorate.

With the decentralisation process in the country, a lot of responsibilities were delegated to the *municipalities*. The municipalities are responsible for important activities: organising the collection, transportation and disposal of municipal wastes; supervising transportation and disposal of industrial non-hazardous waste, deciding on the location of waste management facilities, issuing local regulations on waste management, financing and supervising dump/landfill closures and termination of waste management facilities. Municipalities grant construction permits in cases of their own investments and also grant environmental permits (IPPC B-permits). Establishment of the non-hazardous and inert waste landfills is also the responsibility of the municipalities; but issuing permits, inspection and monitoring regarding environmental issues, with the exception of inert waste landfills, is the responsibility of the MoEPP. However, only few municipalities have established or designated divisions/persons in their administration structure to deal with waste management; a great deal of effort will be required to establish local administrative and expert institutions as well as operative organisations on the inter-municipality, i.e. regional level, which shall be established and adopted by all involved municipalities.

Tasks and responsibilities of MoEPP on waste management, additionally to the preparation and adoption of legal instruments respectively, comprise a whole institutional character: planning and policy development; registration, issuing permits and licensing; monitoring, data collection/handling, database maintenance and reporting; inspection and other kinds of enforcement. It is evident that all responsible institutions within MoEPP and municipalities that carry out their main tasks on waste management, have insufficient knowledge and experience to develop and implement all relevant standards and instruments as required by the new waste legislation. In order to achieve successful co-ordination, monitoring and enforcement of waste management in Macedonia, all institutions shall *strengthen their capacities* by additional re-organisation and financial resources, by additional employment and by executing adequate training of staff at a national, regional and local level.

Collection, treatment and landfill of all kinds of waste, regardless of their hazardous properties, are executed by *other stakeholders* in the waste management process: public enterprises, waste handlers, and informal collectors of usable waste fractions; some enterprises are in possession of and operate their own waste treatment facilities and landfills. However, in spite of the existing legal basis for gathering, recording and reporting on wastes that enter/leave the waste management process, there is no environmental monitoring of waste management facilities, a functioning data recording and reporting system is not in place.

Other institutional stakeholders in waste management processes and development are associations like the Chamber of Commerce, Union of public services, Union of waste handler, NGO-s and scientific institutions of Universities; their roles comprise in particular consultations regarding legislation, waste management functioning and financing, recognition of relationships between environmental parameters, development of environmental technologies and monitoring, and presentation of interests of different groups of society regarding waste management issues in the country.

However, communication, preparation of guidance and trainings are the weakest part of the MoEPP practice. There is no organised system for regular meetings between MoEPP and the municipalities, industry and other stakeholders for exchange of information regarding waste management, and there is no guidance on the implementation of the waste management legislation. There are no established measures to promote dialog between interested parties and competent authorities before the introduction of the waste regulations or measures to promote dialog between interested parties and competent authorities with regard to the design and implementation of a communication program. Such measures shall stimulate waste generators to minimise their waste quantities and to manage of them according to waste management hierarchy.

2.5 Stakeholder and general public awareness /consultation/

The general level of environmental awareness within Macedonia is low, and there is an insufficient understanding of environmental issues. Actually, people are not aware of waste problems and of the adverse effects on their health and living/natural environment. People and industries are not aware of the potential risks of hazardous waste. People are not aware of their own responsibilities and their role as producers of waste and actors on waste reduction. To a large extent, the increasing amount of generated waste is the result of uninformed consumers as well as of their behaviour and choices. There is limited knowledge as to what a sanitary landfill, designed and operating to contemporary standards, really means and the people are used to and accept non-legal dumping of waste. There is also a lack of understanding of the importance to pay for waste collection and disposal services; a high percentage of the population does not pay any fees for waste collection and landfill.

There is the absence of a national public awareness communication strategy on waste issues; however, insufficient institutional capacities can not promote of the public awareness and environmental education Communal public enterprises are suffering from lack of finance and obsolete waste collection equipment, and do not pay, with few exemptions, attention to public awareness and education.

In spite of low public awareness and low awareness of other waste generators, public perceptions can be manifested in strong opposition to necessary changes in existing waste management practice. These public perceptions are founded on genuine fears and concerns and generally not on additional costs to be paid for the proper waste collection and disposal. One of important reasons for oppositions is the lack of information and the lack of public access to information on municipal waste, medical waste, hazardous waste and on other types of waste produced by the production/service/agricultural sector, on their risks to health and environment and on options of their management. Two additional social effects may also not to be neglected: NIMBY effect (**not in my backyard**) and NIMET effects (**not in my election time**).

There are limited attempts in Macedonia to establish a comprehensive programme and instruments to build up citizen awareness about waste problem. Actually all initiatives are non-governmental organisations based, with some exemptions where municipalities develop long-term environmental education strategies for their communities, including education about waste.

2.6 Economic issues

Sources for the cost recovery and financing of waste management operations are mainly direct charges for transport and disposal of waste. Investments in waste management infrastructure, if they are some at all are financed from grants and from yearly budgets of State or municipalities.

The municipalities are generally responsible for organising an effective solid waste management system within their territory, except for hazardous waste, which is according to legislation the responsibility of the State. Public enterprises provide communal services (mainly in urban areas),

which comprise municipal solid waste management, i.e. collection, transport and landfill, on behalf of municipalities.

The financing of the operations of public enterprises (collection, transport & disposal of waste) is based on user fees collected by operating companies from waste producers. The fees are set by the public enterprises in consultation and with the approval of municipal councils. Charges for the provision of the service are set according to different categories of waste producers.

The municipalities generally do not allocate funding for waste handling. Financial situation of public enterprises is getting worse due to the decline of the economy. Such situation adversely impacts on cost recovery resulting in gaps between the current fee levels, low fee collection rates and the real costs of service delivery. None of the existing public enterprises operates at acceptable technical level, with no necessary care and attention to the equipment maintenance and on no provision for replacement of equipment.

Decisions to increase fee levels are based on increased costs or VAT, the separation of waste handling services from other communal services, and/or on reductions in fee collection efficiency. Changes of fees for waste management services are many times not the result of better services and they are sometimes also misused due to local political reasons.

The user fees paid by the receivers of the waste collection services, e.g. the households, provide funding of the municipal solid waste management costs. These fees are invoiced and collected directly by the public communal enterprises and not by the municipalities, which may hamper the development towards increased participation of the private sector in waste collection activities. The base for setting the fee levels differs among the municipalities.

The key problems related to the existing *cost recovery and financing* are:

- With one exception, the existing system for levying and collecting fees for the use of municipal waste management services and facilities is based either on a fixed fee per m² of a flat / house, or a flat fee per household / month.
- The service fees paid by householders and other municipal waste producers are relatively low (and vary considerably in the country). Nevertheless, the proportion of non-payers is often high.
- For the collection and disposal of commercial and industrial waste, the public enterprises charge flat rate by mostly higher tariffs than for the municipal solid waste. Setting the tariffs for commercial and industrial waste is generally based either on m² of roofed area or on the flat monthly fee; only rarely the fees are based on size of container or determined case-by-case.
- Tariffs are determined by each municipality in consultation with the municipal service provider, but these are based more on what is deemed to be affordable/acceptable than on the real cost of providing the services.
- In most cases, current tariffs / fee levels do not even cover the full costs of providing for existing public waste management services and facilities; cost of developing and implementing new waste management systems and facilities that comply with EU standards are not included
- The true costs of providing public waste management facilities and services are rarely known by service providers or understood by service users.
- Municipal enterprises / service providers are generally inefficient in their use of resources, due mainly to a lack of competitive pressure.
- The relationship between the municipalities, whose legal responsibility it is to arrange the waste collection and disposal services on behalf of their citizens, and the service providers (currently, in almost all cases, the public municipal enterprises) lacks transparency and accountability.

- Municipalities are severely constrained in their ability to raise finance for capital investments in waste management infrastructure and equipment, and this situation is unlikely to change in the near future.
- Enforcement of payments for services cannot be executed because of the legislation, which gives *priority to the protection of the individual beneficiary over public interest* and addresses waste management as a social support category.

In the present stage of institutional and economic development in Macedonia, the practical scope for applying *financial/economic instruments* is limited. Environmental charges paid by the waste generators according to the generated quantity of non-hazardous/hazardous waste, to the type/ quantity of imported and produced plastic products and packaging of plastic masses, to the type/quantity of imported wastes and residues for production of lead accumulators and to the type/quantity of imported or generated petroleum residues or oils and waste oils, become a part of the integral State's budget; collected charges represent the basis for financing the priority activities in the area of environment; waste management programs are in competition with other environmental programs.

Solid waste management services are almost entirely provided by public municipal services. Involvement of the *private sector* is limited and not clearly supported by official competitive tendering and contraction policy and procedures. Current low service fee collection rates and the poor financial status of many municipalities represent risks, and the risks regarding the legal and institutional context, competition issues and political situation limit the scope of introducing competition into waste management services and the private sector participation in investments.

Hot-spot remediation can be financed on the case-by-case basis because of the lack of the regulatory provisions in laws on privatisation and on the environment (environmental liability), as well as because of the lack of institutional framework and funding mechanisms.

2.7 Current waste streams and waste management practices

Collection, transport and landfill are the main, regular methods for the final disposal of almost each of the waste fractions. Available facilities and capacities for treatment and disposal of wastes are inadequate, legislation and standards are not effectively enforced, and current waste management practices contribute to the pollution of air, water resources and land. The total amount of generated waste, inclusive of waste from mining, can be estimated at app. 26 mio t/year. The main waste fractions arise from mineral excavation and ore processing (app. 17,3 mio t/year); the Law on mineral resources regulates management of this waste. However, this group of waste contains significant amount of hazardous constituents and improper landfills cause the most evident impacts on the environment. Agriculture waste with app. 4,9 mio t/year of animal excreta and with app. 0,6 mio t/year of plant waste represent the second biggest waste fraction, mainly addressed as by-products, i.e. these types of waste represent "recyclable" fractions in agricultural activities. The management of animal by-products from slaughterhouses and dead animals on breeding farms is far from the requirements of EU regulations.

Municipal solid waste is one of the main generated waste streams (app. 570.000 t/year with prognosis of rising 1,7%/year up-to 700.000 t/y in the year 2020 or 285 - 350 kg/cap. year) consisting of household wastes, street sweepings and park green wastes, commercial-institutional waste and wastes generated in industry with a household-like character. A small proportion of the household waste stream has hazardous properties (batteries containing heavy metals and acids, oil-based paints and solvents....).

An important proportion of the general waste stream is contributed to by spent goods and a variety of end-of-life products such as construction and demolition waste (app. 500.000 t/year), used tyres,

accumulators, end-of-life vehicles, electrical/electronic waste, in total to an amount of app. 40.000 t/year. Construction and demolition waste contain asbestos as specific waste with hazardous properties. Management of these fractions, which may contain hazardous and combustible constituents, is not carried out in compliance with the EU directives and almost all the collected fraction are disposed of in landfills or deposited on wild dumps.

Power plants, thermal metallurgical and inorganic chemical processes generate an additional group of non-hazardous waste to the amount of app. 2 mio t/year; main generators landfill their waste locally, smaller generators together with municipal waste.

The main quantities of hazardous waste (app. 77.500 t/year) are generated by the two main metallurgical industrial facilities and are disposed of on industrial landfill. They also represent environmental "hot-spots" regarding their impact on the environment. Some combustible hazardous waste oils are burned as fuels.

National initiatives in minimising waste at the household and industrial level are lacking in a number of areas. Waste producers are not aware of potential opportunities for, and benefits of, preventing wastes, information on opportunities and techniques for wastes prevention are not generally available, the true costs of environmentally sound waste management are not perceived or met by waste producers, resources, including resources for waste management, are not used effectively, and fees for waste treatment and disposal are higher than needed regarding the quality level of services.

2.7.1 Collection and transport of waste

The collection of municipal waste is mainly performed by public enterprises. Only a small proportion of waste collectors are private companies, typically those dealing with waste in rural areas.

Some 70% of the total population benefits from regular waste collection services, however in rural settlements only 10% of the population benefits from waste collection. Waste collection, selection, transport is insufficient in a number of areas to comply with the existing requirements. Most skips and waste collection vehicles are very old, low capacity and often dilapidated. Mixed industrial and municipal waste, including hazardous fractions waste, is collected from the service beneficiaries. Daily operations are typically characterised by low productivity practices and the inappropriate use of available resources, which does not encourage provision of a cost-effective service.

Separate collection of municipal waste does not take place, except for some bulky waste in Skopje and organic waste in the municipality of Zrnovci.

There are no formal collection systems for construction and demolition waste.

Scrap metals represent the biggest part of the collected recyclables. There is a well-established network of collectors and/or brokers, as well as a strong and stable market for recovered scrap metals.

Mostly 'hard plastics' is collected, including HDPE, PVC, polypropylene and polystyrene. They originate from crashed car batteries, pipes, crates and containers. For now PET plastics are not collected due to the costly collection system. There is also no system for the collection of plastics originating from greenhouses or silage production.

There is presently no system in place for the collection of used engine oils and emulsions or any organised collection of end-of-life vehicles. The car wrecks are usually picked up by the informal sector. Only a part of the annually generated used tyres are collected.

Industrial non-hazardous waste is mainly collected together with municipal waste. Generally, the hazardous waste generators do not separate their industrial waste, but they mix the different types of hazardous wastes with other, non-hazardous wastes. If some separation is done, then this is primarily

driven by market demand i.e. only those types of hazardous wastes are separated that can be sold. There are not any officially licensed collectors and transporters of hazardous waste in the country.

Regarding the waste generated and collected in healthcare institutions, the level of separation and proper handling of the hazardous and other non-hazardous medical waste within the hospitals is generally low. Hazardous medical waste is separately collected only in hospitals in Skopje and Kumanovo.

2.7.2 Treatment, recovery and recycling

The recovery and recycling activities for municipal waste are very limited and without any organised approach. There is no initiative on the municipal level to organise selection and recycling of municipal waste. It is mostly private companies that deal with recycling (scrap yards).

The recovery of recyclable materials such as metals, paper, plastics, car batteries and accumulators, waste oils etc., is undertaken by the informal sector. The recovery of many types/grades of potentially recyclable materials is not financially viable under the prevailing conditions. The logistical costs for a formal recycling system for paper are just covered by the sales price of paper. The informal sector, which has taken over the resources belonging to the closed down recycling network, is very active, though these resources are not used efficiently with both actual and potential economic and environmental consequences.

The paper and cardboard market is divided into two parts: one part (around 20%) is organized by the paper factory, with the application of “collection points”, and the other part is collected by the informal sector. The paper factory does not use all collected fractions of paper and cardboard because of the market limitation and mostly due to the payment conditions of the end-user.

At present the capacity for recycling, reuse and recovery of packaging in Macedonia is very limited. Only a limited percentage of plastics are being recycled or sent to recycling. The recycling market for plastic in Macedonia is underdeveloped.

Scrap metals represent the biggest part of the collected recyclables, and are being processed in Macedonia. There is a well-established network of collectors and/or brokers, as well as a strong and stable market for recovered scrap metals. The car wrecks are either processed for the recovery of spare parts or for scrap metals. The scrap metals are exported, or delivered to the facilities which possess a shredder for cutting the scrap metals prior to smelting.

Waste composting and anaerobic digestion are not in practice in the country. There is a local pilot composting facility, more composting is applied in agriculture by using known and controlled input material.

Few existing facilities for anaerobic digestion aimed at the degradation of agricultural wastes and especially manure has not been in operation for many years. A large part of the plant tissue produced in agriculture is reused in an environmentally sound manner. The relatively high quantities of manure generated by cattle and sheep are completely used for soil fertilisation but without monitoring of the impact on the water environment.

The largest volumes of hazardous waste are generated by the metallurgical industries and generally stored on non-compliant dumps on the companies' premises. The majority of hazardous waste oils generated in the production sector and in other activities are currently burned as fuels, and industrial emulsions are mainly discharged as wastewater.

Only a small part of the annually generated used tyres are used as fuel in tar- and lime production facilities. The management of other types of waste such as batteries, accumulators, end-of-life vehicle,

PCB's, electrical/electronic waste, etc., is not in compliance with EU directives. A recent investigation on PCB wastes concluded that certain amount of suspected PCB oil containing transformers are still used in the energy supply system. Some of this oil waste shall be collected, exported and incinerated abroad in the near future. It is further suspected that PCB containing wastes is generated in some industries, such as railway facilities. It has to be noted that there does not exist any capacity at local laboratories in Macedonia to identify the PCB or PCT contents in solid wastes.

2.7.3 Final disposal of waste

Almost the only method for the final disposal of waste is deposition on landfills; only some hazardous waste from health institutions and some liquid hazardous waste are incinerated and co-incinerated, respectively.

There are 55 active municipal landfills operating without any permits, only the landfill "Drisla" has an operational permit. Most of the *municipal solid waste* and other collected waste is deposited at municipal landfills/dumpsites without any pre-treatment. Most of the packaging waste is disposed of on landfills or dumpsites as a constituent of municipal solid waste and similar commercial/industrial solid waste. Landfills are operating without the techniques usually applied at landfills and without any monitoring activities regarding impacts on the environment. There is no evidence on delivered waste and even no visual inspection regarding the characteristics of waste to be disposed of. Landfill "Drisla" is the only waste site compliant with national requirements; however, even this waste deposition site does not comply with contemporary technical standards or with the requirements of the EU landfill directive. Except for "Drisla", low number of other landfill sites would be capable of being upgraded to become EU-compliant.

Municipal waste that is not collected by official collection enterprises is disposed of at "wild" dumps. Construction and demolition waste are mostly disposed of at "wild dumps" as well; there are no available separation facilities and landfills for disposal of this type of waste. There are estimated to be approximately 1.000 illegal waste dumps, in particular in rural municipalities.

Municipal landfills and wild dumps represent risks for the pollution of air, soil, surface water and groundwater, as well as potential risks for biodiversity, agricultural land and human health due to deposition of mixed hazardous and non-hazardous waste. An additional environmental problem is represented by the traditional burning on open air fires of municipal waste, plant tissue waste and plastics originating from greenhouses or silage coverage; such kind of waste burning may cause the synthesis of highly toxic and bio-accumulative organic compounds and uncontrolled emissions into the air result in the pollution of ambient air and in the long-term pollution of agricultural soil and plant tissues.

Existing waste disposal practices do not comply with any technical and/or environmental standards. Most of the existing municipal dumpsites need to be closed since the site conditions and environmental impact do not allow them to be upgraded economically, to be harmonised with the EU standards.

Active municipal waste landfills are categorised according to the assessment of their environmental risk. 16 landfills are ranked with high risk, 16 with medium risk, and 19 with low environmental risk. 4 high-risk landfills are classified as special cases and need to be closed or remediate in short term.

The *hazardous waste* generated by Macedonian mining and processing industries faced severe problems during the transition period and many have stopped their activities, with no chance of being restarted in the near future. Their on-site process waste dumps were abandoned as well, and little or no information is available on the history of these dump sites. During the privatisation process, no clear

arrangements were made with the new owners with respect to the clean up of the old dumpsites. So these industrial contaminated dumpsites are considered as environmental “hotspots”

An inventory made resulted in the identification of 16 major industrial areas and dumpsites – “*hotspots*” where both contaminated construction as well as deposited process of hazardous waste are present. Major “hotspots” are ranked regarding their detected impact on the environment and their hazardous potential: three “hotspots” were ranked as high environmental risk, seven “hotspots” as medium environmental risk and six “hotspots” as low environmental risk.

Spent batteries used in home appliances are mainly disposed of as a hazardous constituent of municipal solid waste in landfills. Used car accumulators generated in the country are not collected systematically; they usually end up at illegal dumps or even disposed of at municipal landfills. Most of the oily car components are currently disposed or spilled irregularly. Also major portion of used tyres are currently disposed of at municipal landfills/dumpsites or at wild dumpsites.

Hazardous waste from healthcare institutions is separately collected at source and only from hospitals in Skopje and Kumanovo, and is incinerated by the incinerator at the "Drisla" landfill. Medical hazardous and non – hazardous waste from other healthcare institutions is disposed of at municipal landfills without necessary pre-treatment.

At present, the legal framework and environmentally sound system is lacking to handle the animal manure and animal tissues from slaughterhouses and animal breeding farms appropriately. Current practice is to bury the animal tissue in holes in the ground on the farms or throw it onto village dumpsites. In both cases, it takes place in a completely uncontrolled manner and far from the required sanitary standards. Only in a few rare cases are regional burial places organised for this type of waste. There is little or no involvement and supervision by official veterinarians. In Macedonia, there presently exists no organised pet food industry, composting or anaerobic digestion plants, approved landfill sites or incinerating facilities, which might be used for the proper disposal of animal tissue waste.

Safe disposal facilities for agrochemical wastes containing hazardous substances such as contaminated packaging waste, used for pesticides, and spent sheep dip do not exist in Macedonia. The contaminated packaging waste is usually burned or dumped together with municipal waste. The spent sheep dip is released to the environment on location.

2.8 Summary of problems and constrains in Macedonia

A review and analysis of the key problems related to the existing waste management situation in Macedonia show that the main problems and constrains are focused almost on all areas related to the development of the waste management system and its role in the society:

- Policy and legislative framework;
- Institutional/organisational arrangements;
- Human resources/capacity;
- Financing/cost recovery and investments;
- Stakeholder awareness and communication;
- Data availability/reporting;
- Waste avoidance and reduction;
- Waste recovery and recycling;
- Waste segregation, storage, collection and transport;
- Waste treatment/processing;

- Final disposal of waste and remediation of environmental burdens;
- Impact on public health and living/natural environment with the potential impact on the Macedonian economy.

The analysis of these problem areas shows that the present waste management situation in Macedonia can be characterised as sub-standard regarding human and financial resources, insufficient and inefficient regarding monitoring, as well as hampered by political and social lacks (like execution of enforcement, stakeholders consultations, public awareness) resulting in various dysfunctional systems in society and in many related negative effects on the environment and public health.

3. STRATEGIC CONSIDERATION AND GOALS OF WASTE MANAGEMENT

3.1 Strategic issues

Development of the Republic of Macedonia towards a sustainable waste management system will require changes in existing regulations, in institutional organisation and in general waste management practice. Alignment of national laws, rules and procedures to the *acquis communautaire* represents the first and for all sections of society an important sign that something basic shall be changed in the waste management system in all constituents of the society – from Government to production & service sector and to individual citizens. The main starting responsibility is on the side of the Macedonian Government, in particular of the Ministry of Environment and Physical Planning to initiate the process by following activities:

- setting strategic objectives and goals of the contemporary waste management practice, taking into account existing environmental damages;
- ensuring that all stakeholders in society understand the relationship between non-proper waste management and the adverse effects on the environment, in particular soil, surface and ground water, air and drinking water;
- establishing the framework system where all stakeholders can contribute to decisions regarding the development of waste management;
- putting in place all policy measures and instruments necessary to encourage and support changes in the waste management system;
- ensuring that all stakeholders understand their roles and responsibilities in activities necessary to achieve the short- and long-term goals of strategy;
- enforcing agreed measures and instruments.

Successful changes in waste management can be initiated by the Government using its legislative and regulatory power but final success in practice can only be reached if all members of society are aware of their responsibilities in waste management and if they are encouraged by organisational and in particular by economic measures.

Legislation, institutions and enforcement

The successful implementation of the Waste Management Strategy primarily depends on setting up a comprehensive and adequate legislation, together with a clear organisation of institutions, which shall be able to effectively execute the monitoring and enforcement tasks. This framework will provide the foundation for successful implementation of waste management action derived from the strategic document.

The task of *transposing, implementing and enforcing* EU legislation and standards is a major challenge. Implementation of the *Landfill Directives* will be the most difficult and demanding in practice; goals of the special waste streams directives require to build-up a new management system where the private sector, specific methods of monitoring and the application of specific financial instruments shall be involved. Drafting and enforcement of the legal instruments will require additional staff in public institutions (MoEPP and joint units of Local Self Government in particular), appropriate training and specialisation of personnel.

Long term operational flexibility

Transposing of the legal instruments in the Macedonian legislation structure, realisation of investments and putting the new infrastructure for the waste collection/treatment/disposal in operation shall need some additional time; so the infrastructure for a new integrated waste management system will be established and put in operation with some time delay. It is to expect that the European legislation can introduce some new or modified standards and requirements on a range of waste management issues, and so it is important to develop such a waste management system in Macedonia that the infrastructure facilities for waste management operation

- represent the reliable technical basis,
- enable additional technological and spatial expansions and,
- as far as possible, retain a degree of operational flexibility.

Economic factors

Financing of setting-up the new waste management system as well as the remediation of existing environmental burdens caused by non-proper waste management in past are exhibited as specific problems in Macedonia, which shall be carefully considered.

Costs, both the capital investments required and operational costs to be covered, are an extremely important factor for a country with app. 2 million habitants where the effect of economies of scale is especially exhibited. Some standard waste treatment/disposal processes that are appropriate in large European countries seem not be feasible or cost-effective in Macedonia, due to the lower waste volumes, lower waste fees, and the higher costs of operating on a relatively smaller scale. This is evident for recycling/treatment processes of almost all types of waste. However, economic justification of the recycling/treatment processes of some waste streams, in particular of hazardous waste, may be verified by performing some additional feasibility studies.

High efficiency with regard to operational cost is the main precondition for keeping the overall disposal costs at a reasonable level and involvement of the private sector in waste management operations seems to be a good opportunity to reach such efficiency. In general, the private sector may better manage the dominant factors in the overall operational costs, i.e. staff costs and the vehicle & equipment operation & maintenance costs in comparison to public enterprises.

Another key economic factor is the limited local markets for materials and products recovered from waste with intention of recycling or utilisation for energy production. These markets are likely to remain relatively small. The majority of recovered material for recycling would have to be exported, which will incur additional costs for handling and shipping and thus may exceed the market value of the materials. Energy production from waste would require on the one side some additional investments in pre-treatment of waste to produce and utilise gaseous, liquid and solid waste derived fuel as well as the involvement of specific economic instruments, on the other side. The produced energy could be used in the country.

Macedonia is a country with a relatively high degree of economic openness where the foreign trade accounts for over 90% of the GDP. However, the country is characterised with a typical, relatively low income level and with a generally low living standard. So at present, the establishment and

enforcement of realistic waste management tariffs to be paid by households for waste management services is therefore a less realistic task. The financial situation of industries is another constraint to apply fully the “polluter pay” principle for financing the appropriate treatment of non-hazardous and priority hazardous waste.

Some environmental burdens - so called “hot-spots” which have already caused environmental damages with adverse effects to the population health through contamination of water, air and soil, represent specific constraints in the development of a society. Apart from the capital investments for introducing improved waste management standards, there will be substantial costs involved for the necessary closure and/or reclamation activities of old or abandoned municipal and industrial dumpsites. The system funds necessary for execution and (co-) financing the remediation of some “hot-spots” are not available because of stopped industrial operation.

Finally, additional staff requirements within the public institutions, self monitoring by waste generators, as well as regular inspections will require funds to cover increased costs in the public /administrative sector as well in the private production and service sector.

Public awareness of waste issue

Public perceptions of waste and of the waste management issues are a sociological issue. They can be sometimes manifested as strong opposition to necessary effective changes of existing waste management practices and they could present a major barrier and constraint to the implementation of an integrated waste management strategy. Some public perceptions are founded on genuine fears and concerns; some opposition is caused by the lack of information or understanding. There is also the lack of good examples of waste management facilities in practice, like well designed and “state-of-the art” new regional sanitary land and because of historical reasons the population remains distrustful to the new system solutions.

From the sociological viewpoint, the fundamental strategic achievement shall be the qualitative shift in the understanding of the waste problem as a whole, and in the comprehension of the inevitability of acceptable waste management in the present time and space. In this respect, the MoEPP recognises the need to develop and implement a National Public Awareness Communication Strategy and to carry out comprehensive programmes for on-going communications and consultations with the public and all stakeholders in waste management both before and during the implementation of Waste Management Strategy.

3.2 General strategic goals and objectives

In the process of taking political decisions on the future waste management system, the general goals and objectives of the waste management strategy are extremely significant because they define the complex of the long-term inter-related directions and activities how to

- bring under control all generated waste streams,
- decrease the quantities of waste generated,
- recovery of the material and energy value of waste,
- decrease the quantities of hazardous substances in the waste,
- assure environmentally acceptable final disposal,
- prevent the formation of new environmental burdens to be solved by the coming generations,
- remediate environmental burdens that exhibit adverse impacts on the environment and on public health.

Goals and objectives in the waste management strategy reflect the generally agreed ***national policy*** in waste management and represent the basis for preparation and implementation of an integrated and cost-effective waste management system.

Goals and objectives in the waste management field are primarily focused on the management of the waste problems at their sources and on optimal utilisation of their constituents, on the decisions on necessary activities regarding the reduction and prevention of the negative impact of waste and on the steps and measures required to achieve long-term improvement of the environment.

Strategic goals shall be harmonised between all segments in the society and harmonised goals of waste management shall be integrated into development plans at the national and local levels and in plans of the predominantly private owned production and service sectors. Goals and tasks shall be harmonised in main principles with requirements of the co-operating economic environment, i.e. EU countries on one side, and on the other side, they shall be shaped sufficiently realistic to be feasible under specific conditions in the near and more distant future.

Overall strategic goals and objectives shall reflect the commitments of all parts of Macedonian society with regard to the significant and closely interrelated changes in waste management: policy and legislation, institutional and organisational arrangements, human resources and capacity, financing and cost recovery, stakeholder awareness, data collection and information system and establishment of the contemporary technical waste management system as well as the elimination or mitigation of all impacts caused by existing waste management operations.

National legislation relating to waste management shall be the result of the political agreement in the society, it shall become compliant with requirements and standards of EU legislation in all sectors in the society, and it shall enable effective enforcement.

Effective ***institutional and organisational arrangements*** shall be established in all phases of implementation of the new integrated waste management system: from planning, issuing permits, financing, and operating up to enforcing.

In establishing the waste management system, ***human resources and capacities*** shall be adequately strengthened in the public and private sector. Knowledge and technical know-how available in universities and in other institutions as well as the economic potential present in the country shall be engaged to the maximum practical extent.

Stable ***financial resources*** and adequate incentive ***economic mechanisms*** shall be introduced to assure the revenue flows from waste management charges, which are sufficient to meet the full costs of providing an integrated waste management system according to the "polluter pays" principle and which exhibit the maximum effects regarding investment and operational activities.

Awareness of all stakeholders regarding the integration of waste management issues in society and understanding the national policy and strategy for establishment of a contemporary waste management system compliant with European standards shall represent the constant incentive to improve the management of the generated waste and to change the behaviour of all members of society.

The implementation and maintenance of a ***data collection/information system*** shall cover data on the sources, nature, quantities and fate of waste, the main information on facilities for recovery, recycling and energy utilisation of constituents of individual waste streams and information on final disposal facilities.

The new established system for the contemporary management of the generated waste streams shall take into account different technical options for ***waste avoidance, lowering hazardous potential*** of waste and ***reduction at sources, material/energy recovery and utilisation of waste*** as well as the ***reduction of residues to be disposed of*** according to the assessment of "best practicable environmental option" with the aim of environmentally ***safe final disposal*** and preservation of non-renewable natural resources at minimal emissions from the waste treatment/disposal processes to the environment

Waste management operations shall prevent emissions to the environment as well as harmful and other adverse effects to public health and welfare, to animals and vegetation and to habitats and the natural environment by technical measures, with the particular aim to protect agricultural areas and water resources, which represent the goods of special national interest.

The waste management system shall apply the *efficient and cost effective techniques* of collection, transport, separation, temporary storage and treatment/processing of segregated waste streams by means of the private sector participation to reach the waste collection rate up to 100% and the optimal level of material and energy utilisation of usable constituents of waste according to European standards.

The waste management system shall introduce *landfills for hazardous and non-hazardous waste* and other facilities for final disposal of waste fully *compliant with European standards*, it shall enable to lower hazardous potential of disposed residues which may not represent new environmental burdens. Existing municipal dumpsites and/or industrial “hot-spots” shall be progressively closed and /or remediated.

The waste management system shall establish the *inventory of the waste dumps and other environmental burdens* containing information on estimated risks and measured impacts on the environment. As part of the National Environmental Action Programme priority remediation tasks shall be defined according to the criteria that particularly take into account adverse effects and risks to the environment, future utilisation of physical space, costs of rehabilitation, and acceptability by the population.

3.3 Main principles of waste management

3.3.1 Key principles

A number of the EU key principles of waste management need to be taken into account and applied in the implementation process of the National Waste Management Strategy. In spite of the low level of the present waste management system, they shall represent the basic support for Macedonian policy regarding improvement of the present situation in waste management on the one side and the rational and sustainable use of natural resources in the future on the other side. The main key principles are:

- Sustainable development;
- Waste management hierarchy;
- Proximity principle;
- Self-sufficiency;
- Best Practicable Environmental Option (BPEO);
- Precautionary principle;
- Producer Responsibility;
- Polluter pays principle;

Sustainable development: Sustainable waste management means the utilisation of natural resources more efficiently, encouraging utilisation of renewable energy sources, reducing the amounts of waste produced and where waste is generated, dealing with it with the minimal influence to needs, ability and development of future generations.

Waste management hierarchy: Waste management strategies must aim primarily to prevent the generation of waste and to reduce its hazardous properties. Where this is not possible, waste materials should be reused, recycled or recovered, or used as a secondary, even renewable source of energy. Unusable waste fractions shall be disposed of safely in landfill sites or by incineration without energy

recovery. Landfill of waste is the least desirable but an unavoidable option in the waste management system.

Proximity principle: Waste should be treated and/or disposed of as near as possible to the source of generation to avoid adverse environmental impacts of unnecessary transport.

Self-sufficiency: Establishment of the self-sufficient network of disposal facilities inside the territory of an individual state depends on types of waste and on balancing between the proximity principle and economy of scale.

Best Practicable Environmental Option (BPEO): The Best Practicable Environmental Option (BPEO) represent a systematic and consultative decision-making process that emphasises the environmental protection across land, air and water and provides the greatest benefits or least damage to the environment as a whole in the long-term as well as in the short-term, and at acceptable cost.

Precautionary principle: Precautions taken at present shall help to avoid possible environmental damage or harm to human health in the future, in particular in the case of the present lack of full scientific certainty.

Producer's Responsibility: Economic operators, and particularly manufacturers, distributors and retailers of products -generators of waste- should take collective responsibility:

- for minimising waste in the production phase;
- for designing and developing products consisting of materials suitable for reuse, recycling and/or energy production, and of materials without risk or burden for the environment when products at end-of-life become waste;
- for developing markets for reuse and recycling of fractions recovered from end-of-life products.

Polluter pays principle: The polluter pays principle in waste management means that the potential environmental and human health costs of generating, treating and disposing of waste should be reflected in the price of products and in the charges required for proper management of waste (internalisation of external costs).

The Macedonian waste management policy shall have incorporated some additional principles and obligations, namely:

- Clear distinction of hazardous and non-hazardous waste, their separation at source, as well as separate treatment and final disposal of hazardous and non-hazardous waste fractions.
- Encouragement of the priority use of a variety of economic instruments instead and as an addition to administrative enforcement procedures.
- Establishing the supervision/control system regarding shipment of municipal waste inside of the state territory on the national level and establishing a specially regulated control system for the hazardous waste shipment when crossing the state border regardless of the intended reuse, recycling or final disposal of waste.

3.3.2 Key principles of waste management upgraded with the core elements of the EU resource strategy

Strategy on the management of natural resources is the main part of the 6th Environmental Action Programme (2002-2012) regarding waste management as an integral part of *sustainable management*

of natural resources together with the integrated product policy. Such an approach means proactively integrating resource-related environmental issues into other policies of the society.

The thematic strategy on the prevention and recycling of waste sets out guidelines and described the improved ways in waste management by the encouragement of the *integrated product policy* and of the *integrated prevention and pollution control policy*. That means the development, manufacture and consumption of products and goods where the environmental impact through the full life-cycle of products is reduced by the improved use of non-renewable raw material and energy resources, reduction of emissions to the environment and, through sustainable waste management as the final phase of the lifecycle. Reuse, recycling and material/energy recovery processes of waste fractions can lead to the improved use of resources and only unusable fractions shall be put to landfill. Such an approach means that every item of waste is seen not only as a source of pollution but also as a potential resource to be exploited and it shall result to the de-coupling of economic growth and quantities of generated waste.

Proper management with biodegradable waste representing a significant fraction in municipal waste and in waste from wastewater treatment, in agriculture waste and in food and beverage industry waste can significantly contribute *to the reduction of greenhouse gas emissions*. All biodegradable waste means in principle usable material in agricultural production cycles and renewable energy sources. Their redirection from landfill to any other material/energy recovery processes and control of emissions to the air from existing landfill facilities may give a substantial contribution to some local measures against global climate changes.

3.4 Strategic characteristics of the general waste management scheme

3.4.1 Basic principles for development of Macedonian waste management scheme

Application of the European key principle in the new waste management system of Macedonia represents the basic framework for development of the general waste management scheme from sources of the waste generation to the final disposal of residues, taking into account existing environmental burdens caused by improper waste management in the past. The waste management system shall be developed stepwise but progressively and specific measures may have different priorities regarding the present stage of development of the system and presence of environmental burdens. Establishing the national waste management system is a long-term activity in all sections of the society; however, the basic strategic principles for development of the waste management system in Macedonia shall exhibit the main priorities as starting points for the implementation measures of the national waste management strategy as well as for elaboration of waste management plans on the national and local levels.

Solving waste problems at source

The principle of solving waste problems at their source, which shall be implemented as one of the priorities, means the responsibility of the waste holder to control and collect individual waste streams, to register their quantities and characteristics and to provide such treatment and disposal operations that are according to regulations, acceptable from the environmental and from the economic aspect. This principle can be implemented for municipal waste, which is generated at dispersed-sources, by the municipalities and their public services respectively, according to the shared and appointed responsibility of inhabitants. Other legal persons - manufacturing and service sector - shall implement this principle by themselves.

Primary responsibility for waste lies at the holder of waste who remains responsible for it throughout its entire lifetime, from the source of generation to the final disposal facility, and in is general liable for environmental damage caused by the improper management of waste.

Additional responsibility for waste lies at the holder-manufacturer of products in his exclusive ability to prevent the generation of waste by closing internal raw material streams in the manufacturing processes, to recover the process energy from waste streams and to minimise the quantities and hazardous potential of waste to be disposed of. These measures are predominantly technical and technological in nature, including the restructuring of production and the use of recyclable and less hazardous substances in manufacturing processes. The hazardous potential of wastes from production as well as that of the end-of-life products shall decrease and result in lower risks to the environment. Prevention measures shall be encouraged by high environmental requirements accompanied by economic instruments.

Detailed knowledge of the waste characteristics at source enables optimal ways of applying waste management. The knowledge of the optimal way of management even if multiphase treatment processes are required, decreases the risks of adverse impacts to the environment; mixing waste fractions with different hazardous characteristics in order to lower the risk to the environment shall not be allowed.

As priority, the waste holders shall keep a register for all waste streams, paying attention to their hazardous, non-hazardous or inert characteristics, irrespective of their potential utilisation or of the planned treatment or final disposal on other locations.

All technical measures of environmental protection in order to reduce the emissions to air and water are generators of new waste, and the reliable and safe final disposal of those wastes need to be the integral part of technical and financial plans and projects.

Separate collection of waste streams

The separation of the generated waste at their source offers the possibility to select or establish an adequate system for each waste stream, in order to achieve the optimal recovery of material/energetic value of waste at minimal costs of pre-treatment and reduction of the risks, and to minimise the quantities and hazardous potential of unusable residues to be disposed of.

Regarding waste collection, the main Macedonian priority is to establish the system of separate waste collection:

- according to their hazardous characteristics,
- according to their point-source or dispersed-source generation and,
- according to the intention of further management, which shall be acceptable from an environmental and economic aspect.

Waste may in principle be seen as secondary raw material; it can be recycled or some fractions can be recovered for material or energy utilisation. Separate collection of individual waste streams at ***point sources***, which are mainly the manufacturing or energy production facilities; let some open options of choice acceptable from a technical and an environmental viewpoint:

- the utilisation of waste on location which is in the holder's property,
- transport and utilisation in the common or in another treatment or manufacturing facility or
- transport and final disposal of waste on location, which is in the holder's property or, in another disposal facilities in the State or abroad.

Municipal waste including ***waste from small service enterprises*** is a typical waste fraction generated at dispersed sources; a separate collection system shall be developing in some phases with different priorities:

Involvement of all households in the organised collection system for mixed residual waste shall mean the first priority. In parallel, the collection system for selected municipal waste fractions like bulky waste, construction waste and some household waste with hazardous constituents can be developing.

The collection system shall be adapted to the collection territory and to the final disposal facility of collected waste according to the cost/benefit approach.

Source segregation of recyclable constituents from municipal waste, separation of light fraction from mixed municipal waste with intention to prepare waste derived fuel, and encouraging of the bio-waste utilisation at gardens shall represent the next development phase in municipal waste management. Separate collection of the household bio-waste in cities shall be introduced only if there is present the market for treated bio-waste, or the products from treatment can be used in remediation processes of landfills and other environmental burdens for longer period.

The collection network with the intention to utilise valuable constituents of *end-of-life products* shall be organised by the manufacturers, importers, distributors and retailers of products and by the specialised service enterprises. Such a collection network represents a specific form of the separate collection system for individual special waste streams based on the “producer’s responsibility” principle. Implementation of the “producer’s responsibility” may have priority for some streams of end-of-life products inclusive of some types of packaging and packaging waste generated in manufacturing and commercial enterprises. The collection system may be organised and/or executed by the holder/producer of waste or authorised and licensed private or public service. Some favourable and early effects may be expected regarding material/energy recovery of waste, lower waste quantities in landfills and employment at relatively low investment and operational costs.

Waste utilisation as substitute of natural resources

All material placed on the market is destined to become a waste at its end-of-life and every production process generates some forms of waste. As the waste may represent secondary raw material, sustainable waste management means an optimal utilisation of potential resource of waste as replacement for the utilisation of non-renewable natural resources taking into account economic, environmental and social aspects as required by the concept on sustainable development. By implementing the same measure, the links between the economic growth and waste production in the developing country shall be at least weakened if not even broken.

The separation of individual waste stream or compatible group of waste at source is the main condition to obtain the corresponding quality of the usable waste fractions regardless of their hazardous level. Material streams from the separate collection of waste can be technically managed more easily and technical standards as required for material recycling or utilisation of the energy value of waste can be met more easily and at lower cost. In the case of healthcare waste, separate collection of waste to high risk, to residual municipal waste and to recyclable fractions shall represent the main unavoidable internal management measure in healthcare institutions.

Pre-treated waste can be recycled in the same or in another manufacturing process; utilisation of the energy value of individual waste or that of a selected group of waste may become achievable in Macedonia and it can be carried out in some industrial and thermal-energetic facilities under specific technical requirements and environmental conditions. Energy recovery of pre-treated waste in waste-to-energy plants with high-energy efficiency and with exploitation of renewable energy sources seems to be a favourable option for the Macedonian capital city and for some regional centres, if technically and economically feasible, but construction of such facilities may be left for execution in the second development phase of the waste management system.

According to definition, waste biomass is biodegradable material generating in biological and biotechnological processes in agriculture, forestry, in the food and beverage industry and in the municipal sector. Recovery of composts and other soil improvement substrates and their application in agriculture seems to be of the first priority from the viewpoint of sustainable management with the biodegradable waste fraction. However, specific quality requirements regarding the sort of crops,

content of toxic and bio-accumulative substances in substrates and in soils as well as the protection level of underground water shall be met for agricultural application. So, the utilisation of soil-like material prepared from biodegradable waste seems to be a very applicable long-term option for remediation projects of risky landfills and other environmental burdens.

Regardless of origin, biomass is one of the important renewable energy sources, even as a constituent of the municipal solid waste. For a country with low natural energy resources except for forest wood and hydropower potential, other renewable energy resources like demolition and other waste wood, animal by-products, manure, sewage sludge and other types of biomass may become more and more important raw material for the production of gaseous, liquid and solid fuels from waste for transport and for the energy production in industry and households.

All means of the biomass utilisation shall substantially contribute to the reduction of greenhouse gas emissions.

Rational network of treatment and disposal facilities

The collection of the majority of waste streams, and the establishment of a rational network of waste treatment and disposal facilities having the granted permits to carry out appointed waste management operations, are the main and inevitable task of Macedonia in order to preserve and improve the quality of the environment, and to preserve the available space intended for other important current and future activities in society. Improved and new waste management infrastructure shall be established to manage in the first priority, the municipal solid waste and the hazardous waste from industry, health institutions and from animal breeding and slaughterhouses.

Waste management plans and investment plans of the network of the infrastructure facilities in Macedonia providing all required phases of waste management, shall take into account the economy of technically feasible and environmentally friendly treatment and final disposal methods, proximity and self-sufficiency principles and high environmental protection standards. However, some recovery and utilisation processes of generated waste may not be feasible or cost-effective due to lower waste volumes and consequently, due to the inconvenient economic threshold of the scale of treatment plants. To achieve adequate economic thresholds for management with the municipal waste and acceptable prices for executed services, the majority of pre-treatment operations and landfill of residues shall be carried out on the regional level with more than 200.000 habitants.

Hazardous waste from health institutions shall be collected and treated in a special centralised facility before final disposal; other non-hazardous waste fractions shall be managed in the established regional municipal waste management system.

Producers of bigger amounts of hazardous waste shall construct and re-construct their treatment, stabilisation and landfill facilities on their own territories, which shall operate possessing permits to carryout waste management operations. Selected hazardous waste fractions from different smaller industrial and manufacturing facilities may be treated and disposed of in the authorised central facility, some shall be exported under a specially regulated control system for hazardous waste shipments when crossing the state border according to the Basel Convention and EU Directive on Shipment of Waste, regardless of the intention of reuse, recycling or final disposal of waste.

Animal by-products generating in animal breeding facilities and slaughterhouses shall be adequately treated and disposed of to prevent risks they may exhibit to animal and public health and to utilise the energy content of residues.

Waste from the planned municipal wastewater treatment plants in particular sewage sludge may be pre-treated in stand-alone facilities or in facilities for common pre-treatment with some specific municipal waste fractions regardless of the network of municipal wastewater treatment plants. Chosen

technological pre-treatment processes shall depend on planned utilisation in agricultural bio-cycles, in landfill remediation or in waste-to-energy process.

Network of the collection, storage and pre-treatment facilities for special waste streams shall be planned on the basis of results of feasibility studies where available markets for recyclable material and end-of-life products or for some of their fractions shall be taken into account, optionally in state or in some of the neighbouring countries. The special waste stream and some end-of-life products may be managed mainly by small private enterprises under administrative permits for specific waste management operations.

The rationality of space management and preservation of natural and cultural heritage

The territory of the Republic of Macedonia represents national value and the basis for economic and social development of the country. With regard to waste management, the only acceptable solutions are those which promote rational and environmentally safe use of the arable, pasture and forest land, land intended for settlements and for manufacturing activities, as well as those which are based on the rational use and protection of water resources and soil.

Waste management plants shall be placed in appointed areas at acceptable distances from settlements in order to minimise the impacts of perception and possible disturbances. Such solutions shall be based on criteria adopted by the Government, and they shall result in preserving and improving the quality of the living environment.

The preservation and protection measures of natural and cultural heritage are closely related to specially restricted and rational use of land, water resources and characteristic ecological system; all measures shall result in convenient long-term effects to the natural and living environment and in sustainable use of all natural resources in the country.

Landfill of the stabilised and low volume waste residues

Landfill remains the final but unavoidable disposal option for the unusable part of generated waste or for waste residues after various treatment processes; it represents the most undesirable option in the waste management hierarchy in spite of the application of high technical standards in construction and operation in order to protect human health and environment.

Residual waste of which the material and energy value may no longer be utilised under economically acceptable conditions, shall be disposed of in landfill only as stabilised, non-reactive material or it shall be pre-treated prior to landfill in order to stabilise the waste, to minimise the deposition volume and to reduce the mobility of harmful and hazardous substances as well as their emissions by the leaching water out of the landfill facilities.

However, in the first period of establishing the municipal waste management system, mainly the following effects can be achieved:

Generally, the total quantities of waste disposed of on landfills shall rise because of the increasing collection rate. Only some waste streams can partly avoid disposal on landfills. Some reduction of leaching of harmful and hazardous constituents of waste can be expected and minor control of the greenhouse gas emission produced in landfills can be achieved using the improved landfill technology.

Implementation of technologies in the next periods of establishing the municipal waste management system, shall lead to a continuous lowering of the content of biodegradable substances and to a reduction of their biological activity in landfills; the final result shall be a landfill facility of stabilised, almost inert residues, leading to acceptable and controlled emission into the environment.

Unusable construction waste with the characteristics close to that of inert waste shall be disposed of on separate landfill, without other waste residue.

Landfill of hazardous waste fractions may take place only after corresponding pre-treatment in order to immobilise hazardous constituents of waste.

Remediation of contaminated sites -“hot-spots”

Contaminated sites in the environment, i.e. industrial contaminated areas and non-compliant municipal and industrial landfills, represent a serious risk to the population living in or near the contaminated areas because of either the direct adverse impact on their health or indirectly, through the transfer of pollutants into the food chain production caused by emissions to air, surface and ground water and to soil. Remediation of contaminated sites may significantly contribute to the reduction of negative impacts on human health, agricultural land, biodiversity and natural environment and finally, on the quality of the food products on the Macedonian and other markets.

Non-compliant and other non-legal municipal landfills represent specific contaminated areas in the environment that shall be mainly closed and remediated according to priorities that strongly depend on detected risks and/or on direct impacts on the water and soil environment and on the nearby placed settlements.

Environmental audit and risk analyses regarding the assessments of the hazardous potential and environmental impacts of industrial contaminated sites shall serve as the primary basis for the systematic remediation approach and for setting the remediation priorities.

In addition, a completely new system of the environmental liability involving legal, institutional and financial mechanisms shall be established to shape a systematic approach on how to solve problems of the “hot-spots” remediation in the future. Meanwhile however, priority problems on the remediation of industrial contaminated sites shall be solved on a case-by-case approach, particularly with negotiations with new owners of industrial and mining facilities considering legal succession issues, technical demands of remediation, necessary investments and viable funding.

3.4.2 Main characteristics of general waste management scheme

The general waste management scheme represents an outline of the basic interrelated technological - technical measures in the waste management system, which are necessary to substantially increase the waste collection rate, to execute the activities with the aim of gradual decreasing of the waste quantities and hazardous potential of waste at their source, of gradual increasing of the quality of the collected waste fractions in order to increase the material/energy recovery of usable waste fractions, to build and reconstruct landfills of waste residues according to EU standards and finally, to remediate contaminated areas.

Technological and technical measures represent the technical part in the systematic establishing of the waste collection and transport systems and in the systematic establishing of the contemporary infrastructure network of the waste recovery, treatment and final disposal facilities taking into account unavoidable more-phase development of the waste management system and as a consequence, the retarded effects on the decrease of quantities and hazardous potential of waste on landfills.

3.4.2.1 Main characteristics of general municipal waste management scheme

The general management scheme for municipal waste means parallel and consecutive technical options covering the necessary measures from collection, storage, recovery of usable waste fractions and different treatment to the final disposal of waste generated by the entire Macedonian population.

This complex scheme also involves some options regarding the waste generated by small production and service enterprises because of the spatial distribution of smaller amounts of generated waste and because of economic or other reasons.

The general management scheme for municipal waste comprises, above all, the following technical activities and measures:

Reduction of municipal waste quantities and their hazardous potential at source

Reduction of the municipal waste quantities and its hazardous potential at sources may be achieved by

- encouraging the multiple use of the primary packaging;
- composting of biodegradable fraction of household waste where acceptable in settlements, and application of compost in gardens;
- composting of green waste from public and private green areas like parks, gardens, orchards, nurseries;
- separate collection of hazardous constituents of municipal waste and hand-over to the recovery system.

More successful reduction of hazardous constituents in municipal waste depends mainly on application of less hazardous constituents in products and packaging, available on the market.

Separate collection of municipal waste streams

Municipal waste quantities generally increase in parallel with economic growth in the country. However, only the separate collection of individual municipal waste fraction at source may result in main reduction effects on quantities of mixed municipal waste intended to landfills as unusable residues.

Main collection measures of the first priority shall be as follows:

- collection of mixed municipal wastes from settlement using the adequate number of distribution of collection vessels or bags and corresponding equipment for transfer stations and for the waste transport with regards to the density of each settlement and to the size of the collection territory according to the regional organisation of waste management;
- separate collection of bulky waste carried out by the periodic kerbside collection or by using the “bring-system” option to collect the bulky waste fractions at “recycling yards”, i.e. a collection facilities for appointed waste fractions (also convenient for bulky waste with hazardous constituents)
- available option to accept hazardous residues and some other recyclable fraction from households at “recycling yards”.

Technical collection measures for some end-of-life products, which may be implemented easily with the negligible financial contribution of the waste holder or without it:

- separate collection of secondary and tertiary packaging in the form of clean recyclable material at markets, at big storage and distribution centres, at manufacturing enterprises and separate collection of the recyclable paper of higher grade in public institutions.
- collection of used tyres in the tyre and car-repair services, in transport enterprises and at “recycling yards” in the transitional period;
- collection of end-of-life vehicles at authorised breaker’s yards, if equipped for detoxification and dismantling.

Some technical measures for the collection of recyclable constituents in municipal waste shall be implemented with some retard, in particular in settlements with more than 50.000 inhabitants:

- Recyclable constituents in municipal waste as segregate fractions at source; in particular primary packaging shall be collected either by performing the kerbside collection technique or by introduction of “collection islands”.
- Segregate collection of the appointed fractions in municipal waste and smaller amounts of construction waste aimed for material recycling or energy utilisation can also be carried out by using the “bring-system” option to “recycling yards”. “Recycling yards” shall be distributed on locations of regional municipal landfills and on locations of waste transfer stations and/or in the manufacturing/service areas located according to the local space management plans at borders of settlements.
- Technical collection measures for different end-of-life products may be implemented according to the producer’s responsibility. Separate collection of end-of-life products like used tyres, end-of-life cars, waste electric and electronic equipment, used mineral oils, batteries and accumulators may be carried out in the network of the specialised collection- and recycling-yards organised as public services or in the separate collection network organised by producers.

Utilisation of municipal waste and special waste streams as substitute for natural resources

“Recycling yards” may have a general function as additional purification facilities for collected waste fractions in order to achieve required quality according to the recycling standards, and storage facilities for temporary storage of the input “raw material” and purified waste fractions. These functions may also be carried out by the specialised enterprises for management and trade of secondary raw materials, in particular regarding purification processes, compacting and storage of different fractions of the primary packaging.

Some selected municipal waste fractions, even those containing hazardous substances, shall be exported to the treatment and disposal facilities because of economic reasons; co-operation with neighbouring countries seems to be particularly reasonable.

However, “recycling yards” established at a regional level, shall also take a function of mechanical pre-treatment facilities in order to separate *light fraction* and *metals* from the mixed municipal waste fraction and to prepare the secondary fuel for the appointed waste-to-energy facility. Mechanical separation is an integral part of a mechanical-biological treatment (MBT) plant. MBT plant may exhibit a higher level of flexibility regarding further processing of the separated light fraction on the one side, and efficient biological treatment of residual *heavier fraction* regarding the co-treatment with some other organic waste fractions like sewage sludge from municipal wastewater treatment plants, the production and utilisation of biogas, production of biologically stable residues with reduced content of biodegradable constituents on the other side. Nevertheless, in spite of lower flexibility, the municipal waste incineration plant with energy recovery, i.e. electric energy production and heat utilisation for district heating still remains as valuable option.

Stabilised residues from MBT processes can be disposed of by their utilisation as cover material on landfills or as usable material for general long-term remediation activities in the highly polluted mining and industrial landfill areas.

Composting of green waste from public and private green areas such as parks, gardens, orchards, and nurseries shall be carried out with intention of biomass recycling to soil on a local level or in combinations with organic waste from agricultural production.

Pre-treatment, recycling and other kinds of utilisation of *end-of-life products* may be carried out on different technological levels regarding specific characteristics of products, available facilities for

recycling or for other kinds of utilisation and the economy of scale. Products from the pre-treatment processes may enter different technological processes of recycling and final disposal available in Macedonia or other countries.

- Regarding the technical viewpoints viable for execution in the country, the main pre-treatment operation of the end-of life vehicles shall be detoxification and partial dismantling.
- Collection, dismantling and detoxification of car batteries and accumulators shall be encouraged to decrease their non-legal final disposal; due to the same reason, a collection system in stores and services shall be established for the spent small batteries and accumulators, which are usually disposed of in common with municipal waste.
- Partial dismantling and separation of usable, unusable and hazardous constituents may be the only fast feasible tasks in management of the waste electrical and electronic equipment.
- Used tyres may be selected according to suitability for the renewal treatment; unusable tyres may enter special pre-treatment for recycling or they may be utilised as secondary fuel in industrial thermal processes.
- Collected mineral oils from manufacturing/service processes and used engine oils may generally be utilised in industrial thermal processes where air emissions are under control; the recycling of used oils still remains an option, which is feasible under specific economic conditions.

However, establishment of the network of facilities and execution of all technical operations of pre-treatment, recycling and other kinds of sustainable management with end-of life products in the State or abroad shall be finally carried out in an economically feasible manner according to the decision of producers and trade enterprises.

Network of municipal waste treatment and disposal facilities

Network of regional landfills for municipal waste

The central complex of the infrastructure facilities for the final disposal of residual municipal waste shall be represented by the network of landfills on the regional level of waste management, which shall be built, equipped and in operation according to the EU standards on landfill of waste. Waste management regions shall represent the ***obligatory association of communities for the common solving of municipal waste issues***; the size of the waste management regions shall be of such a range that enables the installation of financially optimal economy of scale of regional or inter-municipality landfills and of other accompanying waste material & energy recovery and treatment plants.

The establishment of regional landfill facilities for the final disposal of municipal waste, as a legal obligation of communities, and for some non-hazardous waste from other sources, consist of the following conceptual solutions regarding landfill distribution, constructions and operations:

- setting of technical waste management standards for new and upgraded existing landfill as well as minimal operation standards in order to reconstruct some of the existing landfills for temporary operation;
- re-construction and remediation of landfills with medium risk to the environment due to relatively favourable hydro-geological conditions with intention to assure the temporary waste disposal sites and to assure the proper operational conditions and acceptable environmental impact of such temporary landfills.
- re-construction and upgrading of landfills with low risk and impact on the environment due to relatively favourable hydro-geological conditions to the level of compliant regional landfills;
- construction of new regional landfills according to new technical and environmental standards.

Landfill is the last but unavoidable phase in the waste management hierarchy; however, it represents the only real option for the final disposal of the collected municipal waste until “recycling yards” and other additional infrastructure for waste treatment is built; finally, only unusable and stable fractions of municipal waste may be disposed of on landfills.

At new and reconstructed landfill, separate space shall be intended for disposal of specific non-hazardous waste fractions if common disposal may not be acceptable because of the waste characteristics or landfill technology.

Network of infrastructure facilities for material/energy recovery of municipal waste

Among additional infrastructure facilities, mechanical biological treatment (MBT) plants for municipal waste and waste-to energy (W-t-E) plants shall play the main role in approaching sustainable municipal waste management in the second development phase.

MBT plants may be very effective in the material and energy recovery processes of mixed waste fractions, in reduction of biodegradable constituents in waste residues, in biological stabilisation of the treatment residues and may be also applied in the remediation processes of landfills and other hazardous “hot-spots”. Such plants shall be rationally distributed in the country, taking into account the economy of scale in order to achieve the optimal financial effects; they may be applied also for co-treatment with some selected non-hazardous waste fractions from the food and beverage manufacturing industry.

Waste from the planned municipal wastewater treatment plants, in particular sewage sludge may be pre-treated in stand-alone facilities or in facilities for common pre-treatment with some specific municipal waste fractions regardless of the network of municipal wastewater treatment plants. Chosen technological pre-treatment processes shall depend on planned utilisation in agricultural bio-cycles, in landfill remediation or in waste-to-energy process.

W-t-E plants utilise the high calorific fraction obtained mainly from mechanical separation of municipal waste or from the purification of separately collected recyclable fractions as fuel; they shall fulfil the high efficiency requirements regarding the electricity production and utilisation of waste heat.

Suitable locations for waste-to-energy plants or, if decided for central incineration plant for mixed residual municipal waste may be planned at towns with an existing district heating network or beside the manufacturing plants with the high process heat demand. Non-reactive residues from the thermal treatment of municipal waste with immobilised hazardous constituents may be disposed of on the regional landfills causing negligible environmental impact.

Closure and remediation of non-compliant municipal landfills

Non-compliant municipal landfills representing a high risk to the environment shall be closed down and adequate remediation measures shall be planned to mitigate environmental impact.

The technical remediation options for non-compliant landfills shall mainly consist of earthworks and landscaping, waterproof measures and formation of cover layers, additional stabilisation of deposits and capping. Special attention shall be paid to the break the contacts between water leaching through the landfill body and ground- or/and surface-water and to installation of a passive or even active collection and extraction of landfill gas. Deposited material shall be excavated out of smaller wild landfills and dislocated to the new regional or temporary landfills.

The remediation of landfills is in principle long-term activities; they become the priority in particular in the cases of direct impact on drinking water sources. Remediation shall be carried out on the basis of field survey with regard to the contamination of soil, surface water and ground water, to results of feasibility studies and with regard to available funds.

3.4.2.2 Main characteristics of the healthcare waste management scheme

Waste from healthcare institutions consists of hazardous and non-hazardous fractions and even recyclable; the success of the follow-up waste treatment system strongly depends on the segregation discipline at source. The main technical operations consist of

- separate collection of hazardous waste fraction, waste fraction similar to municipal waste and clean recyclable fractions; hazardous fractions shall be packed at source, stored, manipulated and transported according to sanitary requirements in approved packaging;
- collection and storage of segregated medical waste fractions from central storage facilities that belong to general hospitals, health centres and private clinics;
- division and transport of collected hazardous waste
 - to storage (radioactive medical waste) or
 - to central or interregional treatment/disposal facilities or
 - to other location of treatment and disposal facilities;
- operation of the hazardous waste treatment facility, i.e. incinerator or autoclave including all necessary maintenance, monitoring and reporting activities;
- transport of non-hazardous residues from medical waste treatment process for final disposal including registration of types, amounts and final destination.

The incineration facility for the healthcare hazardous waste may use hazardous (infectious) fraction and other potentially contaminated waste fractions with high calorific value as the main fuel.

Combustible residues exiting the autoclave process may be utilised as fuel in waste-to energy plants.

3.4.2.3 Main characteristics of the construction/demolition waste management scheme

Construction activities are a generator of huge amounts of waste, which can be on the other hand utilised again in the same technical branch either as raw material or as an additive. Some wood and plastic fractions may also be utilised in energy production. However, asbestos waste represents a hazardous fraction of the construction/demolition waste, which requires special techniques of collection and final disposal. The following feasible technical and technological measures shall have priority:

- collection of the construction waste;
- separation of valuable fractions at the source;
- separate collection of asbestos waste at source and wrapping of the waste with plastic foils;
- separation at recycling centres using the stationary and mobile process equipment;
- construction of mono-landfills for the construction wastes and for residues after recycling or deposition on the separate locations of municipal landfills;
- landfill of asbestos waste in separate cells of the construction landfill facilities;
- excavation and utilisation of non-legally deposited construction waste possible as one of options in covering up of municipal landfills, where special remediation measures are not required regarding the environmental impact.

3.4.2.4 Main characteristics of the industrial non-hazardous and hazardous waste management scheme

During the approximation processes to EU integrations, intensive restructuring of Macedonian industrial production may be expected, in particular during the adapting to requirements of the IPPC directives. The expected results of the industrial restructuring are more efficient utilisation of raw materials and energy, more intensive internal cycling of production material streams, and the utilisation of less hazardous substances in products; all of these effects represent efficient measures of the waste minimisation at source. Political and economic relations with the EU, and the joint ownership of companies shall, according to the optimistic scenario, give the basis for the rational waste treatment and safe disposal of hazardous and non-hazardous waste as well as for the remediation of environmental burdens due to the present improper hazardous waste management.

The Macedonian manufacturing industry and energy production shall carry out three main strategic technical measures to manage non-hazardous and hazardous waste issues successfully:

- Non-hazardous and hazardous waste shall be separately managed at source and separately disposed of on different landfill types.
- Internal raw material streams in production processes shall be cycled as technically and economically feasible, or some individual waste streams shall find their utilisation in other industrial and energy sectors as recovered secondary raw material.
- Management of hazardous waste from mining processes shall be shaped, planned and defined by means of strategic consideration and guidelines related to the legislation on mining.

In principle, non-hazardous waste of mainly mineral origin, in particular metallurgic waste and other slag/ash from the thermal and metallurgical processes may be utilised as additives in construction or cement, as the lower layer of roads. Such waste fractions may also be utilised as the main construction material of landfills where non-hazardous waste from production are disposed of on-site. The non-hazardous waste of mineral origin may also be, according to chemical compatibility, disposed of on municipal landfills or used as additional construction material for municipal landfills as well.

Metallurgical industry generates slag and flue gas dusts, which represent the main quantities of hazardous waste in Macedonia. In the near future air and water pollution abatement measures, such as exhaust and flue gas filtering and physicochemical treatment of wastewater will generate additional amounts of hazardous waste to be disposed of.

Zn/Pb slag and flue gas dust shall be reused and recycled to a higher extent by different pre-treatment and re-melting techniques. Unusable residues after immobilisation of harmful constituents shall be disposed of on the new appropriately located hazardous waste disposal facility; existing landfill shall be remediated.

Flue gas dusts from the steel factory shall be made recyclable primarily by utilising the standardised iron scrap as controlled raw material. Unusable residues after immobilisation of harmful constituents shall be disposed of on the new appropriately located hazardous waste disposal facility; existing landfill shall be remediated.

For smaller hazardous waste generators, a proper collection and disposal system shall be established consisting of licensed transporters, licensed collection and storage depots and central hazardous waste processing and disposal facility; export of some hazardous waste fractions such as PCB contained in oils or in electric condensers shall also be taken into account as the only or the most feasible option, in particular in the transition period.

Collected combustible hazardous waste may be utilised as secondary fuel in the cement kiln or incinerated in the hazardous waste incineration plant together with the unusable pesticide residues and contaminated packaging if feasible.

3.4.2.5 Main characteristics of the agriculture waste management scheme

Waste fractions from agriculture and some related manufacturing activities, animal manure, animal tissues and plant tissues are considered as by-products or as waste regarding two options: utilisation or disposal.

The management scheme for agriculture waste and by-products starts with the introduction of the “good agriculture practice”. Good agriculture practice shall be a very important step towards better handling and disposal of agriculture waste, in particular with regard to the proper storage of stabilised manure and its application on fields in limited periods of the year, improvement of living conditions and health of farm animal, changing present practice from leaving environmentally undesirable burning of crop residues with more convenient local composting and, proper management with the pesticide residues and contaminated packaging.

Stabilised manure for agriculture application shall be produced by proper lagooning, longer storage or aerobic/anaerobic treatment. Overflows from lagoons for the manure storage/stabilisation shall be treated before discharge to surface water by wastewater treatment plants.

Animal manure shall be utilised as an excellent substrate for production of renewable energy (biogas) by means of anaerobic digestion on location of the animal farm; existing biogas installations shall be reconstructed and/or renewed. Anaerobic co-digestion of manure with suitable crops like silage corn and/or with the pre-treated lower risk animal by-products from slaughterhouses as required by the EU animal by-product regulations can be placed on other convenient locations as well.

An economic viable structure of separate collection of animal tissues belonging to the different risk classes and of the disposal facilities of separated waste animal tissues shall be established, in particular rendering a facility for high risk animal tissues (hazardous waste). Such a facility may be organised as a public service, but linked to the co-incineration process of meat/bone meal in suitable energy production or industrial facilities where energy is recovered from pre-treated animal tissues.

The additional technical structure for treatment of low risk animal tissues shall consist of industrial managed facilities

- where by-products and waste fractions selected for anaerobic and aerobic treatment and co-treatment produce substrates applicable in agriculture without limits or,
- where by-products may find useful application (fat production, pet food industry..).

A return system for toxic agrochemical residues (insecticides, fungicides) and contaminated packaging shall be established by means of the waste return to suppliers for temporary storage and for further handling, treatment and/or disposal.

Burning the wood biomass is a traditional means of heat production in Macedonian households; however, stimulation of the collection of the waste wood in forests and energy production by burning renewable fuel made from biomass may be introduced on the level of enterprises (local installations or products to be sold on market).

3.4.2.6 Remediation of contaminated industrial sites, landfills and other environmental burdens regarding impacts and risks on environment

Activities of the mining and metallurgic sector, in particular practices far below the standards required for minimising waste generation and proper waste management, have caused the main environmental burdens in Macedonia. Lignite, copper ore, nickel ore and non-metal minerals are extracted by open pit mining, while lead / zinc ores and antimony are extracted by underground mining. Mines produce considerable amounts of mine- and/or flotation tailings and one third of the waste on the on-site

landfills exhibits hazardous properties. The improper management of hazardous residues from the metallurgical and chemical industry and thermal power plants cause a continuous impact on the environment. Applying *criteria on hazardous properties* of the waste, contaminated areas are assigned as “hot-spots”; applying *criteria on the proven or potential contamination* of soil and the water environment and on the local hydro-geological conditions, contaminated areas may be ranked as high risk, medium risk and low-risk “hot-spots”.

Environmental and other technical investigations executed so far, and preliminary assessments on the suitability of available remediation technologies show various remediation options to be applied alone or using the combinations of more technical methods:

- selective demolition and safe removal of obsolete contaminated constructions;
- reshaping of dumpsites in order to limit the surface to be covered and reforestation;
- reshaping of dumpsite, on-site covering with soil or soil-like material followed by reforestation; (covering material: natural or artificial soil or soil-like material, i.e. stabilised organic residues from mechanical biological treatment of municipal waste and sewage sludge);
- on-site insulation: insulation of dumpsites of hazardous or leachable waste by bunding and with drainage system for collection of (unpolluted) runoff water, capping of dumpsite with impermeable multi-layer (if necessary after reshaping) and treatment of the collected leachate;
- making hydrological barrier to extract and treatment of contaminated ground water;
- excavation of hazardous waste and contaminated soil;
- disposal of hazardous waste and contaminated soil at secure hazardous waste landfill;
- extraction of toxic organic constituents from contaminated soils;
- incineration of combustible waste or extracts (local or abroad, fixed or mobile incineration plant);
- application of special methods such as:
 - Erection of a temporary hut above the excavation site with room for excavation and transport equipment and vehicles, to prevent rainwater runoff and to control malodours.
 - Drainage system for collection of leachate for treatment or recovery options.
 - Temporary covering or coating with a polymer compound for later recovery.

The final choice of method and design of the remediation plan shall be made for the individual “hot-spot” after elaboration of feasibility studies, which shall be based mainly on the characteristics of deposited waste material and/or contaminated soils, on hydro-geological conditions and on the detailed soil / surface water / groundwater survey and delineation investigation for each individual location.

Remediation projects with high priority shall be those where impacts of “hot-spots” to the soil and water environment are already proven and where funds may be raised for financing.

4. MEASURES FOR IMPLEMENTATION OF WASTE MANAGEMENT STRATEGY

The achievement of strategic goals is based on the gradual implementation of the general technical waste management scheme, which defines the concept of the technical and technological framework for the waste management adapted to the Macedonian characteristics regarding economic development, living standard and environmental issues. The dynamics of the realisation of the technical and technological measures, i.e. establishment of the network of the collection, treatment and disposal facilities, shall be determined in particular by investment dynamics in waste management facilities, by economic and other measures that stimulate investments, and by measures which assure that the operation costs of the entire waste management sector are fully covered according to the “polluter pays” principle. Necessary investments should be in balance with the economic development of the country and with the living standard of the population on the one hand, and on the other hand with the costs of unfavourable scenarios and long-term environmental and economic consequences if the waste management concept realises too slowly and the main issues regarding waste management are not solved.

Successful realisation and operation of the technical waste management concept, which, to a large extent comprises material/energy recovery and utilisation of waste as well as final disposal of residues, depend on providing the full political consent and favourable conditions for implementation of the inter-linked key measures, i.e. waste management legislation, institutional and organisational measures together with strengthening of human resources, economic measures, protection measures of the natural and cultural heritage, measures for raising stakeholders and public awareness regarding waste issues as well as encouragement of research and development activities.

The necessary development and full implementation of all the necessary measures can not be expected in a short time period; realisation of the sustainable waste management system shall be understood as a gradual process, which however, involves the realisation of some immediate and carefully selected legal, institutional/ organisational and in particular economic measures in order to reach the necessary progress, particularly in those areas where implementation implies fundamental changes in various inter-linked social and economic activities.

Transposition of EU directives on waste management into the national *waste management legislation* framework to harmonise it with *aquis communautaire* is a very usable tool as well as a priority and challenging task; the success of harmonisation shall be of key importance regarding economic relations between the Macedonian economy and countries of the common internal EU market. An advantage is that the main principles and waste management as formulated by the relevant EU directives represent a new area of regulation on waste in the country. The waste management legislation is very complex since it shall consider in adequate balance the two main issues: the demands for operation of a market of “discarded goods” on the one side, and protection of the environment and reduction of adverse impacts caused by the improper and non-sustainable waste management on the other side. Another challenge of transposition shall be the adoption of legislation in order to adequately regulate the co-ordination and liability of different ministries and institutions.

The new legislation framework aligned with the EU regulations represents the main condition for the development of the entire waste management system. It shall consist of primary legislation on waste management with links to horizontal legislation regarding environmental issues as well as to other related primary legislation regarding general administrative procedures, investment construction and physical planning, mining, economy and financing, local self-government, public enterprises and concessions. The primary legislation on waste management shall be supplemented with the secondary legislation (by-laws, decrees, rules, methodologies, guidelines, standards...), which is mandatory for the complete establishment of the legal order on the entire waste management area. The establishment

of the legal order in waste management shall exhibit the influence to all economic branches in the country: industrial manufacturing and mining, medium/small enterprises, trade, agriculture and animal breeding with related food production, forestry, tourism and transport, and it will have an impact on their development dynamics.

Institutional and organisational measures regarding waste management shall consist of establishing organisational structures with the appointed responsible persons on a national level, mainly in MoEPP, on a local level, i.e. on the inter-municipality and municipality levels, and in the manufacturing sector, particularly in enterprises under the obligations of the IPPC directive. Tasks and responsibilities regarding waste management shall be clearly divided among the national stakeholders; ***human resources*** and ***operational capacities*** of all existing and new institutions shall be substantially strengthened in order to successfully realise the given tasks.

Institutions organised on all levels shall cover and synchronise all measures/activities from completion and implementation of legislation, operational tasks like planning, issuing permits, operating, monitoring, record-keeping and reporting up-to the implementation of monitoring and enforcement instruments /procedures. Additional specific tasks are the preparation of conditions and the organisation of functioning of the competitive market for the execution of the waste management services, preparation of conditions for the private sector participation in investments and in service activities as well as the institutional set up for implementation of financial/economic instruments.

Implementation of the “producer’s responsibility” shall require additional institutional organisation, and new municipal waste management enterprises shall be organised at the regional and inter-municipality level, respectively, as legal persons. The organisational framework shall offer to small and medium enterprises and to private entrepreneurs some appointed business opportunities to start and enlarge their operational capacities in the future period.

In order to promote the development of the economical mass and energy efficiency, and of their environment efficiency, ***economic measures*** have to address all economically significant activities: consumption, processing, production and exploitation of natural resources. Economic measures can achieve positive effects in a country under the following conditions: known economic value of environment, given limits of exploitation of natural resources, internalisation of external costs in products and implementation of the “polluter pay principle”.

Waste is a potential raw material if considered as a substitute for natural resources, but its price shall be competitive in relation to primary raw material on the free market. The main objective of economic/financial measures is to change the behaviour of all stakeholders in society regarding the management of waste streams and development of a sustainable waste management system in the country.

The development and operation of a sustainable and environmentally-sound national waste management system requires an assured and reasonably predictable revenue that can be sufficient to service or repay acquired loans, to recover operating costs of the system, to meet the costs for closing, restoration and aftercare of landfills and in the case of private investments, to provide a return on investors’ capital.

Higher operational efficiency may be achieved under competitive conditions in waste management. Favourable institutional and organisational conditions shall encourage the private sector to (co)invest in waste management facilities and to compete for execution waste management operations.

Raising ***public awareness*** and awareness of all stakeholders regarding waste management is one of the unavoidable tools in establishing and functioning of a successful waste management system. Waste represents a complex issue that, in modern societies, exceeds technical, economic and legal aspects. Namely, the problems arise from the basic relationship between man, society, and nature. Waste management concerns a whole series of subjects – stakeholders at all levels of society; there is no one

who may be exempt of the daily waste issues. So, the main task of the waste management strategy with regard to public awareness is to achieve a fundamental shift in the understanding of waste problems as a whole.

Implementation measures to raise awareness of all stakeholders regarding waste management shall take into account objective circumstances in the society and involve the following main elements: general and local political culture, limits of rational arguments, inevitability the parallel formal and informal procedures, legitimacy of legal procedures, substantiation of formal procedures and differentiated communication with the individual groups of stakeholders,

Implementation of the waste management strategy from the social viewpoint and, especially selecting the necessary locations for the waste treatment and disposal facilities may induce some fears and disturbances regarding the possible limitation or changes of the living environment and opposition from the (in)directly affected population. This is the reason why the communication process to all stakeholders is of great importance and why it shall become an inevitable constituent in the establishing of the waste management system.

Activity of special importance for establishing consistent waste management is the development of *own knowledge* in the country generated by means of educational, research and development processes. Education, science and research activities represent the basis for the development of own technologies and applications, in parallel to the unavoidable transfer of foreign know-how and technologies.

4.1 Waste management legislation and harmonisation with *acquis communautaire*

Transposition of the EU legislation on waste management into the national legislation framework is one of the main and priority tasks in the establishing process of the proper waste management system in Macedonia, as well in the accession process to EU. The full *transposition of the Waste Framework Directive and Hazardous Waste Directive* shall be carried into the Law on Waste Management within the short-term schedule as *the first priority*, as both directives set the basic rules, principles and the structure for the proper operation of the waste management system. However, the primary legislation shall, in the best possible manner, incorporate the definitions, main principles, planning, general obligations like permits and allocation of responsibilities. The Law on Waste Management shall also enact the mechanisms for reflection of full costs of environmental damage, enacting the mechanisms for encouraging economic instruments in preference to legislative instruments as the cost recovery measure, enacting financial mechanisms that enable implementation of the “producer's responsibility principle” and environmental liability.

The legislation shall be prepared in accordance with the set priorities and programmed in conjunction with key legislation in other sectors in line with the National Programme for Acquis Adoption. Also the transposition and implementation of the Urban Waste Water Treatment Directive shall be programmed in conjunction with the waste management legislation so that acceptable disposal routes for sludge are available prior to the commissioning of new (or upgraded) waste water treatment plants. The Sewage Sludge Directive may be considered under the Water Sector Approximation Strategy.

In order to start with substantial changes with regard to the existing waste landfill practice, *transposition of the Landfill Directive* with the corresponding Council Decision (acceptance criteria of waste for landfill) and with all annexes in the national legislation on the waste management is a task of the *first priority*. Adopted legislation on the waste landfill shall set the main rules and stipulations in particular on the landfill classes with regard to landfill locations, geological barriers, to the water, gas, soil management and protection, respectively, on the acceptability of waste and on waste acceptance procedures, on permitting, on the process and emission control as well as on the

monitoring of landfill in the course of operation and after closure; adopted legislation on the landfill of waste shall be gradually implemented. National legislation shall also stipulate obligations and rules on the management of uncontrolled landfills and on remediation of the relatively high number of “hot spots”. Incineration of waste, in particular general rules on the waste incineration/co-incineration, the limits on air emission and water discharges shall be regulated on the same regulation level in the legislation framework like obligations and rules that regulate the landfill operation.

Consideration should be given to providing an adequate and robust legal framework, allowing for amendments to legislation, in order to ensure easier and swifter implementation of requirements and obligations given at a national level into the obligation of municipalities and other stakeholders, and compliance thereafter with such obligations.

Due to the flexibility of regulations, it is suggested that detailed procedures, rules as well some obligations found in annexes in the transposed Directives are provided through secondary legislation (decrees, rulebooks, guidelines) wherever possible. Secondary legislation (on the decree level) may and do deal with the detailed procedures on hazardous waste/waste oil/batteries-accumulators/PCB-PCTs/medical waste management, landfills of waste, and on the waste types for which import/export is needed. Specific requirements with regard to the management of used tyres, packaging and packaging waste, waste electrical and electronic equipment, and end-of-life vehicles may also be covered by secondary legislation.

With regard to the current situation regarding waste management in Macedonia, a complex of regulations at national and local level shall be developed and implemented

- to overcome the problems related to the priority waste streams, in particular hazardous waste, and to stop the environmental pollution caused by the current waste management practice, and
- in parallel, to establish the legal framework for the organisation and operation of the new contemporary waste management system.

New regulations on waste management aligned with the *acquis communautaire* shall promote preventive measures in order to reduce the generated waste quantities, and to decrease the hazardous potential of the production waste and end-of-life products, to encourage material and energy recovery and utilisation of recovered waste fractions and to assure the final disposal of the unusable residues in an environmentally safe manner; regulations shall also set high environmental protection standards regarding placing, operation and emissions of waste management facilities. To manage priority mass flows successfully and in a sustainable way, corresponding economic measures shall be developed and incorporated in the legislation, adopted by the legislative body and implemented in the waste management operation system. Application of the mainly earmarked charges/surcharges on the final disposal of the specific waste stream instead of the application of taxes with regard to the quantities of produced waste may be one of the best solutions.

However, the implementation of legal obligations given in the waste management and related legislation at national and local level shall require the inevitable key amendments of the corresponding primary legislation in order to ***assure priority to protect public interest, i.e. environment, over the individual beneficiary***. All obligations introduced by law, in particular financial obligations have to be fulfilled upon demand or the decree of the relevant authority; the legal or physical person has the right to the reverse an action or payment by the court order.

4.2 Institutional and organisational measures and roles of the main stakeholders for the implementation of waste management strategy

4.2.1 Strengthening of institutions on national level

Substantial institutional reorganisations, additional human resources and their strengthening shall be required in order to implement the National waste management strategy, primarily to implement the legislative, institutional and organisational tasks, economic/financial measures and public awareness projects as required on the one hand, and to develop and implement the monitoring, supervision and enforcement mechanisms regarding operation of waste generators and waste management infrastructure on the national and local level (municipal waste management in disposal facilities, industry, other waste generators), on the other hand.

Drafting and adopting of policy documents, waste management legislation and the elaboration of plans and programmes are the main responsibility of the MoEPP, but with strong collaboration of MoH, MoE, MAFWE, MoF, MoIA and MoTC on the interrelated regulations of specific waste stream issues. Basic communication and horizontal co-ordination between various institutions (ministries), departments, and association and donor agencies shall be identified by the act on tasks and responsibilities of Government and Ministries; inter-sector harmonisation shall be substantially improved by establishing a high-level Inter-ministerial Steering Committee body. Additionally, clear division of the responsibilities among the staff inside the individual Ministries shall also be necessary in order to optimise the tasks and special training for staff shall be organised as a basic condition for execution of new tasks.

The MoEPP and MoLSG shall encourage and support the co-operation among the local communities in execution of the organisational measures on territories of similar spatial, technical and technological, transport, economical, development and other characteristics, in processes of common solving of waste problems on a long-term level and on behalf of the population. In such organisational pools, especially in the construction of specialised waste management plants of national and local interest, the state may participate by providing plans, recommendations, studies, project documentation, legal conditions and public awareness campaigns, as well as some capital shares (asset investment), or by setting up public services for management of particular types of waste on a national level. Similar joining activities and participation of the State may encourage manufacturing and other business sector, e.g. in particular in the organisation of the treatment/disposal facility where the variety of small generators of hazardous waste overall in the country may find the common and economically acceptable solution regarding the produced hazardous waste.

4.2.2 Waste management agency on national level

The Waste Management Unit within the Administration for Environment of the MoEPP shall become the leading environmental agency for waste management on behalf of MoEPP and shall be organisationally and by the new employments upgraded in order to establish the Macedonian waste management system successfully, to implement EU-funded projects and to start and maintain the remediation planning and implementation process. Additional responsible persons within the Waste Management Unit shall be appointed, organised and trained for carrying out various activities regarding waste management plans, issuing permits, registration, data collection/handling/reporting, waste dumps closure and hotspot remediation. Issuing all permits, registrations and authorisations related to the specific waste management operations and environmental monitoring shall be granted from the central administration body, i.e. by the Waste Management Unit only.

The Waste Management Unit shall be also responsible for the preparation of various plans on the management of hazardous/non-hazardous/special waste streams, preparation of various terms-of-reference and tender documents, technical and economical studies as well as for leading and/or supervising the investment projects of national importance related to the set-up of the collection/treatment/disposal system; for this field of activities, some of the available foreign technical assistance seems to be necessary. In the coming period, especially in the second period of the Strategy implementation, the mentioned Unit should be upgraded to the level of Department, functionally divided into several units.

The close co-operation of MoEPP with the Ministry of Finance shall be required at coordination of investments and management of financial/economic instruments. Human resources in both institutions of Ministries shall be strengthened by new employment, by additional education and training, to be able to supervise the execution of larger investments internationally funded and to support the institutional changes at both a national and local level.

The strengthened Public Relation Office of the MoEPP shall play the leading role in co-ordination tasks for the development of the national public awareness campaign; it shall co-ordinate the following separated activities: sequence and schedule activities, allocation of human and other resources and expected outcomes/monitoring indicators.

Within the IPPC Unit of the Department for Industrial Pollution and Risk Management, Administration of Environment, specific staff shall be allocated to take over the key responsibility for integrated environmental permitting concerning existing and new landfills and for the new non-hazardous and hazardous waste disposal facilities. The supervision over the enforcement of integrated environmental permits and adjustment permits with adjustment plans shall be strengthened through establishment of close cooperation and communication between the Waste Management Unit and the State Environmental Inspectorate.

4.2.3 Strengthening of institutions on local level

At local level, the Law on waste management delegates a wide scope of responsibilities at local level; local and regional authorities shall develop the capacity to deal with these issues. Additional employment shall be necessary; responsible persons in municipalities shall be organised in departments or offices and appointed to manage activities related to the existing municipal waste dumps, and to support the establishment and operation of new regional systems of the municipal waste management from the legal, organisational and financial viewpoint; they shall attend special training and acquire special knowledge. Regional municipal waste management systems shall represent a link between the state and local communities and they shall take over the majority of their responsibilities and tasks, like planning, leading investments, public relations and organisation of other activities related to the municipal waste management originally addressed to municipalities, on behalf of the joint municipalities and their inhabitants with the consent or participation of MoEPP. From the administrative/organisational and financial side, such systems shall be managed by the inter-municipality boards as political representative bodies of the joint municipalities and of the managing board of the regional waste management companies (RMWMC) which provide the municipal management operations, collection, recovery and final disposal services; RMWMC may also function as the central regional agency carrying out various expert tasks like planning, investments, local regulation, organisation, cost recovery and financing executed municipal waste management operations and environmental monitoring.

4.2.4 Institutions for monitoring and enforcement

The responsibility for monitoring the implementation of the waste management strategy and other related activities should fall primarily on the MoEPP. MoEPP shall develop mechanisms to monitor and review the implementation on the three main fields: policy implementation in practice, development of waste treatment and disposal capacities and assessment of the attained (qualitative) objectives and (quantitative) targets set in waste management plans. Special attention shall be given to indicators, which indicate the progress in reducing environmental hazards and risks associated with waste management activities (environmental monitoring), to the development of new waste management facilities (realised investments), to implementation of strengthened institutional arrangements (licensed waste management operations, data collection/management, reporting) parallel with the monitoring/enforcement activities and to rising funds to finance waste management systems by waste generators and via financial/economic instruments (earmarked cost recovery and financing).

Its subordinate departments of MoEPP, especially the Environmental Inspectorate shall be generally responsible for monitoring/supervising/enforcement of the waste treatment/disposal facilities in operations. Responsibilities between communal and environmental inspectors regarding the waste management issues shall be clearly separated and appointed; issuing administrative permits and enforcement functions shall be entirely split. *Environmental Inspectorate* with tasks of the supervising generation and management of all types of waste in the production and commercial sector as well in institutions and in specialised enterprises for waste treatment shall be **centralised on the national level**; but on departments or offices of the Environmental Inspection may be organised in order to achieve a better specialisation as well as better rationalisation of work and human resources in this field.

The MoEPP's tasks of monitoring/inspecting/enforcement the waste management operations in practice require the strengthening of the human and technical capacity of the inspectorate function on the one side, and the strengthening of the human and technical capacity of the Macedonian Environmental Information Centre on the other side, in order to increase the scope of monitoring activities. The accreditation of measuring laboratory and to process and maintain the database on waste management issues shall be one of the priorities to be implemented by the Department of Environment within the Administration of Environment.

4.2.5 Tasks, obligations and responsibilities of manufacturing and business sector

Other waste producers at local level, in particular manufacturing, trade and other stakeholders of the business sector may appoint responsible persons for execution of internal tasks regarding the environmental management. The manufacturing and other business sector, the authorised public service enterprises and other waste management operators according to their licences and/or permits shall take technological and organisational measures for the prevention, recovery and recycling of waste, ensure proper handling, monitoring and reporting on waste production, recovery and disposal by performing the internal financial and organisational measures (environmental management schemes ISO 14000 or EMAS). The Business sector may solve waste issues by treatment/disposal on own costs, or by establishment of own organisational schemes for management of special waste streams by application of agreements on a voluntary basis or it may solve the problems of specific waste streams by using the waste management schemes organised as public services. This sector shall also be linked to the planned waste management reporting system, which is considered very important taking into consideration the acquisition of important data for waste management on the central and local level.

The Business sector may coordinate their organisational activities and may be involved in negotiations related to the environmental goals, deadlines and implementation of legislation through the economic and other types of associations like the Chamber of Commerce, Trade Chamber, Association of Recyclers and other business associations that may be established in the future.

4.2.6 Roles, obligations and responsibilities of inhabitants

The main role of inhabitants in the waste management system is the collection of the household waste fractions according to the local waste management programmes, in order to minimise the residual fraction to be disposed of, and assuring the payment of waste management services. However, inhabitants shall contribute to establishing a correct business relation between the municipality and public services in order to achieve the optimal relation between the service quality and payment. Some inhabitants shall also represent an interested and affected party because of the proximity of waste management facilities.

2.4.7 Roles, obligations and responsibilities of non-governmental, educational and scientific institutions

Non-governmental organisations shall in principle represent public interest; their role may be in lobbying on planning and environmental issues; such organisation may also provide the population with a variety of environmental information and execute some educational tasks.

Universities and other research institutions may execute some technical research and develop applications; inter alia they may develop new or improved technologies and conduct complex environmental analyses in order to contribute to the better understanding of the interrelation of different environmental parameters.

4.3 Economic measures

As a general principle, Macedonia's long-term interests shall be to implement a policy of full cost recovery for all waste management facilities and services as rapidly as economic circumstances and political constraints would allow. Such a decision represents a clear message to waste producers that the management of their wastes in an environmentally sustainable manner involves significant costs, which shall be on the one side internalised in the market value of a product and on the other side, this would encourage the waste producers to reduce the amount of wastes generated and to start taking measures to recover and recycle wastes. Such a policy would also help to alleviate the growing pressure on state budgetary resources, which shall be used for the project starting activities, and ensure the long-term financial sustainability of waste management facilities and services in Macedonia.

Economic measures comprise three main elements of key importance for the future development and long-term sustainability of waste management services:

- Cost recovery and financing investment, and waste services.
- Economic and financial instruments to regulate activities regarding reduction/ recycling of waste.
- Improving investment and service efficiency through competition and involvement of the private sector in the waste management system

Cost recovery of waste management services and financing waste investment

The priority obligation of the stakeholder in the municipal waste management system is to assure revenue by gradually approaching the full **cost recovery** system for waste management operations, which is being carried out at present, and which shall be upgraded to higher standards in the future. Enforcement of fee collection are complex tasks for the development of waste management; consistent payments of fees for waste management services represent the basis for all economical measures to be introduced in order to reduce the impact on public health and environment caused by uncontrolled and improper waste management.

Realisation of consistent payment of fees and assuring necessary revenues in practice shall be a difficult task because many political, economical, institutional and organisational constrains in the society regarding waste management shall be solved: political decisions on the national and municipal level, raising the public awareness and awareness of all stakeholders and strengthening institutions, establishment of new links between the collection of fees for different utilities, and additionally, adapting the corresponding national legislation in order to assure priority to protect public interest, i.e. environment, over the individual beneficiary.

Important improvement of the execution of fee payments shall be done by re-organisation of collection and disposal services, in particular by establishment of municipal waste management companies at regional and inter-municipality levels respectively, by activation of the private sector and by the

modified interrelated flows of payment between main stakeholders: “inhabitants - municipality - municipal waste management company & landfill facility – waste collection enterprises”.

The costs of developing and operating a regional waste management system shall be borne equitably by participating municipalities. A uniform fee structure and amount shall be developed, adopted by the Government and applied throughout each region, i.e. the fees charged for receiving wastes at transfer stations, landfill sites or by another regional waste management facilities should be the same for all municipalities and collection companies within a region.

In the transition period, the *indirect mechanism* for setting collecting/disposal fees for household waste should continue to be used, whereas in the second development phase fees for managing municipal waste shall be preferably based on volume or weight. The fees for collection and for landfill of commercial and industrial non-hazardous waste shall be preferably based on weight.

The owner or user of landfills for the industrial non-hazardous waste and non-hazardous waste of other treatment facilities shall assure full cost recovery of waste management processes; the costs shall cover current operational costs and the costs of gradual remediation of active and abandoned parts of landfill according to the “polluter pay principle”.

To implement the waste management strategy the Republic of Macedonia may use different **financing options for investments**: loan options provided by international and bilateral financial institutions and funds, lease-purchase method of new waste management facilities and non-repayable grant (co)-financing from international or bilateral donors.

Transfers from the regular state and municipality budgets shall be used mainly for starting the project and for the preparation activities of the priority investments. Earmarked environmental taxes and charges related to the waste treatment and disposal shall generate a reliable and predictable revenue stream in order to assure the creditworthiness of the investor and realisation of investment by (co)-financing in practice.

Financing of investments in the closure/remediation of industrially contaminated sites (“hot-spots”) of national liability shall be carried out by the earmarked Investment Programme Fund, mainly formed with capital grants and soft loans. Investments in re-constructions of some abandoned industrial landfills with the changed functional purpose may be used to assure co-financing the cost from different but real sources; such investment costs may bring some return and financial benefits in the future.

Economic and financial regulation instruments for reduction / recycling of waste

The Republic of Macedonia shall introduce economically, financially and environmentally efficient economic/financial instruments, which are compatible with other legislation, in order to maintain fiscal neutrality and not to create unwanted distortions elsewhere in the economy. Such instruments, i.e. environmental taxes and charges with regard to waste management shall provide economic incentives/disincentives to modify existing practice of environmentally damaging behaviour in the society.

Some of the applied instruments may generate a revenue stream, which can either accrue the general state or municipality budgets or preferably be earmarked for particular purposes related to the waste management. The Government, in particular MoF and MoEPP shall established appropriate institutional mechanisms, clear rules and procedures for allocating and disbursing earmarked revenues for particular purposes.

Introduced **economic disincentives** shall be primarily aimed to induce changes in the behaviour of waste generators by altering the cost structure and shall mainly include waste disposal charges/surcharges, product and raw material charges/surcharges regarding their risks to the environment as well as the deposit/refund system, which shall have the highest importance.

Introduced *economic incentives* shall be designed to provide positive financial encouragement to manage waste in an environmentally sound and sustainable manner; subsidies and other incentives shall be introduced to avoid/reduce the waste to be disposed of, to recover energy of waste and to lower greenhouse gas emissions.

Producer responsibility schemes for management of all three categories of packaging and packaging waste, used tyres and car accumulators may be established as the first projects. Financial and operational schemes shall be initially based on a voluntary agreement of Government, manufacturers, importers, distributors and retailers and on their collective responsibility for solving the generated waste issues in a more cost-efficient and sustainable manner in comparison to the operation of municipal services; legislation may support the producer responsibility scheme as a legal obligation at a later stage. Producer responsibility schemes shall be established, managed and paid for by the manufacturing and trade sector with small involvement, intervention and control by governmental institutions.

Involvement private sector in the waste management system

Private sector participation requires the establishment of a partnership between the public sector and the private sector for the purpose of execution of projects or services traditionally provided by the public sector. Such partnerships may use certain strengths and advantages of both sectors in the performance of specific tasks, allowing each sector to do what it does best and the infrastructure and public services can be provided and operated in a most economically efficient manner.

Regarding private sector involvement in establishment and operation of the waste management system in Macedonia, the main organisational task is to structure the corresponding relationship between public sector-public authority/enterprises and private sector-infrastructure and providers of services to increase the quality of public services through the optimal exploitation of private sector skills and resources. Changes in the institutional and organisational arrangements shall be carried out to assure the delivery and recovery of cost of the municipal waste management services as well as competitive tendering shall be introduced into the system.

The Government shall establish institutional and organisational fundamentals for the private sector participation in order to encourage municipalities to enable participation of private companies in the provision of public services.

The licensed private sector may be involved in waste management of institutional, medical, commercial and industrial waste management, expecting high quality and efficient services.

With regard to the planned waste management operation at a regional or inter-municipality level, the public sector shall retain a high level of control through the regional municipal waste management companies established as “joint stock-company” by municipalities in the region with the optional participation of the private sector. Municipal waste management companies may become the owners of all regional waste management assets (inclusive non-compliant landfills) and they shall carry out, on behalf of the municipalities, local waste management planning and regulation tasks, investment tasks as well as tasks related to control and financing of executed waste collection, landfill and other type of services as previously agreed in contracts between the public and/or private contractors.

Involvement of the private sector participation in the provision for public waste management facilities and services shall be regulated in a manner that requirements for the financing of investments are assessed and addressed separately from organisational and contractual arrangements for designing, constructing and/or operating facilities.

4.4 Instruments of physical planning and protection of natural and cultural heritage

Physical planning shall take into account all topographic, geological, hydro-geological characteristics and current use of land and locations, expanding options of settlement, ownership of land and identified sensitive areas regarding water resources and nature habitats.

When placing the waste treatment facilities for carrying out any phase of waste management in the available space, those long-term potential locations for new facilities shall be selected as priority where different other manufacturing and/or service facilities are already placed according to the national or local physical plans and where no general limitations for technologies regarding the environment may be expected. Such areas are characterised by the predominance of industrial, energy and transport facilities, and railway or road corridors.

Locations for the landfill facilities shall be chosen primarily according to criteria related to the characteristics of the natural environment and its protection, to the ownership of land, to the prevailing utilisation of space as well as to the economic and social effects. The priority shall be given to the following types of locations:

- existing or abandoned landfills for the municipal or specific industrial waste, where alternative utilisation of the location may not practicable or possible, but where environmental criteria regarding landfill can be met;
- new locations for the municipal landfills and for the hazardous waste landfill where environmental and economic criteria can be met in the frame of social acceptance.

Selected existing landfills for municipal waste intended for technical reconstruction shall meet the main environmental criteria regarding the impact on the environment (mainly hydrological and hydro-geological environment); only such landfill may undergo technical reconstruction and may operate for the transition period until the construction of a new landfill.

New or existing locations selected according to the set of criteria and intended to obtain a new long-term function as treatment/landfill facility for the municipal or hazardous waste shall be prepared and adopted as an integral part of physical plans on the national and local level; new adopted physical plans shall also take into account possible expansion of waste management operations on those locations in the future.

Construction waste shall need new locations for some recycling and in particularly for landfills; such facilities shall be planned on the separate or common locations with municipal landfills.

Special attention shall be paid to the mitigation of adverse effects of mining, related pre-treatment processes of raw material and to landfills regarding landscaping and possible use of degraded areas or deposited material.

Regarding the protection of water resources, sensitive fields shall be identified where application of animal manure would be risky due to potential pollution risks and corresponding monitoring shall be carried out.

4.5 Stakeholder and public awareness and consultations

Raising *public awareness, awareness of all stakeholders* and the establishment of the *communication system* regarding the municipal, non-hazardous and hazardous waste management in the country shall be one of the unavoidable and important conditions in building up citizens understanding, acceptance and their involvement in the successful waste management system. The Available tool to aware all stakeholders in the society on waste issues and on the necessary changes regarding their waste management practice, is the communication strategy, realised through the communication process or

public awareness campaigns, respectively. Policy and structural changes in the waste management sector on the national and local levels may be implemented only actively informed public participation and wide public support. The public awareness campaign in Macedonia shall be focused on the following core group of problems: stop environmental impacts due to improper, uncontrolled and non-legal dumping; improving reuse, recycling and recovery of waste; improve hazardous waste management; creation of an integrated and co-operative approach in waste management.

The public awareness process shall, at each-one of its steps, fulfil the following fundamental principles - correctness, truthfulness, justifiability and proactive/positive approach: **correctness** assumes conformity of the planned activity to the adopted legislation; **truthfulness** assumes that the planned activity is in line with available knowledge to the greatest possible extent; **justifiability** assumes that the leaders of the planned activity are convinced of the correctness and truthfulness of the project and **pro-active/positive approach** means the delivery of advanced and timely information on positive effects and benefits of the waste management projects.

The Public Relation Office of the MoEPP shall play the main role regarding the co-ordination tasks for the development of a working plan for the public awareness campaigns on the national level with important links to the local and regional level. Public Relations Office shall

- provide public information on the general waste management issues, on the necessary changes in behaviour/attitudes of all members of society regarding waste management, on the planned regional waste management concepts and on their financial and environmental benefits, and give the opportunities for the information feed-back;
- dissemination of informative material as separate newsletter or brochures;
- co-develop with the Ministry of Education the school education programmes which include environmental issues;
- co-operate with non-governmental organisations and scientific institutions.

In order to implement the waste management strategy or projects of national importance, the Public Relation Office shall prepare/provide the implementation model and provide/organise the awareness campaign for all stakeholders, particularly for the affected target groups.

The Public Relation Office shall also lead the information campaigns to increase awareness of medium and small generators of hazardous waste in order to achieve the understanding, acceptance and co-operation in the identification, prevention, handling, recovery and in solutions for the final disposal of their waste.

The implementation model of the waste management strategy shall consist of the following analytical starting points:

- Identification of public and expert concerns about the current practice of waste management.
- Identification of the spatial, environmental, technological, economic and organisational features of the project.
- Determination and analysis of major experiences, concerns, perceptions, attitudes and expectations about the current and planned waste management practice.
- Analysis of public opinion about the public project manager or management group
- The identification of the public target groups and the identification of the network of the major players in the implementation course
- The analysis of attitudes with regard to environmental issues, in particular with regard to the new waste management treatment and disposal methods.
- The analysis of the socio-psychological and political features of the (indirectly) affected population

Implementation of waste management strategy and that of the individual waste management project requires the identification of appropriate public awareness activities per target group as well as the identification of individual persons or formal/informal target groups who may exhibit strong influence to the realisation of the projects. Communication characteristics of the different types of public target

groups, i.e. project leaders, political public, expert public, general public, media, local communities are very different and different communication and other measures shall be applied in order to realise the individual waste management projects successfully.

5. OUTLINE OF THE ACTION PLAN FOR IMPLEMENTATION OF THE WASTE MANAGEMENT STRATEGY

Achievement of strategic objectives set out towards overcoming present waste management problems and deficiencies by means of the establishment of an efficient and cost effective waste management system and by remediation of the main environmental burdens and “hot-spots” shall require a broad scope of measures to be implemented continuously and over a long-term period of more than 20 years. However, the action plan for the implementation of the waste management strategy shall reflect activities necessary to be realised in a shorter and relatively more predictable period in order to overcome the environmental impacts caused by the existing practice and to prepare a basis for establishment of a technically effective and cost efficient waste management system. The plan for implementation of the waste management strategy considers three main topics:

- prioritisation of the interrelated measures and activities to change the present waste management practice;
- specific temporary measures/activities to enable more smooth transition to the functioning of a more contemporary waste management system;
- estimation of the necessary investments and other accompanying costs as well as short and long-term benefits.

Such a short period poses a significant challenge upon the decision makers to initiate, undertake and to implement those priority measures, which shall ultimately push initiated short-term developments towards the improvement of the present waste management practices.

5.1. Priority measures and actions

In specifying the short-term actions/measures, the most demanding task is to identify the main priorities, in particular in the view of deficiencies, constraints and necessary efforts, which shall be performed with the aim to establish an integrated waste management system compliant with the extensive EU requirements where the sub-standard present situation in waste management shall be taken into account.

The implementation plan of the waste management strategy should be basically regarded as a complex of interrelated instruments in order to establish sustainable functioning of the basic infrastructure for municipal and hazardous waste management and to remediate some priority environmental burdens in the given period of 12 years.

Criteria for selection of the priority measures and actions are based on simple a model, which expresses the logical order for implementation legal requirements on waste management:

- providing human resources and organisational structures;
- preparation of the policy and regulative documents;
- preparation of technical and investment documentation;
- set up the support systems, particularly public awareness and financial support;
- realisation of investments in the basic infrastructure for waste management.

Effective elaboration of *political/regulative tasks* and *setting-up of the necessary institutional structure* unavoidably go hand-to-hand with the adequate strengthening of *human resources*.

Legal framework for waste management and economic instruments:

As *high priority* areas to start, the most important EU Directives shall be transposed and incorporated into the Macedonian legislation with intention to complete the *general legal framework for waste management*:

- on waste management,
- on hazardous waste management and
- on landfill of waste.

Preparation and adoption of a general legal framework for waste management with the accompanying secondary legislation are in the full competence of the MoEPP. Introduction of the waste management *reporting system* is considered particularly important taking in consideration the current status of the lack of data on waste management on the national and local levels. Such a system also represents a measure of the "gentle" enforcement for each waste producer as well as a basis for preparation of waste management plans, technical and investment documents, for supervising the movement of those waste streams in the country and not finally, for charging/surcharging the inadequate management and final disposal of specific waste.

However, implementation of the adopted legislation on waste management will inevitably affect some competencies of other governmental sectors; so, an efficient inter-ministerial coordination and full consensus shall be a mandatory precondition for the successful implementation of the strategy implementation plan. Particularly important *harmonisation of different interests* in the society will be necessary to reach the unavoidable amending of the corresponding legislation in order to assure priority to protect public interest, i.e. environment, over the individual beneficiary.

Adoption of such amendments may establish the legal basis for provisions of the full cost recovery of executed waste management services regardless by indirect or direct charging and, indirectly, for the establishment of own funds, which are necessary to cover the costs for the preparation of feasibility studies, technical/ investment documentation and may serve for some co-investments in the regional waste management facilities. Adopted amendments with direct effect to the payment discipline may also represent the legal basis and the signification of any economic and financial regulation instruments to be applied for reduction/recovery/recycling of waste as well as for the encouragement of the private sector to compete in the execution of some public services and even to invest in some waste treatment facilities.

The only economic instruments, which may be independently applied, are incentives for the sold electricity, which has been produced from biodegradable waste or waste fractions.

Everybody shall be aware that adopted political and legislative documents represent the "sine qua non" condition for establishment of a new contemporary waste management system.

Institutional set-up and activities

Preparation of policy, regulative, planning and technical/investment documents as well as the execution of a variety of registration/issuing permits/licensing and data collection/reporting procedure shall require, as *high priority*, substantial *strengthening of the administrative, inspection and other institutions* and it will lead to the unavoidable new employments and training of staff. The number of additionally trained staff shall rise in the first 5 years and the group of staff shall be well organised inside the environmental sector with a clearly division of the responsibilities among the staff, as well as good collaborative links shall be established between institutions, which belong to different ministerial sectors, and between institutions on the state and local level.

The main focus of activities of new and existing, but strengthened, institutions and administration shall be given to the preparation of the policy documents and investment documents. All these activities are

planned to be conducted mainly by means of technical assistance from the foreign and local consulting companies.

Preparation of the policy and planning documents represents the central part of all the actions proposed for the waste management sector; it will require the time of app. 5 years. Preparation of the waste management plans on the various levels should include the activities, which are based on the specific status of the certain waste types and streams and on the needed actions to overcome existing practice and to initiate better management by means of taking account of the requirements in the corresponding EU waste management directives:

- closure of the high risk municipal dumps,
- conditioning plans for the municipal waste dumps,
- planning activities for hazardous waste management,
- planning the reductions of disposal of biodegradable waste,
- planning the activities for management with construction and demolition waste including necessary landfill capacities,
- policy documents for encouraging waste prevention, reuse and recycling, energy recovery and sustainable use of renewable energy sources and
- policy documents for implementation of the measures (systems) for special, waste streams: waste oils, waste tyres, waste accumulators, end-of-life vehicles, PCB's, packaging waste, waste electrical and electronic equipment together with the promotion, public campaigns and support actions for implementation of all mentioned systems.

Preparation of technical and investment documents represents follow-up tasks after elaboration of the main policy and planning documents. Technical documents shall provide for waste management options from the technical viewpoint, investment documents shall give the correct answer on the necessary amount of investment, on the optimal technical and economical options and on some uncertainties, on the time-table for construction and on real sources of financing.

Immediate political decision on the regional waste management system and establishment of the regional boards on the inter-municipality level are necessary to conduct the important organisational tasks regarding municipal waste management. The **Government**, and in particular **MoEPP shall encourage and organise** the establishment of **new regional bodies - enterprises and/or institutions** to carry out the tasks of the contemporary regional waste management system from planning, preparation of necessary technical and investment documentation, providing necessary consents and permits, organising necessary financial resources for investments up-to realisation of investments in the waste management infrastructure and preparation of rules for the payment system in order to reach the necessary revenues and cost recovery for executed services. Important tasks of new regional institutions are drawing-up and implementing the closure plans for dumps with the high risk to environment and for non-compliant municipal waste dumps.

Important priority action is establishment of the central organisation for the hazardous waste management with the task of planning, designing, building and operating the hazardous waste disposal facility on the national level. Such organisation (public enterprise or joint public and private owned company) will provide services for the variety of the industrial hazardous waste generated by smaller waste generators on different locations, which can not be reused or recycled; the hazardous waste facility shall include execution of different treatment, landfill and, if economically feasible hazardous waste incinerator).

Encouragement of voluntary agreement schemes related to the management of special waste streams according to the "producer's responsibility" principle may not be the first priority activity but operational planning and set-up of a waste management system for special waste streams may substantially support some solution for specific waste streams, reduction of the pressure to landfills and mitigation of risks to the environment. Such schemes provide for minimum involvement of the government, whose role would be mainly to set rules on the earmarked internal disposal cost included

in the price of new sold products and on the payment flows as well as to monitor the organisational/financial performance and the met targets for the recovered waste fractions.

MoEPP shall also inform the production sector of new rules governing after the adoption of general waste management legislation and with the timetable for adapting of production processes to requirements of the IPPC directives. MoEPP shall also immediately start the negotiations with the production sector to find the fastest and feasible solution for final disposal of their hazardous waste and for remediation of “hot-spots” in order to mitigate their environmental impacts.

Priority technical infrastructure

Successive elaboration of technical and investment documents and applications for financing are the primary tasks when starting the investment in the priority technical infrastructure. These tasks can be summarised in two main activities:

- preparation of technical designs and feasibility studies, and
- preparation of applications for the financing of investments, like IPA applications for the already prepared feasibility studies.

Closing-down of wild and high-risk landfill and successive constructions/re-constructions of the central waste management facilities – regional landfills are expected to be realised over a 9-year period.

Establishment of the *priority technical infrastructure for municipal and other non-hazardous waste* management shall be mainly focused on the organisation of waste collection with gradual segregation of selected waste streams at source, up-grading of transport capacities, closing-down of wild dumps and non-compliant landfill and construction/up-grading of the compliant regional landfills for non-hazardous waste; such landfills shall become central facilities of the regional municipal waste management system. Technical infrastructure for dealing with inert, mainly construction and demolition waste, may be developed by giving the opportunity to the licensed private sector.

Management of hazardous waste from industry, healthcare institutions, animal breeding farms and slaughterhouses shall as the *first priority* involve measures for segregation of hazardous and non-hazardous waste fractions at their sources and improvement of storage facilities, preparation of waste management plans, elaboration of the technical and investment documentation regarding the new process technologies and remediation of “hot-spots”. Investments in the new technological process equipment and in the treatment/final disposal facilities of hazardous waste may be moved towards the second part of the implementation period for the waste management strategy.

Generally, the *special waste streams* such as packaging and packaging waste, used tyres, car batteries, ELV, WEEE, and other special end-of-life products are of less importance and the implementation may start in the second development phase of the waste management system, although some of them may be managed via private sector participation and via voluntary scheme according to the “producer’s responsibility” principle.

Elaboration of the corresponding technical and investment documentation for facilities intended for reduction of the disposed biodegradable waste, for energy recovery of waste and for its utilisation in energy production may become subjects of consideration immediately after more detailed knowledge about the quantities and composition of waste streams, which contain organic biodegradable and non-biodegradable waste. Realisation of such waste management projects shall substantially contribute to reductions of greenhouse gas emissions caused by waste and wastewater management.

Public awareness and awareness of waste generators regarding waste management

Establishment of the priority technical infrastructure for municipal and other non-hazardous waste management shall be initiated by broad information activities regarding the *public awareness and*

awareness of the waste generators, it shall be accompanied by effective promotion activities and by public relation campaigns to support other expert activities in the realisation process of the planned waste management system.

5.2 Specific temporary measures and activities

To enable more smooth transition to the functioning of a more contemporary waste management, some unavoidable temporary measures and activities shall be necessary. Closing down all non-compliant landfill for municipal waste in Macedonia may lead to the unacceptable lack of the disposal capacities for municipal waste. The available solution for the transition period seems to be elaboration of conditioning plans, reconstruction projects and execution of reconstruction of selected landfills to overcome the shortage of landfill capacities by means of the *temporary landfill of municipal waste*. Existing but reconstructed landfill shall accept municipal waste from different municipalities, which shall create the future waste management region and it shall be in operation under contemporary operational standards. Landfill to be reconstructed shall meet given criteria with regard to the characteristics of locations, with regard to the transport logistics and proximity to settlements, to hydro-geological and geological requirements as well as with regard to limits regarding nature protection and with regard to the detected environmental impact. It is the priority task of MoEPP to select locations of existing landfills, which may be suitable to be technically up-graded to the fully compliant waste management facilities at the end of the transition period.

Regarding hazardous waste management in the transition period, waste generators need some time available to prepare and realise necessary investments in the treatment and final disposal facilities. In the *transition period*, substantial efforts of MoEPP, ME and waste generators shall be given to assure the environmentally and financially *acceptable solutions for final disposal of the segregated hazardous fractions* in a manner that exhibits the lowest achievable impact on the environment at the presently available technical measures.

5.3 Estimation of the necessary investments and benefits

Total capital/costs of transposing the key EU directives related to waste issues into the Macedonian legislation framework and their full implementation are estimated at approximately 400 mio €. Investment costs for remediation of the closed down municipal landfill are estimated in the range of 30 mio €. Additional investment cost in the range of 77 mio € shall be caused by the remediation activities of the priority hot-spots. These capital costs do not comprise investments in transposition /implementation of the EU Extractive Industry Directive, EU Regulation on animal by-products and Waste Incineration Directive.

In order to reach the main goals regarding the reduction of environmental impacts caused by waste, the *priority investments* in the transposition of legislation and in the basic municipal and hazardous waste infrastructure shall amount yearly to approximately *1,5% of the GDP* (Reference value used is 5,77 billion US\$ in the year 2005). More sophisticated technological facilities regarding biotechnological and thermal treatment of waste shall require additional capital investments; those investments shall become unavoidable at the end of the implementation time of the waste management strategy. Approximately 10% of the yearly investments in establishment of the waste management system shall be spent to cover the personnel related costs for legal transposition and implementation and for technical assistance for legal transposition and implementation. The other 90% of financial amount shall be spent in the realisation of capital investments. According to the first estimation, approximately 40% of all investments shall be realised in the industrial sector and approximately 60% of investments shall be realised in projects of establishing the municipal waste systems and infrastructure, which shall be financed from public financial resources.

Implementation of the waste management strategy shall lead to major changes in handling, treatment and disposal of waste in the country as well as to changes regarding material and energy recovery of waste and utilization of usable fractions. The main benefits from realization of the main strategic goals in waste management shall be:

- Reduced number of respiratory diseases and noise nuisance to local population, and reduced risks to health from contaminated water supplies, air and soil.
- Benefits to eco-systems and other environmental resources as emissions from waste activities into air, water and soil are reduced and the recovery of energy is increased;
- Reduced public health and explosions risks as well as lower impact on global warming as methane emissions from landfills are captured and made to generate energy;
- Lower pollution to groundwater and surface water from leakage of unprotected landfills and, as a result, lower risks of contaminating drinking water, soil and agricultural products;
- Increased efficiency in the use of material and reduced production of primary material as a result of higher levels of recycling;
- Lower costs for waste collection, treatment and disposal, as less waste will be produced;
- Better management and monitoring of waste streams.

5.4 Outline of the action plan for implementation of the waste management strategy

To enable installation of environmentally sound basic technical infrastructures for municipal and hazardous waste management, there should be in place the proper accompanying legislative structure, institutional and organisational and other support structure as well the adequate financial resources. There could not be made any distinction for what is more important, because all prerequisites create conditions for the functioning of the technical infrastructures. Integral elements and all considered topics shall create a general structure of the waste management strategy implementation plan where the main priorities are emphasised and roles/responsibilities of all stakeholders in the waste management are involved.

The action plan for the implementation of the waste management strategy is structured concerning main activities, for which stakeholders are assigned, and compacted description of the main scope as well as the expected start of activities and the time range inside of which the planned tasks shall be carried out. Interrelated tasks and obligations of the highest priority shall be done in parallel; so, it becomes evident that some tasks, in particular construction of technically and financially more demanded plants could be only initiated in the 12 years time range by the elaboration of technical and investment documentation.

Some main interrelated measures / actions are presented and briefly described in groups in *Table 1*.

Table 1: Outline of the waste management strategy action plan with the responsible stakeholders and with the main interrelated measures / actions

MEASURES	STAKEHOLDERS	SCOPE OF MAIN TASKS AND ACTIVITIES	YEARS OF IMPLEMENTATION												
			1	2	3	4	5	6	7	8	9	10	11	12	
Policy and legislative measures															
Complete transposition of the Legal Framework	MoEPP	Transposition of EU directives and amending environmental and other affected legislation, transposition of national legislation and targets to local level, preparation of secondary legislation, technical standards, codes of practice, reporting methodology and guidebooks	x	x	x	x									
Monitoring and enforcement instruments	MEPP	Regulating permitting and licensing, appraising and regulating fees against real cost of environmental damages caused by improper waste management, regulating enforcement procedure regarding the fee collection for executed services		x	x	x	x								
Institutional and organisational arrangements and execution of measures															
DIVISION OF RESPONSIBILITIES AT NATIONAL LEVEL, APPOINTMENT OF COMPETENT AUTHORITIES/PERSONS:															
Division of responsibilities, obligations and tasks	Government and Parliament, MoEPP, MoTC, MoH, MoLSG, MoF, MoE, MoAFWE	Coordination of obligations and responsibilities among Ministries with regard to implementation of waste management strategy; establishment of the inter-ministerial steering and coordination body.	x	x											
Establishment of waste management department	MoEPP-WM dept, MoEPP-PR office	Planning; administrative tasks (permitting, reporting); coordination of conceptual, feasibility, risk assessment and other environmental studies, institutional and financial arrangements; promotion of public campaigns as support activities and other technical assistance tasks	x	x	x	x									
Appointment of responsible bodies/persons in other Ministries, institutions and in production sector	MAFWE, MoH, health institutions, industries and other waste generators, animal breeding farms	Planning; conceptual technical and feasibility tasks, institutional and financial arrangements; promotion of public campaigns as support activities and other technical assistance tasks with regard to hazardous, medical, animal breeding and slaughterhouse waste management.		x	x	x	x								

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MEASURES	STAKEHOLDERS	SCOPE OF MAIN TASKS AND ACTIVITIES	YEARS OF IMPLEMENTATION												
			1	2	3	4	5	6	7	8	9	10	11	12	
LINKED INSTITUTIONAL SET-UP BETWEEN STATE AND LOCAL LEVEL AND OTHER SECTORS															
Linked institutional set-up regarding <i>industrial hazardous waste</i> management system	MoEPP, hazardous waste generators, owners of hazardous waste landfills	Establishing the organisation on the state level for planning, designing, providing financial resources, building and operation of the hazardous waste treatment/disposal facility. Creation of industrial hazardous waste management schemes, plans, execution of feasibility study with regard to extent of the centralised/decentralised/export solutions.		x	x	x									
Linked institutional set-up regarding waste management from <i>healthcare institutions</i>	MoEPP, MoH, health care institutions	Establishing the organisation system for designing, building and operating hazardous medical waste treatment/ disposal facility Execution of feasibility study	x	x	x										
Linked institutional set-up regarding management system of hazardous <i>animal by-products</i> from animal breeding farms and slaughterhouses	MoAFWE, MoEPP, animal by-products generators	Establishing the organisation on the state level for planning, designing, providing financial resources, building and operation of the animal by-products treatment/disposal facility. Creation of animal by-products waste management schemes, plans, execution of feasibility study with regard to options of the final disposal techniques.		x	x										
Linked institutional set-up regarding <i>municipal waste</i> management	MoEPP, MoLSG, municipalities (regional level-MSWMC)	Establishing of the executive bodies for investment and operations on the regional level (MSWMCs) with variety of the technical, space managing, economical and other organisational/operative tasks related to the preparation of waste management schemes, plans and reports, to technical and investment documents, to applications for financing from international funds, to managing of infrastructure and services, to financing of integrated municipal waste management operation, to closures/remediation of dumps, to reduction of bio-waste in landfills.	x	x	x										
Linked institutional set-up regarding management of <i>special waste streams</i>	MoEPP, MoE, MoF, economic sector concerned	Establishing of organisational, financial and operative structure for collection, treatment, recovery/recycling and disposal of selected waste streams, i.e. end-of-life products. Creation of waste management schemes, plans, feasibility studies on management of special waste streams (P&PW, waste oils, PCB waste, accumulators & batteries, WEEE, used tyres);			x	x	x	x							

MEASURES	STAKEHOLDERS	SCOPE OF MAIN TASKS AND ACTIVITIES	YEARS OF IMPLEMENTATION												
			1	2	3	4	5	6	7	8	9	10	11	12	
Linked institutional set-up regarding management of <i>end-of-life vehicles</i>	MoEPP, MoF, MoIA, economic sector concerned	Establishing of organisational, financial and operative structure for collection, treatment, recovery/recycling and disposal of end-of-life vehicles. Creation of the ELV management scheme, plan and feasibility study; set-up a linked certificate system – registration/ destruction.					X	X							
Competitive market for WM services & private sector participation	MoEPP, MoLSG; municipalities (local level -. MSWMC)	Reformation of municipal waste management services; establishing and implementation of tendering for services, monitoring and control of performances of MSWM service providers		X	X	X									
Institutional set up for implementation of financial / economic instruments and	MePP, MoF, municipalities (regional level-MSWMC), waste management operators, waste generators, economic associations	Formation of charges/surcharges and tax system, agreement on the level of earmarking, and on re-investment in waste management infrastructure. Establishment of the voluntary end-of-life products management scheme according to “producer’s responsibility” with earmarked internal cost form disposal included in new products sold		X	X	X	X	X							
PERMITTING AND ENFORCEMENT MEASURES															
Set-up and execution permitting/licensing system	MoEPP	Permitting system for waste collection/treatment/disposal facilities and operations	X	X											
Set-up of monitoring, data collection and reporting system	MoEPP, MEIC, authorised institutions, waste generators	Data collection, record keeping and reporting, environmental monitoring;	X	X											
Execution of enforcement and reporting	MoEPP-inspectorate,	Inspections of waste generators and collection/handling/disposal facilities for all type of waste;	X	X	X	X									
Human Resources / Capacity Building															
MoEPP capacities	MeEPP	WM depart: new employments & staff training; Inspection and MEIC: training, measuring and data processing equipment, PR office: equipment and training for PR issues	X	X	X										
Capacities of municipalities	Municipalities and MSWMCs on regional level	New employment and training of staff because of increased requirements on waste management issues from political, organisational and financial viewpoint		X	X	X	X								
Capacities of waste management operators	Public and private waste management services	Separation of WM service units from the other municipal services, involvement of the private sector in collection, separation, transport activities			X	X	X	X	X						

MEASURES	STAKEHOLDERS	SCOPE OF MAIN TASKS AND ACTIVITIES	YEARS OF IMPLEMENTATION													
			1	2	3	4	5	6	7	8	9	10	11	12		
Capacities of waste generators	Waste generators, holders and operators of facilities; MoEPP	Appointment of competent persons for environmental issues; waste management planning, execution of monitoring, introduction of cleaner production and products, EMAS, IPPC technologies, public relation activities, preparation of investment documentation, financing investments		x	x	x	x	x	x	x						
Technical measures																
TEMPORARY TECHNICAL MEASURES																
Collection, transfer and transport of municipal waste fractions	MSWMCs on regional level; public and private waste management services,	Preparation of technical scheme and feasibility study on waste fraction collection, transfer and transport, tendering and involvement of private sector, investment in upgraded transport system.		x	x	x	x									
Temporary landfill of municipal waste	MoEPP, MoLSG, municipalities	Selection of landfill locations suitable for closures/remediation and remediation /upgrading for temporary /future landfill of municipal waste as a part of the regional waste management schemes and result of executed feasibility studies.	x													
Temporary landfill of municipal waste	MSWMCs on regional level, MoEPP and municipalities	Preparation of conditioning plans, technical, space managing and investment documents for closure/remediation/upgrading/landfill; applications for financing from local and international funds, administrative, technical and financial management of investments from acquiring permits, construction up-to the operation of regional landfill facility.		x	x	x	x	x	x							
Industrial hazardous waste management system	MoEPP, industrial waste generators	Establishment of data collection/reporting system Separate collection of hazardous waste at source and temporary storage (if feasible)	x	x												

MEASURES	STAKEHOLDERS	SCOPE OF MAIN TASKS AND ACTIVITIES	YEARS OF IMPLEMENTATION													
			1	2	3	4	5	6	7	8	9	10	11	12		
SYSTEMATIC TECHNICAL MEASURES																
Landfill of <i>municipal waste</i>	MSWMCs on regional level,	Preparation of technical, space managing and investment documents				x	x	x	x	x	x	x				

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	MoEPP and municipalities	for new regional landfills and for collection of recyclable fractions; applications for financing from local and international funds, administrative, technical and financial management of investments from acquiring permits, construction up-to the operation of regional landfill facility.																		
Management of <i>special waste streams</i>	MoEPP MSWMCs /reg.level/, economic sector concerned, private enterprises	Preparation of technical, space managing, organisational and investment documents for collection, recovery/recycling of recyclable material, P&PW and other end-of-life products; tendering and contracting.							X	X	X	X	X	X	X	X	X			
Design of industrial <i>hazardous waste</i> management plants and landfills	MoEPP, hazardous waste generators	Application for financing from local and international funds. Preparation of technical, space managing and investment documents for establishment of the industrial hazardous waste management system (collection of segregated fractions at their sources, intermediate storage, recovery, pre-treatment, construction/reconstruction of landfills or other safe final disposal techniques in state or abroad)		X	X	X														
Construction / operation of industrial <i>hazardous waste</i> management plants and landfills	MoEPP and/or licensed specialised enterprises (public/private enterprise)	Construction of new common industrial hazardous waste landfill / reconstruction of existing industrial hazardous waste landfills /operation of landfills applying adequate pre-treatment facilities					X	X	X											
Design of treatment and final disposal facilities of <i>the animal by-products</i> from animal breeding farms and slaughterhouses	MoEPP, MoAFWE and/or animal by-products generators	Application for financing from local and international funds. Preparation of technical, space managing and investment documents for establishment of the animal by-products management system (rendering and final disposal of products as 1 st priority, production of biogas and fertilisers as 2 nd priority)			X	X	X													
Construction / operation of treatment and final disposal plants of <i>animal by-products</i>	Specialised licensed enterprises (public/private enterprise)	Construction /operation of new rendering and installations of biogas/electricity production. Adapting the thermal-energetic facilities for co-incineration						X	X	X	X									
Design of medical <i>waste</i> management facilities	MoEPP, MoH, health institutions	Application for financing from local and international funds. Preparation of technical, space managing, organisational and investment documents for establishment of waste management system in healthcare institutions.			X	X														

MEASURES	STAKEHOLDERS	SCOPE OF MAIN TASKS AND ACTIVITIES	YEARS OF IMPLEMENTATION																	
			1	2	3	4	5	6	7	8	9	10	11	12						
Construction / operation of <i>hazardous waste</i> management facilities from the healthcare institutions	MoEPP, MoH, health institutions	Set-up logistic system to link healthcare institutions with regard to the common final disposal of hazardous waste. Construction /operation of temporary storage facilities and central				X	X	X												

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		incineration plant for the medical hazardous waste (or disinfecting facilities)																
Design and construction/operation of treatment/disposal facilities for industrial <i>non-hazardous waste</i> and	MoEPP, MSWMCs on regional level; non-hazardous waste generators, licensed specialised enterprises	Preparation of technical, space managing, organisational and investment documents for establishment of the non-hazardous waste management system. Construction/reconstruction inside of production technologies (separate collection/storage, recovery/recycling) and non-hazardous mono-landfills or common use of municipal & non-hazardous waste landfills							X	X	X	X	X	X	X			
Design and construction/operation of treatment/disposal facilities for <i>construction/demolition waste</i>	MoEPP, construction waste generators; licensed specialised enterprises	Preparation of technical, space managing, organisational and investment documents for establishment of the construction/demolition waste management system. Construction/reconstruction of mono-landfills and adequate pre-treatment facilities								X	X	X	X	X				
Design and construction/operation of treatment/disposal facilities for waste from <i>waste water treatment</i> plants	MoEPP, municipalities, MWWTP	Preparation of technical, space managing, organisational and investment documents for establishment of sewage sludge management system Construction of bio-treatment plants and reconstruction co-incineration plants								X	X	X	X	X	X	X	X	X
Design and construction/operation of plants for <i>material/energy recovery</i> of municipal waste	MoEPP, MSWMCs on regional level, thermal-energetic facilities	Preparation of technical, space managing, organisational and investment documents for mechanical and biological treatment plant and incineration/ co-incineration plants with corresponding feasibility studies /Construction of MBT and incineration plants and/or reconstruction of thermal-energetic or industrial facility/										X	X	X	X	X		
Design and construction/operation of installations for reduction of <i>biodegradable waste</i> fractions in landfills	MoAFWE, MoEPP, animal breeding farms, food production industry, slaughterhouses	Preparation of technical, space managing, organisational and investment documents for establishment of. /Construction/reconstruction of mono-landfills and adequate pre-treatment facilities/										X	X	X	X	X		

Economic / financial measures																		
<i>Hot-spots</i> remediation	MoEPP, legal successors,	Selection of the investigation and remediation priority of hot-spots. Detailed investigation of deposited waste material soil/surface water/groundwater, delineated investigation programme for individual locations and elaboration of feasibility studies, technical	X	X	X	X										X	X	X

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		and investment documents. /Application for financing from local and international funds, tendering, contracting, execution/																
Cost recovery and financing of integrated municipal waste management operation	MoEPP, MoF, municipalities (regional level -MSWMC), waste collectors	Establishment and operation of charging system for MSWM services by approaching to the requirements of “polluter pay principle”, criteria and rules for setting fees/tariffs; providing for uniform charging system for MSWM services and enforcement of fee collection from users of services.			x	x	x	x	x									
Financial / economic instruments	MoEPP, MoF, municipalities at regional level (MSWMC), economic sector concerned.	Implementation of disposal fee + surcharges for non-compliant landfills. Earmarked taxes/surcharges on selected chemical in products and/or on hazardous constituents in end-of-life products and/or on selected packaging material or other selected end-of-life product. Earmarked charges as constituents of the product selling prices in the frame of the voluntary schemes for management of selected waste fractions according to the “producer’s responsibility” principle.			x	x	x	x	x	x	x	x	x	x	x	x	x	x
Stakeholders and general public awareness																		
Stakeholder communication strategy	MoEPP –PRO, waste generators,	Execution of informative, consulting and collaborative tasks to improve awareness and knowledge about waste management issues and solutions	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Public communication strategy	MoEPP –PRO, all stakeholders	Carrying out campaigns to clarify waste issue and related risks, to change negative perceptions on waste management issues, to improve payments, promote against wild and non-legal dumping of waste, to support new waste management projects and investment in infrastructure facilities.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

This Strategy shall be published in the Official Gazette of the Republic of Macedonia.

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**VICE PRESIDENT OF THE GOVERNMENT OF
THE REPUBLIC OF MACEDONIA**

ADOPTED ON 11 March 2008, Skopje

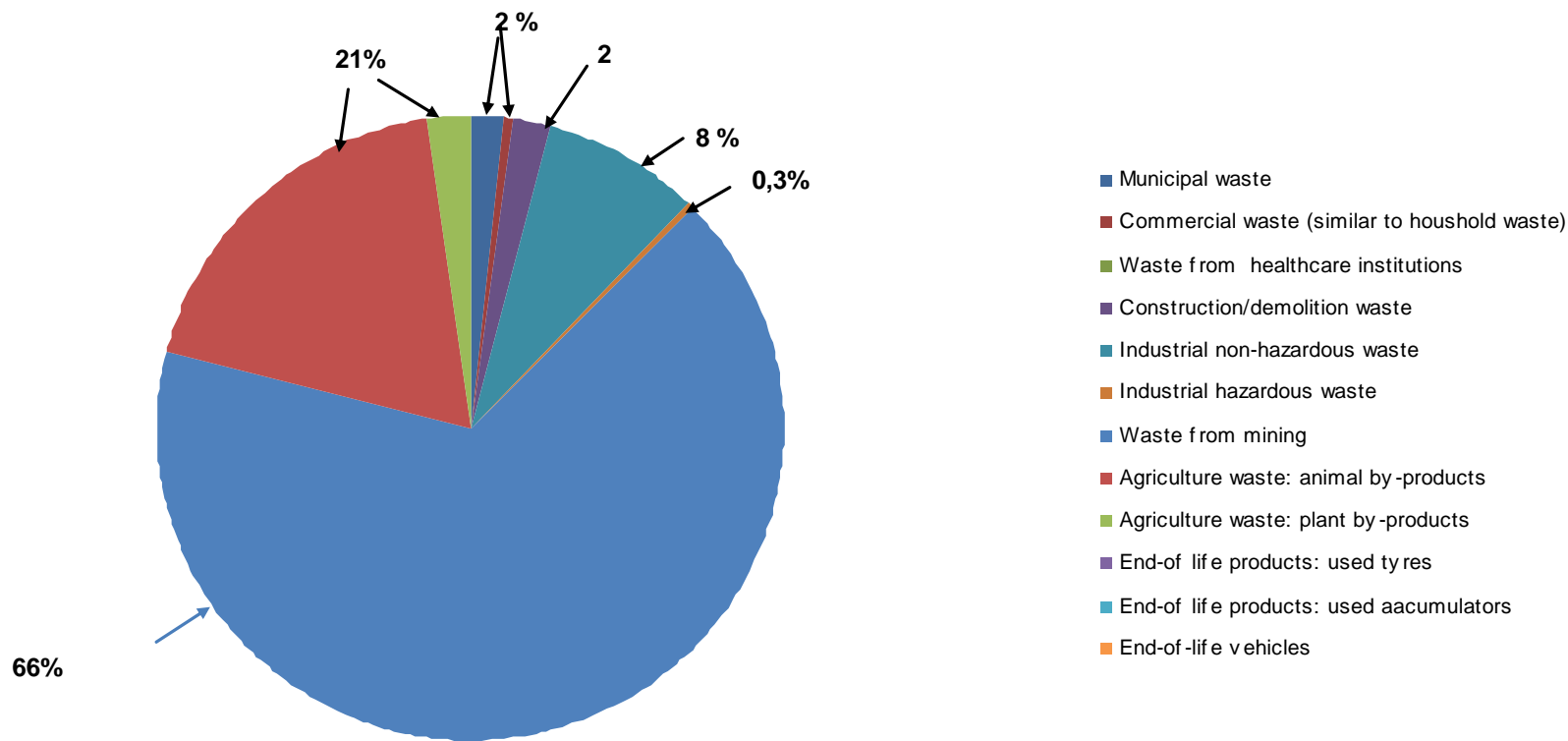
Zoran Stavreski, MSc

6. ANNEXES

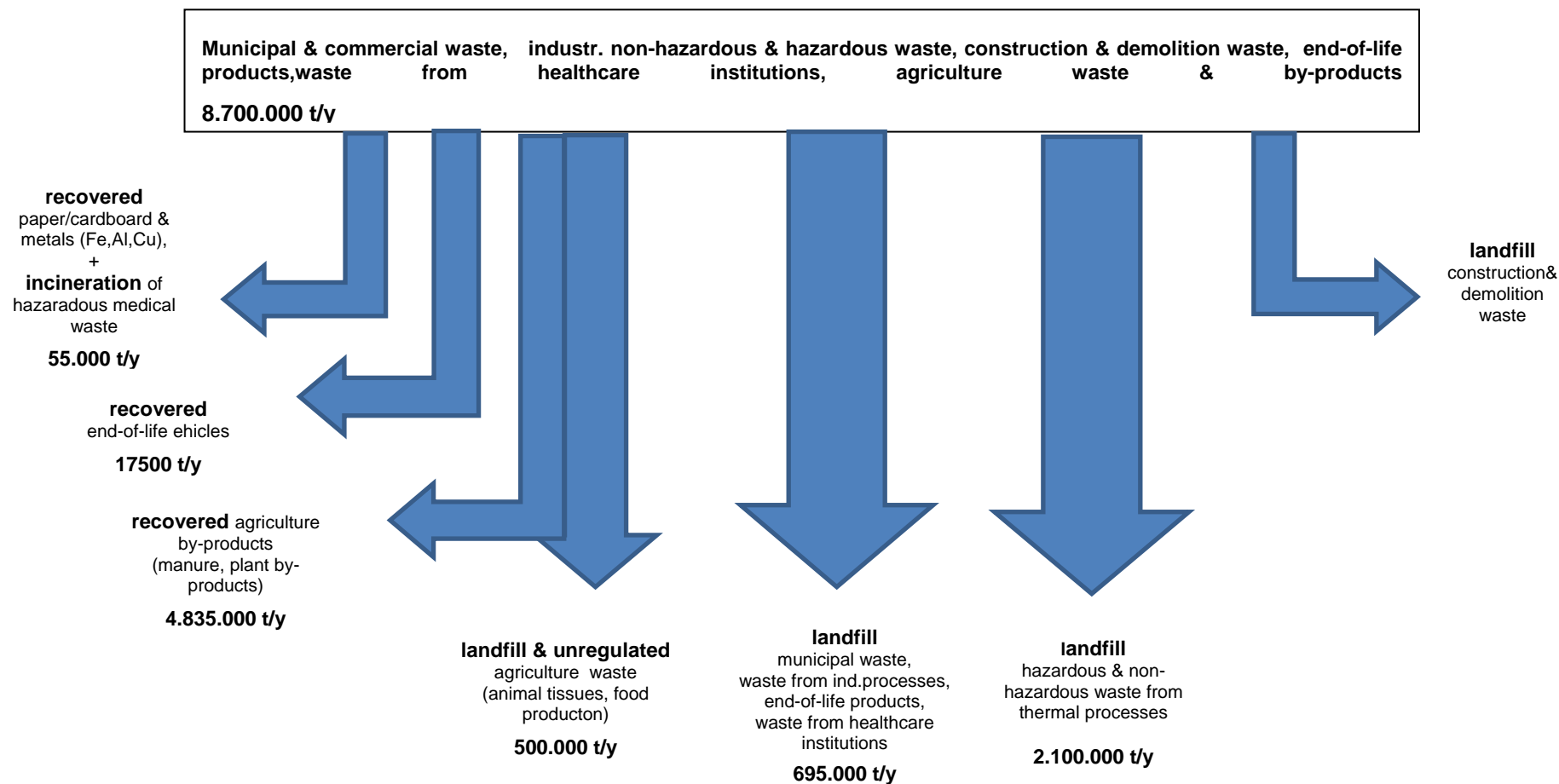
Annex 1: List of abbreviations

BPEO	Best Practicable Environmental Option
EIA	Environmental Impact Assessment
ELV	End-of-life vehicles
EMAS	Environmental Management Audit Schemes
EU	European Union
GDP	Gross domestic product
HDPE	High density polyethylene
HZW	Hazardous waste
IPPC	Integrated Prevention and Pollution Control
ISO	International Standard Organisation
MBT	Mechanical biological treatment
MAFWE	Ministry of Agriculture, Food and Water Environment
MoES	Ministry of Education and Science
MoFA	Ministry of Foreign Affairs
MoLSG	Ministry of Local Self Government
MoE	Ministry of Economy
MoEPP	Ministry of Environment and Physical Planning
MoF	Ministry of Finance
MoH	Ministry of Health
MoIA	Ministry of Internal Affairs
MoTC	Ministry of Transport and Communication
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organisation
NWMP	National Waste Management Plan
NWMS	National Waste Management Strategy
Pb	Lead
PCB	Poly-Chlorinated Biphenyls
PCT	Poly-Chlorinated Terphenyls
PET	Polyethylenetherephtalate
P&PW	Packaging and Packaging waste
PRO	Public Relation Office (MoEPP)
PPP	Public Private Partnership
PVC	polyvinyl chloride
SAI	State Agricultural Inspectorate (MAFWE)
SIE	State Inspectorate for Environment (MoEPP)
SMI	State Market Inspectorate (MoE)
SSHI	State Sanitary and Health Inspectorate (MoH)
SWM	Strategy on Waste Management
TA	Technical Assistance
ToR	Terms of Reference
VOC	Volatile Organic Compound
WEEE	Waste Electric and Electronic Equipment

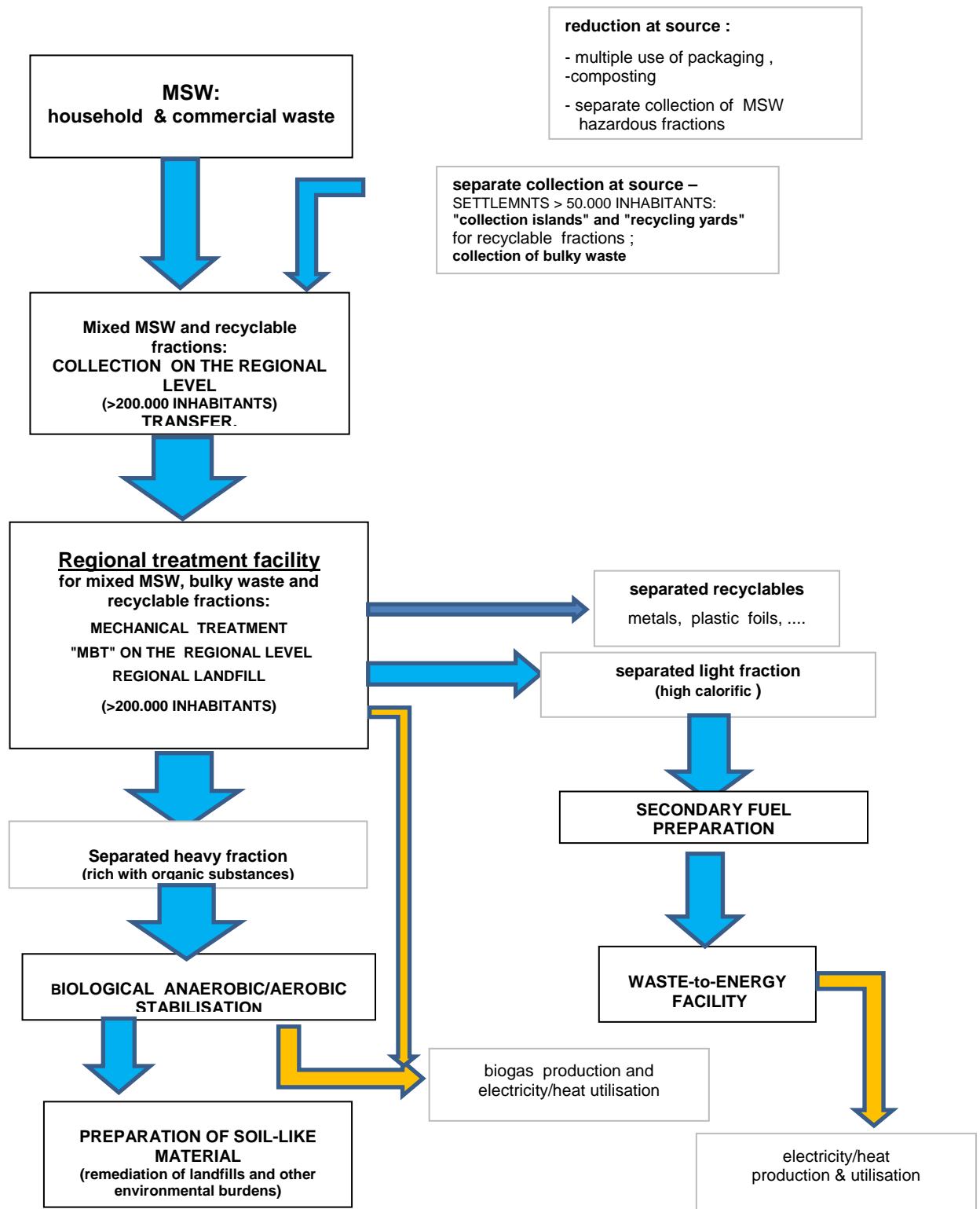
TYPES AND QUANTITIES OF THE INDIVIDUAL WASTE STREAMS - YEAR 2005



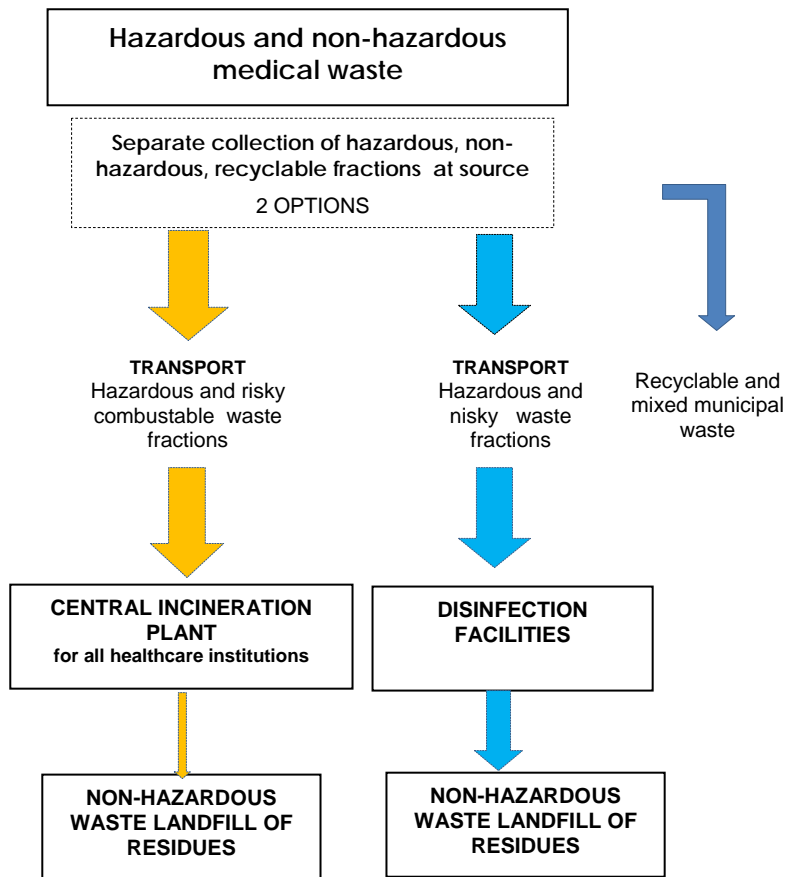
EXISTING WASTE MANAGEMENT (YEAR 2005)



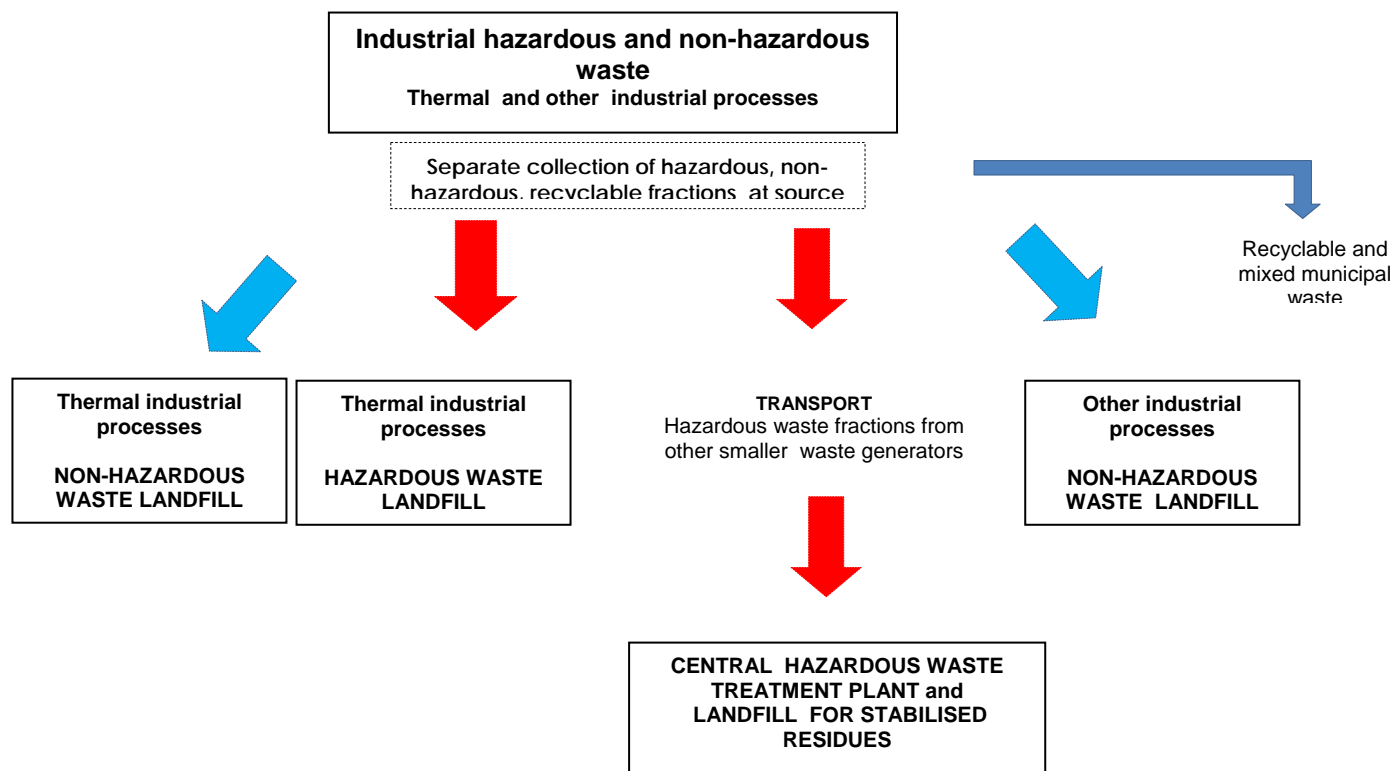
MAIN PRINCIPLES OF THE MUNICIPAL WASTE MANAGEMENT SCHEME



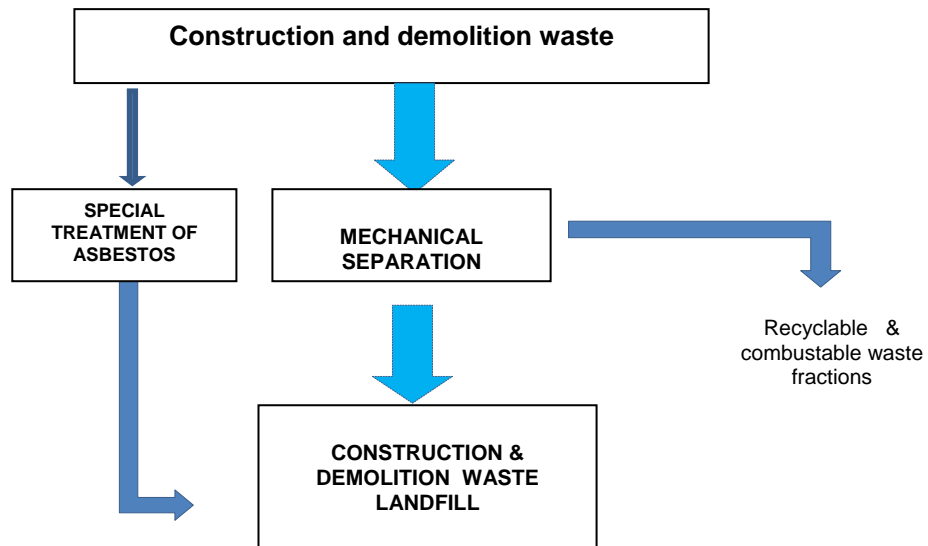
MAIN PRINCIPLES OF THE MEDICAL WASTE MANAGEMENT SCHEME



MAIN PRINCIPLES OF THE INDUSTRIAL HAZARDOUS AND NON-HAZARDOUS WASTE MANAGEMENT SCHEME



MAIN PRINCIPLES OF THE CONSTRUCTION & DEMOLITION WASTE MANAGEMENT SCHEME



MAIN PRINCIPLES OF THE AGRICULTURE WASTE AND BY-PRODUCT MANAGEMENT SCHEME

