



**Republic of Macedonia**  
**MINISTRY OF ENVIRONMENT**  
**AND PHYSICAL PLANNING**

**National Waste Management Plan (2009 - 2015)**  
**of the Republic of Macedonia**

**October 2008**

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## EXECUTIVE SUMMARY

### *Introduction and starting points*

**The National Waste Management Plan (NWMP 2009 - 2015)** as a constitutive part of the National Environmental Action Plan is based on the adopted **Waste Management Strategy of the Republic of Macedonia (WMS)**, which reflects the national policy in waste management and represents the basis for preparation and implementation of an integrated and cost-effective waste management system.

The National Waste Management Plan (2009 - 2015) is a **novelty of the proposed document prepared in 2005**. The purpose of the novelty of the National Waste Management Plan is to provide an adequate environmental policy, decision-making framework, economic basis, public participation and gradual setting-up of the technical infrastructure for carrying out the waste management operation in order to implement the waste management system in compliance with EU legislation and with the EU Sixth Environmental Action Programme (2002-2012), taking into account its priority in waste management, i.e. thematic strategy on sustainable use of resources and thematic strategy on waste prevention and recycling.

The National Waste Management Plan (2009 - 2015) has been developed to facilitate the efforts of the MoEPP and other ministries in gradually implementing the required improvements of the present problematic solid waste management system in Macedonia by setting main goals, objectives and targets in the establishment process of the waste management system which shall be achieved, and by defining the main activities and tasks on the legal, institutional, organisational, technical, and economic fields in the 6 year period.

The National Waste Management Plan indicates the complexity of the main inter-related measures to stop or mitigate environmental impacts caused by the present waste management on the one hand and to build a frame for the gradual set-up of a contemporary and sustainable waste management system by means of an optimal combination of the variety of mechanisms and instruments on the other hand.

The National Waste Management Plan determines activities and tasks of individual stakeholders in the society, sets priority of tasks and timetable by estimation of the time for realisation of the individual tasks and procedures and determines human, institutional and financial resources needed in order to achieve the set goals, objectives and targets in the 6-year period.

The baseline for setting the strategic priorities of the NWMP and the related feasible tasks is the result of the performed analyses of the main present problems related to waste management, as indicated below:

<b>Waste management policy, legislative framework and transposition activities</b>	Legislation incomplete. Partly transposed EU directives. Only some secondary legislation prepared.
<b>Institutional/organisational issues</b>	Unclear roles, tasks and responsibilities of WM stakeholders. Weak role of WM department in MoEPP. Lack of links between national and local level. No organisational arrangements on regional level with regard to MSW management. Lack of monitoring on waste generation and disposal and lack of enforcement. Inappropriate conditions for the private sector participation. No arrangements for financial/economic instruments in place.
<b>Human resources and capacity building</b>	Weak human resources and capacities at national and local institutions (municipalities and MSW management enterprises), no capacities on regional level at all. Weak capacities at other stakeholders in waste management in manufacturing/service/trade sector. Weak monitoring / enforcement capacities at all levels. Lack of self-monitoring capacities.

<b>Technical / operational infrastructure</b>	<p>Insufficient coverage of organized waste collection.  Low standards for MSW collection and disposal.  No separate collection, treatment and disposal of hazardous and non-hazardous waste in manufacturing/energy production &amp; service sector.  Insufficient separation of different fractions of medical waste, low standards for treatment and disposal of waste from the human and animal healthcare.  No separate collection and recovery of usable fractions constituents of the special waste streams, no quality and utilisation standards for compost and secondary fuels.  Low extent of recovery of secondary raw material because of the lack of markets for recyclables, low environmental standards.  Improper management of animal by-products of all categories.  Presence of 16 identified contaminated sites, 55 municipal solid waste dumps without any permits and wild dumps.  No treatment/disposal facilities for C&amp;D waste.</p>
<b>Economic/financial issues</b>	<p>Low cost recovery rate for the executed MSW management services  Low payment discipline  Lack of funds for logistical and disposal infrastructures  Lack of financial/economic instruments to stimulate changes  No earmarked funds for initiation of WM projects</p>
<b>Stakeholder &amp; public awareness</b>	<p>Lack of communication with the general public and dissemination of information on waste issues.  Lack of communication at all stakeholder levels.  Lack of communication campaigns and involvement of habitants in the positive participation in the waste management projects.</p>

The present waste management situation in Macedonia can be characterised as sub-standard, inefficient and hampered by serious organisational and technical deficiencies, resulting in various dysfunctional systems and many related negative effects on the environment and public health.

### ***Goals, objectives and targets***

In order to set the proper direction for the NWMP (2009 - 2015), the National Waste Management Strategy (2008) has set a strategic goal and objectives; the strategic document foresees a complex of measures in order to eliminate or mitigate environmental impacts caused by the existing improper waste management operations, and to carry out the preparation and implementation of an integral and cost effective and sustainable waste management system taking into account the EU key principles of waste management. Principal goals and objectives of the development of the Macedonian waste management system for the 6-year period exhibit the main priorities as starting points for elaboration and implementation of the 6-year NWMP:

- solving waste problems at source according to the “holder’s responsibility of generated waste”
- establishment of a separate collection and recovery system of valuable constituents in selected waste and end-of-life products according to the “producer’s responsibility principle”;
- utilisation of valuable constituents of waste as a substitute for non-renewable natural resources and reduction of greenhouse gas emissions;
- gradual establishment of a rational network of waste management facilities for app. 8,7 million tonnes of municipal, industrial, agriculture, medical and other types of hazardous and non-hazardous waste, in particular by means of
  - o segregation of hazardous and non-hazardous waste fractions at source and their separate treatment and final disposal;
  - o improvement of MSW collection efficiency;
  - o disposal of all collected municipal solid waste on landfills previously conditioned or compliant with EU standards;
- priority start and execution of projects related to the management of high risk medical waste and animal by-product, and industrial hazardous waste;

- disposal of stabilised, non-reactive residues from waste treatment processes on landfills as the final goal;
- closure/remediation of existing non-compliant municipal waste dumps and remediation of contaminated sites and other environmental burdens;
- rational and environmentally safe use of land and protection of natural and cultural heritage.

The priority focus of the NWMP is to gradually establish a sustainable functioning waste management structure, to achieve the strategic goals and principal objectives given in the National Waste Management Strategy regarding the management of the main waste streams, and to remediate some of the critical environmental burdens; derived from the current status of waste management in Macedonia such priorities are reflected in the content and in the structure of the plan:

- Policy and legislation structure
  - Alignment of the national legal WM framework to *acquis communautaire*;
  - Adaption and upgrading of the municipal SWM regulations at a local level;
- Institutional/organisational structures and arrangements
  - Division of tasks/responsibilities and effective horizontal co-operation of the inter-ministerial committee and vertical cooperation between state institutions, local institutions and manufacturing/service sector;
  - Establishment and strengthening the role of the central administration body for waste management and environmental inspection body in the MoEPP.
  - Reforming of the MSW management system and organisational set up of the management system for hazardous waste and special waste streams;
- Strengthening human resources and capacities of all stakeholders in waste management
  - Strengthening human resources and institutional capacities on the state and regional (local) levels;
  - Strengthening human resources and waste management capacities of waste generators and waste management operators;
- Technical infrastructure for waste management operations
  - Establishment of regional MSWM infrastructure - new or upgraded existing landfills, collection, transport and other waste treatment facilities in the frame of the temporary measures and of the systematically planned long-term measures;
  - Establishment of the industrial and medical hazardous waste, special waste streams and animal by-product management infrastructure;
  - Closure of non-compliant landfills /wild dumps (according to the programme for the transition period);
  - Remediation of the high risk environmental burdens (according to the programme for the transition period)
- Economic/financial structure
  - Establishment, testing and continuous up-grading of the cost recovery system for MSWM services based on the “polluter pays” principle;
  - Implementation of the “producer’s and importer’s responsibility” principle for management of used tyres as well as of packaging waste, and for the management of other special waste streams/end-of-life products;
  - Establishment of a system for financing investments in waste management infrastructure in the public and private sector, and in projects for remediation of environmental burdens;
  - Establishment of a system of economic instruments in order to encourage the recovery operation of waste fractions, which may be utilised as substitutes for primary resources.
- Stakeholder and public awareness and communication system
  - Establishment of a communication system to the public and to the waste generators and waste management sector on waste issues
  - Establishment of a public awareness and participation system in the waste management projects.

The principal objectives and targets of the NWMP (2009 - 2015) are elaborated and set in Chapter 3, activities and implementation measures for the period 2009 - 2015 are specified in more detail in Chapter 4, and then presented as an action plan in Chapter 5. Practical implications of the 6-year



activities and implementation measures are based on several executed EU funded special studies and projects managed by EARS, which are listed in Chapter 1 and represent the integral constituents of the novelty of the NWMP (2009 - 2015).

The main implementation measures and activities deal with the following issues:

***Harmonisation of the waste management policy and legislative framework development;***

The primary tasks of the Macedonian government and parliament in the 6-year period are the transposition of the main EU directives related to waste management issues into the national legislation framework, in particular at the level of primary legislation. However, some additional regulation and/or amendments shall be prepared and adopted, in particular those related to the responsibilities and tasks of the local self-government, to management of animal by-products and end-of-life products, contamination of soil, environmental liability and to regulation of the cost recovery system and payment discipline.

The secondary legislation represents an extensive part of the legislation, providing for operative rules and procedures for the administration and inspection tasks: elaboration of *waste management plans* and coordination of *national WM projects*, issuing *licences and permits* for waste management facilities and waste management activities, execution of *monitoring, reporting and inspection* activities and performing *enforcement actions*. Local regulations shall enable the elaboration of regional waste management programmes and investment in the network of the regional waste management facilities.

***Institutional strengthening and organisational arrangements***

Preparation and implementation of the legislative, institutional and organisational tasks, economic/financial measures and public awareness projects as required on the one hand, and application of the monitoring, supervision and enforcement mechanisms regarding operation of waste generators and waste management infrastructure on the national and local level (MSW management and disposal facilities, industry, other waste generators) on the other hand requires the strengthening of all involved institutions, in particular additional human resources, substantial institutional reorganisations, and better communication and cooperation between all institutions.

The waste management department shall become the central administrative body, which, having a proactive role in the country, shall execute the main administrative activities with regard to waste management on national and local (regional) levels and administrative tasks in waste management domain. Environmental inspection shall be strengthened and more effective by means of re-organisation and by authorisation supervision/enforcement of emissions from operation of all legal persons regardless of the level of the issued permit. Administrative and inspection tasks of the Ministry as well as the obligations on reporting on waste management issues are closely related to the management and up-grading of the EIONET database as an integral part of the national database on environment. The role of the Public Relation Office is important and extremely sensitive, in particular in the phase of preparation and leading the waste management projects.

Optimal management of the main individual waste streams regardless of their hazardous level needs linked organisational arrangements from planning, elaboration of technical projects, environmental, spatial and financial documentation, providing funds for the realisation of the investment and the erection of a specific waste management facility, i.e. linked organisation from the national level to the waste generators or specialised company for waste management. Organisational arrangements are based on the implementation of the principle “holder’s responsibility of generated waste” and on “producer’s responsibility” for a product when it becomes a waste. Proposed organisational arrangements for waste management of special waste streams, end-of-life products and hazardous waste emphasise the important and promised role of the licensed private sector, i.e. the network of concessionaires or non-profit companies established by MoEPP; such an approach may lead to earlier

and cheaper solutions for individual waste streams in particular used tyres, packaging and packaging waste, white goods, animal by-products, medical and some hazardous waste.

The concept of the regional municipal waste management system represents the link between the state and municipalities; the majority of responsibilities and tasks shall be passed over to a regional level on behalf of the joint municipalities and their habitants, with the consent and active participation of the MoEPP. Applying the economy of scale optimally, the Republic of Macedonia shall organise 5-7 waste management regions, all having more than 200.000 inhabitants as proposed in Chapter 4. The main planning, project preparation, and investment leading tasks shall be led by the newly established regional municipal waste management companies, as inter-municipality public enterprises. Such companies in the ownership of all municipalities are authorised for contracting with waste collector companies and other waste management operators as well as for the designing of waste management fees and account keeping. Establishment of the demonstration MSWM centre for the selected waste management region shall be planned as the priority pilot project of regionalisation in order to clear some detailed organisation uncertainties, to harmonise some interest of local stake holders, to verify optimal means of designing of fees, charges and surcharges, and their collection, to demonstrate the option of providing earmarked funds for the realisation of investments, and to encourage similar activities in other parts of the Republic of Macedonia.

### ***Strengthening human resources and capacities of all stakeholders in waste management***

The strengthening of institutions on the national, inter-municipality and municipality level needs additional employment and training. One may expect additional employment of app. 100 employees at all levels; some of them may be only re-integrated in new organisational structures. Bigger waste generators shall additionally employ new specialists or appoint some technical staff for environmental issues, in particular those enterprises, which are under the obligation of the IPPC directive. New employments in smaller, mainly private waste management “business units” shall raise parallel to the extent of the collection/pre-treatment of special waste streams and end-of-life products.

### ***Technical infrastructure for waste management operations***

The investment procedure for the construction and erection of new manufacturing, energy production or waste management facility consists of more, presumably consecutive phases of planning and acquiring necessary project conditions, elaboration of project and investment documentation, clearing-up the ownership-, environmental impact- and spatial planning issues, acquiring spatial and construction permits, closing the financial structure, installation of communal infrastructure, erection of the plant and, start-up of the plant and acquiring operational (and other) permits.

The execution of investments in waste management facilities generally takes app. 4 -8 years if there are no specific constrains; the execution of some more demanding projects may even last up to 10 years. Realistic planning, which shall be exhibited in the NWMP (2009 - 2015), shall clearly indicate that the majority of waste management projects shall be started in the period of this NWMP by performing preparation tasks but finished in the period of the next NWMP.

Some waste management projects in the country are of very high priority on the one hand and on the other hand, a variety of the necessary measures shall be executed prior to the start of the investment procedure and plant erection; such a situation directs the NWMP (2009 - 2015) to plan in 2 phases:

- planning and realisation of temporary technical and investment measures and
- systematic planning of a more long-term establishment of the integral and sustainable waste management system.

Such planning, technical and investment activities of the NWMP shall and must be all fully implemented and, if necessary improved and upgraded in the next period, according to the required level, but without general changes of projects or even stops in the investment procedure.

#### **Temporary technical measures**

Temporary technical and investment measures shall help to overcome the shortage of the available landfill volume in the transition time when some of the existing non-compliant landfills shall be closed because of adverse effects and high risks to environment, and planned regional landfills, i.e. upgraded existing or new landfill facilities are still in different phases of the project preparation and administrative procedure.

Temporary technical and investment measures prepared by the new established MSWM companies generally consists of

- elaboration of project and investment documentation for regional MSW management centres and closure of high risk landfills and to make the projects bankable;
- investment in the 1<sup>st</sup> phase of three MSW centres with the disposal capacities for app. 1,2 million habitants : two new MSW management centres and one MSW centre for the Skopje region by the up-grading of the “Drisla” landfill area and
- investment in the gradual closure of app. 40 non-compliant municipal dumps and the remediation of app. 33 ha of the surface of the closed landfills.

A priority technical measure is investment in the treatment facility for medical hazardous waste; the project shall be realised as a final solution for the disposal of medical hazardous waste through a new contemporary incineration plant on the location of the “Drisla” landfill and through landfill of the incineration residues. The new incineration plant shall be planned to enable the expansion of capacities and technical up grading in order to co-incinerate some selected combustible hazardous waste generated in the country.

Important temporary technical measures may be investment in the facilities for safe temporary storage of hazardous waste; storage may be executed on assets of waste generators or on assets of licensed private enterprises; waste storage may be executed as a service activity. The stored hazardous waste may be later pre-treated or disposed of within the country or exported by the licensed service and trade sector.

#### **Systematic technical measures**

Systematic technical and investment measures consist of a variety of projects in different implementation phases, which shall be carried out on the way towards realisation of the middle- and long-term goals, objectives and targets as set in the National Waste Management Strategy.

New established MSWM companies shall keep and strengthen their activities in two main directions:

- in the conditioning of temporary landfill facilities, in continuous investment in new regional landfills, and in organising the gradual closure of non-compliant landfills and elaboration of reports on activities, and.
- in the elaboration of technical, spatial, investment and other documentation, and feasibility studies with regard to the improvement of the MSW collection system and in gradual introduction of the separate collection system, and with regard to planned technological processes on the regional MSWM centres.

The planned technology of the selected MSW treatment processes shall be chosen with regard to the utilisation of individual MSW constituents after mechanical pre-treatment and/or after biological treatment processes and with regard to the possible utilisation of treatment residues. The composition of the municipal solid waste and large areas of existing landfill and environmental burdens which shall be remediated, generally exhibit the mechanical-biological treatment technologies as suitable for main

technological processes, rendering the following products and their utilisation: light fraction for the secondary fuel utilisation, metals and some other fraction for recycling and pre-treated solid residues for preparation of soil-like material that may be utilised as a covering material in the landfill remediation processes. Involvement of anaerobic/aerobic treatment technology in the mechanical-biological processes, biogas production and utilisation of residues may lead to a reduction of the greenhouse gas emissions and improvement of energy balance of the MBT plant by means of the substitution of primary energy sources.

Activation of the licensed private sector and investments in the collection, storage and process equipment for *management of special waste streams and end-of-life products* shall be by the setting-up of (voluntary) “compliant” schemes and by earmarked taxation of selected products like used tyres, used oils and lubricants, packaging and packaging waste, waste electro-and electronic equipment, etc which assure the payment of services executed through the entire collection/recovery and disposal chain.

Used tyres may represent the pilot project for establishment of the complete management system of special waste stream or end-of-life product from the sale of new products and collection to the final disposal – energetic utilisation in the cement kiln in Skopje.

Bigger *industrial generators of hazardous waste* are in the process of adaptation to IPPC requirements, which involve optimal techniques for the management of hazardous and non-hazardous waste. Smaller hazardous waste generators shall find the solution for their temporary stored waste after the dilemma related to the economy of scale of the hazardous waste treatment/disposal facilities will be cleared-up, i.e. dilemma on the set-up of a common treatment and landfill facility of hazardous waste for Macedonia or on the keeping of investments in storage facilities in order to execute the final disposal of the majority of the hazardous waste fraction by means of export to licensed facilities. Some technological links between cement production and thermal energetic facilities producing fly ash shall also be encouraged.

Planning and designing of the *incineration plant for final disposal of medical waste* and accompanying facilities, such as storage facilities and some specialised pre-treatment plants shall take into account necessary technological modifications in order to co-incinerate some other combustible hazardous waste like old remedies, waste solvents, pesticide residues and contaminated packaging.

Final *disposal of agriculture waste* may be divided with regard to risk categories. Disposal of carcasses and high-risk animal by-products is generally the main task and priority of the MoAFWE; however, investments shall be chosen and carried out according to the optimisation of the overall energy consumption/production of alternative technological options. However, there are expected private investments in the anaerobic treatment of other low risk animal by-products, like manures, slaughterhouse waste and selected agriculture residues, with the intention of production of biogas, “green” electricity and soil-like materials usable in gardens and other agriculture branches.

Some other non-hazardous agriculture waste, like husks of rice, clean waste wood and other waste fractions are not of the highest priority from the viewpoint of environmental risk; however, such projects may led to optimal material/energy recovery and utilisation of such waste fractions.

Quantities of *construction and demolition waste* indicate the necessity of establishment of an adequate network of landfill facilities. Initially, such investment projects may be planned and realised in parallel with the establishment of the regional MSWM centres by investing in a simple separation facility placed on a separate area of the MSWM centre; products may be utilised in the landfill construction/operation, waste wood may be added to the MSW light fraction. Some remediated environmental burdens may also represent usable areas for the construction of mono-landfills for construction and demolition waste.

At the present development stage, construction of the municipal and other wastewater treatment plants is placed in an early stage of the planning and investment procedure. As a consequence, one may plan

the start of the majority investment procedures in the sewage sludge treatment and disposal facilities at the end of the period of NWMP (2009 - 2015).

Sixteen contaminated sites with detected impacts on the environment are identified as "hot spots"; nine of them are industrial environmental burdens, mainly landfills, two of them are coal mines and thermal power plants with belonging slag/ash landfill, five of the sites belong to past and/or present mining activities. The remediation procedure is proposed as feasible if based on the equilibration of the investment and operation costs of technical remediation and new market value of the remediated area including revenues by investment in new buildings/equipment and employment. Remediation costs shall be covered by the national Remediation Fund. Two remediation projects (OHIS, Makstil) are plausible to be realised in the six-year period of this NWMP.

### ***Resources and financing of the waste management***

Financing of the establishment of the waste management system and investments in the main technical / operational infrastructure in the period 2009 - 2015 are presented, and consist of the financing of

- different and interrelated tasks on the legislative field, on the field of the institutional strengthening and organisational set-up, and tasks related to communication to public and waste generators;
- financing of investments in the technical /operational WM infrastructure including covering costs for all investment phases, i.e. elaboration of technical, environmental, spatial and economic documentation up-to erection of treatment/disposal plants.

Financing of legislative tasks, institutional and organisational arrangement means generally covering personnel costs, i.e. salaries, trainings of staff and engagement of specialised companies for raising public awareness on waste issues and carrying out necessary campaigns. These costs are estimated at app. 6 million € in the following 6-year period.

The investments to provide 55-60% of the required landfill capacity will be in the range of 51 million €; for the six-year period; investments involve 2 new regional landfills and the upgrading of the Drisla landfill, as well as the conditioning and closure/remediation of app. 34 ha of existing dump facilities. Operating costs of the new and upgraded landfills are estimated at about 16 -17 €/t; almost identical costs (14,5 € /t deposited MSW) shall be spent for the closure/remediation and conditioning of dumps for the transition period. Costs of the MSW collection and transport are estimated at about 30 €/t; investments in new transport equipment (collection and transport vehicles) shall contribute app. 20,5 million € in the 6-year period. The total costs for the newly established MSW management services and improved services on the other 40% of territory could be estimated at about 11,5 € /habitant /year.

Projects related to the collection and recovery/recycling system for other special waste streams and end-of-life products shall be initiated by preparation of the necessary preliminary studies, technical, environmental and investment documentation. A pilot project for the collection/transport/energy recovery of used tyres shall be initiated and may be realised in the six-year period. The functioning of used tyres management system requires minimal investments, operating costs of the entire system are estimated at about 0,15 €/t.

Within the period of the NWMP (2009 - 2015), there are recommended preparation of technical and environmental projects and investment documentation for the introduction of other MSW treatment technologies (like MBT), as priority for demonstration MSWM centre; such MSW treatment technology may efficiently contribute to Macedonia's attempts of meeting EU targets on the reduction of disposed biodegradable waste.

Substantial capital investment in the treatment/disposal infrastructure for industrial, medical and other hazardous waste shall in the transition period pass some additional consideration and execution of feasibility studies with regard to new data on the generated waste and with regard to the optimal capacities of treatment and disposal facilities. In the six-year period approximately 2 million € shall be

invested in the industrial hazardous storage facilities. Results of the meanwhile executed studies shall direct the investments into the central pre-treatment/landfill facility and incineration plant for industrial hazardous waste to a value of about 15-17 million €, or indicate the export of the smaller and dispersed hazardous waste as an optimal solution.

Final disposal of hazardous medical waste shall be carried out by means of the new contemporary central incineration plant located at the “Drisla” landfill; installed incineration equipment may be expanded for co-incineration of some selected hazardous and toxic waste. The investment cost is between 2,5 – 5 million € depending on the necessary peripheral storage buildings and pre-treatment equipment.

Final disposal PCB/PCT of contaminated transformer oils by incineration will cost app. 84.000 €; other costs (transport, permits, cleaning,) shall be determined from case to case

Investments in the central treatment facility and in the collection system for animal carcasses and high-risk animal by-products, which shall be realised in the period of the NWMP (2009 - 2015), are estimated as at least 35-40 million € regardless of the chosen technological process; operating costs are estimated at about 100 -140 €/t of dry by-product including final disposal costs..

Private investments in the biogas production plants, which may be realised in the period of the NWMP (2009 - 2015), are estimated at around 15-25 million €.

Remediation of industrial “hot spots” should be further elaborated through follow up projects. The remediation costs for the six year period to clean-up two contaminated sites (OHIS, Makstil) amount to 11 million € and an additional 6 million € for investment in the communal infrastructure of remediated area and app. 1 million € for investment in the 1<sup>st</sup> phase of the construction and demolition landfill facility.

Division of the estimated costs to the overall strengthening of human resources, to the investments in the public WM infrastructure facilities and to the private investments in waste treatment and disposal facilities (without investment with regard to adaptation to the waste related IPPC requirements), which may be realised to a larger extent in the period of NWMP (2009 - 2015) exhibit the following picture of the 6 year expenditures:

- |  |                |
|--|----------------|
| - strengthening of human capacities + technical assistance         | 6 million €    |
| - investments in public WM infrastructure:                         | 82,3 million € |
| - private investment in WM infrastructure (without IPPC liability) | 101 million €  |

### ***Cost recovery and financing***

Specific recommendations for improvement of cost recovery in order to move payment system progressively towards full cost recovery, consists of

- improvement of the cost recovery for executed services by reorganisation of the payment and control system;
- establishment of the uniform charging system for the executed MSW services (landfill and collection/transport fees) on the base of the unified methodology for setting fees and tariffs standardisation of the accounting system.

The main possible sources of financing investments in order to implement the EU waste legislation, for the execution of the variety of organisational and public relations tasks, and for elaboration of the necessary technical, spatial and investment documentation and environmental studies and capital investments, are:

- waste producers (measures they take and finance by themselves)
- public sources (charges, fees, budgets, national or inter-municipality investment funds)

- private capital (direct private investments, Public Private Partnership arrangements, CO<sub>2</sub> credit lines), and
- international funds and financial institutions providing grants and loans.

Additional source for financing waste management operations may be earmarked in addition to the selling price of waste-generating products ("producer's and or importer's responsibility principle") or earmarked taxes levied by the state or other public authority on waste-generating products (end-of-life products) in the environmental fund which reimburses all costs caused by the execution of organisational tasks related to the end-of-life product and by execution of collection, recovery and disposal of waste residues.

The intention of the *economic and financial instruments* is to improve the existing management of waste in the country and to direct the individual waste streams to the material and energy recovery processes; as small an amount as possible of the stabilised residues shall be disposed of in landfills. Priority financial /economic instruments, which shall be introduced in the first period, are mainly differentiated WM fees and additional (earmarked) surcharges for non-compliant municipal landfills, earmarked import taxes on specific chemical and hazardous goods, incentives for use of the biodegradable waste for electricity production, introduction of different organisation forms according to the 'producers responsibility' and assuring adequate payments, establishment of the earmarked investment and remediation funds, financial assistance for the WM projects from the State budget and provision of payment warranties.;

### ***Stakeholder and public awareness and consultations***

Implementation of the NWMP needs public relation activities in three main fields: on general informative communications to raise general awareness on waste issues, on communication to production sector, in particular to main waste generators, and on raising public awareness to achieve constructive participation of the public in the implementation procedure of MSW and other waste management projects.

The general communication strategy shall direct preparation of public information on general environmental problems including waste, on critical waste issues in Macedonia and on available solutions how to stop or at least mitigate the impact on the environment and on public health as well as on cost and benefits of waste management projects; such informative and educational material shall be easily and frequently accessible to the public. Important content

Industrial waste generators as well as other stakeholder in waste management need in-time information on obligations related to legislation, IPPC requirement, on remediation of environmental burdens located on their assets and on all other HW & non-HZW issues; Government and particularly MoEPP shall always give to waste generators opportunities for feed-back suggestions with regard to legislation issues, planning activities and implementation schedule; they shall seriously take into account their suggestions.

### ***Environmental impact assessment***

The main objective of the NWMP (2009 - 2015) is the reduction of environmental impact by the gradual establishment of a network of waste management facilities by means of temporary investment measures for the transition period and by means of systematic technical and investment measure in the planned long-term waste collection, material/energy recovery and final disposal facilities, by means of diversion of waste from non-compliant landfill and wild dumping as well as by means of remediation of some industrial contaminated sites (hot spots) and closure/remediation of high risk MSW landfills. Legislative measures, institutional and organisational arrangements, economic measures and financial

instruments, and measures related to public relations represent a significant and sensitive supporting basis for the establishment and operation of the technical waste management facilities network.

It is evident that NWMP (2009 - 2015) is an entirely environmental programme consisting of urgent measures for the reduction of impacts on the environment and the public health, systematic management of waste, in particular material and energy recovery of waste and utilisation of valuable constituents, reduction of greenhouse gas emissions and landfill only stabilised, non-reactive residues which may not be used, and a reduction of impact on the environment caused by environmental burdens. So, all successfully undertaken measures influence the elimination or mitigation of possible environmental impacts. All measures related to waste management, which may exhibit the positive or negative effect on different environmental media, possess the technical and spatial planning character.

Spatial planning measures shall take into account the development plans and acceptability of the considered area for the individual waste management facilities considering possible direct/indirect, cumulative, synergic, short-, medium and long-term, constant or temporary impacts on the natural and living environment, cultural heritage and landscaping.

Different foreseen technical and control measures may substantially contribute to the reduction of the hazardous potential of generated and disposed waste, to reduce the environmental risk and consequently the reduction of environmental impact.

Investments in the waste collection, transport and material/energy recovery facilities for usable fractions of waste, end-of-life products and special waste streams shall, by means of supporting legal, financial and other mechanisms raise the extent of substitution of primary natural resources and reduce the quantities of waste residues disposed of landfill.

Separate collection, adequate mechanical and biological treatment of biodegradable waste shall substantially reduce the emissions of greenhouse gases. The up grading of some temporary landfills and construction of new landfills in the frame of regional MSWM centres shall also substantially contribute to the reduction of greenhouse gas emissions.

Realisation of the central incineration plant for infective medical and selected combustible hazardous waste of different origin, and central final disposal facility for animal by-products (1<sup>st</sup> and 2<sup>nd</sup> category) shall contribute to reduction of the health risk potential.

Closure/remediation of high risk and non-compliant non-hazardous waste landfills, execution of remediation of some environmental burdens (hot spots) and in particular, new usability of previously contaminated area shall substantially reduce or at least mitigate the existing environmental impact and improve the quality of the surface and underground water, and soils.

## Conclusions

Implementation of the NWMP (2009 - 2015) has many important benefits with regard to public health, quality of water and soil, saving of natural resources and eco-systems and global warming. Economic and social benefits are in particular clean water resources and agriculture soil, new employment improved living environment and perspective for future generations.

However, the key issues for successful implementation of the NWMP (2009 - 2015) are mainly closely related to the political willingness in the country, available and trained human resources on all levels, and available financial resources. All the implementation activities need a high level of organisation and co-ordination in time, human resources and available financing of investment and waste management operations. One of the most important challenges is the keeping of the implementation continuity of the policy adopted in the National Waste Management Strategy (2008) and in this NWMP (2009 - 2015), which shall be monitored by means of implementation indicators; a lot of different political or business interests could try to change the adopted policy and direction.



## 1. INTRODUCTION

The Republic of Macedonia aspires to join the EU in the near future and expects to start negotiations on integration in the year 2009; accession to the EU represents almost the only perspective for the economic development of Macedonia. However, such a perspective requires thorough arrangement at all levels in the society to prevent possible negative impacts on the environment and to reach optimal benefits which may be derived from the offered opportunities.

As first the Republic of Macedonia shall establish a system of activities to align its national laws, rules and procedures to the *acquis communautaire*. This includes the EU environmental legislation, and in the case of solid waste management the transposition and implementation of EU legislation and directives on waste. Due to intensive trade exchange, such activities are inevitable in the process of the Macedonian approach towards the European Union, even in the worst case of eventual shift of the start of negotiations or even of non-membership.

Looking at possible positive and negative impacts of Macedonia's accession to the EU, the following challenges and opportunities regarding the actual waste management issues may be emphasised:

Macedonia shall adapt its waste management system to EU standards and reduce the impact of existing waste management practice on the environment; however, some additional time and resources shall be obtained in the accession negotiations, in order to prolong the executions of those measures which are related to higher investments, in time even after the obtained status of full EU membership.

Adoption of the waste management regulations and instruments that are applied in EU countries represents the obligations of the candidate country, but on the other hand it may represent an important opportunity in faster and more efficient solving of the waste management issues.

Alignment to the EU environmental policy, in particular to the waste management policy may represent for Macedonia the opportunity to realise some changes in behaviour of the production and consumption pattern as well as to achieve the overall understanding of waste as a source of pollution on the one hand and as a valuable material and energy resource on the other hand.

Solutions of the waste management issues shall allow only the transposition of reliable technologies which are technologically and environmentally tested, as well as acceptable for the Macedonian environment.

The introduction of EU regulations and standards also means application of different complementary mechanisms for waste management, in particular economic mechanisms. Traditional inspection methods are supplemented by new enforcement mechanisms, which are based on preventive measures, record keeping and reporting, on the introduction of process and manufacturing standards and on co-operative activities and shared responsibilities.

The accession process of the Republic of Macedonia to EU integration indicates a particular need for institutional strengthening on all levels and the strengthening of the capacities of all the stakeholders involved in the waste management issues.

The approaching /accession process to EU integration shall be utilised as an incentive for the gradual realisation of contemporary, sustainable waste management within the frame of the Macedonian environmental policy.

## 1.1 General role of the National Waste Management Plan

The National Waste Management Plan shall set the main goals, objectives and targets in the establishment process of the waste management system which shall be achieved, and defines the main activities and tasks in the legal, institutional, organisational, technical, and economic fields during the 6-year period.

The National Waste Management Plan shall indicate the complex of the main inter-related measures to stop or mitigate environmental impacts caused by the present waste management on the one hand and to build a frame for the gradual set-up of a contemporary and sustainable waste management system by means of an optimal combination of different legal, economic and communication mechanisms and instruments on the other hand.

The National Waste Management Plan determines activities and tasks of individual stakeholders in the society, sets priority of tasks and timetable by estimation of the time for realisation of the individual tasks and procedures and determines the human, institutional and financial resources needed in order to achieve the set goals, objectives and targets in the 6-year period.

## 1.2 Main principles of waste management and waste management hierarchy

As a constitutive part of the National Environmental Action Plan the *National Waste Management Plan (NWMP 2009 - 2015)* is based on the adopted *National Waste Management Strategy of the Republic of Macedonia (NWMS)*, which reflects the national policy in waste management and represents the basis for preparation and implementation of an integrated and cost-effective waste management system.

The National Waste Management Strategy defines the fundamental directions in waste management for the coming period, 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. 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.

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 as presented in more details in the NWMS document 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.

The 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 disposed of on landfills. Proper management of biodegradable waste present in waste from different, i.e. municipal and other manufacturing sources 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.

### 1.3 Scope and background of the novelty of the National Waste Management Plan

The National Waste Management Plan (2009 - 2015) is a novelty of the proposed document prepared in 2005. The purpose of the novelty of the National Waste Management Plan is to provide an adequate environmental policy, decision-making framework, economic basis, public participation and gradual setting-up of the technical infrastructure for carrying out the waste management operation in order to implement the waste management system in compliance with EU legislation and with the EU Sixth Environmental Action Programme (2002-2012) taking into account its priority in waste management: Thematic strategy on sustainable use of resources and Thematic strategy on waste prevention and recycling.

Novelty of the National Waste Management Plan is based on the three basic documents:

- National Waste Management Strategy (2008),
- National Strategy for Environmental Approximation–Sector Approximation Strategy–Waste Management Sector (2007), and
- proposal of the National Waste Management Plan (2005),

including nine very extensive studies that shall be integral part of the NWMP (Associated Consultants: DHV Prowa-SWC, EU funded project managed by EAR, Ref. No.: EUROPEAID/115138/D/SV/MK, 2005) which were undertaken in order to define the priority and as well as the long term proposals for development of waste management on the following strategic areas:

- Industrial hazardous waste, agriculture waste and waste from healthcare institutions, providing the MEPP with the scope of activities aiming to establish a national HZW management system;
- Waste reduction, recycling & economic instruments, proposing pilot projects on separate collection of paper and setting of “producer’s responsibility” compliance schemes for tyres and packaging wastes;
- Regionalisation of municipal waste management systems, offering an approach towards gradual and institutional /organisational changes and towards establishment of the regional MSWM facilities, the introduction of landfill taxes-surcharges, and more strict enforcement.
- Closure/remediation non-compliant landfills, resulting by establishment of classes of non-compliant landfills according to their environmental risk, closure methods and cost estimates and offering some options of up-grading low risk landfill as temporary measure in the transition period.
- Cost reduction, Financial-Economic Instruments and Private Sector Participation offering some applicable organisation and other measures for improvement of cost recovery (uniform charging system, involvement of private sector) and introduction of feasible financial/economic instruments (disposal charge/surcharge, charges of selected chemical/mineral oil based products and “producer’s and importer responsibility” schemes for selected special waste streams);
- Identification of 16 contaminated industrial sites (so called “hot spots”), prioritisation of those which are most urgent for closure/remediation, cost estimates and legal measures required to assign the environmental liabilities;
- EIONET database and monitoring system, defining the data quality requirements, data validation methods and institutional set up to allow regular monitoring on WM issues, providing also the base for reporting to EU and EU/EIONET;
- Public Awareness and Participation, resulting by a layout of the communication strategy.

National Strategy for Environmental Approximation–Sector Approximation Strategy–Waste Management Sector (SOFRECO, Carl Bro, EU funded project managed by EAR, Ref. No.: 05MAC01/13/001-EuropeAid/12312/D/SV/MK, 2007) suggests the main directions for the establishment of the general waste management system in Macedonia by proposing priorities for

transposition of the ten key EU directives on waste management and for their implementation, priorities for investment and some further actions needed to accomplish the basic waste management operation. Strategy emphasises as first priority the full transposition of directives on waste management in relatively robust legal framework on waste management allowing for amendments to legislation and for easier regulations by the secondary legislation, i.e. by decrees and rulebooks. The proposed implementation priorities consist of the strengthening of the administrative, technical and financial capacities on the governmental and local levels, in order to enable the development of the new waste management concept viable from the technical, economical and environmental viewpoints. The approximation strategy for the waste management sector assumes a relatively long investment period in the basic infrastructure; it is clearly shown that the investment dynamics depend on the fast and successful transposition of EU directives, on the preparation of the spatial plans, technical and environmental documentation and on the in-time provision of available funds.

Executed feasibility studies on the set-up of the regional MSW management systems for NE & CE Macedonia (Associated Consultants: DHV Prowa-SWC, EU funded project managed by EAR, Ref. No.: DGIUGLARIS097-CARDS-EAR-SK, 2005) and SW Macedonia (KfW, P1471, Sept. 2002) and on the set-up of the medical waste management system (Grontmij CarlBro, EU funded project managed by EAR, CARDS Healthcare Risk Waste management, Ref. No. EuropeAid/123728/D/SER/MK, 2007) may also represent valuable inputs for NWMP with regard to the establishment of institutional, organisational and technical infrastructure for the municipal waste management.

Executed field investigations and elaborated feasibility studies on the remediation of the four priority industrial environmental burdens – “hot-spots” under the title “Development of Remediation Plans with Financial Requirements for Elimination of Industrial Hot spots» (Consultant Consortium EPTISA/DHI), EU funded project managed by EAR, Ref. No. EuropeAid/123674/D/SER/MK, 2007) provide with some more precise estimation of costs for the remediation/restoration-re-utilisation of these contaminated areas.

Priority focus of the NWMP is to establish a sustainable functioning waste management structure, to achieve goals, objectives and targets in the six year period regarding the management of the main waste streams, and to remediate some of the critical environmental burdens; such as priorities derived from the current status of waste management in Macedonia that are reflected in the content and in the structure of the plan:

- Policy and legislation structure
  - Alignment of the national legal WM framework to the EU legislation and upgrading of the MSW management regulations on the local level;
- Institutional/organisational structures and arrangements
  - Division of tasks/responsibilities and effective co-operation on a horizontal inter-ministerial level and on the vertical level between state institutions, local institutions and manufacturing/service sector;
  - Establishment and strengthening of the central waste management body in the MoEPP
  - Reforming of the MSW management system and organisational set up of the management system for hazardous waste and special waste streams;
- Strengthening human resources and capacities of all stakeholder in waste management
  - Strengthening human resources and institutional capacities on the state and local levels;
  - Strengthening human resources and waste management capacities of waste generators and waste management operators;
- Technical infrastructure
  - Establishment of regional MSW management infrastructure- new or upgraded existing landfills, collection, transport and waste treatment facilities in the frame of temporary and planned systematic long-term measures;
  - Establishment of the industrial, medical, hazardous waste, special waste streams and animal by-product management infrastructure;
  - Closure of non-compliant landfills /wild dumps (according to the transition period program);

- Remediation of the high risk environmental burdens (according to the transition period program)
- Economic/financial structure
  - Establishment, testing and continuous up-grading of the cost recovery system for MSWM services based on the “polluter pays” principle;
  - Implementation of the “producer’s and importer’s responsibility” principle for packaging waste and for other special waste streams / end-of-life products;
  - Establishment of a system for financing investments in waste management infrastructure in the public and private sector and in projects for remediation of environmental burdens;
  - Establishment of a system of economic instruments in order to encourage the recovery operation of waste fractions, which may be utilised as substitutes for primary resources.
- Stakeholder & public awareness and communication system
  - Establishment of a communication system to the public and to the waste generators and waste management sector on waste issues
  - Establishment of a public awareness and participation system in the waste management projects.

Priority focus of the novelty NWMP shall be achieving the compliance with those EU directives on waste management which take into account the heritage of the present/past waste management and which do not require too high investments in the start of projects, but mainly the setting up and operating of the basic waste management infrastructure in order to bring under control all main waste streams. However, such basic WM infrastructure shall allow a relatively early start with the complementary investment activities, particularly those related to reduction of biodegradable waste disposed on landfill and those related to recovery of valuable material from collected waste fractions and end-of-life products; such activities are mainly dependent on given opportunities to the private sector, and may allow an earlier compliance with the standards required in the EU legislation for some special waste streams.

## 2. CURRENT STATUS OF WASTE MANAGEMENT IN MACEDONIA

### 2.1 Waste management policy, legislative framework and transposition activities

#### 2.1.1 Waste management policy

Waste management is one of the most serious environmental issues in Macedonia. The general waste management policy with an 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 (novelty of NEAP in year 2007), and in particular in the Law on Waste Management. The Law on Waste Management introduces new documents in waste management policy: National Waste Management Strategy, National Waste Management Plan and Waste Management Programmes. Some policy initiatives in the NEAP (2007) and in the Energy Efficiency Strategy are closely related to the projects of the Kyoto Protocol with regard to Clean Development Mechanisms; such a policy represents the basis for investments in order to simultaneously decrease greenhouse gas emissions and to contribute to the production of sustainable i.e. renewable energy.

The national Waste Management Strategy (adopted in the year 2008) as a Government resolution, which 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. Strategy involves the main characteristics of the EU policy on waste management which is set on in broad terms in the Fifth Action Programme for the Environment (1992-1999), /“Towards Sustainability” /COM (92-93)/, in the Community Strategy for Waste Management /COM (96) 0399, / the Sixth Environment Action Programme (2002-2012), /Decision No.1600/2002/EC/ and related thematic strategies Thematic Strategy on prevention and recycling /COM (2005) 666 final/ and Thematic Strategy on the sustainable use of natural Resources /COM 670(2005)/.

The National Waste Management Strategy is a document, which reflects *the Macedonian long-term policy* on aims and development of measures *related to waste issues*

- 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.

The National Waste Management Strategy explains and takes into account a special status that shall be granted to waste issues because of its environmental and economic characteristics and because of the generally shared responsibility on waste among all members of society; the success and efficiency of the implementation of the waste management strategy and of all follow-up activities 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.

The general strategic goals and objectives in the National Waste Management Strategy 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.

### 2.1.2 Current legal framework

Macedonia is currently undergoing a 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 (O.G. of RM 68/04, 71/04 and 107/07) and some technical rules and guidelines. However, the Law on Waste Management 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; competent authorities to draw up 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 which is regulated by the Law on Mineral Resources ((O.G. of RM No. 24/07), and only partly the management of waste regularly covered by the veterinary regulations; it also does not cover all obligations given in Waste Framework Directive (2006/12/EC) and in Hazardous Waste Directive (91/689/EEC).

The Law on Waste Management has important links to other legislation, in particular to the Law on Environment (O.G. of RM No. 53/05, 81/05, 24/07), which includes basic issues such as environmental permits, EIA procedure, and greenhouse gas emissions. It is also closely linked to the other regulations like the 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, Law on Public Procurement and Law on Water Management, which are all subject to consideration and amendments with regard to the National Waste Management Plan (NWMP 2009 - 2015).

The Law on Waste Management represents the basis for the adoption of secondary legislation, which regulates specific areas in waste management practice at all levels. Secondary legislation, based on the Law on Waste Management and adopted in years 2007 and 2008, regulates permitting procedures and sets technical and other conditions for waste storage and transfer, for acceptance to landfill and for the landfill operations:

- Rulebook on the format and the contents of the journal for records keeping on waste handling, the format and the content of forms for waste identification and transport, the format and the content of the form for annual report on waste handling by legal entities and natural persons and the format and the content of the form for the annual report on waste handling by the mayor (O.G. of RM No. 07/06);
- Rulebook on the form and contents of the request for issuing permit for landfill operator as well as the form for and contents of the permit (O.G. of RM No. 16/07);
- Rulebook on form and contents of the application for obtaining a permit for processing, treatment and /or storing of waste, the form and the content of the permit for waste processing, as well as the minimum technical conditions to perform the activity for processing, treatment and/or storing of waste (O.G. of RM No. 23/07);
- Rulebook on the manner and the conditions for waste storage, as well as on the conditions to be met by the sites on which waste storage is performed (O.G. of RM No. 29/07);
- Rulebook on the minimum technical requirements with regard to environmental protection to be met by waste transfer stations, requirements to be met by the sites where waste transfer stations are built or placed, as well as on the terms for the waste storage in waste transfer stations depending on the types of waste (O.G. of RM No. 39/07);
- Rulebook on the manner of handling medical waste and the manner of packaging and labelling of medical waste (O.G. of RM 146/07);

- Rulebook on the landfill operation, monitoring and controlling in the operational and closing phase as well as on the closure and after-care procedures (O.G. of RM No. 156/07);
- Rulebook for criteria for acceptance of waste to landfill in each landfill class, preparation procedure for acceptance of waste, basic testing procedures, sampling procedure and acceptance of waste (O.G. of RM No. 8/08);

Of particular importance are the activities on the regulation of hazardous waste exhibiting efforts to bring hazardous waste under control by means of the following secondary legislation:

- Rulebook on the manner of handling asbestos waste and waste from products containing asbestos (O.G. of RM No. 89/06);
- Rulebook on the manner and the conditions for handling PCBs, the conditions to be met by installations and facilities for PCBs disposal and decontamination, on used PCBs and on the manner of labelling the equipment that contains PCBs (O.G. of RM No. 48/07);
- Rulebook on the procedures and manner of collection, transport, processing, storage, treatment and disposal of waste oils, and the manner of keeping records and submission of data (O.G. of RM No. 156/07);
- Rulebook of detailed conditions on the handling of hazardous waste, and on the manner of packaging and labelling (O.G. of RM No. 15/08);

The Law on the Ratification of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (O.G. of RM 48/97) and the Law on Environment give the legal basis for the Rulebook on format and content of the forms for transboundary movement of waste (O.G. of RM No. 37/03, 38/03).

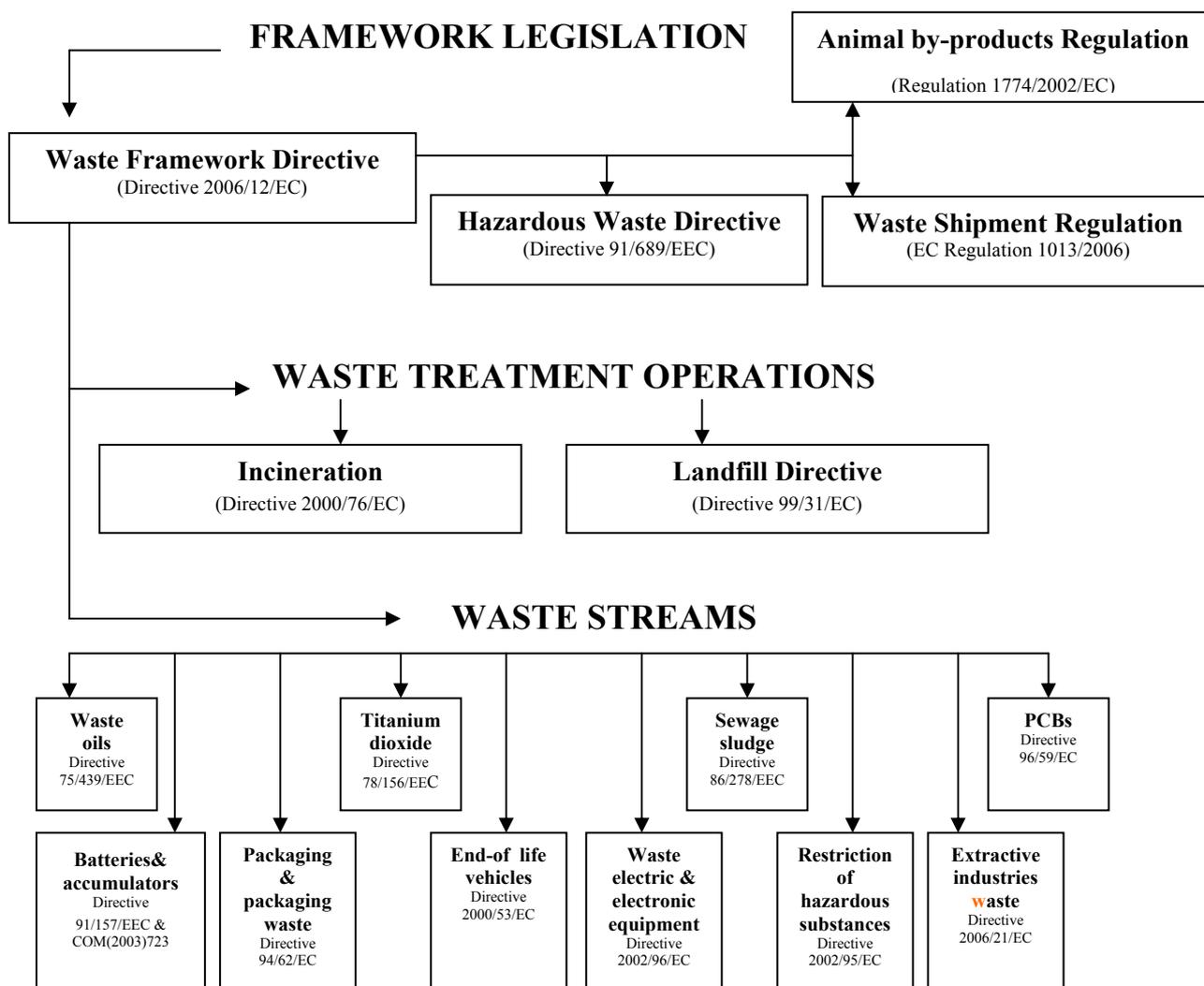
Landfills are included in the Decree for determining the activities of installations requiring an integral environmental permit (O.G. of RM No. 89/05), i.e. adjustment permit with an adjustment plan and time schedule; in this context, the Law on Environment gives the legal basis for the Rulebook on the form and content of the request for issuing a permit for the landfill operator as well as the form for and content of the permit (O.G. of RM No. 140/07);

### 2.1.3 *Transposition activities*

Harmonisation of legislation with the *acquis communautaire* as the inevitable process of the Macedonian approach towards membership of European Union represents a useful tool in the establishment of an efficient and sustainable waste management system. Transposition of the main EU directives on waste management into the Macedonian legislation framework is carried out by drafting and adopting obligations and rules on management of waste in general and of hazardous waste and of the special waste streams, and on the waste treatment operations for the purpose of providing the necessary legal basis for preparation, adoption and implementation of the secondary legislation. The main secondary legislation (decrees, rules, guidelines, standards) for issues defined in the Law on Waste Management shall be prepared to make the Law operative. Some regulations or their drafts have been already prepared (see. Chapter 2.1.2), the majority of waste streams need to be regulated.

Presentation of the EU legislation framework on waste that shall be transposed and incorporated in the national legislation at different levels is schematically shown below.

Additionally to the typical legislation regulating waste streams and management operations, additional non-transposition regulation shall also be fully adopted: Regulation (EC) No.1774/2002 laying down health rules concerning animal by-products not intended for human consumption.



**Figure 1: EU legislation framework on waste**

The presence of environmental burdens, in particular landfills of hazardous residues from industrial processes and mining, and detected impacts on the environment, on public health and on crops represent a critical situation in Macedonia. So, the earlier transposition of the Directive on environmental liability (2004/35/EC) and adoption of a national legislation on soil quality and contamination shall give the legal basis and may offer an initiation of new negotiations on the “hot spots” remediation activities.

The current situation on waste management in Macedonia indicates the urgent need for transposition and adoption of a framework directive on waste and on hazardous waste, on landfill and on incineration of waste together with corresponding technical standards, in order to set environmental and technical criteria that are acceptable for the Macedonian environment.

## 2.2 Current status of institutions, authorities and stakeholders of waste management

The Competent Authority for preparing and adopting all legal instruments and to implement all waste related directives is the MoEPP as the national public 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 Authority

(municipalities). The internal distribution of tasks and responsibilities does exist within the MoEPP 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 legislation, standards and rules on the management of various waste streams, monitoring, issuing permits for waste collectors, transporters, exporters and operators of waste management facilities as well as initiation and co-ordination of waste management projects. 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, competency and authority 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 overlapping can be observed within the MoEPP and inside governmental institutions, as well as between governmental and municipal institutions. There are also some missing activities like acquisition of reliable data on waste and on their generators, on characteristics/constituents of waste or missing registration on waste handlers/operators; such a situation renders any qualitative and quantitative overview on the real waste issue at source as being very difficult.

Regarding waste management issues, the Ministry of Economy (MoE), Ministry of Finance 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, in particular on approval of setting fees/charges/surcharges/earmarked taxes, management of earmarked funds, and on the cost recovery mechanisms for MSW investments and executed services. MoF is in charge of the allocation of annual budgets for all Ministries and local communities, and executes expenditure monitoring, provides co-financing for projects under international financial support (grants, loans, warranties, etc) and finally, it approves the appointment of new employees in the State institutions.

The Ministry of Health (MoH) and the MoEPP are 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, Food and Water Environment (MoAFWE). The Ministry of Transport and Communication (MTC) is responsible for licensing of collectors / transporters of municipal solid waste and hazardous waste.

As a consequence of the decentralisation process in the country, a lot of responsibilities were delegated to the *municipalities*. The municipalities are responsible for many 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. It is confusing that municipalities grant construction permits even if it is for their own investments and they even grant environmental permits (IPPC B-permits). The establishment of non-hazardous and inert waste landfills is also the responsibility of the municipalities. However, only a 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 that is regional level, which shall be established and adopted by all involved municipalities.

In order to achieve successful co-ordination in the development process of the contemporary waste management system, 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 also by executing adequate training of staff at a national, regional and local level.

*Operative stakeholders* in the waste management process execute the collection, treatment and landfill operations for all kinds of waste, regardless of their hazardous properties: public enterprises, waste handlers, and informal collectors of usable waste fractions. Some enterprises are in possession of their assets 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, environmental monitoring of waste management facilities is almost not carried out, a functioning data recording and reporting system is not fully operative yet.

Other *institutional stakeholders* in waste management processes and development are associations like the Union of Municipalities, Chamber of Commerce, Union of Public Services, Union of Waste Handlers, NGO-s and scientific institutions of universities. Institutional stakeholders in waste management are particularly active in consultations regarding legislation, waste management functioning and financing, recognition and explanation of relationships between environmental parameters, development of environmental technologies and monitoring, and in the presentation of interests of different groups of society regarding waste management issues in the country.

It seems that the weakest parts of institutional practice are systematic communications and preparation of guidance on the implementation of the waste management legislation and trainings. There is a lack of regular meetings to promote a dialog between interested parties and competent authorities before the introduction of the waste regulations and there is a lack in the exchange of information regarding waste management issues between the MoEPP and municipalities, industry and other stakeholders in waste management. Such measures shall stimulate waste generators to minimise their waste quantities and to manage of them according to waste management hierarchy.

### 2.3 Economic issues - financing and cost recovery

Key problems of the existing *cost recovery and financing* system for executed services are related to four main issues:

- the institutional organisation of waste collection/disposal services;
- invoicement and fee collection, and enforcement of the “polluter pays” principle is not feasible;
- real costs of executed services are not recovered,
- no available earmarked funds in order to initiate any investment process in waste management infrastructure.

A more detailed overview on the problems of the existing cost recovery and financing system is shown in the special study “Cost Reduction, Financial-Economic Instruments and Private Sector Participation” and summarised in the Waste Management Strategy.

Sources for cost recovery and financing of waste management operations are mainly direct charges for transport and the disposal of waste. Even private waste generators pay only transport and disposal of hazardous and non-hazardous waste on non-compliant landfills and dumps located on their assets; so the internalisation of external costs does not take place at all and the costs of the environment are not a part of the price of products sent to the market.

Fees for the municipal waste management services are invoiced and collected directly by public communal enterprises. The fees 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 municipal commercial and industrial waste are charged by the public enterprises, mostly at higher tariffs than for the municipal solid waste. Such a situation together with low payment discipline hinders higher participation of the private sector in waste collection activities.

At the biggest Macedonian landfill “Drisla”, municipal waste registration takes place and a disposal fee per ton of deposited waste is charged and paid by municipalities which are located outside the

Skopje area and which are using the “Drisla” disposal service. At the landfills in Veles, Bitola and Vinica a flat disposal fee is charged to other municipalities using the landfills regardless of the waste quantities disposed of.

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 slow development of the national economy.

The practical scope for applying *financial/economic instruments* is limited. Environmental charges and taxes are not earmarked and thus become a part of the integral State's budget; consequently they may be used for the execution of waste management programs but in competition with other environmental programs.

No fund raising on the State or municipalities' level is present in order to begin some tasks related to the investment process in new infrastructure; the projects, 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.

## 2.4 Consultations with the waste generators and raising public awareness

The general level of environmental awareness within Macedonia is low, and there is an insufficient understanding of environmental issues. People are not aware of waste problems and the potential risks of hazardous waste, or of the adverse effects on their health and living/natural environment. 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 contemporary sanitary landfill or a contemporary waste treatment facility really means; 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.

There is the absence of a national public awareness communication strategy on waste issues; new Waste Management Strategy with the Special study on “Public Awareness and Participation” offer starting points for elaboration of such a communication strategy. On the other side, insufficient institutional capacities on the State and local level cannot promote public awareness and environmental education, and except for a few exemptions they do not pay 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 the necessary changes in existing waste management practice. These public perceptions are founded on genuine fears and concerns about the unknown and are caused by the lack of in-time information and by the lack of public access to information on issues of waste produced by the production/service/agricultural sector, on risks of waste to health and environment and on options of their successful management. Two additional social effects shall also not to be neglected: the NIMBY effect (**not in my backyard**) and the NIMET effects (**not in my election time**).

Almost all initiatives to establish a comprehensive programme and instruments to build up citizen awareness about waste problems are based on initiatives of non-governmental organisations, with some exemptions where municipalities develop long-term environmental education strategies, including education about waste.

## 2.5 Current waste streams and waste management practice

The total amount of generated waste, inclusive of waste from mining, can be estimated app.26 million t/year. The main waste fractions arise from mineral excavation and ore processing (app. 17,3 million t/year); the Law on mineral resources shall regulate the management of this group of waste. However,

the group of waste from mineral extraction and processing contains a significant amount of hazardous constituents and improper landfills and managing of technological processes cause the most evident impacts on the environment. At present, the main impact on the environment is observed as the consequence of the abandoned landfills of hazardous constituents in disposed residues, the so-called hot spots. Waste from mining and remediation of landfills as a heritage of the former mining activities shall be regulated by the Act on Mining after the transposition of the Directive 2006/21/EC on Management of Waste from Extractive Industries; so those issues shall not be in the focus of the present waste management plan.

The estimated quantity of waste without mining waste renders app. 8,7 million t of waste per year and consists of the waste groups presented in the *table 1*.

**Table 1: Estimated quantities of generated waste (2005)**

Classification number	Type of waste	Estimated quantity (t/year)
01	Waste arising from exploration, mining, quarrying, physical and chemical treatment of minerals (Hz + non-HZ)	17.246.000
02	Waste from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing <ul style="list-style-type: none"> <li>• Animal by-products</li> <li>• Plant by-products</li> </ul>	5.060.000 550.000
03	Waste from wood processing and production of panels and furniture, pulp, paper and cardboard	300
04	Waste from the leather, fur and textile industries <ul style="list-style-type: none"> <li>• non-hazardous waste</li> <li>• hazardous waste</li> </ul>	795 155
05	Waste from petroleum refining, natural gas purification and pyrolytic treatment of coal (HZ)	391
06	Waste from inorganic chemical processes <ul style="list-style-type: none"> <li>• non-hazardous waste</li> <li>• hazardous waste</li> </ul>	101.611 227
07	Waste from organic chemical processes	467
08	Waste from manufacturing, formulation, supply, and use (MFSU) of coatings (paints, varnishes and vitreous enamel), adhesives, sealants and printing inks (HZ)	12
09	Waste from photographic industry (HZ)	3
10	Waste from thermal processes <ul style="list-style-type: none"> <li>• non-hazardous waste</li> <li>• hazardous waste</li> </ul>	2.015.379 75.347
11	Waste from chemical surface treatment and coating of metals and other materials; non-ferrous hydro-metallurgy <ul style="list-style-type: none"> <li>• non-hazardous waste</li> <li>• hazardous waste</li> </ul>	596 240
12	Waste from shaping and physical and mechanical surface treatment of metals and plastics (HZ)	48
13	Oily waste and waste from liquid fuels (HZ) Used oils Oils containing PCB/PCT	777 8000 121
15	Waste packaging; absorbents, wiping, cloth, filter materials and protective clothing not otherwise specified (HZ)	52
16	Waste not other specified in the list <ul style="list-style-type: none"> <li>• End-of-life vehicles</li> <li>• Used tyres</li> <li>• Used accumulators</li> <li>• Other unspecified waste (linings and refractories from metallurgical processes (non-HZ))</li> </ul>	17.500 6500 1500 1550
17	Construction and demolition waste (including excavated soil from contaminated sites)	500.000
18	Waste from human and animal health care and /or related research (except kitchen and restaurant waste not arising from immediate health care) <ul style="list-style-type: none"> <li>• non-hazardous waste</li> <li>• hazardous waste</li> </ul>	5.670 1.000
19	Waste from waste management facilities, off-site waste water treatment plants and preparation of water intended for human consumption and for industrial use <ul style="list-style-type: none"> <li>• non-hazardous waste (sludge, waste metals to recycling,...)</li> <li>• hazardous waste</li> </ul>	54000 16
20	Municipal waste <ul style="list-style-type: none"> <li>• Household waste</li> <li>• Commercial waste (constituents similar to those in household waste)</li> </ul>	420.000 150.000

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	- paper/cardboard (16000 t to recycling) - PET - glass	86.500 10.700 14.000
	Total	App. 26.200.000

### **2.5.1 Agriculture waste (Identif. No. 02)**

Reliable statistical information on waste generation from agriculture is absent. Estimations based on a field survey including the larger crop and feedstock farms in Macedonia indicate the following situation: agriculture waste is a waste group consisting of app. 5 million. t/year of animal excreta, app. 5600 t/year of carcasses and of app. 6000 t/year of animal by-products from slaughterhouses, and app. 500.000 t/years of the plant residues. There is also present app. 3800 t of waste plastics generated by early vegetable production under plastic covers and from silage production, and app. 3400-5000 t of agrochemical waste containing dangerous substances. The group of agriculture waste represent the second biggest waste fraction, mainly addressed as by-products, i.e. these types of waste shall 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.

#### ***Animal by-products***

Regarding quantities of manure, only app. 3,6 million. t of animal manure per year (pigs, cattle and poultry manure) is applied on arable land and grassland, in vineyards and in orchards, However, storage of manure on farms and the application of manure on agricultural land is generally very questionable with respect to the pollution of soil and groundwater, and waste generated in commercial pig, poultry and cattle farms in Macedonia form a real threat to the environment. Actions should be taken to strengthen the knowledge and capacity of farmers to manage this type of waste in an environmentally sound manner, in particular in direction of anaerobic/aerobic stabilisation and preparation of humus and artificial soils.

It is current practice to bury carcasses and animal tissue from slaughterhouses in holes in the ground on the farms or to throw them on dumpsites. In both situations it takes place in a completely uncontrolled manner and not according to sanitary standards. Only in a few rare situations regional burial places are 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.

#### ***Plant tissues***

A large part of the plant tissue produced in agriculture is reused in an environmentally sound manner. However, also large amounts of plant wastes are burned in open fires in the fields. This results in uncontrolled emissions into the air and in the removal of organic matter from the agricultural soils.

#### ***Plastic waste***

The common practice is to burn plastic waste on open fires on location, often combined with plant tissue waste. To a small extent local recycling companies collect plastic wastes. Only a limited percentage of plastics are being recycled, while the capacity to recycle these wastes is many times bigger.

#### ***Agrochemical waste***

There are no available disposal facilities in Macedonia for agrochemical wastes containing hazardous substances like contaminated packaging waste and pesticide residues. The contaminated packaging waste is usually burned or dumped together with municipal waste. The unused pesticide residues are mainly released or left to drain slowly into the environment. Such lack of management seriously threatens the environment and requires substantial change and improvement.

### **2.5.2 Hazardous and non-hazardous waste generated in industrial and thermo-energetic facilities (Identif. No. 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 15, 161104)**

Industrial solid wastes consist of all solid waste generated in industries, either from the industrial process or any other source within the industrial premises. Total quantity generated is app. 2,2 million t/year. Only power plants and thermal metallurgical processes generate a group of non-hazardous waste to the amount of app. 2 million t/year; inorganic chemical processes contribute additional amount of 107.000 t/year of the non-hazardous waste. The main generators landfill their waste locally on their assets; smaller generators dispose of their non-hazardous waste together with municipal waste (app. 4900 t/year).

The main quantities of hazardous waste (app. 75.500 t/year) are generated by the two main metallurgical industrial facilities (the smelting plant Zletovo /if in operation/ and the Makstil steel factory) and are disposed of on industrial landfill; smaller hazardous waste generators produce app. 2400 t of hazardous waste per year. App. 1300 t hazardous waste is sold/recycled (54%); other wastes are disposed of on-site as shown later (25%) or together with municipal waste (21%). It is also assumed that some generator and their waste are not included and the missing quantity is estimated at app. 500 t/year or is disposed of together with municipal waste. Local deposits containing hazardous waste represent environmental “hot spots” regarding their impact on the environment. Some combustible hazardous waste oils are burned as fuels. Identification of locations of the PCB transformers and disposal (incineration abroad) is already taking place.

### **2.5.3 Waste not other specified in the list ((Identif. No. 16)**

Waste streams requiring special consideration are the following:

- end of life vehicles (ELV);
- waste electrical and electronic equipment (WEEE);
- car batteries and accumulators;
- used tires.

Statistical information on the annual generation of these streams is presently not quite reliable. In Macedonia there exist neither collection schemes nor environmentally sound recovery systems.

Although part of the annually generated used tyres are collected and used as fuel in tar and lime production facilities, most used tyres are currently land filled. Apart from locally generated quantities there is the import of used tires for rethreading. Energy recovery is not applied presently, although there is processing capacity available in the cement kiln in Skopje and clear interest to process used tyres.

Spent batteries used in home appliances are mainly disposed as a constituent of MSW in landfills. Used car accumulators are being imported (about 7000 ton/year) by a number of companies, who dismantle the batteries and export the recyclable components to processing facilities overseas. Used car accumulators generated in the country (1,500 ton/year) are not collected and usually end up at non-legal dumps or are mixed with the MSW and disposed at municipal landfills.

There is not any organized collection of ELV; however, the car wrecks are usually picked up by informal collectors and are either processed for the recovery of spare parts or for scrap metals. The scrap metals are exported, or delivered to the steel factory in Skopje, which possesses a shredder for cutting scrap metals prior to smelting.

Discarded electrical and electronic equipment (WEEE) mainly appears as a constituent of the municipal waste and it is disposed of in municipal landfills.

#### **2.5.4 Construction and demolition waste /including excavated soil from contaminated sites/ (Identif. No. 17)**

Construction and demolition waste arise from activities such as the construction of buildings and civil infrastructure, total or partial demolition of buildings and civil infrastructure, road planning and maintenance. It usually comprises of: concrete, tiles, reinforcement bars, asphalt paving, asphalt roofing, lumber, gypsum board, rock, soil and fines, and remains. Some hazardous constituents can also be found such as: fluorescent tubes, asbestos, lead, mercury and paints.

The annual generation of this C&D waste stream is highly dependent upon the construction activities in either the public or private sector. The estimated quantities for Macedonia are based on experience in other countries and a generation of app 230-250 kg/capita/year is assumed; for Macedonia the average annual generation of C&D waste is estimated at ranging from 460.000 to 500.000 ton/year.

#### **2.5.5 Waste from human and animal health care (Identif. No. 18)**

Waste from healthcare institutions (medical waste = MeW) is considered solid wastes generated in dispensaries, hospitals, polyclinics and outpatient departments, dental clinics etc.), which originated from used items and materials as a result of diagnosing, medical treatment and prevention of diseases in humans and animals (Law on Waste). Medical waste is divided in the following classification (EU) and required management of the mentioned groups of waste requires specific manipulation, treatment and final disposal:

18 01 02	Body parts and organs including blood bags and blood preserves (pathological waste);
18 01 03*	Waste whose collection and disposal is subject to special requirements in order to prevent infection (infectious waste);
18 01 06	Chemicals consisting of or containing dangerous substances
18 01 07	Other chemicals
18 01 08*	Cytotoxic and cytostatic medicines
18 01 09	Other medicines
19 01 10	Amalgam waste from dental care

In Macedonia approximately 900 -1,000 ton of hazardous medical waste is generated per year, which represents about 15% of the total waste generated in health care institutions. Separate collection and separation of medical waste in hospitals and in other healthcare institutions is slowly growing; at present only about 35% of hazardous medical waste is separately collected, transported and incinerated at the Drisla landfill (up to 360 ton/year). The remaining 65% of the hazardous medical waste is disposed of at municipal landfills or wild dumpsites. Financing of these operations is provided by the MoH for public health care centres and by individual private producers of medical waste participating in the system.

#### **2.5.6 Waste from waste management facilities, off-site waste water treatment plants and preparation of water intended for human consumption and for industrial use (Identif. No. 19)**

There are at present almost no waste facilities, except for newly established private companies performing collection and recovery of secondary raw materials, associated in the Association "Makedonska Surovina". The main collected raw materials are paper & cardboard fraction (app. 20.000 t/y recovered for recycling or for export) and scrap metal (recovered app. 34.000 t/y); plastic foils are collected and sold according to conditions on the market.

Only a limited percentage of plastics are being recycled or sent to recycling. The recycling market for plastic in Macedonia is underdeveloped.

Quantities of waste from the waste water treatment plants and from the preparation of water intended for human consumption and for industrial use are not known; however, they shall give rise a real problem in the future after realisation of two national plans: the first-one on the management of waste water and the second-one on the establishment of the drinking water supply system.

### 2.5.7 Municipal waste

Municipal solid waste is one of the main generated waste streams (app. 570.000 t/year for the years 2004/2005) 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....).

Total municipal waste consists of two main generated streams: household waste and commercial waste. The generation rate is between 253 – 313 kg/capita/year, specific weight of household waste is between 112 – 127 kg/m<sup>3</sup> and app. 96 kg/m<sup>3</sup> of the commercial waste. The approximate MSW composition is similar to those in other Eastern Europe countries (*Table 2*)

**Table 2: Main fractions of the municipal waste (2005)**

Classification number	Type of waste	Estimated quantity (t/year)	(%)
20 01 /2 0 02	Biodegradable (organic) waste	148.819	26,2
20 03 07	Bulky waste	28.619	5
15 01	Packaging waste	97.305	17
	Other waste	297.638	52
	<b>Total MSW</b>	<b>572.381</b>	100

The estimated composition of MSW, according to the executed mechanical and manual sorting (Annex 5, Special Study A, Part A: Municipal/Household Waste Analyses) is shown in the *Table 3*.

**Table 3: Estimated composition of municipal waste (2005)**

Classification number	Type of waste	Estimated quantity (t/year)	(%)
20 01 /2 0 02	Biodegradable (organic) waste	148.819	26,0
20 01 38	Wood	15.454	2,7
20 01 01	Paper and cardboard	68.113	11,9
20 01 39	Plastics	54.949	9,6
20 01 02	Glass	20.033	3,5
20 01 11	Textiles	16.599	2,9
20 01 40	Metals	14.882	2,6
15 01 05	Composite packaging	12.592	2,2
	Other waste (complex products, inert material, other categories)	42.929	7,5
20 01	Hazardous household waste	1.145	0,2
20 01/02/03	Fine mixed particles (< 10 mm)	176.866	30,9
	<b>Total MSW</b>	<b>572.381</b>	100,0

The presence of high proportions of biodegradable waste fractions is evident, i.e. more than 43%. However, fine particles (< 10mm) contain app. 60% biodegradable organics; the final proportion of biodegradable organic substances is between 59 and 65 %.

Most of the waste fractions are disposed of in landfills or dumpsites as a constituent of mixed MSW and similar commercial/industrial solid wastes. There are some recycling activities in the informal sector with a growing tendency due to the increased interest of numerous small private companies to get involved in the recycling business.

### **2.5.8 Current MSW management practise**

#### ***Municipal waste collection services***

Waste collection services including other activities such as, street cleaning, public parks and gardens, and cemetery maintenance are primarily performed by the Communal Enterprises. Only a small proportion of waste collectors are private companies, typically those dealing with waste in rural areas.

Only 60 -70% of the population is involved in the public municipal waste collection system, which is performed by public enterprises, but only 10% of habitants in rural settlements receive regular municipal solid waste collection services. Waste collection equipment and the extent of services do 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.

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

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. Only a part of the annually generated used tyres are collected.

Most of the MSW and other collected wastes are deposited at municipal dumpsites or at wild dump sites without any pre-treatment. There are app. 54 active municipal dumps used by communal enterprises and a huge number of non-legal dumpsites created by population that do not receive a waste collection service. Only a few communal enterprises seem to allocate the necessary funds for equipment maintenance or make appropriate provision for the replacement of the collection and transport vehicles.

#### ***Treatment, recovery and recycling of MSW***

Biodegradable waste composting and anaerobic digestion are not in practice in the country. There is a local pilot composting facility (Zrnovci, which at present not in operation).

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

The recovery of recyclable materials such as metals, paper, plastics, car batteries and accumulators, waste oils etc. are 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. The paper factory, with the application of “collection points”, organises the collection of one part (around 20%) and the other part is mainly 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 end-user payment conditions.

## 2.6 Waste management infrastructure and facilities

### 2.6.1 Disposal facilities

The solid waste generated in Macedonia is mostly disposed of on landfills (**Table 4**). The landfill Drisla, serving the Skopje region, with app. 590.000 habitants, is the only permitted landfill in Macedonia and it is relatively well managed. Impermeable lining with intention to prevent groundwater contamination has not yet been yet installed. The landfill area surrounding the landfill consists of permeable sand and gravel deposits, exhibiting risk; no special construction measures have been taken so far to prevent possible percolation of leachate water into the upper and lower aquifers. Municipal waste registration takes place only at Drisla landfill and nowhere else in Macedonia. Compaction and soil covering is executed only at a number of bigger municipal landfills.

At the municipal landfills, or dumpsites, in rural areas the wastes are simply dumped by the Communal Enterprises with no operational costs, except for some overheads (paid to guardians, if any) and occasional water consumption costs for the extinguishing of emerging landfill fires.

**Table 4: Overview of municipal landfills**

Municipal landfill	Population served	Deposits <sup>3</sup> (m <sup>3</sup> )	Area <sup>2</sup> (m <sup>2</sup> )
Kumanovo/ “Kраста”	72.243	1,832,200	65,000
Pehcevo / “Suvi Dol”	3.862	20,000	4,500
Murtino / “Dineva “Bara”	3.272	5,000	4,500
Krivogastani / “Livadski Pat”	3.003	800	900
Novo Selo / “Solena Reka”	5983	480	600
Resen / “Alcevi Kosari”	11.777	200,000	30,000
Bitola / “Meglenci”	60.486	1,500,000	75,000
Belcista (4 dep.)	1.470	16,250	10,000
Valandovo / “Suvodolica”	8.323	80,000	15,000
Zletovo / Meliste”	2.477	72,000	70,000
Krusevo (2 dep.) / “Kole Nalco”	6.779	5,400	3,000
Sveti Nikole / “Nemanjeci”	12.948	60,000	12,000
Veles / “Bunardere”	43.716	620,000	75,000
Probistip / “Strmos”	8.935	12,000	1,600
Kriva Palanka / “Konopnica”	14.574	120,000	5,500
Lipkovo (4) / “Nikustak”	13.529	n/a	n/a
Strumica	31.561	350,000	80,000
Kavadarci / “Melci”	26.874	480,000	60,000
Kocani / “Belski Pat”	23.582	300,000	120,000
Vinica / “Leski”	12.540	430,000	15,000
Meseista	1,284	6,240	3,000



Karbinci (4 dep.)	2.006	5,824	4,500
Kicevo	21.097	50,000	30,000
Mak. Kamenica / “Kamenicki Rid”	5.677	50,000	5,000

<b>Cont.: Municipal landfill</b>	<b>Population served</b>	<b>Deposits (m3)</b>	<b>Area (m2)</b>
Miravci / “Karaivanovi kuli”	1.313	2,000	1,300
Delcevo / “Ostrec”	12.254	175,000	25,000
Gevgelija / “Suva Reka”	14.253	20,000	15,000
Gostivar / “Susicki Most”	34.682	720,000	32,000
Dojran / “Dekil Tas”	1.713	12,000	6,500
Blatec / “Pocivalo”	1.012	3,840	900
Orizari / “Bel Kamen”	2.202	7,000	20,000
Oblesevo (2 dep)/ “Progon & Jaz”	2.535	n/a	n/a
Mak. Brod / “Barbaros”	2.912	12,000	8,000
Ohrid / “Bukovo”	38.066	200,000	60,000
Struga (2 dep)	n/a	50,000	n/a
Dolneni / “Crmiliste”	5.792	1,300	800
Prilep / “Omec”	51.346	530,000	38,000
Stip / “Trestena Skala”	33.457	8,000	6,000
Berovo / “Iljadin Valog”	9.759	22,000	5,600
Debar / “Krivci”	12.566	150,000	19,000
Kratovo / “Zeleznica”	7.309	20,000	2,500
Radovis	17.149	50,000	11,000
Bogdanci / “Brdanov Kamen”	6.095	50,000	20,000
Demir Kapija / “Pcenicni Dupki”	3.181	101,200	35,000
Negotino / “Buceto”	13448	120,000	46,000

Existing waste disposal practices do not comply with any technical and/or environmental standards; landfills 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. 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. Existing municipal waste landfills categorised according to their environmental risk are shown in **Figure 2**. Four high-risk landfills are classified as special cases and need to be closed and/or remediated immediately.

### 2.6.2 Industrial landfills (“hot spots”)

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 dumpsites. During the privatisation process, no clear arrangements were made with the new owners in respect to a clean-up of the old dumpsites. So these industrial contaminated dumpsites are considered as environmental “hot spots” (**Table 5**).



**Fig.2: Overview of the existing municipal landfills and categorisation according to their risk on the environment**

**Table 5: Industrial contaminated sites – (“hot spots”)**

No	Hot-spot	Operational status	Deposits (m <sup>3</sup> )	Area (m <sup>2</sup> )
1	OHIS A.D. Chlorine alkali plant Lindane plant HCH dump site Dump site	abandoned abandoned abandoned operational	252.200	76.725
2	Bucim (copper mine - flotation tailings)	operational	196.000.000	900-000
3	MHK Zletovo (smelter – mine tailings)	operational	1.115.000	95.000
4	Lojane chromium, arsenic, antimony mine	abandoned	1,000,000	100,000
5	Sasa (lead and zinc mining)	abandoned	30,000,000	285,000
6	Silmak (ferro-silicium plant)	operational	851,000	80,000
7	Toranica (lead and zinc)	abandoned	3,000,000	25,000
8	Makstil (iron & steel plant)	operational	2,500,000	125,000
9	Zletovo (lead & zinc mining)	abandoned	14,000,000	280,000
10	REK Bitola (power plant and coal mine)	operational	11,000,000	100,000
11	Feni (ferro-nickel smelter)	operational	2,200,000	167,000
12	MHK Zletovo (fertiliser)	abandoned	3,700,000	70,000
13	REK Oslomej (power plant and coal mine)	operational	2,000,000	280,000
14	Godel (tannery)	abandoned	5,600	500
15	OKTA (oil refinery)	operational	3,000	6,000
16	Tane Caleski (metal surface treatment)	abandoned	10	100
<b>Average/total</b>			<b>267,626,810</b>	<b>2,590,325</b>

■	high risk contaminated site
■	medium risk contaminated site
■	low risk contaminated site

16 major industrial areas and dumpsites, "hot spots" were identified where both contaminated construction as well as the deposited process of hazardous waste are present. There are nine industrial

areas, two mining and power plant areas and five locations with disposed residues from mining activities. Major “hot spots” are ranked regarding their detected impact on the environment and their hazardous potential: three “hot spots” were ranked as high environmental risk, seven “hot spots” as medium environmental risk and six “hot spots” as low environmental risk.

Apart from the larger industrial dumpsites, being considered as “hot spots” exhibiting higher risk to the environment, there also exist smaller dumpsites where both processing waste and HZ waste are and/or has been disposed on site but in lower quantities than 1000 t of non-hazardous waste /year; only “MTZ Foundry” generates app. 2500 t of casting sand and core.

### ***2.6.3 Incineration facilities***

At the landfill site Drisla serving the Skopje area a 2 chamber medical waste incinerator has been installed and started operation in the year 2000. Capacity of the plant is 0,2 t/h, maximal daily capacity is 1 t/day, operation temperatures are 800/1000° C and the plant is not equipped with a flue gas cleaning system. The main characteristics of the incinerator are shown in Table 13. It is estimated that about 35% of the total amount of hazardous waste from healthcare institutions in Macedonia is incinerated.

### ***2.6.4 Other treatment/processing facilities***

#### ***Recycling***

The recovery of wastes is undertaken for various commodities such as paper, hard plastics and HSPE foils in which operations the scrap yards as well as end user facilities/processors are involved. The scrap yard’s activities however strive to complement the processing capacity in the country, although some commodities for which market prices do cover the transportation costs are being exported.

#### ***Biodegradable wastes treatment***

In the past various facilities for the biological treatment of organic wastes have been installed in Macedonia:

- Biogas installation within the military economy compound “Petrovec”;
- Biogas installation “Svinjarska farm”, Delveco;
- Biogas installation within the “Lozar” pig farm, Veles;
- Composting installation “Champinjoni” Kocani;
- “Osogovo” Kriva Palanka;
- “Tajmiste” installation, Kicevo;
- “Dabo” installation, Kriva Palanka;
- “Standard” installation, village Psaca K. Palanka.

The first two installations are relatively high capacity anaerobic digestion installations, which have been constructed in the mid 80’s and have only been in operation for a short period of time. The others are much smaller facilities both for anaerobic digestion and composting. They all use manure mixed with straw as feedstock.

Composting of afro-feedstock waste takes place at several locations and there also exists one small pilot plant for the composting of biodegradable household waste, which is separately collected in the rural community of Zrnovci; this composting plant is currently not in operation.

## 2.7 Waste forecasts and projections

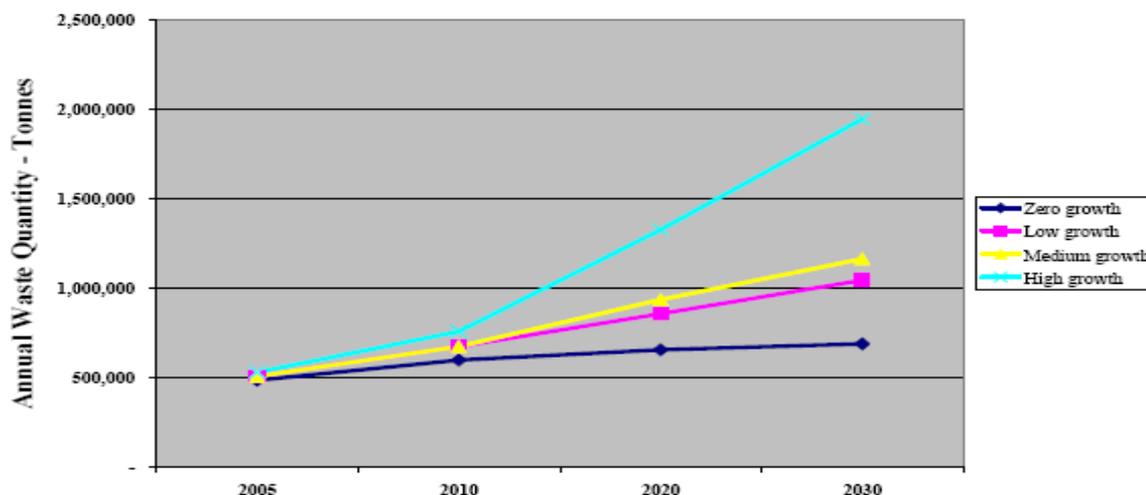
Development of the WM system and construction of the corresponding infrastructure required to handle MSW and HZ waste (industrial and medical waste) in compliance with EU standards is related to some basic assumptions: dynamics of transposition of legislation and of the institutional reforms and of the capacity building, dynamics of the construction of those waste recovery and disposal plants in the general waste management scheme, which enable the optimal control of waste streams in the shortest time period, acceptable investment dynamics and determination of the real operation costs under assumption of application of the optimal economy of scale over the total cost of new waste management system.

However, the generated waste quantities and composition and projections represent the initial and the most uncertain assumption. The capacity requirements for MSW handling systems and facilities will be significantly influenced by the future economic developments of the country. Even though it is to expect that the measures aiming to recover wastes will have an impact on reducing the amounts of waste generated, for the purpose of assessing the types and estimating the required capacities of future systems and facilities, projections of future waste generation need to be based on more conservative assumptions, at least for the first 6 years period.

Projections of future waste generations may be prepared for four different scenarios. In most of the EU countries and certainly the new accession countries, waste generation per capita continues to rise, despite efforts at waste minimisation at source and to decouple the growth of the waste quantities and economic growth. The effect of such growth can be quite substantial

Assumed scenarios for waste generation in the future are linked to population growth and growth in GDP as shown in **Figure 3**:

- Zero growth* - no growth in per capita generation, waste generation grows proportional to population;
- Low growth* - in addition to population growth, per capita generation linked to 50% of growth in GDP (projected at 3% p.a.);
- Medium growth* - as 2 but assume GDP growth of 5% for 10 years after EU membership (projected to be in 2012);
- High growth* - as 3 but 100% linkage to GDP growth.



**Figure 3: Effect of the growth per capita waste generation on annual waste quantity (National Waste management Plan, Sept.2005)**

Taking another assumption on waste growth per capita according to OECD prognosis (Environmental Outlook, (ISBN 2-64- 18615-8), OECD Report, Paris, 2001), i.e. 1,7 % per year, the generated municipal waste quantity in Macedonia would reach in the following six years app. 600.000 t MSW/years, in the year 2020 the generated amount of MSW could be app.700.00 t/year or specific MSW generation would be between 290-350 kg/capita/year. Application of OECD methodology gives the dynamics of the MSW growth between zero and low growth.

## **2.8 Waste management 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, 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.

An 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 cost recovery and investments; there is also present the lack of the common national model for determination of the waste cost-tariff, cost monitoring and enforcement. Many initiatives and actions seem to be hampered by serious political and social lackings (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. GOALS, OBJECTIVES AND TARGETS OF WASTE MANAGEMENT

#### 3.1 Strategic goals, objectives and principles of waste management

##### 3.1.1 Strategic goals and objectives of the National Waste Management Strategy

Goals and objectives of the National Waste Management Strategy reflect the generally *agreed national policy* in waste management and *commitments* of all parts of Macedonian society with regard to the significant and closely interrelated changes in the policy and legislation, in institutional and organisational arrangements, with regard to human resources and capacity, in financing and cost recovery of waste management operation, in the stakeholder /public awareness and participation and in establishment of the information system in order

- to eliminate or mitigate all environmental impacts caused by the existing improper waste management operations, and
- to carry out the preparation and implementation of an integral and cost effective and sustainable waste management system, taking into account the EU key principles of waste management.

*National legislation* relating to waste management shall become compliant with requirements and standards of EU legislation in all sectors in the society.

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.

*Human resources and capacities* shall be adequately strengthened in the public and private sector, the network of the waste treatment /disposal capacities shall be gradually built.

Stable *financial resources* and adequate incentive *economic mechanisms* shall be introduced to assure sufficient and reliable revenue flows to meet the full costs of providing an integrated waste management system according to the "polluter pays" principle, and to enable 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 shall represent constant activities and intentions to improve the existing waste management practice and to change the behaviour of all members of society.

*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; such a system shall enable the access of public information on environmental issues.

The new established technical system for the contemporary management of the generated waste streams as represented in the National Waste Management Strategy shall take in *waste management hierarchy* and different available 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*, preservation of the non-renewable natural resources and achieving minimal emissions from the waste treatment/disposal processes to the environment.

Establishment of the new waste management system shall integrate the main characteristics of the *sustainable management of natural resources*, together with the *integrated product policy* and the *integrated prevention and pollution control policy*.

**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 private sector participation to reach the waste collection rate of 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 inert, hazardous and non-hazardous waste** and other facilities for final disposal of waste that are 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** that will contain 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, as well as future utilisation of physical space, costs of rehabilitation, and acceptability by the population.

### 3.1.2 Basic principles for development of the Macedonian waste management system

Basic strategic principles for development of the Macedonian waste management system exhibit the main priorities as starting points for the implementation measures of the national waste management plan:

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 economic aspect. Additional responsibility is given to the manufacturers-waste generators, which are only able to prevent the generation of the production waste and to minimise hazardous potential of waste to be disposed of.

The system shall enable the **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** shall be based on the “producer’s responsibility” principle and organised by the manufacturers, importers, distributors and retailers of products and by the specialised service enterprises.

As the waste may represent secondary raw material, establishment of the sustainable waste management shall introduce an optimal utilisation of available potential resources of **waste as a substitute for non-renewable natural resources** and contribute to the reduction of greenhouse gas emissions taking into account economic, environmental and social aspects.

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. The new waste management infrastructure shall be established for collection,

treatment and final disposal of **municipal solid waste** on a **regional level**, which shall comprise more than 200.000 inhabitants in order to achieve the adequate economic thresholds for investments and operations of the municipal waste management facilities and acceptable prices for executed services.

Establishment of the network of **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.

The network of the collection, storage and pre-treatment facilities for **special waste streams** and **end-of-life products** shall be planned on the basis of results of feasibility studies where there are available markets for recyclable material and end-of-life products; those waste streams may be managed mainly by small private enterprises under administrative permits for specific waste management operations.

The territory of the Republic of Macedonia as a national value and the basis for economic and social development of the country requires **rational and environmentally safe use of land** and protection of its natural resources, in particular soil and water environment.

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 be 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 environmental liability involving legal, institutional and financial mechanisms shall be established to solve the problems of the “hot spots” remediation in the future.

### 3.2 Principal objectives for the six-year period

Preparation and implementation of an integral and cost effective and sustainable waste management system requires interrelated and simultaneous changes in the policy and legislation, in institutional and organisational arrangements, in strengthening of human resources and capacity building, in financing investments in infrastructure and in assuring the cost recovery of the waste management operation, in the stakeholder /public awareness and participation in waste management projects and in establishment of an easy accessible and transparent information system.

The Republic of Macedonia has adopted the general and long-term policy on waste management in the Law on Waste Management and in the National Waste Management Strategy, i.e. the principles of the sustainable development of the waste management system, general framework of the technical waste management scheme and general measures to overcome existing environmental issues and to assure a rational and efficient network of facilities for the waste collection, material/energy recovery and for disposal of residues.

Objectives that could be realised in the time period of this waste management plan are presented in the **Table 6**.

**Table 6: Principal objectives for the 6-year period**

No. O <sub>x</sub>	Area /activity	Principal objective and sub-objectives
O1	<b>Policy and legislation structure</b>	<ul style="list-style-type: none"> <li>• <i>Alignment of legislation with acquis communautaire</i></li> <li>• National level: Transposition of EU legislation and accomplishment of the basic legal WM framework</li> <li>• Completion of regulations indirectly related to WM (asbestos, emissions to air &amp; water, water &amp; soil environment, environmental liability)</li> <li>• Local &amp; regional level: Upgrading of the municipal SWM regulations, physical planning acts and regulations living environment, sensitive areas, water environment and natural/cultural heritage;</li> </ul>
O2	<b>Institutional/organisational structures &amp; arrangements</b>	<ul style="list-style-type: none"> <li>• <i>Division of obligations, tasks, responsibilities &amp; organisational reforming, raising capacities of all stakeholders in WM</i></li> <li>• Division of tasks/responsibilities and effective co-operation of the inter-ministerial committee;</li> <li>• Strengthening of the role and capacities of the central WM body in MoEPP to carry out the planning, reporting, monitoring, administration (permitting, licensing) and project coordination activities;</li> <li>• Strengthening and reforming the enforcement bodies;</li> <li>• Set-up the institutional links between state institutions, local institutions and manufacturing/service sector and vertical co-operation;</li> <li>• Reforming of the MSW management system by formation 5 to 7 regional MSW systems, by strengthening human resources and waste management capacities on regional/local level and by involvement of the licensed private sector in the MSW collection/transport operations;</li> <li>• Bringing under control the industrial non-hazardous and hazardous waste streams by setting-up a feasible and economically acceptable and licensed organisational system, complementary to the adaptation to IPPC requirements and to the introduction of environmental standards (ISO 14000, EMAS) in companies.</li> <li>• Diverting special waste streams and end-of-life products from landfills by setting-up a linked collection/recovery/disposal system (public services/enterprises) according to the “producer’s responsibility principle”.</li> <li>• Strengthening human resources and waste management capacities of WM operators and generators.</li> </ul>
O3	<b>Technical infrastructure facilities</b>	<ul style="list-style-type: none"> <li>• <i>Reduction of environmental impact by establishment of the network of the technical infrastructure waste management facilities</i></li> <li>• Gradual establishment of the regional MSWM infrastructure facilities with the corresponding efficient &amp; cost effective collection system and transport logistics for different waste fractions: <ul style="list-style-type: none"> <li>- <u>in the transition period</u> by improvement of collection, transport and landfill of waste on the existing low risk landfills after conditioning, on new landfills and by diversion of waste from non-legal landfills,</li> <li>- <u>in the follow-up phases</u>, the construction of the landfill facilities with the supplemental infrastructure facilities for material/energy recovery and final disposal operations fully compliant with EU standards.</li> </ul> </li> <li>• Closure of landfills non-compliant with EU standards (presumably 40 high /medium risk landfills according to the programme of the MSW transition period).</li> <li>• Establishment of the collection and material/energy recovery facilities for special waste streams and end-of-life products according the “producer’s responsibility</li> <li>• Establishment of the hazardous waste management infrastructure according to the technological adaptation programmes to the IPPC directive (application of BAT) and according to other feasible technical/logistical solutions for small HW generators.</li> <li>• Remediation/upgrading of landfills on premises of hazardous and non-hazardous waste generators; remediation of at least one priority “hot spot”.</li> <li>• Establishment of the network for the animal by-product management infrastructure compliant with EU standards.</li> <li>• Establishment of the logistics system and treatment/disposal infrastructure for medical waste and for the selected groups of combustible hazardous waste fractions from different sources.</li> <li>• Establishment of the network for the recovery/disposal facilities for construction/demolition waste compliant with EU standards, including</li> </ul>

safe disposal of asbestos waste.

No. O <sub>x</sub>	Area /activity	Principal objective and sub-objectives
O4	<b>Cost recovery and financing investment</b>	<p><b><i>Assuring revenue flows to cover full cost for executed services provided by the gradually developing waste management system</i></b></p> <ul style="list-style-type: none"> <li>Assuring the cost recovery system for MSWM services based on the “polluter pays” principle;</li> <li>Assuring earmarked taxes and payment mechanisms for executed services in the frame of the “compliant” scheme according to the “producer’s &amp; importer’s responsibility for packaging waste and for other special waste streams / end-of-life products;</li> <li>Assuring cost more efficient waste management by involvement of private sector in execution of waste management operations.</li> </ul> <p><b><i>Assuring revenues of funds for financing investments</i></b></p> <ul style="list-style-type: none"> <li>Assuring funds for investments in the WM infrastructure facilities and in closure/remediation of landfills by means of earmarked charges/surcharges / taxes, collected on the national &amp; local level.</li> <li>Assuring funds for investments in the infrastructure facilities for management of special waste streams &amp; end-of-life products, and in remediation/reactivation of “hot spots” by means of local and international private investors, funds, banks and donations.</li> </ul>
O5	<b>Stakeholder &amp; public awareness and communication system</b>	<p><b><i>Understanding of waste issues and role of all stakeholders and inevitable policy/structural changes, positive public participation supporting the waste management projects</i></b></p> <ul style="list-style-type: none"> <li>General and constant public information and raising awareness on waste issues</li> <li>Understanding legal requirements, constrains and technical options of waste generators and WM sector with regard to waste management operations and impacts on environment.</li> <li>Raising public awareness and positive participation in implementation of regional MSW and other waste management projects.</li> </ul>

In addition to principal objectives and sub-objectives, quantitative targets for some specific activities and waste streams may be also set in spite of the many uncertainties of the plan (*Tables 7 & 8*).

**Table 7: Targets for some specific activities in the 6-year period**

Activity / waste stream	Target	To be achieved by
<b><i>Improvement of collection and source segregation efficiency:</i></b>		
- mixed municipal waste	collection efficiency 90%	2014
- segregation of hazardous and non-hazardous waste fraction (manufacturing/service sector)	segregation efficiency 100%	2010
<b><i>Landfill of waste:</i></b>		
- landfill of MSW on temporary facilities (after conditioning)	100 % of the collected MSW	2014
- landfill of MSW on facility compliant with EU standards	50% of the total MSW	2014
- reduction of biodegradable waste disposed on landfills (transition period needed)	reduction to 75%	2014
- reduction of the greenhouse gas emissions (landfills only)	reduction for app 25% of CO <sub>2</sub> eq.	2014
- diversion of industrial hazardous waste streams from non-hazardous landfills	100 % effect	2010

**Table 8: Targets for some specific waste streams in the 6-year period**

Activity / waste stream	Target	To be achieved by
<i>Special waste streams</i>		
- packaging waste of all 3 categories (transition period needed)	recovery 50% recycling 25%	(2018)* (2018)*
- used tyres	collection efficiency 90% energy recovery 100%	2014 2014
- batteries /accumulators	ban on import and sale of the Hg& Cd batteries and batteries containing too high Pb content	2010
- end of life vehicles	collection 90% recovery or reuse 70% recovery or reuse 85%	2014 (2018)* (2018)*
- waste electric & electronic equipment	collection 90%	2014
- PCB/PCT waste	Inventory complete destruction	2009 (2018)*
- C&D waste collection / recovery/ recycling facilities & landfill	collected 30 % recovered/recycled 10% disposal 90%	2014

\* Years of achievement given in brackets means that target may be achieved beyond the timetable of this document.

## 4. IMPLEMENTATION MEASURES

A six-year period is really a short time to mobilise all members of the society to overcome a variety of existing and interrelated constraints with regard to waste management issues and to succeed in the positive activities and co-operation of all stakeholders in the society. Additionally, all technical, economical and sociological projects need a lot of time to develop from the conception phase to the phase of implementation. In particular, all environmental, i.e. waste management projects with investments in buildings and in process equipment need 5-7 years if a high consent of all stakeholders is present. That is the reason that almost all activities being started in this six-year period shall exhibit their effect later and the main infrastructure for waste treatment and disposal can be finished and put into operation in the next period.

However, the implementation measures reflect activities necessary to be realised in a shorter period of 6 years and concretise three main topics from the National Waste Management Strategy, which represent the basis for:

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

All activities and measures related to the harmonisation of the national policy and legislation with *acquis communautaire*, to the institutional/organisational arrangements, strengthening human resources and to capacity building in state/local institutions and economic sector, to establishment of the network of the technical infrastructure for waste management operations, to economy and financial issues, and to the public and other stakeholder awareness & communication system are presented in details in *table 15* in Chapter 5.

### 4.1 Harmonisation of the policy and legislative measures - P

Transposition 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 problems related to the main waste streams, in particular hazardous waste, and to stop environmental pollution caused by the current waste management practice. Waste management legislation is linked to the horizontal environmental legislation and to other national regulations on general administrative procedures and inspection, on investment constructions and physical planning; other links to regulations on mining, economy and financing, local self-government, public enterprises and concessions shall be improved and made clear. Reforming of the organisation and competences of the environmental inspectorate as well as granting of IPPC permits (A & B) shall be realised through amendments of the legislation according to directions in the adopted Waste Management Strategy.

Full incorporation of the Waste Framework Directive, Hazardous Waste Directive, and Directive on Landfill of Waste and Incineration Directive into the national legislation framework is the first priority task reflecting the main directions of the Waste Management Strategy on the policy/legislation field (*PI*) and it shall be carried out within a short-term schedule and will require fast implementation. All the cited directives comprise the main obligations, rules and environmental limits, principles and the structure for the proper operation of the general waste management systems (elaboration of waste management plans, permitting of WM services & facilities, tendering and contractual issues, technical guidance and technical standards, reporting, monitoring/enforcement & inspections, etc) including implementation of the two main principles: the “polluter pays” principle and the “producer’s responsibility” principle.

In parallel, the limits on air emission, water discharges and waste application on soil shall be regulated on the same regulation level in the legislation framework like obligations and rules regulating the landfill operation.

Legislation on landfill shall determine the main criteria on landfill locations, on technical constructions and permits, on landfill classification and on the corresponding acceptability of waste, on monitoring and on measures after the closure of a landfill. Selection criteria and standards for closure of landfills and for the conditioning of some landfills to accept waste in the transition period, and the long-term plan of landfill closure and remediation shall be regulated by legislation on landfill of waste.

Additionally to the national legislation on landfill of waste, amendments to the draft legislation on soil contamination shall be prepared to set-up a legal basis on the management of non-legal landfills, wild dumps and contaminated soils, as well on the remediation of the relatively high number of “hot spots”.

National legislation shall set criteria and rules on appraising and regulating penalties and fees against the real costs of environmental damages caused by improper waste management and mechanisms to enforce them.

Transposition of the Environmental Liability Directive may be not understood as the highest transposition priority; however for Macedonia its implementation may represent a legal basis for negotiations on the remediation activities and on the financing of those “hot-spots” where legal succession is not quite clear, where the waste generators are active and utilise landfill location for manufacturing activities.

Transposition of other main directives on the management of special waste streams and end-of-life products into the national legislation framework needs some additional regulation to be successfully implemented. Successful and sustainable management of these waste streams need some additional decisions and regulations to assure:

- a legal basis for the involvement of the private sector in waste management system, conditions and forms of involvement (services, investment);
- a legal basis for establishment of the organisational structures for management of the individual special waste and end-of-life product streams (public service, public enterprise) according to the “producer’s responsibility” principle and for the execution of corresponding financial operations (earmarked charges/taxes) in order to assure the full cost recovery for waste management operations;
- a legal basis for setting of the methodologically uniform charging and fee approval system for the cost recovery for the executed MSW management services and for management of other special waste streams/end-of-life products including capital costs;
- a legal basis for diverting waste streams from local non-legal landfills/dumps to the regional MSWM centres or, depending on the type of waste to other disposal facilities, and for assuring some revenues to autonomic investment funds by setting charges and surcharges for landfills with different levels of environment risks.

Secondary legislation (**P2**) generally comprise permitting and enforcement instruments, executive regulations like decrees, rulebooks, guidelines and standards on management of appointed waste streams, on elaboration of the waste management programmes and outlines at all levels (national, regional/local, waste generators) according to criteria (waste quantities and risks to environment) and on record keeping, reporting and on data transfer. It shall regulate permitting, licensing and authorisation according to defined criteria and administrative procedure, and keep records on institutions & enterprises that perform waste management operations.

The important executive part of the secondary legislation is the application guidelines; in particular the definition of scope, contents, forms and required annexes for granting consents/permits for existing and new manufacturing/service facilities, as well as management rules with regard to environmental protection and technical standards for segregation, separate collection, storage, treatment, processing and final disposal of special types of hazardous and non-hazardous waste.

Reorganisation of the municipal waste management system on the inter-municipality or even on the inter-regional level requires some new linked regulation on the national and local level (**P3**). New regulations shall be required, in particular on the conditions and rules of authorisation of the common MSW enterprise to provide the agreed WM services on behalf of the joint communities in the waste management region, on the scope and contents of the MSW management programmes, on the transfer of obligations from a national to regional level and from the municipality to a regional level inclusive of a charging policy, management of investment funds, monitoring and enforcement procedures. Additional regulations shall set the relations between all WM services and facilities in the collection/treatment/disposal network for the management of the special waste streams.

## **4.2 Institutional strengthening and organisational arrangements - I**

### **4.2.1 Strengthening of institutions on a national level I-1**

Preparation and implementation of the legislative, institutional and organisational tasks, economic/financial measures and public awareness projects as required on the one hand, and development and implementation of the monitoring, supervision and enforcement mechanisms regarding operation of waste generators and waste management infrastructure on the national and local level (municipal waste management and disposal facilities, industry, other waste generators), on the other hand requires strengthening of all involved institutions, in particular additional human resources, substantial institutional reorganisations and, better communication and cooperation between all institutions.

Drafting and adopting policy documents, waste management legislation, elaboration of plans and programmes and the coordination of waste management projects as well as carrying out all administrative procedures related to licensing/permitting/reporting and shipment of waste require beside strong cooperation on the inter-ministerial level, new human resources, i.e. the additional employment of staff experienced in understanding of waste management issues, skilled in administrative procedures and in organisation tasks to coordinate waste management projects. It is evident that a lot of training of staff shall be necessary to achieve an efficient institutional organisation. All employed staff shall attend the trainings on the organisation of the state administration, on the general and special administrative procedures and on special expert field (e.g. for MoEPP: environmental management, administration and economy) and pass the so-called “state examination”, which represents the basic requirement and condition for employment of staff on the national (and local) level.

Transposition of the main EU directives related to waste management issues into the national legislation framework is identified as the task of highest priority and it shall be done by the EU legislative sector of the MoEPP to set-up legal links to the reformed regulations on local level and with the MoF on methodology for setting fees for executed services, on charges/surcharges for landfill of waste, on earmarking of appointed surcharges and taxes for re-investment in waste management facilities and for recovering cost for collection/treatment of special waste streams and end-of-life products.

In the 6-year period, Waste Management Department (WMD) shall become the central administrative body responsible for waste management within the Administration for Environment of the MoEPP and it shall carry out the main administrative, planning, monitoring and development tasks related to the

waste management projects on the national and local (WM regional) level. Personnel in WMD shall be appointed as competent for elaboration of waste management plans and programmes of national importance, for monitoring of their execution and for preparation of periodic reports. Personnel shall also be appointed for issuing consents, permits and registrations with regard to all waste management facilities and operations, for permitting waste shipment inside and particularly outside of the country according to the Basel Convention, for monitoring and data collection/handling/reporting, for elaboration and coordination of technical and economical studies for management of special waste streams and end-of-life products as well as for elaboration of programmes of the waste dumps closure and of the “hotspot” remediation.

Additional specialisation of staff shall be required for planning, co-ordinating and/or supervising of investment projects of national and inter-municipality importance, and development and implementation of financial/economic instruments in cooperation with the MoF, including setting-up compliance schemes for special waste streams and end-of-life products. In the time period of the NWMP (2009 - 2015), some co-operation and foreign technical assistance seems to be necessary for this field of activities.

The Public Relation Office shall prepare the main communication programme and begin with the organisation and co-ordination tasks of different specialised institutions for carrying out the communication activities related to the general informative communications, for raising public awareness and awareness of industrial and other waste generators on waste management issues, and to actively assist in the regional MSWM projects since the start-up phase; special attention shall be paid to the first, i.e. demonstration waste management projects.

The Environmental Inspectorate as a subordinate department of the MoEPP shall be reorganised/centralised on the national level and shall become responsible for monitoring/supervising/enforcement of all manufacturing and commercial facilities or institutions (regardless of the permit level) and of all waste management services, i.e. waste treatment/disposal facilities in operations (regardless of types of waste). Reorganisation shall be executed by integration of the existing communal inspectors into the Environmental Inspectorate on a national level and by re-delegation of the inspection/enforcement tasks and obligations to new established departments or offices.

#### **4.2.2 Set-up of linked institutional arrangement I-2**

The Organisation scheme of the complete cycle for management of special waste streams and end-of-life products may be realised in the linked institutional set-up where responsible Ministries (mainly MoEPP, MoE, MoF, MoAFWE) prepare waste management schemes and organise together with the waste generators & trade sector (or with their professional associations) more detailed investigations on waste streams and carry out the feasibility studies with regard to technical, spatial and economical options. Acceptable organisation schemes, material and financial streams for management of the individual waste type/end-of-life product and the legal and economic instruments (in particular earmarked taxes paid by purchasing a product) which may be applied to implement the “producer’s responsibility” principle and to encourage the management of the individual waste according to a selected management scheme, may be as follows:

- a) a network of concessionaires with partners performing the collection/recovery of separately collected waste fractions and end-of-life products and sell the secondary raw material for recycling or energy utilisation, or
- b) WM (no-profit) company established by MoEPP and by the private manufacturing and trade sector organises a network of private companies who perform collection/recovery of the separate collected waste fractions and end-of-life products and sell the secondary raw material for recycling or energy utilisation.

In both cases, the MoEPP is involved in the waste collection/treatment/disposal scheme by preparing tenders, by granting concession or by co-establishment, by subscribing management rules and targets and performs material and financial monitoring. In such schemes, the private sector finds its optimal involvement in waste management, i.e. in investments in collection/treatment facilities and in the execution of waste management operations.

In the 6-year period, organisation structure for management of at least two special waste streams shall be established and partly or entirely put into operation:

- Used tyres may be collected according to the “concession scheme”, and utilised as a substitute for primary fuel in the Macedonian cement kiln.
- Packaging and packaging waste may be managed by performing the second “non-profit WM” scheme (partial implementation).

Newly established regional MSWM companies shall become a part of both management options because of genuine tasks regarding the collection and segregation of special waste streams generated by habitants.

However, generally speaking the companies may organise themselves; this may be the particular case if a company belongs to a foreign company and may become a part of their current end-of-life management system, which fulfils the set technical requirements and targets.

Authorised public enterprise (or public service as second option) shall be, as a part of the complete collection/storage/transport/pre-treatment system established for the final disposal of medical waste; such system may be expanded for final disposal of old remedies, of contaminated packaging by pesticides and of some other combustible hazardous waste.

Successful management of the industrial hazardous waste generated in bigger amounts shall be solved mainly by the organisational (and technological) measures within the production plant and by reconstruction (upgrading) of their own landfill facilities; the main problems on industrial hazardous waste management may be solved at least within the timetable of the NWMP (2009 - 2015) because of obligations with regard to the deadlines set in the transposed IPPC directive.

Segregation of hazardous and non-hazardous waste fractions at their source by smaller waste generators, reporting on waste and the ban of disposal of hazardous waste on municipal landfills shall offer the information on real quantities and characteristics of generated hazardous waste as reliable inputs for the feasibility study execution; meanwhile export to the final disposal, according to the Basel Convention, seems to be a good solution if performed by the specialised licensed (private) companies.

The organisational structure for the management of animal by-products (agriculture waste) links three main beneficiaries: the producers of animal by-products (animal breeding farms, slaughterhouses), users of treatment residues (farmers, gardeners and other producers in agriculture) and the State, responsible for protection of environment and for reduction of greenhouse gases. The driving forces of private sector investments in treatment facilities are

- in the case of biogas production the subsidy of the “green” electricity price, and known user of treatment residues, and
- in the case of composting (generally common treatment with green biomass residues), the price of fertilising or soil improving material and known user.

However, the organisation of management of the animal by-products not intended for human consumption, in particular those of the 1<sup>st</sup> category and some of the 2<sup>nd</sup> category shall take into account all prevention measures in collection, treatment and disposal to avoid any risk of pathogen dispersal. Special authorised collection & treatment facilities of such by-products according to EU regulation shall be organised on the national level taking into account the specific animal deceases and their distribution in the country as well.

Linked organisation structure for the management of other *non-hazardous waste from agricultural* activities (some plant residues like husks of rice and other cereals, plastics, etc.) may be established aligned in the interest of the private sector, which may also find some positive business relations with public interest.

Important linked organisation structure shall also be set-up for the collection of hazardous and toxic *residual of pesticides and contaminated packaging*, presumably by return to the network of retailers and/or farming-cooperatives; such organisational measures shall find the basis in the legislation on management of poisons and in the related regulation on good agriculture practice.

#### 4.2.3 Reforms of the MSW management system I- 3

*Regional municipal waste management systems* shall represent a link between the state and the municipalities; the majority of responsibilities and tasks related to the municipal waste management originally addressed to municipalities shall be taken over to regional level organisation *on behalf of the joint municipalities and their inhabitants* with the consent and active participation of MoEPP.

The Republic of Macedonia, applying economies of scale, may optimally organise 5 -7 waste management regions, generally comprising more statistical regions; such waste management regions shall cover in principle a territory with more than 200.000 habitants as stated in the National Waste management Strategy (2008). Such a waste management region shall also possess at least one suitable location, compliant with variety of criteria for construction of the regional MSWM centre which comprise the regional landfill facility for non-hazardous waste and which is acceptable from the viewpoint of the transport economy (proposal in **Table 9**). The division of the Macedonian territory to 8 statistical regions is shown in **Figure 3**.

Statistical regions and municipalities in the Republic of Macedonia



Figure 3: Statistical regions in Macedonia and list of municipalities

**Table 9: Two proposed formations of the waste management regions according to administrative regions**

Administrative region	Option 1 for WM region	No. of habitants in WM region (2006)	Administrative region	Option 2 for WM region	No. of habitants in WM region
Skopje region 590455	WM region 1	590.455	Skopje region 590455	WM region 1	590.455
North East region 173982	WM region 2	519.150	North East region 173982	WM region 2	354.920
East region 180938			East region 180938		
Vardar region 154230			Vardar region 154230		
South East region 171972	WM region3	171972	South East region 171972	WM region 3	390.318
Pelagonian region 236088	WM region 4	458473	Pelagonian region 236088	WM region 4	458473
South West region 222385			South West region 222385		
Polog region 310178	WM region 5	310.178	Polog region 310178	WM region 5	310.178
2040228			2040228		

Municipalities and the City of Skopje shall prepare the municipal solid waste management plan. Municipalities with less than 10.000 inhabitants may develop waste management plans jointly with one of more neighbouring municipalities.

For the purpose of establishing an integrated waste management and, thus using the economies of scale pursuing cost effective and efficient operations, municipalities shall found regional municipal solid waste management companies (regional MSWM companies) by adopting the Decisions of municipal councils. In the case of joint (inter-municipal) companies, the power of municipalities shall be represented by appropriate votes in the inter-municipal Board.

A municipality may initiate the process of establishment of a regional municipal solid waste management company and municipal solid waste management centre with regional landfill at its own territory, and upon an appropriate Decision by the Ministry of Environment and Physical Planning, other municipalities in the "waste management region" shall join the system. The ownership over the "regional" assets shall be clarified accordingly, it is possible however that the municipality hosting the waste management centre is an owner of regional assets.

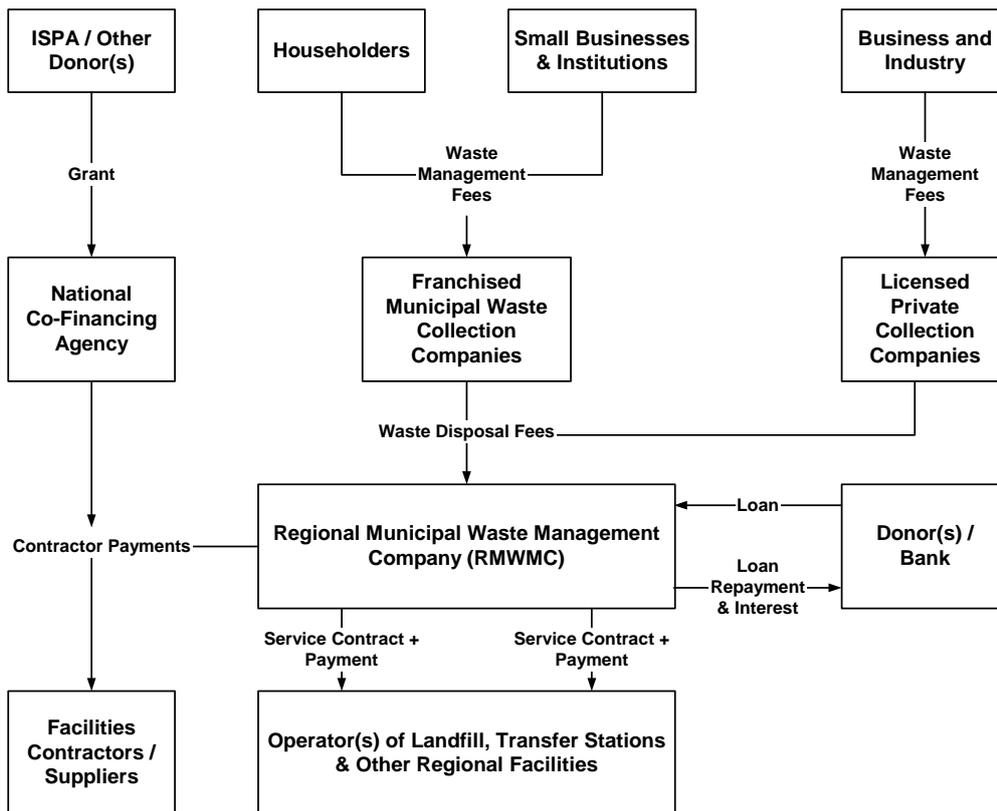
Regional MSWM companies provide the municipal management operations: collection, transport and recovery of waste and final disposal services by tendering & awarding contracts/franchises to the experienced companies for the provision of the waste management facilities (waste recovery & landfill facilities) and services (collection & transport). Engaged franchised MSW management companies, which execute MSW collection and transport shall have license for such operations and the awarded concessions by municipalities according to the territory key. Business and industry may provide the

transport of the appointed fractions of non-hazardous waste if accepted for final disposal, by means of the licensed private collection companies.

However, the first condition of such organisational reform is the organisational and financial separation of WM services from other communal services within existing public enterprises; they shall be gradually reorganised and transformed with regard to new tasks and opportunities in the organisation scheme of the developing MSW management system.

The newly established regional MSWM Company shall take over the management of existing landfill facilities in the WM region and hand over the operation of facilities to new operators; ownership of the landfill areas and equipment (if any) shall also be officially regulated. Some of the dump facilities will be closed and remediated, some will be upgraded for temporary or future operation.

The regional MSWM company shall also function as a inter-municipality agency carrying out various expert tasks like planning, record keeping and reporting, drafting local regulation, leading investment projects and managing regional investment funds for new investments and for closure of non-compliant landfills, supervising the amount and quality of executed services, assuring cost recovery, account-keeping services and financing of the executed municipal waste management operations, cooperating in public relations activities and performing environmental monitoring. As *an inter-municipality public enterprise the regional MSWM Company* also possess a legal status having access to loans from international financial institutions and banks, as well as access to EU funds (IPA) through the National Co-financing Agency and the re-paying of loans and interest, and payment for equipment. Management of the income and expenditure financial flows by the regional MSWM Company, its links and role in the investment operation are presented in **Figure 4**.



**Figure 4: Service delivery, cost recovery & financing investments – proposed modification for short- to medium term**

Executing the pilot regionalisation project and designing of the organisation scheme of the regional *demonstration MSWM centre* for a selected waste management region would be a very welcome action in order to clear some detailed organisation uncertainties, to harmonise some interests of the local stakeholders with the objectives and goals of the MSWM reform, to exhibit benefits, to demonstrate the optimal means of closing financial structure for investment by providing funds, and to encourage and accelerate similar activities in other parts of the Republic of Macedonia. Transformations of the existing MSWM system and set-up, and functioning of the regional MSW management schemes shall be from the organisational side completed by the end of this NWMP (2009 - 2015).

In the 1<sup>st</sup> phase, a new MSWM company shall be established that shall take over the main administrative, organisational, account-keeping, planning and investment tasks and competencies from communal enterprises on behalf of municipalities and set-up of the contracting organisation system from collection to the final disposal for operation of WM facilities and for executed collection and transport services. These operations may be temporarily carried out by the organisationally transformed communal enterprises; involvement of the experienced private sector remains an open option in this phase. Development of the organisation in the 2<sup>nd</sup> phase leads to the set-up /implementation of the tendering / contraction procedures for operation of WM facilities and execution services under competitive conditions (involvement of the private sector) and set-up of the monitoring system with regard to amount and quality of the executed services.

#### **4.2.4 Organisational set-up of financial/ economic measures I- 4**

Organisational set-up of financial and economic measures mainly consists of determination of the optimal charging/surcharging and taxation system, of the set-up of the fee collection system, of the introduction of the standardised accounting system and, in particular of determination of types and locations of funds for (co) financing necessary investments and determination of their genuine revenues (national & community budgets, regional investment fund for MSW infrastructure, funds intended for management of special waste streams and end-of-life products according to the “compliant scheme”.

Additionally, a remediation fund shall be established in order to provide financing of remediation of environmental burdens (“hot spots”) from preliminary investigations, elaboration of technical and other investment documentation as well as for financing the construction works, processing of contaminated materials and restoration of previously contaminated territory for new utilisation. Competence for management of these funds, the strict earmarking rules and rules on the access financing and disbursement lines to the funds, national and local budgets shall be set-up as transparent and regulated in the national legislation.

A demonstration regional MSWM project shall apply selected charging/surcharging and taxation and fee collection system in appointed WM region, and set-up necessary links to the national co-financing agency, to national and local budgets and to funds for investment activities on the national and (new) regional level as previously harmonised with the MoF.

### **4.3 Human resources and capacity building - H**

#### **4.3.1 Capacity building of MoEPP H-1**

The *Legislative department* of the MoEPP shall be additionally strengthened by 2 specialised employees who will be responsible for the preparation of the draft national legislation on waste issues, for elaboration of the secondary executive legislation and, in coordination with other Ministries (particularly with MoF, MoE, MoAFWE, MoIA), for elaboration of regulations related to waste management issues.

In the following six years, the employment of new staff in the *Waste Management Department* shall gradually be raised to 14 new employees who shall be appointed as competent for elaboration of waste management plans and programmes of national importance, for issuing consents, permits and registrations with regard to waste management facilities and operations, for permitting waste shipment inside and particularly outside of the country according to the Basel Convention, for monitoring and data collecting/ handling/reporting, for elaboration and coordination of technical/economical studies for management of main waste streams and end-of-life products, for collaboration with other governmental sectors, with industry and municipalities and for coordination of the follow-up projects as well as for elaboration of plans and programmes of the waste dumps closure and of the “hotspot” remediation. Head of the WMD may become only a highly qualified waste management expert. .

*The Macedonian Environmental Information centre* needs to strengthen their capacities to process and maintain Database on environmental (and waste) issues by increasing the number of staff by 5 persons; two of them shall be in charge of waste issues.

*The Public Relation Office* shall be strengthened with 2 new employees specialised for co-ordination tasks and communication activities.

The Environmental Inspectorate shall, additionally to the integration of existing communal inspection offices, gradually employ 10 inspectors over the 6-year period.

#### **4.3.2 Capacity building of other national stakeholders in WM H-2**

Other national stakeholders, in particular other ministries and professional associations shall appoint responsible persons for WM issues in order to constructively contribute to the development of the integral waste management system and to the harmonisation of different interests in the society. An additional employment of 6 persons may be expected.

#### **4.3.3 Capacity building of municipalities in MSWM H-3**

Establishment of the regional MSWM systems and needs for collaboration of all joint municipalities in this process inevitably lead to new tasks as well as to new employments. Municipalities shall appoint responsible persons for waste management issues in the municipality administration and professionals of different profiles shall be employed in the new regional MSWM company, so as to be able to carry out the extensive and demanding tasks. At start, new employment on existing landfill facilities shall be necessary to survey and bring under control the disposal of all kinds of waste on municipal landfills. Reorganised MSW collection/disposal departments (or as independent WM firms) may reduce the employment but some personnel may find their new role in the new established MSWM companies or in the landfill operation teams or in any other waste transfer or recovery facilities.

We assume for the six year period that new employments of app. 50 personnel shall be necessary for execution of activities in all regional MSWM companies in Macedonia, for execution of the MSW landfill operations and gradual closing of some landfills in the transition period according to the programme, and for the operation of two MSWM centres (one of them shall be a demonstration facility) providing the main municipal waste management services, i.e. collection/transport/transfer and some waste recovery operations and landfill operations. Municipalities with a higher number of habitants shall appoint a responsible person for waste management issues; in smaller municipalities, a responsible person for MSW management may also deal with environmental and other related municipality issues.

Separate collection development of waste streams and investments in the waste recovery facilities may lead even to a higher employment rate in those municipalities where MSWM centres with regional landfill are located.

The new regional MSWM system with the demonstration waste treatment/disposal facility represents the testing area in order to recognise all constrains and deficiencies in the WM region and how to

overcome problems with employments and with a deficiency of knowledge on the waste issues and skills to manage them.

#### **4.3.4 Capacity building of waste management operators** **H-4**

New employments in smaller, mainly private WM “business units” shall raise parallel to extent of the involvement of the licensed private sector in WM operations, to the extent of collection/pre-treatment of special waste streams and end-of life products (market conditions, encouragement by financial/economic instruments), as well as on offers of opportunities for investments of private capital in public services (PPP or other PSP mechanisms).

Licensed hazardous and non –hazardous waste collectors/operators of treatment facilities may find the opportunity to extend some new services in the management of waste generated in the manufacturing industry and service activities including trade/export business services.

#### **4.3.5 Capacity building of waste generators** **H-5**

Generally private industrial enterprises as main waste generators shall solve their waste problems inside or by upgrading of the production processes, mainly on location of their assets and at their own cost. Implementation of internal technological and technical measures on waste management and engagement of their own expert teams represent the successful building of the capacity of these waste generators.

Waste generators under IPPC obligation (A permit), i.e. mainly industrial and related companies shall appoint or employ at least one competent person authorised for environmental (waste) issues in the company. The industry’s development and investment sectors shall be involved in the demanding technological changes to adapt the technological processes to requirements of the “best available techniques” in order to get environmental permits. From the start, all these sectors shall deeply understand the meaning of separation of hazardous and non-hazardous waste and separate treatment/disposal, and short- and long-term costs of technical measures related to reduction, internal recycling processes, recovery and disposal of generated waste fractions as well to remediation of their partially active landfill facilities. Additionally, application of environmental management standards according to EMAS or ISO 14000 may substantially contribute to the successful execution of the waste management project led by the waste generators and their groups.

#### **4.3.6 Educational and training activities**

Execution of all demanding tasks in waste management needs in addition to new employment, skilled personnel on all levels: national and local administration, MSWM companies, management and operators of waste treatment/disposal facilities and waste generators. All personnel shall attend additional educational courses and trainings, which shall be designed according to the task specificity. All professional groups in the industrial sector and operators of waste management facilities shall upgrade their technical and technological knowledge with the key philosophy on waste management in the EU, with the knowledge of national and EU regulations, programmes and rules as well as with economic/financial issues and consequences.

Education courses and trainings of WM department staff within the frame of the MoEPP as well as the staff in regional MSWM companies shall mainly discuss general political, legal, public awareness, organisational, technical, spatial, logistical and economic/ financial topics and aligned topics to special tasks, in particular to coordination of WM development and investment projects, and to provision for financial resources.

Landfill operators and operators of other process technologies in waste management shall attend educational courses and trainings on regulations and standards of general waste management, on specific technical and operational issues that some overall waste management skills are need for, on impacts of WN facilities on the environment and on economic/financial issues of waste management



operations. WM operators shall possess some additional knowledge on waste characteristics and on technologies and technical applications comprising collection, transfer/transport, storage of hazardous/non-hazardous waste fraction and potential recyclables, mechanical and biological and other treatment and disposal processes of all kinds of waste.

HW generators, and in particular HW facility operators and exporters shall attend special educational courses and trainings of personnel on the management of hazardous and toxic materials (waste); the personnel shall pass examinations and be awarded with a personal licence for management of hazardous and toxic materials.

#### 4.4 Technical infrastructure for waste management operation and investments T

Establishment of technical infrastructure in order to carry out the *public services of the MSW management*, i.e. the waste transport and transfer activities, material and energy recovery of waste and the final disposal operations (incineration plants and landfills) will take a relatively long period, much longer than the period of implementation of the NWMP (2009 - 2015). Almost all parts of the waste management system need new investments in mobile waste collection equipment, and in the stationary waste transfer and processing equipment as well as in new buildings and in special constructions such as landfill facilities in accordance with elaborated waste management concepts, schemes and projects.

In order to expand the MSW collection efficiency of the integral MSW management system, substantial investments in variety of the compatible waste collection vessels, waste collection vehicles and mobile or stationary transfer facilities shall be carried out. Collection of the individual waste fractions, application of the corresponding waste collection and transfer techniques, and frequency of transport shall also be adjusted to the waste quantities generated on the individual territories within the WM region as being projected by means of logistic schemes and economic analyses.

Municipal solid waste management facilities, which shall execute services on a regional level, usually consist of the following storage, recovery and disposal facilities:

- receiving / surveying area and recycling yard for the individual delivery of bulky waste or other separately collected fractions,
- mechanical/manual separation plant for treatment of waste fractions separately collected at source, and for bulky waste treatment,
- mechanical and biological treatment plant of the mixed MSW for recovery of usable waste fractions intended for reuse and recycling, to the energy production and to the preparation of artificial soil-like materials,
- intermediate storage facility for hazardous fractions present in MSW, and other necessary storage facilities for separated waste fractions;
- non-hazardous waste landfill facility, with the planned capacity of at least 20 – 30 years, equipped with the leachate and the biogas collection system;
- communal infrastructure, equipment for biogas utilisation, internal transport and manipulations areas, and leachate and other wastewater collection and treatment plants.

All constituents of the regional MSW management centre shall be planned as a whole but the financing, construction and erection, and starting of operation shall be carried out in more phases.

An unavoidable part of the establishment of the regional MSW management systems in the 6-year period of the NWMP (2009 - 2015) is also the closure and aftercare activities of some existing landfill facilities, generally non-compliant with EU and national legislation and contemporary standards on the landfill construction and operation. Conditioning and partial remediation of some existing landfill shall be carried out only to overcome the transition period; the upgrading of some existing landfill shall be carried out only if such a facility shall take over the role of the regional MSW treatment and disposal facility.

Waste-to energy (WtE) plants which shall utilise secondary fuels prepared from the MSW light fraction or from some residues of the biomass treatment according to the standards, are usually placed near those settled locations where optimal utilisation of the released heat is available and where additional investments in heat distribution infrastructure could be avoided. In the MW region of Skopje, app. 70.000 t of light fraction may be recovered from the collected MSW which correspond to app. 30 MW of heat power released in combustion in a WtE plant; energy released may be utilised for the electric power generation as well as for central heating.

The manufacturing sector and waste management treatment/disposal facilities as typical waste generators are owned and operated by mainly the private sector. New investments to the technological adaptation and changes with regard to waste generation, internal management and final disposal are specific for each technological process; plans and programmes as well as technical and investment projects related to hazardous and non-hazardous waste handling, recovery, disposal and landfill remediation shall be led and, for the main waste generators realised according to the conditioning timetable until 2014, as commonly set by the Governmental institutions and by the manufacturing and service sector.

Investments in improved and in new waste management facilities are closely related to the business opportunities of the private service sector, i.e. waste collectors/WM operators in the field of hazardous waste management, on management of special waste streams, end-of-life products as well as of animal by-products and other agriculture waste fractions, and the ability to assure the utilisation of recovered material and energy and/or safe final disposal of residues.

Investment procedure for the construction of any new manufacturing or energy production facility consists of many, presumably consecutive phases of planning and acquiring necessary project conditions, elaboration of project and investment documentation, clearing-up the ownership-, environmental impact- and spatial planning issues, acquiring spatial and construction permits, closing the financial structure, execution of construction works, building, installation of process equipment and infrastructure, start-up of the plant and acquiring operational (and other) permits. Investments in any waste management facilities generally do not substantially differ from investments in manufacturing or energy production plants. The only difference may be the investment in a landfill facility, which represents a specific construction and an unavoidable part of the waste management system; all unusable residues, depending on environmental risk shall be safely disposed of on the landfill of a corresponding category.

Execution of investments in waste management facilities generally takes app. 4 -7 years if there are no specific constrains, execution of some more demanding projects may last even 10 years. Investments in the waste management infrastructure within the frame of public services need more time in comparison to investment in the private sector because of demanding administrative procedures and tendering, elaboration of transparent financial structures and because of the demanding procedure to assure funds with acceptable financial conditions. This is the reason that all activities shall be very carefully planned at the start of the project and all necessary measures shall be foreseen and taken progressively to neutralise possibly appearing constrains in time.

A very approximate estimation of the necessary time needed for the main phases in the investment procedures for waste management facilities is shown in **Table 10**.

**Table 10: Estimation of the time needed for main phases of the investment project for waste management facilities\***

Activities	year
Site investigation and assessment (climate, geology, hydrogeology, hydrology, nature), assessment of available infrastructure (power, water, wastewater recipient,..), changes and adoption of physical plans (national and local level) of selected location, purchasing land	1-1,5
Elaboration of technical projects (basic project, main project) according to conditions set by authorities and elaboration of investment documentation, feasibility study, EIA; Acquiring spatial permit, environmental permit, building permit;	1 -1,5

Closing financial structure and application for funding	
Elaboration of tender documentation, tendering and contracting	0,5 – 1,5
Construction work, building and installation of process equipment and infrastructure **	1- 3
Technical survey, start-up the plant operation and acquiring operational (and other) permits	0,5
<b>Time required</b>	<b>4 –8</b>

\* A longer time shall be used for those waste management projects, which include a location for a new landfill facility

\*\* More demanding projects may take even more time for construction works and equipment installation.

Realistic planning, which shall be exhibited in the NWMP (2008-2012) shall clearly indicate that the majority of waste management projects shall be started in the period of this NWMP but finished in the next period. Some waste management projects in the country are of very high priority on the one hand and on the other hand a variety of necessary measures shall be executed prior to the start investment procedure; such a situation directs the NWMP (2009 - 2015) to the planning of 2 phases:

- planning and realisation of temporary technical and investment measures and
- systematic planning of establishment of the more long-term integral and sustainable waste management system,

which shall and must be technical fully implemented and, if necessary improved and upgraded in the next period.

#### 4.4.1 Temporary technical measures T-1

Temporary technical and investment measures shall help to overcome the shortage of the available landfill volume in the transition time when some of the existing non-compliant landfills shall be closed because of adverse effects and high risks to the environment and planned regional landfills, i.e. upgraded existing or new landfill facilities are still in one of the unavoidable phases of administrative procedure for the realisation of the waste management project.

It is evident from the waste management action plan for the 6-year period (**Table 15** in Chapter 5), that the transition period for implementation of temporary measures shall last more than 6 years for the majority of new waste management regions. After the selection of some low risk landfills with regard to conditioning of landfill facilities with intention to gradually take over the municipal solid waste from the app. 40 existing landfills in the first period, newly established MSWM companies in the waste management regions shall elaborate

- conditioning plans and, project and investment documentation for temporary landfills,
- technical, spatial, investment and other necessary documentation for the future regional MSWM centres,
- project and investment documentation for closure of existing non-compliant landfills,

and make the projects bankable. Landfill facility of the planned regional MSWM centre may be developed as an extension of the conditioned temporary landfill.

To more easily overcome some possible constrains to the new WM facilities and to save time in the realisation process of investments in the regional MSW collection/storage/treatment and disposal facilities, the demonstration regional MSWM centre shall be established, consisting of the main operational facilities as follows:

- a) waste reception and control area,
- b) sorting, storage and treatment plant for commercial waste and bulky waste,
- c) storage of hazardous constituents in MSW;
- d) mechanical biological treatment plant (MBT plant),
- e) wash facility for trucks and waste collection vehicles,

- f) infrastructure including landfill gas and water management, leachate treatment plant, corresponding electricity supply, access road,
- g) reserved areas intended for private investments in storage, separation and pre-treatment plants for selected special waste and end-of-life products, and
- h) disposal, i.e. landfill facility for non-hazardous waste.

Initial preparatory works, i.e. elaboration of the technical project documentation including all main treatment and disposal plants, and the feasibility study shall start immediately, taking into account realisation of investment in more phases. The 1<sup>st</sup> phase represents investments in buildings, equipment and infrastructure under points a), b), c), e), f) and h); the 1<sup>st</sup> phase of the investment in the landfill facility, which shall be realised and put in operation within the six-year period.

Elaboration of the documentation shall be focused on the known location that is suitable for the regional MSWM facility, and which seems to be acceptable by the public and where the site investigations have already been mainly performed and finally, where regional MSWM solutions are also in the interest of policy of the majority of the main municipalities in the planned MSW management region. It is quite important for the future development of the MSW management in Macedonia to make at least one of the MSW management projects, i.e. demonstration project, bankable and to bring it to stepwise realisation as soon as possible.

Additionally to the selected *demonstration regional MSWM centre*, at least one *additional new regional MSWM centre* shall be developed and the 1<sup>st</sup> phase (collection/transfer/landfill, facility for separation of commercial waste and storage/treatment of bulky waste, recycling yard) could be realised in the period of this NWMP providing a WM service to app. 500.000-600.000 habitants. Realisation of such investments means the construction of two regional landfill facilities with the total capacity of app. 160.000 t of MSW/year, and the purchase of app. 75 new collection vehicles of different sizes. Additional investment in app.25 waste collection vehicles and trailers, and application of the waste transfer stations shall depend on results of the previously executed feasibility studies for the individual waste management region. Construction of the facility for separation of commercial waste and storage/treatment of bulky waste and the recycling yard on the location of the MSWM centre may be tested in the demonstration centre; better locations for placement of recycling yards for different waste fractions brought by habitants are manufacturing and service zones inside or near settlements. Such recycling yards shall be constructed, equipped and in operation without any emissions to the environment or visual disturbances.

At the same time, closure of non-compliant landfills shall take place according to the adopted plan. App. 23 ha of the non-compliant MSW landfills and 11 ha of special high risk MSW landfills shall be closed and remediated in the period of the NWMP (2009 - 2015) with regard to the total of 86 ha of the existing non-compliant MSW landfills.

Additionally, the Skopje region shall establish the MSWM company and authorise it to execute the necessary tasks in order to upgrade the “Drisla” landfill to the level of the regional MSWM centre by carrying out the necessary technical remediation measures with regard to groundwater pollution, and by elaboration of regional waste management plans and programmes, as well as technical and investment documentation. In order to realise the integral WM concept for the Skopje region including the MBT and WtE, plant realisation of the main capital investments may be moved to the beginning of the next planning period, except investments in the landfill facility and in improved waste collection vehicles. The “Drisla” landfill, which may accept municipal solid waste of app. 630.000 habitants shall be upgraded by means of the contemporary construction of the new part of the landfill and by the remediation of the older part of the landfill facility, and it will take over the role of the central regional centre for non-hazardous waste management.

Generators of hazardous waste have shorter transition time to implement segregation of hazardous and non-hazardous waste at source and to establish data collection and reporting system. Consistent segregation of hazardous and non-hazardous waste fractions at source and the ban of disposal of the hazardous waste fractions on the municipal landfills shall direct the smaller hazardous waste generators to assure the disposal of their waste, mainly by intermediate storage on their assets or by

means of the licensed private facilities that shall offer the storage as a service activity; the stored waste may be later disposed of in the country or exported by the licensed service and trade sector.

App. 1200 t of hazardous waste from the health care institutions represents a relatively small amount of material with regard to the economy of scale but because of the existing waste management practice and risk to public health and environment priority activities shall be carried out in order to establish an adequate separate collection system in healthcare institutions, a system of transport logistics and replacement of the existing non-compliant hazardous waste incineration plant on the “Drisla” location with the contemporary incineration plant, compliant to all regulation on incineration of hazardous waste. New incineration plant shall also be planned to enable the technical up-grading in order to co-incinerate some selected hazardous waste generated in the country.

#### **4.4.2 Systematic implementation of technical measures T-2**

##### **4.4.2.1 Municipal waste**

Newly established MSWM companies in all waste management regions execute continuous investments in new or conditioned MSW landfills, take care for improvements of the operation of the temporary landfill facilities according to the conditioning plan, organise the gradual closure of non-compliant landfills and elaborate reports on activities.

In parallel, MSWM companies shall keep an elaboration of technical, spatial, investment and other documentation, and feasibility studies with regard to the planned regional MSWM centres and to the gradual introduction of the separate collection system, and make the projects bankable. Executed studies shall also show and justify additional options if the landfill facilities and facilities for special waste treatment and for the material/energy recovery of municipal waste fractions are placed on separate sites in order to enable more economic utilisation of waste as secondary resource.

The planned technology of the selected MSW treatment processes shall be chosen with regard to the utilisation of individual MSW constituents after mechanical pre-treatment and/or after biological treatment processes and with regard to the possible utilisation of treatment residues. Total areas of more than 300 ha of existing landfills and other environmental burdens which shall be closed and remediated, and additional needs for the yearly covering of the app. 10 ha of the new and/or conditioned municipal landfills, direct the development of the integral municipal solid waste management system towards the mechanical and biological treatment (MBT) because the stabilised process residues, still rich in biodegradable organics may be additionally treated and utilised as a soil-like covering material for app. 30 years. Additionally, depending on the MSW composition, MBT processes may also enable the utilisation of some separated waste fraction for recycling (app. 10% of the MSW input), utilisation of the separated light fraction in the thermal-energetic plant(s) (app. 40% of MSW input) and the reduction of the greenhouse gas emission by means of compost or/and biogas production, as well as the reduction of amounts of disposed biodegradable waste residues on landfills. The optimal combinations of investments for individual waste management regions shall be studied and assessed in more details in the regional waste management concepts and plans, in technical and spatial project documentation, and in feasibility studies from the economic viewpoint.

##### **4.4.2.2 Special waste streams and end-of-life products**

Investments in the collection, storage and process equipment for management of special waste streams and end-of-life products shall start by the activation of the licensed private sector immediately after the elaboration of management schemes and plans for the individual waste fractions and after the establishment of a favourable economic environment, in particular by the set-up of (voluntary) “compliant” schemes and earmarked taxation of selected products like used tyres, used oils and lubricants, packaging and packaging waste, waste electro-and electronic equipment, etc. which assure the payment of services executed through the entire collection/recovery and disposal chain.

Storage/sorting and pre-treatment plants for special waste streams may be located in the manufacturing/storage/service zones or placed in the planned MSW centres on the rented areas, which may be intended for such activities.

Used tyres may represent the pilot project for establishment of the complete management system of special waste stream or end-of-life product, comprising all phases from collection, storage and transport to the co-incineration process in the cement kiln. The cement factory shall also execute the necessary investments in technological changes for the charging of tyres into the cement kiln. The power of two cement kilns in Skopje is 2 x 60 MW; the factory plans the secondary fuel utilisation and in the 1<sup>st</sup> phase, the substitution of the primary fuel for 20% and later for 40%. However, utilisation of all yearly generated tyres in Macedonia for secondary fuel in one cement kiln could substitute only app. 10% of the necessary process power presently obtained by the primary fuel combustion; so there are free capacities left for utilisation of other secondary fuels.

#### **4.4.2.3 Hazardous and non-hazardous waste from industrial sources**

At present, the generation of the main quantities of hazardous waste has been stopped (Zletovo smelter); Makstil (steel factory) is in the process of adaptation to IPPC requirements; there are in the main some hotspots and contaminated soils left, which shall be remediated according to the separated projects.

Temporary solution, i.e. temporary storage of smaller amounts of generated hazardous waste, before the final disposal, offers to the state institutions and to the waste generators some additional time to draw-up the hazardous waste management scheme and to carry out the feasibility study, which may already involve improved and more reliable data on types and quantities of waste fractions. The feasibility study in primary shall clear-up the dilemma related to the economy of scale of the hazardous waste facilities, i.e. on the set-up of a common treatment and landfill facility of hazardous waste for Macedonia or continue with investments in storage facilities and to execute the final disposal of majority of the hazardous waste fraction by means of export to licensed facilities. Waste generators, in particular those with the IPPC obligations have to decide by themselves on the optimal solution (and on investments) for their hazardous waste from the technical and economical viewpoint but in the frame of the new waste management legislation, and start with the investment procedures.

Companies which generate main amounts of non-hazardous waste have prepared their own development plans to adapt the process technologies to the BAT requirements. Variety of documentation shall be necessary to prepare in the period of this NWMP (2009 - 2015) with intention to realise investments in technological changes in order to reduce the waste generation, to assure recovery and utilisation of the majority of the waste fractions on site or in dislocated technological processes, and a safe final disposal of residues waste including reconstruction of the landfills sited on their assets and remediation of the older parts of landfills, in particular in the next planning period. The characteristic link between two industrial branches may be represented by the utilisation of fly ash from the coal power plants and cement factory in Skopje with the utilisation capacity of mineral additives (fly ash, blast furnace slag) in an average of 0,14 t/t of the produced cement.

#### **4.4.2.4 Hazardous waste from health care institutions and some selected hazardous waste fraction from non-industrial sources**

App. 1200 t of hazardous waste from the health care institutions represents a relatively small amount of material with regard to the economy of scale of any kind of treatment facility. However, in the country some specific hazardous waste fractions are produced which may represent a real risk to the environment and public health, like old remedies, residues of pesticides and contaminated packaging across the country, selected old chemicals and residues of laboratory chemicals, and similar combustible hazardous materials. According to origin and chemical characteristics such chemical substances cannot be co-incinerated in any industrial or thermal-energetic plant; however, they could be co-incinerated in the adequately designed incineration plant together with hazardous waste from the health care institutions and may improve the economy of scale of the planned incineration plant.

Planning and designing of the incineration plant and accompanying facilities, such as storage facilities and some specialised pre-treatment plants, as systematic technical measure for final disposal of medical and some other selected combustible hazardous waste shall be based on the amounts and characteristics of additional types of hazardous and toxic materials; it shall take into account necessary technological modifications to achieve higher material/energetic throughput. Additionally to the technological modification of incineration plant, some organisational, technical, spatial, logistic and economic issues shall be discussed and the opportunities, benefits and shortages of such a complex waste treatment system shall be assessed.

#### **4.4.2.5 Agriculture waste and waste from feedstock production**

Elaboration of a feasibility study on options of management of carcasses and of the high risk animal by-products represents the main and priority task of the MoAFWE, which shall be followed by the investment activities in new collection/storage facilities and in the adequate thermal treatment and disposal facilities for dead animals and animal by-products of the 1<sup>st</sup> and for some of the 2<sup>nd</sup> category.

Other animal by-products, i.e. manure from pig, cattle and chicken farms, and animal by-products from slaughterhouses may be the source of renewable energy, i.e. biogas. Residues may be utilised as stabilised fertilisers or soil improvers. Amounts of highly loaded wastewater are substantially reduced because of the almost closed loops of water streams; however, efficient wastewater treatment plants are unavoidable. Entire benefits of biogas plants may be expressed by estimated values as follows:

- The entire energy potential of biological transformation of available animal by-products in the country to biogas can be estimated to app. 70 MW,
- Biogas production and utilisation may contribute to the yearly reduction of the greenhouse gas emission of the country by app. 200.000 – 250.000 t CO<sub>2</sub> eq.
- Biological transformation of animal by-products may produce app. 50.000 t of residues (expressed as dry matter), which can be utilised in agriculture and in greenhouse gardening.

The drivers of mainly private investments in the biogas plants are the subvention of price for electricity produced from renewable sources, utilisation of waste heat and quality, price and low cost of transport of the fertilising/soil improving substrates. Encouraging business environment for investment and cost recovery on the one hand, and real environmental problems regarding manures and other animal by-product on the other hand may stimulate the private sector to start with the organisation, project preparation and investment activities faster than expected.

Looking generally, the investment activities in the alternative utilisation of waste plant tissues (such as husks of rice and other cereals, wood cuttings from vineyards and orchards, non-contaminated plastics, etc.) are not of the highest priority regarding waste management; realisation of investments shall depend on results of the corresponding feasibility studies on waste management options and economy, and according to the business interest of the private sector.

#### **4.4.2.5 Construction and demolition waste (C&D waste)**

Interest for investments in the collection/recovery and recycling business depends on the secondary legislation, i.e. on adopted rules and standards on management of C&D waste including asbestos waste, on obligation of the construction, mainly private sector to follow such rules and on the success of enforcement activities. On the other hand, recycled material shall be competitive in price and in achieving construction standards; generally looking, the last mentioned reasons do not encourage investments in the recovery and recycling facilities for construction and demolition waste.

However, the quantities of C&D waste indicate the establishment of an adequate network of landfill facilities. Initially, such investment projects may be planned and realised in parallel with the establishment of the regional MSWM centres by investing in a simple separation facility placed on a separate area of the MSWM centre; products may be utilised in the landfill construction/operation, waste wood may be added to the MSW light fraction. Additionally, execution of remediation activities

of the Makstil's slag landfill may be utilised for construction of the recycling and landfill facility of the C&D waste with a total capacity of app. 500.000 m<sup>3</sup>.

#### 4.4.2.6 Waste from wastewater treatment plants

Planning and elaboration of the technical and other documentation for treatment and disposal facilities for sewage sludge as the main waste fraction from the municipal waste water treatment plants shall be carried out in parallel with the technical designing and realisation of investment in waste water treatment plants. Such activities represent for sure the most optimal way to get a harmonised long-term solution for the disposal of sewage sludge taking into account that only smaller amount of sewage sludge may be applied in agriculture.

However, at present the development stage of the waste management sector is in its very early beginning, construction of the municipal and other wastewater treatment plants are placed in an early stage of the planning and investment procedure as well. So, one may plan the start of the majority of investment procedures in the sewage sludge disposal facilities at the end of the period of NWMP (2009 - 2015).

#### 4.4.2.7 Remediation of "hot spots"

Identification of contaminated sites with detected impacts on the environment ("hot spots") has exhibited 16 locations; 9 of them are industrial environmental burdens, mainly landfills, 2 of them are coal mines and thermal power plants, 5 of the sites belong to past and/or present mining activities.

The remediation process of a "hot spot" generally runs in somewhat more consecutive phases:

- a) Selection of site according to the remediation priority,
- b) Site investigations and elaboration of the remediation concept from the environmental, technical and economical viewpoint (feasibility study):
  - process assessment and detailed investigation of the former activities, characteristics of location and contaminated material,
  - environmental and public health impact evaluation of existing contamination,
  - review of available remediation techniques and review of options for land utilisation after the end of remediation,
  - economic - financial evaluation of the remediation environmental burden;
- c) elaboration of technical, spatial and investment documentation, EIA study with regard to remediation process, and acquisition of necessary permits;
- d) Closing financial structure of the project and assuring funds for financing the planned remediation investment and operations,
- e) Tendering and contracting, execution of the civil engineering works, installation of process equipment, physical execution of remediation process and restoration of land for a new purpose of utilisation.

All costs for execution of tasks a) - d) shall be covered by the national Remediation Fund.

Site investigation and feasibility studies were executed for 4 environmental burdens caused by the former industrial and landfill activities: OHIS area contaminated with mercury and HCH, MHK Zletovo (Pb, Zn smelter and slag dumpsite), Makstil (Fe-slag dumpsite) and Silmak (sludge and slag dumpsite contaminated with Cr(VI). Initial investigations and elaboration of feasibility studies on remediation of other industrial contaminated sites may start in the second half of the period of the NWMP (2009 - 2015); preparation works for remediation of environmental burdens because of former (and present) mining are primarily in the competence of the Ministry of Economy.

Executed feasibility studies have paid special attention to possible utilisation and to the market value of land after the executed remediation; all new investment in remediated areas and operation may represent a real source of funding and recovering costs of remediation.

Two “hot spot” remediation projects may be put into operation in the period of the NWMP (2009 - 2015): remediation of the OHIS factory area and remediation of the former Makstil Fe-slag dumpsite. Remediation of the OHIS area shall consist of excavation, transport and landfill of app. 50.000 t of the Hg- and HCH- contaminated material to the landfill facility for hazardous waste or treated on-site; a central landfill facility for hazardous waste for Macedonia shall, according to assumption of the feasibility study, be established in parallel with the remediation process. After remediation, the land may become attractive for investment in Free Trade Zone of Skopje; the project shall start and be finished soon.

Remediation of the Fe-slag dumpsite shall be executed by excavation of app. 6.1 million tons of Fe-slag, by recovery of scrap Fe-fraction of slag and utilisation in steel production, and by utilisation of the majority of residual Fe-slag as a mineral additive in the cement production. The remediation process may run in 2 phases; almost parallel with the execution of the 1<sup>st</sup> phase, reconstruction of the remediated area enables the investment and operation of the new C&D waste recovery and landfill facility.

## 4.5 Resources and financing of the waste management E

Economic measures comprise the main financial assumptions with regard to the establishment of the waste management system, to the estimates of capacities and to projections of costs for the treatment and disposal facilities in which investment will be initiated and/or realised in the period of this NWMP, usable financial and economic instruments to provide the financing of investments in the WM infrastructure and to assure the cost recovery of executed WM services.

### 4.5.1 Financing the establishment of waste management system

Financing of the establishment of the waste management system and investments in the main technical / operational infrastructure in the period 2009 - 2015 are presented, consists of the financing

- different and interrelated tasks on the legislative field, on the field of the institutional strengthening and organisational set-up, and tasks related to communication to public and waste generators;
- financing of investments in the technical /operational WM infrastructure.

Financing of legislative tasks, institutional and organisational arrangement means generally covering personnel costs, i.e. mainly additional personnel costs because of the necessary new employments, trainings of staff and engagement of specialised companies for raising public awareness on waste issues and carrying out necessary campaigns. A short description of tasks is systematically in more details shown in the Waste Management Action Plan in **Table 15** in Chapter 5. The estimated personnel costs, technical assistance costs and investment costs are summarised in **Table 14**.

Investments in the technical /operational WM infrastructure facilities consist generally of two main phases:

- preparation phase (planning, preparation of project and investment documentation, provision of consents and permits, closing financial structure, assuring funds), and
- construction works and plant erection & start-up of operation.

Financing of tasks in the preparation phase generally means the covering of personnel costs and costs of technical assistance of expert companies, institutions and physical persons; such costs are usually between 3 to 10% of the nominal investment values of plants.

Construction works and plant erection represent the main part of investment costs spent for buildings, infrastructure facilities, mobile and mechanical process equipment, electro equipment and process leading/controlling equipment. Some additional employments are also needed, which mainly contribute to labour costs as constituents of the operating costs.

Investment values and operation costs of the WM infrastructure facilities for waste management depend on the amounts of collected waste or generated waste fractions, on capacities of the waste treatment plants, on the choice of the waste treatment technology and/or on the technical and technological changes in industry and service with regard to waste generation, and to recovery/reuse of waste fractions. The dynamics of financing the investments is determined by the investment procedures and by the successful passing of the following milestones:

- elaborated project and investment documentation, EIA and public acceptance,
- administrative consents and permits,
- provided sources of funds for execution of the investment.

Investments which shall be initiated and partly realised in the six year period 2009 - 2015 are related to the new or improved WM infrastructure to handle and dispose of the main waste streams, i.e. municipal solid waste, industrial hazardous and non-hazardous waste, medical hazardous waste and some other specific combustible hazardous waste, animal by-products and construction & demolition waste stream. In parallel to the establishment of the WM infrastructure network, investments in the closure/remediation of selected municipal dumps shall be realised and investment in (at least) one remediation project of the priority hot spots shall be initiated and realised.

However, the estimates of capacity requirements and realisation of planned investment in the six-year period (2009 - 2015) relate only to those management systems and facilities that the State and municipalities are responsible for providing or arranging according to EU standards and to the existing legislation. Such waste streams are particularly municipal solid waste and hazardous waste (industrial and other small generators, health care institutions, other public institutions and other dispersed or specific sources generating combustible hazardous waste); State and municipalities are also responsible for providing, arranging or organising of the closure/remediation of non-compliant landfills and remediation of the high risk industrial environmental burdens.

Investment in collection/treatment/disposal facilities for main amounts of hazardous and non-hazardous waste, animal by-products, construction and demolition waste as well as for special waste streams and end-of-life products will be mainly executed by the private sector, in particular by those companies which are adapting their technologies to the IPPC obligations. The State shall set the rules and execute strict enforcement activities on the one side, and on the other side a convenient economic environment for such investments and operations shall be generated. Unknown dynamics of involvement of the private sector in the investment activities is one of the reasons that only some investments in treatment facilities could be estimated. The other reason is that the majority of investments in the storage/treatment/disposal facilities to manage animal by-products, special waste streams and end-of life products shall be mainly realised in the next period of national planning; only the pilot project on management of used tyres and investment in some animal by-product collection and treatment facilities could be initiated and realised in this six year period.

#### **4.5.2 Capacity estimates, estimation of investments in infrastructure WM facilities and estimation of operating costs E1**

##### **4.5.2.1 Municipal solid waste treatment /disposal facilities**

The MSWM system shall be established on the regional basis; individual WM regions shall comprise more than 200.000 habitants because of impact of the economy of scale, which clearly favours investments in the high capacity WM facilities.

According to the planned dynamics of the establishment of the technical infrastructure for the municipal waste management, i.e. the 1<sup>st</sup> phase of the two regional MSWM centres shall be realised in order to collect and dispose of app. 2 x 80.000 t MSW/year generated by app. 2x280.000 habitants/region. Additionally, landfill "Drizla" providing landfill of app. 180.000 t of the MSW generated by app. 630.000 habitants shall be upgraded according to EU standards.

The 1<sup>st</sup> phase of investment in the regional MSWM centre comprises mainly investments in new or extended landfill fields (6-year period) which are constructed according to EU standards, investments in the landfill infrastructure related to waste reception and internal transport, to water and landfill gas management, and investments in mobile equipment intended for carrying out the landfill operations. Unavoidable parts of the regional MSWM centre are weighbridge, reception office, small administration building with sanitation facility and basic laboratory, truck wash facility, recycling yard for individual waste fractions and a building for manual (and later mechanical) separation of usable fraction from commercial and bulky waste.

The 1<sup>st</sup> phase of investments also comprises the gradual closure/remediation of the 34 ha of the existing MSW dumps.

Typical investment costs in the landfill facility and in the closure/remediation of waste dumps, which depend of the landfill area characteristics, are presented in **Table 11**. Other investment costs in the basic buildings and in the process, measuring and control equipment are estimated at 1.700.000 EURO.

**Table 11: Typical investment costs of new landfill and closure of landfill dump**

Investment in the construction works and erection of new landfill facility	Typical investment values for MSW landfill facility	Investments in the closure of non-compliant landfill facility	Closure (remediation) of existing non-compliant MSW dumps
	€/ha		€/ha
Construction works and preparation of the new landfill area for operation	750.000	Provision of necessary materials and construction works for closure of the landfill area	250.000
Investment in landfill infrastructure, including water management	83.000	Investment in rainwater management	40.000
Leachate and other wastewater treatment plant	125.000	Investment in collection system and in wastewater treatment plant	30.000
Installation of active landfill gas collection and pre-treatment	21.000	Installation of (presumably) passive landfill gas collection and discharging	10.000
Total	979.000		330.000

Estimated investment and operating cost of 2 regional MSWM centres with regional landfill each having app. 80.000 t yearly capacity, estimated investment and operation cost of the up-graded “Drisla” regional centre, and investment cost in closure/remediation of 23 ha of existing waste dumps and remediation of 4 special landfill cases (11 ha) are summarised in **Table 12**.

**Table 12: Investment and operating cost estimates for 3 planned regional MSWM centres**

MSW treatment/landfill facility	Capacity of facility	Investment cost (6 years period)	Operating cost		
			million €/year	€/t	€/hab.year
Demonstration MSWM centre No.1	80.000	9,0	1,5	16,9	5,4
Regional MSWM centre No.2	80.000	9,0	1,5	16,9	5,4

Regional MSWM centre Drisla No.3	180.000	19,3	2,98	16,6	4,7
<b>Total - treatment/landfill facilities</b>		<b>37,3</b>			
<b>Conditioning/ closure/ remediation of dumps*</b>					
Closure/remediation of MSW dumps	23 ha	7,96	2,28	14,6	4,1
Closure/remediation of MSW dumps (4 special cases = Ohrid, Kičevo, Gevgelija, Kriva Palanka)	11 ha	5,72			
<b>Total - conditioning/ closure/ remediation</b>		<b>13,7</b>			
<b>Total investment in MSWM facilities 6- year period</b>		<b>51</b>			

\*Investments in conditioning and closure/remediation of all 86 ha of existing MSW dumps are estimated at 30 million €.

The operating costs calculation is largely based on EU and some local experience. Calculations assume return of investment in 20 years for buildings and infrastructure and in 8 years for the mobile, process, measuring and control equipment and 7 % interest rate has been used to estimate financing costs. Operating cost of the 1<sup>st</sup> phase of the MSWM centre consist of the capital cost (60%), of the labour, insurance and maintenance costs (22%) and of the proportional (fuel, electricity) and other costs, such as aftercare, monitoring (18%).

Investments, which shall be realised in the 2<sup>nd</sup> or even in the 3<sup>rd</sup> phase of establishment of the municipal waste management system, are much higher (separate collection of selected MSW fractions at source, MBT, WtE plant, biogas production and composting plants,..). However, technical, environmental and investment documentation shall be elaborated according to the regional MSWM scheme for all phases of the waste management project, investment cost shall be estimated for the entire technological complex and all accessible administrative and environmental consents/permits shall be provided; such a way of leading the project enables the continuity of investments and provision of financial resources.

#### 4.5.2.2 Cost of the MSW collection and transport

It is difficult to generalise about the MSW collection and transport costs because there are many variables that affect them. These include:

- distance and round-trip distances to the MSWM centre with landfill;
- annual tonnage of the MSW produced (habits of population, living standard);
- density of population, proportion of housing in rural areas and accessibility of waste collection vehicles to individual settlements.

MSW collection costs by using RCVs are estimated in range of 6 – 14 €/t. However, prices of diesel fuel have recently become an important factor that may exhibit significant influence on the transport costs; costs of the fuel contribute app. 50% to the costs of the MSW collection. Collection and transport costs also depend on the capacity of the refuse collection vehicles (RCVs), on application of long-distance transport and waste transfer station; the last transport option becomes favourable if the amounts of the transported waste exceed 20.000 t /year; higher prices of diesel may make this option more favourable.

Estimated investments in the MSW collection / transport equipment for the six year period and corresponding operating costs are presented in **Table 13**.

**Table 13: Investment and operating costs estimates for the collection and transport equipment**

	Capacity(t/y)	Investment cost (6 years period)	Operating cost (6-year period)
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Transport equipment	€	million €	million €
Required capacity MSWM centres No.1 +2	160.000	13	63
Regional MSWM centre "Drisla" No.3 *	180.000	7,2	
<b>Total investments in collection / transport equipment in the 6-year period</b>		<b>20,2</b>	

\*Only exchange of existing waste collection vehicles

#### 4.5.2.3 Cost of collection/treatment of separate collected bio-waste fraction and recyclable material

##### *Biodegradable waste*

Considering the management of the biodegradable fraction in MSW waste, some important factors need to be taken into account concerning the low waste generation rate as well as participation rate of households (65% participation estimated), intensive costs of separate collection and aerobic or anaerobic treatment as well as the final quality of the compost and market limitations.

Relatively high costs of processing are projected to be app. 43 €/tonne and may contribute to the costs of the overall MSW management by more than 12,5 %. Additionally, the compost of low quality may not find a reliable market in agriculture. Consequently, undertaking a composting operation within the period of the NWMP (2009 - 2015) years is not recommended, even by using simple technology (open composting in piles). Macedonia may, in attempts to meet the EU targets for reducing biodegradable waste to landfill avoid the separate collection and treatment of biodegradable fraction in MSW and apply some other efficient MSW treatment technologies (like MBT). Residues from such mechanical and biological technological processes may be prepared as soil-like material and utilised in the landfill covering and remediation projects. Such technologies also require high investment and operating costs and shall be realised in the next period of establishment of the MSWM infrastructure.

##### *Recovery of waste fractions and recycling*

Regular separate collection of the individual MSW fractions at their source in settlements as a public service and recycling activities would commence in 2012 and gradually build up from 1% in the first year to about 8% after 4 years. Separate collection of recyclables in settlements will cause an additional cost associated with it. The additional cost of recycling has been assessed to about 4.4% of the cost of collecting the residual mixed waste. Therefore, the separate collection of recyclables under the given financing patterns within the municipalities is not yet recommended, except some pilot scale recycling for selected material for which a market already exists is proposed.

However, on the other hand, separate collection of selected fractions of commercial waste shall be encouraged because relatively big amounts of clean recyclable material may be collected; recovery and partly recycling may be carried out by Macedonian companies or recovered waste fractions may be exported to foreign recycling facilities. Such recyclable waste fractions are in particular waste wood, secondary and tertiary packing, used tyres, used oils and lubricants, metal waste, waste electro and electronic equipment; the private sector shall be encourage to be involved in separate collection of some special wastes streams and end-of life products, and in recovery, pre-treatment and trade of usable waste fractions. Planned regional MSWM centres shall rent some areas for investment by the private sector in waste recovery and recycling facilities.

The pilot system for collection, transport and energy recovery shall be established for used tyres in connection with trade companies, which sell new tyres for cars, trucks and heavy-duty machines. The system does not need high investments, only storage facilities (tyres changing and car services, recycling yards) and transport equipment, and is operated by the private sector. The only more demanding investment may be the delivering and charging equipment of the cement kiln. From the organisational viewpoint, the entire system may be operated as a public service by a concessionaire who pays the collection network and transporters, and co-incineration in the cement kiln and recovers

his cost from earmarked taxes included in the selling price of new tyres. Operating costs of the entire system are estimated at app. 0,15 €/kg of tyres.

#### 4.5.2.4 Industrial hazardous waste management system

Organisation of the hazardous waste management system is the competence of the national authorities; however, the active generators of bigger amounts of hazardous waste have to adapt their manufacturing processes as well as waste management to the requirements of the IPPC directive. Hazardous waste management is entirely in the hands of the private sector, which shall solve their hazardous waste issues by means of investment in changing technological processes, in internal facilities for material /energy recovery and recycling of hazardous waste fractions, and disposal facilities that are placed mainly on their assets.

Smaller hazardous waste generators (app. 70 active enterprises) shall as priority invest in the temporary storage facilities for hazardous waste on their assets or make the corresponding arrangement with licensed private companies that execute storage service. According to the known amounts of generated hazardous waste in a year, it should be necessary to invest in the hazardous waste storage capacities for 2- 3 years with total area of 4500 m<sup>2</sup>; the entire investment value in storage buildings, infrastructure and adequate packaging would amount to app. 1,8 million €.

Such a transition period of the 2-3 years offers waste generators the opportunity to find an optimal solution for each stored and generated fraction of hazardous waste. MoEPP shall prohibit the disposal of industrial hazardous waste on existing MSW dumps and, according to the new data in yearly reports on waste quantities encourage the execution of the follow up project, i.e. the new feasibility study on the optimal solution for the main groups of hazardous waste. The feasibility study shall give the answers about favouring the common treatment and landfill facility for a variety of generated hazardous wastes or individual solutions, and answer about the feasibility of a common incineration plant. Both facilities shall operate as public services.

At present, estimation of the investment and operating costs of the treatment and landfill facility for hazardous waste on the basis of existing available data are very uncertain. There is no big difference between the necessary 3 years storage capacities and the capacity of the first cell of landfill, which needs an investment of app. 2 million € (see annexed special study “Strategies other than municipal waste; i.e. industrial hazardous waste issues); however, there shall be also installed a variety of equipment for pre-treatment operations for which the investment and operation costs cannot be evaluated at present with adequate certainty; according to data on EU facilities, operation costs are between 200 -300 € /t of hazardous waste.

Not all hazardous waste is allowed to be disposed of on landfill even after pre-treatment, in particular those having high calorific value; such waste shall be incinerated in incineration plants or co-incinerated in an industrial or thermal energetic facility as secondary fuels. Investment in the incineration plant with a capacity of 2.500-5000 t of combustible hazardous waste per year is estimated at 10-15 million €; the operating costs of the hazardous waste incineration plant are, according to the typical prices in EU countries, app. 350 -500 €/t depending on the characteristics of waste and on the landfill prices for residues. There is not enough reliable input data on combustible hazardous waste, which must be incinerated in the incineration plant or could be co-incinerated in another co-incineration facility in the country. A special feasibility study shall be carried out on the base of new data in yearly reports to assess all parameters necessary for decision taking and for elaboration of adequate technical, environmental and investment documentation, and to provide the necessary funds; cost of the execution of the 1<sup>st</sup> phase of investment may be estimated at 1,5 million €.

The costs for the final disposal of PCB/PCT containing oils are of similar magnitude; the estimated incineration costs of 120 t of the PCB/PCT contaminated transformer oils shall amount to app. 84.000 €. Cleaning of the PCB/PCT contaminated equipment and vessels, carrying out the export according to the rules of the Basel Convention and transport being executed according to the ADR rules for the

road and to the RID rules for railway transport give rise to additional costs to the cost of final disposal; such costs may be determined from case to case.

#### **4.5.2.5 Management of hazardous waste from health care institutions and some selected hazardous waste fractions**

Investment costs in the technical infrastructure for management of 1200 t hazardous medical waste are estimated at about 0,5 -0,7 million € for elaboration of the project and the investment documentation, approximately 1,6 million € in healthcare institutions (storage, containers, internal mobile equipment), about 2,3 million € for 3 dislocated treatment facilities (buildings and stationary autoclaves), and approximately 216.000 € for the collection trucks and accompanying equipment. According to the executed draft feasibility study and HCRW management plan in the year 2007 (CARDS – Healthcare Risk Waste Management Project, EuropeAid/123728/D/SER/MK), the total annual cost (depreciation and recurrent costs) are app. 1,61 million €, specific operating costs are app. 1340 €/t or, only thermal treatment process in autoclaves gives rise to the operating costs (depreciation and recurrent costs) of 730 €/t. Such relatively high investment costs of the process equipment and high operating cost if compared to the typical prices for hazardous waste incineration indicate some possible deficiencies in the conclusions of the executed feasibility study; disinfection of hazardous medical waste by steam does not mean final solution for disposal of this group of waste.

However, there is generating in the country a variety of combustible hazardous waste or waste which must be incinerated in contemporary incineration plant, i.e. in public sector and in the private manufacturing and agriculture sector, like old remedies, pesticide residues and contaminated packaging, different solvents, etc. Such situation indicates that common incineration plant with very comparable investment (2 – 2,5 million €) and operation cost (more convenient economy of scale) is more optimal solution providing final disposal for more problematic materials in Macedonia.

#### **4.5.2.6 Management of animal by-products**

Costs for the preparation of technical and investment documentation, and realisation of investments in the central treatment facility of animal carcasses and animal by-products of the 1<sup>st</sup> and 2<sup>nd</sup> category including collection facilities and mobile equipment are estimated at app. 35 million € in case of the investments in the central autoclaving facility and in the distributed collection and transport facilities which are constructed and in operation according to the required hygienic standards. The costs of the autoclaving and of the final disposal of the dried high calorific residues by means of the co-incineration in a thermal energetic facility are relatively high, i.e. between 100 -140 €/t.

Animal by-products of the 3<sup>rd</sup> category (partly of the 2<sup>nd</sup>) generated on animal breeding farms and in slaughterhouses represent a high potential for the production/utilisation of biogas and of soil-like materials with the characteristics of fertilisers or soil improvers. Estimated quantities of animal by-products would enable investment in 5-8 biogas production facilities at the total investment value of app.100 million €. Investment in such animal by-product treatment facilities shall be of the private character and in the period of NWMP (2009 - 2015), an app. 15-25 million € investment in biogas plants may be planned, realised and put into operation. The side effects of such projects are also substantial improvement of wastewater management on farms and other feedstock manufacturing facilities.

#### **4.5.2.7 Industrial hot spots remediation projects**

Based on the methods of closure / remediation methodology (special study on industrial contaminated sites – "hotspots") the costs of recommended measures have been estimated by applying the unit costs for different remediation options, linked to physical properties of sites, resulting in total costs per site as well as total costs involved. Based on the calculations the following cost estimates have been made:

- Total remediation costs are estimated at about 77 million € (ranging from 2,7 € to 12,7 million € for individual sites);
- Total costs of exploratory soil and groundwater survey, delineation investigation and remediation plan up to 0,9 million €;
- Total cost of aftercare and monitoring about 0,15 million € per year.

Feasibility studies on remediation of 4 typical contaminated sites (OHIS, Makstil, Silmak and Zletovo-smelter) direct the remediation processes to the linked activities:

- use of part of the contaminated material and/or treatment and disposal of residues on the one hand, and
- granting a new market value to the areas which have cleaned up-to the technically and environmental acceptable levels on the other.

In the six-year period of the NWMP (2009 - 2015), two investment processes may be started: remediation of the OHIS contaminated site and remediation of the abandoned Makstil landfill.

The first project is based on the removal and disposal of the HCH and Hg contaminated material on the new hazardous waste landfill facility, and on the establishment of the Free Trade Zone. Economic exploitation of areas after the executed remediation process may cover the remediation costs which are estimated at about 2,5 - 5 million € and may allow the return of investment in about 4,5 - 8 years.

Remediation costs of the abandoned Makstil landfill which are estimated at about 160 million € shall be covered mainly by incomes from the re-treatment of residual scrap iron and from selling slag (app. 20 million €) as an additive of the cement. So, the cost of the remediation project may be recovered in app. 8 years. The estimated investment costs are app. 0,1 million € for the remediation process and app. 0,9 million € for investment in the 1st phase of the new regional landfill of construction and demolition waste; app. 0,2 million € shall be taken into account for preparation of technical, environmental and investment documentation. Incomes of the disposal fees for the C and D waste landfill of app. 500.000 t of construction and demolition waste may be estimated at about 2 million €.

#### **4.5.3 Key conclusion about costs of the establishment of an integral waste management system in the 6-year period**

The capacity requirements for MSW management systems comprise of the construction of regional landfills for non-hazardous waste and provision of logistics for long distance transport. The projections of MSW generation are based on the 1,7% growth scenario according to prognosis of the MSW growth given by the OECD (Environmental Outlook, (ISBN 2-64- 18615-8), OECD Report, Paris, 2001).

The investments to provide 55-60% of the required landfill capacity will be in the range of 51 million €; for the six-year period, investments involve 2 new regional landfills and the upgrading of the Drisla landfill, as well as the conditioning and closure/remediation of app. 34 ha of existing dump facilities. Operating costs of new and upgraded landfills are estimated at about 16 -17 €/t; almost identical costs (14,5 € /t deposited MSW) shall be spent for closure/remediation and conditioning of dumps for the transition period. Costs of the MSW collection and transport are estimated at about 6-14 €/t; investments in new transport equipment (collection vehicle) contribute an additional 20,5 million €. The total costs for the newly established MSW management services and improved services on other 40% of territory could be estimated at about 11,5 € /habitant /year.

The additional cost of recycling has been assessed at about 4.4% of the cost of collecting the residual waste. Therefore, the separate collection of recyclables under the given financing patterns within the municipalities is not recommended yet. Projects related to the collection and recovery/recycling system for other special waste streams and end-of-life products shall be initiated by preparation of the necessary preliminary studies, technical, environmental and investment documentation. A pilot project for the collection/transport/energy recovery of used tyres shall be initiated and realised in the six-year period; the final user of collected tyres is known and additionally the landfill legislation will not allow

landfill of used tyres. The functioning of such a used tyres management system requires minimal investments, operating costs of the entire system are estimated at about 0,15 €/t.

Composting of biodegradable waste was considered, but given the additional costs for separate collection and treatment of up to 12,5% over the costs of handling of mixed waste, the undertaking a composting operation within the period of the NWMP (2009 - 2015) is not recommended. However, there are recommended preparation of technical and environmental projects and investment documentation for the introduction of other MSW treatment technologies (like MBT), which may more efficiently contribute to Macedonia's attempts of meeting EU targets on the reduction of disposed biodegradable waste.

Substantial capital investment in the treatment/disposal infrastructure for industrial, medical and other hazardous waste shall in the transition period pass some additional consideration and execution of feasibility studies with regard to new data on generated waste and with regard to the optimal capacities of treatment and disposal facilities. In the six year period, app 2 million € shall be invested in the industrial hazardous storage facilities. Results of the meanwhile executed studies shall direct the investments into the central pre-treatment /landfill facility and incineration plant for industrial hazardous waste to a value of about 15-17 million €, or indicate the export of the smaller and dispersed hazardous waste as an optimal solution.

Final disposal of hazardous medical waste shall be carried out by means of the new contemporary central incineration plant located at "Drisla" landfill; installed incineration equipment may be expanded for co-incineration of some selected hazardous and toxic waste. Investment cost is between 2,5 – 5 million € depending on the necessary peripheral storage buildings and pre-treatment equipment.

Final disposal PCB/PCT of contaminated transformer oils by incineration will cost app. 84.000 €; other costs (transport, permits, cleaning,) shall be determined from case to case

Investments in the central treatment facility and in the collection system for animal carcasses and high-risk animal by-products, which shall be realised in the period of the NWMP (2009 - 2015), are estimated at least 35-40 million € regardless of the chosen technological process; operating costs are estimated at about 100 -140 €/t of dry by-product.

Private investments in the biogas production plants, which may be realised in the period of the NWMP (2009 - 2015), are estimated at around 15-25 million €.

Remediation of industrial "hot spots" should be further elaborated through follow up projects. The remediation costs for the six year period to clean-up two contaminated sites (OHIS, Makstil) amount to 11 million € and additionally 6 million € for investment in the communal infrastructure of remediated area and app. 1 million € for investment in the 1<sup>st</sup> phase of the C and D landfill facility.

The achieving of compliance with all EU Directives is not the primary aim of the NWMP, but the gradual improvements towards setting the basic MSWM and HZWM infrastructure and towards adequate and economically optimal management solutions. The landfill, HZW, packaging and some special waste directives will be targeted, but the compliance dates may not be set at this stage. A lot of other approximation projects and monitoring that are present in this NWMP shall start by extensive preparation works, but the majority of capital investments necessary for implementation of the plan shall be realised in the next period. A summary of required resources –human and financial, in order to realise the set implementation tasks and to approach to the set targets is presented in **Table 14**. Division of the estimated costs to the overall strengthening of human resources, to the investments in the public WM infrastructure facilities and to the private investments in waste treatment and disposal facilities (without investment with regard to adaptation to the waste related IPPC requirements) which may be realised to a larger extent in the period of NWMP (2009 - 2015) exhibit the following picture of the 6 year expenditures:

- |  |                |
|--|----------------|
| - strengthening of human capacities + technical assistance | 6 million €    |
| - investments in public WM infrastructure:                 | 82,3 million € |

- private investment in WM infrastructure (without IPPC liability) 101 million €

**Table 14: Institutional and financial resources required for implementation of NWMP (2008 -2014)**

Sector		Main activities and tasks	Responsibility	Personnel	Expenditure category	Costs (million €)
						2008 - 2014
<b>Policy and legislation</b>	<i>P-1</i>	<i>Transposition of the EU directives, completion of WM and related legislation</i>	MoEPP, MoF, MoT MoAFWE, MoIA, municipalities	2	P	0,12
	<i>P-2</i>	<i>Secondary legislation and permitting /enforcement instruments</i>	MoEPP	2+10	P	0,72
	<i>P-3</i>	<i>Local level regulations</i>	MoEPP, municipalities	1	P	0,06
<b>Institutional /organisational arrangements</b>	<i>I-1</i>	<i>Division of responsibilities, tasks and competency</i>	Government Parliament, MoEPP, and other ministries	1+1	P	0,12
	<i>I-2</i>	<i>Linked institutional set-up</i>	MoEPP and other Ministries, waste generators;	2	P	0,22
	<i>I-3</i>	<i>Reforms of the MSW management system</i>	MoEPP, MoLSG;	2	P+TA	0,36
	<i>I-4</i>	<i>Organisational set-up of financial/ economic measures</i>	MeEPP, MoF; municipalities;	3	P+TA	0,30
<b>Human resources /capacity building</b>	<i>H-1</i>	<i>Capacity building of MoEPP</i>	MeEPP	14+5+2	P	1,3
	<i>H-2</i>	<i>Capacity building -other national stakeholders</i>	Ministries, branch associations	6	P	0,36
	<i>H-3</i>	<i>Capacity building of municipalities /+regions/</i>	Municipalities, MoEPP	50	P	2,4
	<i>H-4</i>	<i>Capacity building of MW operators</i>	Municipalities, private/public WM "business units"	not determined.	-	-
	<i>H-5</i>	<i>Capacity building of waste generators</i>	MoEPP, waste generators	20	**	1,02
<b>Set-up of technical and operation infrastructure</b>	<i>T-1</i>	<i>Temporary technical measures</i>	MoEPP, MoLSG, municip.			
	<i>T1+E1</i>	<i>Initiation of regional MSWM projects</i>			TA+C	5+9
	<i>T1+E1</i>	<i>Hazardous waste projects</i>			TA+C	2,5
	<i>T-2</i>	<i>Systematic technical measures</i>	MoEPP, MoLSG, municipal.			
	<i>T2+E1</i>	<i>Regional MSW collection/treatment/disposal facilities</i>		36	TA+C	1,6+28+20,5
	<i>T2+E1</i>	<i>Closure/remediation MSW dumps</i>			TA+C	14
	<i>T2+E1</i>	<i>Development of HWM systems and investments</i>	MoEPP, waste generators		TA+C **	1+17
	<i>T2+E1</i>	<i>Medical and selected HWM systems and investments</i>	MoEPP, MoH, other waste holders/generators		TA+C	1+5
	<i>T2+E1</i>	<i>AbP management systems and investments</i>	MoAFWE, MoEPP, producers		TA+C **	40+25
	<i>T2+E1</i>	<i>Closure/remediation of "hot spots"</i>	MoEPP, municipalities		TA+C **	17
<b>Improvement of economic/ financial situation</b>	<i>E-2</i>	<i>Cost recovery and financing</i>	MoEPP, MoF, municipalities	50	-	-
	<i>E-3</i>	<i>Financial / economic instruments</i>	MoEPP, MoF	2	-	-
<b>Stakeholder/public awareness raising</b>	<i>A-1</i>	<i>General public awareness on WM issues</i>	MoEPP	1	TA	0,2
	<i>A-2</i>	<i>Communication to the production sector</i>	MoEPP, MoE	1	TA	0,1
	<i>A-3</i>	<i>Public awareness and participation in projects</i>	MoEPP, Municipalities	1	TA	0,4

\* Expenditure categories: P-personnel related exp.; TA- technical assistance (expert aids and elaboration of documentation); C-capital investments; \*\* Estimated private investments



#### 4.5.4 *Cost recovery and financing* E 2

##### 4.5.4.1 *Cost recovery*

It will be necessary in the future to move the payment system progressively towards full cost recovery for the use of public waste management services and facilities so as to ensure their long-term financial viability and sustainability, and to provide an increasing incentive for waste producers to reduce and recover wastes. An Economic / Financial Measures policy will be phased in over appropriate transitional periods and takes into account the ability of waste producers to respond to higher costs for managing their wastes. Specific recommendations are made to suggest, with priority, the introduction of the following instruments:

- improvement of the cost recovery for executed services by reorganisation of the payment and control system;
- establishment of the uniform charging system for the executed MSW services (landfill and collection/transport fees) on the base of the unified methodology for setting fees and tariffs standardisation of the accounting system;

##### 4.5.4.2 *Financing investments*

The main possible sources of financing investments for the implementation of the EU waste legislation, for the execution of the variety of organisational and public relations tasks, and for elaboration of the necessary technical, spatial and investment documentation and environmental studies and capital investments, are:

- waste producers (measures they take themselves);
- public sources consisting of:
  - o charges paid by waste producers to waste management service providers;
  - o fees for licences and other services,
  - o State or municipal budgets, and
  - o investment funds (established on the regional/inter-municipality level)
- private capital (through direct private investments, through the Public Private Partnership arrangements, CO<sub>2</sub> credit lines), and
- international funds and financial institutions providing grants (IPA fund, ERDF, international donors) and loans (different IFI, bilateral financing institutions, commercial bank, bonds issued by the central or local government authorities)

By means of the earmarked addition to the selling price of waste-generating products levied by the producer or importer, the producers or importers may fund a system organised by themselves to collect, recover and dispose of waste (end-of-life products) according the "producer's and or importer's responsibility principle".

There is also another option available: earmarked taxes levied by the state or other public authority on waste-generating products (end-of-life products) are collecting in the environmental fund (in principle in the State budget); these taxes are used for organisation and execution of collection, recovery and disposal of waste residues in the organisation form of the joint public services. Such a system also represents one of the economical/financial instruments.

Some of these main, various sources are considered below.

##### Waste producers (measures they take themselves)

For example producers of some high volume hazardous wastes will be required either to take measures to reduce the volume of hazardous waste being produced or to store or dispose of that waste in a manner which meets EU standards. This will be done at their own expense.

Charges paid by waste producers to waste management service providers

These will mainly be charges for waste collection and disposal. Waste producers are already paying such charges to local authorities and to transport contractors who transport their waste, but these charges are likely to rise to reflect the costs of complying with EU legislation.

Fees for licences and other services

The costs of a competent authority for issuing and maintaining a waste management licence or for carrying out an inspection could be met by levying a fee for that activity.

State or municipal budgets

This may be either part of the regular budget or a special allocation earmarked to deal with a one-off or special situation. Earmarked taxes as well as surcharges on improper waste management practises may also become a significant resource of regional funds established on inter-municipality level and intended for regional investments in the MSWM infrastructure facilities.

Establishment of the investment funds from earmarked sources on the State and regional level is very important for a country developing a new waste management system almost from the very beginning. There are a lot of tasks on the national and local level with regard to elaboration of the variety of documentation which need their own financial sources; the majority of international investment institutions also require a determined part of the co-investment.

Instrument for Pre-Accession Assistance (IPA)

IPA is now the European Union's principal mechanism for providing financial assistance for compliance-related investments in candidate and accession countries. Its key features and conditions are:

- IPA support is available for investment projects in the transport and environment sectors, and is provided in the form of (non-repayable) grant contributions.
- IPA support is only available to public sector investors.
- The total cost of the investment project should be Euro 5 million or greater.

In principle, IPA could finance up to 75% of the total investment cost of a suitable project. In practice, however, IPA is unlikely to cover much more than 50% of the total investment cost. The balance of the project financing will need to come from other sources (for example a loan from an investment bank).

The IPA is made up of 5 'components', i.e.:

- Component I - Transition assistance and institution building
- Component II - Cross-border cooperation
- Component III - Regional development, particularly roads and municipal infrastructure including waste disposal facilities
- Component IV - Human resources development
- Component V - Rural Development

Components I, III and IV are the most relevant for the environmental acquis generally and waste management in particular. The indicative amounts available for Macedonia up to 2010 are as follows: 58,5 million € (2007), 70,2 million € (2008), 81,8 million € (2009) and 92,3 million € (2010). It is evident that Macedonia shall prepare the necessary documentation and applications in time, in order to compete for financing investments according to Component III in the period 2010 - 2013.

The IPA is a new EU instrument, and some funding hiatus may appear in the interim period between the winding up of the CARDS programme and the start-up of IPA. However, this should not result in the ultimate loss of funding, since amounts unallocated due to late start-up will be carried forward.

#### Grants from other international donors

A variety of bilateral development cooperation organisations provide grants to middle income countries preparing for accession to the EU such as Macedonia. These include US-AID, GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit), Danida (Danish International Development Aid), SIDA (Swedish International Development Aid), DfID (Department for International Development of UK), SDC (Swiss Agency for Development and Cooperation), ADA (Austrian Development Agency), JICA (Japan International Cooperation Agency). Such funding is of course likely to dry up after Macedonia accedes to the EU.

#### Loans from international funding institutions

The international funding institutions (IFIs) are development banks such as the World Bank, the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB), which offer loans at a relatively low rate of interest for investments (amongst others) intended to establish or improve environmental facilities or infrastructure. In general, applications for financing to an IFI will need to have the official approval and a supporting guarantee from the government of Macedonia.

An exception to this general rule is the EBRD, which may require a sovereign guarantee. However, the interest rates charged by the EBRD tend to be higher than those typically offered by other international (or bilateral) financing institutions (for example LIBOR + 2 to 4%, say 6 to 8% at the time of writing). The World Bank will only lend to a government body but the EBRD and the EIB will also lend to private companies. Most of the international financing institutions will only lend to companies or to corporate entities having clearly defined objectives, management and decision-making structure, which are operated along commercial lines. Also, some institutions have a minimum size of loan. For example, the EBRD will only directly finance loans of 5 million US or greater. These constraints tend to limit the scope for IFI participation in financing capital investments to projects of a fairly substantial size. In addition, significant resources and time are usually needed to develop and negotiate an IFI loan.

The World Bank recently finalised its Country Partnership Strategy 2007-2010 for the Republic of Macedonia. The total funding for 2007-2010 shall be 230 million US \$. Of this, perhaps 10% will go to municipal development. The World Bank at present is not enthusiastic about investing in wastewater treatment in Macedonia (doubts about sustainability due to high operating costs), but thinks the time is ripe for the development of modern waste management facilities.

#### Loans from bilateral financing institutions

A number of EU countries, the USA, Japan and Canada provide financial assistance to central and eastern European countries through bilateral financing institutions. These differ in their areas of interest and *modus operandi* but, in general, operate along similar lines and with similar constraints to the IFIs.

The largest bilateral financing institution operating in Europe is the German Bank for Reconstruction (Kreditanstalt für Wiederaufbau – KfW). This is currently lending at very soft rates (around 2%) to accession countries for environmental projects.

#### Loans from commercial banks

Local authorities may be able to obtain loans from commercial banks, but the terms are likely to be much less favourable than from international and bilateral funding institutions. The banking sector in

the Republic of Macedonia is presently hampered by a relatively uncompetitive banking climate; low banking efficiency and difficulties in assessing the credit risks of potential borrowers.

#### Bonds issued by local government authorities

Most local authorities, with the possible exception of the City of Skopje, are probably not yet at a stage where they can envisage issuing bonds as a means of raising finance. This is because of their small size, lack of an independent audit of their accounts, low quality of financial data, the need for obtaining a credit rating from organisations such as Standard and Poor, Moody's, etc.

#### Private capital

The private sector could play a role in financing the development of the waste management infrastructure in the country. There are many different arrangements by which the private sector could participate, for example private contractors could operate a sanitary landfill as a concession or the landfill might be the subject of a BOT (Build - Operate - Transfer) contract. Such constructions will require a number of developments before they can be envisaged in the Republic of Macedonia, including reform of accounting in municipalities and communal enterprises, clear evidence that the state is willing to enforce the new laws and that municipalities are willing to allow the real waste management costs to be charged to waste producers and the emergence of credible operators of the new facilities.

#### **4.5.5 Financial / economic instruments E2**

The intention of the economic and financial instruments is to improve the existing management of waste in the country and to direct the individual waste streams to the material and energy recovery processes; as small amount as possible of the stabilised residues shall be disposed of landfills.

The priority task in waste management in Macedonia is to bring under control all waste streams and to initiate waste management projects, which represent the basis for the sustainable and economically efficient waste management system.

Priority financial /economic instruments which shall be introduced in the first period are:

- differentiated WM fees and additional (earmarked) surcharges for non-compliant municipal landfills;
- earmarked import taxes on specific chemical and hazardous goods closely related to appearance of end-of-life products, in particular hazardous waste;
- incentives for use of the biodegradable waste for electricity production;
- introduction of different organisation forms according to the 'producers responsibility' and assuring adequate payments (pilot on recycling used tyres);
- enabling of establishment of the earmarked investment and remediation funds;
- financial assistance for the WM projects (chosen according to the transparent selection criteria) from the State budget and provision of payment warranties.

#### **4.6 Stakeholder and public awareness and consultations A**

Raising public awareness, awareness of all stakeholders and the establishment of a communication system regarding municipal, other 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 a successful waste management system.

Implementation of the NWMP needs public relation activities in three main fields:

- general informative communications to raise general awareness on waste issues
- communication to production sector
- public awareness on importance and consequences of implementation of waste management projects to achieve constructive public participation.

In order to provide general communication activities and rising public awareness the following activities shall be intensified:

A general communication strategy shall be designed; the strategy shall be based on the identified waste issue, on the present behaviour of waste generators, on the set goals, on the necessary activities and individual target groups and on the analysis of socio-psychological and political features of the population.

Preparation and dissemination of public information on environmental problems, on critical waste issues in Macedonia and on available solutions how to stop or at least mitigate the impact on the environment and on public health. Public information on waste issues shall be emphasised in environmental reports and publications, dissemination of informative and educational material on waste issues in public media, round-tables, cost/benefits information, school programmes on environmental issues etc.

Communication to production sector mainly consists of activities related to the behaviour of industrial waste generators related to waste issues. Industrial waste generators as well as other stakeholders in waste management shall be provided with information on obligations related to legislation, IPPC requirements, on remediation of environmental burdens located on their assets and on all other HW & non-HZW issues, and by giving opportunities /accepting their feed-back suggestions.

Information shall be provided mainly by means of official and un-official discussions and informative workshops. Additionally, communication programmes for individual waste generators shall be elaborated; such programmes shall accompany the realisation of planned investments in waste management and in other environmental technical infrastructure of industrial plants. For the implementation of communication programmes, communication tools shall be selected and adapted to the individual target groups.

Public awareness in regional MSW management & participation in individual regional waste management projects shall be implemented by means of communication activities and relations to individual public groups.

The development of regional MSW management projects will start by means of preliminary investigations and definition of the communication problem on specific local levels, i.e. perception analysis shall be done, possible objections and constrains shall be identified as well as their sources; target groups and major players on the local level shall be addressed.

An elaborated communication programme as well as campaigns shall clarify the characteristic waste issue for individual MSW management regions. The main activities of such campaigns consist of round tables and presentations of proposed organisational and technical solutions and improvements with regard to the impact on the living, water and natural environment. Presentations shall emphasise costs, direct and indirect benefits and opportunities for the affected population from the viewpoint of lower fees for WM services, employment, infrastructure, public health, etc.

In the course of the realisation of the demonstration regional MSW management project, a pilot public awareness and public communication programme shall be prepared as a constitutive part of the entire project documentation. It shall be necessary to carry out all phases of the public relation campaign; however, each phase shall be monitored by means of success indicators and necessary corrections shall be made.

## 5 ENVIRONMENTAL IMPACT ASSESSMENT

### 5.1 General objectives of the national waste management plan

The main task of the National Waste Management Plan is to set the goals and objectives which shall be achieved in the 6-year period of establishment of an integral cost effective and sustainable waste management system, to set targets related to management of individual waste streams and to propose main measures to be taken to achieve the set goals, objectives and targets. The basic conditions for the proper functioning of an integral waste management system are the establishment of the network for the waste collection, treatment and disposal infrastructure on the one hand and the gradual implementation of interrelated measures in the policy and legislation on the other, in institutional and organisational arrangements, in strengthening of human resources and capacity building and in assuring the cost recovery of the waste management operation, in the stakeholder /public awareness and participation in waste management projects and in establishment of an easy accessible and transparent information system.

The main objective of the NWMP (2009 - 2015) for the six-year period is the reduction of environmental impact by the gradual establishment of the network of the waste management facilities, which comprise:

- temporary technical measures and investments in the transition period for the collection, treatment/final disposal of hazardous and non-hazardous waste including medical waste and animal by-products;
- systematic technical measures and investments in the planned long-term infrastructure for the collection, material/energy recovery and recycling and final disposal of hazardous and non-hazardous waste, as well as for management of end-of-life products;
- diversion of waste from non-compliant landfill and wild dumping as well as the closure/remediation of high risk landfills;
- remediation of some industrial environmental burdens;

supported by

- alignment of the national legislation with *acquis communautaire* and set-up of the vertical links to the local level and to the waste generators;
- successful division of obligations, responsibilities and tasks in waste management, strengthening institutions and other stakeholders in waste management by means of raising human capacities and by reforming the institutional organisations and arrangements;
- assuring approachability to the full cost recovery for executed services provided by the gradually developing waste management system;
- assuring revenues of funds for financing investments in the waste management facilities;
- achieving the broad understanding of waste issues and necessary policy and structural changes, the role of all stakeholders in the society and positive public participation in waste management projects.

## 5.2 Environmental problems in the Republic of Macedonia and environmental media under impact of waste management

Numerous identified environmental problems in the Republic of Macedonia can be grouped according to the environmental media and areas of their appearance:

- Problems with the waste management (municipal, industrial hazardous and non-hazardous and other types of waste) due to the absence of an integrated waste management system (organised collection, transport, treatment and final disposal) consisting of an adequate network of material/energy recovery facilities and landfills constructed in accordance to contemporary standards;
- Air pollution with different intensities in different parts of the country;
- Soil contamination, resulting in inadequate quality of agriculture products caused by such of contamination.

A particular problem related to the status of all environmental media is *insufficiently developed environmental monitoring* with an emphasis on the absence of historical data. Such data on the status of individual environmental media represent the basic condition in order to determine the new goal status of the media as well as to plan the correct and reliable action for mitigation or elimination of the environmental problem.

During the past and still at this present time the improper waste management practices have led to degradation of the ecosystems and to the loss of precious natural resources. Some impacts on environment have even led to potential and detected public health risks.

The improper waste management exhibit serious impacts in particular to the soil and water environment, i.e. to underground and surface water. Underground water is contaminated by the landfill leachate water, which in general is highly contaminated with toxic organic and inorganic compounds, in some cases with pesticides and heavy metals as well. The impact on the quality of surface water (rivers and lakes) is evident by higher concentrations of biodegradable organics, ammonium and nitrates and toxic metals.

Improper landfill of waste, common deposition of hazardous and non-hazardous waste and wild dumps represent the risk and really exhibit the pollution of soil and water; in some cases, impacts on the health of nearby settled populations have been detected.

Industrial contaminated sites represent a specific source of water, soil and air contamination. They mainly belong to mining and thermal processes (thermal energetic facilities and metallurgy) and mainly contribute to the higher concentration of toxic metals and suspended material; abandoned areas containing flotation sludge or fly ash landfill areas in the dry weather represent conditions of a very inconvenient source of dust particles. An impact on the natural environment and agriculture crops is evident.

Improper management of medical waste and potentially infected animal by-products represent a serious risk to the public health as well an economic risk to the food manufacturing facilities.

Uncontrolled combustion on open fires of waste on landfills and plastic foils on fields, and utilisation of waste oil and other combustible waste fractions cause the synthesis of highly toxic and bio-accumulative organic compounds. Such uncontrolled emissions into the air result in the pollution of ambient air, in the long-term pollution of agricultural soil and plant tissues and represent a serious risk to the public health.

## 5.3 Environmental goals

The main goals of the NWMP (2009 - 2015) are

- execution of the priority legal, organisational, technical, economical and other measures to overcome the unacceptable environmental situation with regard to impact of the improper waste management on air - water- soil - and natural environment as well as on public health.
- initiation of the complex investment activities from planning activities to erection of treatment plants in order to gradually establish an integral sustainable waste management system, which shall be flexibly built and long-term planned taking into account urgent activities in the transition period.

Development of the integral waste management system is an environmental project by itself; so the environmental goals of the establishment of an integral waste management system are almost identical to the environmental goals that shall be achieved by establishment and operation of the waste collection system and by investments in the network of the waste treatment and disposal facilities.

Additionally, some environmental goals related to waste management and adopted at international levels shall be gradually realised by measures foreseen in the NWMP (2009 - 2015); in particular such goals are the reduction of greenhouse gas emissions (according to the Kyoto Protocol) and controlled cross-border movement of hazardous waste (according to the Basel Convention).

The environmental goals, which may be achieved by means of temporary and systematic measures taken in the transition period until the year 2014, are as follows:

- reduction of the environmental impact on the air and water environment caused by the improper landfill and other improper disposal means.
- reduction of the hazardous potential of the disposed waste from the manufacturing and service sector;
- reduction of the environmental risk caused by the uncontrolled movement of hazardous waste within the country and by the uncontrolled cross-border movement;
- raising of the collected amounts of all generated waste, in particular the usable fractions of waste, end-of life products and special waste streams which may be recovered for material/energy utilisation;
- reduction of the greenhouse gas emissions from landfill
- reduction of the health risk potential of infective medical waste and animal by-products;
- reduction or at least mitigation of environmental impact caused by the MSW dumps and by the industrial and mining environmental burdens;
- control of potential impact on land use, natural and living environment, in particular on protected species and habitats, on cultural heritage and on landscaping, which may be caused by placing new waste management facilities in.

#### **5.4 Measures for elimination or mitigation of possible environmental impacts**

Legislative measures, institutional and organisational arrangements, economic measures and financial instruments, and measures related to public relation represent a significant and sensitive supporting basis for establishment and operation of the technical waste management facilities network. All measures related to waste management, which may exhibit the positive effect to different environmental media possess the technical and spatial planning character.

*Spatial planning measures* represent a complex of projects on the proper assessment of possible placing of the waste treatment plants and disposal facilities in intended areas, taking into account the present use of land, proximity of settlements and manufacturing/service zones, availability of transport communication and utilities, the geological and hydro-geological situation, areas with protected living species and habitats. Spatial planning activities shall take into consideration the possible direct/indirect, cumulative, synergic, short-, medium and long-term, constant or temporary impacts on the natural and living environment, cultural heritage and landscaping, in particular in relation to other development plans of the considered area and especially protected natural resources.

***Environmental impacts on the air and water environment caused by improper landfill*** and by other improper means of the management of waste shall be reduced by means of the following technical, organisational and financial measures:

- establishment of the regional waste management system of collection/transport/ disposal and the construction of contemporary, upgraded or new regional landfill for non-hazardous waste;
- diversion of the mixed MSW from the landfills non-compliant with EU standards and the giving-up of uncontrolled dumping of waste.

***Reduction of the hazardous potential*** of the disposed waste from the manufacturing and service sector shall be achieved by applying the following technical measures

- segregation of hazardous and non-hazardous fractions at source,
- separate storage/treatment/disposal of hazardous and non-hazardous waste fractions generated the manufacturing/service and institution sector,
- remediation and upgrading of existing industrial landfill facilities,
- alignment of the manufacturing and treatment technologies to the requirements of the IPPC directive including the replacements of more hazardous production ingredients with less the hazardous-ones.

***Reduction of the environmental risk caused by the uncontrolled movement of hazardous waste*** within the country and by the uncontrolled cross-border movement shall be achieved by the implementation measures of monitoring, inspection, control, reporting and data managing system.

***Raising of collected amounts of all generated waste*** as potential substitute of natural resource shall be achieved by means of realising the investments in the waste collection and transport facilities, supported by the organisational arrangements and implementation of the “polluter pays” principle and holder’s responsibility for waste.

***Raising of the collected amounts of usable fractions of waste, end-of life products and special waste streams*** which represent a potential substitute of natural resources and may be recovered for material/energy utilisation, shall be gradually achieved by means of the following technical measures:

- investments in the network of the new collection, mechanical separation and pre-treatment facilities,
- additional investment in existing facilities suitable for some co-treatment of waste,
- private sector participation.

Economic stimulation measures and organisation measures substantially influence the more or less free market of the secondary materials recovered from waste.

***Reduction of the greenhouse gas emissions from landfills*** shall be realised by means of the following main measures:

- separation, recycling or other manner of utilisation of some biodegradable fractions (paper, cardboard, wood, textile) from the main mixed waste stream before the landfill process;
- separate collection/treatment of biodegradable organic waste from food manufacturing industry and utilisation of residues in agriculture;
- upgrading of some existing landfills up to temporary landfill for non-hazardous waste with regard to the control of the methane emissions to air;
- upgrading of existing landfill (Drisla) and construction of two new landfill facilities for non-hazardous waste serving in total app. 1 million – 1,2 million habitants equipped to control the methane emissions to air and to utilise the landfill gas for the electricity and heat production;

***Reduction of the health risk potential*** of the infective medical waste and some specific combustible hazardous waste, and animal by-products, which need safe final disposal shall be realised by means of the following main measures:

- planning, investment and erection of the central incineration plant for medical waste and specific combustible hazardous waste from different sources;

- planning (together with the MAFWE), investment and erection of the central pre-treatment/co-incineration or final disposal facility for animal by-products (1<sup>st</sup> and 2<sup>nd</sup> category)

***Reduction or mitigation of impact on environment caused by the MSW dumps and by the environmental burdens as residues of the former industrial and mining activities*** shall be realised by means of different measures:

- priority closure / remediation of four non-hazardous waste landfills, which exhibit a high risk to the environment, and additionally the closure and remediation of up to different demanding levels of app. 36 non-compliant MSW landfills in the parallel process of the landfill regionalisation of landfill;
- cleaning-up the soil by excavation of disposed material from some wild dumps;
- execution of remediation of the industrial environmental burden and providing for new intention of the previously polluted area, expecting improvement to the quality of the river Vardar, underground water and soil.

The majority of the MSW management projects and projects on the end-of-life products shall only start in the time of the NWMP (2009 - 2015) by performing planning activities, institutional reorganisation and preparation of technical, spatial, environmental and financial documentation; so, the positive influence of the project realisation on environmental media could be only exhibited after the operation start of the treatment and disposal facilities and after obtaining all the necessary permits.

The main effects to the reduction of the impact to environment may be expected from the control measures on sources of hazardous waste and on the manner of their controlled storage, treatment and final disposal.

## **5.5 Uncertainties of the environmental assessment**

Assessments of existing and planned environmental impacts on the environment after realisation of the individual part of the NWMP or of the plan as whole contain some uncertainties:

There is a lack of data on the existing state of the environment because of the insufficiently developed national environmental monitoring system; there is also a lack of interrelated qualitative and quantitative data between emissions from different sources and extent of contamination of individual environmental media caused by defined emissions.

The input data on the waste quantities and on the waste composition are uncertain, but the national waste reporting system is not developed enough to supply an elaboration of this NWMP with more accurate data.

The network of new or upgraded waste treatment and disposal facilities cannot be defined yet, the waste collection system and material and energy recovery and final disposal technologies remain only partly determined and suitable locations for waste management facilities require previously established or at least planned regional organisational area.

All positive effects on local environmental media, i.e. reduction of emissions and reduction of contamination of the environment, and positive effects on the global environment (reduction of the greenhouse gas emissions from landfills) are derived from the input data, from the previously executed technical, feasibility and other special studies, and calculated on the assumptions of proposed waste treatment technologies, on the time schedule for erection of the waste management facilities and on the assumed network of the waste management facilities with regard to regionalisation; as the reference data were taken from the monitoring data given in the Environmental Statistics Report (2007) and the environmental and risk analyses of environmental burdens and existing MSW landfills.

## 5.6 Measures with regard to the environmental monitoring

Execution of the regional MSW management plans and waste management projects of the industrial / service/ agriculture waste generators shall pass the environmental impact assessment, for which the execution of special environmental studies is needed. Provision for the basic official input data on the state of individual environmental media is the task of the Ministry of Environment and Physical Planning. MoEPP shall set-up the environmental monitoring system, which shall assure reliable quantitative data on the state of the environment in the project preparation phase and monitor the expected effects of operation of the new waste management facilities; the centralised reporting system on generation, movement and on the fate of the waste streams represent a complementary information mechanism to understand and assess other environmental data and their interrelations.

## 6. OUTLINE OF THE WASTE MANAGEMENT ACTION PLAN

The action plan for the implementation of the waste management plan shall reflect activities necessary to be realised in a shorter and relatively more predictable time, i.e. 6-year period in order to overcome the environmental impacts caused by the existing practice and to prepare a basis for the establishment of a technically effective and cost efficient waste management system. NWMP (2009 - 2015) reflects the following main tasks:

- 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.

The integral elements of the Action plan can be recognized throughout its main focus, which is structured as shown in detail in **Table 15**:

### Legislative structure

- National level; completion of legal WM framework.
- Local level; upgrading of municipal SWM regulation.

### Organisational structures and strengthening of human capacities

- Establishment of the WM department in the MoEPP and appointment of responsible persons.
- Increased and effective inspection and enforcement capacity.
- Effective inter-ministerial cooperation and cooperation between the government and the manufacturing / service sector.
- Reorganisation and strengthening capacities of the MSWM services and strengthening capacities of the industrial and other waste generators.

### Technical infrastructures

- Establishment of MSWM centres based on the new or up-graded landfills for non-hazardous waste.
- Closure of non-compliant landfills / wild dumps (in more phases).
- Improvement of the collection (90%) and transport systems.
- Establishment in treatment/disposal infrastructure for high-risk animal by-products and establishment of an adequate system for industrial and medical hazardous waste.

### Financial structures

- "Polluter Pay principle" development and enforcement

- Co-finance of integrated MSW management systems (introduction of disposal fees and surcharges, fines-penalties, establishment of earmarked funds)
- Introduction “producers responsibility” principle for used tyres as a model management system (establishment of earmarked funds as well for packaging waste, special HZ waste streams)
- Establishment of the system for co-financing the closure/reclamation of industrial ‘hotspots’ (remediation fund)

Public communication structures

- Dissemination of general information on waste issues
- Establishment of a communication system to waste generators in the production sector
- Establishment of a public relation system for implementation of regional MSWM projects.

**Table 15: WM action plan for the 6-year period with the responsible stakeholders, main interrelated measures/actions and estimation of costs**

P	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>P 1</b>	<b>Policy and legislation</b>										
<b>P 1.1</b>	<i>Transposition of the EU legislation and directives on waste management into the national legislation framework</i>	MoEPP	Transposition of the priority EU directives on waste management:	Waste Framework Directive, Hazardous Waste Directive, Landfill Directive, Directive on Incineration and on emissions *: Transposition of obligation on management of all types of waste and targets, on the construction and operation standards and rules, on the acceptance standards/rules related to recovery and final disposal of waste, on elaboration of WM plans&programmes, on permitting, reporting, monitoring and enforcement; on financing; setting criteria/standards and elaboration of plan and timetable for conditioning /closing-down / remediation of the non-compliant landfills (transition and the follow-up period).	x						
<b>P 1.2</b>		MoEPP	International Conventions	<ul style="list-style-type: none"> <li>Implementation of Basel Convention and Kyoto Protocol.</li> </ul>	x	x	x	x	x	x	
<b>P 1.3</b>		MoEPP	Transposition of other EU Directives on WM	<ul style="list-style-type: none"> <li>Transposition of other directive related to special waste streams and setting corresponding targets*.</li> <li>Regulation of the environmental liability*.</li> </ul>	x	x	x	x			
<b>P 1.4</b>		MoEPP, MF; producers, importers, retailers;	Amending environmental and other affected legislation with regard to end-of life products:	<ul style="list-style-type: none"> <li>Establishment and implementation of Producer's/Importers responsibility optionally linked with Environmental Fund as an earmarked part of the State budget.</li> <li>Involvement in voluntary agreement scheme and/or earmarked tax collection for management/disposal of the EL products (tyres, packaging, batteries/accumulators, used oils, WEEE, ELV,C &amp;D waste).</li> <li>Obligations for the recovery (take-back) mechanisms EL products.</li> <li>Financial/economic instruments; material and financial monitoring and reporting.</li> </ul>		x	x	x	x	x	x
<b>P 1.5</b>		MoEPP	Amending and adoption by laws on waste management	Groups of waste, classification with regard to nature or origin; constituents causing the hazardous properties of waste; hazardous waste characteristics; list of the recovery and disposal procedures, list of waste according to EWC.							
<b>P 1.6</b>		MoEPP	Amending and adoption by laws (local self-government)	Reforming (formal centralisation) of organisation of the environmental inspection and adopting central level of issuing IPPC (A and B) permits.	x	x					
<b>P 1.7</b>		MoAFWE, MoEPP	Transposition of the EU Regulation on the animal by-products management*	Setting obligations, rules, code of practice and enforcement with regard to the categorisation, segregation at source, treatment and final disposal of the selected AbP fractions.	x	x					
<b>P 1.8</b>		MoEPP	Amending the proposed legislation on the soil contamination	Definition environmental burdens, "hot-spots", contaminated soil, artificial soil, excavated soil; setting criteria on the soil quality and on remediation of contaminated sites and other environmental burdens.		x					
<b>P 1.9</b>		MoEPP, MF, municipalities	Regulating cost recovery system and payment discipline	Regulating charges/surcharges/taxation /earmarking system; Creation of transparent budget lines and rules on re-investment in new WM infrastructure.		x					
<b>P 1.10</b>		MoEPP, MF, MIA	Regulating of penalties because of improper waste management	Setting criteria and rules on appraising and regulating penalties and fees against real cost of environmental damages caused by improper waste management.		x					

## National Waste Management Plan (2008-2014) of the Republic of Macedonia

P	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>P 2</b>	<b>Policy and legislation - ►</b>										
<b>P 2.1</b>	<i>Secondary legislation and permitting /enforcement instruments</i>	MoEPP	Preparation of secondary legislation	Secondary legislation sets rules and limitations on <ul style="list-style-type: none"> <li>- management rules for appointed waste streams;</li> <li>- record keeping, reporting and data transfer.</li> </ul>	x	x	x	x			
<b>P 2.2</b>		MEPP	Regulating permitting, licensing, authorisation with regard to WM operations	Scope of requirements and content of the applications for permits/licence for operation of waste treatment/disposal facilities and for the carrying out of waste transport, for execution of environmental monitoring /analyses.		x	x	x	x		
<b>P 2.3</b>		MoEPP	List of enterprises and institutions active in WM	List of licensed enterprises and of the waste management facilities possessing adequate permit; scope of licences/permits, list of authorised institutions and scope of authorisation.		x	x	x	x		
<b>P 2.4</b>		MoEPP	List of WM companies under IPPC obligations	Setting-up criteria for the waste management processes to get the IPPC environmental permits; list of WM companies with obligation of integral environmental permits or of partial environmental permits.	x						
<b>P 2.5</b>		MoEPP, municipalities	Inspection programmes and regular inspection	Address priorities for waste streams, waste generators, operators and facilities in inspection programmes; monitor the implementation of WM plans and programmes of municipalities and other waste generators.		x					
<b>P 2.6</b>		MoEPP	Application guidelines for consent/permit (existing and new manufacturing facilities)	Scope and content of applications for environmental consent and permit for manufacturing and service production with regard to waste management (outline of the waste management in manufacturing facilities),	x						
<b>P 2.7</b>		MoEPP	Guide lines for monitoring and reporting	Reporting methodology, guidebooks for monitoring, record keeping and reporting forms for municipalities and waste generators	x	x					
<b>P 2.8</b>		MoEPP	Implementation rules of waste legislation/standards	Obligations, rules, standards for segregation, separate collection, storage, treatment, processing and final disposal of special types of hazardous, non-hazardous, construction/demolition and other waste.		x	x				
<b>P 3</b>	<b>Local level regulations</b>	MoEPP	Waste management programmes – regional/local level	Scope, contents and guidelines for elaboration of the municipalities' WM programmes and of WM outlines for waste generators - manufacturing, service and institutional sector.		x					
<b>P 3.2</b>		MoEPP, municipalities,	Regulation on the local level for MSW	Regulation of the organisational and technical setting-up the obligations, rules, codes practice for the execution of MSWM services, transferred on relations:“national to regional level” and “municipality to regional level; inclusive charging policy, monitoring and enforcement procedures.		x	x	x	x	x	
<b>P 3.3</b>		MoEPP, municipalities, producers	Regulation on the local level for management of special waste streams	Regulation of the organisational and technical setting-up of WM services and facilities for the special waste streams, i.e. tyres, packaging, batteries/accumulators, used oils, WEEE, ELV, construction/demolition waste in relations to compliant scheme according to “producer’s responsibility”.		x					

\*List of directives: Waste Framework Directive (2006/12/EC); Hazardous Waste Directive (91/689/EEC); and Landfill Directive (1999/31/EC) and Council Decision establishing criteria and procedures for the acceptance of waste at landfill (2003/33/EC); Packaging and Packaging waste Directive (94/62/EC+ amendm.); Waste Incineration Directive (2000/76/EC); Batteries and accumulators Directive (2006/66/EC); WEEE Directive (2002/96/EC+amedm.); Disposal of Waste Oil (75/439/EEC+amandm.); ELV Directive (2000/53/EC+amedm.); Disposal of PCB/PCT Directive (96/59/EC);Waste Shipment regulation(259/93+amendm. 1013/2006); Regulation No.1774/2002 on the animal by-products + amendm.; Environmental Liability Directive 2004/35/EC;



	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>I</b>	<b>Institutional /organisational arrangements</b>										
<b><u>I 1</u></b>	<b><i>Division of responsibilities, tasks and competency</i></b>										
<b>I 1.1</b>	<i>State level</i>	Government Parliament, MoEPP, MoF MTC, MoH, MoE, MoAFWE	Division of responsibilities, obligations and tasks, appointment of competent authorities /person	Improvement of legislation in order to achieve better harmonisation of obligations and responsibilities among Ministries with regard to implementation of waste management strategy and plan. Establishment of the inter-ministerial steering and coordination body.	x	x					
<b>I 1.2</b>		MoEPP-WM dept, MoEPP-MEIC	Establishment of waste management department, appointment of responsible person for execution of the planning, administrative, coordination, and organisation tasks	Waste management planning on the State level. Administrative tasks on permitting for waste collection/treatment/disposal facilities and operations. Data collection, record keeping and reporting, environmental monitoring. Proactive coordination and encouraging the activities concerning the MSW management on the regional level, organising the necessary technical assistance; proactive coordination of conceptual, feasibility, risk assessment and other environmental studies; providing links to the institutional and financial arrangements;	x	x	x	x			
<b>I 1.3</b>		MoEPP-PR office	Strengthening of the role of PR office in waste management projects	Promotion of public campaigns as support activities concerning general knowledge on waste issues and solutions as well as on the MSW management plans and activities on the regional level.	x	x					
<b>I 1.4</b>		MoEPP-inspectorate	Execution of enforcement and reporting	Execution of the reform of environmental inspection organisation; appointment and division of responsibilities/tasks, execution of the inspections of waste generators and collection/handling/disposal facilities for all type of waste.	x	x	x	x			
<b>I 1.5</b>		MoEPP, other ministries, health institutes, waste generators, animal breeding farms	Appointment of responsible bodies /persons in other Ministries, institutions nad in the manufacturing, service and other sectors	Waste management planning for Macedonian priority waste streams. Proactive coordination and encouraging the activities and optimal organisational / technical /economical solutions for hazardous and medical waste, animal breeding and slaughterhouse waste as well as for the construction/demolition waste; assistance for institutional and financial arrangements; promotion of public campaigns as support activities.		x	x	x	x		
<b>I 1.6</b>		MoEPP	Establishment of the Remediation Fund for the "hot spots" remediation	-Managing of the contaminated site database, financing the investigations, risk assessment and feasibility studies, designing and implementation of remediation programmes and annual operative plans, tendering the project preparation and execution/ contracting/ supervision. -Funding execution of remediation of contaminated sites by exploiting the national sources of income and by attracting some contribution of donor and investment agencies / institutions.			x	x			

	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>I</b>	<b>Institutional / organisational arrangements ►</b>										
<b>I 2</b>	<b>Linked institutional set-up</b>										
<b>I 2.1</b>	<b>Industrial hazardous and non-hazardous waste</b>	MoEPP, HW generators, owners of the HW disposal facilities	Linked institutional set-up of management system for <b>industrial hazardous and non-hazardous waste</b>	- Establishing the organisation on the state level for planning, designing, assisting for financial resources; building and put operation of the separate treatment/disposal facilities: for hazardous and non-hazardous waste. - Creation of industrial HW and non-HW management scheme (separately for both streams), plans, and execution of feasibility study (in particular from the viewpoint of centralised/decentralised treatment and/or export).		x	x	x			
<b>I 2.2</b>	<b>HW from healthcare institutions and some selected hazardous and toxic materials</b>	MoEPP, MoH, MoAFWE; MoF, health institutions, pharmacies	Linked institutional set-up of management system for <b>medical waste</b> , some <b>selected hazardous and toxic materials</b>	Establishing the operative body (legal person) of the national level for leading the investment project of collection/treatment and incineration facility of hazardous medical waste; facility may be expanded for incineration of old remedies, pesticide residues and contaminated packaging and of some selected combustible hazardous and toxic materials.	x	x	x				
<b>I 2.3</b>	<b>Agriculture waste</b>	MoAFWE, MoEPP, Ab-P generators, plant tissue generators	Linked institutional set-up of the management system for recovery and disposal of <b>animal by-products</b> and <b>plant tissue waste</b>	<b>ANIMAL BY-PRODUCTS</b> -Creation of AbP management system and technical scheme, execution of feasibility study with regard to options of the final disposal techniques. - Organising the central facility or a network of treatment and final disposal facilities (as public enterprises or public services). <b>PLANT TISSUE WASTE</b> Execution of feasibility studies with regard to the optimisation of the collection and material/energy recovery of plant tissue waste.	x	x					
<b>I 2.4</b>	<b>Special waste streams</b>	MoEPP, MoE, MoF, economic sector concerned, municipalities*	Linked institutional set-up for management of the <b>special waste streams and end-of-life products</b>	-Creation of waste management schemes, plans, targets, feasibility studies on management of special waste streams (P &PW*, oils, PCB waste, accumulators and batteries, WEEE*, tyres*, construction/demolition waste*, waste from water treatment plants*). -Establishing of organisational, financial and operative structure for the collection, treatment, recovery/recycling and disposal of selected special waste streams and end-of-life products. System operates mainly on the basis of public services by involvement of private sector.			x	x			
<b>I 2.5</b>	<b>End-of-life vehicles</b>	MoEPP, MoF, MoIA, economic sector concerned	Linked institutional set-up regarding management of <b>end-of-life vehicles</b>	-Creation of the ELV management scheme, plan and feasibility study; set-up a linked certificate system –earmarked taxes (purchasing) / registration / destruction of ELV. -Establishing of organisational, financial and operative structure for collection, treatment, recovery/recycling and disposal of end-of-life vehicles.				x	x	x	

	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>I</b>	<b>Institutional / organisational arrangements ►</b>										
<b>I 3</b>	<b>Reforms of the MSW management system</b>	MoEPP, MTC municipalities (regionally joint MSWM companies)	Reorganisation of MSW services and introduction of the competitive market for WM services and private sector participation	-Separation of WM services from other communal services. -Establishing of the MSWM Companies with intention to provide of waste management operations on the regional level, lead investment activities to execute a variety of development, technical, financial and other organisational/ operative tasks (like tendering/contracting, involvement of private sector ) to assure the operation and financing of integrated MSWM system including closure of non-compliant landfills. - Set-up the monitoring and accounting system with regard to amount and quality of the executed services.	X	X	X	X	X		
<b>I 3.1</b>	<b>MSW management</b>									X	X
<b>I 3.2</b>	<b>MSW demonstration regional project</b>	MoEPP, MTC, MLSG, regionally joint municipalities	Reorganisation of <b>MSW management system</b> in the selected WM regional and testing of introduction of the competitive market for WM service	1 <sup>st</sup> .phase: Establishment a new <i>MSWM Company</i> as enterprise, taking over of main administrative, organisational, account-keeping, planning and investment tasks and competencies from communal enterprises on behalf of municipalities; Set-up a <i>regional MSWM centre</i> (legal person) as an MSWM facility for waste recovery and disposal; Set-up of the contracting organisation system for execution of waste collection and for operation of WM facilities. 2 <sup>nd</sup> phase: Set-up/implementation of the tendering / contraction procedures with licensed WM facilities and for execution services under competitive conditions; set-up the monitoring system with regard to amount and quality of the executed services.	X	X		X	X		
<b>I 4</b>	<b>Organisational set-up of financial/ economic measures</b>										
<b>I 4.1</b>	<b>Charging mechanisms and funds</b>	MeEPP, MoF,	FS for disposal fee/ surcharge and cost recovery	Location and management of funds and (co) financing criteria and conditions; optimal charging mechanisms, standardised accounting system.	X						
<b>I 4.2</b>	<b>Financing of regional MSWM system and institutional set-up of for implementation of financial/economic instruments</b>	MeEPP, MoF; municipalities; WM operators, producers, importers	Financing of investments and operation of an integrated MSWM on the regional level	-Setting uniform charging system, transparent setting of fees and organising an efficient fee collection. -Setting taxes for selected products, surcharges for non-compliant waste management options and their levels; Creating transparent budget lines to national and local budgets; Creation of regional investment funds; Creation of rules on re-investment of taxes and surcharges in the new WM infrastructure, and disbursement procedures (reflected in regulations).			X	X	X	X	
<b>I 4.3</b>	<b>MSW demonstration regional project</b>	MeEPP, MoF; regionally joint municipalities, operators,	Charges/ taxes for execution of MSWM services applied in the “demo” project on regional level	Application of charges/surcharges and fee collection system for the cost recovery of MSWM services and financing of planned investments, setting-up a surcharges system to divert the municipal waste streams from the non-compliant landfills and assure own regional (earmarked) fund.	X	X					
<b>I 4.4</b>	<b>Special waste streams</b>	MeEPP, MoF, region.MSWMC, producers, importers, WM operators	Establishment of waste management schemes for special waste streams and selected EL-products	-Establishment of the voluntary agreement scheme (1 <sup>st</sup> phase) for selected end-of-life products according to the “producer’s responsibility” ; earmarked financial flows for cost recovery of executed services (level of taxes, earmarked taxes collection, creation of transparent budget lines). - Obligatory involvement of producers and importers in available management schemes for selected waste stream (2 <sup>nd</sup> phase).			X	X	X	X	

	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>H</b>	<b>Human resources /capacity building</b>										
<b>H 1</b>	<b>MoEPP capacity building</b>	MeEPP	Main tasks of WM department of MoEPP	New employment. Education courses and trainings of staff of the WM department, oriented generally to political, legal, public awareness, organisational, technical, spatial, logistical and economic/ financial topics and according to special tasks.	X	X	X				
H 1.1											
H 1.2		MeEPP	Environmental inspectorate resources; training and equipment	New employments; providing equipment, elaboration of inspection handbook and attending educational courses and trainings on general and technical WM issues in relation to other environmental parameters and, in particular on administrative and punishment legislation and procedures.	X	X	X				
H 1.3		MeEPP	Specialisation of the Unit in MEIC-to process/maintain database on WM issues.	New employment and providing of software/hardware; elaboration of standard procedures, forms, indicators for data verification.	X	X	X				
H 1.4		MeEPP	Specialisation of MoEPP-PR-unit	Additional employment and focusing the selection of personnel profiles for coordination tasks and leading extensive campaigns possessing a broad understanding of waste issues from the psychological and sociological viewpoint, as well as knowing and experience of application variety of PR instruments.	X	X	X				
<b>H 2</b>	<b>Capacity building - other National Stakeholders ( State level)</b>	MoF,MoE,MTC, MoAFWE; MoH, MoLSG associations	Tasks of the inter-ministerial coordination and collaboration with all stakeholders in WM	Appointment of responsible persons regarding WM issues from the viewpoint of the responsibility and competency division. Seminars on EU legislation, development programmes, financial resources.	X	X	X	X	X	X	X
H 2.1											
<b>H 3</b>	<b>Capacity building of municipalities</b>	Municipalities, MoEPP	Raising the performances of municipalities to establish a contemporary waste management system on the regional level	New employments (and/or appointments) in the municipality administration and new employment in the new regional MSWM companies and in regional centres as MSWM facilities for waste recovery and disposal because of the new tasks on the MSWM field. related to the: (see I 3.1). Educational courses and trainings of staff in regional MSWM companies shall comprise MSWM issues from the political, legal, public awareness, organisational, technical, spatial, logistical and economic/ financial viewpoints.		X	X	X	X	X	X
H 3.1											
XH 3.2	<b>Demonstration project</b>	MoEPP, joint municipalities in selected WM region	Establishment of demonstration MSWM centre on the regional level	New employments (and/or appointments) in the municipality administration and new employment of staff in the demonstration regional MSWM centre (legal person) as an MSWM facility for waste recovery and disposal because of the new requirements on the waste management issues related to the political, legal, organisational and financial viewpoints (ref. H 3.1).	X	X					

	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>H</b>	<b>Human resources /capacity building</b>										
<b>H 4</b> H 4.1	<b>Capacity building of MW operators</b>	Joint municipalities, private and public WM “business units”	Involvement of private business units in the waste management services	New employments for efficient, effective and environmentally sound operations according to the extent of the private sector involvement in WM operations and to the extent of collection/pre-treatment of special waste streams and end-of life products (market conditions, encouragement by financial/economic instruments). Educational courses and trainings on legislative requirements regarding the general waste management issues and on technical issues comprising separate collection, segregation and storage of waste fraction and potential recyclables, management of hazardous and toxic materials (waste), and awarding licences.			x	x	x	x	
H 4.2		MoEPP, joint municipalities, MSWM facilities; waste operators and AbP treatment facilities	Training for landfill operators and for other process technology operations of waste management	Educational courses and trainings of employees shall be focused on: -Waste management policy, national and EU legal requirements and standards in waste management, waste characteristics and mechanical and biological and other treatment and disposal technologies. -Overall waste management skills and specific technical and operational issues; impacts on environment, economic/ financial issues.			x	x	x	x	
<b>H 5</b> H 5.1	<b>Capacity building of waste generators</b>	MoEPP, waste generators	Implementation of NWMS and NWMP	Establishment of steering committees and expert community. Reflection of NWMP in WM plans of waste generators. Conducting of self-monitoring.	x	x					
H 5.2		Waste generators	Employment (appointment) of competent person for environmental issues	Appointment and/or additional employment of competent person for environmental (waste) issues; involvement in adequate trainings (WM plans, EMAS, IPPC requirements, monitoring of emissions, EIA).	x	x					
H 5.3		Waste generators; MoEPP	Technologies and techniques for waste avoidance, reduction, reduction of hazardous potential of products; segregation, storage, transport of hazardous waste	Strengthening and involvement of development and investment sectors in the investment activities with regard to the planned technological changes / adaptations (clean production and products, technologies and techniques under IPPC requirements; focused on waste reduction and reduction of biodegradable waste, storage/transport, recovery/reuse of waste fractions, disposal, in particular on hazardous waste).		x	x	x	x	x	
H 5.4		HW generators, HW facility operators and exporters,	Hazardous and toxic waste manipulation : separate segregation and storage, transport, treatment,	Educational courses and trainings of personnel on management of hazardous and toxic materials (waste). Awarding personal licences after passed examinations. Seminars on regulations, standards and technical rules for import/export of waste fractions.			x	x	x	x	

	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>T</b>	<b>Technical and invest. measures</b>										
<b><u>TI+</u> <u>EI</u></b>	<b>Temporary measures</b>										
T 1.1	<i>MSWM demonstration project</i>	MoEPP, municipalities, regional MSWM company and MSWM centre; public /private WM services;	Demonstration project on regional MSW management for selected waste management region with known location of landfill and with the knowledge of main characteristics of location	-Preparation of WM regional technical scheme and feasibility study on the MSW collection, transfer and transport, on reconstruction of the existing or on the new future regional landfill, on construction of MBT, treatment facilities for selected waste streams and on the accompanying infrastructure; regional programme of closing down non-compliant landfills. -Elaboration of technical, EIA, feasibility and investment documentation and application for funding from local and international funds.	x	x					
T 1.2	<i>Follow-up of the MSWM demonstration project</i>	MoEPP, municipalities, regional MSWM company and MSWM centre; public /private WM services;	Construction of the regional landfill and selected waste treatment facilities with the accompanying infrastructure and transport facilities	-Execution of the investment procedure: administrative, technical and financial management of the project: acquiring necessary permits, tendering/contracting and execution of the construction and putting into normal operation of regional waste treatment facility (1 <sup>th</sup> phase- landfill and accompanying processes). -Closing down selected landfills according to the programme (T.1.1).			x	x	x	x	
T 1.3	<i>Regional MSWM and waste technical schemes for the transition period</i>	MoEPP, municipalities	Selection of locations for the temporary (future) regional MSW landfill after reconstruction/conditioning	-Selection of the landfill locations which have to be closed; -Selection of landfill locations suitable for - for the temporary landfill and - for the future regional landfill, new or after remediation /upgrading as a part of the regional waste management schemes and as a result of the executed feasibility studies.	x x						
T 1.4		MoEPP, Municipalities, regional MSWM companies; public /private WM services,	Collection, transfer and transport of MSW and selected waste fractions	-Preparation of WM regional technical scheme and feasibility study on the MSW fraction collection, transfer and transport, tendering and involvement of private sector, investment in upgraded transport system with regard to the chosen location of the temporary and/or future regional landfill.		x	x	x	x		
T 1.5		MSWMCs on regional level, MoEPP and municipalities,	Landfill of municipal waste as reconstructed temporary landfill	-Elaboration of conditioning plans, technical, space managing and feasibility and investment documents for closure/remediation/upgrading of landfills; -Applications for financing from local and international funds; - Administrative, technical and financial management of investment procedure from the acquiring permits and execution of the construction up-to the normal operation of regional landfill (waste treatment) facility.		x	x	x		x	x
T 1.6	<i>HW management</i>	MoEPP, industry. waste	Industrial hazardous waste management system	-Establishment of data collection/reporting system -Separate collection of hazardous waste at source and temporary storage	x	x					



		generators	(where feasible)								
T	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>T 2+</b> <b>EL</b>	<b>Systematic measures</b>										
T 2.1	<i>Regional MSW management facilities</i>	Regional MSWMCs, MoEPP and municipalities,	Regional facility for <b>municipal waste treatment and disposal</b>	<ul style="list-style-type: none"> <li>-Preparation of regional MSW technical scheme and feasibility study on the (re)construction of future regional landfills, on construction of MBT, treatment facilities for selected waste streams, on the accompanying infrastructure and on adequate transport facilities; programme of closing down non-compliant landfills.</li> <li>-Elaboration of feasibility study on optional W-t-E plant in Skopje and co-incineration options (thermo-energetic industrial facilities) in order to utilise calorific value of the MSW light fractions, separated in MBTs.</li> <li>- Elaboration of technical, EIA, feasibility and investment documentation, application for funding from different funds, closing financial structure.</li> <li>-Execution of the investment procedure: administrative, technical and financial management of the project: acquiring necessary permits, tendering/contracting and execution of the construction and putting into normal operation of the regional waste treatment facility (1<sup>st</sup> phase-landfill &amp; treatment facility for selected waste streams; 2<sup>nd</sup> phase MBT );</li> <li>-Closing down selected landfills according to the programme.</li> </ul>			X	X	X		
T 2.2	<i>Special waste streams and end-of life products</i>	MoEPP reg. MSWMCs economic sector concerned, private sector	Design and construction /operation of management facilities for <b>special waste streams</b> and end-of life products	<ul style="list-style-type: none"> <li>- Preparation of WM schemes for the individual special waste streams: tyres, P and PW, recyclable materials, used oils and end-of-life products.</li> <li>- Elaboration of technical, space managing, organisational documentation, EIA study, feasibility studies and investment documentation for construction of storage and material recovery facilities and for energy recovery of waste in co-incineration facilities.</li> <li>-Tendering and contracting.</li> </ul>		X			X	X	
T 2.3	<i>Industrial hazardous waste</i>	MoEPP, HW generators, licensed specialised enterprises /public/private/	Design and construction /operation of industrial <b>hazardous waste</b> storage, treatment and disposal facilities	<ul style="list-style-type: none"> <li>-Preparation of technical, space managing, EIA and investment documents for design/construction of the industrial hazardous waste management facilities according to results of the feasibility study (collection and intermediate storage of segregated fractions at their sources, transport facilities, recovery and pre-treatment facilities, common HW landfill or incineration plant, or utilisation of available co-incineration facilities).</li> <li>-Closing the financial structure and execution of the investment/realisation procedure: administrative, technical and financial management of the project up-to the start-up of the facility operation.</li> </ul>		X	X	X		X	X
T 2.4	<i>Industrial non-hazardous waste</i>	MoEPP, non-HW generators, licensed specialised enterprises /public/private/	Design and construction /operation of industrial non-hazardous waste storage, treatment and disposal facilities;	<ul style="list-style-type: none"> <li>-Preparation of technical, space managing, EIA and investment documents for design/construction of the industrial non-hazardous waste management facilities (collection and intermediate storage of segregated fractions at their sources, transport facilities, internal recovery, recycling and pre-treatment facilities, common non-HW landfill or other safe final disposal).</li> <li>-Closing the financial structure and execution of the investment procedure:</li> </ul>		X	X	X		X	X



				administrative, technical and financial management of the project up-to the start-up of the facility operation.						
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T	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>T</b>	<b>Technical and invest. measures</b>										
<b>T 2+</b>	<b>Systematic measures</b>										
<b>T 2.5</b>	<b>Agriculture waste s</b>	MoAFWE MoEPP, and/or AbP generators, other	Design and construction /operation of treatment and final disposal facilities of <b>the animal by-products</b> (slaughterhouses, farms, waste food animal origin)  Design and construction /operation of treatment and final disposal facilities of <b>the plant tissue waste</b> (cereals, fruit production /treatment, waste wood,.)	<b>ANIMAL BY-PRODUCTS</b> - Preparation of technical, space managing, EIA and investment documents for design/construction of the animal by-products treatment (co-treatment) facilities of according to the executed feasibility study *1 <sup>st</sup> priority: collection, transport and intermediate storage facilities, Final disposal (rendering/co-incineration or incineration) facilities with regard to the source and to the risk category of the AbP. * 2 <sup>nd</sup> priority: production of biogas, energy and fertilisers. - Closing the financial structure and execution of the investment/realisation procedure: administrative, technical and financial management of the project up-to the putting the treatment facilities into operation. <b>PLANT TISSUE WASTE</b> - Preparation of technical, space managing, EIA and investment documents for design and construction of the collection and material/energy recovery facilities of plant tissue waste according to results of the executed feasibility study. - Closing the financial structure and execution of the investment/realisation procedure: administrative, technical and financial management of the project, up-to the start of operation of the treatment facilities.		X	X				
<b>T 2.6</b>	<b>HW from healthcare institutions and some selected hazardous waste fractions</b>	MoEPP, MH, MoAFWE, MoF, health institutions, pharmacies; other stakeholders	Design and construction/operation of treatment facility for <b>medical and some selected hazardous waste</b>	- Preparation of waste management scheme for collection/ treatment and final disposal of hazardous medical waste, old remedies, pesticide residues and contaminated packaging and for the selected combustible fractions of hazardous waste from the organisational, technical, spatial and environmental viewpoint, technical and investment documentation for treatment facility, EIA, and corresponding feasibility study. -Elaboration of application for funding the investment from national and international funds and closing financial structure. -Execution of the investment procedure: administrative, technical and financial management of the project: acquiring necessary permits, tendering/contracting and execution of the construction and installation works and putting the transport logistic system, storage facility and central incineration facility on "Drisla" location into normal operation	X	X	X				
<b>T 2.7</b>	<b>Construction/demolition waste</b>	MoEPP, MTC, municipalities, construction waste generators; licensed specialised enterprises	Design and construction /operation of treatment / disposal facilities for <b>construction/demolition waste</b>	-Preparation of technical, space managing, EIA and investment documents for design/construction of the collection, recovery/recycling facilities for the construction/demolition waste and landfills for residues. -Closing the financial structure and execution of the investment/realisation procedure: administrative, technical and financial management of the project up-to the start-up of the facility operation.					X		X



	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>T</b>	<b>Technical and invest. measures</b>										
<b><u>T 2+</u></b> <b><u>EI</u></b>	<b>Systematic measures</b>										
T 2.8	Waste from wastewater treatment plants	MoEPP, municipalities, MWWTP	Design and construction /operation of treatment /disposal facilities for <i>sewage sludge</i>	-Preparation of technical, space managing, EIA and investment documents for design/construction of the collection facilities, construction of bio-treatment plants and reconstruction of co-incineration plants for sewage sludge according to results of the executed feasibility study. -Closing the financial structure and execution of the investment/realisation procedure: administrative, technical and financial management of the project up-to the start-up of the facilities operation.							x  x
T 2.9	"Hot spot" remediation	MoEPP, Remediation Fund, legal successors	Design, construction and execution of remediation of the " <i>hot spot</i> " areas	- Selection of the investigation and remediation priority of "hot spots". - Detailed investigation of the individual "hot spot sites", of deposited waste material, of the soil/surface water/groundwater, climate, and environment. - Risk assessment and assessment of technical remediation options and costs with special regard to utilisation of the remediated area and to the options of final disposal of contaminated material (feasibility study). - Elaboration of technical and investment documents (based on the executed investigations and studies for <u>2 locations in the year 2007</u> ). - Decision on the execution of individual remediation project, closure of financial structure and assuring recovery of costs; -Application for financing investments by local and international funds, tendering, contracting, execution, supervision. - Start of 1 or max. 2 remediation projects.		x	x				x x x  x  x

	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION						
					1	2	3	4	5	6	
<b>E</b>	<b>Resources and WM financing</b>										
<b>E 2</b>	<b>Cost recovery and financing</b>										
E 2.1	<i>Cost recovery for MSWM services</i>	MoEPP, MoF, municipalities (regional level – MSWMC), waste collectors	Establishment of the charging system for the executed MSWM services	-Establishment and operation of the improved charging system for the executed MSWM services from the viewpoints: “polluter pay principle” requirements, uniform charging system for MSWM services based on uniform criteria; development of the fee invoicing and collecting system in 2 phases (by MSW collectors and /by communities (or on behalf), reimbursement of contractors for executed services and execution of efficient enforcement mechanisms and procedures. -Formation of regional funds (earmarked surcharges, environmental taxes) for re-investments in new waste management infrastructure.			x	x	x		
E 2.2	<i>Cost recovery for MSWM services – regional demonstration project</i>	MoEPP, MoF, regionally joint municipalities (MSWM C), waste collectors	Pilot implementation and testing of charging system for cost recovery of MSWM services	-Assessment of direct/indirect charging; standardised accounting system; -Set-up the methodology and criteria for setting fees/tariffs; management of funds and setting financing/co-financing criteria and conditions. -Adaptation of the existing fee collection /payment system, testing of the 1 <sup>st</sup> phase with regard to relations: MSW collectors - regional MSWM company – contractors for executed services (transfer stations, recovery of waste, landfill or other disposal service in waste management chain). - Establishment of regional fund for financing WM investments by means of local landfill surcharges and of the control system.		x					
E 2.3	<i>Financing of investments</i>	MoEPP, MoF, MoH	Provision of funds for financing investments	Establishment of the system of earmarked national and local (regional) funds including the central hot spot remediation fund, assuring of financial sources; setting criteria and provision of links to international credit funds, to investors and donors, CO <sub>2</sub> credit links, warranties;		x	x	x	x	x	
<b>E 3</b>	<b>Financial / economic instruments</b>										
E 3.1	<i>Financial/economic instruments for investment in MSWM facilities</i>	MoEPP, MoF, regionally joint municipalities (= MSWMC);	Implementation of disposal fee+ surcharges system related to investments in MSW infrastructure	- Setting-up and implementation of disposal fee and earmarked surcharges system (non-compliant landfills) to improve the investment ability of the joint municipalities and to divert the MSW streams from the non-compliant landfills. - Use of selected earmarked taxes in re-investment cycle of WM facilities. - Financial assistance from the national budget for investment in regional MSWM facilities; provision of payment warranties.			x	x			
E 3.2	<i>Financial/economic instruments for operation of HW and non-HZ WM system</i>	MoEPP, MoF, manufacturing/ service sector, agriculture; importers	Use of the earmarked taxation of chemicals and hazardous constituents in products and of the finally disposed waste	-Earmarked taxation of selected chemical products (mineral oil, hazardous and toxic chemicals) and on selected end-of-life products, and of surcharges on disposed waste from the manufacturing/service activities; -Reimbursement of paid taxes/surcharges for executed investments in the new management facilities and industrial “hot-spot” remediation. -Incentives for use of biodegradable material for the electricity production.		x	x	x	x	x	
E 3.3	<i>Financial/economic instruments for operation of WM</i>	MoEPP, MoF, manufacturing sector, trade,	Implementation of the earmarked taxation for special waste streams	Earmarked taxes as constituents of the product selling prices used for financing of management of selected waste streams according to “compliance schemes”, (implementation of “producer’s responsibility”			x	x	x	x	

	system for special waste	importers		principle.						
	MEASURES	STAKE- HOLDERS	ACTIVITIES	SCOPE OF MAIN TASKS	YEARS OF IMPLEMENTATION					
A	Stakeholders and public awareness				1	2	3	4	5	6
<u>A 1</u>	<i>General public awareness</i>									
A 1.1	<i>General informative communications and rising public awareness</i>	MoEPP –PRO,	General communication activities and rising public awareness	- Designing of general communication strategy based on the identified waste issue, on the present behaviour of waste generators, on the set goals, on the necessary activities and individual target groups and on analysis of socio-psychological and political features of population. - Providing public information on environmental problems, on critical waste issues in Macedonia and on solutions to stop /mitigate the impact on environment and on public health (environmental reports and publications, dissemination of informative and educational material on waste issues in public media, round-tables, cost / benefits information, school programmes on environmental issues...).	x	x	x	x	x	x
<u>A 2</u>	<i>Communication to production sector</i>									
A 2.1	<i>Industrial waste generators</i>	MoEPP –PRO, industrial and other waste generators form production	Communication activities related to behaviour of waste generators	-Providing information to waste generators and other stakeholder in waste management by performing discussions and informative workshops on obligations related to legislation, IPPC requirement, on remediation of environmental burdens located on their assets and on all other HW and non-HZW issues, and by giving opportunities /accepting feed-back. -Elaboration of the communication programmes for individual waste generators, which shall accompany realisation of necessary investments. -Selection of communication tools and implementation of communication programmes adapted to the selected target groups.	x	x				
						x	x	x	x	x
<u>A 3</u>	<i>Public awareness and participation</i>									
A 3.1	<i>Regional level</i>	MoEPP –PRO, municipalities, MSWMCs, all stakeholders in the regions	Communication activities and public relations in implementation of regional MSWM projects	-Preliminary investigations and definition of the communication problem on specific local levels (perception analysis, identifications of possible objections and constrains as well as their sources, identification of target groups and major players on local level) -Elaboration of main communication programme and carrying out campaigns by clarifying the characteristic waste issue for individual MSWM region, organisation of round tables and presentations of proposed organisational and technical solutions, costs, improvements with regard impact to the living, water and natural environment, benefits and opportunities for affected population from the viewpoint of lower fees for WM services, employment, infrastructure, public health, ...		x	x	x		
								x	x	x
A 3.1	<i>Demonstration project for selected region</i>	MoEPP –PRO, municipalities, MSWMC, other stakeholder in the WM region	Communication activities and public relations in implementation of demonstration regional MSWM project	- Elaboration of the preliminary investigations and the pilot public awareness / public communication programme as a constitutive part of the regional MSWM project. - Carrying out all phases of the public relation campaigns by monitoring the success indicators and performing necessary correction.	x					
						x	x	x	x	x

## 7. INDICATORS OF MONITORING OF THE NATIONAL WASTE MANAGEMENT PLAN (2009 - 2015)

The NWMP 2009 - 2015 represents the initial stage of the establishment of an integral waste management system, which is a long-term process. The needs and circumstances in Macedonia related to wastes management issues certainly will change, in particular after the start of negotiations for full membership of EU. It is therefore important that the implementation of the National Waste Management Plan (2009 - 2015) is continually monitored and regularly reviewed to ensure that the objectives, adopted implementation measures and underlying assumptions are still valid and appropriate, and that the time scales for achieving compliance with both European and national legislation and targets are set and implemented.

The MoEPP receives data and information through the planned national waste management information system on a regular basis. It is evident from the proposed plan of activities that many waste streams and the corresponding management options shall be assessed from the technological, spatial and financial side in more detail because of the new input data which have recently been acquired by means of the first reports of waste generators.

In the context of NWMP 2009 - 2015 implementation period, the requirements for monitoring and reviewing will arise in the following main ways:

- **Implementation of policy and legislation** – the extent to which the national legislation is successfully aligned with *acquis communautaire* and the extent to which the measures and policies set out in the NWMP are implemented in practice.
- **Establishment and strengthening of the institutional / organisational structures and arrangements** to the extent which exhibit a clear horizontal and vertical division of obligations, tasks and responsibilities, which enable organisational reforms related to the MSW management on a regional level and which assure known and controlled management of all generated waste streams.
- **Strengthening the role and human and technical capacities** of the central WM administrative and enforcement institutions of all stakeholders involved in waste management practice – to the extent of which the adopted regulations, plans and programmes and investments may be realised in time set in the NWMP.
- **Establishment of the network of the technical waste management facilities and closure/remediation of landfills** - the extent and realisation dynamics to which the investments in the technical infrastructure and systems for the collection/treatment/disposal of waste as well as the closure/remediation of the non-compliant or abandoned landfills meet the main objectives of the NWMP.
- **Results of implementation** – the results achieved in terms of the attainment of the qualitative objectives and partly quantitative targets in the NWMP.

Having in mind the main groups of tasks, which require implementation monitoring and reviews, the MoEPP will monitor implementation of the NWMP (2009 - 2015), as well as wider developments in the field of waste management. Special attention will be given to progress in the following tasks:

- Reduction of environmental hazards, risks and pollution associated with waste management activities on the municipal level and with activities of the manufacturing, service and trade sector, by means of the functionally linked administrative, monitoring and enforcement institutional system.

- Waste management planning, preparation of technical, environmental and financial documentations needed for investment activities in new waste management systems and facilities.
- Implementation of the planned waste management activities related to the technological alignment of the manufacturing sector to the requirements of the IPPC directive.
- Approaching to the full cost recovery for executed WM services and rising of funds for financing of investments in the WM infrastructure by means of earmarked revenues, disposal fees, and surcharges.

Macedonian society is recently becoming generally more concerned about environmental issues; however, the fundamental shifts in social attitudes and behaviour required to bring about major and sustainable improvements in waste management have yet to occur. Monitoring of the successfulness of communication to the public and to all stakeholders in the society on waste issues is complex and each task needs specific indicators of success. Individual waste management projects and, in particular establishment of the regional MSW management projects will need the design of some special information and communication measures and positive participation of the public; successful realisation of such projects may be the only real indicator of the final success.

Summary reports on the progress achieved in implementing this NWMP shall be prepared and published at 1-year intervals. The NWMP (2009 - 2015) shall be reviewed and updated at 3-year intervals.

## 8. ANNEXES

### 8.1 List of abbreviations

AbP	Animal by-Products
App.	approximately
ADR	Accord europeen relatif au transport international des marchandises Dangereuses par <b>Route</b> " (European agreement on the international carriage of dangerous goods on road)
BAT	Best Available Technique
C&D	Construction & demolition waste
CARDS	Community assistance for reconstruction, development and stabilisation
Cd	Cadmium
Cont.	continuation
Cr(VI)	Chromium(VI)
EAR	European Agency for Reconstruction
EIA	Environmental Impact Assessment
EL product	End-of-Life product
ELV	End-of-life vehicles
EMAS	Environmental Management Audit Schemes
eq.	Equivalent
ERDF	European Region Development Fund
EU	European Union
EU/EIONET	European Environment Information and Observation Network
EWC	European Waste Catalogue
GDP	Gross domestic product
HDPE	High density polyethylene
Hg	Mercury
HZ	Hazardous
HZWM	Hazardous Waste Management
IFI	International Funding Institution
IPPC	Integrated Prevention and Pollution Control
ISO	International Standard Organisation
IPA	Instrument for Pre-Accession Assistance
LIBOR	London Interbank Offered Rate
MBT	Mechanical biological treatment
MAFWE	Ministry of Agriculture, Food and Water Environment
MeW	Medical Waste
MoE	Ministry of Economy
MoF	Ministry of Finance
MoEPP	Ministry of Environment and Physical Planning
MoES	Ministry of Education and Science
MoFA	Ministry of Foreign Affairs
MoH	Ministry of Health
MoIA	Ministry of Internal Affairs
MoLSG	Ministry of Local Self Government
MTC	Ministry of Transport and Communication
MFSU	Manufacturing, Formulation, Supply, and Use
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management

MSWMC	Municipal Solid Waste Management Company
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organisation
Non-HZ	non-hazardous
NWMP	National Waste Management Plan
NWMS	National Waste Management Strategy
OECD	Organisation for Economic Cooperation and Development
O.G. of RM	Official Gazette of Republic of Macedonia
Pb	Lead
PCB	Poly-Chlorinated Biphenyls
PCT	Poly-Chlorinated Terphenyls
PET	Polyethylenetherephtalate
P&PW	Packaging and Packaging waste
PRO(office)	Public Relation Office (MoEPP)
PPP	Public Private Partnership
PSP	Private Sector Participation
PVC	polyvinyl chloride
RCV	Refuse Collection Vehicle
RID	<b>R</b> eglement <b>I</b> nternational concernant le transport des marchandises <b>D</b> angereuses par chemin de fer (International regulations concerning the international carriage of dangerous goods by rail.)
TA	Technical Assistance
EIB	European Investment Bank
WEEE	Waste Electric and Electronic Equipment
WM	Waste Management
WMD	Waste Management Department
WtE	Waste-to-Energy
Zn	zink