

FEASIBILITY STUDY

project “Waste management systems - shared experience and good practices in BG-SR cross-border region” (WASTE), Bulgaria-Serbia IPA Cross-Border Cooperation Program, priority axis ‘1: Development of small-scale infrastructure, key area of intervention ‘1.2: Infrastructure concerning environmental issue’

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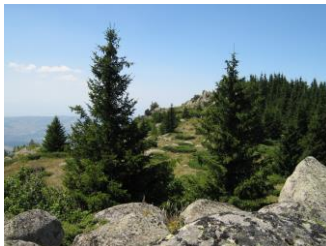


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This Feasibility Study is developed within the project “Waste management systems- shared experience and good practices in BG-SR cross-border region” (WASTE), which is granted under Bulgaria-Serbia IPA Cross-Border Cooperation Program, priority axis ‘1: Development of small-scale infrastructure, key area of intervention ‘1.2: Infrastructure concerning environmental issue’. The team of experts involved in the preparation of the study according on their professional experience analyzed in detail the characteristics of the system of waste management in the region of Pernik and draw conclusions that will support the preparation and implementation of similar projects in Republic of Serbia. The indicated recommendations comply with the experience of Republic of Bulgaria as an EU member country. Also they are in line with EU legislation and the principles for building of systems for waste management. The study has the following scope:

1. Regional system of waste management in the region of Pernik - Brief History (ISPA and OPE)

In the past before the political changes in Bulgaria Pernik region is an administrative center of the heavy industry. The population is concentrated in the main town and regional center – Pernik. There are some smaller towns as satellites of the industrial center- Bresnik, Radomir, Trun, Zemen and some bigger villages.





Location

Pernik region is situated in Western Bulgaria. The region borders Sofia city on the East, Serbia on the West, Sofia region on the North and South-east and Kjustendil region on the South. Pernik region includes the following municipalities: Breznik, Zemen, Kovachevtsi, Radomir and Trun. The administrative and economical centre is Pernik.

Relief

Pernik Municipality is situated in the hollow of the same name, which is distinguished by its well-developed foot, as well as with the predominant development of high terraces. The hollow's floor is of a hilly nature. The Struma River and its tributary, the Konska River, drain it. The southern side of the Ljulin Mountain and the western flank of the Vitosha Mountain draw to the North and to the East the orographic boundaries of the hollow. These are separated by the Vladaja defile (890 meters above sea level). The adjacent Breznik Hollow through a low elevation - the Usoitsa Ridge, bound the hollow to the West (780-810 meters above sea level), and Golo Bardo, which is split by the Struma gorge below the Krakra region.

The hollow's relief is highly varied. The southern slopes are slant and bare, while the northern slopes are steeper and covered with vegetation.

The town of Pernik itself has a linearly developed structure. It is situated primarily in the lowlands along the Struma River.

Climate

The climate in the region has four seasons- the summer is warm but not hot while the winter is very cold. The spring is breezy and with great number of rainfalls- it begins at the end of March or at the beginning of April while the autumn is more warmer. Foehn winds are typical for the spring and autumn.

The regions near mountains Vitosha, Lyulin, Golo Bardo and Lyubash / in the regions of Rudartsi, Kladnitsa, Studena, Pernik and etc./ has wetter climate with more numbers of rainfalls.

When there are Western or South-western winds, which are prevalent, foehns is observed on the Northern slopes of Golo Bardo. It is most typically observed in springtime.

The number of foggy days in the year is relatively large - about 28.8. There are about 2.5 foggy days in the warm half of the year and about 26.3 in the cold half.

Precipitations are of a markedly continental nature. They play an important role in the process of pollution and self-purification of the atmosphere. The amount of precipitations, along with the relatively low summer temperatures, are the main causes for the summer droughts being less severe than in the lowlands of Northern and Central Bulgaria. The average yearly precipitations amount is 550 to 606 mm. The average precipitation amount for each season is, as follows: Spring - 162 mm., summer - 165 mm., autumn - 152 mm., winter - 128 mm. May is the most humid month of the year. March is the month with least precipitations amount.



The comparatively large precipitation amount is a favourable factor for the self-purification of the atmosphere. However, it decreases the diffusion and leads to an increased burden on the soil and the surface waters.

Pernik is situated along the upper course of Struma river. The climate in the region is temperate-continental. The soils are mainly alluvial-meadow. The town is 30 km far from the capital Sofia at the main cross-road Sofia-Thessaloniki-Skopje. It occupies an area of 2390.5 sqkm, representing 2.1% from the country's territory. In administrative aspect the region has 171 populated settlements, including 6 towns and 164 villages, distributed in six territorial municipal administrations: Pernik, Radomir, Breznik, Zemen, Trun and Kovatchevtzy.

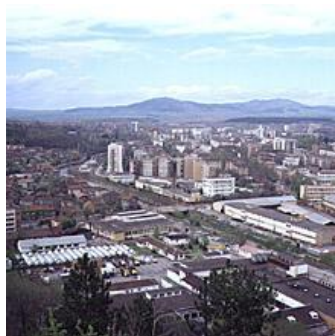
Population

The density of population is 68 people per sqkm at an average 76 people for the country. The population of the region is 156 561 people, from which 76 893 men and 79 668 women, differentiated in 60 183 households. Mostly, the population 74.1% lives in the towns. From the total number of population 24 935 or 15.9% are below the active age, 87 569 or 55.9% are in active age and 44 057 or 28.2% are over the active age.



Infrastructure

Pernik is located at one of the oldest trade roads on the Balkan Peninsula, which is the shortest way from the Danube to the Aegean region. The railroads Sofia-Blagoevgrad-Petrich, Sofia-Kjustendil-Gjueshevo, Sofia-Volujak-Pernik as well as the E-79 highway have crucial economic importance for the region.





Economy

In economy, all branches of the material production are practiced, as a leading role has the iron and steel metallurgy- 46.5% from the total sales of industrial products, power and thermal energy - 15.1%, machine-building and metalworking industry -12.8% etc. In the region's territory variety of productions are creating. Here coal are mined, different steel profiles, universal technics, weak current transformers, electronic elements-magnets and ferrite, different kinds of glass and cement are produced. The production of ready-to-wear cloths and different types knitted goods is practiced. In the town of Pernik is the only plant in the Balkan Peninsula for production of pectin, parallelly in production of fruit concentrate , pasteurized juices and nectars.

Problems of the territory in waste treatment are the same like in Bulgaria and have serious development in last then years and we have to underline three periods – the period till 2003 / pre-accession period/, period 2003-2007 / period of accession /, period 2007-2013 / period of function of Operational Programm for environment/ and now is going next period 2014-2020/ second perod of function of Operational program for environment/.

Different periods in development of the environmental protection, connected with the EU partnership, could be described, as:

1. Pre-accession period till 2003

- Survey of the actual status of the problem with waste treatment and its impact to the environment of Bulgaria
- Identify the main target of the problem's decision
- Risk assessment of the existing dumps for waste dispasal all over the country
- Survey of leading technical and managemet's decisions
- Survey of specialized designer companies, leading in environmental designing
- Political arrangement of potential cooperation between Bulgarian and leading companies
- Arrangement of studies of the problems with waste management in Bulgaria
- In this period was prepared report for the design investigation for construction of six typical regional landfills in Bulgaria



2. Period for accession 2003 – 2007. This is a period for function of program ISPA for Bulgaria as partnership with EU under the administration from European commission. In this period could be mentioned the follows activities and problems:

- Contracting of the frame of the implementation of ISPA program as main ruling document for the procedures with listed projects
- Using of the high quality designers for the implementation of the procedures of project in priority areas of ISPA program and especially for projects in environmental area
- Determining of the real projects, which will be proceeded under ISPA
- Preparing of the procedures for implementation of the projects in environmental area – waste treatment, treatment of waste waters for regional centres- procedures for preparation of tender documentations, manuals for the implementation of tenders, different forms for implementation and monitoring of the implementation and others.
- Based on the mentioned above study for technical and economical searching of the local and state status and conditions for landfills, design process was arranged with specialized cooperation between Bulgarian and Danish companies, including special training in Danish. Designs were prepared on the base of EU valid requirements for designing – technical norms.
- For the treatment of waste were suggested next principles for the realizations, as:
 - Regional principle for measures for waste treatment
 - Establishment of system for waste treatment, searching all processes of waste collection, waste transport, waste treatment
- Following these principles, some regional associations / especially for the first projects, including Pernik, were established
- A team of designers, who could be used in next phases of projects development were trained in foreign company
- All manuals, instructions, forms and other documents were consulted with the EC
- With supporting of the EU Delegation in Sofia a tender for the supervision in accordance with standard EU procedures and FIDIC regulation was proceeded and foreign company with special experience in construction of landfills for non hazardous wastes.
- A team from the Ministry of Environment and water, who was employed for the administration of contracts of ISPA measures was trained and taught in many courses, using different manners of training
- The whole process of implementation was under the permanent observing from EC



- All of technical and juridical norms were adopted and actualized with norms of EU
- National plan for regionality of the waste treatment with pointed of 56 regional landfills was approved
- In accordance with this plan some Assotiation in regions were established
- Similar Assotiation was established for Pernk, Breznik, Zemen, Kowatchevci, Radomir and Trun with leading munipality – Pernik.
- All necessary steps for the design approvals and contracting of all contracts for project implementation, were done on time and costruction of the landfill was started.
- With decision of EC, based on the difficulties with property of the plot for the landfill, the construction was blocked and contarcts -cancelled.
- Summarized:

The period of pre-accecion was time for the teaching of the teams of all partners in the process of realization of program's targets

The period was time for real preparation of the projects for implementation.

The period was very important, because many of technical norms and practice, were implemented in first projects, and after that were harmotyzed with legislation

The period was base for the next Operational program for environment 2007-2013.

1.1. PROJECT MANAGEMENT SCHEME

According to the signed agreements, the CF regulation (ex-ISPA) measure 2000/BG/16/P/PE/002 Set of 5 regional waste disposal sites located in Montana, Ruse, Sevlievo, Silistra and Sozopol in Bulgaria is implemented under the jurisdiction of the following authorities:



EUROPEAN COMISSION



MINISTRY OF FINANCE



NATIONAL ISPA COORDINATOR



MINISTRY OF ENVIRONMENT AND WATER – EMPLOYER



SECTORAL AUTHORIZING ISPA OFFICER



STEERING COMMITTEE



BILATERAL AGREEMENTS BETWEEN MOEW AND MUNICIPALITIES



MUNICIPAL AMDINISTARTIONS OF LEADING MUNICIPALITIES



REGIONAL MUNICIPAL ASSOCIATIONS FOR LANDFILL’S USAGE



The management of the Employer was supported by Steering Committee for which is established according to the Program's conditions.

Important participants in the project implementation are the municipal administrations. Following accepted model and distribution of responsibilities in Bilateral Agreements between MoEW and municipal associations in respective regions on territorial principle, the administration in municipalities have the following obligations:

- To arrange the surveys for geological and hydro geological data appointed plot, where will be constructed the further landfill. Results from analyses, presented in reports, have to be submitted to the Ministry and Design Company for basic data in project preparation.
- To submit correct information to the Designers and consultants about the status of the waste management in their region, that will be incorporated in further regional system for waste management.
- To organize all procedures for acquisition of ownership of sites, defined for plots for construction of regional landfills.
- To request all basic data and sign contracts for arrangement of supply infrastructure.
- To assist the Employer in preparation and proceeding of designs in accordance with Territorial Structural Act.
- To participate equally in all events during the implementation of projects on site
- To arrange the organization of further operation of regional landfill
- To adopt their programmes for waste management in accordance with activities and operation of regional landfill



- To organize closure of non-legal dumpsites after starting exploitation period of new regional landfill
- To assist Meow for implementation of recultivation activities for closure of existing dumpsites, which is part of scope of work on approved Financing Memorandum
- Participation in Steering Committees and having an opinion on questions regarding activities of project development

2. Options considered in the feasibility studies

3. Staging and design solution in the construction process. Review of the management of waste:

- Cells for disposal of non-hazardous waste;
- Treatment facilities clean and infiltrated water;
- Gas drainage system;
- Transport links (internal and external);
- Plumbing - external and site;
- Power supply - external and site;
- Installations for separation and composting

The total project budget is 21 467 427.26 BGN from which - 16 262 683.35 BGN (the European Regional Development Fund), 2,869,885, 30 BGN (national co-financing), 2 334 858.61 BGN (Pernik Municipality). It must be completed till the end of 2014.

It is planned to be constructed landfill and build installations for separation and composting of green waste. With the construction of the landfill will solve the serious problem of waste management and will support the introduction of a modern integrated system for their management in the region of Pernik, corresponding to the requirements of the Bulgarian and European legislation. Artist of the object is a union "Trace - Corday - Pernik."



Regional landfill will serve Pernik, Radomir, Breznik Zemen, Kovachevtsi and thorns. The composition of the six municipalities include 170 locations. The allotted land is located next to the old redundant pool of Pernik near neighborhood Teva.

The planned site of 140 acres is a stove, derived from the spoils deposited in the overburden of the mines. The terrain is a non-draining negative earthly form, filled with powerful layer of heterogeneous soils (reverse mining fill) of a different nature, but with great presence of marl, which in contact with water lose all physical and mechanical properties.

On site there would be groundwater fed by rains, but mainly from neighboring water saturated embankments. This involves continuously pumped drainage both during construction and during operation. For this purpose designed integrated drainage system that discharges into a pumping station, water outlet into a water existing gully second category 1km - Moczynski dere.

For proper operation of the landfill are provided: farmyard, 4 cells for the disposal of non-hazardous waste treatment facilities clean and infiltrated water, gas drainage system, transport links, water and sanitation, electricity supply, installation hall separation of MSW and composting installation of "green" waste.

Planned to be built modern facility that meets the requirements of environmental protection and contribute to the ecological balance in the region. The landfill will be equipped with a special drainage system for leachate, which will leads to the WWTP. Capture the resultant biogas will be built gas drainage system in the process of filling and the final reclamation.

System for surface insulation layer will consist of a layer of gas drainage impermeable layer (compacted clay layer and geosynthetics) drainage system and a layer of reclamation. To avoid pollution of surface waters in the operation of the landfill and to prevent damage to the facility itself, surface water will drain out and diverted landfill through channels for surface water. It is envisaged that the reception area is equipped with biological treatment plant for waste water.

Based on information gathered from third-annual reports to RIEWs all municipalities quantity and composition of MSW and after accidental measurements generated BO in Pernik and Radomir, the estimated amount of BO in the region for the period 2013 to 2040 was approximately 46 thousand . tons / year. Supplied by a common BO annual average will spend about 8 thousand tons / year. recycled materials and about 2.9 thousand tons / year. green waste to be composted in appropriate facilities, built on a site.

The measure implements one of eight axes of the National Waste Management Programme (NWMP) elaborated in March 1998 by the Bulgarian authorities. The Programme contains an action plan covering legislative, institutional and investment measures. The plan identifies performance objectives, responsible institutions and potential sources of financing – national and international (EU instruments, international financial instruments, bilateral agreements with Member States, etc.).



Generally, waste disposal in Bulgaria has been carried out without much consideration for environmental impact. In the municipalities included in this measure the capacity of the existing waste disposal sites will soon become totally exhausted. For the landfilling activities it is essential to take account of the state of environment and human health.

The main objective of the measure is to achieve a solid waste management in full compliance with EU and Bulgarian Regulations and thus avoid potential environmental damages from landfills.

The project includes construction of 6 regional landfills as these for Montana, Pernik, Sevlievo and Silistra shall be located at existing sites, while the landfills for Ruse and Sozopol will be built up at new sites.

The leachate will be collected and treated locally before being discharged to the municipal sewage systems (except in Sevlievo and Ruse). In Sevlievo the leachate is collected and directly discharged to the municipal sewage system. In Rouse the leachate is collected and then re-circulated to the landfill. Biogas will be collected and flared in a torch, thus reducing the environmental impact.

Total population served by the 6 landfills is estimated at 567,000 and the municipal waste volume is some 714,554 m³ for the year 2000. The life span for the sites varies between 20 and 25 years.

In Sevlievo and Rouse separate disposal cells for hazardous waste are included.

The expected environmental impact is generally not quantified, but the impact of the new sites is considered insignificant concerning emissions to soil, ground and surface water, in comparison to the existing ones.

There will also be a significant improvement concerning emissions to the atmosphere for the five sites where the biogas is collected and either burned or flared.

The measure relates to the “Environment-friendly waste disposal” objective which is one of the priority objectives of the National Waste Management Programme.

Through the successful implementation of the project the following results have been achieved:

- Clean and healthy environment;
- Rational use of the available resources;
- Integrated waste management for the target regions;
- Prevention and reduction of generated waste;
- Reuse and recycling;
- The organization of waste collection and transportation;



- Environmentally-friendly disposal of waste;
- Minimization of the risk from past pollution with waste;
- Legal regulation of waste management;
- Public participation;
- Improving monitoring systems and information for collection and control.

For Pernik region some plan for Study and technical and economical / financial/ search was prepared. More of necessary parameters for further invests are calculated, and after achieving of acceptable results, construction of Regional waste treatment system was agreed. Chance for Municipalities of Pernik was option to use EU funds trough ISPA Program with signing of Financial memorandum fo the project.

For implementation of the project, next ground steps and stages, were organized:

1. Identification of the real problem and necessity of construction of Regional system for the waste treatment.
2. Adoption of all of technical norms, requirements from EU to Bulgarian legislation in environmental area and in waste treatment area.
3. Arrangement of principles for waste collection and waste treatment, which will be valid for project, and real parameters of the function, physical and financial indicators, national goals, that have to be achieved with the project.
4. Arrangement of potencial financial sources and conditions for financing of the measure. Searching of specific requirements, procedures, manner for implementation, manner for management of the implementation, forms and others.
5. Preparation of feasibility Study for the project with next more important parts:
 - a. Identification and location of the further system



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- b. Statistic analysis for the population, inhabitants of towns and villages, type of the relief, industrial parameters, trends for population in different sections, and others

- c. Analysis of existing status of waste treatment, as:
 - i. Organization of waste collection of non-hazardous waste

 - ii. Transport of the collected waste to the waste disposals

 - iii. Observation of the function of regional disposal-status, waste quantities, waste treatment on site

 - iv. Separate waste collection as different flows in waste treatment system – collection, preparation for transport, transport, recycling of the separated materials and others

 - v. Treatment of the placed in disposals waste and environmental protection

 - vi. Legislation of the waste system by control institutions and observing system

 - vii. Analysis of financial parameters of existing system – fees, taxes, investments,

 - viii. Technical investigation of potential territories for arrangement of new regional landfill, as:



1. Determination of potencial plots, which could be used for the purpose as property, infrastructure, status for usage of the plot for construction
2. Geodetical survey of the hall plot. Geological and hydro-geological survey of yhe plot.
3. Preparation of the initial design with the determined parameters with calculation of the potencial costs for invests. For Pernik region ware investigated on the first stage / ISPA Program/ construction of large waste landfill.
4. Procedures for approval of the design according vald lows, procedures, ordinances, for acception of Permit for construction.
5. Preparation of documentations for public procurement for implementation of the works and other activities according to the Financial memorandum.
6. Preparation of implementation of other conditions, which have to be followed for organization of Regional Assotiation from sewerl Municipalities in region according to the National plan for management of the waste with Region Pernik. For Regional system members of assotiations are Pernik town, Breznik town,Radomir town, Trun town, Kowachevtzi, Zemen,
7. Organization of the management system of the project according to the EU requirements, standard practice, FIDIC conditions, public procurement norms, accreditations of Agency in MOEW e.t.c.
8. Implementation of the project with next ground activities:
 - a. Apointment of main contractor for the construction of the landfill and for delivery of the equipment



- b. Appointment of Supervisor according to FIDIC conditions
- c. Appointment of Technical assistance for the implementation of the works
- d. Procedures for taking over of the project
- e. Procedures for finalizing of the projects

The present survey is not aiming to carry out thorough analysis of the compliance of the Bulgarian legislation with the EU legislation but it has for an object to familiarize the municipal administrations with the main requirements that should be taken into account in planning and organization of waste management activities within the territory of the municipalities. In that respect EU directives that are falling out of the scope of the present project activities are also described. The survey covers the following directives:

- Directive 75/442/EEC on waste;
- Directive 91/689/EEC on hazardous waste;
- Directive 91/157/EEC on batteries and accumulators containing certain dangerous substances.
- Directive 94/62/EC on packaging and packaging waste;
- Directive 1999/31/EC on landfill of waste;
- Directive 2000/53/EC on end-of-life vehicles.

Directives 75/439/EEC, 86/278/EEC and 2000/76/EC relevant to the processes of planning and control on municipal or regional level or regulating the operation of waste disposal facilities are surveyed in addition.

The EU legislative requirements in the field of transfrontier shipment of waste, disposal of polychlorinated biphenyls (PCBs) are out of the scope of the survey because the corresponding national legislation does not impose obligations and responsibilities for the municipal administrations. The requirements for municipal and hazardous waste incineration¹ currently in force are included in the analysis as far as within these regions there are no

¹ Directive 89/429/EEC on the reduction of air pollution from existing municipal waste-incineration, Directive 89/369/EEC on the prevention of air pollution from new municipal waste incineration plants, Directive 94/67/EC on the incineration of hazardous waste



existing facilities falling into the scope of the above mentioned legislation. The plans for construction of new facilities for waste incineration should be in conformity with the requirements of the new Directive 2000/76/EC on incineration of waste.

The responsibilities of the municipal mayors and municipal administrations for implementation of the national waste management legislation are identified in the framework of the survey. Despite the fact that the present project refers only the management of municipal waste the survey includes the regulations affecting indirectly municipal administration in regard to their duties for organization and control over the management of construction waste and some specific waste streams. Special attention is paid to the legislative texts requiring establishment of procedures and planning on municipal level. Concrete technical requirements toward facilities and installations for recovery or disposal of waste are not examined in the framework of this survey as far as there are no such requirements clearly specified in the respective legal acts.

The survey covers also the provisions of Local Taxes and Fees Act and Municipal Budgets Act in relation to the planning and the procedures for financing of the costs for municipal waste management on municipal level.

General waste management principles

The European waste management policy is laid out by the Community strategy for waste management. The general principles of that Strategy are laid down by the Framework Directive 75/442/EC on waste² and the supplementing Directive 91/689/EEC on hazardous waste. The framework legislation is further developed by two types of daughter directives. The first group lays down the requirements for permitting and operation of the waste disposal facilities and installations. The other group treats specific waste streams as used oils, packaging waste and used batteries.

The waste is considered by the Strategy as a source of pollution of growing importance. The appropriate waste management policy should lead to conservation of natural resources as well as to protection of the quality of life. The following general waste management principles are presented on European level:

- **Waste management hierarchy.** Waste prevention and reduction of their hazardous properties shall be considered as first priority. Where this is not possible the waste shall be reused, recycled, regenerated or incinerated with energy recovery. Priority should be given to the recovery of materials from the waste comparing to energy recovery. As a last possibility the waste must be disposed in a safe for human health and environment manner (for example by incineration or landfilling).
- **Self-sufficiency.** Member states should establish in cooperation with other member states integrated and adequate system of waste disposal facilities and installations.

² Everywhere in the text numeration of the respective directives does not specify their subsequent amendments



- **Best available techniques not involving excessive costs (BATNEEC).** The emissions from the installations into the environment should be reduced as much as possible and in an economically effective manner.
- **Proximity.** The waste should be disposed in one of the nearest sites from the place of generation.
- **Polluter pays.** The costs for waste management should be covered as much as possible by their producers.
- **Producer responsibility** for the products put on the market.

Directive 75/442/EEC on waste

Requirements of the Directive

The Directive lays down the framework for regulation of waste disposal on a member-state's national level. The Directive provides for legal framework for prevention, management and disposal of waste by stipulating general terminology and definitions. It requires that the member-states shall ensure waste recovery or disposal without risk to human health or damage to the environment.

The Directive sets a hierarchy of the waste management principles by which the member-states are obliged to encourage waste prevention and the content of hazardous substances in the waste by development of clean technology, improvement of the product quality and the disposal technologies used. Along with that member states should encourage waste recovery by means of recycling and incineration with energy recovery.

Member-states should prohibit the abandonment, dumping or uncontrolled disposal of waste.

The Directive requires the national competent authorities to draw up waste management plans covering waste types, quantity and origin and identification of appropriate methods and disposal facilities. The plans should specify the institutions and organizations engaged, expenditures envisaged and the measures for encouraging of collection, separation and treatment of the waste.

It is required the national competent authorities to establish procedures for issuing of permits and for control over the enterprises for recovery or disposal of waste.

In accordance with the "polluter pays" principle the waste holder or the previous holder should take the costs for disposal of waste. Member states should guarantee that every holder of waste is handled by specialized company for collection and subsequent recovery or disposal of waste.

The Directive involves establishment of adequate administrative system on national, regional or local level.



National legislation transposing the Directive

The requirements of the Directive are transposed into the Bulgarian legislation by the Waste Management Act. In addition the following secondary legislation stipulates specific requirements and procedures for the implementation of the Directive:

- Order No RD-323 from 1998 of the Minister of Environment and Water and the Minister of Health on classification of waste
- Regulation № 10 from 1998 on procedure for filling out of report and information documents for the waste management activities
- regulation № 11 on the conditions and requirements for the construction and operation of municipal waste disposal facilities and installations
- Regulation № 12 from 1998 on the requirements which must be met by the waste treatment facility sites
- Regulation on the treatment and transportation of industrial and hazardous waste (adopted by Council of Ministers Decree № 53 from 1999)

The national legislation sets out definitions for waste, producer, holder, waste recovery and waste disposal.

Permit or registration regimes are introduced for all waste management activities including for recycling and treatment of waste in facilities owned by the waste producer. The Waste Management Act stipulates the procedures and the competent authorities – MEW, the Regional Inspectorates of Environment and Water (RIEW) – responsible for issuance of the permits or registrations for waste management activities.

It is also adopted a National Waste Management Program covering the period 2003-2007 and it envisages concrete measures for improvement of waste management on national level. This National Program identifies the problems and describes the main tendencies in generation and treatment of municipal, construction, industrial and hazardous waste in Bulgaria. It also lays out the main strategic objectives in the field of waste management on national level. An Action plan is drawn up specifying the necessary short and long term measures, the responsible institutions and the necessary financial resources for ensuring of the implementation of the Program.

The municipalities and the companies that carry out waste management activities (including the waste producers) are obliged to draw up Waste Management Programs in accordance with “Instructions for the scope and the content of the Waste Management Programs” approved by MEW. The programs drawn up by companies should be presented to the RIEWs for approval and the RIEWs control their implementation.



The European Waste Catalogue³ is adopted as a national waste classification.

An obligation for registration and reporting of the quantities of municipal, construction, industrial and hazardous waste generated or treated is laid down.

Problems related to the implementation of the requirements of the Directive

The requirement for disposal of waste without risk to the environment and the human health makes no distinction between the existing facilities (including the facilities out of operation) and newly constructed facilities. The implementation of this requirement entails significant financial expenditures for adapting into compliance and/or closure of the existing facilities and installations. This problem affects mainly the existing landfills for municipal waste (ref. 1999/31/EC).

Waste collection and disposal are considered as non-profit as far as the municipalities because of social reasons are not able to adapt the level of the local fees in compliance with the real expenditures necessary for ensuring the collection and disposal of waste. Despite the fact that the municipalities have the necessary authority and power they do not undertake the necessary actions for improvement of waste management on the territory of the municipalities. It is expected that the state and external sources to continue to subsidize waste disposal by means of grant funds. The implementation of the legal requirements necessitates the municipal waste fees to be increased considerably. It is necessary to be taken into account that the increase of the fees will lead to significant improvement in waste management activities not until several years after the new fees are imposed.

The implementation of the requirement for construction of integrated⁴ and adequate network of disposal installations for disposal entails considerable investments in the sector. Moreover there is lack of capacity for recovery or disposal of some types of hazardous waste. Besides the main part of the existing facilities and installations (waste landfills, incinerators, recycling enterprises) are constructed during 70s and 80s and as a whole are not in compliance with the modern technical standards. The construction of new facilities and installations needs to be done in short terms⁵ (3-10 years) which do not allows uniform allocation of the investments for a long period of time. Even assuming that the construction of the facilities will be provided for financially it is technically hardly realizable for the period till 2007.

The change towards regional facilities for disposal of the municipal waste will increase significantly the costs for waste transportation and will require investments for new equipment for collection and transportation of waste.

The NIMBY syndrome additionally impedes the construction of new disposal facilities.

³ The national waste classification corresponds to Decision 94/3/EC and Decision 94/904/EC. In the survey of the national legislation the waste are classified in accordance with these Decisions. The amendment of Ordinance RD 323 and introduction of Decision 2001/118/EC is planned for 2004.

⁴ Integrated within the European Community

⁵ Shorter than the term of operation of the respective facility



Likewise there is no developed manufacture of the necessary facilities, installations and equipment for waste treatment in the country or the existing manufacture is not enough or do not fulfills the modern requirements (containers, waste collection and transportation equipment, containers for storage and transportation of hazardous waste, materials used in landfills construction, installations for waste incineration etc.). The main part of the investments will be for imported equipment.

The requirement every holder of waste to be handled by specialized company for disposal of waste necessitates the existing system for waste collection to be expanded. The implementation of this requirement will entail additional expenditures for special waste collection and transportation equipment.

The existing waste collection and transportation equipment is rather old and its renovation will entail significant expenditures. The existing manufacturing of waste collection and transportation vehicles is not competitive.

There is no system for collection and disposal of wide spread hazardous waste in the country. No one municipality is invested financial resources for establishment of such system. (see Directive 91/689/EEC on hazardous waste.

The requirement for applying of waste management hierarchy⁶ necessitates the introduction of additional preferences and incentives for encouraging of waste recycling. Currently there are no such measures. The lower price for landfilling of waste makes the separate collection, recycling or incineration with energy recovery ineffective because of the significantly higher costs for these operations. The implementation of this requirement will entail additional costs because the landfilling is much cheaper treatment method comparing to the incineration and recycling.

Since there is not enough administrative capacity the permit regime for waste disposal activities established by Reduction of the Harmful Impact of Waste to the Environment Act and subsequently by Waste Management Act is not enforced effectively.

Significant part of the waste management experts in the municipalities and in the companies are not acquainted with the requirements of the national and European legislation in details and do not have the necessary information for planning of the waste management activities.

Directive 1999/31/EC on landfill of waste

Requirements of the Directive

The Directive stipulates measures, procedures and rules aiming to prevent the negative impact on the environment and the risks to human health arising from the landfilling of waste.

⁶ Prevention > Reuse and Recycling > Recovery > Energy recovery > Landfilling



The Directive classifies the landfills as landfills for hazardous waste, landfills for non-hazardous waste and landfills for inert waste as well as it specifies the types of waste that can be landfilled.

The Directive requires each member-state to apply strategy for reduction of biodegradable waste going to landfills. The strategy sets up concrete quantitative targets for reduction of the quantity biodegradable municipal waste going to landfills. In long term perspective not later than the 15th year from the adoption of the national legislation the strategy should ensure the reduction of the quantity biodegradable waste going to landfills to 35% of the total amount (by weight) of biodegradable municipal waste produced in 1995. The Directive allows the postponement of the attainment of the targets for those countries which in 1995 put more than 80 % of their collected municipal waste to landfill.

Member states are obliged to ensure that the landfills for waste are located, constructed and operated in accordance with the standards applicable.

The Directive prohibits the landfilling of liquid waste, hospital and other infectious waste, waste which, in the conditions of landfill, is explosive, corrosive, oxidising, highly flammable or flammable and used tyres. The waste mandatory should be pre-treated before landfilling.

The Directive introduces an obligation for acceptance of waste only if it is in accordance with specific criteria and procedures including checks and documentation. The Directive does not allow the delusion or mixing of waste solely in order to meet the waste acceptance criteria.

There are specific requirements that should be observed for issuance of permit for construction and operation of landfills of waste as the following:

- the management of the landfill site will be in the hands of a person who is technically competent to manage the site;
- submission of adequate financial security guaranteeing the management and closure of the landfill site;
- the landfill project is in line with the national waste management plan referred to Directive 75/442/EEC on waste.

The Directive specifies the requirements for monitoring and the procedures for closure of the landfills for waste.

Requirements are laid down for draw up of conditioning plans for the existing landfills for waste.

National legislation transposing the Directive

The requirements of the Directive are partially transposed into the Bulgarian legislation by the Waste Management Act, Regulation № 12 on the requirements which must be met by the



waste treatment facility sites and Regulation №13 from 1998 on the conditions and requirements towards the construction and operation of waste landfills.

The national legislation in practice introduces all technical requirements toward landfill base, bottom and top layers, drainage system, gas drainage system and the closure of the landfills. The requirements of the Directive are applicable for all newly constructed landfills for waste.

Problems related with the implementation of the requirements of the Directive

The closure of the existing landfills will entail considerable financial resources but currently there are no financial mechanisms in the country that can ensure the implementation of the legal requirements. The problem is related with the expansion of the existing waste collection and transportation systems. Currently in considerable part of the small settlements there are no organized waste collection and transportation systems.

In large part of the municipalities there is not enough administrative capacity for control over the landfills located on the municipal territory.

The implementation of the requirements for minimal charge for landfilling will entail considerable increment of the waste disposal costs. The requirement for financial security made by the landfill operators will involve additional difficulties for the municipalities and the companies. The amount of the financial security should cover all costs for closure, rehabilitation and monitoring of the landfill.

Currently there are no installations in operation (incl. Composting, biogas production, incineration) that can allow the reduction of the quantities biodegradable waste. The attainment of the quantitative targets referred in the Directive entails change in the organization of municipal waste collection and will require additional financial sources for construction of facilities and installation for separation and organic recycling.

The pre-treatment of waste before landfilling is not mandatory only after prescription by the competent authorities. The fulfillment of this requirement for municipal waste (for example separation, packing in bales etc.) also will entail additional costs.

The prohibition for landfilling of used tyres requires establishment of a system for collection and providing for appropriate conditions for their treatment or recovery⁷.

The requirements for monitoring of leachate, surface and ground water are not implemented in practice.

There is a necessity of training in all levels – competent authorities (municipalities), landfill operators.

⁷ It is assumed that the product charge for tyres covers the costs for implementation of the system for collection and recovery and the problem should be solved on national level



Obligations for the municipalities arising from the national waste management legislation

The obligations of the municipal mayors are stipulated by the new Waste Management Act that repealed the Reduction of the Harmful Impact of Waste on the Environment Act (RHIWEA)⁸, adopted in 1997.

The present survey includes the obligations arising from the secondary legislation adopted during the period 1998 – 2001 in the field of waste classification, requirements for the sites and the treatment and disposal facilities and the requirements for the specific waste streams. Despite the fact that this secondary legislation is adopted on the basis of the RHIWEA already repealed they are in force till the adoption of the respective secondary legislation under the Waste Management Act as far as they do not contradict to the new Act.

In addition to the legislation specialized in waste management field the requirements of the Local Taxes and Fees Act and Municipal Budgets Act are taken into account in regard to the determination of the amount of municipal waste fees and the rules for spending of these fees.

Waste Management Act⁹

General requirements

The Waste Management Act stipulates the general requirements for protection of the environment and the human health from the activities connected with the production, storage, collection, transportation, recovery and disposal of waste. The Act regulates the environmentally sound management of the waste as a combination of rights, obligations, solutions, actions and activities related with the waste production and treatment as well as the various forms of control.

The Act sets different requirements for the different waste depending on their properties and origin. For this purpose the following waste classes are defined – municipal¹⁰, industrial¹¹, construction and hazardous¹² waste.

Waste management hierarchy is laid down that sets as:

- first priority – prevention of waste,

⁸ Promulgated in State Gazette 86 from 30.09.1997 amended State Gazette 56 from 22.06.1999 amended State Gazette. 27 from 31.03.2000 amended State Gazette 28 from 4.04.2000 repealed

⁹ Promulgated in State Gazette 86 from 30th of September 2003.

¹⁰ "Municipal waste" shall be the waste resulting from the activities of people at homes, in administrative, social and public buildings. Included here shall be also waste from commercial establishments, craftsmanship activities, recreational and entertainment facilities, which are not hazardous and at the same time, their quantity or composition shall not obstruct their treatment together with municipal waste;

¹¹ "Construction waste" shall be the waste resulting from construction activities on construction sites, and also waste from demolition or reconstruction of buildings and facilities.

¹² "Hazardous waste" shall be the waste whose composition, quantity and properties create risks to the human health and the environment, and is defined as such under the Convention for Control of Trans-boundary Movement of Hazardous Waste and its Disposal (Basel Convention).



- second priority - recovery of waste by means of recycling, re-use or reclamation secondary raw materials, or energy;
- third priority – final disposal by landfilling or incineration for this waste that their generation can not be prevented and/or that can not be recovered.

The waste management hierarchy stipulates the obligations for use of waste as an alternative raw material and energy source thus contributing to preservation of primary natural resources.

Art. 6 of Waste Management Act obliges the waste holders to submit the waste for collection, transportation, recovery or disposal to persons authorized for carrying out of the respective activities and also prohibits the abandonment, illegal discharge and uncontrolled incineration or other method of waste disposal.

According to Article 16, paragraph 1 from Waste Management Act the municipal mayor provides for every holder of municipal waste to be handled by person that has concluded written contract following the order of Public Procurement Act.

The provisions of paragraph 3 from the same Article specify the responsibilities of the municipal mayor related to:

- providing for equipment for storage of municipal waste – containers, bins etc.;
- collection of the municipal waste and its transportation to the landfills and other waste disposal facilities and installations;
- cleaning of the streets, alleys, parks and green areas;
- selection of site, construction, maintenance, operation and monitoring of the landfills for municipal and construction waste or other municipal and construction other waste disposal facilities and installations;
- separate collection of municipal waste including packaging waste only by specifying the places where the necessary elements from the system for separate collection and sorting of packaging waste have to be located;
- organization and application of system for separate collection of used luminescent lamps and other lamps containing mercury;
- organization of the activities for collection and storage of end-of-life vehicles on the sites for temporary storage;
- prevention of the tipping of waste on places where this is not allowed and prevention of the creation of illegal dumpsites;
- determination of the places for change of waste oils and informing of the public;
- determination of the places for putting of containers for collection of used batteries.



The municipal mayors determine the route for transportation of construction waste and the facility/installation for their treatment.

Permitting and registration of the waste activities

According to Article 37, paragraph 1 from the Waste Management Act the permits for the activities of disposal and/or recovery of municipal, construction and industrial non-hazardous waste have to be issued by the Director of the Regional Inspectorate of Environment and Water except for the cases when Integrated Prevention and Pollution Control Permit is required.

The permits for activities with hazardous waste have to be issued by the Director of the Regional Inspectorate of Environment and Water for all activities. In the case of transportation of waste collected from the territory of the whole country the transportation is limited only to sites located on the territory of one Regional Inspectorate as well as for the transportation of waste collected on the territory of one Regional Inspectorate the transportation is limited to objects located on the territory of the whole country. In case that the activities with hazardous waste are carried out on the territory of more than one Regional Inspectorate the permit has to be issued by the Ministry of Environment and Water.

In addition to the above mentioned requirements according to Article 7 from the Waste Management Act the persons applying for construction permit together with the documents listed in Article 144, paragraph 1 from the the Territorial and Urban Development Act should present information about the quantity and the type of the industrial and hazardous wastes that are expected to be produced after the realization of the investment project. Paragraph 3 from the same Article prohibits the issuance of permit for use of buildings without permit for waste activities in case such permit is required.

Permits are no required for collection, transportation and temporary storage of non-hazardous waste and for commercial activities with waste from ferrous and nonferrous metals. For the activities of collection, transportation and temporary storage of non-hazardous waste the Director of the Regional Inspectorate of Environment and Water where the activities are located issues registration document in accordance with a form approved by the Minister of Environment and Water.

The above mentioned requirements repeal the provisions of Article 37, paragraph 1, 1st indent from RHIWEA that were in force till the end of 2003. According to these provisions the permits for carrying out of activities of collection, transportation, storage or disposal of construction and municipal waste had to be issued by the municipal mayors on which territory the activities are carried out. Despite this fact the provisions for permit issuance affect directly the municipal administrations because in some cases the municipality is the owner of disposal facilities and installations or employer of activities that require permit under Article 37 from Waste Management Act.

The municipality should stop and prohibit the operation of the facilities for construction and municipal waste that do not have the respective permit. The municipal mayor should arrange



for application for issuance of permits for disposal or recovery of municipal or construction waste for all facilities located on the territory of the municipality.

Expenditures for waste management

Article 33 of the Waste Management Act stipulates that the costs for waste treatment and transportation should be borne by the waste holders. In specific cases the costs for treatment may be covered by the persons that put on the market products, which after use generate wide spread waste.

In addition Article 9 of Waste Management Act requires that all costs for rehabilitation of the damages to the environment should be reimbursed by the real waste producer. When the real producer is unknown the costs for restoration of the environmental quality shall be borne by the waste holders. The persons concerned may receive aid by the municipality following the order specified in the municipal regulations referred in Article 19 of the Waste Management Act. In case of pollution with hazardous waste such aid may be received following the order specified in the Rules for the structure and the activities of the Enterprise for Management of Environmental Protection Activities.

On a annual basis with the State Budget Act by proposal of the Minister of Environment and Water purposive funds are allocated for construction of facilities and installations for treatment of municipal, wide spread and hazardous waste as well as for cleaning and rehabilitation of sites polluted with waste.

Facilities and installations for waste treatment constructed or being constructed with financial resources provided for by the State Budget Act or other national or international funding have to be used in compliance with the measures set in the Action Plan of the National Waste Management Program. In case of offense of this requirement the municipalities reimburse the funds from the State Budget or international instruments to the Enterprise for Management of Environmental Protection Activities.

Municipal regulations

Article 19 of the waste Management Act obliges the Municipal Councils to adopt regulations in order to stipulate the order and conditions for discharge, collection, including separate collection, transportation, transfer, recovery and disposal of municipal, construction and wide spread waste on their territory, as well as the payment of the respective services following the order of Local Taxes and Fees Act.

Waste management programs

Article 29, paragraph 1, 1st indent obliges the municipal mayors to draw up and implement waste management programs. These programs are an integral part of the municipal programs on environment and should be draw up, adopted and reported following the order of Chapter



V of Environmental Protection Act. The programs should cover period not shorter than 3 years and should be reviewed in case of change in actual or legal conditions.

The waste management programs plan measures for attainment of the following objectives:

1. reduction or limitation of the waste generation and reduction of its hazardous properties;
2. recycling, regeneration or other forms of recovery;
3. environmentally sound disposal;
4. cleaning of past waste damages.

The programs must include:

- analysis of the state and a prediction of the type, properties and quantities of waste generated and pending treatment;
- goals, stages, and deadlines for their implementation;
- methods and facilities for treatment or safe storage;
- description of the specialized treatment installations and of the areas appropriate for waste treatment;
- scheme of waste flows transfer towards the treatment facilities;
- waste management decisions specific for the respective area or facility ;
- financial resources for the implementation of the program ;
- measures for construction of disposal or recovery facilities on sites located as near as possible to the source of waste production and by use of most appropriate methods and techniques;
- plan for adaptation into compliance with the requirements of the Act and the secondary legislation of existing waste disposal installations and facilities containing concrete measures, financial resources and deadlines for implementation;
- measures for treatment of biodegradable waste with the purpose of reducing their quantity and restricting their landfilling;
- co-ordination with other programs related to the activity;
- system for reporting and control of the implementation;
- result evaluation and program updating system;



- information related with the persons authorized and responsible for the management of the waste.

Representatives of public environmental organizations are allowed to take part in the process of elaboration of the municipal waste management programs. The municipal mayor makes the municipal waste management program accessible to the public.

The facilities for treatment and storage of waste, the specialized installations for treatment as well as the sites suitable for waste treatment must be specified in the the Territorial and Urban Development Plans.

The waste management programs shall be drawn up and adopted within 1 year from the entry into force of the Waste Management Act. The programs adopted by virtue of Article 28, paragraph 1 from the RHIWEA are in force till the expiration of their term but not later than 3 years after the entry into force of the Waste Management Act.

The provisions of Article 17, paragraph 1 from the Waste Management Act also have direct connection with the preparation and the actualization of the municipal programs as far as it obliges the persons that dispose of municipal and construction waste to inform the municipal mayor not later than two years before filling up of the landfill volume or before the expiration of the operational term of the installation. The municipal mayor shall take necessary actions for location of new site and construction of new facility and/or installation or to organize the disposal of waste together with other municipalities on a regional basis.

Reporting¹³

The persons that carry out treatment of municipal and/or construction waste are obliged to keep report books certified by the Regional Inspectorate of Environment and Water. The order and the forms for reporting of waste management activities shall be specified by Regulation of the Minister of Environment and Water coordinated by the Minister of Regional Development and the Minister of Health.

The annual report for the implementation of the municipal waste management programs shall be presented to the respective RIEW till 31 March next year.

Waste management control

According to Article 92 of the Waste Management Act the municipal mayor or officials authorized by the mayor control:

1. the activities related to the generation, collection, including separate collection, transportation, recovery and disposal of construction and municipal waste;

¹³ Additional requirements for reporting and documentation of the activities with municipal and construction waste are described in the section for Regulation No 10 / 1998



2. the landfilling of industrial and hazardous waste and the implementation of the programs for management of these types of waste;

3. the fulfillment of other requirements specified by the municipal regulations on the order and conditions for discharge, collection, including separate collection, transportation, transfer, recovery and disposal of municipal, construction and wide spread waste.

The municipal mayor organizes and controls closure, rehabilitation of the sites and the subsequent monitoring of the landfills located on the territory of the respective municipality.

Administrative offenses and penalties

The offenses from Article 104 to Article 114 of the Waste Management Act with exception of Article 119 shall be ascertained by means of statement by the Director of the Regional Inspectorate of Environment and Water or officials authorized by the Director as well as by officials authorized by the mayor of the respective municipality. The ascertainment of the offenses, the issuance, the appeal and the correction of the penalty decrees should observe the order of the Administrative Offenses and Penalties Act.

Article 35, paragraph 2 stipulates that in the budget of the funds from the fines and the sanctions are collected in the municipal budget in case the penalty decrees are issued by the municipal mayor. These funds should be spent only for waste treatment projects and facilities.

Some measures and reviu e of the system for separate collection of waste.

According to Article 11, paragraph 2 of the Waste Management Act the producers and the importers of packed goods are responsible for separate collection of the waste generated after the consumption of these goods as well as for the attainment of the following recycling and recovery targets:

1. between 50 % as a minimum and 65 % as a maximum by weight of the packaging waste should be recovered.
2. between 25 % as a minimum and 45 % as a maximum by weight of the totality of packaging materials contained in packaging waste should be recycled with a minimum of 15 % by weight for each packaging material.



These targets have to be attained gradually in accordance with the following terms:

№	Year	Minimal target [% by weight]		
		recovery	recycling	
			total	by packaging material
1.	1.01.2004 – 31.12.2004	20		
2.	1.01.2005 – 31.12.2005	25		
3.	1.01.2006 – 31.12.2006	32		
4.	1.01.2007 – 31.12.2007	39	25	15 (12% for plastic waste)
5.	1.01.2008 – 31.12.2008	42	30	15 (14% for plastic waste)
6.	1.01.2009 – 31.12.2009	45	35	15
7.	1.01.2010 – 31.12.2010	48	40	15
8.	After 2010	50	25	15

According to Article 36, paragraph 1 of the waste Management Act, the persons that put on the market products that after use generate wide spread waste have to pay product charges.

The amount and the order for payment of the product charge for the packaging put on the Bulgarian market will be regulate by a Council of Ministers Decree. The producers and the importers of the packed goods may not pay product charge in case that they present to the Minister of Environment and Water proofs that they fulfill their obligations for separate collection and recovery of packaging waste.

The producers and the importers of packed goods may fulfill their obligations:

1. individually, or
2. by collective systems represented by Recovery Organization.

In the case of individual fulfillment of the obligations the producers and the importers of packed goods as well as all their distributors, including the persons that sell the products to



the final consumers are obliged to take back the waste generated after the consumption of the products at the point of sale or at other appropriate place

In the case of fulfillment of the obligations by collective systems the Recovery Organization should obtain permit by the Minister of Environment and Water following the order of Chapter V, Section IV of the Waste Management Act.

Together with the application for the permit for Recovery Organization it is necessary to be applied preliminary written contracts concluded with persons possessing permits or registration documents for collection and transportation of waste or contracts with municipalities for fulfillment of the above mentioned obligations for recycling and recovery.

The waste management program drawn up by each Recovery organization has to include:

- plan containing terms (by years) for conclusion of contracts with municipalities and the minimal population that will be served by packaging waste separate collection systems in accordance with the recycling and recovery targets;
- measures for collection of packaging waste from households, administrative, social and public buildings, commercial places, catering establishments and recreation centers.

Obligations of the municipal administrations in relation with the organization of separate collection and recovery of packaging waste

The draft Regulation on packaging and packaging waste¹⁴ envisages joint responsibility between municipalities and the producers and the importers of packed goods for implementation of systems for collection and sorting of packaging waste generated on the territory of the respective municipality.

Separate collection, transportation, sorting and recovery of packaging waste have to be carry out by persons possessing the respective permits or registration documents issued following the order in Chapter V, Sections I and II or license for commercial activities issued following the order of Chapter V, Section III of the Waste Management Act on the basis of contracts concluded with:

1. the respective municipality or
2. manufacturing enterprises or
3. Recovery Organization.

¹⁴ The report is prepared on the basis of the draft Regulation on packaging and packaging waste from 22.10.2003 r.



Separate collection and sorting of packaging waste from households, administrative, social and public buildings, commercial places, catering establishments and recreation centers have to be organized on the basis of contract between Recovery Organization and the respective municipality. In the contract it has to be specified:

1. type of the packaging waste collected and the conditions for organization of separate collection and sorting of packaging waste including the containers, transport means, sorting sites etc.;
2. requirements for the quality of the sorted materials and the methods for their treatment before their transportation for recovery or recycling;
3. the amount of the costs that the Recovery Organization pays to the respective municipality for organization of separate collection and sorting of packaging waste and their transport to the final recycling or recovery enterprises;
4. obligation of the respective municipality to present annually information to the Recovery Organization for the quantity packaging waste collected and sorted (in tons) as well as the quantities of packaging waste recycled or recovered.

The following additional provisions may be included in the contract:

- expected quantity and type of waste included in the system;
- property rights on the packaging waste collected by the respective systems;
- rights and obligations of the parties for establishment and operation of the systems for separate collection of packaging waste including:
 - right of payment for services rendered;
 - right of payment for the quantity and quality of the packaging waste collected;
 - determination of the temporary storage sites for collection of the packaging waste covered by the system;
 - financing of the system including the initial investments and the operational costs;
 - financing and organizing of campaigns for the public and pilot projects.
 - the way for determination of the actual contractor that will carry out the collection of packaging waste. It should be selected in observation of the requirements of the existing legislation for public procurement especially the Public Procurement Act and the other normative acts regulating this matters;
- control and accounting of the contract implementation;



The organization of separate waste collection for each of the regions within the scope of the project requires assessment of different scenarios of organization and technical solutions as mentioned above it depends on large number of variable factors.

With a view to take into account as much as possible number of solutions, for the preparation of the proposals for collection of waste in the different municipalities, the team working on the project made an effort to develop software model which allows accounting of various task variables.

For each of the settlements in the 6 regions with population over 10,000 inhabitants three scenarios for organizing of separate collection with subsequent separation and recovery of the waste have been analyzed:

Scenario 1 → Collection against payment by system of buying back centers;

Scenario 2 → Collection by waste delivery for free by plastic bags at the source of generation;

Scenario 3 → Collection by containers for the different packaging materials

Comments for the types of the waste and requirements for operation of landfills:

Ordinance № RD-323 Dated 10 August 1998 of the Minister of Environment and Water and the Minister of Health on classification of waste¹⁵

The Ordinance determines the classification of waste pursuant to §1, item 1 of the RHIWEA according to a list of waste in Annex №1. The list of waste is drawn up in compliance with the European Waste Catalog (EWC), adopted by Decision 94/3/EC.

The different types of waste are defined by the six-digit code for the waste and the respective two-digit and four-digit chapter headings.

The types of waste have to be considered in the context of the chapter they pertain.

If a substance or an object presents in the list, it does not mean that this substance or object is a waste under all circumstances. A given substance or object is a waste solely, when it corresponds to the definition of waste, given in paragraph 1, item 1 of the Additional Provisions of the RHIWEA considered hazardous shall be:

¹⁵ Promulgated in State Gazette No 120 from 1998



The waste designated with a “*” are waste included in the European Hazardous Waste List, according to Decision 94/904/EC.

In accordance with Article 2, paragraph 4 of Directive 91/689/EEC on hazardous waste with the “**” sign are designated waste that might hazardous properties. The same are determined through expert assessment on the basis of the hazardous waste catalog in force in the country till 1998 (adopted by Council of Ministers Decree No 153 from 1993 on collection, transportation and disposal of hazardous waste).

The municipal waste is classified in the 20th chapter of the Waste List as follows:

Code	Name
20.00.00	Municipal wastes and similar commercial, industrial and institutional wastes including separately collected fractions
20 01 00	separately collected fractions
20 01 01	paper and cardboard
20 01 02	glass
20 01 03	small plastics
20 01 04	other plastics
20 01 05	small metals (cans etc.)
20 01 06	other metals
20 01 07	wood
20 01 08	organic compostable kitchen waste (including frying oil and kitchen waste from canteens and restaurants)
20 01 09	oil and fat
20 01 10	clothes
20 01 11	textiles
20 01 12	paint, inks. adhesives and resins*
20 01 13	solvents*
20 01 14	acids**



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20 01 15	alkalines**
20 01 16	detergents
20 01 17	photochemicals*
20 01 18	medicines**
20 01 19	pesticides*
20 01 20	batteries
20 01 21	fluorescent tubes and other mercury containing waste*
20 01 22	aerosols
20 01 23	equipment containing chlorofluorocarbons
20 01 24	electronic equipment (e.g. printed circuit boards)
20 02 00	garden and park waste (including cemetery waste)
20 02 01	compostable wastes
20 02 02	soil and stones
20 02 03	other non-compostable wastes
20 03 00	other municipal waste
20 03 01	mixed municipal waste
20 03 02	waste from markets
20 03 03	street cleaning residues
20 03 04	septic tank sludge
20 03 05	end of life vehicles

Despite the fact that the following chapters are out of the scope of the present project we consider that the municipal administration should pay special attention to these types of waste in case of amendments of the municipal waste management programs:



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17 00 00	Construction and demolition waste (including road construction)
17 01 00	concrete, bricks, tiles, ceramics, and gypsum based materials
17 01 01	concrete
17 01 02	bricks
17 01 03	tiles and ceramics
17 01 04	gypsum based construction materials
17 01 05	asbestos based construction materials
17 02 00	wood, glass and plastics
17 02 01	wood
17 02 02	glass
17 02 03	plastics
17 03 00	asphalt
17 03 01	asphalt containing tar
17 03 02	asphalt (not containing tar)
17 03 03	tar and tar products
17 04 00	metals (including their alloys) ¹⁶
17 04 01	copper, bronze, brass
17 04 02	aluminum
17 04 03	lead
17 04 04	zinc
17 04 05	iron and steel
17 04 06	tin
17 04 07	mixed metals

¹⁶ The conditions and the order for commercial activities with ferrous and non-ferrous metals, as well as their export are regulated by the Council of Ministers according to §11 of RHIWEA



17 04 08	cables
17 05 00	soil and dredging spoil
17 05 01	soil and stones
17 05 02	dredging spoil
17 06 00	insulation materials
17 06 01	insulation materials containing asbestos*
17 06 02	other insulation materials
17 07 00	mixed construction and demolition waste
17 07 01	mixed construction and demolition waste

Other chapters of waste concerning the planning on municipal level:

02 00 00	Waste from agricultural, horticultural, hunting, fishing and aquaculture primary production, food preparation and processing
02 01 02	animal tissue waste
02 01 03	plant tissue waste
02 01 04	waste plastics (excluding packaging)
02 01 05	agrochemical wastes*
02 01 06	animal feces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site
02 01 07	waste from forestry exploitation
02 07 00	Wastes from the production of alcoholic and non-alcoholic beverages (excluding coffee, tea and cocoa)
02 07 02	wastes from spirits distillation
03 01 00	Wastes from wood processing and the production of panels and furniture
03 01 02	sawdust
03 01 03	shavings, cuttings, spoiled timber/particle board/veneer



10.01.00	Wastes from power station and other combustion plants (except 19 00 00)
10.01.02	coal fly ash
13.01.00	waste hydraulic oils and brake fluids
13.01.08	brake fluids*
13.02.00	waste engine, gear & lubricating oils
	(all types)
18.00.00	waste from natal care, diagnostics, treatment or prevention of decease in humans
	(all types)
19 08 00	wastes from waste water treatment plants not otherwise specified
19 08 01	screenings
19 08 02	wastes from desanding
19 08 03	grease and oil mixture from oil/waste water separation*
19 08 05	sludges from the treatment of urban waste water
19.09.00	wastes from preparation of drinking water or water for industrial use
19.08.01	solid wastes from primary filtration and screening
19.08.02	sludges from water clarification

Regulation № 11 on the conditions and requirements for the construction and operation of domestic waste disposal facilities and installations¹⁷

This Regulation sets out the requirements for construction and operation of domestic waste disposal facilities and installations, including those for:

- thermal disposal (incineration, pyrolysis etc.);
- domestic waste composting;
- domestic waste recycling;

¹⁷ Promulgated in State Gazette No 152 from 1998



- other domestic waste disposal and treatment methods.

The municipality should ensure the implementation of the requirements of the Regulation in its capacity of employer of the waste treatment activities or as owner of the facilities or the installations for waste disposal.

The technical requirements of the Regulation should be taken into account during the elaboration of municipal waste management programs including during the planning of the expenditures for their implementation.

Regulation No 13 on the Conditions and Requirements towards the Construction and Operation of Waste Landfills¹⁸

This Regulation shall set forth the requirements towards the construction and operation¹⁹ of landfills for storage of domestic, construction, industrial and hazardous waste.

According to Article 1, paragraph 2 waste landfills classified under the following classes:

- hazardous waste landfills;
- non-hazardous waste landfills;
- inert waste landfills.

Article 3, paragraph 1 prohibits the landfilling of:

- liquid waste;
- waste emitting an unpleasant odor;
- incompatible waste;
- waste which in the conditions of landfill are explosive, corrosive, oxidizing, flammable, highly flammable or combustible within the meaning of Order No. RD-322 from 1998;
- hospital and other clinic waste from health establishments and veterinary services defined as infectious within the meaning of Order No. RD-323 from 1998;
- hazardous waste which does not match the parameters, listed in Annex No.1, Table 1 of the Regulation.

According to Article 6, paragraph 1 the acceptance of the waste in the different classes of landfills in observance of the following requirements:

¹⁸ Promulgated in State Gazette No 152 from 1998

¹⁹ Only the requirements for landfill classification, restrictions for landfilling of specific types of waste and the requirements toward the existing landfills.



- only hazardous waste may be disposed in hazardous waste landfills;
- NON-HAZARDOUS WASTE LANDFILLS SHALL BE USED TO DISPOSE:
 - municipal waste;
 - non-hazardous industrial waste;
- inert waste landfills shall accept inert waste only.

The provisions of Article 8, paragraph 1 stipulate that the landfill operator shall be responsible for the waste disposal operations. According to paragraph 3 from the same Article the management of waste landfilling operations shall be carried out under a waste management program, adopted by the operators of facilities and installations.

The waste management programs adopted by the operators shall be in compliance with the objectives and tasks of the corresponding municipal program and the National waste management. In case that landfill is located within the territory of service more than one municipality and/or serve more than one municipality, the waste management program shall be coordinated with all municipalities involved.

In accordance with Article 45 the operation of all existing landfills at the time of entry into force²⁰ of this Regulation should be stopped in case the following conditions are not met:

- within one year of the entry into force of this Regulation they have failed to erect a fence, provide for security, mark off the landfill territory with signs and signals and set up waste entry-point control;
- within two years of the entry into force of this Regulation the landfill operator has not drawn up and submitted for approval by the competent environmental and water authorities a conditioning plan for adapting of the landfill with this Regulation. To this plan a landfill reconstruction design shall obligatorily be attached;
- an Environmental Impact Assessment for the landfill reconstruction design has not been commissioned within the terms under subparagraph 2;
- the measures in the plan under subparagraph 2 and the landfill reconstruction design are not planned for implementation up to 5 years from the entry into force of this Regulation.

The requirements for closure of the landfills are stipulated in Chapter VI of the Regulation.

The provisions of Article 43 require that the closure of the landfills should be carried out under a preliminary prepared plan and the main phases in this plan have been specified in the landfill design. The plan for landfill closure includes the following activities:

²⁰ 1st of January 1999



- dismantling of the durable facilities which are not related with environmental protection or to the future functional designation of the terrain ;
- the surface isolation liner of the landfill including the technical and biological land restoration, anti-erosion and anti-land slide operations.

Article 44 obliges the landfill operator to control and monitor the parameters for 30 years period after the stop of operation of landfill in accordance with the monitoring system specified in Annex 3.

Some comments about the survey of waste generation

The determination of the content and properties of municipal solid wastes (MSW) is a basis for selection of method, facilities and equipment for their disposal and recycling options. It is the basis for their management.

One of the tasks of the present project is to carry out representative study for determination of the content and properties of municipal solid waste on the territory of six regions – Montana, Pernik, Russe, Sevlievo, Silistra and Sozopol and on this basis an optimized systems for waste collection (including separate collection) and transportation to be developed in these six regions.

Subject to the present project are 16 municipalities that are grouped in 6 regions for regional waste management. The number of the settlements in these 16 municipalities is 313, which are:

- 134 settlements - with population up to 200 inhabitants;
- 162 settlements - with population between 200 and 3 000 inhabitants;
- 11 settlements - with population between 3 000 and 25 000 inhabitants;
- 5 settlements - with population up to 100 000 inhabitants;
- 1 settlement - with population up to 100 000 inhabitants.

Totally 307 settlements or 98% of all settlements included in the project fall into the category of settlements with less than 25 000 inhabitants. More detailed information is presented in Table 1.



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Table 1 – Allocation of the settlements depending on their population

№	Municipality	Population	Number of settlements (by number of inhabitants)							
			up to 200	up to 1 000	up to 3 000	up to 10 000	up to 25 000	up to 50 000	up to 100 000	above 100 000
1	Berkovitza	22 664	11	6	2		1			
2	Lom	35 077		5	4			1		
3	Montana	61 422	1	19	2			1		
4	Breznik	8 532	27	7		1				
5	Pernik	104 625	8	7	8				1	
6	Russe	178 379		4	5	2				1
7	Slivo pole	12 912		4	5	1				
8	Ivanovo	11 092		6	4	1				
9	Sevlievo	43 099	20	22	5			1		
10	Dryanovo	11 705	44	3		1				
11	Silistra	61 942	7	7	2	2		1		
12	Kaynardja	5 467	6	6	3					
13	Alfatar	3 990	3	3	1					
14	Sozopol	14 227	1	7	4	1				
15	Tzarevo	10 229	5	7	1	1				
16	Primorsko	4 079	1	2	1					
Total inhabitants		589 441								
Total settlements		313	134	115	47	10	1	4	1	1



Up to now there were no systematic and thorough studies of the waste generation rate, morphological content and the specific weight of the MSW. For small settlements with population less than 25 000 inhabitants there are no similar studies. From the 16 municipalities included in the project only for Pernik there are studies, carried out in 1999 and for Lom – carried out under the guidance of the company ENTEC in 2001.

The data for the quantity of MSW presented by the rest of the municipalities are unrealistic because of the lack of technical resources for measurement. The same information is presented to the National statistics authorities and is used as official information in the field.

This part of the report presents the results from the studies of the different methodologies for assessment of the content and the properties of the municipal solid waste as well as short description of the methodology itself. Detailed presentation of the study, the assessments carried out and the results are presented in a separate volume (No. 2) of the final report of the project.

General conclusions from the survey of the different methodologies

Within the European Union there is no general unified methodology for taking of samples from MSW and methods for determination of their content.

The methodologies existing in Europe and worldwide differ each other by the way of sampling and by the number of the morphologic content components. There are more serious differences in the methodologies for determination of chemical, biological and thermo technical properties but we will not dwell on these differences.

The system of indicators developed by the Communal Economy in Moscow characterizes the properties by allocating them in four groups: (1) physical, (2) chemical, (3) biological and (4) thermo technical.

The physical properties, adopted in most of the countries in Europe are: specific weight, morphological content, fractional content and dampness.

In Poland and some other Central European countries the partition is as follows:

- indicators for composting (organic substances, carbon, nitrogen, phosphorus, potassium);
- indicators for incineration (caloric value, combustible and non-combustible part, aggressive elements, elementary analysis, ash properties)
- total dampness.

In the USA and Canada firstly the total chemical and physical properties necessary for the classification of waste are characterized. The content includes: domestic, commercial and institutional waste; agricultural waste; industrial, metallurgic and special waste. The morphological content is determined per each waste group and afterwards it is averaged.



Taking of homogenized average sample of the mixed urban waste is used as a second method. The sample should be representative by content and quantity. The components of the morphological content that shall be determined are: food waste, yard and garden waste; glass; ceramics; metals; paper; leather; plastics; rubber; textiles; wood; mixed waste. The specific weight is determined for waste in loose and compacted state thus the limit values of the specific weight are determined.

In some other methodologies in EU member states (including the methodology developed by the Spanish company INITEC, which the project team has studied thoroughly) the properties are allocated into two groups: physical and chemical. The physical properties include specific weight, fractional content, dampness, morphological content, calorific value, dampness capacity (adsorption). The chemical properties include: pH, ash content, organic content, gases, carbon, nitrogen, C/N proportion, phosphorus, sulfur, biodegradation.

The difference between East and West European methodologies is basically in the way of sampling. The requirements toward the samples in all countries are the same namely: their content shall correspond to the highest degree to the average content of the whole waste quantity and the dampness of the waste shall be unchanged.

In the East European methodologies firstly initial sample of 30-50 kg is taken and from this sample by the method of quartering average sample of 10 kg is separated. After preliminary fragmentation from the average sample a laboratory sample is extracted of 1 kilogram in weight. The fragmentation of the waste is up to 1-2 mm. The sampling is performed also by quartering. For different laboratory analysis an analytical sample is taken using the quartering method.

According to the Spanish and some other West European methodologies the standard sample is taken by the following stages of selection:

- mixing and homogenization of the waste from different areas by mechanical equipment;
- selection of about 1000 kg. Of this mixture and collection of the rest of the material in containers;
- the selected quantity shall be spread on a flat area as a layer 0.4 m thick in a square form.
- after three quarterings a quantity of 125 kg is achieved that will be used as standard sample for physical analyses.

The determination of the morphological content by analyzing sample of 125 kg is more representative comparing to analyzing of 10 kg average sample. This was one of the main reasons for the project team to propose in its offer for the public tender the use of the Spanish methodology of the company INITEC for the present project activities.

All classes of waste are grouped depending on their content to the following categories:

- **Organic:**



- food waste (remains of fruits, vegetables, meat, fish, spoiled food products, bones etc.);
 - paper (packaging, newspapers, bags, packets, fag-ends etc.);
 - paperboard;
 - plastics (packaging, bottles, bags, plastic boxes, cups etc.);
 - textile (old clothes, rags, wadding, felting, ropes etc.);
 - rubber and leather;
 - garden waste (flowers, leafs, branches, grass);
 - wood materials (saw-dust, chops, wooden pallets etc.)
 - mixed waste (hardly classifiable waste fractions)
- **Inorganic:**
 - glass (glass vessels, bottles, cullet);
 - metals (ferrous, non-ferrous, cans etc.);
 - inert materials(sand, grave, plaster, ceramic waste etc.)

The percentage of each component in the above list – organic and inorganic is determined by the following order:

- An average sample of 125 kg is placed.
- The components are separated manually in accordance with the above mentioned categories. The operator must be instructed in advance how to determine the different categories.
- Each of the classified components shall be placed in a plastic bag and shall be individually weighted. Finally the weights of all identical components are summed and the total weight for the given component is obtained.
- The total weight of each component is divided by the initial weight of the sample /125 kg./. The result multiplied by 100 gives the percentage of the component from the initial sample and the percentage that is expected in the total waste quantity, generated in a given settlement.

In all countries for the determination of the waste quantity the standard waste generation rate is used.

In Germany, Switzerland, Russia and many others it is adopted that the waste generation rate shall be determined every five years. The measurement is carried out monthly in the course of



the whole year. The base indicators for the determination of the waste generation rate are the weight, the volume and the coefficient of twenty-four-hour variations as well as the specific weight. For implementation of experimental measurements the buildings are divided in the following groups:

- Well laid out buildings having water-conduit, sewerage, central heating, natural gas supply. The buildings with litter-conduit are allocated in a separate group.
- Mean laid out buildings divided in two subgroups:
 - having water-conduit, sewerage, central heating and electric cooking-stoves;
 - having water-conduit, sewerage and local solid fuel heating;
- non-laid out having local solid fuel heating without water-conduit and sewerage

For the determination of waste generation rate from the household buildings the waste from minimum 2% of each building types are taken into consideration.

From the public buildings, institutions, small enterprises, commercial shops, restaurants, educational institutions etc. at least 2-3 most spread and typical places are selected per each type.

On the selected places with a purpose of measuring sanitary passport is filled in according to special model. Before dropping of the container or the bin into the waste transportation truck the waste are leveled and the percentage of filling is measured by means of ruler. Afterwards the waste volume is calculated.

The waste generation rate per inhabitant per day in volume units is determined by dividing the total volume of the different waste from a given place by the number of the units accountable and the days between two waste collections.

The waste generation rate in weight units is determined by taking into account of the specific weight. After the determination of the daily rates the monthly rates are determined as well as the specific weight and the coefficients of the variation. The coefficient of maximum variation is determined by dividing of the maximum daily value (by volume and by weight) by the average annual value.

Below it is presented brief description of the approach used for the performance of the waste analyses.

Brief description of the methodology used

The assessment of the waste generation rates, the specific weight and the morphological content of the municipal solid waste shall be performed for:

- settlement with population up to 1000 inhabitants;
- settlement with population up to 10 000 inhabitants;



- settlement with population above 100 000 inhabitants;

The assessment covers 4 seasons in the course of one year. The work begun in 2002 and is divided into 4 main stages (groups of months): March-May, June-August, September-November and December-February. The duration of the measurements in case of everyday waste transportation is assumed to be in course of 7 days, in case of waste transportation within 1-2 days – in course of 10 days and in case of waste transportation once per 10-14 days – 2 times per month.

Some comments for criteria for searching and optimization of the system for collection of the waste.

Criteria

Economic affordability

The affordability analysis of the system should prove that the municipal waste fees collected from the population in order to cover the waste management costs are within the limits of the population affordability. According to data from the World Bank the percentage applicable for such projects amounts between 0,75-1,7 of the average household income. As another reference point may be used the data for the international standard levels for the amount of municipal waste fee defined as 0,5% of the Gross Domestic Product per capita. The revenue part of the municipal budget for waste management will be formed on this basis and taking into account the economic situation in the respective region.

In accordance with EC requirements regarding the “polluter pays” principle the costs for waste management and the cleanness of the settlements should be covered totally by the consumers. These fees are collected in accordance with Local Taxes and Fees Act and Local Self-Government and Local Administration Act. For the population these fees are based on percentage of the taxation evaluation of the property and for the enterprises – according to the number, the type and the frequency of collection of the municipal solid waste containers or on the basis of the balance value of their assets.

The expenditure part of the budget for waste treatment activities is proven by annually developed plan bills approved by the Municipal Council. This document includes the costs for operation and maintenance during the whole waste management process as well as the amortization of the long term assets.

The level of collection of the municipal waste fee is very important and risky. By the meetings with the municipal administrations and according to the data from the tables containing the basic information for the project the fee collection rate in most of the municipalities is between 55 and 70%.

Due to this reason for every individual project balance must be found between the amount and the collection rate of the municipal waste fees.

The fact that for most of the municipalities the determination of municipal waste fees is part of the municipal social policy shall not be underestimated.



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Sustainability of the project in long-term aspect

The waste collection and transportation systems shall be technically and economically reasonable and sustainable in long term aspect. The systems for collection, transportation and pre-treatment of the waste before landfilling established in accordance with the legislation transposing the EU acquires will contribute to the improvement of environmental standards and to the accession of the country to EU. The systems will gradually include activities resulting from the continuously revised legislative requirements and will be spread over territories and objects that were not planned in the initial variant of the systems.

The reorganization and the adaptation of the systems to continuously changing conditions should be done in a manner entailing minimal investments and achieving maximal effect. This means that the activities shall commence using universal, heavy duty, modern technical equipment, meeting the EU standards used for a long time.

In order to guarantee the economic sustainability of the project the municipal waste fee should entirely cover at all time the costs for development, modernization and improvement of the systems. The sustainability means that the waste management systems should be consistent with the progress of the society.

Contribution to the conservation of the natural resources and environmental protection

The waste should not be considered only as polluter to the environment but to be regarded as a source of raw materials and energy.

The waste collection and transportation systems shall reflect the requirements of Directive 94/62/EC on packaging and packaging waste. The measures and the stimulus for promotion of pre-treatment of waste before landfilling introduced on the national level (by the time of project completion) will reduce the waste quantity and the need of new areas for waste landfilling as well as the risk of soil, water and air pollution.

The use of highly effective waste transportation vehicles that meet the requirements for abnormal noise and emissions from engine gases as well as the use of containers that do not allow the pollution of the surrounding areas will contribute to considerable improvement of the state of the environment, especially to the settlements.

The strict control and the positive public opinion about the waste management problems also will play important role for positive change in the quality of the work of the municipal waste management companies and for use of environmentally sound technologies.

Provision of services in conformity with the law

Full compliance with the legal requirements can be achieved only after improvement of the economic situation in the society.

The continuous change and increase of the emission limit values require considerable investments for reconstruction and improvement of the pollution abatement facilities often exceeding the resources for the fundamental equipment.



The waste collection and transportation systems including also the facilities for pre-treatment of waste before disposal should in maximal degree be in compliance with the requirements of the specific national legislation.

Provision of employment

The waste treatment has some specific peculiarities allowing the employment of less qualified and seasonal workers. These activities are appropriate for provision of jobs for the minority groups for which there are no other spheres of the economy life as well as for the people taking part in the social programs for temporary employment.

By appropriate selection of the stuff and strict control within the waste transportation systems it can be provided regular employment for the above mentioned categories.

Adaptation to the conditions specific for the municipality and to the consumer requirements

The waste collection systems should in maximum degree be adapted to the conditions of each municipality and settlement. Their effectiveness depends on the selection of containers and vehicles suitable for practical implementation of the systems.

The operating conditions of the equipment should allow optimal regime of work (for example two teams working 12 hours per day 7 days per week), but at the same time it should be in accordance with the working regime of the waste acceptance facility.

The containers should be up-to-date, with modern design and technical characteristics, convenient for use, in conformity with the regime of the services for the respective area, not involving excessive costs.

For big settlements with high building density most appropriate are the containers of the type “Beaver” and everyday regime of service.

For one-family houses the plastic bins of 120 and 240 liters have certain advantages. The wide spread in the country containers “Meva” made of zinc-coated sheet iron have unsatisfactory properties – unstable to atmospheric influences (easily rusting and piercing), small volume, make unnecessary noise while manipulating by the transport vehicles. The lid is closed not so tightly and does not prevent the spreading of odor, the access of insects and rodents and the spillage of light waste fractions.

The use of removable containers of 4 m³ and 2 m³ in urban areas is unacceptable but it can be admitted in exceptional cases in order to preserve the heavy and expensive equipment when the infrastructure is not yet finished up.

The supplying of transport vehicles should be carried out in observance at the grate possible extent of the following conditions:

- unification of the transport means and providing for options for their exchange;



- equipment of the waste collection vehicles with universal hoists serving wide range of MSW containers;
- use of waste collection vehicles with compactors that are appropriate for the waste type (rotor-press or vario-press) and with superstructure volume consistent with the working regime, the road infrastructure, the traffic on the transport route etc.

Compatibility of the existing systems with the technical novelties and management know-how

The systems for waste collection and transportation should be flexible and have to allow reduction of service intensity in certain cases as well as to provide the possibility for introduction of technical novelties and know-how in their management for the whole term of operation.

Implementation approach

The approach for approval and implementation of the system is as follows. The proposed variant has to be supported by the project employer and by the beneficiaries (the municipalities). If by financial or other considerations it is necessary compromise decision to be taken it will be proposed as second but not recommendable variant. In case that the second variant is chosen for the initial stage of establishment of the system, proper conditions for gradual switching to the optimal solution must be created.

The following principles are taken into consideration for the optimization of the systems:

- **For the big settlements with traditions in waste collection – maintenance and maximal improvement of the existing waste collection system (containers and collection frequency).**

Normally the inhabitants have no attitude towards the waste collection equipment provided that it will not cause additional problems like pollution to the environment by spillage of waste and abnormal noise. However the inhabitants are notably touchy when the quality of the service is worsening by provision of ugly-looking and in bad technical condition containers or reduction of the waste collection frequency. The destination between the home and the container as well as the convenience in their use (access, easy opening and closure of the lid, prevention of pollution) is also of great importance.

The waste collection frequency usually is in compliance with the existing requirements for the waste frequency specified by ordinances of the municipal mayors according to Article 63, paragraph 2 of the Local Taxes and Fees Act. Where the experts find that the frequency is groundlessly increased or decreased the respective corrigendum is entered in the projects. The frequency varies in towns from 1 to 7 days while in villages it is from 7 to 15 days. Moreover this principle guarantees minimal investments for optimization of the systems.

- **In urban environment – maximal use of the containers of the type “Beaver” and minimization of waste collection frequency .**



Daily servicing is recommended for territories with high building density or high concentration of people. The use of these containers is effective also for waste collection frequency once per 2 days or twice per a week.

- **Stop of the use of 4 m³ containers for urban territories mainly due to their bad aesthetic characteristics and operational parameters.**

It is proposed that if possible the 4m³ containers shall be replaced by containers of the type “Beaver” in industrial places as well as in the individual places – camps, petrol stations, commercial shops, service-stations etc.

- **For servicing of one- and two-family houses – use of individual containers by each household.**

After the complete amortization of the wide spread metal bins of the type “Meva” they can be replaced by plastic containers of 240 liters. In the country there is already 7 year long experience in the use of these containers in settlements with solid fuel heating and the argument that they are unsuitable for these conditions is groundless. The containers are granted to the population after sign for it without payment. In case of destroying or theft new container is received against payment. This system ensures their protection and long lasting use. In comparison with the bins of the type “Maeva” the plastic bins of 240 l have considerable advantages:

- two times larger volume for the same time of manipulation by the waste collection vehicle;
- tightly closing lid that does not allow spread of odor and spillage of the light waste fractions;
- noiseless when moving and tipping;
- the wheels allow easy moving to long distance;
- more durable comparing to metal containers because of the lack of rust, flexing and other deformations during the loading etc.

The disadvantage combustibility can be avoided by dropping only extinct ashes into the bins.

- **For the small settlements (below 200 inhabitants) the waste collection system can not be effective due to the obligation every holder of municipal waste to be served by waste collector.**



COMMENTS FOR CONTENT OF WASTE

Assessment of the potential for MSW recycling and the capacity for waste recovery in the country

Assessment of the quantity of the waste suitable for recycling in the different regions

The results from the studies carried out in Ruse, the town of Dryanovo and the village of Mestitsa in municipality of Pernik are used for assessment of the quantity of the waste suitable for recycling. On the basis of the waste quantities for these settlements the assessments of the waste quantities for the different settlement groups are derived from.

Table 2 – Content of recyclable materials in the municipal waste

№	Waste components	Content depending on the number of the population in the settlement							
		below 3 000 inhabitants		from 3 000 to 25000 inhabitants		from 25 000 to 100 000 inhabitants		over 100 000 inhabitants	
		%	kg./capita.year	%	kg./capita.year	%	kg./capita.year	%	kg./capita.year
	Total waste quantity including:	100	150-180	100	330-365	100	380-420	100	420-455
1	Paper and cardboard	5-6	8-11	6-8	20-29	8-10	30-42	10-12	44-56
2	Plastics	5-6	8-11	7-9	23-33	7-9	26-38	7-9	31-42
3	Glass	5-6	7-11	4-5	13-18	5,5-6,5	21-27	7-8	31-38
4	Metals	2,5-3,5	4-6	1-2	3-7	2-3	8-13	2,5-3,5	11-17

The above shown values are used for evaluation of the quantity of the waste suitable for recycling per each of the 16 municipalities included in the project. For this purpose the population of each municipality is allocated by settlements in each of the above mentioned



groups depending on the number of the inhabitants and values for the quantities per each of the waste materials are assumed within the limits specified in Table 3.

The results from the last census made in 2001 and the prognosis for the decrease of the population contained in the Plan for implementation of Directive 1999/31/EC on landfill of waste were used for the calculation of the population of the settlements. It is assumed that the change in the population number expressed in percents for all settlements in the municipalities remains equal.

Evaluation of the waste recycling market in the country

Despite the variations in the functioning of the recycling industry during the past years and the difficulties encountered by great number of the recovery enterprises, there is much capacity for waste recycling that exceeds considerably the quantity of the waste collected in the country.

The existing capacity for recycling of the different packaging materials is evaluated as follows:

Waste materials	Capacity
1. Paper and paperboard waste	200
2. Plastic waste	12
3. Glass waste	60
4. Metal waste	750 ²¹
TOTAL:	

During the elaboration of the projects for separate waste collection, the incomes from selling of the sorted materials are evaluated according to the average prices paid by the recycling companies by the middle of 2003. For the period of implementation of the separate collection systems considerable deviations from these levels are possible. The main factors influencing on the prices are:

- correlation between the demand and the supply of waste for recycling;
- demand and variations in the market prices of the goods made by waste recovery;

²¹ Including the capacity for recovery of metal scrap.



- correlation between the costs for production of goods using waste and the goods made by conventional raw materials;
- requirements for the quality of the different materials;
- quantity, quality and price of the waste imported in the country;
- changes in the national legislation in relation to Directive 94/62/EC on packaging and packaging waste and the measures that will be undertaken by the producers of packed goods for achievement of the recycling and recovery targets.
- waste recycling markets in neighboring countries.

The influence of the above mentioned factors shall be expected mainly in direction of decrease of the prices paid by the recycling enterprises for the different materials (mainly for paper and paperboard waste and plastic waste).

On the other hand it can be expected increase of the price margins paid for waste of different quality and increase of the prices for certain groups sorted materials.

The most probable recycling companies per each of the regions in question are identified in Table 3. The capacity and the transport destinations for supply of the collected materials were used as main factors.

The basic characteristics of CF regulation (ex- ISPA) measure 2000/BG/16/P/PE/002 Set of 5 regional waste disposal sites located in Montana, Ruse, Sevlievo, Silistra and Sozopol in Bulgaria are a part of the Financing Memorandum and they are reflected in the summarized tables about physical indicators.

The existing landfill used by the Pernik Municipality accounts for some 5 ha and hosts municipal and construction waste. The area for the proposed municipal waste landfill is 12 ha. The site is located North-east of the town of Pernik, some 4 km from the centre of the town in the vicinity of Teva District. The proposed landfill is designed to receive municipal and industrial waste generated on the territory of the municipality.

The project comprises the following elements:

- External communications – access roads, water and power supply, drainage of leachate from WWTP to Pernik sewerage system;
- 5 cells including surrounding and partition dikes with road and fence, control drainage, bottom watertight seal and drainage system for leachate collection, gas pipeline in the surrounding dike;
- Front area including office, traffic control building, weigh bridges; garage with repair room and store, car wash; emergency generator plant; station for purification and burning of bio- gas; a local WWTP;



- Wells for monitoring and control of ground waters - 8 outside the landfill and 2 in the waste cells;

Machinery and equipment including: a bulldozer (front-end loader) for spreading and flattening the loose wastes, for applying the daily soil cover; a compactor for compacting the waste to threefold compaction, a dump-truck for transporting earth and other loose materials; computer.

MUNICIPALITY OF PERNIK

The waste management programme of Pernik municipality is updated during 2002 and operational till 2007.

Waste recycling and reuse is defined as a main goal of the programme and is supported by the respective measures. For the waste minimization and confinement, concrete measures are not provided.

Exploitation of the small landfills is envisaged to continue until a regional landfill is build. However, their treatment till such time is not defined.

The municipality has up-to-date information about the MSW composition and quantities for the year of 2000 and forecast data for the year of 2005. Explicit requirements for the waste collection system are given. Concrete measures are provided for the separate waste collection and subsequent recovery.

With respect to the financial provision of the activities a comprehensive analysis of the existing state, regarding waste management, is carried out and the necessity of permanent increase of “household waste” fee is ascertained.

An Instruction for “Street cleaning and garbage collection maintenance and waste management” is developed, which is synchronized with the municipal programmes for waste management.

As a whole, the Waste management programme of Pernik municipality is developed according to the acting at the time of its development laws and statutory framework and in particular with the MOEW “Instructions for development of municipal programmes for waste management”.

Considering the main goal of this section of the project – to propose changes in the programme, which to reflect the new waste management laws and statutory formulations, regardless of the programme time of operation, a certain update will be necessary.

The enforced in September of the year of 2003 new Waste management act, and in particular art 29, p. 1 obliges the municipality mayors within a one-year period of its enforcement, to develop municipal programmes for waste management. Those municipalities that have valid operating programmes are maintained till their time of operation expires, but no longer than 3 years from the date of the law enforcement.



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The goals, pointed out in the next table are directed to the problems that should be solved, considering the National and European law requirements and the policy in the field of waste management. In developing the new programme, the goals mentioned in the table below should be considered and reflected in the appropriate sections.

Goals	Actions	Necessary Funds (lv.)	Sources of finance	Responsible institutions	Deadline
1. Prevention or restriction of waste generation.	Development of a detailed register for the state of the waste economy on the territory of the municipality –origin, type, quantity, composition and manner of disposal. Identifying all wastes producers in the commercial, industry and services area.	1000	MB.	MM.	31.10.2004
	Introduction of incentives for waste restriction and recovery through adoption of differentiated fees, which depend on the actual waste quantity.			MM.	05.2005
	Development of a municipal plan with specific measures for minimizing the biodegradable waste quantities sent for landfilling.			MM.	06.2004
	Preparation and implementation of a pilot project for home composting.	25 000	MB	MM.	05.2004
	Contract and investigation study for the supply for building a regional plant for recovery and/or treatment before landfilling of the biodegradable household waste.	5 000	MB	MM.	30.06.2004
2. Increase of the recycled and recovered waste quantities	Introductions of systems for separate waste collection from households.				01.02.2004 permanent



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Goals	Actions	Necessary Funds (lv.)	Sources of finance	Responsible institutions	Deadline
Applying of selective collection of paper and cardboard waste, plastic waste and glass and metal residues collection, through container system for separate collection and subsequent separation (including package waste)	Preparation and decision making by the Municipal Council for opening a procedure on LTA for selection of executor of the separate waste collection.			MM.	10.02.2004
	Carrying out a procedure for the selection of an executor and signing contract for assigning the task.			MM.	31.03.2004
	Appointment of additional administrative personnel engaged with the project for separate waste collection.	6 000 annually 3000 only once		MM.	10.04.2004
	Preparation and signing of credit contract and contract for reimbursement for the separate collection of package waste funds between Pernik municipality and SEMEPA			MM.	31.05.2004
	Design, construction, equipment and machinery supply, acquiring licence for construction and use of a separation and processing site.	2 925 575	SEMEPA	MM.	20.05.2004 - 01.12.2006
	Registration of the company in RIEW-Sofia for the waste collection and storage activities, in compliance with the Waste management act.	500	Executor	Executor	01.12.2006
	Placements of containers for separate collection.		Executor	Executor	10.01.2006
	Organizing a public campaign for promoting the population participation in the systems for separate collection.	28 000 annually	Executor	Executor	30.02.2006 - annually



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Goals	Actions	Necessary Funds (lv.)	Sources of finance	Responsible institutions	Deadline
	Placing in operation the separation and processing site and commencement of separate collection.			Executor	11.01. 2006 - permanent
	Carrying out investigations about the quantity and composition of the household wastes.	5 000	MB	MM.	During 2005 and every three year
3. Optimization of the waste collection and transportation system	Preparation and decision making by the Municipal Council, to include all towns and villages within the municipal region in a system for organized waste collection and its funding.			MM.	30.04. 2004
	Development and adoption by the Municipal Council of a charter-account on street cleaning and garbage collection for 2005 and setting “household waste” fee for the new villages of the waste collection system.			MM.	30.10. 2004
	In the “Resource provisioning of the waste management programme” section to provide the necessary means and sources of finance, for implementing the optimized MSW collection and haulage system.			MM.	30.10. 2004
	Optimization of the system for organized waste collection.	1 615 500 only once, 1 243 500 annually	MB SEMEP A	MM.	30.06. 2005



Bulgaria – Serbia
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Goals	Actions	Necessary Funds (lv.)	Sources of finance	Responsible institutions	Deadline
	Introduction of separate collection of ash and cinders residues from solid fuel combustion from households. Introduction of differentiated waste fee for households using solid fuel for heating (lower waste charge for households using central heating).	4 000	MB.	MM.	30.03. 2004
	Specification of sites for delivery of used batteries, fluorescent and other lamps containing mercury, spent oils, etc. Rendering an account of the expenditures for collecting these wastes when setting the “household waste” fee.			MM.	30.05. 2004
4. Waste treatment, environmental friendly disposal	Finding the possibilities and the expedience of the application of the accompanying landfilling technologies for waste destruction and the possibilities for integration with the nearby municipalities.	10 000	MB	MM.	30.12. 2004
	Building of a site for manure and vegetation waste in the inhabited areas in the municipality.			Executor	30.07. 2004
	Conclusion of contract for collection and incineration of infectious wastes from the health centres on the municipal territory with the incinerator in GUH “Aleksandrovska” or HMA – Sofia.	7 000	MB	MM	30.03. 2004
	Contract and investigation study for the supply and assembly of equipment for disposal with water vapour, for the hospital waste, in compliance with the National programme for waste management.		MB	MM.	30.06. 2004



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Goals	Actions	Necessary Funds (lv.)	Sources of finance	Responsible institutions	Deadline
	Provision of conditions for environmental friendly disposal of sludges from WWTP.				
5. Risk prevention or minimization from old contaminations	Execution of the Programme for closedown and rehabilitation of old MSW landfills.	7 273 007	MB SEMEP A	MM.	2004 – 2009
6. Increase of personnel of the waste management competence bodies	Formation of Regional Council on integrated waste management.			MM.	30.03. 2004
	Appointment of additional administrative personnel for implementation of scheme for applying of joint and separate waste collection and subsequent control. Provision of the personnel activities with the necessary technical resources.	6 000 annually 3 000 only once	MB	MM.	31.01.2005
	Development of a procedure for data collection for the generation and treatment of households widely spread construction wastes and information reporting to the governmental body in the set by the statutory framework format.			MM.	30.06. 2004
	Formation of an Environmental Inspection for carrying out the entire control upon the waste management activities. Training of the Inspection employee on law application in the field of waste management.	30 000	MB	MM.	30.06. 2005
7. Other specific	Adoption of programme for work with the society and the future generation.	28 000	MB	MM	30.06. 2004



Goals	Actions	Necessary Funds (lv.)	Sources of finance	Responsible institutions	Deadline
measures	Update of the municipal street cleaning and garbage collection maintenance instruction and waste management, with the aim of reflecting the requirements of the waste management act and the resulting secondary law legislative acts.			MM	30.04.2004
	Development of a system for reporting on the accomplished measures and used funds from the programme and making possible the feedback between the municipal administration and the population.			MM	30.06.2004
	Development of a system for controlling the measures provided in the programme and manners for the programme update.			MM	30.06.2004
	Setting of “household waste” fee according to the quantity and volume of the generated waste. Proceeding to a long term planning of the amount and income from “household waste” fee. Securing the necessary incomes for implementing the provided in the programme measures.			MM	30.10.2004
	Development of investment incentive projects for finance through SEMEPA in the field of waste management activities.	40 000	MB	MM	30.12.2004
	Assignment of feasibility study for construction of equipment for recycling the construction and demolition waste.	10 000	MB	MM	30.06.2004
	Increase the control over the disposal of construction waste at issuing building permits and usage of construction sites on the municipal territory.			MM	30.12.2004



Goals	Actions	Necessary Funds (lv.)	Sources of finance	Responsible institutions	Deadline
	Specification of sites for delivery of obsolete vehicles. Setting of the existing sites in compliance with the environmental statutory framework requirements.		Executor MB	Executor	30.06.2004

Some of the above mentioned actions have a strategic nature and should be scrutinized considering the specifics and capabilities of each municipality.

In the programme update, other measures should be considered too, resulting from the applied to the present project comprehensive development:

- Project for optimized waste collection and waste haulage system on the territory of Pernik municipality;
- Project to organize the separate waste collection for recycling;
- Programme for close – down and rehabilitation of old MSW landfills.

ACCUMULATION RATE

The following tables present the summary results regarding the accumulation rate for the three settlements where the waste survey was held.

Table 1 – Accumulation Rate (summary of results) – Meshtitza village – Pernik Region

№	Month and year of survey	Waste quantity (kg)	No. of inhabitants	Period between 2 transports (days)	Accumulation Rate	
					Kg/p/day	Kg/p/year
1.	March 2002	2527	376	14	0,48	175
2.	March 2002	2583	369	14	0,50	182
3.	April 2002	3021	415	14	0,52	190
4.	April 2002	2328	326	14	0,51	186
5.	April 2002	2796	384	14	0,52	190



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6.	April 2002	2399	357	14	0,48	175
7.	May 2002	9619	683	28	0,50	182
8.	May 2002	5544	792	14	0,50	182
9.	June 2002	3166	388	24	0,34	124
10.	June 2002	3213	357	25	0,36	131
11.	August 2002	3128	392	21	0,38	139
12.	August 2002	2815	383	21	0,35	128
13.	August 2002	2755	410	21	0,32	117
14.	August 2002	2752	336	21	0,39	142
15.	September 2002	2342	286	21	0,39	142
16.	September 2002	3366	391	21	0,41	150
17.	October 2002	2556	415	14	0,44	161
18.	October 2002	1614	293	14	0,40	146
19.	October 2002	2511	427	14	0,42	153
20.	October 2002	1916	311	14	0,44	161
21.	December 2002	3701	375	21	0,47	172
22.	December 2002	3110	322	21	0,46	168
23.	December 2002	4183	415	21	0,48	175
24.	December 2002	3108	296	21	0,50	186
25.	February 2003	4096	276	28	0,53	193
26.	February 2003	4641	325	28	0,51	186



Morphological content (summary of results) – Meshtitza village – Pernik Region

N	Waste components	Content									
		As % of the weight					in kg/p/year				
		I stage	II stage	III stage	IV stage	Average	I stage	II stage	III stage	IV stage	Average
A. ORGANIC											
1	FOOD	2.9	6.8	6.2	4.2	5.0	5.3	8.9	9.5	7.5	8
2	PAPER	3.8	6.1	2.4	3.2	3.9	6.9	8.0	3.7	5.7	6
3	CARDBOARD	1.3	1.8	0.2	1.9	1.3	2.3	2.3	0.3	3.4	2
4	PLASTICS	5.3	8.0	4.2	3.3	5.2	9.6	10.5	6.4	5.9	8
5	TEXTILE	3.6	4.4	2.4	3.5	3.5	6.6	5.8	3.7	6.3	6
6	RUBBER	1.1	1.9	0.3	1.3	1.1	2.0	2.5	0.5	2.3	2
7	LEATHER	1.5	1.9	0.5	1.5	1.4	2.7	2.5	0.8	2.7	2
8	GARDEN	4.1	16.3	33.2	6.2	15.0	7.5	21.4	50.8	11.1	24
9	WOOD	2.5	3.3	1.1	1.5	2.1	4.6	4.3	1.7	2.7	3
B. NON ORGANIC											
1	GLASS	10.0	12.7	5.2	7.1	8.7	18.2	16.6	8.0	12.7	14



.											
2	METALS	3.1	3.4	2.2	2.9	2.9	5.6	4.4	3.4	5.1	5
3	INERT	6.2	6.4	7.8	6.6	6.8	11.3	8.4	11.9	11.8	11
	C. OTHER										
1	ASHES,CINDER,SOIL MANURE, OTHER	54.6	27.0	34.2	56.8	43.1	99.4	35.4	52.3	101.7	69.8
	TOTAL:	100,0	100,0	100,0	100,0	100,0	182.0	131.0	153.0	179.0	160.0

IMPLEMENTATION OF PROJECT LOT – 3 REGIONALL LANDFILL IN PERNIK

Regional landfill Pernik is designed to satisfy the necessity of region and municipalities, members in Association according signed agreement with MoEW for minimum 20 years exploitation period. The landfill is situated in territory of Lulin village in Teva district, close to Pernik town, and will be space for disposal of waste for next municipalities:

- Pernik
- Radomir
- Breznik
- Zemen
- Kowathevci
- Trun

Description of regional landfill in principal

Each of the regional landfills is designed and developed following the requirements of EC Directives for environment protection. During the landfill design all requirements of these directives were incorporated by Leading Designer – COWI Company. Later these requirements were developed as technical requirements and norms, set out in present



Regulations 7 and 8 to the Waste Management Act, which are developed variant of Regulations 12 and 13. During the design the following main principles were included:

- Principe for measurement and strict reporting of wastes.

This is one of the significant characteristics of systems for collection and treatment of wastes. More of landfills were working without systems for weighting of the wastes. System for correct registration was missing, too. For this purpose for the project No 2000/BG/16/P/PE/002 Set of 5 regional waste disposal sites located in Montana, Ruse, Sevlievo, Silistra and Sozopol automatic weightbridge with wide dimensions and characteristics, are supplied and installed. The weighting will be perform when technics come in and come out of the landfill. In this connection the measurement is significant part from the technological proces of the facilities.

- Principe for creation of significant soil protection from contamination by landfilled wastes and their leachate waters.

The body of landfilled wastes is placed on big area and it is exposed on direct influence of precipitations and other climate influences. Together with the dissociated by the different process fluids from the body, a significant leachate water flow is created, which has harmful impacts upon soils under landfilled wastes. They are harmful polluter of underground waters with unforeseen dangerous impact of waters. For this purposes the norms foreseen creation of geological barrier of well compacted and waterproof clay layer with filtration coefficient 10^{-9} , with thickness of layer 50 centimeters. If suitable material is missing the thickness of layer should be changed and respective tests have to be implemented. Upon placed on the bottom of the cell and upon contaminated form accumulation slopes of cells waterproof material HDPE liner with proper physical characteristics is foreseen. This method ensures additional solid protection of soils.

As additional engineers measures is the protection of the facility flow waters underground and surface, such as drainage ditch, underground drainage, sewerage facilities, surrounding open ditches. The meaning of these measures is to minimize negative impact of water upon compacted layer and the design parameters for protection to be fulfilled.

The main system of facility is system for catching, collection and transportation of collected leachate and its permanent and safety treatment. In principle, the infiltrate system is consisting of:

- Drainage channels, situated in the cells' bottom, consisted of perforated HDPE pipes and drainage body from inert material. Drainages are placed over the linear.
- Shafts for infiltrate collection to the cells.



- Pumping station, which is situated in the shafts, which transports with pumping infiltrate to the Wastewater Treatment Plant for leachate.
 - Leachate Treatment Facility
-
- Principe for leading out of generated landfill gases.

Generated in the body of landfilled wastes gas with main component - methane /not pure/ creates significant dangers of burning of the landfill body or explosions of generated gases. The generated gases are collected with proper system; consisting of gas drain well, lead pipelines and treatment installation /burning/ of gases.

- Principe of permanent monitoring of facility

On the selected by designers points the implementation of monitoring wells is foreseen, in which through periodical tests and monitoring is collecting the information for quality of underground waters and presence of polluted waters which can influenced geological barrier. The well numbers is different, depending of cells dimensions and the whole facility.

- Principe for equal waste treatment for all parties in Regional Associations.

The methods for waste treatment are developed and presented by the designers in operation manual. Subsequently, these methods are included in harmonization of waste legislation. It is foreseen discharging of wastes in the landfill cells by specialized transport, spreading out in layers with different thickness, depending of packaging techniques /usually 0,5 – 0,8 m/ with bulldozer. After that the wastes are compacted with heavy compactor to the rate of 0.7-0.8 t/per cub.m. Compaction will be alone with vibrations. The top of spreaded wastes will be covered with soil layer with thickness from 20 centimeters.

- Principe for reasonable remediation on the accumulated and treated wastes.

One of the elements for project preparation during the operation period is approval of design solution for biological and technical remediation of landfills after completion of their exploitation period. In most of the landfills before opening the new cell, remediation of already filled in cell is foreseen. Final and interim remediation of cells is designed and foreseen.



- On that base the necessary set of machines is defined:
 - Compactor for compaction of spreaded layers in cells
 - Chain Bulldozer for spreading of waste after unloading
 - Combined excavator for excavation of soils for remedial measures
 - Frontal loader
 - Truck for transport of soils for remediation of cells
 - Tip – lorry
 - Small lorries

The existing landfill currently used by Pernik Municipality, accounts for some 5ha and hosts municipal and construction waste. The area for the proposed municipal waste landfill is 12ha. The site is located Northeast of the town of Pernik, some 4km from the center of the town in the vicinity of Teva District. The proposed landfill is designed to receive municipal and industrial waste generated on the territory of the municipality.

The project comprises the following elements:

- External communications – access roads, water and power supply, drainage of leachate from WWTP to Pernik sewerage system;
- 5 cells including surrounding and partition dikes with road and fence, control drainage, bottom watertight seal and drainage system for leachate collection, gas pipeline in the surrounding dike;
- Front area including office, traffic control building, weigh bridges; garage with repair room and store, car wash; emergency generator plant; station for purification and burning of bio- gas; WWTP;
- Wells for monitoring and control of ground waters - 8 outside the landfill and 2 in the waste cells;
- Machinery and equipment including: bulldozer (front-end loader): for spreading and flattening the loose wastes, for applying the daily soil cover; compactor: for compacting the waste to threefold compaction, dump-truck for transporting earth and other loose materials; computer.



Construction of roads comprises development of access road to the site, as well as a site network of service roads to allow dumping of wastes in the different daily sections.

Watertight sealing of the bottom of the cell shall include a clay screen, HDPE liner and sand. Drainage for leachate collection is placed above.

Main dike is constructed surrounding the cells with road and fence. To form the 5 cells of the landfill it is planned to construct 4 partition dikes (and one extra dike to separate the existing landfill). The dikes shall be made out of earth and will be faced with clay and an HDPE liner.

Draining of the leachate shall be done for each cell by a drainage system, which will collect into a collection shaft for leachate (interim shafts and one main shaft for each cell). The drainage system shall consist of blanket drainage laid on the bottom and includes perforated and non-perforated pipes. The main shaft shall be furnished with a sewage pump, which will transfer the leachate to the pressure pipeline and thus lead to WWTP. After treatment, the water discharges into the Pernik sewerage system.

For abstraction of the biogas from the landfill a gas extraction system shall be constructed, consisting of blanket drainage and 6 - gas abstraction wells. The blanket drainage shall be done by laying of gravel on top of the filled waste under the sealing top layer of the cells. The wells shall be constructed continuously in parallel with operation of the cells and depositing of the waste. Surrounding gas pipeline, made out of HDPE pipes is constructed for leading the gas away from gas wells to the Gas station.

To prevent uncontrolled access of people and cattle a fence made of reinforced concrete shall surround the site.

After completion of works the operation of the landfill will start with filling in Cell 1. Deposited waste shall be spread and compacted by a compactor in layers of 20 to 30cm. Deposition of waste shall be done in daily sections with 1.8m height. Sections shall be separated with soil and crushed construction waste. After reaching a thickness of 1.8 m the waste layer shall be covered by a 0.2m soil layer. Deposition will continue in this way until reaching the crest of the surrounding and partition dikes. After that the waste body will be shaped to form a slope with inclination 1:3 towards the crest of dike. Operation of the other cells shall be similar.

After reaching the planned elevation of the waste body in each cell, it shall be covered by a top layer, which includes gas abstraction, sealing and drainage layers. Finally, for rehabilitation of the site, soil and humus layers shall be laid and grass will be planted.

The landfill will incorporate following elements:

- Cells for wastes storage – 4 number. The design of cells is done with digging works for cell forming and construction of surrounding dikes.



- Cell 1 will be filled up with existing wastes, stored close to the new landfill. The design for rehabilitation of existing dumpsites was prepared, also design of installation for collection and treatment of landfill gas was prepared, too.
- The drainage for collection of leachate, coming from covered old wastes, will be constructed in zone between existing wastes and in cells for new wastes.
- At the bottom some measures for stabilization of the ground base in cells are foreseen with filling of crush stone, spreaded and compacted
- At the bottom of cells, the drainage system for collection of underground water will be constructed,
- Construction of geological barrier is foreseen – laying and compacting to the necessary waterproof capacity of clay layers with thickness more then 50 cm. Upon clay layer, HDPE liner will be placed, which is protected with geotextile.
- Over geological barrier is constructed drainage system for collection of leachate.
- An installation for collection and torch burning of landfill gas, as method for its treatment, is foreseen.
- Design foreseen works for stabilization of slops of existing mines embankment in north sector.
- Design foreseens implementation of stabilization measures upon ring road and internal technological road in south part of the landfill.
- Design foreseen removal of two existing distribution power lines 20 KW from cell's zone.
- According to the designs, internal technological access roads to cells and for operation of installations have to be constructed.
- Design foreseens implementation of reception area /, which includes the following:
 - Entrance Gate.
 - Automatic weighbridge
 - Installation for washing up of tires of vehicles before leaving the site
 - Administrative building with Traffic control Station and small laboratory on site. Construction is monolithic – reinforced concrete structures, with walls of gas blocs for masonry.
 - Garage with workshop. Construction is steel with farms, columns.



- Shelter for compactor. Construction is steel.
- Diesel-aggregate. Monolithic construction.
- Treatment Plant for leachate. Monolithic construction.
- Protective facilities are foreseen – ring-road ditches and facilities for lead out of surface water.
- District lightening is foreseen.
- Whole fence is designed.
- Access road to the regional landfill is foreseen as rehabilitation of existing road, linking with Tewa district.

Whole reception area is situated upon new fills, which ensures necessary technological area. Landscape and Road Works are included in design.

- Close to cell N 1 will be arrange center for collection of different groups of waste , as electrical devices, hazard domestic wastes , old cars and others.
- Near to the landfill, with technological connections will be arranged center for separation of the waste and installation for the treatment of biological waste – composting

By this way the first steps for the construction of regional system for waste treatment in region Pernik.

Constructions are organized under Bulgarian specialized legislation and FIDIK regulations – Red and Yellow books.

Pernik Municipality has an Act for municipal's property for the site. See Annex D.4.

All needed protocols for the activating of contract are prepared on time, as:

- Protocol N 1 for official submission of approved designs and issued Permit for construction; It is submitted during official Kick off meeting
- Protocol N 2 for the taking over of the site with presentation of internal infrastructure's supplies
- Protocol N 3 for laying out of the main structures and checking from authorities
- Some approvals and statements from companies for infrastructure was submitted to the engineer and contractor for detail designing of water supply sewerage and power supply



- Temporary facilities for the landfill was constructed, workshop, office for the Contractor, Engineer's office /Supervision/, office for the staff, together with changing room and bathroom. Temporary structures / containers/ are supplied with water, sanitary knot, and electricity, furniture, air conditions, in accordance with technical specifications.

Following machines and equipment to the landfill have to be supplied:

- Compactor
- Chain bulldozer
- Combined excavator and front loader
- Tip-lorry
- Vehicle

Conclusions:

1. Construction of the Regional system for waste collection and treatment is based on the detail searching of all of existing conditions in Municipality of Pernik and others municipalities in the region.
2. The regional system includes:
 - a. System for waste collection and transport to the landfill
 - b. System for separate collection of waste in main towns in the region
 - c. Construction of regional landfill
 - d. Construction for installation for separating of mixed non hazard waste
 - e. Construction of installation for treatment of biological waste for composting
3. The system guarantees:
 - a. System's manner for operation of the treatment of the waste



- b. Environmental protection
 - c. Effectively explore of the all components of the system
 - d. Regional principle of waste treatment
 - e. Combine between collection and treatment of mixed and separated waste
 - f. Recikling of mareials from waste treatment
 - g. Recultivation of existing plots for dumping of waste
4. Determination of fees for waste collection, treatment and disposal of waste in the regional system.
 5. Management of the existing infrastructure and consider alternative options.

Recommendations to Niš region to prepare the project for construction of a regional system for waste management. Stepwise model recommended approach and methodology for the preparation and implementation of the project.

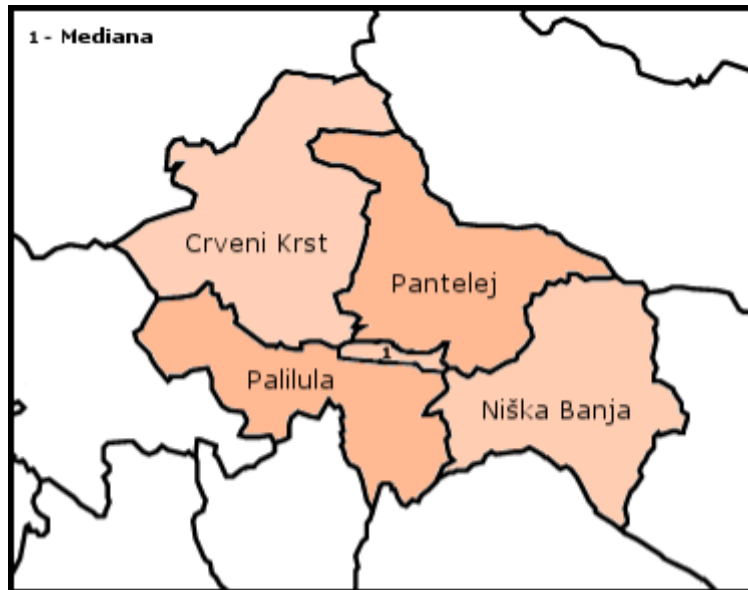
Town of Niš






Country	 Serbia
District	Nišava
Municipalities	5
First mention	2nd century AD
Liberation from Ottomans	11 January 1878
Government	
• Mayor of Niš	Zoran Perišić (SNS)
• Ruling parties	SNS
Area	
• City	597 km ² (231 sq mi)
Elevation	195 m (640 ft)
Population (2011)	
• City	▲ 183,164 ^[2]
• Density	435.9/km ² (1,129/sq mi)
• Urban	▲ 187,544 ^[2]
• Metro	▲ 260,237 ^[2]






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Coat arms	of	Name	Territory km ²	Population 1991	Population 2002	Population 2011
		Mediana	16	88.602	87.405	85.969
		Palilula	117	73.610	72.165	73.801
		Crveni Krst	181	34.062	33.452	32.301
		Pantelej	141	43.371	42.137	53.486
		Niška Banja	147	15.325	15.359	14.680



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	Total:	597	254.970	250.518	260.237
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Source: Републички завод за статистику^[67]

Climate data for Niš (1961-1990)													
Indicators	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C	18,6	23,2	28,6	33,0	34,2	38,3	42,3	39,6	37,2	32,6	27,1	20,7	42,3
Average high °C	3,8	7,1	12,3	18,0	22,9	25,9	28,0	28,5	24,8	18,9	11,7	5,4	17,3
Average temperature °C	-0,2	2,5	6,7	11,9	16,6	19,5	21,3	21,1	17,2	11,9	6,4	1,7	11,4
Average low °C	-3,5	-1,3	1,8	6,1	10,4	13,4	14,5	14,4	11,1	6,5	2,4	-1,4	6,2
Absolute low °C	-23,7	-19,3	-13,2	-3,5	-1	4,2	7,6	4,6	-2,2	-6,8	-14	-15,8	-23,7
Precipitation mm	41	40	45	51	67	70	44	43	44	34	57	54	590

Source^[2]

Climate data for Niš (2004—2013)

Indicators	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C	5,2	6,5	13,1	19,6	23,8	27,9	30,8	30,9	25,5	19,5	13,3	6,5	18,6
Average temperature °C	1,7	2,6	7,9	13,4	17,5	21,4	23,6	23,6	18,9	13,7	8,3	3,4	13,0
Average low °C	-1,8	-1,4	2,7	7,2	11,2	14,8	16,4	16,3	12,3	7,9	3,4	0,2	7,4
Precipitation mm	47	53	49	54	64	57	39	41	33	53	51	58	599

Source: www.weatheronline.co.uk



The climate in Nis is temperate continental with an average annual temperature of 11,4 ° C. The hottest month is July with an average temperature of 21,3 ° C. The coldest month is January with an average temperature - 0,2 ° C.

Annual average of 589.6 mm falling rain and snow per square meter, representing an average of 123 rainy days and 43 days of snow. The maximum temperature registered was 44,2 ° C on July 24 in 2007, and the lowest -23,7 ° C on January 25 in 1963. The maximum rainfall was registered on November 5th in 1954 and is 76.6 mm. The thickest snow cover was 62 cm, formed from 23 to 25 February in 1954. Monitoring change in Nis is carried out by the meteorological station situated at a height of 202 meters above sea level.

Districts

The statistical region of Southern and Eastern Serbia is composed of 9 administrative districts:

District	Area (km ²)	Population (2011 Census)	Administrative Capital
Podunavlje	1,250	199,395	Smederevo
Braničevo	3,865	183,625	Požarevac
Bor	3,510	124,992	Bor
Zaječar	3,623	119,967	Zaječar
Nišava	2,727	376,319	Niš
Pirot	2,761	92,479	Pirot
Toplica	2,229	91,754	Prokuplje
Jablanica	2,770	216,304	Leskovac
Pčinja	3,520	159,081	Vranje
Source: Statistical Office of Serbia			



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Cities and towns

The largest cities and towns of the region are:

City or town	Population (2011 Census) ^[2]
Niš	260,237
Leskovac	162,206
Smederevo	108,209
Vranje	83,524
Požarevac	75,334
Zaječar	59,461
Pirot	57,928
Aleksinac	51,863
Smederevska Palanka	50,284
Bor	48,615
Prokuplje	44,419
Velika Plana	40,578



Some summarized information about generated waste in Nish for 2012 year.

	Number of population covered by the collection system	The mass of generated waste project (t/ned)	The mass of waste generated per year (t/god)	The mass of waste per capita per day (kg/st/dn)	The mass of waste per apartment per year (kg/st/god)
05.2012	255288	1.369,20	71.394	0,766	279,59

	Number of population covered by the collection system	The mass of generated waste project (t/ned)	The mass of waste generated per year (t/god)	The mass of waste per capita per day (kg/st/dn)	The mass of waste per apartment per year (kg/st/god)
12.2012	255288	1286	69795	0,74	271

	Number of population covered by the collection system	The mass of generated waste project (t/ned)	The mass of waste generated per year (t/god)	The mass of waste per capita per day (kg/st/dn)	The mass of waste per apartment per year (kg/st/god)
03.2012.год	255288	1299,71	67890	0,75	273,8



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	Number of population covered by the collection system	The mass of generated waste project (t/ned)	The mass of waste generated per year (t/god)	The mass of waste per capita per day (kg/st/dn)	The mass of waste per apartment per year (kg/st/god)
09.2012	255288	1.376,24	71.564	0,77	281,05

DATA ABOUT MORFOLOGY OF CONTENT OF WASTE FROM OBSERVING OF WASTE COLLECTION IN REGION.

Morfology of waste in Nish region – December 2002

ВРСТА ОТПАДА	Град индивидуално становање		Град колективно становање		Сеоско подручје	
	МАСА (Kg)	%	МАСА (Kg)	%	МАСА (Kg)	%
БАШТЕНСКИ ОТПАД	112	22.48	31	6.4	142	29.35
ОСТАЛИ БИОРАЗГРАДИВИ	69	13.85	39	8.05	71	14.68
ПАПИР	7	1.4	32.3	6.67	21.6	4.46
СТАКЛО	6.3	1.26	15.2	3.14	13.1	2.71
КАРТОН	7.1	1.42	22.1	4.56	12.9	2.67
КОМПОЗИТНИ МАТЕРИЈАЛ	5.2	1.04	11.1	2.29	7.6	1.57
АМБАЛАЖНИ И ОСТАЛИ	2	0.4	5.3	1.09	2.4	0.5
АЛУМИНИЈУМСКЕ КОНЗЕРВЕ	0.5	0.1	1.9	0.39	0.6	0.12
ПЛАСТИЧНИ АМБАЛАЖНИ ОТПАД	13	2.61	35.3	7.29	23.4	4.84
ПЛАСТИЧНЕ КЕСЕ	39	7.83	78	16.11	48.5	10.02
ТВРДА ПЛАСТИКА	41	8.23	51.9	10.72	14.2	2.94
ТЕКСТИЛ	7.2	1.44	27.8	5.74	2.1	0.43
КОЖА	0	0	0	0	3.5	0.72
ПЕЛЕНЕ	14	2.81	21.3	4.4	1.9	0.39
ФИНИ ЕЛЕМЕНТИ	175	35.12	112	23.13	119	24.6
УКУПНО:	498.3	100	484.2	100	483.8	100



Table for population in Region of Nish:

N	town	Total inhab	m	f	Inhabitants in towns	Inhabitants in villages
	Region of Nish	376 319	184 966	191353	213075	163 244
	Nish town	260 237	126 645	133 952	187 544	72 693

CONCLUSIONS FOR PRESENTATION OF NISH REGION:

1. Characteristics of climate of region Nish is similar as the climate of region Penrkq especially for average temperature, rains, seasons.
2. Global information about the populatiob gives the option to underline yhe similarity of global data and structure, as:
 - Population in region
 - Structure of population – inhabitants in towns and others
 - Structure of the urban in the region- main regional center / town Nish/ smaller towns, villages,
 - Structure of the economy of the region
3. Data about relief of the territory is the similar as the Pernk region – mix from mountains and flat territories. This means , that some “green waste” have to be expected in the system as seriouise quantities.
4. The expecting flows of waste have top be the similar, as these in Pernik Region and are:
 - Household waste
 - Industrial waste – hazard and non-hazard waste
 - Green waste



- Specific flows as batteries, lumps, cars, chemicals e.t.c.
 - Waste from construction works- excavated soils, demolition waste, waste from repairs, waste from road constructions, e.t.c.
5. Morphology is similar, as this in Pernik region.
 6. Structure of the waste is in direct relation with seasons, like similar process in Pernik region.
 7. Morphology of the waste depends from different season
 8. The global generated waste is little more as reports from the waste quantity in Prnik region – 270 kg/per inhabitants/per year for Nish and 217-220 kg/per inhabitant average /per year.
 9. Calculation of generation of the waste in relation with population could expect similar parameters for the system, like the system in Pernik.
 10. Some activities for waste treatment are arranged, as:
 - waste colletion
 - transport of waste with special vehicule
 - dumping of waste in local disposal
 11. Technical requirements technical norms and legislation in environmental area are different, especially adopted
 12. Missing acyivities for the system in Nish
 13. **Plan for activities for system of waste collection and waste treatment:**
 - 13.1. Preparation of initial study for Regional System for waste collection and waste treatment with searching of:
 - 1) Collection and analizing of statistic data for demographic of region, trend of the population, sections of population,
 - 2) Determination of real region, which will object of impact of mesure over the potential system
 - 3) Determination of minimum 2-3 plots with area from 75-90 decars, with potencial for construction of new objects of system.
 - 4) Investigation of existing base of norms – juridical, technical, design,



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- 5) Adoption of ground norms for the preparation of project to the “good practice”, that could be European technical norms and laws for environmental protection. This is most important step, which is obligation of central administration of the state and of the local authorities
- 6) Detail searching of the real status for the waste collection in the region.
- 7) Detail searching of the status of arrangement of waste treatment in the region of Nish, as:
 - a. Availability of the Program for waste treatment in Municipality of Nish
 - b. Analyzing of existing system for waste collection in Nish and region – program for the collection, machinery for collection and transport of the waste, different types of collection containers, e.t.c.
 - c. Analyzing of different districts for waste collection as area, type of waste generation
 - d. Determination of national and local goals for waste system for different stages of the system
 - e. Deep searching of existing manner for dumping of waste on chosen plot, as:
 - i. Legislation of the usage of the plot for waste dumping according to the valid norms
 - ii. Legislation of the usage of the plot according to the further norms, that will be applicable for the next period / for example pre-accession period/
 - iii. Age of the existing dumps
 - iv. Treatment of the waste on site
 - v. Statistic data if usage of the plot
 - vi. Measures for environmental protection
 - vii. Availability of some designs for the dumps
- 8) Analyzing of the practice for separate waste collection, as:
 - a. Determination of districts, villages and towns, which could be with organization of separate collection



- b. Choice of the type of organization- state company, municipality's company, public-private cooperation, private company with arrangement of operation and function
 - c. Analysis of the transport for collection of separate collected waste
 - d. Analysis of potential options for recycling of materials after separate collection
- 9) Analyzing of options for treatment of waste for separation of mixed household waste – quantity, technology, technological equipment, usage of material, specialized transport, e.t.c.
 - 10) Preparation of ground data for the designing of installation for composting of biological materials.
14. Financial investigation of the system as:
- 1) Pre- calculation of eventual costs and invests for establishment of the system for waste treatment
 - 2) Searching about potential sources for financing, including using of EU funds in process of accession to EU
 - 3) Analyzing of the system from fees, taxes and other generators of sources from population
 - 4) Analyzing the principles for financing of potential project according to the required methodology
15. Preparation of contract for implementation of the project for establishment of regional system for waste treatment.
16. Implementation of the project from the contracts for construction and other activities till commissioning of objects in project, using different practices, determined in Frame contract.
17. Arrangement of manner for cooperation and partners for the operation of the constructed elements of waste management system following different options, as:
- State companies operators
 - Private company operators
 - Public-private operators



All present steps will be described in details and detail schedules.

Description of the Regional system for waste treatment in Nish region.

Based on the mentioned above explanations, eventual elements of further system for waste, could be the next:

- 1) Organization of the effective system for waste collection in all of the urban cities and villages in Nish Region.
 - a. Presentation of waste collection program for the half year, including:
 - i. Searching for the quantity of the waste generation in the region
 - ii. Searching for the trend and tendency for the waste generation
 - iii. Searching for the status of the economy in the region
 - iv. Status of potential waste generation for construction waste, based on the assessment of the age of the buildings and industrial structures, domestic renovations, and others
 - v. Investigation for the generation of “green waste” from the green systems of the region- forest materials, grass waste, wooden material, e.t.c.
 - vi. Availability and plan for the transport machinery for the waste collection
 - vii. Availability and plan for the insurance of the suitable buckets and containers for waste collection, depending or agreed with the eventual transport equipment
 - viii. Arrangement of the plan for the waste collection for the week, month, and year
 - ix. Arrangement and planning of the program of waste collection, depending from the seasons, type of the heating in cities and villages, e.t.c.
 - b. Preparation and presentation of the Program for waste treatment in the region, which has to include:
 - i. Analysis for the waste generation in the region
 - ii. Analysis of the morphology of the generated waste



- iii. Analysis of the type of the waste, as:
 1. Hazard waste
 2. Non-hazard waste
 - iv. Classification of the waste – depending from their origin
 - v. Adaptation of the national principles and goals as phisiskal parameters
 - vi. Analisyis for the separated waste collection – possibilities, capacities, optimal treatment
 - vii. Analysis for the explore of place for dumping of waste and treatment on site
 - viii. Measuers for protection of environment:
 1. Norms of lows and ordinances
 2. Measures on site as design, procedures for approval of them for implementation
 3. Measures for monitoring of the components of the environment
 4. Measures for the reporting of the status
 - ix. Economical and financial parameters of waste collection and treatment of the waste in the region
- 2) Arrangement of the system for separated waste collection
- a. Investigation of the morphology of the generated waste in the region
 - i. Generation of the waste in villages
 - ii. Generation of the waste in cities
 - iii. Generation of the waste in the region
 - b. Determination of the territories, which could be organized separation of waste collection, as:



- i. Arrangement of partnership with potential business partner in the process
 - ii. Adopting the potential system with options for the recycling of the collected materials
- c. Designing of the system for separated waste collection for the determination of:
- i. Determination of urban territories for separate waste collection
 - ii. Determination of goals for the processes for waste treatment
 - iii. Determination of the suitable and effective manner for arrangement of this type of business
 - iv. Designing of factory with suitable technology for covering the goals of the process
 - v. Designing of system for monitoring and reporting for results of the treatment

3) Arrangement of the system for construction of regional landfill

This arrangement has to follow next main directions:

- Determination of the capacity and the necessity of construction of regional landfill for foreseen period
- Determination of some suitable plot for construction of new regional landfill
- Execution of all procedures for the approval of choised plot
- Arrangement of financing of construction of new landfill
- Arrangement of process for implementation of project for new landfill
- Design for explore of new constructed landfill
- Monitoring of function of the landfill



- 4) Arrangement of the function of hall system for collection, transport, dumping, environmental protection, economical plans and forecasts for the parameters

STEPS, STAGES AND ACTION PLAN FOR THE IMPLEMENTATION OF EVENTUAL PROJECT FOR WASTE TREATMENT IN THE REGION OF NISH

Based of the present investigations and conclusions, team of Consultants could submit their visions for the establishment and arrangement of new system for the treatment of waste in the region of Nish.

The first step, which is necessary to be successfully done, is the arrangement of the technical, financial, administrative and juridical norms / lows, ordinances and others/ , which be valid for further period. Now, when Serbia is in pre-asesion period, it is strongly necessary to adopt all kinds of lows and norms to the European norms in environmental area. It follows two main goals:

- To be sure, that the high experience of hall continent will be implemented in situ in the region with all advantages for environmental protection
- To find eventual European funds for establishment of new system. It could be possible, if the good practice will be implement in the project, and all European technical norms and procedures will be strongly followed.

The steps for the arrangement of the system for waste collection and treatment, could be presented in Feasibility study . The feasibility Study will illustrate the steps, that have to be done step by step. The Feasibility Study could be with some eventual content:

- 1) POPULATION AT PRESENT AND TREND FOR NEXT INVESIGATED PERIOD
- 2) DESCRIPTION OF THE TERRITORY AND COVERAGE WITH BUILDINGS FOR
- 3) INFRASTRUCTURE
- 4) WASTE TREATMENT AND DISPOSAL FACILITIES
- 5) WASTE GENERATION AT PRESENT
- 6) WASTE COLLECTION AND TRANSPORTATION AT PRESENT
- 7) SCOPE OF THE SYSTEM
- 8) INSTITUTIONAL/ORGANIZATIONAL SET –UP



- 9) COLLECTION EQUIPMENT AND MACHINERY
- 10) EXISTING POTENTIAL FOR RECYCLING
- 11) FINANCING AND COST RECOVERY
- 12) STRUCTURE OF THE MUNICIPAL BUDGET
- 13) WASTE MANAGEMENT COSTS AND REVENUES
- 14) OPTIMISATION OF THE WASTE COLLECTION AND TRANSPORTATION SYSTEM
- 15) OBJECTIVES
- 16) FUTURE POPULATION
- 17) FUTURE WASTE GENERATION
- 18) FUTURE WASTE COLLECTION AND TRANSPORTATION SYSTEM
- 19) COST ESTIMATES FOR SYSTEM OPTIMIZATION
- 20) INVESTMENT AND FINANCIAL COSTS
- 21) OPERATION AND MAINTENANCE COSTS
- 22) ECONOMIC AFFORDABILITY
- 23) TIME SCHEDULE FOR IMPLEMENTATION
- 24) OPTIMISATION OF THE SEPARATE WASTE COLLECTION SYSTEM
- 25) FUTURE SEPARATE WASTE COLLECTION SYSTEM
- 26) COST ESTIMATES
- 27) COST ESTIMATES OF THE ENTIRE OPTIMISED SYSTEM INCLUDING SEPARATE COLLECTION
- 28) FINANCIAL ANALYSIS AND AFFORDABILITY OF THE ENTIRE OPTIMISED SYSTEM
- 29) DESCRIPTION OF THE TERRITORY AND COVERAGE WITH BUILDINGS
- 30) INFRASTRUCTURE
- 31) WASTE TREATMENT AND DISPOSAL FACILITIES



- 32) WASTE GENERATION AT PRESENT
- 33) WASTE COLLECTION AND TRANSPORTATION AT PRESENT
- 34) SCOPE OF THE SYSTEM
- 35) INSTITUTIONAL/ORGANIZATIONAL SET -UP
- 36) COLLECTION EQUIPMENT AND MACHINERY
- 37) EXISTING POTENTIAL FOR RECYCLING
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- 48) OPERATION AND MAINTENANCE COSTS
- 49) ECONOMIC AFFORDABILITY
- 50) TIME SCHEDULE FOR IMPLEMENTATION
- 51) OPTIMISATION OF THE SEPARATE WASTE COLLECTION SYSTEM
- 52) FUTURE SEPARATE WASTE COLLECTION SYSTEM
- 53) COST ESTIMATES
- 54) COST ESTIMATES OF THE ENTIRE OPTIMISED SYSTEM INCLUDING SEPARATE COLLECTION
- 55) FINANCIAL ANALYSIS AND AFFORDABILITY OF THE ENTIRE OPTIMISED SYSTEM

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