

**TECHNICAL ASSISTANCE FOR PIPELINE OF PROJECTS PREPARATION
PHARE 2005/017-553.04.03/08.01**

NON-TECHNICAL SUMMARY

REPORT ON THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY

Municipal Waste Integrated Waste Management System

MURES COUNTY

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1. GENERAL DATA

The Report on the Environmental Impact Assessment Study refers to the following investments within the "Integrated Municipal Waste Management System in Mures County", which are to be financed within the Environmental Sectoral Operational Program:

- equipment for the separate collection of recyclable waste in the entire county, both in urban and rural area;
- equipment for the separate collection of biodegradable waste from the population living in individual houses in Tirgu Mures municipality;
- transfer station, sorting plant and composting plant for Tirgu Mures area;
- transport means for the transport of residual waste from the transfer station to the landfill and the mechanical-biological treatment plant;
- mechanical-biological treatment facility;
- zonal landfill for non-hazardous waste;
- closure of the non-compliant landfills at Tirgu Mures, Reghin, Iernut, Ludus and Sovata.

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The scope of the project "Integrated Municipal Waste Management System in Mures County" is to create the infrastructure needed in the county for waste management carried out in accordance with the legal provisions, protecting the environment and the health of the population.

Dimensioning of the facilities to be developed within the project (composting plant, sorting plant, mechanical-biological treatment facility, landfill) as well as the number of containers for separate collection and home composting units, were determined within the Master Plan and the Feasibility Study, to ensure the reaching of the targets from the County Waste Management Strategy, mainly the targets concerning the recovery of packaging and reduction of the quantity of biodegradable waste landfilled.

2. CURRENT SITUATION

Currently, annually, in Mures county, a quantity of approximately 210,000 tonnes of municipal waste is generated, of which approximately 140,000 tonnes of household waste, and approximately 20,000 tonnes of waste from gardens and parks, market waste and street waste. Currently, from the entire quantity of waste generated only 80 % are collected. Uncollected waste is generally household waste generated in rural area.

Waste collection is carried out by six sanitation operators, of which five have an ANRSCUP license. At the end of 2008, the connection rate to sanitation services in urban area was of approximately 88 %. The urban population not connected to sanitation services is the population from the periurban areas. In rural area, 21% of the population is connected to sanitation operators.

Although the connection rate to sanitation services in the county is relatively high (it is over the national average), the services do not fully comply with the legislation in the field, currently, only mixed collection of household waste being carried out.

Currently, in the county, there is no operating waste sorting plant, as well as no facility for the treatment of biodegradable waste. Furthermore, currently, there is no operating transfer station.

Currently, landfill of waste is carried out on two non-compliant landfills (the landfill at Tirgu-Mures Cristesti and the landfill at Reghin) which have to cease landfill activity on July 16th 2009 and one compliant landfill (the landfill at Sighisoara). The landfill at Sighisoara is the first compliant landfill constructed in Romania (started operation in 1999) and it still has an available capacity of approximately 200,000 m³.

In addition to these landfills, in the county, there is another non-compliant landfill at Tarnaveni, which ceased landfill activity in 2006 and now is under the closure procedure, the landfill at Ludus, which ceased landfill activity at the end of 2007 and the landfills at Iernut and Sovata, which ceased landfill activity in December 2008.

Currently, in Mures County, there are under implementation 5 projects in the field of waste management (5 projects financed through PHARE ESC 2003, 2005 and one project financed through Ordinance 7/2006). During 2009-2010, through these projects five transfer stations (Reghin, Tarnaveni, Riciu, Balauseri and Sighisoara), 6 small capacity sorting stations (Reghin, Tarnaveni, Balauseri, Riciu, Acatari and Sighisoara) shall be constructed and equipment for waste collection and transport shall be purchased. Until the implementation of the present project, the residual waste collected both from rural and urban area (except the Tirgu Mures area) shall be transported directly or through transfer stations (which shall be constructed through the existing projects) to the Sighisoara landfill. The residual waste collected from Tirgu Mures municipality and the neighbouring localities shall be baled and temporary stored on the designated platform at Cristesti, which is an investment of Tirgu Mures City Hall.

3. DESCRIPTION OF THE PROJECT

The strategy of Mures County concerning waste management follows the waste management hierarchy, giving priority to waste generation prevention measures by promoting home composting in rural area, but also to waste recycling and recovery by implementing separate collection, to construction of sorting plants and of a composting plant. Based on this strategy, within the Master Plan, the long-term investment plan was developed.

From all these investments, the priority investments were selected, which are object of the project to be financed by SOP Environment, respectively of the Environmental Impact Assessment Study.

The components of the project are:

- purchase of containers and bins for the separate collection of recyclable waste;
- purchase of bins for the separate collection of biodegradable waste;
- purchase of home composting units;
- transfer station for Tirgu Mures area;
- purchase of transport means for the transport of waste from the transfer stations to the landfill and MBT;
- sorting plant for Tirgu Mures area;
- composting plant for Tirgu Mures area;
- mechanical-biological treatment facility at Sinpaul;
- compliant landfill at Sinpaul;
- closure of non-compliant landfills ((Tirgu Mures, Iernut, Reghin, Ludus, Sovata).

The transfer station, the sorting plant and the composting plant for the Tirgu Mures are shall be developed on the site at Cristesti, and the landfill and the mechanical-biological treatment facility shall be developed on the site at Sinpaul.

3.1 Waste Collection and Transport

Through the project it is foreseen to purchase containers and bins for the separate collection of recyclable waste for the entire county (urban and rural area). The system for the separate collection of recyclable waste is the following:

- Separate collection of glass waste shall be carried out both in urban and rural area through street collection points using 1.1 m³ containers;
- Separate collection of paper and cardboard waste shall be carried through street collection points using 1.1 m³ containers (in the area of individual houses in urban area and rural area), as well as through collection points for the blocks of flats area;
- Separate collection of plastic and metal waste shall be carried out through collection points in rural area using 1.1 m³ containers, using 250 l individual bins for the areas of individual houses in urban area and 1.1 m³ containers placed in the area of blocks of flats in urban area.

Through the project, in order to reach the target concerning the reduction of biodegradable municipal waste, in addition to the separate collection of green waste, market waste and biodegradable waste from canteens and markets, it is proposed to separately collect biodegradable waste from 80 % of the houses in Tirgu Mures municipality. Thus, 120 l bins shall be purchased.

In addition, home composting shall be stimulated in rural area, purchasing, through the project, home composting units for 50 % of the population in rural area (50,250 composting units).

The authorities of the local public administration together with the sanitation operators are responsible with the purchase of vessels for the collection of residual waste to reach a connection rate to sanitation services of 100 % both in urban and rural area. Furthermore, the authorities of the local public administration and the sanitation operators shall provide the needed transport means for the transport of recyclable and biodegradable waste to the waste management facilities (transfer stations, sorting plants, composting plant, zonal landfill and mechanical-biological treatment facility).

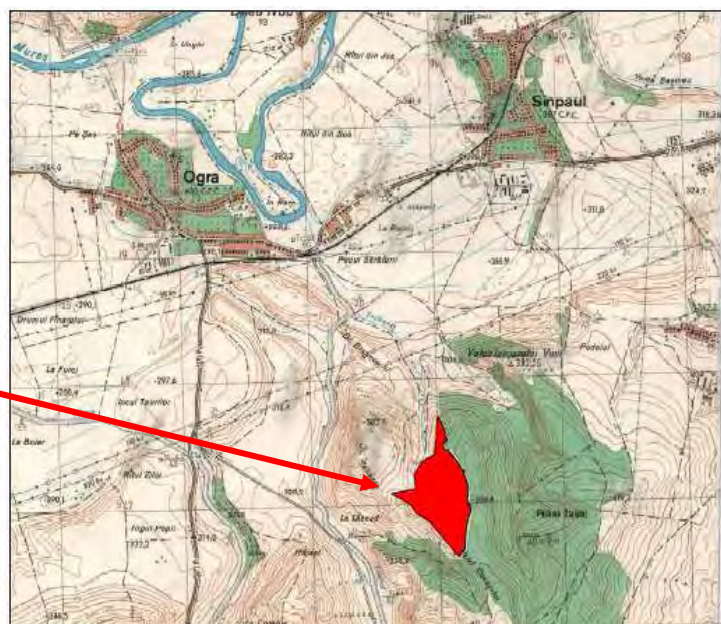
The integrated waste management system envisages 7 waste collection areas. The collection areas were established based on the transfer stations under development (Reghin, Tarnaveni, Balauseri, Riciu), the transfer station which shall be developed at Cristesti through the present project, the existing landfill at Sighisoara and the zonal landfill at Sinpaul to be developed through the project.

3.2 Sinpaul Site – Landfill and Mechanical-Biological Treatment Facility

3.2.1 Description of the Sinpaul Site

The site is located in the extravillan of Sinpaul Commune (Fodora area), at approximately 4 km South of the administrative centre of the commune and the distance to the nearest household (Sinpaul and Valea Izvoarelor localities) and the nearest relevant watercourse is of approximately 2 km. During heavy rain periods, in the North of the land, Techenis creek comes to life. The Eastern limit of the site is the same with the border of the forest.

Sinpaul Site



Access to the objective is done through a 2.5 km long earth road starting from European road E 60, connecting Tirgu Mures and Cluj-Napoca, crossing agricultural service roads.

Access to the Sinpaul site

The total surface of the site where the landfill and the mechanical-biological treatment facility shall be developed is of 31.14 ha. For the future development of the compliant landfill, as well as of the mechanical-biological treatment facility, Mures County Council shall absorb 3 other parcels of land in the close vicinity. The parcels of land summing up to approximately 11.24 ha are on the administrative territory of Ogra and Sinpaul communes. For the extension of the landfill, 9.36 ha of 11.24 ha were considered, and for the extension of the mechanical-biological treatment facility 1.88 ha.



To carry out the investments on the site, Land Development Certificate no. 279/14.08.2008 was obtained. In accordance with the requirements of the Land Development Certificate, the Zonal Land Development Plan was elaborated for the development of the class "b" landfill and the MBT facility and all required licenses were obtained. The Zonal Land Development Plan received the approval of the Chief Architect of the county (sole license no. 90/30.10.2008), was approved through Sinpaul LCD no. 32/26.09.2008 and M CCD no. 162/30.10.2008 and it went through the strategical environmental assessment (SEA) procedure.

3.2.2 Landfill

Taking into account the types of waste landfilled, the landfill at Sinpaul shall be a non-hazardous waste landfill (class „b" in accordance with the provisions of GD 349/2005 on landfill of waste).

It shall receive for landfill residual municipal waste and any type of non-hazardous waste, complying with the acceptance criteria at non-hazardous waste landfills envisaged in the Order of the ministry of environment no. 95/2005 on the establishing of the acceptance criteria and preliminary waste acceptance procedures at landfills and the national list of waste accepted at each type of waste landfill.

By 2016, in the county, in addition to the zonal landfill at Sinpaul, the landfill at Sighisoara shall also be operating, which shall receive the waste from that area, meaning a population of 52,000 inhabitants. *Thus, by 2016, the population connected to the zonal landfill at Sinpaul shall be of 510,000 inhabitants. After 2016, the landfill shall serve the entire county, i.e. a population of approximately 560,000 inhabitants.*

The landfill has been designed with a lifetime of 21 years (3 cells, first cell operating for 5 years). The total surface of the first cell is of 8.3150 ha, and the total surface afferent to the landfill for the entire lifetime is of 31.1 ha.

The capacity of the first landfill cell is of 125,000 m³, and the total capacity of the landfill is of 4,900,000 m³. The landfill shall be equipped with four large capacity transport means that shall assure the transport of waste from the transfer stations developed through other projects to the landfill.

The design of the landfill was made in accordance with the in force legal provisions. The base of the landfill is sealed in accordance with the provisions of the Landfill Normative. The landfill is equipped with a leachate collection system. The collected leachate shall be treated using a reverse osmosis facility, which assures the quality parameters needed for discharge into the surface water (Tehenis Creek).

During the operation of the landfill, the waste unloaded and compacted in the cell is periodically covered, to avoid odours, light waste scattered by wind and insects and birds. The covering also intends to improve the appearance of the landfill. As covering material, mainly biologically stabilized waste from the mechanical-biological treatment facility shall be used.

To protect the landfill from wind, which could scatter the light waste, as well as to improve visual aspect, all around the landfill, a 20 m wide protection curtain of high trees shall be planted.

3.2.3 Mechanical-Biological Treatment Facility

The mechanical-biological treatment facility to be developed at Sinpaul shall have an initial capacity of 65,000 tonnes/year. Generally, within the facility, residual waste collected from the Tirgu Mures and Reghin area shall be treated.

This type of treatment has the role to reduce the biodegradable component of this waste and the volume of waste landfilled. The mechanical-biological treatment facility consists of mechanical treatment and biological treatment.

Within mechanical treatment, all conditions for further biological treatment must be assured. This may be achieved by separating, respectively, eliminating materials that make difficult the biological treatment of waste, respectively, which cannot be biologically treated or which encounter difficulty in decomposing, or which represent a potential of useful materials (for example, ferrous and non-ferrous metals).

The mechanical treatment shall take place in a ventilated hall and gas removal shall be carried out using a biofilter.

Intensive decomposition and maturation or biological treatment of waste is carried out in heaps.

On the intensive decomposition platforms, 52 trapezoidal heaps shall be organized. During the intensive decomposition phase, the heaps shall be covered with membrane and shall be aerated.

In the maturation area, 23 trapezoidal heaps shall be organized.

In case of maturation, with low activity from a biological point of view, the heaps shall not be covered, they shall be turned only once a week using a front loader.

3.3 Cristesti Site – Transfer Station, Sorting Plant and Composting Plant

3.3.1 Description of the Cristesti Site

The site has a surface of 39.744 m² and it is located in the extravillan of Valureni locality, Cristesti Commune, the owner being Tirgu Mures Municipality.

The land is located at approximately 400 m E from the non-compliant landfill at Tirgu Mures, at approximately 1,500 m S from the Auchan – Metro commercial area and approximately 700 m W from the first household.

Access on the site shall be done from Gheorghe Doja Street, near the site of the non-compliant landfill.

New Cristesti Site

Non-compliant landfill at Tirgu Mures



Through LCD no. 183/30.10.2008, Tirgu Mures Municipality has approved the purchase of surface of land of approximately 4 ha, located in Cristesti Commune,

Valureni Village, land parcel no. A-157-1, for the construction of the transfer station, sorting plant and composting plant.

All the sale-purchase agreements were signed in April 2009.

On April 29th 2009, Mures County Council has issued the Land Development Certificate no. 105 for:

- Stage I – Elaboration of LDP (PUZ), establishing the operation area and the needed mandatory regulations;
- Stage II – Construction of the transfer station, sorting plant and composting plant in Valureni locality, Cristesti commune.

3.3.2 Transfer Station and Sorting Plant

Tirgu Mures transfer station shall receive residual municipal waste collected from Tirgu Mures municipality and the adjacent localities. Thus, the transfer station shall serve a number of approximately 223,600 inhabitants, of which a number of approximately 152,700 inhabitants in urban area (Tirgu Mures municipality and Miercurea Nirajului city). The capacity of the transfer station shall be of approximately 87500 tonnes/year. The compacted waste shall be transported in large containers to the mechanical-biological treatment facility and the zonal landfill at Sinpaul.

The transfer station shall be equipped with 3 compactors and four large capacity transport means.

Within the Tirgu Mures sorting plant, the recyclable waste separately collected from the population, industry, commerce and institutions (packaging waste and similar household waste) in Tirgu Mures and the neighbouring localities shall be sorted. In the sorting plant, paper and cardboard waste, metal waste and plastic waste shall be sorted. The total capacity of the sorting plant shall be of approximately 28,000 tonnes/year and the plant shall serve approximately 203,000 inhabitants, of which approximately 146,000 inhabitants from urban area (Tirgu Mures municipality).

3.3.3 Composting Plant

In the composting plant at Tirgu Mures, biodegradable household waste collected from 80 % of the households in Tirgu Mures, as well as biodegradable waste from parks and gardens, markets and canteens and restaurants in Tirgu Mures shall be composted. The composting plant shall have a capacity of approximately 9,000 tonnes/year.

The intensive decomposition phase, which takes four weeks, shall be carried out in heaps covered with membrane and fitted with forced aeration. The maturation phase takes 12 weeks and is carried out in heaps. In the first 8 weeks of maturation, the heaps are under a shed in order to eliminate rainwater pollution.

After the maturation phase, the compost is sieved and temporary stored on a covered platform.

3.4 Closure of the Non-Compliant Landfills

In Mures county, there are 5 non-compliant landfills which have ceased landfill activity (Ludus, Iernut and Sovata) or which shall cease the landfill activity by July 16th 2009 (Tirgu Mures and Reghin). All these landfills shall be closed within the project in 2010, respectively 2011 (Tirgu Mures and Reghin). Details regarding each landfill are given below.

All 5 landfills shall be closed in compliance with the provisions of the Technical Normative on waste landfill.

For the non-compliant landfill at Tirgu Mures it is proposed that the landfill gas is collected using a catching installation, consisting of:

- Landfill gas extraction wells;
- Landfill collection and transport system, including pipes, dewatering system and gas substation;
- Gas flare system.

For the non-compliant landfills at Reghin, Iernut, Ludus and Sovata a passive degasification system is proposed.

For all landfills, leachate collection and treatment is envisaged.

4. ANALYSED ALTERNATIVES

In order to establish the investments which shall be carried out within the Integrated Waste Management System from the pre-feasibility stage (Master Plan) several alternatives were analysed, namely:

- Technical options for each waste management stage (collection, transport/transfer, sorting, treatment, disposal);
- Site alternatives.

Once the technical option for each waste management stage has been established, within the Feasibility Study, several technical possibilities to develop the waste management facilities were analysed, the best solution from an environmental protection point of view being chosen.

The technical alternatives proposed for the integrated waste management system in Mures County were established considering:

- technical options proposed for each stage of the waste management system;
- the current situation and ongoing projects in the waste management field in the county;
- possible sites for the development of the waste management facilities.

The assessment of the alternatives was carried out based on:

- economic criteria;
- criteria concerning the site of the zonal landfill.

The assessment economic criteria were the following:

- total value of the investments needed for the development of the waste management system;
- operation and maintenance costs.

For the assessment of the site 6 categories of criteria were used:

- Environmental criteria;
- Geologic-hydrogeologic-hydrologic criteria;
- Criteria concerning the infrastructure;
- Operation criteria;
- Social criteria;
- Financial criteria.

After the assessment of the 4 sites (Iernut, Sinpaul I and II and Cristesti), it was determined that the site at Sinpaul II (Fodora) is the most appropriate.

The table below presents the 3 assessed alternatives. The chosen alternative was Alternative 1.

Summary of Alternatives

	Alternative 1	Alternative 2	Alternative 3
Household waste collection	Urban area households with individual bins: <ul style="list-style-type: none"> Individual bin for collection of metal and plastic waste; Individual bins for residues; Individual bin for 80 % of the individual households in Tirgu Mures for the collection of biodegradable waste; 	Urban area households with individual bins: <ul style="list-style-type: none"> Individual bin for collection of metal and plastic waste; Individual bins for residues; Individual bin for 80 % of the individual households in Tirgu Mures for the collection of biodegradable waste; 	Urban area households with individual bins: <ul style="list-style-type: none"> Individual bin for collection of metal and plastic waste; Individual bins for residues; Individual bin for 80 % of the individual households in Tirgu Mures, Sighisoara, Reghin and Tarnaveni for the collection of biodegradable waste;
	Urban area blocks of flats - containers: <ul style="list-style-type: none"> 1.1 m³ containers for the collection of metal and plastic waste ; 1.1 m³ containers for the collection of paper and cardboard waste; 1.1 m³ containers for the collection of residues 	Urban area blocks of flats - containers: <ul style="list-style-type: none"> 1.1 m³ containers for the collection of metal and plastic waste ; 1.1 m³ containers for the collection of paper and cardboard waste; 1.1 m³ containers for the collection of residues 	Urban area blocks of flats - containers: <ul style="list-style-type: none"> 1.1 m³ containers for the collection of metal and plastic waste ; 1.1 m³ containers for the collection of paper and cardboard waste; 1.1 m³ containers for the collection of residues; 1.1 m³ containers for the separate collection of biodegradable waste from 60 % of the population living in blocks of flats in Tirgu Mures, Sighisoara, Reghin and Tarnaveni
	Urban area – street collection points: <ul style="list-style-type: none"> 1.1 m³ containers for the collection of glass; 1.1 m³ containers for the collection of paper and cardboard 	Urban area – street collection points: <ul style="list-style-type: none"> 1.1 m³ containers for the collection of glass; 1.1 m³ containers for the collection of paper and cardboard 	Urban area – street collection points: <ul style="list-style-type: none"> 1.1 m³ containers for the collection of glass; 1.1 m³ containers for the collection of paper and cardboard
	Rural area: <ul style="list-style-type: none"> Street collection points equipped with 3 containers for 	Rural area: <ul style="list-style-type: none"> Street collection points equipped with 3 containers for 	Rural area: <ul style="list-style-type: none"> Street collection points equipped with 3 containers for the

	Alternative 1	Alternative 2	Alternative 3
	the collection of glass, paper and cardboard and metals and plastic; <ul style="list-style-type: none"> Bins/1.1 m³ containers for the collection of residual waste 	the collection of glass, paper and cardboard and metals and plastic; <ul style="list-style-type: none"> Bins/1.1 m³ containers for the collection of residual waste 	collection of glass, paper and cardboard and metals and plastic; <ul style="list-style-type: none"> Bins/1.1 m³ containers for the collection of residual waste
Transfer stations	Existing projects for transfer stations: Reghin, Tarnaveni, Riciu, Balauseri Proposed transfer stations: Tirgu Mures. Sighisoara shall be constructed after the exhaustion of the capacity of the landfill (after 2013)	Existing projects for transfer stations: Reghin, Tarnaveni, Riciu, Balauseri Proposed transfer stations: Ludus. Sighisoara shall be constructed after the exhaustion of the capacity of the landfill (after 2013)	Existing projects for transfer stations: Reghin, Tarnaveni, Riciu, Balauseri Proposed transfer stations: Tirgu Mures. Sighisoara shall be constructed after the exhaustion of the capacity of the landfill (after 2013)
Sorting plants	Existing projects sorting plants: Reghin, Tarnaveni, Riciu, Balauseri, Acatari, Sighisoara Proposed sorting plants: Tirgu Mures	Existing projects sorting plants: Reghin, Tarnaveni, Riciu, Balauseri, Acatari, Sighisoara Proposed sorting plants: Ludus	Existing projects sorting plants: Reghin, Tarnaveni, Riciu, Balauseri, Acatari, Sighisoara Proposed sorting plants: Tirgu Mures
Composting facilities	<ul style="list-style-type: none"> Composting facility Tirgu Mures – capacity of approximately 9,000 tonnes/year, operating in 2010 	<ul style="list-style-type: none"> Composting facility Tirgu Mures – capacity of approximately 9,000 tonnes/year, operating in 2010 	<ul style="list-style-type: none"> Composting facility Tirgu Mures – capacity of approximately 17,000 tonnes/year, operating in 2013; Composting facility Reghin – capacity of approximately 4,000 tonnes/year, operating in 2013; Composting facility Sighisoara – capacity of approximately 4,000 tonnes/year, operating in 2012; Composting facility Tarnaveni – capacity of approximately 3,000 tonnes/year, operating in 2012;
Home composting	Home composting in 50 % of the households in rural area, which shall compost 50 % of the quantity of biodegradable waste generated	Home composting in 50 % of the households in rural area, which shall compost 50 % of the quantity of biodegradable waste generated	Home composting in 60 % of the households in rural area, which shall compost 80 % of the quantity of biodegradable waste generated
Mechanical-biological treatment	Mechanical-biological treatment facility (MBT) on the site of the landfill at Sinpaul, capacity of 65,000 t/year, operating in 2013, extension of the capacity to 120,000 tonnes/year in 2015	MBT facility, capacity of 120,000 t/year, operating in 2013	MBT facility, capacity of 70,000 t/year, operating in 2016 (construction phase 2014-2015)
Landfill	Zonal landfill at Sinpaul	Zonal landfill at Cristesti	Zonal landfill at Sinpaul

5. IMPACT ON THE ENVIRONMENTAL COMPONENTS AND MEASURES FOR REEDUCTION

The assessment of the impact of the project implementation on the environment has been carried out for each environmental factor (including for the socio-economic factor) for all stages of the project – construction, operation and post-closure phase (for landfills).

For each environmental factor, which may be affected, measures for the reduction of the impact were proposed.

Below, for each environmental factor, the possible impact of the project implementation and measures for its reduction are presented.

The possible impact on the environment during the construction phase shall be the similar for all the investments analysed. For the operation and post-closure phases, the impact varies, mainly, depending on the location and activities carried out.

5.1 Impact on the Water Resources

5.1.1 Construction Stage

Construction of New Investments

Following the regulations concerning construction site management and applying the proposed measures for the reduction of the impact, the activities carried out on the site shall have an insignificant impact on the water quality.

Closure f the Non-Compliant Landfills in Urban Area

The sites of the non-compliant landfills at Reghin and Sovata are located close to surface watercourses (Recea Creek, respectively Iuhod Creek).

In case, during the profiling operations, waste is scattered in the watercourses, there shall be a significant impact on the water.

In addition, accidental losses of oil compounds (fuels and motor oils) from machinery and vehicles carrying out the closure works shall have big impact on the water.

The closure operations of the other non-compliant landfills (Tirgu Mures, Iernut and Ludus) shall not have a negative impact of the quality of the water resources.

5.1.2 Operation Stage

Sinpaul Site

Except the household waste waters, an eventual discharge without treatment of the other categories of waste water (caused by malfunctioning of the sealing system or of the collection and treatment system) leads to the generation of a medium impact on the water resources.

Cristesti Site

If the excess water resulted from composting is discharged without any treatment, there will be a significant impact on the water environmental factor.

5.1.3 Post-Closure Stage

Sinpaul Zonal Landfill

In case of deterioration of the leachate collection and treatment system, there will be a significant impact on the surface and underground waters.

Non-Compliant Landfills

By closing and sealing the surface of the 5 non-compliant landfills in urban area, the quantities of infiltrating rainwater shall be drastically reduced, thus, reducing the volume of leachate produced and its negative impact on the water bodies.

Practically, the impact of the closure activities on the water environmental factor, during this stage, shall be a positive one.

5.2 Impact on the Air

The methodologies used for the determination of the mass flows of pollutants emitted during the implementation phase of the project are:

- Methodology *US EPA/AP-42 (Air CHIEF – Fifth Edition Updated in 2007)* for the dust generated by any type of sources;
- Methodology *EEA/EMEP/CORINAIR (latest version, 2008)* for pollutants generated by the stationary combustion sources and mobile machinery;
- COPERT IV program and the technical specifications for some types of machinery, for pollutants generated by vehicles.

In order to evaluate the impact on the air during the stage of operation of the facilities constructed through the project, *OML – multi* was used, a pollutant dispersion model at a local scale developed by the National Environment Research Institute – NERI (Denmark).

5.2.4 Construction Stage

The main pollutants specific to the construction operations are the suspended particles (with a large dimensional spectrum) and the pollutants specific to Diesel type internal combustion engines the machinery and transport vehicles are equipped with are (nitrogen oxides, carbon oxides, sulphur oxides, particles with heavy metal content, organic compounds – including polycyclic aromatic hydrocarbons – PAH, substances with carcinogenic potential).

Taking into account the mass flow of the main pollutants produced, it is considered that the impact of the construction activities on the air is reduced and focused on the area where the activities are carried out.

5.2.5 Operation Stage

The impact of the generated aerial pollutants on the air quality has been determined using the mathematical modelling.

The analysed pollutants were both the regular ones (NO₂, CO, PM₁₀) and the specific ones, mainly those with a possible high olfactory impact: COV_{nm}, H₂S, dimethyl sulphide, carbon sulphide and methanethiol. In addition, calculations were made for methane and carbon dioxide.

The emissions afferent to 2014 were modelled, because in this year, all facilities on the sites at Cristesti and Sinpaul shall be operating and the landfill at Cristesti shall be closed.

The analysis of the results obtained after the mathematical modelling of the pollutants dispersion into the atmosphere, compared to the limit values for the concentrations envisaged by the in force legislation, underlines the fact that the levels of concentration in the air of the majority of the analysed pollutants and established by the existing legislation, generated by the sources afferent to the entire system shall be heavily under the limit values, independent of the mediation interval.

In addition, the modelled values of the pollutant concentrations and due to the exclusive operation of the analysed objectives, corroborated with the base values, shall not generated values exceeding the limit values.

An exception is the methanethiol for which the maximum values for 24 h exceed the limit value established by STAS 12574/1987 and the dimethyl sulphide for which the olfactory limit is exceeded. These excess values are registered in the close vicinity of the landfill at Sinpaul (maximum 500 m form the border of its perimeter) and due to the large distances to the neighbouring localities, the occurrence of olfactory discomforts is extremely low (the values of the concentrations of the compounds with an odorant potential is lower than the olfactory limits).

5.2.6 Post-Closure Stage

The calculation of the pollutants flows were made using the emissions model **LandGEM** – version 3.02 (Landfill Gas Emission Model), model recommended by the USA Environmental Protection Agency, for the estimation of the pollutants emissions on the surface of household – municipal waste landfills.

To estimate the emissions during the post-closure period, for each particular case, the landfill operation period and the final quantities of waste landfilled during this period were considered.

In case of the compliant landfill at Sinpaul, due to the disposal of waste with a low content of biodegradable substances, respectively of stabilized waste resulted from the mechanical-biological treatment facility, *the real waste quantities with a potential to generate landfill gas were considerably lower.*

Sinpaul Compliant Landfill

The emission rate of all sources shall decrease in time after the closure of the landfill, until the exhaustion of the gases generated by the decomposition of the landfilled waste.

The sources were not assessed in relation with the in force legal provisions because for the specific emission sources there are no emission limits.

Non-Compliant Landfills in Urban Area

As a result of the estimations, it was noticed that the emission rate of all sources should decrease in time after the closure of the landfill, until the exhaustion of the gases generated by the decomposition of the landfilled waste.

The sources were not assessed in relation with the in force legal provisions because for the undirected sources there are no specific limits.

5.3 Impact on the Soil and the Geologic Environment

5.3.1 Construction Stage

Construction of the New Investments

The main forms of impact on the soil, which may occur during the construction stage of the new investments, are:

- removal from the agricultural circuit and final taking over of a surface of 311,400 m² for the construction of the investments on the Sinpaul site, of which approximately 20,000 m² for the landfill;
- removal from the agricultural circuit and final taking over of a surface of 4,480 m² for the construction of the sorting plant and transfer station and composting plant;
- irreversible modification of some natural circuits involving bio-chemical processes taking place at the level of the soil;
- pollution with oil products and heavy metals;
- degradation of the quality as result of the storage of different materials/waste directly on the soil;
- pollution with organic matters from the waste waters.

Closure of Non-Compliant Landfills in Urban Area

The potential impact produced during the carrying of the construction works shall be low, focused in the area where these works take place and only during the construction site management activities.

The long-term impact of the non-compliant landfill closure activities is a positive one. By reprofiling and covering the waste, their scattering is prevented as well as the discharge of leachate to the adjacent surfaces.

In conclusion, the main forms of impact on the soil generated by the implementation of the project are caused by the removal of a high land surface from the agricultural circuit (35.62 ha), respectively the mitigation of a large volume of fertile soil (48,400 m³).

The management of the fertile soil mitigated for the development of the new facilities shall be carried out as follows:

Sinpaul site - setting up of green areas on the site, closure of the non-compliant landfill at Iernut, closure of the non-compliant landfill at Ludus; the rest shall be made available for the Tirgu Mures Communal Management Service;

Cristesti site - setting up of green areas on the site, closure of the non-compliant landfill at Tirgu Mures.

The distance between the new sites and the non-compliant landfills at Reghin and Sovata is too large for the transport of fertile soil to be feasible from an economic point of view.

Having in view the recovery of the entire quantity of soil removed for the development of the investments and the remediation of a large surface of currently exhausted soil, the negative impact of the project implementation on the soil is significantly reduced.

5.3.2 Operation Stage

The possible forms of impact on the soil, produced during the period of operation of the investment are:

- damaged soil quality in the area as result of infiltrations/leakage of leachate and other waste waters on unsealed surfaces;
- damaged soil quality in the surrounding areas as result of the scattering of waste on unprotected areas;
- pollution with heavy metals and oil products of the soil on the sites.

Because in both cases the investments are going to be carried out on a low production land (quality class III), it is considered that there is a reduced negative impact on the soil.

5.3.3 Closure Stage

The impact on the soil determined by the closure activities of the cells of the compliant landfill and of the non-compliant landfills is similar to that of the construction period.

Provision of the needed clayey earth for the covering of the landfills shall be done, if it is possible, from the construction sites from the vicinity of the sites. In case this is not feasible, borrow pits shall be done.

This shall generate a negative impact on the soil, by modifying the structure of the soil profiles.

Provision of the fertile soil by recovering the soil removed from the new sites, shall lead to the avoidance of the occurrence of a negative impact on the soil.

In conclusion, the potential impact produced during the carrying out of the works shall be reduced, focused to the area where these works are carried out and only during the construction site management period.

5.3.4 Post-Closure Stage

In the post-closure stage there are going to be no activities producing a significant impact on the soil.

Concerning the impact of project implementation on the geologic environment, this shall be insignificant in case of construction of the new landfill and there shall be none in case of the other investments.

During the operation stage there is no impact on the geologic environment.

5.4 Impact on the Biodiversity

Sinpaul Site

The impact on the biodiversity during the construction phase of the new landfill and of the mechanical-biological treatment facility shall be significant (the vegetation and the fauna on the site shall be removed).

During the facility operation stage, in case of compliant operation, the impact shall be high, by proliferating different species. The impact may be reduced by applying certain measures.

Both during the construction and operation stage of the investments, the *protection of the forest ecosystem* must be considered, which is located to the E of the site.

The period during which the forest shall be affected by the construction activities shall be limited to the duration of the construction site management activities.

The impact of the closure activities on the biodiversity shall be insignificant, having in view that the biodiversity is significantly reduced, being irremediably affected during the construction stage. The covered surface shall be entirely recultivated, which shall have positive impact in the biodiversity.

During the post-monitoring stage there is no activity with impact on the biodiversity environmental factor.

The closest natural protected area is located at 5.8 km from the site, a special avifaunistic protection area – the Iernut-Cipau ponds (ROSPA0041). With a surface of 454.4 ha, they represent an important stop-over for the migrating birds in Transylvania.

Cristesti Site

There is a reduced impact of the construction activities of the investment objectives on the biodiversity. There is reduced biodiversity on the site (agricultural ecosystem). Being located close to the non-compliant landfill at

Tirgu Mures has been, over the years, a factor for the reduction of the biodiversity.

During the facility operation stage, because the majority of the operations are carried out in enclosures, respectively closed and sealed, there is going to be a reduced impact on the biodiversity in the area of the site. The biodegradable waste composting operation may attract an opportunistic fauna.

Closure of the Non-Compliant Landfills in Urban Area

The closure works and sealing of the non-compliant landfills shall have a positive impact on the ecosystems from the adjacent areas.

Practically, there is going to be a reduced volume of infiltrating leachate (due to the waterproofing of the surface), the waste shall not be scattered by wind anymore and the landfill gases with an impact on the adjacent ecosystems shall be reduced.

During the post-closure monitoring stage, which shall last at least 30 years, there is going to be no impact on the biodiversity.

The closest protected natural area is the avifaunistic special protection area *Dealurile Tarnavelor – Valea Nirajului* (ROSPA00289), located at 4.6 km S from the site. With a surface of 85.217 ha, the site is important because it is the habitat for a significant number of community importance species of birds.

In conclusion, the impact generated by the construction works for the investment objectives on the biodiversity shall not be significant because:

- the period of time is limited;
- the machinery operation time is well defined (8-12 hours/day);
- there is a restricted area of influence;
- no clearing shall be carried out, no wood loses shall be registered.

In exchange, the landfill operation shall definitely lead to changes in the level of the biocenosis. It can be said for sure that the opportunistic species (mainly rodents and birds) shall significantly increase. In addition, the operation of the landfill shall lead to a pressure on the ecosystems from the close vicinity due to emissions of pollutants into the atmosphere (from the landfill mass and the intensification of the traffic in the area).

The operation of the other facilities (sorting plant and transfer station, composting plant) shall produce no negative impact on the biodiversity environmental factor.

5.5 Impact on the Landscape

Sinpaul Site

After the construction of the new landfill and the mechanical-biological treatment facility, the existing landscape shall be modified. Practically, the landfill, at the maximum operation quota shall be 30 m over the natural ground level. After the exhaustion of the final capacity, the surface shall be sealed and sown with grass, and then returned to the natural circuit.

Due to the morphology of the area, the impact of the construction of the investment objectives on the landscape shall be reduced. The forest body shall cover the landfill body, it cannot be seen from Sinpaul locality. From the area of NR 15 only the administrative facilities of the site shall be seen.

Cristesti Site

The constructions on the site shall be visible both from NR14 and from a section of Valureni locality. It has to be mentioned that the landscape of the area is significantly urbanized by the presence of S.C. AZOMURES S.A. at approximately 2 km from the site.

Closure of the Non-Compliant Landfills in Urban Area

The impact on the landscape, generated by the activities of closure of the non-compliant landfills in urban area, shall be positive. Currently, because of non-compliant landfill of waste on the respective sites, the landscape has been deeply affected.

5.6 Impact on the Social and Economic Environment

The impact of the project on the economic conditions shall be a positive one by creating an additional number of positions, both during construction and operation stage.

Concerning the potential impact on the residential areas – having in view that the nearest households are at a distance of 2 km (Sinpaul village) from the N of the site – these shall not be affected by the stage of operation of the zonal landfill and of –biological treatment facility.

5.7 Global Impact Assessment

The environmental impact assessment was carried out per sections, for each environmental factor and separately for each stage of the investment, for each site.

The table below present, for each site, the forms of environmental impact, for which reduction measures were foreseen through the project.

In order to carry out the assessment, the intensity of the impact on each environmental factor was identified, respectively quantified, using the following codes:

- tot applicable – the activities carried out do not influence in any way the impact in the environment;
- insignificant – minor prejudice to the environment, seen only at the borders of the site;
- medium – some exceeding of the limit values established by the legislation and regulations, affect the surroundings;
- significant – high prejudice to the environment, numerous exceedings of the established limit values.

Sinpaul Site – Impact Assessment Matrix

IMPACT	STAGE			Measures for Reduction	Residual Impact	Intensity of the Residual Impact
	Construction	Operation	Post-Closure			
Air emissions						
Dust and pollutions specific to internal combustion engines	medium	medium	Nu	Use of vehicles and equipment fitted with EURO IV type engines	Yes	insignificant
Landfill gas	not applicable	medium	medium	Operation of the smallest possible surface	yes	insignificant
Emissions from the waste biological stabilizing stage in the MBT facility	not applicable	medium	not applicable	Covering with membrane of the waste heaps (intensive decomposition)	yes	insignificant
Soil, subsoil and underground water						
Breakage of the embankments	medium	medium	medium	Compliance with the design parameters	not applicable	
Removal of land from the agricultural circuit	significant	not applicable	not applicable	Recovery of the fertile resulted soil Setting up of the remaining available spaces as green areas	yes	medium
Pollution (oil products, heavy metals, organic materials with waste water content)	medium	medium	medium	Oil products separator	not applicable	
Erosion and transport of sediments	medium	medium	medium	Execution of earthworks on small areas Cultivation of the surface resulted	not applicable	
Contamination of the underground water (leakage of leachate and other categories of waste water)	insignificant	medium	medium	Automatic control of the effluent for relevant parameters	yes	insignificant
Contamination of the underground water (fissuration of the diesel storage tank, accidental oil leakage, etc)	medium	medium	medium	Retention tank of the diesel storage basin Decontamination of soil polluted with oil products	not applicable	
Noise and vibrations						
Increase of the noise level in the vicinity	insignificant	insignificant	not applicable	Development of the protection vegetal curtain Mechanical treatment of waste shall be carried out in an enclosure – hall	not applicable	
Waste and waste water management						
Leachate infiltrations as result of the damage of the waterproofing system	not applicable	medium	medium	Waterproofing layer monitoring system	yes	insignificant

Non-Technical Summary

IMPACT	STAGE			Measures for Reduction	Residual Impact	Intensity of the Residual Impact
	Construction	Operation	Post-Closure			
Accidental leakage of oil compounds	insignificant	medium	not applicable	Retention tank of the diesel storage basin Materials for the decontamination of soil polluted with oil products	not applicable	
Accidental discharge of insufficiently treated waste waters	not applicable	medium	medium	Automatic control of the effluent for relevant parameters	not applicable	
Scattering of waste by the wind	insignificant	medium	not applicable	Covering of landfilled waste with a layer of inert material Purchase of compliant vessels for the storage of waste generated on the site	not applicable	
Landscape						
Impact on the landscape caused by new constructions	insignificant	medium	medium	Cultivation of the surface resulted after the closure and covering	yes	insignificant
Biodiversity						
Damaging of the nearby forest (in the South and East of the site)	medium	significant	insignificant	Covering of landfilled waste with a layer of inert material Covering with a membrane of the heaps of waste (intensive decomposition)	yes	insignificant

Impact Assessment Matrix –Cristesti Site

IMPACT	STAGE		Measures for Reduction	Residual Impact	Intensity of the Residual Impact
	Construction	Operation			
Air emissions, odours					
Dust and pollutions specific to internal combustion engines	medium	medium	Use of vehicles and equipment fitted with EURO IV type engines	yes	insignificant
Emissions from the intensive waste composting stage	not applicable	medium	Covering with membrane of the waste heaps	yes	insignificant
Removal of land from the agricultural circuit	significant	not applicable	Recovery of the fertile resulted soil Setting up of the remaining available spaces as green areas	yes	medium

Non-Technical Summary

IMPACT	STAGE		Measures for Reduction	Residual Impact	Intensity of the Residual Impact
	Construction	Operation			
Soil, subsoil, waste water					
Pollution (oil products, heavy metals, organic materials with waste water content)	medium	medium	Oil products separator	not applicable	
Erosion and transport of sediments	insignificant	insignificant	Execution of earthworks on small areas	not applicable	
Contamination of the underground water (leakage of excess water from the composting process and other categories of waste water)	insignificant	medium	Automatic control of the effluent for relevant parameters	yes	insignificant
Contamination of the underground water (fissuration of the diesel storage tank, accidental oil leakage)	medium	medium	Retention tank of the diesel storage basin Decontamination material for soil polluted with oil products	not applicable	
Noise and vibrations					
Increase of the noise level in the vicinity	insignificant	insignificant	Development of the protection vegetal curtain Sorting of waste shall be carried out in an enclosure - hall Operation time – during daytime		
Waste and waste water management					
Accidental leakage of oil compounds	insignificant	medium	Retention tank of the diesel storage basin Materials for the decontamination of soil polluted with oil products	not applicable	
Accidental discharge of insufficiently treated waste waters	not applicable	medium	Automatic control of the effluent for relevant parameters		
Scattering of waste by the wind	insignificant	medium	Covering with a membrane of waste during the composting process Purchase of compliant vessels for the storage of waste generated on the site	not applicable	
Discharge of untreated rainwater	not applicable	significant	Covering of the maturation area	not applicable	
Landscape					
Impact on the landscape caused by new constructions	insignificant	medium	Development of a protection vegetal curtain	not applicable	

6. MONITORING

During the construction stage (new investment objects and closure of the non-compliant landfills) the following shall be monitored:

- use of high quality materials, especially for the geomembrane that assures the waterproofing of the landfill;
- ensuring the integrity of the membrane when applying it;
- inspection of the places where the geomembrane was welded;
- inspection of the development of the designed slopes, to assure the stability of the landfill.

During the operation stage of the constructed facilities, the monitored parameters are different from one facility to the other, depending on the operations carried out. The monitored indicators are:

- industrial indicators – control of waste entries and exits, of the facility operation parameters;
- meteorological data (only in case of landfills);
- emissions of pollutants – waste water (including leachate), waste, air emissions;
- quality of the environmental factors – surface water, underground water, soil, air.

In accordance with the in force provisions, the landfill operator must carry out a post-closure monitoring for a at least 30 years. The postmonitoring programme (parameters and measuring frequency) is established by the territorial authority for environmental protection. The results of the monitoring are kept in the Landfill Record.

In accordance with the Articles of Association between the local public authorities, the Local Councils on which territory the non-compliant landfills are located, have to assure their post-closure monitoring for a period of 30 years.

7. RISKS

During the construction stage of the new facilities, respectively of closure of the landfills which have exhausted their capacity (compliant and non-compliant) the following risks may appear:

- fissuration of the geomembrane used for waterproofing;
- breakage of embankments;
- accidental discharge of fuels and oils.

To reduce to minimum the probability of their occurrence, the following measures shall be taken:

- supply with waterproofing materials in parallel with the execution of the earthworks;
- testing of the welding on the site;
- compliance with the design conditions when designing the embankments;

- use of vehicles and equipment in a good technical state.

The main risks which may appear during the period of operation of the investments on the Sinpaul site (compliant landfill and mechanical-biological treatment facility) are concerning:

- fissuration of the waterproofing layer, of the waste water collection and treatment system (including leachate);
- faulty handling of hazardous chemical substances used on site;
- faulty operation of the landfill gas collection facilities;
- waste temporarily stored for mechanical-biological treatment caught on fire;
- risks concerning the biological treatment of waste – odours, fauna.

The measures for reduction, mainly consisted of the periodic inspection of the integrity of the waterproofing layer, of the waste water collection and treatment system and of the landfill gas collection system and periodic staff training.

During the period of operation of the facilities on the Cristesti site (sorting plant, transfer station and composting plant), the risks are related to the operation of the composting plant, namely:

- generation of odours and occurrence of opportunistic fauna;
- spontaneous combustion of the waste mass;
- exceeding of the capacity of the waste water collection tank in the intensive composting area..

the main measures which shall be taken are the following: correct dimensioning, turning and levelling of the heaps, watering.

In the area where the analysed objectives shall be placed there are going to be no natural risks (earthquakes, flooding, landslide, etc).

To reduce to minimum the frequency of occurrence of risk situations and for a good management, it is recommended to implement a quality – environment – health and safety management system.

One of the procedures of the system shall be *Preparation for emergencies and reaction*, which shall consist of all the emergencies that may appear, the measures to reduce the probability of occurrence and intervention measures. In addition, the responsibilities regarding the preparation and organisation of the interventions shall be established.

8. THE DIFFICULTIES DESCRIPTION

The Environmental Impact Assessment process for the project “*Integrated Waste Management System in Mures County*” has not encountered critical technical issues or concerning data collection.

With regards to the public consultation process, some difficulties were encountered during the respective process. Therefore, in June 2009, the inhabitants of Valureni Village have expressed their disagreement concerning the carrying out of the investments transfer station, sorting plant and composting

plant in Cristesti Commune. The County Council has responded to this through a letter, and in June 2009 a meeting with the representatives of Valureni Village was held at the headquarters of Mures County Council.

Both through the letter and within the meeting with the representatives of Valureni Village, the representatives of Mures County Council have introduced the project components, in particular the investments proposed for the site located on the territory of the village (sorting plant, transfer station and composting plant). It has been underlined that on this site no landfill shall be developed (as understood by the villagers) but, on the contrary, in addition to the new facilities, the closure of Tirgu Mures – Cristesti non-compliant landfill, also located on the territory of the village, in the close vicinity of the site proposed for the carrying out of the new investments, shall be carried out.

In October 2009 the decision to issuance of the Environmental Agreement was issued. In the same month, the inhabitants of Valureni Village have challenged the decision and have requested additional information.

As a result of the requests received from the public, ARPM Sibiu has requested Mures County Council to draw up a Study on the assessment of the impact on the health of the population of Valureni Village. The study, carried out by Cluj Napoca Centre for Environment and Health, was made available to the public in November 2009, and the results of the study were presented within the public debate organised in Valureni Village in December 2009. The results of the study show that the area shall not be affected by the operation of the investments sorting plant, composting plant and transfer plant which are to be carried out on the Cristesti-Valureni site.

The Environmental Agreement was issued in December 2009.