Closure Solutions for a Non-Compliant Landfill: Case Study from Parța Non-Compliant Landfill, Timiș County, Romania

Cretan Ioana-Alina ¹, Moscovici Anea ²

¹ Politehnica University Timisoara, Hydrotechnical Engineering Department, Spiru Haret Street No. 1A, Timisoara, Romania
² Politehnica University Timisoara, Department of Overland Communication Ways, Foundation and Cadastral Survey, Ioan Curea Street No. 1, Timisoara, Romania

alina.costescu@upt.ro

Abstract. Non-compliant landfills contain significant amounts of waste accumulated for years, representing significant sources of soil, air and groundwater pollution and population illness. All non-compliant urban landfills have closed storage before the year 2009. The non-compliant urban deposits in Timis County were unfinished and did not meet the conditions for the protection of environmental factors according to the Government Decision no. 349/2005 on waste disposal, Decision transposing Directive no. 1999/31 / EC on the storage of waste, therefore the required closure procedures that were finalized in the year 2015. The paper aims to present closing procedures that were taken to close the Parța non-compliant landfill as part of the Integrated Waste Management System in Timis County, co-financed by the European Regional Development Fund (ERDF), through the Sectoral Operational Program Environment 2007 - 2013, Priority Axis 2, "Development of integrated waste management systems and the rehabilitation of contaminated historical sites "

1. Introduction

The non-compliant Landfill located in Parta, Timis County has a surface of 16 ha consisting in municipal wastes and it is managed by the Local Council of Timisoara. Since the beginning the location has functioned as a landfill for waste from population in Timișoara municipality and Timiș county. For the exploitation of the landfill, according to the Romanian environmental legislation, the Annual Plan for the exploitation of the Parța -Sag landfill was drawn up. According to this, a series of works were carried out: mapping of the whole surface of the deposit, hydrological study and drilling of 3 wells for monitoring the first groundwater layer, The Risk Assessment Study of the Landfill was carried out and a partial enclosure of the facility. Considering the negative impact that the landfill had over the environment due to the pollution for soils, subsoils and surface waters from the area, generation of pathogen that can be transported by water or air and last but not least by CO₂ discharge and various toxic gases they pollute the atmosphere, it was necessary to conduct closing operations to the non-compliant landfill.
2. Assessment of the risk factors over the environment posed by a non-compliant landfill.

To evaluate the risk that a non-compliant landfill poses over the environment we can rely on mathematical methodology or simulation, using the technical information but also other information, considering multiple scenarios.

For the community risk evaluation, it is required a good knowledge of the natural extreme phenomenon (storms, floods, droughts) also called by geographers hazards, but vulnerability must be also studied knowing the fact that the main way to decreasing it is the prevention.

The hazard is natural anthropogenic phenomenon that can appear in a certain period of time, with negative consequences for the society due to overtaking of certain thresholds of adjustments of society. For a hazard to occur the presence of society it is needed.

Vulnerability expresses the amount of exposure of man and his goods in front of the various size hazards. In a more concrete way it is distinguished the level of damages maid by a phenomenon, on a scale from 0 to 1, 1 representing the total annihilation from an area.

Risks it is defined as a probability of exposure of a man and his goods to an action of a hazard. Mathematical risk (R) can be express thru the produce hazard (H), elements at risk (E) and vulnerability (V) therefore:

\[ R = H \cdot E \cdot V \]  

With this relation we can make estimation for various damages caused by natural or technological phenomenon. For the Parța non-compliant landfill the risks involving the environmental factors and near communities are the following:

- ✔ pollution of the environment: soil, subsoil, surface and deep waters;
- ✔ damage to the human health, flora and fauna by toxic gases discharges and solids particle;
- ✔ auto-ignition and discharges of gases resulted from fermentation processes inside the perimeters of the landfill;
- ✔ pollution with volatile odorant substances.
In non-compliant landfill cases the risks are appearing in the form of annual discharges, infiltration or human accidents due to inscrutable events. The specialty literature presents the following formula as an alternative for the environment risk evaluation.

\[ R = F \cdot C \]  

Where:  
- \( R \) – risk, losses, degradation;  
- \( F \) – frequency, probability of overstepping of a MAC / year;  
- \( C \) – consequences, gravity, medium lost / event.

To apply the relation above it is required an analysis that can contain the following:  
- Risk identification – it is determined the previous experience, a good knowledge of processes for a good determination of the source of pollution and the phenomenon with a highly potential for the accidents apparition;  
- Estimation of the frequency situation that can caused an accident;  
- Determination of the medium consequences for a certain event – offers a view for the possibilities of a scenario made for inscrutable events.

The main charges that landfill must comply to are:  
- precipitation (rains, snows);  
- the transportation, compaction and other ways, weight used for the ramp closing;  
- the waste own weight;  
- the landfill tendencies of the talus;  
- hydrodynamic and hydrostatical charges from infiltration and lixiviate waters;  
- heat transfer;  
- ascensional movement of biogas can generate deformation: gliding, shearing, settling, contraction-dilatation charges, humidity variation.

3. Closing solution for a non-compliant landfill. Case study: Parța non-compliant landfill, Timiș County, Romania

For the Parța non-compliant urban landfill, Timiș County, Romania, the closure actions were the following:  
- relocation of the waste sporadically stored to the basis area of the landfill;  
- minimizing as much as possible the final surface of the landfill;  
- removal of the voluminous wastes from the final storing area of the landfill (electrical appliances, car batteries, car tires ferrous materials, construction waste);  
- removal of the plastic wastes from the superior final storing area of the landfill (PET, plastic bags, plastic foils);  
- leveling the landfill by filling the dumps on the final depositing area;  
- compaction of wastes by successive passes over the load, 3 to 5 times, minimum;  
- compliance to the slopes and profiled tilts of the landfill correlated to the minimum sole of 1:3 and maximum slope of 1:20;  
- covering profiled waste mass with a support layer of excavated soil (\( k > 1 \times 10^{-4} \) m/s) equally distributed over the closing area;  
- disposal of the tridimensional geosynthetical material for gas collection (\( k > 1 \times 10^{-4} \) m/s) drainage material according to the Order 757 from 26.11.2014 [1];  
- sealing geocomposite material \( G = 6000 \) g/mp, anchored into the perimeter area with clay plugs;  
- adopting a layer of minimum 0.30 m thick to drain the precipitation waters (>1 x 10-4 m/s, sort 4/32 mm);  
- disposal of a separation geotextile layer into the drainage layer and the soil layer;  
- disposal of a clay soil layer with sand and rocks that is not compacted in order to allow the rapid vegetation growth;  
- disposal of 0.15 vegetation soil equally over the closing area;  
- arraying the lateral channels at the basis of the landfill in order to collect the precipitation waters into the landfill body;
the execution of biogas capture drills, evenly distributed over the landfill surface and connected to a controlled collection system;
- perimetral channel for leachate collection connected to a drainage tank;
- monitoring the underground water layer through monitoring wells.

The execution works carried out are shown in the figure 1 and 2 below. The improper or incomplete approach of these solicitation, the use of inadequate materials at the execution of a landfill, feasibility studies incorrectly drawn up, local interests technically sustained may lead in no uncertain terms to accidents and from here pollution to environment hard and expensive to remediate.

For Timiş County, local authorities obtained European funds worth 555 200 euro for the Project implementation "selective waste collection in municipalities Satchineş, Varias, Ortisoara, Becicherecu Mic Biled, Dudeştii November and Sandra ". As a result of the project, in 2011 the recyclable waste sorting station Satchineş – has become operative and the recyclable waste is collected and sorted for the territorial administrative localities mentioned (the working capacity is 1.5 t/h).

The project "Integrated waste management in the Timis county "has led to the ecological landfill site Ghizela and the following waste treatment facilities: collected waste sorting station, a dry fraction of the landfill site neighboring Ghizela area (Capacity of 16111 tons/year), composting station (capacity 1781 t/year) and the mechanical-biological-treatment station (capacity 77 018 t / year), which are currently in function [2].

Figure 2. Image of the closing works for non-compliant landfill Parța, Timiş County, Romania (closing works to the right and present to the left)

4. Results and discussions

The actions and strategies are similar for the waste storage area and for other type of area that have as a consequence soils and deep water pollution. All the enterprise actions must lead to a prevention and elimination of potential and threats for health and for environment. All these objectives are stipulated in the Romanian legislation. An important objective that derives from the sustainable development concept is avoiding waste depositing on of the new area in order to prevent the contamination of soil and protecting the water and soil resources.

The proposed strategies for the compliant landfill operation consist of the followings main aspects:

- approaching a new politic in the historical landfill management, through an identification, and prevention system of soils contamination from landfills uncontrolled in the past;
✓ the establishment of responsibilities for the landfill operators and owners of the lands, but also for the local authorities in the case of historical and orphans’ area, to accomplish the evaluation of the remediation measures required;
✓ accomplishment of a data base at county level and then at national level for the contaminated areas;
✓ the establishment of the data for the identification, investigations proceedings;
✓ the identification of priorities in the launching of new programs regarding the cleaning area where activities for decreasing exposure will start;
✓ applying of the legislation regarding pollution control and storage of the waste with the purpose to prevent the apparition of others contaminated areas;
✓ the implementation of efficient measures with low costs to prevent risk exposure such like boundary fence, signalize panel and low scale reduction in land utilization;

The proposed actions are aiming s to reduce/ eliminate the environment risks.

In 2010, the European Commission launched the Europe 2020 strategy - a strategy for smart, ecological growth and sustainable for inclusion with the purpose to guide the EU's economic development through the next ten years [3]. The new strategy's main objective is to provide a high level of employment, productivity and ensure economic, social and territorial cohesion in the European Union.

The new strategy's main objective is to provide a high level of employment, productivity and ensure economic, social and territorial cohesion in the European Union.

The National Waste Management Strategy enacted by the Romanian Government in 2013, [4], for the years 2014-2020 aims at the following lines of action:
✓ prioritizing the efforts of waste management in line with the waste hierarchy;
✓ development of measures to encourage waste prevention and reuse, promoting the sustainable use of resources;
✓ increasing the rates for recycling and improving the quality of recycled materials, by working closely with the business sector and the economic operators which recover wastes;
✓ promotion of packaging waste recovery;
✓ reducing the carbon impact of generated waste;
✓ encouraging the energy generation from waste for waste that cannot be recycled;
✓ organizing the national database and a more efficient monitoring process;
✓ implementing the concept of "life cycle analysis" related to the politics/management of waste.

It also intended to improve the services to the public and business sector through [4,:
✓ encouraging green investments;
✓ supporting initiatives that recognizes and rewards people who reduce, reuse and recycle waste from households;
✓ working with local government authorities to increase efficiency and quality of collected waste, making them easier to recycle;
✓ working with local government authorities and the business sector to improve waste collection systems.

5. Conclusions
For Romania the problem of non-compliant landfill and selective collection has not been completely resolved regarding the subject of integrated management. Accessing European funds for closing non-compliant landfills and building locations to limit their impact on the environment is one of the first steps in the right direction. This includes applying the waste hierarchy and the use of effective tools and market-based measures to ensure the phasing out of landfills, limiting energy recovery only for recyclable material, use recycled scrap as a major and reliable source for raw materials for European Union, safe management for hazardous waste and reduce their generation, eradication of illegal non-compliable landfills and removing the barriers inside the internal market that prevent for recycling activities respect the requirements and standards concerning environmental protection.
References

[1] ORDER no. 757 of 26 November 2004 for the approval of the Technical Standard on Waste Storage

[2] Ministry of Environment, Water and Forests, National Agency for Environmental Protection, Annual report on the state of the environment in Timiș County, for 2017.

[3] European commission Brussels, 3.3.2010 com (2010) 2020, Communication from the Commission, Europe 2020, A strategy for smart, sustainable and inclusive growth, http://ec.europa.eu/;

[4] National sustainable development strategy Romania 2013 - 2020 - 2030 Government of Romania ministry of environment and sustainable development, United Nations Development, Program National Centre for sustainable development, Bucharest, 2008 http://www.insse.ro/.

[5] Eurostat, 2012b, Guidance on municipal waste data collection – November 2012, WASTE WG 5.2 b (2012), Eurostat – Unit E3 – Environment and forestry