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TWO DECADES OF DESIGN AND EXECUTION OF MODERN LANDFILLS IN ROMANIA

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Abstract

The paper deals with the juridical-legislative, technical and administrative framework which substantiated the projects developed and executed in the 20 years, starting with Romania's EU pre-accession till now, respectively the national strategy documents of waste management: the national Plan of waste Management and the National Strategy for waste management, also the local / county / regional waste management plans and strategies, including master plans. All this legislation has been permanently updated and aligned to the European legislation. The article deals especially with the problems encountered by the specialists in the landfills' designing and execution, with examples through case studies. In the year 1994 was put into operation in Ovidiu, Constanta County, the first municipal, ecologic landfill from Romania, followed by that from Sighisoara designed in 1993-1994 and put into operation in 1995. Since the execution of the first ecologic landfill in 1994 till now, over 40 compliant landfills have been executed in Romania with private or public funds.

Key words*: landfill, ecological, lining, case-studies, training.*

INTRODUCTION

In Romania, the wastes' disposal has been made and is made exclusively by storage, according to the Annual Report on the Romanian Environment State from 2013. Till now haven't been put into operation installations for the incineration of the municipal wastes, solution that is currently used at this moment in Europe for the environmental protection. The need to meet the obligations assumed by Romania within the negotiation process with the European Commission on the Chapter 22 "Environment Protection" and the obligations under the Adherence Treaty to the European Union, the Government Decision no. 349/2005 regarding the waste disposal foresees the ceasing and closure of non-compliant landfills.

The construction and put into work of the new landfills has been accelerated together with the Romania entry into the European Union and the implementation, in the period 2007-2013, with structural and cohesion funds, of the project "Integrated Waste Management System", so that at the end 2013 were authorized 33 landfills.

Table 1. List of the compliant municipal landfills, authorized at the end of 2013

County	Landfill
Neamt	Piatra Neamt
Bacau	Bacau
Iasi	Tutora
Braila	Braila – Muchea loc.
Buzau	Buzau – Galbinasi
Constanta	Ovidiu; Costinesti; Mangalia; Albesti; Incinta Port
Tulcea	Vararie
Ialomita	Slobozia
Prahova	Ploiesti – Boldesti; Valenii de Munte
Dambovita	Aninoasa; Titu
Teleorman	Mavrodin
Arges	Albota
Dolj	Mofleni-Craiova
Gorj	Tg. Jiu
Mehedinti	Halanga
Valcea	Feteni
Arad	Arad
Timis	Ghizela
Bihor	Oradea
Satu Mare	Doba
Bistrita-Nasaud	Tarpiu
Brasov	Brasov
Mures	Sighisoara
Sibiu	Sibiu-Cristian
Harghita	CeKend- Odorhei
Bucuresti/Ilfov	Chiajna/Vidra • Glina

THE SITUATION OF THE MUNICIPAL WASTE MANAGEMENT INTEGRATED SYSTEMS

At the end of 2013 were in course of implementing the following projects approved by the European Commission and the Management Authority of Environment, respectively:

- Vrancea, Giurgiu (approved in 2009);
- Arad, Sibiu, Mures, Covasna, Salaj, Botosani (approved in 2010);
- Neamt, Suceava, Cluj, Bacau, Vaslui, Calarasi, Olt, Arges (approved in 2011);
- Caras-Severin, Alba (approved in 2012);
- Prahova, Iasi, Mehedinti, Harghita, Braila, Valcea, Constanta, Maramures, Tulcea (approved in 2013).

The physical stage of project development from Galati, Tulcea, Valcea, Maramures, Bihor and Constanta counties was of 0% at the end of 2014.

Together with the new landfills' put into operation, it has continued the work's ceasing on non-conforming landfills at the terms provided by G.D. no.349/2005 on waste disposal so that at the end of 2013 were in function only 46 non-compliant landfills for municipal wastes which will be gradually closed till 16 July 2017.

In the Government Decision no.349/2005 has been nominated the 240 landfills that must be closed in the period 2004-2017 (Figure 1).

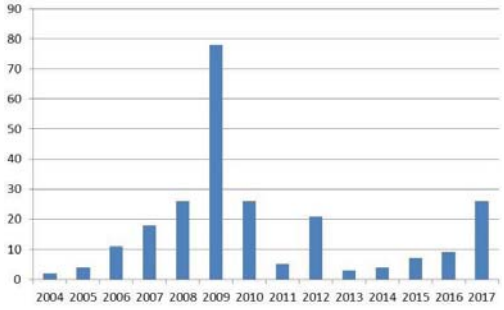

Figure 1. Planning of the non-compliant landfills' closures

It is important to note that, to meet the conditions imposed by the European Union, Romania had to work in some cases simultaneously on several levels, namely: legislative – in order to create the necessary legal framework, technical – in order to produce the technical documentation (projects) needed both for non-compliant landfills closure and for building new ones according to the requirements on environmental protection, educational - for training, public and even local authorities awareness on wastes issue, economical – in order to elaborate the necessary documentation for the investments' financing under the proposed program.

LEGISLATIVE

Among the obligations assumed by Romania in the pre-accession period was the obligation of implementing the European directives in all fields, including waste disposal activities, constructions, public acquisitions, etc.

Public acquisitions in Romania are regulated by Ordinance OUG 34/2006, modified according to Directive 2004/18/ EC and G.D. 925/2006 for approving the implementing rules of the provisions regarding to the award of public acquisition contracts.

The institutionalization of Red and Yellow FIDIC contracts' use and their establishment as contractual framework was made by Order no. 2266/335/2012. Although it was likely to bring a number of undeniable advantages in ensuring the celerity of the award procedure's browsing, this order has also attracted some inconveniences which in practice have been translated into difficulties in the application of contractual clauses and, consequently, in the execution of the construction works.

These inconveniences arise mainly from the fact that these FIDIC contracts were created by the Anglo-Saxon authority (common law) and were adopted into domestic legislation as such, without proceeding to a correlation / adaptation of contractual clauses reported to the applicable legal provisions at national level. Between the contract terms and the (mandatory, compulsory) legal provisions there are certain contradictions or at least inadvertences that lead to disputes settled by the courts (e.g. the interpretation given by the contracting authorities to differences in amounts in comparison with those from the project lists as additional works. In case of Red FIDIC

contracts, the quantities executed and measured by the Engineer are paid).
Without disputing the beneficial effect of introducing these standardized documentation we noted some incompatibilities, discrepancies between the provisions of the Order's Annexes (both those related to the phase of the award procedure and those relating to contract execution phase) and the applicable legal provisions, which have reduced this effect.

PROCEDURE FOR THE AWARD OF ACQUISITION CONTRACT

In this phase, the main faults resulted from:
• the method of preparation the tender documentation (specifications, qualification requirements, etc.);
• the manner in which the contracting authorities responded to requests for clarification on the tender documentation submitted by potential bidders;
• establishing of some restrictive selection criteria;
• the tenders' evaluation period.
Preparation of tender documentation.
The specifications were elaborated, not infrequently, based on feasibility studies and/or projects incomplete, inaccurate, outdated and unrelated to the situation in the field and/or in the absence of geological, hydrological studies both in case of the contracts under Red FIDIC (works designed by the beneficiary) and under Yellow FIDIC (works designed by the contractor).
These circumstances have led, on the one hand, to the tender documentation's contesting at the National Council for Complaints' Solving (CNSC) and thereafter to the dispute continuation at the competent courts and, on the other hand, to disputes between the contractor and the beneficiary on payment of the additional amounts, term extension, solution modifying etc.
Projects for the landfills' closure and relevant specifications were based in many cases on feasibility studies made usually until 2009, when it was anticipated that these landfills will be closed. The existence of some major errors and omissions in the bills of quantities (in case of contracts under FIDIC Red). Thus, in landfill closures were frequent situations where, in fact, the waste has been stored on large areas, off-site, including private lands. This situation has created problems related to the use of European funds in order to ecologize these lands, possible ownership disturbing, additional amounts of works, and so on.
The manner in which the contracting authorities responded to requests for clarification on the tender documentation submitted by potential bidders.
Contracting authorities gave excessively answers like "will comply with the requirements specifications", even in cases where the specification requirements were difficult or impossible to be applied in practice or which literally appliance would lead to counterproductive, oversized solutions in relation to the result followed up by the contracting authorities and the public acquisition contract's object.
Selection criteria - similar experience.
There were situations when the contracting authority has imposed as a requirement for qualification, the experience in similar construction works and / or design with almost equal value to the contract to be awarded or reported to very big amounts, requirement likely to restrict the access to procedure for the Romanian contractors, considering that similar works to those covered by the procedure that meets the requirements of value or quantity have not performed so far in Romania.
Tenders' evaluation period.
There were situations in which the evaluation of the tenders submitted in the procedure lasted unacceptably long, exceeding the limit term set by law in this regard, without a valid reason for this.

CONTRACT EXECUTION PHASE

Subsequently to the award of public acquisition contracts, in the execution phase and during the works, a number of problems related to the actual execution of contracts have been reported, such as:
a) late handover of the site by the contractor, resulting from: late obtaining of urbanism certificates and building permits; difficulties and delay in clarifying the legal status of the

buildings' property on which will carried out the works and/or the existence of some charges affecting the site; delivery of some improper emplacements for the works' execution, that need changes in solutions / location; delay in the utilities' providing.

b) Interpretation of some Yellow FIDIC contracts provisions relating to the contract price.

Although in case of the contracts executed according to Yellow FIDIC, the contract price is a blanket price, in practice there were interpretations of the consultants in the sense that also in this case it is necessary to measure the actually performed works and pay the contractor according to these measurements.

Such an interpretation is contrary both to the spirit of Yellow FIDIC and the applicable law, in case of global pricing establishment, flat rate, this will be paid as such regardless of the amount of works effectively carried out and the costs incurred by the contractor which may be higher or lower based on the contract price, the risk of paying higher costs than the price obtained from beneficiary being assumed by the contractor. In this context, it is necessary to accentuate that the bills of quantities tendered by the contractor under a Yellow FIDIC contract are estimated and do not alter the legal regime of price.

c) Non-appliance/reservation in applying the Guidelines on the main risks identified in public acquisitions and European Commission's recommendations to be followed by the managing authorities/intermediate bodies in the checking process of public acquisitions procedures approved by the common Order no. 543/2366/1446/1489/1441/879/2013.

Although in force since August 2013, the contracting authorities have been reticent in applying the provisions of this Guide that clarify the situations in which public acquisition contract must be amended for the payment of additional amounts/works or those that do not require such a change.

This Guide defines what is meant by substantial change in the presence of which is necessary a competitive public acquisition procedure and distinguishes from this situation other cases in which, during the contract execution appear additional quantities/works due to the application of contractual mechanisms, when it is not necessary the completion of such proceedings for the payment of such amounts / works.

The operator is generally designated based on the tariff and royalty promised to Beneficiary and some performance criteria in landfill operation. The operator trends to complain, after the bid award, deficiencies in the design and execution of the works in order to obtain a price increase from Beneficiary.

To avoid such situations, a solution would have been the rethinking of the biddings' organization so that from one single bid to be designated the association between the Contractor who executes the landfill and the Operator who will achieve its operation after the execution's completion.

TECHNICAL – ECONOMIC

The compliant landfills' design and execution has been made under the following legislation:

- Waste Framework Directive no. 2006/12 / EEC;
- Directive 1999/31 / EC- concerning the wastes' disposal;
- Law no. 211/2011 on waste regime;
- GD no. 349/2005 - Landfills (ED 31/1999 transposition);
- Order no. 757/2004 – Technical Norm regarding the wastes 'disposal (according ED 31/1999 and GD 349/2005).

According to the legislation into force, the landfills' design and implementation must follow some basic rules so that the adverse environmental effects are eliminated or minimized as possible. We are talking about the pollution of surface and groundwater's, soil and air pollution, including greenhouse effect and also the risk of damage to human health throughout the lifetime of the landfills meaning execution, operation and post- closure.

In order to fulfill these mentioned above, the landfills' designing has been made respecting the following 7 basic rules, respectively:

1. Waterproofing system must ensure maximum sealing.
2. The drainage system must be properly sized.
3. The waterproofing system and drainage system must be designed forever, being

necessary to operate in a sustainable manner.
4. Covering the landfill after filling is compulsory and it will be sized based on the risks of pollution resulting from contaminated water, gas emissions and odors.
5. To the extent possible, the location chosen must provide sufficient natural seal guarantees in order to take up eventual problems that may arise in the event of any damages to the designed and executed sealing system.
6. All residual liquids must be collected from a landfill and they will necessarily be treated in a wastewater treatment plant.
7. Landfills will be monitored in order to establish the impact they have on the environment and to intervene in case of pollution.

Although, in some cases, the designers have provided wrong solutions for the non-compliant landfill projects of closure or new ones execution, the authorities refused their correction. As example:

- for some landfill closure projects were designed access roads from concrete slabs, 30 cm thickness, or were provided biogas combustion plants where biochemical processes are completed and no longer biogas is produced; most often landfill modeling has been designed with very steep slopes of 1: 2 or even 1:1, so that the stability of the cover layers is not assured;
- for the projects of new landfills execution, has been provided the purchase of expensive biogas installations that will enter into service after many years and will be physically and morally used until their operation.

The activity done till now in this area has relieved three main directions in which technical problems appeared and produced technical accidents (such as landslides, damages of the waterproofing system) or produced delays in execution and additional costs of resources in order to remedy the problems during execution. The three directions previously mentioned are:

1) Improper locations for the new built landfills and projects without serious studies for the chosen emplacement, which was later found with serious problems of stability or foundation.
2) Solutions to waterproofing system achievement insufficiently studied in terms of internal stability.
3) Insufficient time allocated to the produced settlements due to decomposition of organic waste in non-compliant municipal landfills before the final covering. Closure solutions in one stage instead of two stages, as required by the technical standard on storage approved by the Ministry of Environment and Water Management, Order no. 757/2004.

   These problems have led to disputes on payment of additional works, the need for technical expertise, implementation of controversial and expensive solutions in order to ensure stability, term extensions, etc.

CHOOSING THE LOCATION FOR NEW LANDFILLS

The location of the compliant municipal landfills must correspond to the sustainable development through the environment use on long-term such as the economic, technological and ecological development to meet present and future requirements.

Following preconditions are required to establish the municipal landfill sites:

1) Integration in the provisions of the County Plans of territorial landscaping, general and regional urban Plans and the regulations relevant for both cities and villages. This shows that the urban and territorial landscaping Plans transpose in the territory the strategies, policies and programs for sustainable development in spatial profile, the functional developing directions in territories, the routes for traffic corridors specified in the national, regional and county development plans.
2) Integration in the environmental strategies and policies including developing of works, installations and water management according to the Guiding Schemes on hydrographic basins concerning the planning, development and water management and Improvement Plans for

hydrographic basins focusing on banks protection, hydro-technical constructions and protection areas.

3) Unaffecting of the existing land improvement or planned to be achieved (damming and watercourses regularizations, irrigation, drainage, combating of soil erosion and lands affected by slides, soil amelioration).
4) Correlation with the forest development Program in order to improve the environmental conditions and to optimize the landscape, to protect the communication lines, dams and riverbanks, localities and social and economic objectives, agricultural lands.

The choice of some sites lands loping located was the most often option found in other applications, EU co-financed:

Table 2. Slope inclination of landfill

Landfill	Slope inclination
Feteni, Valcea county	18% on average (14-24%)
Tarpiu, Bistrita Nasaud county	10%
Stauceni, Botosani county	7-8%
Sinpaul, Mures county	13-14%
Dobrin, Salaj county	12.5%
URM Pata Rat landfill, Cluj landfill	8%

LINING SYSTEMS

According to Government Decision no. 349 from 21 April 2005 regarding waste depositing and Annex to the Order of the Minister of Environment and Water Management no. 757/2004 on waste disposal and also European legislation for non-hazardous waste disposal it is necessary to be provided the following conditions and constructive elements:

1) clay geological barrier with a minimum thickness of 1.0 m and 10-9 m/s maximum value for the coefficient of permeability;
2) HDPE geomembrane of 2 mm thickness;
3) drainage layer for leachate, 0.50 m thickness, made of river washed gravel 16/32 sort.

For ecological reasons as well as for the environment protection, waste deposits are provided with lining systems. In the current stage of knowledge and technological capacity, lining is carried out with geomembranes that hold the most important function. The layers of the lining packs are clinging together so strongly that they confine the geomembranes within them. The packs have a sandwich structure, whereas relative displacements can develop between layers, clearly, with expected local frictions. Therefore, these lining packs do not constitute composite systems as such, i.e. they do not fulfill the geometric condition of continuity of strains according to the Principle of Saint Venant.

No matter how well designed and executed is the waterproofing system of a landfill there is the risk of leakage through the liner. The detecting of these leaks can be done if adequate systems for detecting and locating are provided from the design phase. (Feodorov, 2013)

RESULTS AND DISCUSSIONS

Case study 1: Feteni Landfill, Ramnicu Valcea, 2009.

Project name: Construction of a compost station, a new waste deposit in Feteni, and closure of the Raureni waste deposit.

Located in Feteni city, Valcea County. Year of inauguration: 2009. Waste deposit area: 77,000 m^2. Storage volume: 1,300,000 m^3. Volumetric indices: 5.65 Euro/m^3 of waste. Indices of area dedicated to the waste deposit: 95.5 Euro/m^2.

The lining system of the deposit base includes a geosynthetic clay liner, a HDPE geomembrane, a protection geotextile and a filtering geotextile.

In this case the selected location complied with the requirements for minimal distance to inhabited areas, roads, etc., since it is located 6 km away from the city of Ramnicu Valcea, but the access to the deposit is rather difficult, especially in bad weather conditions such as winter-time, because of the steep slopes.

Figure 2. Feteni deposit during the construction works.

Like in most similar projects financed from European funds, the piece of land selected for the erection of the new deposit is inclined, i.e. a large valley surrounded by forest. The level difference is 40 m, from 410 to 450 m from the sea level, and the area is subject to landslides. In 2003 and 2005 geotechnical, hydro-geological and geo-physical surveys were carried out, as well as a stability analysis (2005).

These surveys involved drillings at depths between 6 and 10 m and electrometric surveys. The data that was gathered lead to a labeling of the site in the 3rd category of major geotechnical risk.

In 2004, following the international bidding, the execution contract was granted to an Italian Contractor who pledged to complete the works for 9,298,279 Euro by July 2005. The progress of the works was extremely slow and they could not be completed in due time, which lead the contracting authorities to cancel the contract in October 2006.

The Contractor who was granted the project after the new bidding procedure resumed the works in 2008, only after he carried out a new geotechnical survey and he formulated the technical measures required by the execution of the works in safe conditions.

The project was carried out within the budget fixed by the new bidding process: 7,352,625 Euro.

Out of the total value that was granted for the construction of the new municipal waste deposit 8% were works dedicated to soil stabilization. (Feodorov, 2013)

Case study 2: Dumitra-Tarpiu Deposit, Bistrita, 2012.

Project name: Construction of an Integrated Waste Management Centre, a sorting station and a compost station, in Bistrita-Nasaud County.

Located between Dumitra-Tarpiu villages, Bistrita-Nasaud County. The cell no. 1 deposit area: 34,035m^2. Cell no.1 volume: 1,310,000 m^3. It has been inaugurated in 2012. Final value: 10,920,000 Euro. Volumetric indices: 8.3 Euro/m^3 of waste. Indices of area dedicated to the waste deposit: 321Euro/sqm.

The location is situated on an approx. 10% slope directed on East to West, so that the main technical issues concern the requirement for: 1) the overall stability all through the execution of the works; 2) the overall stability during operation; 3) the local stability of each object comprised in the Integrated Waste Management Centre.

Afterwards, during the earthworks in the area of the compost platform, it was revealed that, although safety measures had been taken, landslides within the slopes were becoming active again.

When carrying out sounding operations at the location of the compost platform aiming to reveal the factors that generated the repeated landslide of the excavated slopes, other geotechnical circumstances than those revealed by preceding surveys were found in the entire location, i.e.: 1) Presence of old polyethylene drains 50 mm in diameter, crossing the location from West to East. The drains are placed 1.50-2.00 m deep. 2) These drains take in the waters that penetrate the slope and discharge them upstream of the plastic materials deposit platform. 3) The foundation soil is made of blackish clay rich in plant refuse of a sludge odor, 2-3 m deep.

Figure 3. Dumitra-Tarpiu deposit, Bistrita, after completion.

In august 2011 the General Contractor sent a request to the Technical University of Civil Engineering in Bucharest (UTCB), Geotechnical and Foundations Department, to perform a "Study regarding the use of the local resources as backfilling in order to carry out the perimeter dams surrounding the waste landfill", and a Technical Expertise as well, both resulting in one Study and two Expertise Reports, based on site findings (technical sightseeing during the execution, in 2010-2011), specific in situ investigations, laboratory testing, and stability calculations. The expertise of both reports identified a lot of causes and presented several technical recommendations, which were then transferred into steps for project adjustment and the composition of new design chapters. (Feodorov, 2013)

Case study 3: Dobrin Deposit, Salaj, 2013
Project name: Integrated waste management system in Salaj County.
Located in Dobrin city, Salaj County. Waste deposit area: 41,546.05sqm. Depositing volume: 950,000 m^3. Landfill value: 5,700,000 Euro.
Volumetric indices: 6 Euro/m^3 of waste. Indices of area dedicated to the waste deposit: 137.2 Euro/sqm.
The Dobrin waste deposit is located north of the Zalau Municipality, on a site covering a total area of 19.5 ha, whereas 6.8 ha will be occupied by the ecological landfill that is going to be built. Again, in this case the land is sloping, with a level difference from 315 m to 265 m from the sea level and a smooth slope ranging 1:7 to 1:8, direction North to South.
The waste deposit was subjected to a bidding governed by red FIDIC regulations. According to the stipulations of this type of contract, the Contractor is required to strictly observe the Beneficiary's project. The designed base lining system consists in a rough HDPE geomembrane on both sides and an unwoven geotextile for protection.
Unfortunately, the Designer did not do stability calculations for the lining system and he included in the design long embankments, reaching even to 53 m, without any intermediate berm, while the designed anchorage trench for geosynthetic materials was merely 0.5 m x 0.5 m.
In these circumstances, the Contractor recommended a new geotechnical survey to be done, tests to determine the friction angle between the geomembrane and the clay layer, as well as a recalculation of the dimensions of the anchorage trench.
The geotechnical drillings that were carried out surveyed the soil to a depth between 10 and 30 m. Land surveys and laboratory analyses revealed the presence of clays that displayed a large amount of swelling and contraction. The geotechnical study led to a labeling of the site in the 2nd category of geotechnical risk, as a difficult site.

Figure 4. Dobrin-Salaj deposit during the works.

Therefore, special measure need to be adopted concerning the infrastructure works, including: 1) 1:3 slope embankments and berms of minimum 4-5 m width; 2) avoiding the exposure of the embankments to humidity and temperature variations, by immediately covering them up; 3) in case excavations are not sloped at the angle of the naturally stable embankment, support works need to be carried out; 4) excavation surveillance and control by a geo-technician; 5) rainfall's discharging measures.
Since any modification applied to a design that is carried out under red FIDIC regulations requires a lot of approvals from the Designer, the Consultant and the Beneficiary, implying a long delay, and the period when the documents were prepared has been very rich in precipitations, negative effects rapidly occurred. Thus, a need appeared to carry out additional stability works on the embankment that had been damaged by landslides. (Feodorov, 2013)

Case study 4: Sanpaul Deposit, Targu-Mures, 2013.

Project name: Integrated waste management system, Mures County.Sanpaul landfill. Located in Sanpaul city, Mures County. Landfill area: 73,986 m^2. Depositing volume: 1,250,000 m^3. Currently is under construction. Project value: 16,820,000 Euro.

Volumetric indices: 13.45 Euro/m^3 of waste. Indices of area dedicated to the waste deposit: 227.34 Euro/sqm.

The location is in the farming field of Sanpaul Village, around 4 km south of the administrative center, on a piece of land that belongs to the Mures County Council. The total site area is of 31.14 ha, whereas 24.88 ha will be occupied by the deposit, the management area and the water-purification stations, and 6.26 ha will be occupied by the mechanical-biologic treatment station (mechanical treatment plant, composting and maturation platforms).

It was noticed on site that the embankments were not been provided with berms, and by studying the design it became clear that almost half of the embankment slopes were designed to a width of 40 m or more. According to the design data, the maximum embankment width is 48 m. The execution contract is a red FIDIC type, and the execution design is handed to the Contractor by the Beneficiary.

Figure 5. Sanpaul deposit-Targu Mures, west and north overview

The most important role in the lining system is clearly played by the 2 mm geomembrane which needs to guarantee the sealing of the deposit all through its designed life time. Therefore, the main target is to protect the geomembrane, so as it will stay below a 3% elongation.

This being considered, the General Contractor proposed the adoption, for the deposit lining system, of a configuration where the geomembrane installed on slopes is protected by a geogrid that fulfills the strength requirements, while the gravel layer is replaced by a drainage geocomposite. The Contractor's proposal has been accepted by the Consultant-Engineer and Beneficiary. (Feodorov, 2013)

Case study 5: Closure Of The Cristesti Deposit, Mures County, 2013.

The non-ecological deposit in Cristesti is situated to the west of the Targu-Mures city, near the Cristesti village. The river Mures flows around 3 km west of the site. Close to the landfill, around 200 m north, also flows the Cocorilor stream. The distance from the site to the first dwellings and commercial area is around 800 m. The access on site is done through a service road which is around 1,000 m from the national road.

Cristesti deposit was officially closed in 2009. From the feasibility study which has been the basis for financing and drawing up the specifications in order to organize the bid for landfill closure resulted in a waste occupied area of 50,000 m^2 and a waste volume of 257,000 m^3.

The use's continuance by the local authorities of Cristesti landfill for waste disposal, taking into consideration that by the initial requirements Cristesti was considered a closed deposit in 2009, constitutes a major change of the initial requirements from Specifications.

In accordance with this normative "municipal landfills are first provided with a temporary covering of soil, during the period with the largest settlements (3-5 years)".

The Contractor's proposal was partially accepted so that the project of landfill closure in Cristesti was done in two phases but the time between the two phases was only 6 months.

In the first phase have been relocated the wastes from the designated site, waste has been covered with soil in a layer of 0.5 m and have been executed 24 wells for biogas capture, works for leachate's capture and drainage,

access roads and fencing. Execution of the first phase was completed in November, 2013.
In the second phase were carried out the biogas collecting system and its neutralization, the entire surface waterproofing with geosynthetic materials, spreading of 1 m thick soil layer and grassing works.
Between phases one and two was made a deposit monitoring in order to follow up, in particular, the evolution of differential settlements that will develop in the relocated wastes' body.

Figure 6. View of Cristesti landfill

CONCLUSIONS

The contracts concluded by the local authorities with various Contractors for the execution of the new landfills and closure of non-compliant landfills, works financed by EU funds, have been based on FIDIC agreements (red and yellow).
Between FIDIC terms of such agreements and Romanian legislation of public acquisition (Ordinance No. 34) there are important differences that have marked the progress of the contract works. There are currently in court litigations between Beneficiaries (County Councils) and various Contractors in order to solve some disputes arising from the different ways of understanding the FIDIC rules and Romanian legislation, Ordinance 34 in particular.

For Romania, the municipal waste management program that had to be fulfilled in accordance with the obligations from entering into the European Community has required a major effort and important resources consumption.
The execution Program development for the new landfills and closure of non-compliant landfills highlighted the fact that the level of knowledge in this area should be much higher and depth. Numerous legal, technical and economic problems occurred during the contracts.
You must know very well that landfills construction and installation works have a hidden essential character. Due to traditional academic conservatism, Romanian technical universities included too little in their programs of higher education issues concerning the calculation and dimensioning of the geosynthetics used for the landfill designing and execution.
Choosing the operators to exploit new landfills is an important step that must be started just from the execution stage.
By the European financing program that finishes at the end of 2015, were built Waste Integrated Management Centres in almost all counties of Romania.
Their operating will require the execution of new waste storage cells and in the same time cells that are filled will be closed. It is therefore necessary that the experience gained in two decades of design and construction of complying landfills to be used.

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