

AGRICULTURAL POLLUTION CONTROL PROJECT

**FEASIBILITY STUDY
FOR MANURE STORAGE SYSTEM**

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1. GENERAL INFORMATION

1.1 Name of investment objective

This study refers to the “Design of Village-level Manure Management, Storage and Handling System”, namely to its manure storage platforms construction component.

1.2 Designer

This feasibility study was elaborated by the APCP Project Preparation Unit team, through its civil engineering consultant, Eng. Anca Gheorghiu.

1.3 Implementing agency

The principal implementing agency, designated by the GoR is the Ministry of Waters and Environmental Protection.

1.4 Client

The Client is represented by the “Agricultural Pollution Control Project” Project Preparation Unit, with head offices in Calarasi, Romania.

1.5 Location

The objective of the feasibility study is represented by a number of 14 manure and recyclable materials storage platforms, located within the territory of 7 communes from Calarasi county, as follows:

Platforms #1 and #2, to be located in Alexandru Odobescu commune – platform #1 will be situated to the north of Alexandru Odobescu village, surrounded to the N and to the W by arable land from outside the village and to the E and S, by arable land pending distribution through the Local Land Reform Commission. Platform #2 will be located to the north of Nicolae Balcescu village, surrounded on all sides by arable land from outside the village.

Platforms #3 and #4, to be located in Ciocanesti commune – platform #3 will be situated to the north of Smirdan village, bordered to the N, E and W by arable land from outside the village and to the S, by land formerly occupied by the livestock farm. Platform #4 will be located to the north of Sirbi village, bordered to the N, W and S by arable land and to the E by a portion of land formerly occupied by the livestock farm.

Platforms #5 and #6, to be located in Cuza Voda commune – platform #5 will be situated to the east of Cuza Voda village and to the SW of Calarasii Vechi village, bordered on all sides by agricultural land from outside the village area. Platform #6 will be located to the N of Ceacu village, bordered on all sides by agricultural land from outside the village area.

Platforms #7, #8 and #9, to be located in Gradistea commune – platform #7 will be situated to the north-west of Gradistea village, bordered to the N, E and S by land formerly occupied by the livestock farm and to the W by Calarasi-Lehliu asphalt road. Platform #8 will be located to the N of Rasa village, bordered to the N and E by arable land and to the S and W by land formerly occupied by the animal farm.

Platform #9 will be situated to the SW of Rasa village and to the SE of Bogata village respectively, bordered to the N, W and S by arable land and to the E by the Rasa - Danube floodplain road.

Platforms #10 and #11, to be located in Independenta commune – platform #10 will be situated to the SW of Independenta village, near the bank of Galatui lake, bordered on all sides by communal grazing land.

Platform #11 will be located to the west of Visini village, surrounded on all sides by arable land from outside the village.

Platforms #12 and #13, to be located in Vilcelele commune – platform #12 will be situated to the south of Vilcelele village, at approx.1km south of the community cemetery, bordered to the N, W and S by arable land from outside the village and to the east by a communal road providing access to the agricultural exploitation.

Platform #13 will be located to the NE of Floroaica village, at approx.1km north-north-east of the community cemetery, bordered to the N, W and S by arable land from outside the village and to the E by a road that links Vilcelele – Cuza Voda county road with Bucharest – Fetesti national road.

Platform #14, to be located in Vlad Tepes commune - this platform will be situated to the east of Vlad Tepes village, at approx. 400 m of the administrative buildings of the village agricultural commercial companies, bordered to the N, W and S by arable land from outside the village and to the east by D.C 62 communal road.

In selecting platform locations, the following criteria were taken into consideration:

- Integration with the existing Land Planning Masterplan
- Safe minimum distance from the nearest household or building
- Safe minimum distance from the nearest stream or drinking water well
- Flexible enough to allow future extension
- Clear land tenure situation
- Population density and surrounding landscape
- Access facilities towards manure and domestic waste sources

1.6 Investment necessity and opportunity

This feasibility study is based upon the TOR for the Agricultural Pollution Control Project, financed from GEF funds through the World Bank; this project aims to reduce the amount of nutrients and other agricultural pollutants that enter Danube River and Black Sea, by promoting environment-friendly agricultural practices within rural communities.

The TOR include the design and provision of cost estimates for the construction of a “village-level Manure Management, Storage and Handling System”.

Existing waste management at village level may be described as below:

- Within households from the project rural area, domestic wastes (containing plastic, glass, metal, cardboard materials) are usually mixed with manure coming from the stock accommodation
- Primarily, the manure is deposited on the earth, in the proximity of stock housing
- Urine and liquid phase from wastes’ decomposition are allowed direct infiltration into the ground or in some cases are collected through channels into unlined pits

- Waste deposited near the stock housing was allowed to accumulate over 2-3 days before it is scraped up into a wheelbarrow and taken to a waste store, usually located close to the large gates at the front of the holding; this is also the place where the other household wastes are accumulated
- Each householder usually loads these wastes into a cart or trailer and takes them to the existing commune level “platform”

Such system has obvious flaws, such as:

- Inside the holding, wastes are practically handled twice
- Wastes are contaminated, therefore making manure direct use onto agricultural land unacceptable (relatively small amounts of inert materials contaminating significant quantities of manure)
- Lack of an impermeable concrete base for the main waste store also makes picking up the waste difficult
- Periodically, waste accumulated on the main store is set fire to, thus inducing negative effects on the environment
- Accumulated wastes cannot be stacked high nor livestock kept out because there are no retaining walls
- Rain water from roofed areas entering the waste stream can increase the volumes of effluents which can pollute
- Most holdings do not have access to mechanical handling equipment such as tractors with loaders and are limited to horse and cart

Existing commune level “platforms” already accumulated 10 to 12 years’ loads of wastes, representing real threats to the environment, through nutrient leaching, either by direct infiltration into the watertable, or by surface runoff into canals and streams. Therefore, in order to reduce the volume of leached nutrients, one needs to enforce a set of integrated measures, of which the management of manure and recyclable wastes comes as one of the first priorities.

1.7 Technological and operational description

APCP project relies on the assumption that current waste management practices must be changed, by introducing waste segregation at household level and by encouraging utilization of environment-friendly practices. At platform level, the design concept includes the following:

- 1 Proper management of manure, involving stacking in shaped windrow heaps, 3m tall, so that the area receiving rainfall is minimised
- 2 Provide impermeable walls and floor to eliminate leaching
- 3 Provide catchment to effluent runoff and urine (draining channel and storage tank)
- 4 Provide adequate security and protection fencing
- 5 Provide by design, sufficient storage capacity for accumulated manure (a minimum of four months) so that matured material will be available for use on the agricultural land; the objective should be to empty the store by the end of autumn.

The envisaged commune level waste storage and handling system would consist of:

- One rectangular shaped platform, open fronted, with reinforced concrete floor and walls; the whole structure should be designed to withstand specific loads exerted by the accumulated wastes, handling machinery, external forces, etc. It should be unrestricted by internal walls so that the space needed for waste management and

storage can be flexible. This would also suit the requirements for composting if this proves necessary for certain materials. An apron of concrete is provided for the movement of machinery and the unloading of the household carts or trailers. An effluent collection channel is provided across the full width of the front of the platform, with a metallic grizzly screen; this collects rainfall and effluent into a large basin to the side of the platform.

- One rectangular shaped storage basin, constructed in cut and fill, made of reinforced concrete and positioned immediately next to the platform, designed to collect rain water and platform effluent. It has to be able to accommodate a volume equivalent to 30 days of mean daily rainfall; the accumulated liquid will either be spread onto the field using a vacuum tanker or added on top of the waste heaps inside the platform (more frequently than the waste is spread)
- Three reinforced concrete bunkers, open fronted and of rectangular shape, for the householders to deposit the 3 types of inert wastes: steel, glass and plastic/cardboard; materials collected here would be emptied by a JCB (WOLA) type mechanical loader shovel.
- One concrete access road, stretching all the way from the front gates to the platform apron
- Security fencing, consisting of barbed wire on concrete poles

Also, for the purpose of achieving a biological filter and enhancing local landscape, a windbreak/shelterbelt will be installed parallel to the platform fencing, using separate funding.

2. INVESTMENT TECHNICAL DATA

2.1 Investment objective area and land tenure situation

Any such investment objective should only be constructed on public land. Areas of land to be occupied by commune level platforms vary in size, according to the waste volumes estimated to be generated within each community:

- platform #1, Alexandru Odobescu commune, Alexandru Odobescu village - area = 5,000 sq.m
- platform #2, Alexandru Odobescu commune, Nicolae Balcescu village – area = 5,000 sq.m
- platform #3, Ciocanesti commune, Smirdan village – area = 5,000 sq.m
- platform #4, Ciocanesti commune, Sirbi village – area = 5,000 sq.m
- platform #5, Cuza Voda commune, Cuza Voda village – area = 4,560 sq.m
- platform #6, Cuza Voda commune, Ceacu village – area = 4,560 sq.m
- platform #7, Gradistea commune, Gradistea village – area = 4,600 sq.m
- platform #8, Gradistea commune, Rasa village – area = 4,600 sq.m
- platform #9, Gradistea commune, Rasa and Bogata villages – area = 4,600 sq.m
- platform #10, Independenta commune, Independenta village – area = 5,000 sq.m
- platform #11, Independenta commune, Visini village – area = 5,000 sq.m
- platform #12, Vilcelele commune, Vilcelele village – area = 8,300 sq.m
- platform #13, Vilcelele commune, Floroaica village – area = 4,000 sq.m
- platform #14, Vlad Tepes commune, Vlad Tepes village – area = 4,600 sq.m

2.2 Geomorphology of the investment location

In compliance with Romanian standard P 100/1992, the land where the investment objective will be constructed, is classified as “D” seismic zoning category, with K_s (seismic coefficient) = 0.16 and T_c (corner period) = 1.5 sec.

Geomorphologically speaking, the location area is part of the Southern Baragan plain, with Danube terraces and with elevations in the range of 20 - 46 m.

Geologically, this area is part of the Moesic tableland, its structure including deposits dating back to the mezozoic, neozoic and quaternary ages.

From the hydrogeological point of view, the primary watertable can be encountered at depths ranging from 3 to 15 m, with the general flow from WNW to ESE.

2.3 Main characteristics of structures

2.3.1 Structures to be built

The project waste management component will include the construction of 14 manure storage platforms, situated in 7 communes within Calarasi county. Each commune level platform (s) represents a construction objective:

Objective no.1 – Alexandru Odobescu commune, two platforms

Objective no.2 – Ciocanesti commune, two platforms

Objective no.3 – Cuza Voda commune, two platforms

Objective no.4 – Gradistea commune, three platforms

Objective no.5 – Independenta commune, two platforms

Objective no.6 – Vilcelele commune, two platforms

Objective no.7 – Vlad Tepes commune, one platform

2.3.2 Principal features

According to the estimated volumes of manure generated by each commune, actual platform size may vary.

Objective no.1 – Alexandru Odobescu commune:

Platform:

- storage capacity = 2,400 tonnes
- length = 34.6 m
- width = 33.0 m
- wall height = 3.0 m
- collector length = 34.0 m
- apron = 34.0/6.4 m

Storage tank:

- storage capacity = 97.5 cu.m
- length = 6.5 m
- width = 10 m
- depth = 1.5 m of which 0.3 m above ground level

Bunkers for recyclable materials:

- number per platform = 3
- length of one bunker = 4.0 m
- width of one bunker = 2.5 m
- height of one bunker = 1.5 m

Access road:

- length = 26.0 m

- width = 6.0 m

Fencing:

- length = 233.0 m
- height = 2.0 m

Objective no.2 – Ciocanesti commune:

Platform:

- storage capacity = 3,700 tonnes
- length = 53.3 m
- width = 33.0 m
- wall height = 3.0 m
- collector length = 34.0 m
- apron = 34.0/6.4 m

Storage tank:

- storage capacity = 147.0 cu.m
- length = 9.8 m
- width = 10 m
- depth = 1.5 m of which 0.3 m above ground level

Bunkers for recyclable materials:

- number per platform = 3
- length of one = 4.0 m
- width of one = 2.5 m
- height of one = 1.5 m

Access road:

- length = 26.0 m
- width = 6.0 m

Fencing:

- length = 270.0 m
- height = 2.0 m

Objective no.3 – Cuza Voda commune:

Platform:

- storage capacity = 2,800 tonnes
- length = 40.4 m
- width = 33.0 m
- wall height = 3.0 m
- collector length = 34.0 m
- apron = 34.0/6.4 m

Storage tank:

- storage capacity = 112.5 cu.m
- length = 7.5 m
- width = 10 m
- depth = 1.5 m of which 0.3 m above ground level

Bunkers for recyclable materials:

- number per platform = 3
- length of one = 4.0 m

- width of one = 2.5 m
- height of one = 1.5 m

Access road:

- length = 26.0 m
- width = 6.0 m

Fencing:

- length = 245.0 m
- height = 2.0 m

Objective no.4 – Gradistea commune:

Platform:

- storage capacity = 4,100 tonnes
- length = 59.0 m
- width = 33.0 m
- wall height = 3.0 m
- collector length = 34.0 m
- apron = 34.0/6.4 m

Storage tank:

- storage capacity = 163.5 cu.m
- length = 10.9 m
- width = 10 m
- depth = 1.5 m of which 0.3 m above ground level

Bunkers for recyclable materials:

- number per platform = 3
- length of one = 4.0 m
- width of one = 2.5 m
- height of one = 1.5 m

Access road:

- length = 26.0 m
- width = 6.0 m

Fencing:

- length = 282.0 m
- height = 2.0 m

Objective no.5 – Independenta commune:

Platform:

- storage capacity = 3,200 tonnes
- length = 46.1 m
- width = 33.0 m
- wall height = 3.0 m
- collector length = 34.0 m
- apron = 34.0/6.4 m

Storage tank:

- storage capacity = 127.5 cu.m
- length = 8.5 m
- width = 10 m

- depth = 1.5 m of which 0.3 m above ground level

Bunkers for recyclable materials:

- number per platform = 3
- length of one = 4.0 m
- width of one = 2.5 m
- height of one = 1.5 m

Access road:

- length = 26.0 m
- width = 6.0 m

Fencing:

- length = 256.0 m
- height = 2.0 m

Objective no.6 – Vilcelele commune:

Platform:

- storage capacity = 3,000 tonnes
- length = 43.2 m
- width = 33.0 m
- wall height = 3.0 m
- collector length = 34.0 m
- apron = 34.0/6.4 m

Storage tank:

- storage capacity = 120.0 cu.m
- length = 8.0 m
- width = 10 m
- depth = 1.5 m of which 0.3 m above ground level

Bunkers for recyclable materials:

- number per platform = 3
- length of one = 4.0 m
- width of one = 2.5 m
- height of one = 1.5 m

Access road:

- length = 26.0 m
- width = 6.0 m

Fencing:

- length = 250.0 m
- height = 2.0 m

Objective no.7 – Vlad Tepes commune:

Platform:

- storage capacity = 2,600 tonnes
- length = 37.5 m
- width = 33.0 m
- wall height = 3.0 m
- collector length = 34.0 m
- apron = 34.0/6.4 m

Storage tank:

- storage capacity = 103.5 cu.m
- length = 6.9 m
- width = 10 m
- depth = 1.5 m of which 0.3 m above ground level

Bunkers for recyclable materials:

- number per platform = 3
- length of one = 4.0 m
- width of one = 2.5 m
- height of one = 1.5 m

Access road:

- length = 26.0 m
- width = 6.0 m

Fencing:

- length = 239.0 m
- height = 2.0 m

2.4 Structural components

2.4.1 Concrete platform

For the construction of the concrete manure storage platform (s), several preparation operations are required, such as topsoil removal, foundation excavation, trench bottom levelling, earthwork transport and spreading, aggregate bed laying and rolling, sealing membrane laying, etc.

Basic works include: formwork manufacturing and installation, concrete reinforcement rebars manufacturing and installation, foundation concrete casting, platform floor and apron concrete casting, precast concrete units manufacturing and installation (on three sides), concrete lining slabs and joints installation on the effluent collector, metallic grizzly screen manufacturing and installation across the effluent collector, PVC pipe installation at the downstream end of the collection channel.

Ancillary operations consist of : haulage of aggregates and other materials, concrete mixing, deployment, installation and redeployment of mobile crane, etc.

2.4.2 Storage tank

Preparation works: topsoil excavation, foundation excavation, trench bottom levelling, earthwork removal and spreading, hardcore laying and rolling, damp proof membrane laying.

Basic operations: formwork manufacturing and installation, concrete reinforcement rebars manufacturing and installation, foundation concrete casting, tank wall concrete casting, special plaster works, vapour barrier casting (warm conditions), etc.

Ancillary works: haulage of aggregates and various materials, concrete mixing and transport, manual compaction operations, provision of the outlet link to the PVC pipe discharging the effluent from the collection channel.

2.4.3 Bunkers for segregated wastes

Preparation works: topsoil removal, foundation excavation, trench bottom levelling, earthwork transport and spreading, hardcore laying and rolling.

Basic operations: concrete poles' foundation casting, poles' and precast slabs' installation.

Ancillary works: haulage of aggregates and various materials, concrete mixing and transport, manual compaction, provision of the outlet link to the PVC pipe that discharges effluent from the collection channel.

2.4.4 Access roads

Preparation works: topsoil excavation, foundation excavation, trench bottom levelling, earthwork removal and spreading, hardcore laying and rolling.

Basic operations: concrete foundation casting, laying of concrete wearing course.

Ancillary works: haulage of aggregates and materials, concrete mixing and transport.

2.4.5 Fencing

Preparation works: marking the perimeter with pegs.

Basic operations: installation of precast reinforced concrete poles and barbed wire, installation of cast iron gates.

Ancillary works: haulage of aggregates and other materials.

2.5 Required machinery and equipment

Waste management concept involves the collection of domestic and farm wastes, unloading them at the commune level platform, managing these wastes within the storage platform and spreading matured manure on cultivated fields. For these purposes, the following plant is required:

JCB/WOLA – type loader shovel

Type: 4 wheel drive

Loading height: 4 m

Fork capacity: 2 cu.m

Bucket capacity: 2 cu.m

Minimum engine power: 90 hp

Number required per commune: 1 for each individual platform

Waste spreader

Type: rear discharge

Capacity: 5 cu.m (largest Romanian supply)

Number required per commune: 2

Vacuum tanker

Type: vacuum

Capacity: 5,000 litres

Number required per commune: 1

Tractor

Type: 2 wheel drive

Engine power: 65 hp

Manufacturer: Tractorul Brasov

Number required per commune: 2

Trailer

Type: single axle tipping body
Nominal capacity: 5 tonnes
Number required per commune: 2

Waste shredder

Number required per commune: 1 for each individual platform

Costs of this plant were included under the “Design of Village-level Manure Management Storage and Handling System” component of the APCP project.

2.6 Ancillary installations

No other installations are envisaged for the platforms at this stage.

2.7 Other infrastructure

Consolidated access roads are to be constructed in the area, using separate disbursement sources.

3. INFORMATION ON HUMAN RESOURCES

3.1 Total staff

During the initial phase, 35 operational staff members will be required, of which:

- 14 drivers for JCB/WOLA loaders
- 7 drivers for vacuum tankers
- 14 tractor drivers

3.2 Newly created jobs

All 35 positions can be considered as newly created.

4. INVESTMENT COST EVALUATION

4.1 General BoQ

Approved,
Calarasi County Council President

General Bill of Quantities for Manure and Recyclable Materials Storage Platforms

Item no.	Name of expenditure chapter	Total value (thousand ROL)	Of which subject to tendering (thousand ROL)
1	2	3	4
Part I			
Chapter 1 – Land procurement and preparation expenditures			
1.1	Land procurement	-	-
1.2	Land preparation	-	-
1.3	Environmental protection works including ecological reconstruction	-	-
Total Chapter 1		-	-
Chapter 2 – Investment ancillary infrastructure (utilities' links, networks)			
2.1		-	-
Chapter 3 – Design and technical assistance expenditures			
3.1	Field investigations, hydrogeological and topographical surveys	112,000	-
3.2	Necessary authorizations, permits, official charges and other dues	10,500	-
3.3	Design and engineering activities	376,000	-
3.4	Organization of contractors' tendering	170,603	-
3.5	Consultation and technical assistance, including the fees for the technical supervision staff, during the construction phase	29,750	-
Total Chapter 3		698,853	-
Chapter 4 – Investment costs			
4.1	Objective no.1 – Alex.Odobescu commune	3,882,642	3,882,642
4.2	Objective no.2 – Ciocanesti commune	5,543,118	5,543,118
4.3	Objective no.3 – Cuza Voda commune	4,232,960	4,232,960
4.4	Objective no.4 – Gradistea commune	8,825,583	8,825,583
4.5	Objective no.5 – Independenta commune	4,736,452	4,736,452
4.6	Objective no.6 – Vilcelele commune	4,532,386	4,532,386
4.7	Objective no.7 – Vlad Tepes commune	1,962,832	1,962,832

Total Chapter 4		33,715,973	33,715,973
Chapter 5 – Other expenditures			
5.1	Site mobilization	404,592	404,592
5.2	Commissions, charges, etc.	236,012	-
5.3	Contingencies	1,704,786	-
Total Chapter 5		2,345,390	404,592
Chapter 6 – Commissioning expenditures			
6.1	Training of operational personnel	-	-
6.2	Technological tests, trials, official appraisal and commissioning	-	-
Total Part I, of which Construction + Installation		36,760,216	34,120,565
		35,825,351	34,120,565
Part II			
Updated residual value of existing fixed assets which are included in the investment objective		-	-
Part III			
Circulating fund required for the first production cycle		-	-
GRAND TOTAL, of which Construction +Installation		36,760,216	34,120,565
		35,825,351	34,120,565

4.2 BoQs for each investment component

BILL OF QUANTITIES for Objective no. 1 – Alex. Odobescu commune

Item no.	Name of work category	Cost per unit (excluding VAT) in thousand ROL	No. of units	Cost per work category (excluding VAT) in thousand ROL
1.	Manure storage platform	1,345,395	2	2,690,790
2.	Effluent storage tank	142,853	2	285,706
3.	Bunkers for recyclable materials	30,886	2	61,772
4.	Access road	57,950	2	115,900
5.	Fencing	54,278	2	108,556
Total		1,631,362	2	3,262,724
VAT (19 %)		309,959	2	619,918
BoQ TOTAL, of which Construction + Installation		1,941,321	2	3,882,642
		1,941,321		3,882,642

BILL OF QUANTITIES for Objective no. 2 – Ciocanesti commune

Item no.	Name of work category	Cost per unit (excluding VAT) in thousand ROL	No. of units	Cost per work category (excluding VAT) in thousand ROL
1.	Manure storage platform	1,959,519	2	3,919,038
2.	Effluent storage tank	215,380	2	430,760
3.	Bunkers for recyclable materials	30,886	2	61,772
4.	Access road	57,950	2	115,900
5.	Fencing	65,306	2	130,612
Total		2,329,041	2	4,658,082
VAT (19 %)		442,518	2	885,036
BoQ TOTAL, of which Construction + Installation		2,771,559	2	5,543,118
		2,771,559		5,543,118

BILL OF QUANTITIES for Objective no. 3 – Cuza Voda commune

Item no.	Name of work category	Cost per unit (excluding VAT) in thousand ROL	No. of units	Cost per work category (excluding VAT) in thousand ROL
1.	Manure storage platform	1,468,431	2	2,936,862
2.	Effluent storage tank	164,831	2	329,662
3.	Bunkers for recyclable materials	30,886	2	61,772
4.	Access road	57,950	2	115,900
5.	Fencing	56,457	2	112,914
Total		1,778,555	2	3,557,110
VAT (19 %)		337,925	2	675,850
BoQ TOTAL, of which		2,116,480	2	4,232,960
Construction + Installation		2,116,480		4,232,960

BILL OF QUANTITIES for Objective no. 4 – Gradistea commune

Item no.	Name of work category	Cost per unit (excluding VAT) in thousand ROL	No. of units	Cost per work category (excluding VAT) in thousand ROL
1.	Manure storage platform	2,080,908	3	6,242,724
2.	Effluent storage tank	239,555	3	718,665
3.	Bunkers for recyclable materials	30,886	3	92,658
4.	Access road	57,950	3	173,850
5.	Fencing	62,853	3	188,559
Total		2,472,152	3	7,416,456
VAT (19 %)		469,709	3	1,409,127
BoQ TOTAL, of which Construction +Installation		2,941,861	3	8,825,583
		2,941,861		8,825,583

BILL OF QUANTITIES for Objective no.5 – Independenta commune

Item no.	Name of work category	Cost per unit (excluding VAT) in thousand ROL	No. of units	Cost per work category (excluding VAT) in thousand ROL
1.	Manure storage platform	1,656,046	2	3,312,092
2.	Effluent storage tank	186,809	2	373,618
3.	Bunkers for recyclable materials	30,886	2	61,772
4.	Access road	57,950	2	115,900
5.	Fencing	58,415	2	116,830
Total		1,990,106	2	3,980,212
VAT (19 %)		378,120	2	756,240
BoQ TOTAL, of which Construction + Installation		2,368,226	2	4,736,452
		2,368,226		4,736,452

BILL OF QUANTITIES for Objective no.6 – Vilcelele commune

Item no.	Name of work category	Cost per unit (excluding VAT) in thousand ROL	No. of units	Cost per work category (excluding VAT) in thousand ROL
1.	Manure storage platform	1,582,293	2	3,164,586
2.	Effluent storage tank	175,823	2	351,646
3.	Bunkers for recyclable materials	30,886	2	61,772
4.	Access road	57,950	2	115,900
5.	Fencing	57,412	2	114,824
Total		1,904,364	2	3,808,728
VAT (19 %)		361,829	2	723,658
BoQ TOTAL, of which Construction + Installation		2,266,193	2	4,532,386
		2,266,193		4,532,386

BILL OF QUANTITIES for Objective no.7 – Vlad Tepes commune

Item no.	Name of work category	Cost per unit (excluding VAT) in thousand ROL	No. of units	Cost per work category (excluding VAT) in thousand ROL
1.	Manure storage platform	1,352,571	1	1,352,571
2.	Effluent storage tank	152,576	1	152,576
3.	Bunkers for recyclable materials	30,886	1	30,886
4.	Access road	57,950	1	57,950
5.	Fencing	55,456	1	55,456
Total		1,649,439	1	1,649,439
VAT (19 %)		313,393	1	313,393
BoQ TOTAL, of which Construction + Installation		1,962,832	1	1,962,832
		1,962,832		1,962,832

4.3 Financial costs

A. Financial costs, pertaining to Chapter 3 of the General BoQ

3.1 Field investigations:

- geotechnical surveys: $5,000 \times 14 = 70,000$ thousand ROL
- topographical surveys: $3,000 \times 14 = 42,000$ thousand ROL
- **TOTAL** = **112,000 thousand ROL**

3.2 Authorizations, permits, consents, official charges and other dues to be obtained or incurred by the investor:

- Construction Authorization, according to provisions stipulated by Law no.27/17.05.1994 and by Government Ordinance no.24/11.08.1991: exempted
- Other permits and consents: $3 \text{ permits} \times 500 \times 7 = 10,500$ thousand ROL
- **TOTAL** = **10,500 thousand ROL**

3.3 Design and engineering:

Costing was done in compliance with the methodology for land planning investments' studies and design (approved through Ordinance no.11/N/01.06.1994), accepted for the tendering of feasibility studies (FS):

- FS = 26,000 thousand ROL
- TD + TDO + CS*: $50,000 \times 7 = 350,000$ thousand ROL
- **TOTAL** = **376,000 thousand ROL**

3.4 Organization of contractors' tendering:

$V = 1\%$ of the total value of works subject to tendering (Chapter 4 and paragr. 5.1)
 $V = 0.01 \times (33,715,973 + 404,592) = 341,206$ thousand ROL : 2 works per commune =
170,603 thousand ROL

TOTAL **170,603 thousand ROL**

3.5 Consultation and technical assistance, including the fees for the technical supervision staff, during the construction phase:

- technical assistance and supervision during the construction phase would be provided by specialists of the Local Councils
- expenditures for TD and TDO verification:
- $V = 8.5 \%$ of the relevant phase design value
- $V = 0.085 \times 50,000 \text{ thousand ROL} \times 7 = 29,750$ thousand ROL
- **TOTAL** **29,750 thousand ROL**

* where: TD = Technical Design; TDO = Tender Dossier; CS = Construction Specifications

B. Financial costs pertaining to Chapter 5 of the General BoQ

5.1 Site mobilization

For this, 1.2 % of the C + I (Chapter 4) value is allocated:

$$V = 0.012 \times 33,715,973 = 404,592 \text{ thousand ROL}$$

TOTAL **404,592 thousand ROL**

5.2 Commissions and other charges

Commissioning of Construction + Installation works:

$$0.7 \% \text{ of (C+I) value} = 0.007 \times 33,715,973 = 236,012 \text{ thousand ROL}$$

TOTAL **236,012 thousand ROL**

5.3 Contingencies

For this, 5 % of the total value of works (paragr.3.3 + paragr.3.5 + Chapter 4) is allocated in accordance with Government Decision 376/08.07.1994:

$$V = 0.05 \times (350,000 + 29,750 + 33,715,973) = 1,704,786 \text{ thousand ROL}$$

TOTAL **1,704,786 thousand ROL**

5. MAIN TECHNICAL AND ECONOMIC INDICES

5.1 Total investment value of which construction + installation

Total investment value = 36,760,216 thousand ROL
Of which C+I = 35,825,351 thousand ROL

5.2 Investment implementation schedule, of which construction + installation

Year 2002: - total investment value = 10,502,918 thousand ROL
 - of which C+I = 10,235,815 thousand ROL
Year 2003: - total investment value = 10,502,918 thousand ROL
 - of which C+I = 10,235,815 thousand ROL
Year 2004: - total investment value = 10,502,918 thousand ROL
 - of which C+I = 10,235,815 thousand ROL
Year 2005: - total investment value = 5,251,459 thousand ROL
 - of which C+I = 5,117,907 thousand ROL

5.3 Planned duration of investment implementation

28 months (7 months per year)

5.4 Planned investment commissioning schedule

Year 2002: 4 platforms
Year 2003: 4 platforms
Year 2004: 4 platforms
Year 2005: 2 platforms

6. DISBURSEMENT SOURCES

The investment in manure storage platforms will be 50 % financed from Global Environment Facility (GEF) funds administered by the World Bank and 50 % from the Romanian Government.

7. NECESSARY AUTHORIZATIONS AND PERMITS

Existing:

1. Land Planning Certificate no. 123/24.11.2000 for Alexandru Odobescu commune
2. Land Planning Certificate no. 128/24.11.2000 for Ciocanesti commune
3. Land Planning Certificate no. 127/24.11.2000 for Cuza Voda commune
4. Land Planning Certificate no. 124/24.11.2000 for Gradistea commune
5. Land Planning Certificate no. 125/24.11.2000 for Independenta commune
6. Land Planning Certificate no. 129/24.11.2000 for Vilcelele commune
7. Land Planning Certificate no. 126/24.11.2000 for Vlad Tepes commune

To be obtained

8. Environmental Permit
9. Public Health Directorate Authorization
10. "Apele Romane" National Water Authority Permit
11. Authorization from the "Lower Danube Museum"

DRAWINGS