JOINT IMPLEMENTATION PROJECT

"Introduction of sugar production organic waste management system at "Podilski sugar mills" LTD"

Position of manager of the company,
institution, establishment -developer of the document.
General Director of LLC "MT-Invest Carbon"

29 . 11 .2012 ______________ **Falendysh Yaroslav Myroslavovych**

P. for S.

Position of the head of the entity
-owner of the source,
where is planning to carry out the JI Project
t.a.a.Director of "Podilski sugar mills" LTD

29 . 11 .2012 ______________ **Mihaylovska Tatiana Yuzkivna**

P. for S.

JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

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Annexes

SECTION A. General description of the project

A.1. Title of the project:

"Introduction of sugar production organic waste management system at the "Podilski sugar mills" LTD"

Sector: 13.Waste recycling and utilization.

Version of the document: 2.0

Date of the document: 28 November 2012.

A.2. Description of the project:

The project aims at improving and modernizing the practice of recycling of organic waste at sugar plants, included in the project boundaries. The project activity results in decrease of the amount of sugar beet pulp to be disposed in landfills, where due to decomposition of organic matter in the pulp under anaerobic conditions the methane releases, which is a greenhouse gas.

The project has been implemented at three sugar plants of the Vinnytsia Region of Ukraine. "Podilski sugar mills" LTD coordinates the project activity. Sugar beet pulp is a by-product of its production, which is a spent sugar-beet chips. This product has valuable feed properties and can be successfully used for feeding cattle, which eats good quality pulp in any form: fresh, benign acidic, ensilage or dry. The technical process of sugar plants involves the production of fresh pulp. The high content of organic components makes it an excellent environment for intensive growth of microorganisms that cause rapid deterioration of pulp, though it can no longer be used for feeding cattle and must be taken to landfills for disposal as an organic waste.[1] Drying of fresh pulp makes it suitable for ensiling (preservation of pulp by creating conditions for lactic acid fermentation). The period of pulp storage can be increased to one year and more, when it is air-tightly preserved. By ensuring a deeper pulp extraction, the plants expand opportunities to use the beneficial beet pulp, which increases the demand, consequently reducing the amount of pulp that could deteriorate. However, the shelf life for pulp dried for silage is short as well, so the range of consumers is limited to livestock breeding complexes, located near the sugar plant. To increase the amount of pulp that can be recycled, it is required to dry it. For this purposes the pulp drying equipment is used. The resulting product is suitable for long-term warehousing and transportation for long distances.

The proposed project activity provides the introduction of deeper pulp extraction systems: installation of additional presses of deeper extraction. Currently, most planned activities are already implemented and lead to the generation of CO_2 emissions reductions.

[1] 1583.2.9.01 is a code attributed to a beet pulp as per the State Classifier of Ukraine SC 005-96 "Waste Classifier": http://www.uazakon.com/big/text78/pg6.htm.

Situation before project implementation

Before the project realization, equipment and infrastructure (warehouses, adjusted logistics system) necessary to decrease moisture content in the pulp, wherefore it quickly deteriorated, and this valuable feed resource turned into organic waste, which at first was stored in pulp pits (up to three months) and then transported to landfills. When emptying the pulp pits from deteriorated pulp, 3-5% of its mass left at the pit bottom, containing a large number of microorganisms that rapidly contaminated new pulp and speeded up the pace of its deterioration. Due to the use of this practice, the pulp produced at the JI project plants could not be used for feeding cattle and was disposed at landfills.

Baseline scenario

In the baseline scenario in the absence of the project the situation would continue: companies would still store sugar beet pulp in pits in the substance as it was produced, with no additional actions aimed at reduction of its moisture content. After filling the pulp pits with pulp, it would be transported and disposed at landfills. This scenario foresees decomposition of organic matter with the generation of landfill gas containing greenhouse gas – methane.

Sugar production is a main business activity of the sugar plants. However, other products or waste is secondary and those to which not much attention is paid. The base scenario envisaged the continuation of the pulp handling practice that used to be applied by the plants. This scenario does not require any changes to the technical process of the plant, investment and does not face any barriers.

Project scenario (technical resume)

Project scenario assumes installation of equipment for decreasing of moisture content in the pulp, which allows its beneficial utilization as feed for cattle, thus it is not to be disposed at landfills and methane does not release into the atmosphere in result of pulp decomposition.

Project history

The project was initiated by “Podilski sugar mills” LTD in early 2005. Along with the ratification of the Kyoto Protocol, the opportunity to receive additional financial benefits from reducing greenhouse gases has appeared that was an additional argument for the introduction of such activities at other plants of the Vinnytsia Region. Implementation of the main project activity took place during 2005-2007. Emission reductions will be sold as ERUs in the international emission trading market, and the funds obtained will improve the financial performance of the project to a level that justifies the means that were used for its implementation. From the very beginning, the joint implementation mechanism was one of the prominent factors of the project, and financial benefits under this mechanism plays an important role in deciding on the start of the operation and is considered to be one of the reasons to launch the project realization.

The project has been applied to the State Environmental Investment Agency of Ukraine to obtaine Letter of Endorsement.

Project implementation schedule is presented as Table 5 below.

A.3. Project participants:

Table 1. Project participants

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host party)	"Podilski sugar mills" LTD	No
The Netherlands	United Carbon Finance Ltd	No

"Podilski sugar mills" LTD is the owner of the emission sources at which Joint Implementation project was realized. The company represents the structural units − sugar mills – listed in Table 1, where JI project was implemented.

United Carbon Finance Ltd is a potential buyer of emission reductions from this project.

"MT-Invest Carbon" LLC is a consultant in the development of JI projects and is not a project participant. It is responsible for development of data substantiating materials, PDD, support "Podilski sugar mills" LTD in the process of determination, obtaining Letter of Endorsement and a Letter of Approval, support for the final determination of the project.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

Ukraine

A.4.1.2. Region/State/Province etc.:

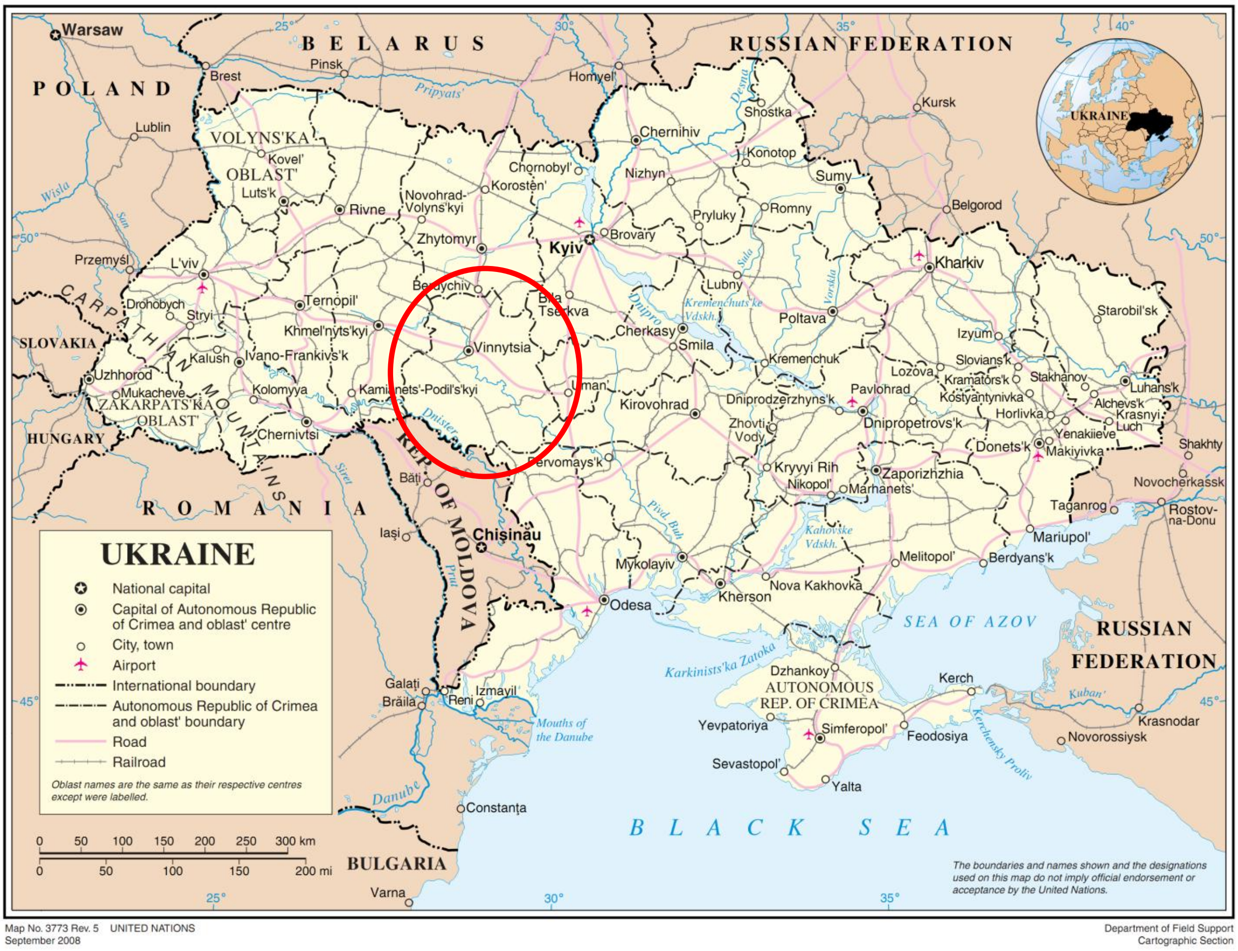


Figure 1. Project location on the map of Ukraine.

A.4.1.3. City/Town/Community etc.:

This project is implemented at production facilities of "Podilski sugar mills" LTD within three sugar plants in the Vinnytsia Region of Ukraine.

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

This project is implemented within three sugar plants in the Vinnytsia Region of Ukraine, which are structural subordinates of "Podilski sugar mills" LTD that coordinates this project activity. To ensure the project transparency, every plant attributed to the project implementation is assigned with a number. The list below includes the plants, where the project activity has been realized.

Table 2. List of facilities, where the project activity has been realized.

Identification #	*Factory name*	*Short name in PDD*	*Address*	*Geographical coordinates*
1.	"Podilski sugar mills" LTD SU "Sokolivsk sugar"	Sokolivsk	1, Sluzhbova Str., Sokolivka Village, Kryzhopil District, Vinnutsya Region, 24634	48°26'31.00"N 28°59'32.00"E
2.	"Podilski sugar mills" LTD SU "Kapustianskiy sugar"	Kapustianskiy	1, S. Murovanogo Str., Kapustiany Village, Trostianets District, Vinnytsya Region, 24332	48°31'57.00"N 29° 1'43.00"E
3.	"Podilski sugar mills" LTD SU "Moivskiy sugar"	Moivskiy	73, Lenina Str., building A, Moivka Village, Chernivetskyi District, Vinnytsya Region, 24133	48°27'48.17"N 28°13'23.35"E

Vinnytsia Region is an administrative and territorial unit of Ukraine with its center in Vinnytsia. Square area is 26 513 km^2 (4.39% of Ukraine), 1639.7 thousand inhabitants (as of March 1, 2010). There are 18 cities, 29 towns, 1466 villages, 18 districts in the region.

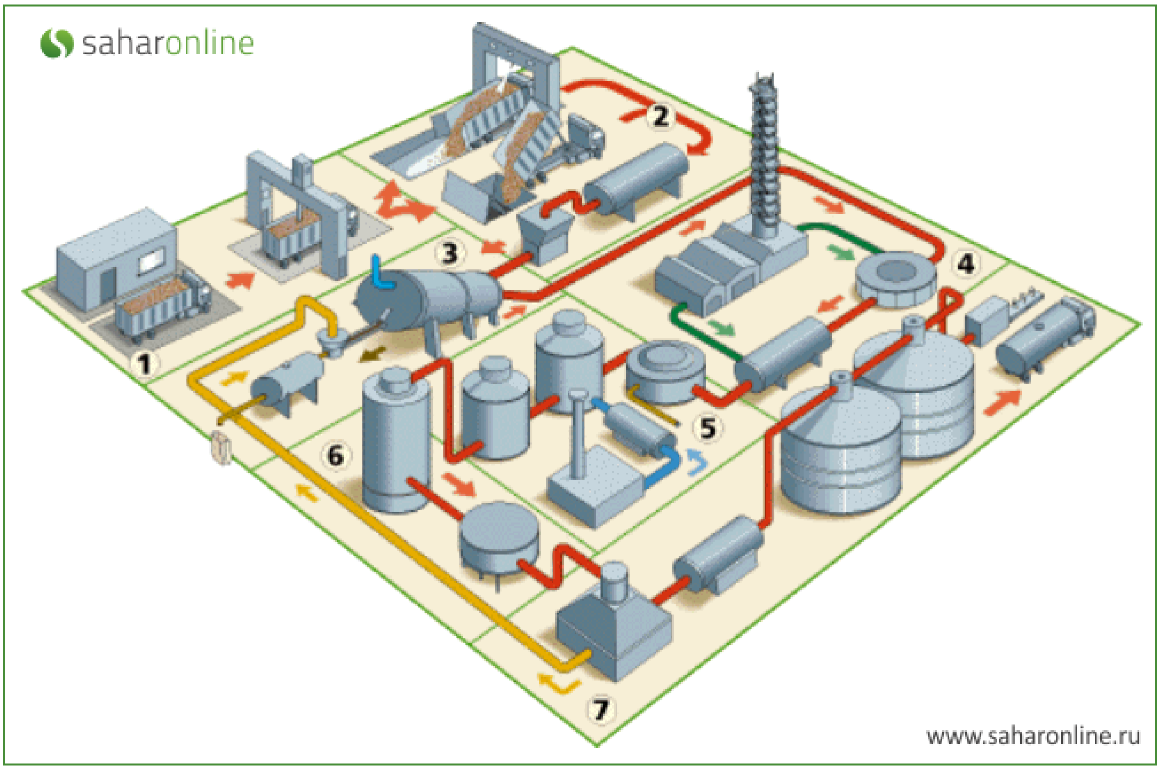
Ternopil Region occupies the western part of Podolsk plateau, bordering with Zhytomyr Region to the north, Odessa Region and Moldova to the south, Chernivtsi and Khmelnitsk Regions to west, Kyiv,Cherkasy and Kirovograd Region at the east of Ukraine.

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

The project assumes the implementation of comprehensive actions aimed at improvement of waste management practice at three sugar plants, the participants of joint activity. "Podilski sugar mills" LTD coordinates the Joint Implementation project activity. All plants produce sugar of sugar beets using common technological process.

Technology of sugar production

Sugar production is a complex multistage process illustrated at the technological process flow-chart in Figure 2. It comprises of beet supply, its unloading and washing, shredding, extraction of sucrose and other sugar-free components into the solution (diffusion), purification of diffusion juice with addition of lime and use of CO_2 gas (carbonation) and SO_2 (sulfication), condensing of purified juice to the syrup consistency through evaporation. Its further thickening in vacuum evaporators until it turns into thick mass (7% of water content) – a massecuite from which crystallized sugar are produced during centrifugation. Every stage is described in detail below.



Flow-chart description:

1. Sugar beet supply;
2. Unloading and washing;
3. Diffusion (stage when beet pulp occurs);
4. Saturation;
5. Evaporation;
6 Crystallization;
7. Centrifugation.

Figure 2. Flow-chart of sugar production process of sugar beet. (Source: Saharinline[2])

Sugar beets supply

One of the most important factors for obtaining high-quality raw sugar is a characteristic of raw material that gets recycled.

When collecting and transporting beet, except greenery that stuck to beets, small and heavy impurities: tops, straw, sand, stones also get to beets. Using mechanized means for cultivation and harvesting of sugar beet, the amount of such additives is about 10-12% of received raw materials weight. When supplying sugar beets at the plant, beet laboratory makes an analysis of received beets. Technological quality of sugar beets is characterized by a number of properties the main of which is sugar content (average sucrose content is about 18%) and purity of beet juice that is interrelated. As sucrose percentage increases, beet juice purity increases as well. Reception of sugar beet, its sampling, determination of contamination and sugar content is performed in accordance with GOST 17421-82 “Sugar beet for industrial processing. Requirements for procurement”.

[2] http://www.saharonline.ru/e_shema.php?enc=301

Unloading and washing

A good washing of sugar beets and timely capture of impurities before the refining process starts allows for improving the quality of products, reducing the amount of chemicals used for purification of diffusion juice and allow extend the life of capital equipment, such as beet choppers, diffusers, filters, etc.

The plants use wet method of sugar beets transportation for its processing. In this way, sugar beet is washed out of a truck body by means of water jet and hydraulic conveyors, after which it is transported to production shops. While being under the process, it is primarily washed using sand, straw, tops and stone separators through which the plant is trying to minimize the amount of impurities. For the final purification of sugar beet washing machine is used. The beets are washed from the clay and soil the best when rubbing together, that is successfully performed in washing machines of drum type. After that, the beets are taken to rinsers and washing machines of barrel type with further transportation to the tankers before being carried to beet choppers.

Diffusion

To produce sugar using diffusion method, beets have to be grinded with beet choppers, after which we can obtain beet chips. Diffusion unit efficiency and sugar content in sugar-free chips to a great extent depends on the quality of chips. Beet chips can be in the form of gutter or tablet depending on the type of diffusers. The thickness of normal chips is 0.5-1 m. Its surface should be smooth without any cracks. Too thin chips are undesirable because they lose their shape, lump and affect the circulation in the diffusion juice units.

In the process of diffusion, beet chips are ponded with hot water, so that cell walls of sugar beet will be destructed and sucrose turn into solution. When the diffusers are running effectively and the beet chips are of high quality, over than 98% of sucrose can turn into a solution, sugar-free components dissolve as well, namely: soluble protein, peptic substances and products of their decay, reducing sugars, amino acids, etc., which are to be removed at the next stages. As a result of diffusion diffuse juice are obtained that goes further into the technological process, and ***sugar-free chips − waste of sugar production − pulp***.

Further stages of sugar production are not involved into project activity and are briefly explained to give the information.

Carbonation and sulfication

During the carbonation process, diffusion juice is treated with lime milk and carbonation gas (CO_2). Lime and carbon dioxide are obtained during roasting limestone.[3] On addition of lime, CaO reacts with components of the diffusion juice, thus creating insoluble compounds with its sugar-free components that precipitate and can be separated by filtration. CO_2 and SO_3 treating allows for recovering sucrose and converting it into insoluble compounds, which are then filtered. The process can be repeated several times in order to increase the efficiency of purification. Purity of syrup should be adjusted to about 92%[4], because mistakes made during the previous stages are impossible to correct.

[3] CO_2 emissions due to thermal decomposition of limestone are not taken into consideration within the joint implementation project, because project activity has no effect on them.
[4] http://www.saharonline.ru/e_evaporator.php?enc=306

Evaporation

Purified diffusion juice is subjected to evaporation until it turns into syrup.

Crystallized sugar obtaining

Crystallization begins in vacuum units, where syrup is thickening until it turns into a massecuite – a dense mass with approximately 7% of water content. Massecuite is carried for centrifugation, which results in obtaining of crystallized sugar and intercrystalline substance − syrup, which has a high content of sucrose (massecuite II). It is transported for re-evaporation and centrifugation. The resulting sugar is dried and packed.

Characteristics of sugar beet pulp

As mentioned above, the pulp is a byproduct of sugar production that is a result of diffusion process on sugar-free beet chips. The fresh pulp is usually removed to temporary pulp storage tanks, some plants are equipped with pulp presses for recirculation of pulp water into the manufacturing process that reduces the loss of sugar together with pulp. The resulting pulp comes to pulp pits, from where it is transported to landfills or may be sent for recycling.

Pulp consists of pectin, cellulose, hemicellulose. There is also a small amount of proteins, minerals and sugar. A small amount of fiber, easy absorption of carbohydrates and proteins make it a very valuable food for cattle, which eats it very well, either fresh, or sour fermented, siloing or dried. Chemical composition of different types of pulp is presented in Table 3.

Table 3. Chemical composition of different types of pulp (Source: Ugagroprom[5]).

Parameter	Pulp, %			
	Fresh	Pressed	Sour	Dried
Crude protein content	1.2-1.5	1.7-1.9	1.3-2.6	7-9
Crude fiber content	3.5-4.5	5.0-7.0	2.8-4.2	19-23
Nitrogen-free extractives content	4.3-6.5	8.5-10.0	2.7-5.8	55-65
Cinder	0.6-1.0	1.1-1.4	0.7-1.8	2.4-4.3
Fat	0.4-0.7	0.6-0.9	0.7-1.0	0.3-0.5

The main problem of pulp handling is quick fermentation and putrefaction processes due to the high organic matter content, which spoil forage properties of pulp and converts it from useful by-product of sugar production into waste that has to be recycled or disposed. Fresh pulp should be used for feed purposes or conserved only within short period of time[6] after its production. Its short-term fermentation in pulp pits under anaerobic conditions for sour pulp is allowed, but the period of which is about 3 days after its formation. The most common way of pulp preserving is siloing. Warm pulp is packed air-tightly into containers, where lactic acid bacteria grow that produce lactic acid that is a conservant. In this case the term of pulp handling extends up to 4-8 month and more.

[5] Kolesnikov M.V. "Storage and use of beet pulp. Chemical composition of pulp". (М.В. Колеснiков. «Зберiгання та використання жому цукрового буряка. Хiмiчний склад жому») http://www.ugagroprom.ru/2/
[6] Isaev M.D. "For what you can use the pulp and molasses?"(М.Д. Iсаєв. «Для чого можна використати жом та мелясу?») http://agro.tatarstan.ru/rus/file/pub/pub_37228.doc

Feeding animals with spoiled pulp may cause serious digestive disorders.[7] Thus, fresh sugar beet pulp, which was not immediately used for animal feeding or was not taken under special treatment, inevitably becomes waste product to be disposed at landfills.

Change of pulp management practices

The project activity involves the introduction of raw pulp processing to increase the term of its suitability for use as cattle feeding by its drying. Consequently, it allows for avoiding of sugar beet pulp spoiling and its removal to landfills, where it would be decomposed along with methane gas generation.

By ensuring a deeper pulp extraction, the plants expand opportunities to use the beneficial beet pulp, which increases the demand, consequently reducing the amount of pulp that could deteriorate. But the shelf life for pulp prepared for silage is short as well, so the range of consumers is limited to livestock breeding complexes, located near the sugar plant.

The project activity provides installation of presses of deeper extraction and setting up logistics for processing the maximum amount of sugar beet pulp at plants involved in joint activities. Details on changes of pulp management practices implemented at each of the plants are listed below.

During the implementation of a set of measures envisaged by the project modern presses of deeper extraction were installed that resulted in the pulp with a much lower content of moisture, that makes it suitable for siloing and longer storage.

The complex effect of project activity realization, which leads to the reduction of greenhouse gases emissions. Table 2 contains a general list of equipment that leads to these results.

Table 4. Project equipment

Equipment	Specifications
“Podilski sugar mills” LTD SU “Sokolivsk sugar”	
Screw press ShZh	Screw flight diameter: 900 mm, installed capacity: 41 kW. Manufacturer: Frunze plant, Ukraine. Units: 1 press.
“Podilski sugar mills” LTD SU “Kapustianskiy sugar”	
Screw press ShZh	Screw flight diameter: 900 mm, installed capacity: 41 kW. Manufacturer: Frunze plant, Ukraine. Units: 1 press.
“Podilski sugar mills” LTD SU “Moivskiy sugar”	
Press of deep extraction GH-2	Screw flight diameter: 800 mm, installed capacity: 37 kW. Manufacturer: Plant Sangerhausen, Germany. Units: 6 presses.

[7] Kolesnikov M.V. “Storage and use of beet pulp. Chemical composition of pulp”. (М.В. Колеснiков. «Зберігання та використання жому цукрового буряка. Хімічний склад жому») http://www.ugagroprom.ru/2/

Figure 3. Press of deep extraction GH-2 (Made in Sangerhausen, Germany)

General description of presses of deeper extraction

The press consists of: separator, screw, body, control device, electric drive, nozzle and additional filtration surface. The principle of operation is as follows: fresh pulp enters into the separator, where it is separated from the part of water, which is removed from the separator through the nozzle. Then pulp enters into press chamber, where it is pressed of the rest of water left, which is separated by cylindrical sieve and goes through another nozzle. Water pressing occurs due to decreasing of screw chambers in volume in the direction of pulp displacement.

Special device regulates time of pulp being under press and water pressing degree. It consists of a body press, sieves, cone, rod, spring, brackets, nut, flange, cone and body of screw extractors. The degree of pulp extraction depends on the movement of the cone and sieve either to right, or left, while the gap for pulp output increases or decreases. Pressure on the cone sieve is undertaken by springs, tightening of which regulates pressing degree.

Results

Implementation of the proposed project had a positive impact on the environment, since the amount of waste received for disposal at the landfills was reduced. It should be noted that the reduction of methane emissions generated due to the anaerobic fermentation into waste layer and other gases of pulp decomposition. Business activity of the plant involved into joint activity is carried out within the limits of emissions permits for water use and waste disposal.

Currently the project is already implemented. Implementation of the measures to ensure pulp processing with its drying was completed in 2007. The ratification of Kyoto Protocol by Ukraine February 4, 2004 also had an effect on the decision to implement project activities. Below is a schedule of main stage of the project activity.

Table 5. Project implementation schedule.

Activity	*Date*
Decision making on the project realization	12/03/2005
Investment stage	01/04/2006 - 01/05/2007
Construction-assembly and administration works	23/05/2006 - 28/07/2007
Operation stage	01/08/2007[8]-31/12/2026[9]
Emission reduction generation	01/01/2008[10]-31/12/2026

The project does not require intensive staff training. The required amount of employees can obtain a basic technical training at the project site. Most of the necessary workers such as engineers, packers, power engineers and mechanics, truck drivers are locally available. Local resources meet project maintenance needs: own and hired workers and repair contractor. Project foresees the need for training. All employees must have a valid certificate of vocational education, and periodically pass safety training and exams. Vocational training in all required areas of professional project is available in the educational institution of Ukraine.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

"Podilski sugar mills" LTD implemented JI project with the following objectives:

- Reduction of greenhouse gas emissions due to recycling of organic waste;
- Development of new technologies of waste management;
- Creation of a closed waste-free production cycle;
- Support to increase livestock forage;
- Improving environmental and social situation in the region.

Emission reductions are achieved by avoiding the generation of methane containing in the landfill gas that occurs after sugar beet pulp disposal at the landfills. After implementation of the project activity, pulp is taken under processing, which prevents its deterioration, prolongs its shelf life as a food for livestock, which could allow its being transported to long distances for the consumer.

In the absence of the proposed project, fresh pulp would lose its valuable feed properties after the first 24 hours after production due to the intensive processes of fermentation and putrefaction, which inevitably

[8] Beginning of sugar making season.

[9] End of sugar making season.

[10] Emission reductions in 2007 are neglected.

would have been occurred under conditions of high temperatures of summer season of sugar beet processing. After that, the only way plants could remove it from the area was its disposal to the landfill, where in the process of its decomposition, landfill methane containing gas would release.

Since the project leads to the reduction of greenhouse gas emissions into the atmosphere, such reduction must be taken into account when making a decision on the project realization. Emission reductions can be sold as ERUs in the international emission trading market and received funds will improve the financial performance of the project to a level that will enable to make a decision on its implementation.

Detailed description of the baseline and additionality justification is provided in Section B of this PDD.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

Calculations of emission reductions provided in the file Excel *Kryazh_ER.xls.*

Table 6. Estimated amount of emission reductions during the crediting period

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2008	293 294
Year 2009	307 369
Year 2010	412 032
Year 2011	546 998
Year 2012	591 255
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	2 150 948
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	430 190

Table 7. Estimated amount of emission reductions after the crediting period

	Years
Length of the period after 2012, for which emission reductions are estimated	14
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2013	628 037
Year 2014	658 606
Year 2015	684 013
Year 2016	705 129
Year 2017	722 678
Year 2018	737 263
Year 2019	749 385
Year 2020	759 459
Year 2021	767 832
Year 2022	774 791
Year 2023	780 574
Year 2024	785 381
Year 2025	789 376
Year 2026	792 696
Total estimated emission reductions after the first crediting period (tonnes of CO_2 equivalent)	10 335 220
Annual average of estimated emission reductions after the first crediting period (tonnes of CO_2 equivalent)	738 230

A.5. Project approval by the Parties involved:

Letter of Endorsement No. 3663/23/7 was obtained from the State Environmental Investment Agency of Ukraine on 28/11/2012. Obtaining the Letter of Approval by the Host country is expected after completion of the determination process.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

In accordance with the Guidance on criteria for baseline setting and monitoring (Version 03)[11] (hereinafter referred to as the Guidance), the baseline for a JI project is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of GHGs that would occur in the absence of the proposed project.

In accordance with the Paragraph 9 of the Guidance the project participants may select either a) an approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach); or b) or a methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM); or c) an approach to the setting of baseline and monitoring that has already been applied to comparative JI projects.

Project participants chose an approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach).

Description and justification of the baseline chosen is provided below in accordance with the Guidelines for users of the Joint Implementation Project Design Document Form, version 04[12], using the following step-wise approach:

Step 1. Indication and description of the approach chosen regarding baseline setting

To determine the baseline scenario and demonstrate additionality the Combined tool to identify the baseline scenario and demonstrate additionality (Version 04.0.0) has been applied. The recommendations of the Guidelines for objective demonstration and assessment of barriers were also taken into account (Version 01).

Step 2. Application of the approach chosen

Step 0. Determining whether the project activity was the first of its kind
Outcome II: The project activity was not the first of its kind.

Step 1. Identification of alternatives to the project activity

The following plausible alternatives to the implementation of each component of the project activity are identified that (a) were available to the project participants; (b) could not be implemented simultaneously with the project activity and (c) ensure the obtaining of the same result as the project activity had.

I1: Continuation of existing situation that does not require any additional investment;
I2: Utilization of sugar beet pulp along with the production of biogas;
I3: Preparation of pulp for use as feed for cattle;
I4: Production of beet pectin, pectin glue or dietary fiber from pulp.

[11] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[12] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

Sub-step 1a. Description of alternatives to the project activity

I1: Continuation of existing situation that does not require any additional investment;
Fresh sugar beet pulp in that form as it has been produced, without any additional operations aimed at its drying, addition of dry biomass, etc., it would be disposed to pulp pits, where as far as they are filled and decayed, it would be transported to the landfill, where it would be buried respectively to the specified limits on waste disposal. This option did not need any additional investment.

I2: Utilization of sugar beet pulp along with the production of biogas;
This option provides introduction of methane tank to control anaerobic digestion of waste resulting from sugar production with the addition of dry biomass, installation of special equipment for enrichment and purification of the obtained methane and construction of necessary infrastructure for its combustion to generate heat or electricity (boilers or generators). This option also requires constant provision of dry biomass and other additives to intensify the process of fermentation and improve the properties of the material obtained that can be used as a fertilizer. If this application of regenerated material is not possible, as a result of the process less amount of waste will be received, when the potential emission of methane is close to zero, which will be subject to disposal in the repository.

I3: Preparation of pulp for use as feed for cattle;

All kinds of well-preserved pulp can be used as feed for livestock. To extend the period of pulp preservation and to improve its feed value, it is subject to various kinds of processing (siloing, drying, granulation, the enrichment with protein substitutes). This allows for expanding the circle of potential consumers of feed pulp due to increase of distance, where the better pulp could be delivered, and increase the amount of pulp that can be used as feed. This option requires installation of special equipment for pulp drying and granulating and the construction of facilities for warehousing of dry products obtained.

Project participants consider that pulp siloing using their own resources is irrational, because it requires a containers of large volume, in which pulp could be preserved air-tightly for long periods (ensiling process takes 6-8 weeks, after which it can be used); or large areas of storage facilities using large hermetic tubular sheeting up to 350 tons of silage volume. Transportation of siloing pulp over long distances is also complicated, since the pulp being under aerobic conditions rapidly deteriorates[13], thus it would be rational to perform siloing in close proximity to the consumer. However, project participants are interested in using additional pulp presses for deeper extraction of pulp, therefore increasing the amount of fresh pulp that can be potentially realized at livestock complexes.

I4: Production of beet pectin, pectin glue or dietary fiber from pulp;
Sugar beet pulp is one of the most promising raw materials for low esterified pectin production[14], which is widely used in medicine, pharmacology and in confectionery industry due to its bactericidal properties, the ability to form water-soluble films, the ability to bind heavy metal ions. For extraction of pectin from pulp method of hydrolysis with mineral acids are most commonly used.

[13] Krutko V. "Once more about pulp", Bulletin of Sugar Producers in Ukraine (Крутько В. «Ще раз про жом», Вісник цукровиків України): http://www.google.com.ua/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CE8QFjAA&url=http%3A%2F%2Fsugar-journal.com.ua%2Fcustom%2Ffiles%2FVesnik_ua_04_11%2Fua_4_6.pdf&ei=l6n6T_mlMo22hAe5jMGkAQ&usg=AFQjCNG607qJf1YPuTc6agvLFThwa6BR6Q

[14] Donchenko L. "The ability to use secondary resources of sugar production of sugar beets for its further processing" (Донченко Л.В. «Можливість використання вторинних ресурсів виробництва цукру із цукрових буряків для подальшої переробки»): http://www.ugagroprom.ru/1/

In addition, pectin glue can be obtained from the pulp, the manufacturing process of which is the conversion of insoluble in cold water and pectin substances arabane into the solution. Glue outcome is 2.5-3% of the fresh pulp weight.

Another promising area in the pulp processing is dietary fibers production – edible parts of plants or similar carbohydrates resistant to digestion and absorption in the small intestine, which are completely or partly fermented in the large intestine. The daily human need in food fibers is 28-38 grams. Applying modern technologies of fiber production, pulp is used to manufacture the products that can be widely applied in manufacturing of wide range of foods products.

Project participants would consider this alternative implementation as the need to build and equip some enterprise for the production of pectin from fresh or dried pulp. At the time of the decision-making on project, proposals from third parties who are ready to invest in such activities have not been reported.

Outcome of Sub-step 1a: We have identified realistic and credible alternative scenarios to the project activity:

I1: Continuation of existing situation that does not require any additional investment;
I2: Utilization of sugar beet pulp along with the production of biogas;
I3: Preparation of pulp for use as feed for cattle;
I4: Production of beet pectin, pectin glue or dietary fiber from pulp.

Sub-step 1b. Compliance with the present legislation.

Activities attributed to waste management in Ukraine are governed by the following regulations:

The Law of Ukraine “On ensuring sanitary- epidemiological welfare of population”, the Law of Ukraine “On wastes”; the Law of Ukraine “On licensing system in economic activity”; the Cabinet of Ministers of Ukraine Decree # 1218 dated 03/08/1998 “On approval of the procedure of drafting, approval and revision of waste generation and placement limits”, the Cabinet of Ministers of Ukraine Decree # 1109 dated 22/06/1999 “On approval of the Statute of the State sanitary and epidemiological surveillance in Ukraine”, President of Ukraine Decree # 400/2011 dated 06/04/2011 “On state sanitary-epidemiological service of Ukraine”.

According to the provisions of this legislative environment, companies must receive from waste management designated executive authorities permits for waste disposal within the established limits in storages equipped in accordance with the applicable standards[15], and by paying the corresponding fee for waste disposal. In accordance with Instruction on procedure of calculation and payment for environmental pollution tax # 162 approved by the Ministry of Environmental Protection and Nuclear Safety of Ukraine and State Tax Administration of Ukraine dated 19/07/99 with changes and amendments adopted by the Order of Ministry of Environmental Protection and Nuclear Safety of Ukraine # 24/37 dated 27/01/2000, which was in force at the time of decision making about project implementation, in case of overlimiting waste disposal the fine is paid a five times the amount of the fee for waste disposal.

Thus, the implementation of any of the above-mentioned alternatives complies with the legislation in force at the moment of decision making about the project, provided that the waste management procedures are followed.

[15] http://www.budinfo.org.ua/doc/1812504.jsp

Outcome of Sub-step 1b: All these realistic and feasible alternatives to the project activities comply with current legislation of Ukraine.

Step 2. Barrier analysis.

At the time of the decision making on the project implementation, sugar industry in Ukraine was in deep crisis.[16] Due to reducing the acreage of sugar beet, shortage of raw materials for processing has arisen, leading to significant underloading capacity of sugar plants. Along with the old obsolete equipment, inefficient industry policy, sugar production at the majority of sugar plants was not profitable; a situation was aggravated with competition from refineries of cane sugar. Consequently, the number of employees of sugar plants in Ukraine sharply reduced. Thus, in 1991 in Ukraine there were 192[17] sugar plants, in 2011, there were already 61[18]. Stagnation of the sugar industry continues in 2012[19], the plants are in a difficult economic situation, government regulation of prices for sugar considerably reduces the profitability of the sugar business in Ukraine.

The main barrier that prevents the implementation of project activities is a financial barrier. The total cost of the implemented activities under the project is about 15 255.4 thousand UAH. This is a significant cost, which the project owner did not have at the time of making the decision on implementation of the project activities, and they should be involved in capital market.

Both projects are implemented in terms of investment climate in Ukraine, which is not favorable. Ukraine is a country of high risk for business and investment. The risk of investing in Ukraine is additionally confirmed by the country rating according to international rating agency Moody's and the corresponding risk premium. The following table demonstrates a risk premium for Ukraine:[20]

Table 8. Risk premium for Ukraine:

Total Risk Premium, %	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Ukraine	11.57	11.59	10.8	10.16	10.04	14.75	12.75	12.5

As discussed during the roundtable of OECD (Organization for Economic Cooperation and Development) on the development of business and investment climate in Ukraine, the existing legal framework is not only inadequate, but significantly sabotages the development of market economy in Ukraine. According to Western press reports, the following conclusion can be made: the tax and legal system reforming has improved the situation by adopting the Commercial Code, Civil Code and Tax Code dated January 1, 2004, but there are still unsatisfactory elements that represent a risk for foreign investors.[21] Ukraine is believed to adhere to the right direction in regard to introducing the significant reforms, but it still has a long way to realizing their full potential. Frequent and unpredictable changes in the legal system along with the contradictory and inconsistent Civil and Commercial Codes do not allow

[16] http://dt.ua/ECONOMICS/tsukrova_galuz_ukrayini_vid_solodkih_mifiv_do_girkoyi_realnosti-31612.html
[17] http://www.umoloda.kiev.ua/number/1252/160/44359/
[18] http://agronovator.ua/ua/sugar_factories/
[19] http://www.myvin.com.ua/ua/news/region/14920.html
[20] Data provided by Aswath Damodaran, Ph.D., Stern School of Business NYU http://pages.stern.nyu.edu/~adamodar/
[21] Foreign Direct Investment in Ukraine – Donbass, Philip Burris, Problems of foreign economic relations development and attraction of foreign investments: regional aspect., ISSN 1991-3524, Donetsk, 2007. p. 507-510

transparent and stable legal conditions for business. International companies consider this to be a source of great uncertainty, which makes risky predictions about future business goals and strategies.

According to various sources and as described above, the investment climate in Ukraine is risky and unfavorable, private capital from domestic or international sources are not available or accessible only at excessively high price because of real and perceived risks of doing business in Ukraine

Therefore, the investment climate in Ukraine is risky and unfavorable, private capital from domestic or international sources is not available or accessible only at excessively high price because of real and perceived risks of doing business in Ukraine.

JI incentive was taken into account was taken into account while decision-making about the launch of the project. Below the influence of economic conditions on the decision regarding the implementation of alternatives to the project activity is considered.

I1: Continuation of existing situation that does not require any additional investment;
This option does not require any investments necessary to comply with legal requirements and so for there is no financial barrier.
I2: Utilization of sugar beet pulp along with the production of biogas;
Investment required to implement this alternative equals to approximately 80 million UAH for one company.
I3: Preparation of pulp for use as feed for cattle;
Implementation of this alternative requires investment in additional pulp presses, pulp drying equipment, facilities for pulp drying and granulation, construction of facilities for the storage of dry pulp. In addition, the operation of this equipment increases the overall costs of enterprises for fuel and electricity.
I4: Production of beet pectin, pectin glue or dietary fiber from pulp;
This alternative foresees green field building of the pulp processing plant to pectin, pectin glue or dietary fiber. The volume of necessary investments equals to hundreds of millions UAH. For this alternative financial barrier is the biggest.

Outcome: Thus the existence of financial barrier would prevent the implementation of the above listed alternatives to the project activity, except I1: "Continuation of existing situation that does not require any additional investment". Thus, the continuation of the current situation is the most plausible future scenario that is the baseline.

This baseline scenario has been established according to the criteria outlined in the Guidance by JISC:

1) On a project specific basis;
2) In a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors. All parameters and data are either monitored by the project participants or are taken from sources that provide a verifiable reference for each parameter. Project participants use approaches suggested by the Guidance and the methodological Tools approved by the CDM Executive Board;
3) Taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic

situation in the project sector. The above analysis shows that the chosen baseline is the most plausible future scenario, taking into account the current situation in sugar industry;

4) In such a way that emission reduction units (ERUs) cannot be earned for decreases in activity levels outside the project activity or due to force majeure. According to the proposed approach emission reduction units will be earned only when project activity will eliminate methane emissions from anaerobic decomposition of pulp at landfills and excluding emissions reduction that can be earned due to any changes outside the project activity;
5) Taking account of uncertainties and using conservative assumptions. A number of steps have been taken in order to account for uncertainties and safeguard conservativeness:
    a. If possible, the same approach to calculating the level of baseline and project emissions as specified in the National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine are used. The National emissions inventories use country-specific emission factors that are set to meet the IPCC values;
    b. Lower range of parameters is used for calculation of baseline emissions and higher range of parameters is used for calculation of project activity emissions;
    c. Default values were used to the extent possible in order to reduce uncertainty and provide conservative data for emission calculations.

Baseline emissions

Baseline emissions come from one major source:

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

Detailed description of the baseline emissions calculation, applied formulas and emission reductions factors are provided in Annex 2 “Baseline information” of this PDD.

Key information and data used to establish the baseline – data on the amount of sugar plant waste (pulp), which would be disposed at the landfill - are provided below in tabular form:

Data/Parameter	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, SU "Sokolivsk sugar" (*i*=1)			
Time of determination/monitoring	To be monitored throughout the monitoring period			
Source of data (to be) used	"Podilski sugar mills" LTD SU "Sokolivsk sugar" Daily production reports			
Value of data applied (for ex ante calculations/determinations)	**2008**	**2009**	**2010**	**2011**
	116 610	79 475	131 939	168 333
Justification of the choice of data or description of measurement methods	Measured for the plant commercial purposes on site.			
QA/QC procedures (to be) applied	According to the project owner policy.			
Any comment	No			

Data/Parameter	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, SU "Kapustianskiy sugar" (*i*=2)			
Time of determination/monitoring	To be monitored throughout the monitoring period			
Source of data (to be) used	"Podilski sugar mills" LTD SU "Kapustianskiy sugar" Daily production reports			
Value of data applied (for ex ante calculations/determinations)	**2008**	**2009**	**2010**	**2011**
	43 556	-	53 084	97 181
Justification of the choice of data or description of measurement methods	Measured for the plant commercial purposes on site.			
QA/QC procedures (to be) applied	According to the project owner policy.			
Any comment	No			

Data/Parameter	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, SU "Moivskiy sugar" (*i*=3)			
Time of determination/monitoring	To be monitored throughout the monitoring period			
Source of data (to be) used	"Podilski sugar mills" LTD SU "Moivskiy sugar" Daily production reports			
Value of data applied (for ex ante calculations/determinations)	**2008**	**2009**	**2010**	**2011**
	97 443	55 036	146 070	167 036
Justification of the choice of data or description of measurement methods	Measured for the plant commercial purposes on site.			
QA/QC procedures (to be) applied	According to the project owner policy.			
Any comment	No			

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

To determine the baseline scenario and demonstrate additionality the Combined tool to identify the baseline scenario and demonstrate additionality (Version 04.0.0) has been used. The recommendations of the Guidelines for objective demonstration and assessment of barriers (Version 01) were also taken into account.

The proposed JI project is not the first of its kind. The following step-wise approach is used to demonstrate that the project carbon dioxide emissions reductions by sources are additional with respect to any other emissions reductions:

Step 1. Identification of alternatives to the project activity

Alternatives were identified and described in the previous Section B.1. of this PDD while determining the baseline scenario.

I1: Continuation of existing situation that does not require any additional investment;
I2: Utilization of sugar beet pulp along with the production of biogas;
I3: Preparation of pulp for use as feed for cattle;
I4: Production of beet pectin, pectin glue or dietary fiber from pulp.

Step 2. Barrier analysis

Barrier analysis of identified alternatives was conducted in the previous Section B.1. of this PDD while determining the baseline scenario. As the result of analysis, the following alternatives to project activities have remained that are not project scenario without JI mechanism, which were identified by baseline scenario:

I1: Continuation of existing situation that does not require any additional investment.

As demonstrated in previous Section, the main barrier that prevents the project implementation is financial. As a result of selling greenhouse gas emission reductions expected revenues of about 1.9 million euro or 19 million UAH, which is much more then the project funds required, that is weighty argument when making decision on the project. Thus, participation in joint implementation mechanism eliminates barriers for the project.

Therefore, when the requirements of Step 1 and 2 were satisfied, then according to the Combined tool to identify the baseline scenario and demonstrate additionality (Version 04.0.0) it can be preceded to the analysis of common practices.

Step 3: Investment analysis

Not performed according to the Combined tool to identify the baseline scenario and demonstrate additionality (Version 04.0.0).

Step 4: Common practice analysis

Sub-step 4a: The proposed project activities include the activities listed in section with definitions [22] ***of the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 04.0.0).***

Sub-step 4a(1): Calculation + / 50 percent of production due to proposed project activity.

Sugar plants in the region, built under typical designs and capacity, fall in the interval + / -50 percent of plants involved in joint activity.

Sub-step 4a(2): Identification of companies that have the same production level within a certain range in the corresponding geographic area.

There are 12 sugar plants in the Vinnytsia region (N_{all}=12).

Sub-step 4a(3): Identification of the plants which use different technology than the project activity among the identified plants.

Only 2 companies utilize pulp, the others bury pulp[23], thus (N_{diff}=10).

Sub-step 4a(4): The following Factor calculation $F=1- N_{diff}/N_{all}$ rendering the number of plants that use the same practice as under the project activity, including all plants that have the same production level as the plants involved in project activity.

$F=1- 10/12=0.167$

The proposed project activity is considered as common practice in the relevant sector and within a specified geographic area under implementation of both these requirements:

(a) $F > 0.2$;
(b) $N_{all} - N_{diff} > 3$.

None of abovementioned requirement applies to the proposed project activity, so it is not a common practice, so we can proceed directly to the outcome of Step 4.

Outcome of Step 4: The proposed project activity is not a common practice.

Analysis outcome: Since all three steps of analysis were satisfied, the project is additional.

[22] Activity aimed at methane emissions reduction.
[23] Vinnytsia Regional State Administration, Decree # 446 dated 08/11/2006 "On approval of limits on the formation and placement of waste for 2007" http://search.ligazakon.ua/l_doc2.nsf/link1/VI060112.html

B.3. Description of how the definition of the project boundary is applied to the project:

Project activity is physically limited by plant facilities participating in joint activity, and equipment listed in Section A.4.2.

The table below shows an overview of all sources of emissions in the baseline and project scenarios. The project boundary is illustrated in accordance with the paragraphs 14 and 16 of the Guidance on criteria for baseline setting and monitoring (Version 03)[24]

Table 9. Sources of emissions in the baseline and project scenarios

	Source	Gas	Included/Excluded	Justification/Explanation
Baseline scenario	Anaerobic fermentation of sugar plant waste (pulp)	CO_2	Excluded	Neglected for simplification. Conservatively.
		CH_4	Included	Main source of emissions.
		N_2O	Excluded	Neglected for simplification. Conservatively.
	Fuel combustion during pulp transportation to landfills	CO_2	Excluded	Neglected for simplification. Conservatively.
		CH_4	Excluded	Neglected for simplification. Conservatively.
		N_2O	Excluded	Neglected for simplification. Conservatively.
Project scenario	Anaerobic fermentation of sugar plant waste (pulp)	CO_2	Excluded	Neglected for simplification likewise the baseline scenario.
		CH_4	Included	Main source of emissions.
		N_2O	Excluded	Neglected for simplification likewise the baseline scenario.
	Electricity consumption by pulp presses	CO_2	Excluded	Neglected due to the small volume under paragraph 14 the Guidance[25].
		CH_4	Excluded	Neglected for simplification.
		N_2O	Excluded	Neglected for simplification.
	Fuel combustion during pulp transportation to landfills	CO_2	Excluded	Neglected for simplification. Conservatively.
		CH_4	Excluded	Neglected for simplification. Conservatively.
		N_2O	Excluded	Neglected for simplification. Conservatively.

Fuel combustion during transportation of pulp into the landfills in baseline scenario and to the agricultural enterprises for the utilization in project scenario are not taken into account as emission sources because the distance to the landfills is comparable to the distance to the majority of places of pulp utilization, so the GHG emissions are of the same quantity. Beside there is a widespread common practice of partial settling by dried pulp for beet root supplying on the plant. The integrated enterprises (more than 50% of suppliers) which are involved in both in agriculture and cattle breeding are those who have much to gain. Thereby, the project uses the transport which in the absence of the project would came back without cargo causing the emissions of GHG gases. In this case emissions of GHG gases

[24] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[25] In accordance with electricity consumption data of the equipment used for beetroot pulp pressing, maximal energy consumption took place at "Podilski Sugar Mills" LTD SU "Moivskiy sugar" in 2011 and it was 364 MWh resulting in emissions of 444 tonnes of CO_2. This is lower than 1% of anthropogenic emissions by sources and less than 2000 tonnes of CO_2 per year, so these sources of emissions were not taken into account.

caused by pulp transportation are equal to zero and neglecting emissions of GHG gases from transportation in baseline scenario is conservative because it reduces emission reductions due to the project implementation.

Baseline scenario

The basic scenario of the proposed project is a continuation of the existing situation before the project implementation. The activity of project owner in this case would be the following: absence of fresh pulp treatment with the purpose of its drying, keeping it in pulp pits, where it would get spoiled and become unusable for cattle feeding in a first three days and would be transported into the landfills, where due to its anaerobic fermentation landfill gases containing methane (GHG gas) would be formed. Natural gas and electricity consumption levels will stay on the pre-project level.

In the baseline scenario the emission sources within the project boundaries are:

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

Project scenario

In result of implemented activity, sugar plant waste was significantly dried, making it possible to transport pulp for use as feed for cattle, which includes its anaerobic fermentation. In the project scenario the sources of emissions are:

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

Leakage

Leakage is the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that can be measured and is directly attributable to the JI project.

Due to the project implementation, no leakages are expected.

Schematic representation of the project boundaries is illustrated by the figures below.

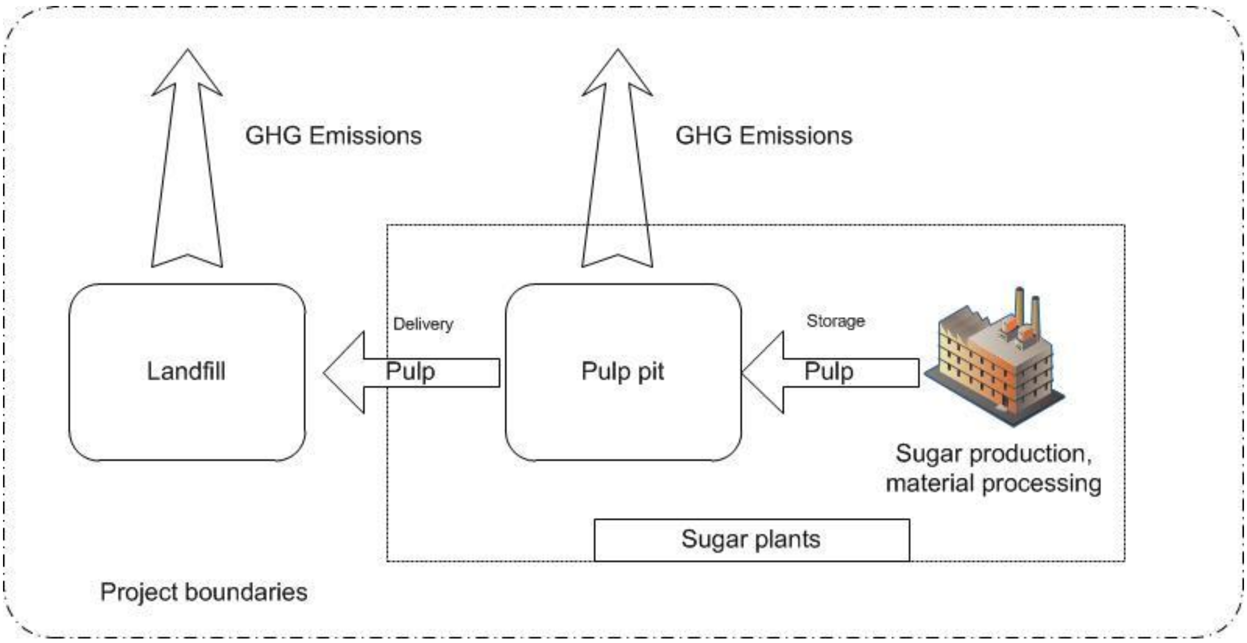


Figure 4. Baseline boundaries

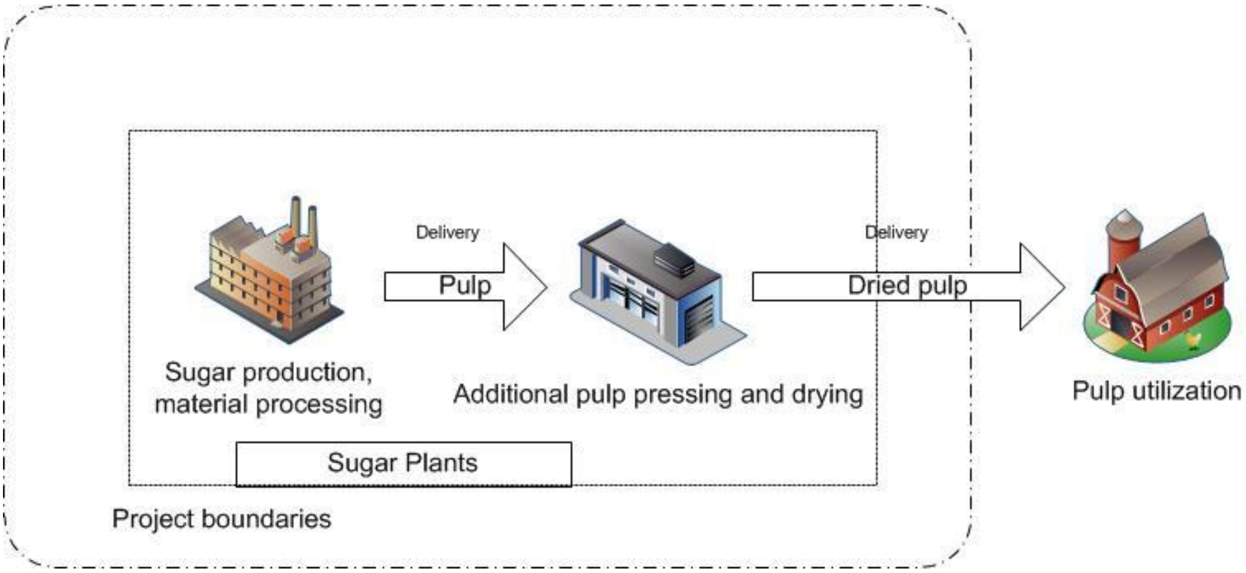


Figure 5. Project boundaries

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of baseline setting: 30/10/2012

Name of person/entity setting the baseline:

Analysis of the baseline level was performed by “MT-Invest Carbon” LLC that is not a project participant.

Contact information:

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SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is March 12, 2005.

C.2. Expected operational lifetime of the project:

The expected lifetime of the project is estimated to last until the end of 2026. Thus, the operational lifetime of the project will be 19 years or 228 months. The project started operation in 2007, but emission reductions before 2008 are neglected, therefore, starting date of emission reductions generation: 01/01/2008; ending date of emission reductions generation: 31/12/2026.

C.3. Length of the crediting period:

Start of the first crediting period: 01/01/2008.
End of the crediting period: 31/12/2026

Length of the first crediting period under the project: 5 years or 60 months (01/01/2008-31/12/2012).

Length of the part of crediting period within the first commitment period of the Kyoto Protocol: 14 years or 168 months (01/01/2013-31/12/2026).

The total length of the crediting period is 19 years or 228 months (01.01.2008-31.12.2026).

Crediting period for generating ERUs starts after the beginning of 2008 and will continue throughout the project life cycle.

Status of emission reductions or enhancements of removals generated by JI project after the first commitment period under the Kyoto Protocol (lengthening of the crediting period after 2012) may be determined in accordance with relevant arrangements and procedures under the UNFCCC and host Party.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

This monitoring plan is established in accordance with appendix B of the JI guidelines and further Guidance on Baseline Setting and Monitoring, Version 03, and Guidelines for Users of the JI PDD Form, Version 04.

The description of the monitoring plan chosen is provided using the following step-wise approach:

Step 1. Indication and description of the approach chosen regarding monitoring

Option *a* provided by the Guidelines for the Users of the Joint Implementation Project Design Document Form, Version 04[26] is applied: JI specific approach is used for the monitoring plan.

Step 2. Application of the approach chosen

Baseline scenario

The basic scenario of the proposed project is a continuation of the existing situation before the project implementation. Sugar production waste management practices would remain unchanged, i.e. disposal of sugar beet pulp at the landfills would be continued.

In the baseline scenario the emission sources within the project boundaries are:

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

Project scenario

As a result of implemented activity, sugar plant waste was significantly dried, making it possible to transport pulp for use as feed for cattle, which includes its anaerobic fermentation.

In the project scenario the sources of emissions are:

- CH_4 emissions due to anaerobic fermentation of sugar production waste (pulp).

[26] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

Emission reductions occur by reducing the amount of methane generated during storage of sugar plant waste (pulp) as the result of a decrease of its amount that is disposed to the landfill.

Data collection and calculations procedure

To calculate the amount of GHG emissions of the project (in baseline and project scenarios) the data of internal standard reporting, which are collected and processed independently from the JI project for commercial purposes of business activity, using the rules and procedures for collecting, processing and carrying out cross-checks will be used. This approach meets good practice of monitoring plans development. The data acquired during the monitoring will be entered into special database and stored electronically and on paper. Electronic versions of monitoring database will be sent to the responsible person from the management of "Podilski sugar mills" LTD, who will create a common database of monitoring parameter values, which are to be transferred to the JI project consultant to calculate the emissions reductions and prepare the monitoring reports. Paper versions of monitoring database will be available for examination during onsite visits of accredited independent entity at the request of its representative.

Measuring devices, data processing and archiving

According to the applied approach for monitoring, the following parameters are to be measured: the amount of sugar plant waste (pulp), which were not used and were disposed to the landfill; and the amount of sugar plant waste (pulp), which would be disposed at the landfill. The first parameter is determined according to the internal accounting procedures adopted by each of the plants through the use of truck scales and, in their absence, the standard coefficients of weight pulp per volume unit of the vehicle. The data are cross-check with the calculated amount of the pulp produced, which is calculated by multiplying the amount of processed sugar beet pulp by the factor of pulp production per ton of sugar beet, which is deducted from the amount of pulp sold. Sugar production waste (pulp), which would be disposed to the landfill is determined using the truck scales or, in their absence, with the standard factors of pulp weight per volume unit of the vehicle body. Agreed values are entered into the waste management reports to be used for the preparation of monitoring reports.

In cases if any errors, fraud or inconsistencies will be identified during the monitoring process special commission will be appointed by project host management that will conduct a review of such case and issue an order that must also include provisions for necessary corrective actions to be implemented that will ensure such situations are avoided in future.

Waste management reports and other monitoring data required for determination and verification, and any other data relevant to the project activity will be kept at least two years after the last transfer of ERUs. If parameters values are not available that is used to calculate the baseline emissions i.e. the amount of sugar plant waste (pulp) which were not used and were disposed to the landfill − these data are not included. This is conservative.

Training of monitoring personnel

Activities that are directly related to the monitoring do not require specific knowledge and skills other than provided in the job descriptions of personnel involved into the monitoring. The facilities at which the project is being implemented, periodic health and safety training are carried out. Control over the performance of the rules, detection and correction of violations is assigned to the heads of departments. Thus, the personnel responsible for monitoring receive appropriate training on procedures and requirements for monitoring. JI projects consultant will provide consultations on the Kyoto Protocol, JI projects and monitoring.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
P-1	$P_{i,x}$ Amount of sugar plant waste (pulp), which were not sold and were disposed to the landfill	Sugar plants records and project participants	t	m	continuously with monthly totals	100%	Electronic and paper	-
P-2	*f* share of methane being captured and utilized at the disposal site	The data from project owner regarding the landfill used	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-3	GWP_{CH4} global warming potential for methane	In accordance with UNFCCC decision and Kyoto Protocol	tCO_2e/tCH_4	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet,

								attached to the PDD
P-4	*OX* oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	2006 IPCC[27]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-5	*F* volume of methane in the landfill gas	2006 IPCC[28]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-6	DOC_f fraction of carbon of organic origin, which can be decomposed	2006 IPCC [29]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation

27 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
28 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
29 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14

								spreadsheet, attached to the PDD
P-7	*MCF* methane conversion factor	2006 IPCC[30]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
P-8	*DOC* Weight fraction of organic origin carbon in the beetroot pulp	Data of laboratory research	t C/ t beetroot pulp	e	annually	100%	Electronic and paper	The result is within the values specified in 2006 IPCC[31]. The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD

[30] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14
[31] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13

P-9	*k* Decomposition factor of wastes (beetroot pulp)	2006 IPCC[32]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD

The table above includes data and parameters that are monitored throughout the crediting period.

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Emissions generated after the project activity implementation are calculated as follows:

$$PE_y = \sum_{i=1}^{n} PE_{i,CH4,y},$$ (Equation 1)

where:

PE_y, Project GHG emissions due to project implementation in period *y*, tCO_2e[33];

$PE_{i,CH4,y}$ Project methane emissions due to the decomposition of organic waste of the plant *i* at the landfill in the period *y*, (tCO_2e);

i Project plant index;

n Number of project plants.

Project methane emissions due to organic waste decay[34] at landfill[35] are calculated in the following way[36]::

[32] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.17

[33] 1 tCO_2e = 1 tCO_2

$$PE_{i,CH4,y} = (1-f)\cdot GWP_{CH4}\cdot(1-OX)\cdot {}^{16}/_{12}\cdot F\cdot DOC_f\cdot MCF\cdot \sum_{x=1}^{y} P_{i,x}\cdot DOC\cdot e^{-k\cdot(y-x)}\cdot\left(1-e^{-k}\right),$$ (Equation 2)

where:

$PE_{i,CH4,y}$	Project methane emissions due to the decomposition of organic waste of the plant *i* at the landfill in the period *y*, (tCO_2e);
$P_{i,x}$	Amount of sugar plant waste (pulp), which were not sold and were disposed to the landfill, t (Parameter P-1);
f	CH_4 fraction captured and utilized at the landfill, fraction[37] (Parameter P-2);
GWP_{CH4}	Global warming potential for methane, tCO_2e/tCH_4 (According to the UNFCCC and the Kyoto Protocol) (Parameter P-3);
OX	Oxidation factor reflects the amount of CH_4 that is oxidised in other material covering the waste, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15 [38]) (Parameter P-4);
F	Fraction of CH_4, by volume, in generated landfill gas, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15 [39]) (Parameter P-5);

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[34] During the drafting of any study of greenhouse gas emissions resulting from anaerobic decomposition of sugar beet pulp in landfills, conducted in the western part of Ukraine in the relevant project implementation period was found, so local data is not available. Regarding the use of national data (such as data from the National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine), this would lead to a large error rate by applying parameters calculated for the average morphological composition of MSW used to estimate national emissions of greenhouse gases sector "waste" (description of the calculation on p. 287-296 National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010 years). Thus, international data on greenhouse gas emissions during the anaerobic decomposition of organic waste, depending on their characteristics, storage conditions and climatic factors are the best currently available estimates of parameters of calculation, allowing a more accurate result of emission reductions resulting from the implementation Project. Coefficients used entirely consistent with laboratory analysis of the pulp.

[35] Coefficients used for calculations represents unmanageable deep landfills with no cover material and without biogas gathering practice (IPCC classification). This is typical conditions for Ukraine.

[36] To calculate the annual baseline emissions of methane from the decomposition of organic waste from sugar mills at the site using the methodological approach used in assessing methane emissions from MSW landfills in the preparation of national reports on greenhouse gas emissions. A detailed description of the calculation methodology described on p. 287-288 National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010 biennium formula for calculating methane emissions in the project (baseline and project) is derived by substituting intermediate calculation formulas in one expression, simplified expression for calculating emissions from schedule one type of waste involved in the project (bagasse), and putting factor "global warming potential" to obtain the result in tons of CO_2 equivalent.

[37] The data from project owner regarding the landfill used.

[38] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p. 3.15

DOC_f Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.13 [40]) (Parameter P-6);

MCF CH_4 correction factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.14 [41]) (Parameter P-7);

DOC Fraction of the degradable organic carbon that decomposes, fraction (Laboratory testing data. Results are in the range provided by 2006 IPCC Volume 5: Waste, Chapter 2, Page 2.14[42]) (Parameter P-8);

k Waste (pulp) decomposition factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.17[43]) (Parameter P-9);

x Period during the crediting period: $x \in (1; y)$;

y Period for which methane emissions are calculated.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
B-1	Wi,x Amount of sugar plant waste (pulp), which would be disposed at the landfill	Sugar plants records and project participants	t	m	continuously with monthly totals	100%	Electronic and paper	-

39 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p. 3.15
40 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , p. 2.14
41 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p. 3.14
42 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p. 3.13
43 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p. 3.17

B-2	*f* share of methane being captured and utilized at the disposal site	The data from project owner regarding the landfill used	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-3	GWP_{CH4} global warming potential for methane	In accordance with UNFCCC decision and Kyoto Protocol	tCO_2e/tCH_4	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-4	*OX* oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	2006 IPCC[44]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-5	*F* volume of methane in the landfill gas	2006 IPCC[45]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-6	DOC_f fraction of carbon of organic origin, which can be decomposed	2006 IPCC [46]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD

[44] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[45] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.15
[46] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , page 2.14

B-7	*MCF* methane conversion factor	2006 IPCC[47]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-8	*DOC* Weight fraction of organic origin carbon in the beetroot pulp	Data of laboratory research	t C/ t beetroot pulp	e	annually	100%	Electronic and paper	The result is within the values specified in 2006 IPCC[48]. The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD
B-9	*k* Decomposition factor of wastes (beetroot pulp)	2006 IPCC[49]	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD

The table above provides data and parameters to be monitored throughout the crediting period.

[47] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.14
[48] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.13
[49] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , page 3.17

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Baseline emissions are calculated as follows:

$$BE_y = \sum_{i=1}^{n} BE_{i,CH4,y}, \quad \text{(Equation 3)}$$

where:

BE_y Baseline GHG emissions in the period y, (tCO_2e[50]);

$BE_{i,CH4,y}$ Baseline CH_4 emissions from degradable organic waste of i-plant at the landfill in the period y, (tCO_2e);

i Project plant index;

n Number of project plants.

Baseline methane emissions due to organic waste decay[51] at landfill[52] are calculated in the following way[53]:

[50] 1 tCO_2e = 1 tCO_2.

[51] During the drafting of any study of greenhouse gas emissions resulting from anaerobic decomposition of sugar beet pulp in landfills, conducted in the western part of Ukraine in the relevant project implementation period was found, so local data is not available. Regarding the use of national data (such as data from the National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine), this would lead to a large error rate by applying parameters calculated for the average morphological composition of MSW used to estimate national emissions of greenhouse gases sector "waste" (description of the calculation on p. 287-296 National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010 years). Thus, international data on greenhouse gas emissions during the anaerobic decomposition of organic waste, depending on their characteristics, storage conditions and climatic factors are the best currently available estimates of parameters of calculation, allowing a more accurate result of emission reductions resulting from the implementation Project. Coefficients used entirely consistent with laboratory analysis of the pulp.

[52] Coefficients used for calculations represents unmanageable deep landfills with no cover material and without biogas gathering practice (IPCC classification). This is typical conditions for Ukraine.

[53] To calculate the annual baseline emissions of methane from the decomposition of organic waste from sugar mills at the site using the methodological approach used in assessing methane emissions from MSW landfills in the preparation of national reports on greenhouse gas emissions. A detailed description of the calculation methodology described on p. 287-288 National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010 biennium formula for calculating methane emissions in the project (baseline and project) is derived by substituting intermediate calculation formulas in one expression, simplified expression for

$$BE_{i,CH4,y} = (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot {}^{16}/_{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} W_{i,x} \cdot DOC \cdot e^{-k\cdot(y-x)} \cdot (1-e^{-k}),$$ (Equation 4)

where:

$BE_{i,CH4,y}$ Baseline CH_4 emissions from degradable organic waste of *i*-plant at the landfill in the period *y*, (tCO_2e);

$W_{i,x}$ Amount of sugar plant (*i*-plant) waste, which would be disposed at the landfill in the periods *x*, t (Parameter B-1);

f CH_4 fraction captured and utilized at the landfill, fraction[54] (Parameter B-2);

GWP_{CH4} Global warming potential for methane, tCO_2e/tCH_4 (According to the UNFCCC and the Kyoto Protocol) (Parameter B-3);

OX Oxidation factor reflects the amount of CH_4 that is oxidised in other material covering the waste, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15 [55]) (Parameter B-4);

F Fraction of CH_4, by volume, in generated landfill gas, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15 [56]) (Parameter B-5);

DOC_f Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.13 [57]) (Parameter B-6);

MCF CH_4 correction factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.14 [58]) (Parameter B-7);

DOC Fraction of the degradable organic carbon that decomposes, fraction (Laboratory testing data. Results are in the range provided by 2006 IPCC Volume 5: Waste, Chapter 2, Page 2.14[59]) (Parameter B-8);

k Waste (pulp) decomposition factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.17[60]) (Parameter B-9);

x Period during the crediting period;

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calculating emissions from schedule one type of waste involved in the project (bagasse), and putting factor "global warming potential" to obtain the result in tons of CO_2 equivalent.

[54] The data from project owner regarding the landfill used.
[55] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p.3.15
[56] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p.3.15
[57] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf , p.2.14
[58] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p.3.14
[59] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p.3.13
[60] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf , p.3.17

y Period for which methane emissions are calculated.

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E):

This section is left blank on purpose.

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

This section is left blank on purpose.

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

This section is left blank on purpose.

D.1.3. Treatment of leakage in the monitoring plan:

No leakage emissions are expected due the project implementation.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
-	-	-	-	-	-	-	-	-

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

Leakage in year *y* is calculated as follows:

$$LE_y = 0 ,$$ (Equation 5)

where

LE_y Leakage due to the project realization in period *y*, tCO_2e.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

The annual emission reductions are calculated as follows:

$$ER_y = BE_y - LE_y - PE_y$$ (Equation 6)

where:

ER_y Emission reduction under JI project in period *y* (tCO_2e);

LE_y Leakage due to the project realization in period *y* (tCO_2e);

BE_y Baseline emissions in period *y* (tCO_2e);

PE_y Project emissions in period *y*(tCO_2e).

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

Any negative impact on the environment as a result of project is missing. Accordingly, the requirements of the Host Party cannot are not applied (see Section F.1).

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.1.1.1. – ID P-1 $P_{i,x}$ Amount of sugar plant waste (pulp), which were not sold and were disposed to the landfill	Low	The parameter is determined according to internal accounting procedures adopted by each of the plants through the use of truck scales, and the impossibility of their use – the standard coefficients of weight pulp per volume unit of the vehicle body. The data are cross-checked with the calculated amount of the pulp produced, which is calculated by multiplying the amount of processed sugar beet pulp by the rate of formation per tonne of sugar beet, which is deducted from the amount of pulp sold. Calibration interval of all the automobile scales are 1 year. More information will be provided in the monitoring report.
D.1.1.3. – ID P-1 $W_{i,x}$ Amount of sugar plant waste (pulp), which would be disposed at the landfill	Low	The parameter is defined through the use of truck scales, and the impossibility of their use – the standard coefficients of weight pulp per volume unit of the vehicle body. Calibration interval of all the automobile scales are 1 year. More information will be provided in the monitoring report.
D.1.1.1. – ID P-2 D.1.1.3. – ID B-2 f share of methane being captured and utilized at the disposal site	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-3 D.1.1.3. – ID B-3 GWP_{CH4} global warming potential for methane	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.

D.1.1.1. – ID P-4 D.1.1.3. – ID B-4 *OX* oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-5 D.1.1.3. – ID B-5 *F* volume of methane in the landfill gas	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-6 D.1.1.3. – ID B-6 DOC_f fraction of carbon of organic origin, which can be decomposed	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-7 D.1.1.3. – ID B-7 *MCF* methane conversion factor	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-8 D.1.1.3. – ID B-8 *DOC* Weight fraction of organic origin carbon in the beetroot pulp	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.
D.1.1.1. – ID P-9 D.1.1.3. – ID B-9 *k* Decomposition factor of wastes (beetroot pulp)	low	The source of information is the IPCC data that is reliable source. Use of this source is justified because of the numbers of JI projects in which you used the same source. Additional QA/QC procedures are not required.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

"Podilski sugar mills" LTD coordinates the joint activity. Sugar plant management headed by the Director will be responsible for performance monitoring, data collection, registration, visualization, archiving of monitoring data, and periodic inspection of measuring devices. A responsible person from "Podilski sugar mills" LTD will control this process. Detailed structure of responsible person's interaction will be provided in the Monitoring Report to the initial and the first verification. The following block diagram demonstrates principal scheme of data flow.

Since the monitoring plan does not provide any input of specific data collection procedures, and reduction of greenhouse gas emissions will be calculated using the standardized reporting data, the person from "Podilski sugar mills" LTD will be responsible for sending requests to other project sugar plants, the responses processing and making of a common database for monitoring parameters of the project. On the basis of the consolidated database and primary documents (internal production plant accounts and records of electricity consumption) JI project consultant will prepare Monitoring Reports.

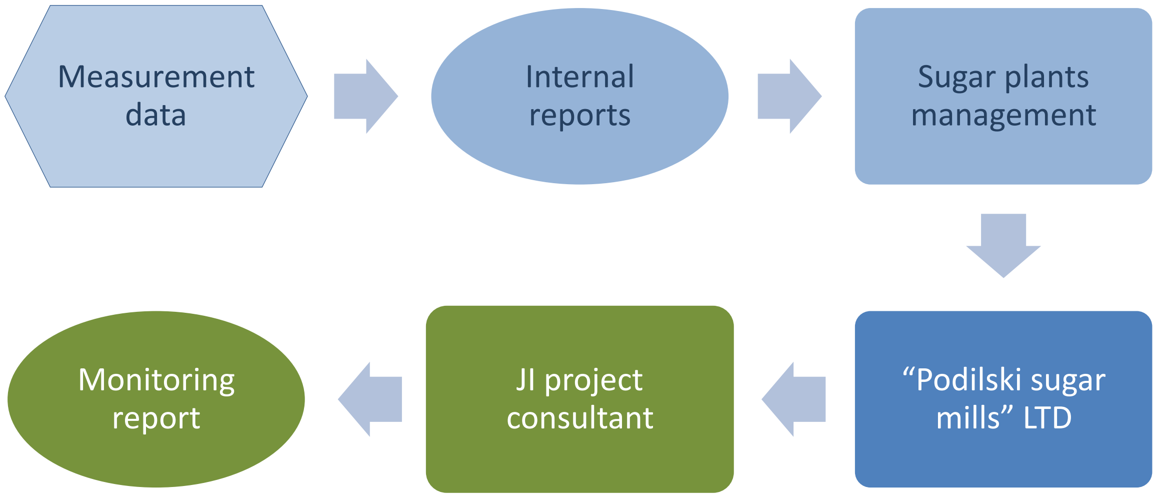

Figure 6. Monitoring flow chart.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Monitoring plan is developed by “MT-Invest Carbon” LLC that is not a project participant.

Contact information:

“MT-Invest Carbon” LLC
Address: 1 Panasa Myrnoho Str., office 2, Kyiv, 01011, Ukraine.
Phone: +38 044 280 2350
Fax: +38 044 280 2350

Vasylieva Nataliya Vjacheslavivna
E-mail: nataliya.vasylieva@mtinvest.com.ua
Position: Joint Implementation project manager
Phone/fax: +38 044 280 23 50

Monitoring plant is to be performed by “Podilski sugar mills” LTD that is a project participant.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table 10. Estimated project emissions during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
Project emissions from anaerobic fermentation of pulp	tCO_2e	0	0	0	0	0	**0**
Total project emissions during the first crediting period	tCO_2e	**0**	**0**	**0**	**0**	**0**	**0**

Table 11. Estimated project emissions after the first crediting period (2013-2026).

Year	Units	Project emissions from anaerobic fermentation of pulp
2013	tCO_2e	0
2014	tCO_2e	0
2015	tCO_2e	0
2016	tCO_2e	0
2017	tCO_2e	0
2018	tCO_2e	0
2019	tCO_2e	0
2020	tCO_2e	0
2021	tCO_2e	0
2022	tCO_2e	0
2023	tCO_2e	0
2024	tCO_2e	0
2025	tCO_2e	0
2026	tCO_2e	0
Total project emissions after the first crediting period	**tCO_2e**	**0**

E.2. Estimated leakage:

Table 12. Estimated leakage during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
Estimated leakage during the first crediting period	tCO_2e	**0**	**0**	**0**	**0**	**0**	**0**

Table 13. Estimated leakage after the first crediting period (2013-2026).

Year	Units	Leakage from anaerobic fermentation of pulp
2013	tCO_2e	0
2014	tCO_2e	0
2015	tCO_2e	0
2016	tCO_2e	0
2017	tCO_2e	0
2018	tCO_2e	0
2019	tCO_2e	0
2020	tCO_2e	0
2021	tCO_2e	0
2022	tCO_2e	0
2023	tCO_2e	0
2024	tCO_2e	0
2025	tCO_2e	0
2026	tCO_2e	0
Estimated leakage after the first crediting period	**tCO_2e**	**0**

E.3. The sum of E.1. and E.2.:

Table 14. Estimated total project emissions during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
Total project emissions during the first crediting period	tCO_2e	**0**	**0**	**0**	**0**	**0**	**0**

Table 15. Estimated total project emissions after the first crediting period (2013-2026).

Year	Units	Project emissions from anaerobic fermentation of pulp
2013	tCO_2e	0
2014	tCO_2e	0
2015	tCO_2e	0
2016	tCO_2e	0
2017	tCO_2e	0
2018	tCO_2e	0
2019	tCO_2e	0
2020	tCO_2e	0
2021	tCO_2e	0
2022	tCO_2e	0
2023	tCO_2e	0
2024	tCO_2e	0
2025	tCO_2e	0
2026	tCO_2e	0
Total project emissions after the first crediting period	$\mathbf{tCO_2e}$	**0**

E.4. Estimated baseline emissions:

Calculations of emission reductions provided in the file Excel *Kryazh_ER.xls*.

Table 16. Estimated baseline emissions during the first crediting period

	Units	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**
Baseline emissions from anaerobic fermentation of pulp	tCO_2e	293 294	307 369	412 032	546 998	591 255	**2 150 948**
Total baseline emissions during the first crediting period	tCO_2e	**293 294**	**307 369**	**412 032**	**546 998**	**591 255**	**2 150 948**

Table 17. Estimated total baseline emissions after the first crediting period (2013-2026).

Year	**Units**	**Baseline emissions from anaerobic fermentation of pulp**
2013	tCO_2e	628 037
2014	tCO_2e	658 606
2015	tCO_2e	684 013
2016	tCO_2e	705 129
2017	tCO_2e	722 678
2018	tCO_2e	737 263
2019	tCO_2e	749 385
2020	tCO_2e	759 459
2021	tCO_2e	767 832
2022	tCO_2e	774 791
2023	tCO_2e	780 574
2024	tCO_2e	785 381
2025	tCO_2e	789 376
2026	tCO_2e	792 696
Total baseline emissions after the first crediting period	**tCO_2e**	10 335 220

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Calculations of emission reductions provided in the file Excel *Kryazh_ER.xls.*

Table 18. Estimated emission reductions during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
Emission reductions during the first crediting period	tCO_2e	**293 294**	**307 369**	**412 032**	**546 998**	**591 255**	**2 150 948**

Table 19. Estimated emission reductions after the first crediting period (2013-2026).

Year	Units	Emission reductions from anaerobic fermentation of pulp
2013	tCO_2e	628 037
2014	tCO_2e	658 606
2015	tCO_2e	684 013
2016	tCO_2e	705 129
2017	tCO_2e	722 678
2018	tCO_2e	737 263
2019	tCO_2e	749 385
2020	tCO_2e	759 459
2021	tCO_2e	767 832
2022	tCO_2e	774 791
2023	tCO_2e	780 574
2024	tCO_2e	785 381
2025	tCO_2e	789 376
2026	tCO_2e	792 696
Estimated emission reductions after the first crediting period	$\mathbf{tCO_2e}$	10 335 220

E.6. Table providing values obtained when applying formulae above:

Table 20. Estimated balance of emissions under the proposed project during the first crediting period

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2008	0	0	293 294	293 294
Year 2009	0	0	307 369	307 369
Year 2010	0	0	412 032	412 032
Year 2011	0	0	546 998	546 998
Year 2012	0	0	591 255	591 255
Total (tonnes of CO_2 equivalent)	0	0	2 150 948	2 150 948

Table 21. Estimated balance of emissions under the proposed project after the first crediting period

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2013	0	0	628 037	628 037
Year 2014	0	0	658 606	658 606
Year 2015	0	0	684 013	684 013
Year 2016	0	0	705 129	705 129
Year 2017	0	0	722 678	722 678
Year 2018	0	0	737 263	737 263
Year 2019	0	0	749 385	749 385
Year 2020	0	0	759 459	759 459
Year 2021	0	0	767 832	767 832
Year 2022	0	0	774 791	774 791
Year 2023	0	0	780 574	780 574
Year 2024	0	0	785 381	785 381
Year 2025	0	0	789 376	789 376
Year 2026	0	0	792 696	792 696
Total (tonnes of CO_2 equivalent)	0	0	10 335 220	10 335 220

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the Host Party:

The Host Party for this project is Ukraine. Environmental Impact Assessment (EIA) is the part of the Ukrainian project planning and permitting procedures. Implementation regulations for EIA are included in the Ukrainian State Construction Standard DBN A.2.2.-1-2003[61] (Title: "Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures").

Annex F of this standard contains a list of "types of projects or activities which constitute higher environmental risk" for which full EIA is mandatory, and the Ministry of Environment being the competent authority. Project activity related to the construction of sugar plants is included in this list.

According to the legislation of Ukraine, a detailed EIA for this project is not needed.

In general, environmental impact of the project activity is positive. Reduction of natural gas consumption leads to decrease in emissions of its combustion products to the atmosphere. Lowering electricity consumption reduces negative effects of its production.

Implementation of the project activity also has a positive social impact through removing of the concentrated odor beetroot pulp storage facilities and improving working conditions at the sugar plant. Since in the area of the project implementation the use of well water is widespread, the reduction of groundwater pollution has positive effects on health of locals.

Since the project does not lead to negative impacts on the environment, transboundary impacts that occur in any other country, and are caused by implementation of this project, which is physically located entirely within Ukraine, are absent.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The proposed project will have a positive overall impact on the environment compared to the existing condition. Thus, in general, the impact of reconstruction is negligible.

[61] *State Construction Standard DBN A.2.2.-1-2003: "Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures"* State Committee Of Ukraine On Construction And Architecture, 2004

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

No stakeholder consultation process for the JI projects is required by the Host Party. Stakeholder comments will be collected during the time of this PDD publication in the internet during the determination procedure.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Project owner:

Organisation:	“Podilski Sugar Mills” Limited
Street/P.O.Box:	Chkalova
Building:	16 B
City:	Kryzhopil
State/Region:	
Postal code:	24600
Country:	Ukraine
Phone:	+38 097 507 65 13
Fax:	+38 0432 507887
E-mail:	Sugar.development@kryazh.com
URL:	-
Represented by:	
Title:	Head of the sugar industry development department
Salutation:	Mr
Last name:	Selitbovskiy
Middle name:	Albinovych
First name:	Vladyslav
Department:	
Phone (direct):	+38 097 507 65 13
Fax (direct):	+38 0432 507887
Mobile:	+38 097 507 65 13
Personal e-mail:	Sugar.development@kryazh.com

Limited Liability Company “Podilski sugar mills”:

EDRPOU Code (Code in the State Unified Register of Companies and Enterprises of Ukraine): 36327881

KVED[62] types of economic activities:
10.81 Sugar production
46.36 Wholesale sugar, chocolate and sugar confectionery
46.75 Wholesale of chemical products
46.90 Non-specialized wholesale trading
47.30 Retail sale of fuel
52.10 Agriculture

[62]The specified activities under the classification of economic activities DK 009:2005, valid to 31/12/2012 by order of the State Committee of Ukraine for technical regulation and consumer policy # 457 dtd. 11/10/2010. Available for reference: http://zakon.nau.ua/doc/?code=v0457609-10. Last reference 19/04/2012.

Buyer of project emission reduction units:

Organisation:	United Carbon Finance Ltd
Street/P.O.Box:	OMC Chambers, Wickhams Cay 1
Building:	
City:	Road Town
State/Region:	Tortola
Postal code:	
Country:	British Virgin Islands
Phone:	0038 044 4906968
Fax:	0038 044 4906925
E-mail:	
URL:	
Represented by:	
Title:	Chief Representative Officer
Salutation:	Mr
Last name:	Hajizada
Middle name:	
First name:	Kanan
Department:	
Phone (direct):	0038 099 2619300
Fax (direct):	
Mobile:	
Personal e-mail:	atumis@mail.ru

Project developer.

Organisation:	"MT-Invest Carbon" LLC
Street/P.O.Box:	Panasa Myrnoho str.
Building:	1
City:	Kyiv
State/Region:	Kyivska
Postal code:	01011
Country:	Ukraine
Phone:	0038 044 2802350
Fax:	0038 044 2802350
E-mail:	
URL:	http://www.mtinvest.com.ua
Represented by:	
Title:	Joint implementation project manager
Salutation:	Ms.
Last name:	Vasylieva
Middle name:	Vjacheslavivna
First name:	Nataliya
Department:	
Phone (direct):	0038 044 2802350
Fax (direct):	0038 044 2802350
Mobile:	0038 067 7770596
Personal e-mail:	nataliya.vasylieva@mtinvest.com.ua

Annex 2

BASELINE INFORMATION

To set a baseline scenario and calculate baseline emissions the specific approach of JI projects are used in accordance with paragraph 9 of the Guidelines on criteria for baseline setting and monitoring (Version 3). To develop methods of calculating emissions based on data, IPCC methodologies are used for preparation of National GHG inventories.

Baseline emissions are calculated as follows:

$$BE_y = \sum_{i=1}^{n} BE_{i,CH4,y},$$

where:

BE_y	Baseline GHG emissions in the period *y*, (tCO_2e [63]),
$BE_{i,CH4,y}$	Baseline CH_4 emissions from degradable organic waste of *i*-plant at the landfill in the period *y*, (tCO_2e);
i	Project plant index;
n	Number of project plants.

Baseline methane emissions due to organic waste decay[64] at landfill[65] are calculated in the following way[66]:

$$BE_{i,CH4,y} = (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot {}^{16}/_{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} W_{i,x} \cdot DOC \cdot e^{-k\cdot(y-x)} \cdot (1-e^{-k})$$

[63] 1 tCO_2e = 1 tCO_2.

[64] During the drafting of any study of greenhouse gas emissions resulting from anaerobic decomposition of sugar beet pulp in landfills, conducted in the western part of Ukraine in the relevant project implementation period was found, so local data is not available. Regarding the use of national data (such as data from the National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in the Ukraine), this would lead to a large error rate by applying parameters calculated for the average morphological composition of MSW used to estimate national emissions of greenhouse gases sector "waste" (description of the calculation on p. 287-296 National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010 years). Thus, international data on greenhouse gas emissions during the anaerobic decomposition of organic waste, depending on their characteristics, storage conditions and climatic factors are the best currently available estimates of parameters of calculation, allowing a more accurate result of emission reductions resulting from the implementation Project. Coefficients used entirely consistent with laboratory analysis of the pulp.

[65] Coefficients used for calculations represents unmanageable deep landfills with no cover material and without biogas gathering practice (IPCC classification). This is typical conditions for Ukraine.

[66] To calculate the annual baseline emissions of methane from the decomposition of organic waste from sugar mills at the site using the methodological approach used in assessing methane emissions from MSW landfills in the preparation of national reports on greenhouse gas emissions. A detailed description of the calculation methodology described on p. 287-288 National inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010 biennium formula for calculating methane emissions in the project (baseline and project) is derived by substituting intermediate calculation formulas in one expression, simplified expression for calculating emissions from schedule one type of waste involved in the project (bagasse), and putting factor "global warming potential" to obtain the result in tons of CO_2 equivalent.

where:

$BE_{i,CH4,y}$	Baseline CH_4 emissions from degradable organic waste of *i*-plant at the landfill in the period *y*, (tCO_2e);
$W_{i,x}$	Amount of sugar plant (*i*-plant) waste, which would be disposed at the landfill in the periods *x*, t (Ex-post for 2008-2011; 2012-2026 – ex-ante);
f	CH_4 fraction captured and utilized at the landfill, fraction [67];
GWP_{CH4}	Global warming potential for methane, tCO_2e/tCH_4 (According to the UNFCCC and the Kyoto Protocol);
OX	Oxidation factor reflects the amount of CH_4 that is oxidised in other material covering the waste, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15 [68]);
F	Fraction of CH_4, by volume, in generated landfill gas, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15 [69]);
DOC_f	Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.13 [70]);
MCF	CH_4 correction factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.14 [71]);
DOC	Fraction of the degradable organic carbon that decomposes, fraction (Laboratory testing data. Results are in the range provided by 2006 IPCC Volume 5: Waste, Chapter 2, Page 2.14[72]);
k	Waste (pulp) decomposition factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.17[73]);
x	Period during the crediting period: $x \in (1; y)$;
y	Period for which methane emissions are calculated.

[67] The data from project owner regarding the landfill used
[68] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf
[69] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf
[70] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf
[71] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf
[72] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf
[73] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf

Key information and data used to establish the baseline – data on the amount of sugar plant waste (pulp), which would be disposed at the landfill - are provided below in tabular form:

Data/Parameter	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, SU “Sokolivsk sugar” (*i*=1)			
Time of determination/monitoring	To be monitored throughout the monitoring period			
Source of data (to be) used	“Podilski sugar mills” LTD SU “Sokolivsk sugar” Daily production reports			
Value of data applied (for ex ante calculations/determinations)	**2008**	**2009**	**2010**	**2011**
	116 610	79 475	131 939	168 333
Justification of the choice of data or description of measurement methods	Measured for the plant commercial purposes on site.			
QA/QC procedures (to be) applied	According to the project owner policy.			
Any comment	No			

Data/Parameter	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, SU “Kapustianskiy sugar” (*i*=2)			
Time of determination/monitoring	To be monitored throughout the monitoring period			
Source of data (to be) used	“Podilski sugar mills” LTD SU “Kapustianskiy sugar” Daily production reports			
Value of data applied (for ex ante calculations/determinations)	**2008**	**2009**	**2010**	**2011**
	43 556	-	53 084	97 181
Justification of the choice of data or description of measurement methods	Measured for the plant commercial purposes on site.			
QA/QC procedures (to be) applied	According to the project owner policy.			
Any comment	No			

Data/Parameter	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, SU “Moivskiy sugar” (*i*=3)			
Time of determination/monitoring	To be monitored throughout the monitoring period			
Source of data (to be) used	“Podilski sugar mills” LTD SU “Moivskiy sugar” Daily production reports			
Value of data applied (for ex ante calculations/determinations)	**2008**	**2009**	**2010**	**2011**
	97 443	55 036	146 070	167 036
Justification of the choice of data or description of measurement methods	Measured for the plant commercial purposes on site.			
QA/QC procedures (to be) applied	According to the project owner policy.			
Any comment	No			

Annex 3

MONITORING PLAN

Monitoring plan is provided in Section D of this PDD.

У цьому документі прошито, пронумеровано

та скріплено печаткою 62 аркушів

т.в.о. Директора

ТОВ «Подільські цукроварні» ________ Міхайловська Т.Ю.

(підпис)

МП