

JOINT IMPLEMENTATION PROJECT

**“Implementation of technological modernization of installations with the aim of  
the introduction of sugar  
production organic waste management system for the sugar factories  
participating in the joint activities”**

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

12.11.2012



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Position of the head of the entity  
-owner of the source,  
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12.11.2012



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

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**SECTION A. General description of the project****A.1. Title of the project:**

“Implementation of technological modernization of installations with the aim of the introduction of sugar production organic waste management system for the sugar factories participating in the joint activities”

Sector: 13.Waste recycling and utilization.

Version of the document: 2.1

Date of the document: 21 September 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 five sugar plants of the Ternopil Region of Ukraine. Khorostkivskiy Sugar Plant LLC 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, siloing 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.<sup>1</sup> 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 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 and granulation 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 and drying systems: installation of additional presses of deeper extraction, use of pulp drying and granulation units. Currently, most planned activities are already implemented and lead to the generation of CO<sub>2</sub> emissions reductions.

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<sup>1</sup> 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**

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 Lanovetskiy sugar plant LLC in early 2004. 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 Ternopil Region. Implementation of the main project activity took place during 2004-2006, although implementation of some measures continued in 2009-2010. 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 Environment Investment Agency of Ukraine and obtained the Letter of Endorsement #2683/23/7 on 20/09/2012.

The list of facilities, where the project activity has been realized is presented in Table 2.

**A.3. Project participants:***Table 1. Project participants*

<u>Party involved</u>	<u>Legal entity project participant</u> (as applicable)	Please indicate if the <u>Party involved</u> wishes to be considered as <u>project participant</u> (Yes/No)
Ukraine (Host party)	Khorostkivskiy Sugar Plant LLC	No
The Netherlands	United Carbon Finance Ltd	No

**Khorostkivskiy Sugar Plant LLC** – Limited Liability Company “Khorostkivskiy Sugar Plant” is established on the industrial base of the integral property complex of the “Komsomolets” sugar plant, built in 1958 with capacity of 6 000 tons of raw materials processing per day.

Raw-materials base of the plant (beet-sowing area) covered four districts of the Ternopil Region, namely, Husyatyn and Terebovlya, part of Chortkiv and Borshchiv districts. The sugar plant being a state enterprise operated till the spring of 1996. In April 1996, a general meeting of plant workers decided to participate in the privatization of the sugar plant as a state enterprise. By Order # 973 of the Regional Branch of the State Property Fund in the Ternopil Region dated 29/07/1996, the state enterprise was reorganized into Open Joint Stock Company “Khorostkivskiy Sugar Plant”. After being reorganized several times, in 2007 the enterprise was registered as Khorostkivskiy Sugar Plant LLC. The plant represents a group of other sugar plants that have signed a joint activity agreement for JI project implementation. Khorostkivskiy Sugar Plant LLC is an owner of the emissions reductions generated due to the project implementation.

**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 Khorostkivskiy Sugar Plant LLC 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 within five sugar plants in the Ternopil Region of Ukraine, which signed a joint activity agreement for JI project implementation. Khorostkivskiy Sugar Plant LLC 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.

<i>Identification #</i>	<i>Factory name</i>	<i>Short name in PDD</i>	<i>Address</i>	<i>Geographical coordinates</i>
1.	Limited Liability Company "Kozivskiy Sugar Plant"	Kozivskiy	47600, Ternopil Region, Kozova District., Koziv, Zavodskaya Str., 1	49°25'59.18" N. 25° 9'17.51" E
2.	Limited Liability Company "Lanovetskiy Sugar Plant"	Lanovetskiy	47400, Ternopil Region, Lanivtsi District, Lanivtsi, Vyshnivetska Str., 35	49°51'39.45" N 26° 5'34.72" E
3.	Limited Liability Company "Borshivskiy Sugar Plant"	Borshivskiy	48701, Ternopil Region, Borshchiv District, Borshchiv, Volodymyra Velykoho Str., 1	48°48'16.24" N 26° 2'25.41" E
4.	Limited Liability Company "Buchatskiy Sugar Plant"	Buchatskiy	48401, Ternopil Region, Buchach District, Buchach, Pavlo Tychyna Str., 3	49° 3'53.39" N 25°22'54.18" E
5.	Limited Liability Company "Zbarazkiy Sugar Plant"	Zbarazkiy	47302, Ternopil Region, Zbarazh District, Zbarazh, Karmelyuk Square, 1	49°40'0.00" N 25°46'40.00" E

**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 five sugar plants in the Ternopil Region of Ukraine, which signed a joint activity agreement for JI project implementation. Khorostkivskiy Sugar Plant LLC coordinates this project activity. Detailed addresses of the plants involved into the project are listed in the Section above.

Ternopil region is an administrative and territorial unit of Ukraine with its center in Ternopil. Square area is 13 800 km<sup>2</sup> (2.3% of Ukraine), 1 087 844 inhabitants (as of March 1, 2010), including 474 729 urban (43.6%) and 613 115 rural (56.4%). There are 18 cities, 17 towns, 1020 villages, 17 districts, 580 rural councils in the region.

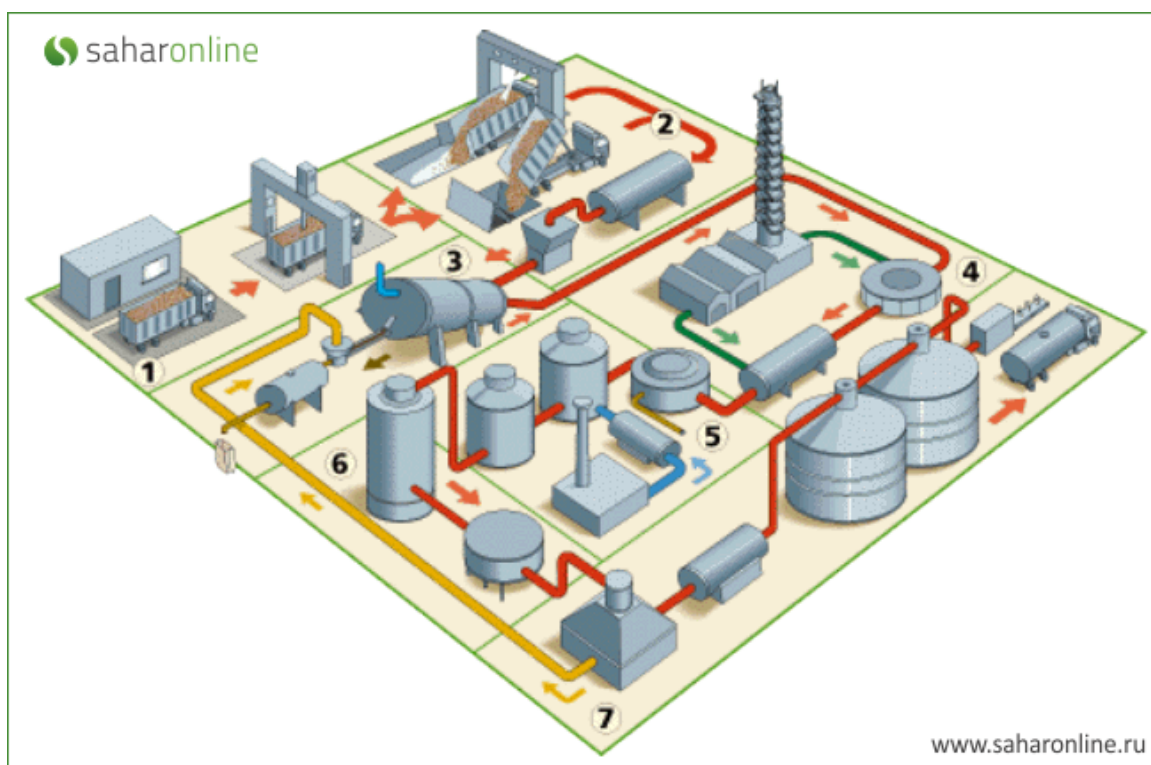
Ternopil Region occupies the western part of Podolsk plateau, bordering with Rivne Region to the north, Chernivtsi to the south, Ivano-Frankivsk – south-west, Lviv at the west, Khmelnytsky Region at the east of Ukraine. Southern boundary of the Ternopil Region runs along Dniester River, at the east – Zbruch River. Ternopil region is situated near the Ukrainian border with Poland, Slovakia, Hungary and Romania.

**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 five sugar plants, the participants of joint activity. Khorostkivskiy Sugar Plant LLC 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<sub>2</sub> gas (carbonation) and SO<sub>2</sub> (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;           | 5. Evaporation;     |
| 2. Unloading and washing;       | 6. Crystallization; |
| 3. Diffusion (pulp generation); | 7. Centrifugation.  |
| 4. Saturation;                  |                     |

Figure 2. Flow-chart of sugar production process of sugar beet. (Source: Saharinline<sup>2</sup>)

<sup>2</sup> [http://www.saharonline.ru/e\\_shema.php?enc=301](http://www.saharonline.ru/e_shema.php?enc=301)





### *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".

### *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 diffuser 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<sub>2</sub>). Lime and carbon dioxide are obtained during roasting limestone.<sup>3</sup> 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<sub>2</sub> and SO<sub>3</sub> 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%<sup>4</sup>, because mistakes made during the previous stages are impossible to correct.

### ***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 (under this project these are Borshivskiy Sugar Plant LLC and Buchatskiy Sugar Plant LLC) 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<sup>5</sup>).

Parameter	Pulp, %			
	Fresh	Pressed	Sour	Dried
Crude protein content	1.2-1.5	1.7-1.9	1.3-2.6	7-9

<sup>3</sup> CO<sub>2</sub> 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.

<sup>4</sup> [http://www.saharonline.ru/e\\_evaporator.php?enc=306](http://www.saharonline.ru/e_evaporator.php?enc=306)

<sup>5</sup> Kolesnikov M.V. "Storage and use of beet pulp. Chemical composition of pulp". (M.B. Колесніков. «Зберігання та використання жому цукрового буряка. Хімічний склад жому») <http://www.ugagroprom.ru/2/>



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 the high moisture and organic matter content, which spoil forage properties of pulp and converts it being useful by-product of sugar production into waste than has to be recycled or disposed. Fresh pulp should be used for feed purposes or conserved only within the short time period<sup>6</sup> 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 years and more.

Feeding animals with spoiled pulp may cause serious digestive disorders: diarrhea, almost with blood, bloating – tympaniyu; it also makes animals more vulnerable to bacteria that cause foot diseases.<sup>7</sup> Thus, fresh sugar beet pulp, which was not immediately used for animal feeding or was not taken under special treatment, inevitably becomes liquid waste production 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 achieving significant reduction of 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 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 and granulation equipment is used. The resulting product is suitable for long-term warehousing and transportation for long distances.

The project activity provides installation of presses of deeper extraction, equipment for pulp drying and granulation, construction of warehouses for storing of dry product and setting up logistics for processing the maximum amount of sugar beet pulp companies involved in joint activities. Details on changes of pulp management practices implemented at each of the plants are listed below.

### ***General description of the equipment***

#### **Pulp press:**

Vertical press GC-2, made in Germany.

<sup>6</sup> Isaev M.D. "For what you can use the pulp and molasses?" (М.Д. Исаев. «Для чого можна використати жом та меласу?») [http://agro.tatarstan.ru/rus/file/pub/pub\\_37228.doc](http://agro.tatarstan.ru/rus/file/pub/pub_37228.doc)

<sup>7</sup> Kolesnikov M.V. "Storage and use of beet pulp. Chemical composition of pulp". (М.В. Колесніков. «Зберігання та використання жому цукрового буряка. Хімічний склад жому») <http://www.ugagroprom.ru/2/>



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.

### Pulp driers

Pulp drying unit is a horizontal rotating drum with diameters from 2.4 to 4 m, in the center of which cruciform checkers are installed to overturn pulp during its drying and to ensure better contact with the flue gases. One end of the drum is fixed to stationary mixing chamber, and other – to the discharge chamber.

The fresh pulp, pressed to the maximum possible content of dry matter, is supplied to the mixing chamber, where camera combustion flue gases come. Then pulp with the flue gases are mixed by cruciform checkers, dried and moved to the discharge chamber. The fan takes air into combustion and mixing chambers. From the discharge chamber dried pulp falls to a screw, which feeds it into the elevator. Further, pulp gets to the scales, from where it goes to the warehouse.

In the steady mode temperature of flue gases at the inlet to mixing chamber is maintained of 800 ... 900 °C, the temperature of off-gases – 120 ... 140 °C, when evacuating in drying drum – 350 ... 400 Pa. The drum rotates with the known frequency of electric power of 15 kW and allows for adjusting the amount of dried pulp and its humidity. Due to variable speed of drum it is possible to increase the amount of dried pulp in several times with decreasing drying degree to the required minimum. At some plants it is used to increase the number of processed pulp.

### Pulp granulator

CPM pulp granulator was installed at one of the plants involved in the joint activity. Granulation is used to increase the density of pulp when it is storing from 0.25 t/m<sup>3</sup> and when stored in bulk to 0.6-0.65 t/m<sup>3</sup>, which significantly reduces the space required for storage facilities. In addition, the benefits of granulation are as follows:

- granulation ensures preservation of pulp for a long time;
- granulated feed has a high density, that is, to a limited extent of the stomach can fit more nutrients;
- starch can be transformed into easy hydrolysable form - dextrans, which allow fuller use of the nutrients contained in the feed;
- due to the granulation, 95% mold spots producing toxins are destroyed in pelleted feed;



- fat contained in the feed, is evenly distributed on the surface of the feed, which helps its better digestion.

#### Pulp drier facilities and dry pulp storages

After the transition to the drying pulp practice, factories were equipped with special building for dry pulp storage, which allows for relatively constant temperature storage of pulp to prevent ingress of moisture from precipitation. The buildings are heated. Heating system can be used in case of pulp finish drying after pulp drying drum. It is usually used during peak loads.

#### ***Limited Liability Company “Kozivskiy Sugar Plant”***

During the implementation of these measures envisaged by the project, the following actions were carried out:

- 1) Managing the drainage systems in warehouses storing raw pulp, which reduces humidity and water content of raw pulp;
- 2) Construction of pulp drying facility of area equals to 380 m<sup>2</sup>, Installation of pulp drier with capacity of 30t of dry pulp per day, construction of dry pulp storage facility of area equals to 1250m<sup>2</sup>.

The implementation of project activity allowed avoids completely pulp spoiling and ensures its full utilization.

#### ***Limited Liability Company “Lanovetskiy Sugar Plant”***

The project activity within the plant is:

- 1) Managing the drainage systems in warehouses storing raw pulp, which reduces humidity and water content of raw pulp;
- 2) Installation of pulp drier with capacity of 100t of dry pulp per day, and construction of dry pulp storage facility of area equals to 15 750 m<sup>3</sup>.

The result of the project implementation was complete utilization of the plant's own pulp and partial utilization of pulp from Zbarazh Sugar Plant.

#### ***Limited Liability Company “Borshivskiy Sugar Plant”***

During the implementation of project activity, the following measures were taken:

- 1) Construction of pulp drying facility, installation of two pulp drying machines with capacity of 30t of dry pulp per day each and construction of dry pulp storage facility;
- 2) Replacement of press equipment in order to obtain pulp of better extraction: old presses of prior pulp extraction were replaced to three additional GH-2 presses of deep pulp extraction with capacity of 1200 tons per day each;
- 3) Installation of pulp drying and granulation complex with capacity of 60 tons of dry pulp per day.

Specifications are listed in the table below.

At this plant project activity was implemented in two stages:

*Stage 1:* construction of pulp drying facility, installation of one pulp drying machine, replacement of two presses and construction of dry pulp storage;



Stage 2: installation of the second pulp drier, replacement of the 1<sup>st</sup> press and installation of a granulation unit.

Table 4. Specifications of pulp drying and granulation complex.

Parameter	Value
Productivity of dry pulp, t/per day	60-70
Calorific value of furnace, MWt	15
Air pressure to the burner, mm w.g.	90-100
Coolant temperature at the outlet of the furnace, °C	850-900
Fuel type	natural gas
Natural gas consumption, m <sup>3</sup> /h	~350
Drive power of drier body, kWt	37-55
Rotating frequency of drier body, rpm	1.25-2.5
Drive power of screw, kWt	5.5
Rotating frequency of screw, rpm	12
Drive power of discharge screw, kWt	3.0
Rotating frequency of discharge screw, rpm	25
Granulator efficiency, t/per day	25-30

Outcome: complete utilization of its own pulp and partial utilization of pulp at Zbaraskiy Sugar Plant.

#### **Limited Liability Company “Buchatskiy Sugar Plant”**

Project activity at the plant included:

- 1) Pulp drier installation with capacity of 24 t/per day;
- 2) Two GH -2 additional presses of deep extraction with capacity of 1200 tons per day each;

Outcome: complete utilization of own pulp.

#### **Limited Liability Company “Zbarazkiy Sugar Plant”**

Project activity at Zbarazkiy Sugar Plant was to establish logistics connections for ensuring the timely transportation of the produced raw pulp (about 114 tons annually) for its processing and drying at Lanovetskiy (about 73 tons per year) and Borshchivskiy (about 41 tons annually) sugar plants.

Pulp delivery for its processing is carried out by a motor transport for the first 24 hours after the pulp production. Table 5 contains basic information about the pulp delivery for its processing.

Table 5. Transportation of pulp from Zbarazkiy Sugar Plant for processing.

Zbarazh - Lanivtsi	Zbarazh - Borshchiv

Zbarazh - Lanivtsi	Zbarazh - Borshchiv
Distance: 34 km Estimated travel time: 34 mins. Time together with loading/unloading: 1 hour	Distance: 142 km Estimated travel time: 2 h. 13 mins. Time together with loading/unloading: 2.5 hours
Daily amount of round trips: 37 Number of trucks involved: 6	Daily amount of round trips: 21 Number of trucks involved: 10

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. Also the negative impact on groundwater reduced due to the decrease of filtrate reaching the groundwater from landfills. 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 enterprises 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 a significant decrease of its moisture content was completed in 2004, when pulp drying drums were installed at Lanovetskiy, Borshivskiy and Buchatskiy sugar plants. 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 6. Project implementation schedule.

Activity	Plant	Date
Decision making on the project realization	Kozivskiy	03/2004
	Lanovetskiy	01/2004
	Borshivskiy	04/2004
	Buchatskiy	02/2004
	Zbarazkiy	11/2004
Investment stage	Kozivskiy	04/2004-10/2004
	Lanovetskiy	01/2004-05/2010
	Borshivskiy	05/2004-08/2011
	Buchatskiy	04/2004-11/2006
	Zbarazkiy	-
Construction-assembly and administration works	Kozivskiy	06/2004-11/2004
	Lanovetskiy	05/2004-11/2004
	Borshivskiy	Stage 1 05/2004-09/2004 Stage 2 06/2009-09/2010
	Buchatskiy	05/2004-11/2006
	Zbarazkiy	07/2005-09/2005
Operation stage	Kozivskiy	08/2005-11/2024
	Lanovetskiy	08/2005-11/2029



	Borshivskiy	08/2005-11/2029
	Buchatskiy	08/2005-11/2025
	Zbarazkiy	08/2005-11/2029
Emission reduction generation	Kozivskiy	08/2005-11/2024
	Lanovetskiy	08/2005-11/2029
	Borshivskiy	08/2005-11/2029
	Buchatskiy	08/2005-11/2025
	Zbarazkiy	08/2005-11/2029

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:**

Sugar plants – the participants of joint activity – implement 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 quickly lose its valuable feed properties due to the intensive processes of fermentation and putrefaction, which inevitably 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:***Table 7. Estimated amount of emission reductions before the crediting period*

	Years
Length of the <u>crediting period</u>	3
Year	Estimate of annual emission reductions in tons of CO <sub>2</sub> equivalent
Year 2005	244 433
Year 2006	542 620
Year 2007	662 997
Total estimated emission reductions over the <u>crediting period</u> (tons of CO <sub>2</sub> equivalent)	1 450 050
Annual average of estimated emission reductions over the <u>crediting period</u> (tons of CO <sub>2</sub> equivalent)	483 350

*Table 8. Estimated amount of emission reductions during the crediting period*

	Years
Length of the <u>crediting period</u>	5
Year	Estimate of annual emission reductions in tons of CO <sub>2</sub> equivalent
Year 2008	666 680
Year 2009	819 855
Year 2010	1 014 099
Year 2011	1 242 855
Year 2012	1 503 462
Total estimated emission reductions over the <u>crediting period</u> (tons of CO <sub>2</sub> equivalent)	5 246 951
Annual average of estimated emission reductions over the <u>crediting period</u> (tons of CO <sub>2</sub> equivalent)	1 049 390

*Table 9. Estimated amount of emission reductions after the crediting period*

	Years
Length of the period after 2012, for which emission reductions are estimated	17
Year	Estimate of annual emission reductions in tons of CO <sub>2</sub> equivalent
Year 2013	1 720 053
Year 2014	1 900 064
Year 2015	2 049 671
Year 2016	1 999 332
Year 2017	2 277 348
Year 2018	2 363 234
Year 2019	2 434 614
Year 2020	2 493 938
Year 2021	2 543 243
Year 2022	2 584 220
Year 2023	2 618 275
Year 2024	2 646 580



Year 2025	2 670 103
Year 2026	2 689 653
Year 2027	2 705 904
Year 2028	2 719 408
Year 2029	2 730 631
Total estimated emission reductions over the <u>crediting period</u> (tons of CO <sub>2</sub> equivalent)	41 146 271
Annual average of estimated emission reductions over the <u>crediting period</u> (tons of CO <sub>2</sub> equivalent)	2 420 369

**A.5. Project approval by the Parties involved:**

Letter of Endorsement No. 2683/23/7 was obtained from the State Environmental Investment Agency of Ukraine on 20/09/2012. 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)<sup>8</sup> (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.

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<sup>9</sup>, 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.*

**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

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<sup>8</sup>[http://ji.unfccc.int/Ref/Documents/Baseline\\_setting\\_and\\_monitoring.pdf](http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf)

<sup>9</sup><http://ji.unfccc.int/Ref/Documents/Guidelines.pdf>



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 (silaging, 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 silaging 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 silaging pulp over long distances is also complicated, since the pulp being under aerobic conditions rapidly deteriorates<sup>10</sup>, thus it would be rational to perform silaging 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<sup>11</sup>, 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.

<sup>10</sup> 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&usq=AFQjCNG607qJfIYPuTc6agvLFThwa6BR6Q](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&usq=AFQjCNG607qJfIYPuTc6agvLFThwa6BR6Q)

<sup>11</sup> 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<sup>12</sup>, 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.

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<sup>12</sup> <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.<sup>13</sup> 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<sup>14</sup> sugar plants, in 2011, there were already 61<sup>15</sup>. Stagnation of the sugar industry continues in 2012<sup>16</sup>, 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 18 698 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:<sup>17</sup>

Table 10. 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.<sup>18</sup> 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

<sup>13</sup> [http://dt.ua/ECONOMICS/tsukrova\\_galuz\\_ukrayini\\_vid\\_solodkih\\_mifiv\\_do\\_girkoyi\\_realnosti-31612.html](http://dt.ua/ECONOMICS/tsukrova_galuz_ukrayini_vid_solodkih_mifiv_do_girkoyi_realnosti-31612.html)

<sup>14</sup> <http://www.umoloda.kiev.ua/number/1252/160/44359/>

<sup>15</sup> [http://agronovator.ua/ua/sugar\\_factories/](http://agronovator.ua/ua/sugar_factories/)

<sup>16</sup> <http://www.myvin.com.ua/ua/news/region/14920.html>

<sup>17</sup> Data provided by Aswath Damodaran, Ph.D., Stern School of Business NYU <http://pages.stern.nyu.edu/~adamodar/>

<sup>18</sup> 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 largest.

**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<sub>4</sub> 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:**

<b>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, Kozivskiy Sugar Plant LLC ( <i>i=1</i> )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			
Source of data (to be) used	Kozivskiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	136858	191257	119817	63597
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	132000	173250	214500	255750
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>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to			





	the landfill, Lanovetskiy Sugar Plant LLC ( $i=2$ )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			
Source of data (to be) used	Lanovetskiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	92232	142314	116206	47236
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	80000	105300	139400	172200
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>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, Borshivskiy Sugar Plant LLC ( $i=3$ )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			
Source of data (to be) used	Borshivskiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	70568	88594	34443	33017
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	70000	105000	140000	175000
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>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, Buchatskiy Sugar Plant LLC ( $i=4$ )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			
Source of data (to be) used	Buchatskiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	89241	145580	36828	27939
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	80000	104000	128000	152000
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>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, Zbaraskiy Sugar Plant LLC ( $i=5$ )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			



Source of data (to be) used	Zbarazkiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	127974	150090	141048	72783
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	200000	216000	224000	240000
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 18.8 million euro or 188 million UAH, which is much more than 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<sup>19</sup> 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. Total<sup>20</sup> number of sugar factories in the region is 9.

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

There are 9 such enterprises in the Ternopil Region, but there is no publicly available information about waste treatment practices at them. To analyze the common practice, data from the nearest region – Vinnitsa- were used, however it is slightly larger in size, but it is in the same climatic zone and has similar agricultural specialization, the companies of this region are in the same legislative field and in the same economic conditions as the Ternopil region companies are. There are 12 sugar plants in the 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<sup>21</sup>, 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.

<sup>19</sup> Activity aimed at methane emissions reduction.

<sup>20</sup> <http://www.rada.com.ua/ukr/RegionsPotential/Ternopil/>

<sup>21</sup> 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](http://search.ligazakon.ua/l_doc2.nsf/link1/VI060112.html)

**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.

**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.

Table 11. Sources of emissions in the baseline and project scenarios

	Source	Gas	Included/Excluded	Justification/Explanation
Baseline scenario	Anaerobic fermentation of sugar plant waste (pulp) at landfills	CO <sub>2</sub>	Excluded	Neglected for simplification. Conservatively.
		CH <sub>4</sub>	Included	Main source of emissions.
		N <sub>2</sub> O	Excluded	Neglected for simplification. Conservatively.
	Fuel combustion during pulp transportation to landfills	CO <sub>2</sub>	Excluded	Neglected for simplification. Conservatively.
		CH <sub>4</sub>	Excluded	Neglected for simplification. Conservatively.
		N <sub>2</sub> O	Excluded	Neglected for simplification. Conservatively.
Project scenario	Anaerobic fermentation of sugar plant waste (pulp) at landfills	CO <sub>2</sub>	Excluded	Neglected for simplification likewise the baseline scenario.
		CH <sub>4</sub>	Included	Main source of emissions.
		N <sub>2</sub> O	Excluded	Neglected for simplification likewise the baseline scenario.
	Natural gas consumption by pulp drying units	CO <sub>2</sub>	Excluded	Neglected due to the small volume under paragraph 14 the Guidance <sup>22</sup> .
		CH <sub>4</sub>	Excluded	Neglected for simplification.
		N <sub>2</sub> O	Excluded	Neglected for simplification.
	Electricity consumption by pulp drying units	CO <sub>2</sub>	Excluded	Neglected due to the small volume under paragraph 14 the Guidance <sup>23</sup> .
		CH <sub>4</sub>	Excluded	Neglected for simplification.
		N <sub>2</sub> O	Excluded	Neglected for simplification.
	Fuel combustion during pulp transportation for utilization	CO <sub>2</sub>	Excluded	Neglected for simplification.
		CH <sub>4</sub>	Excluded	Neglected for simplification.
		N <sub>2</sub> O	Excluded	Neglected for simplification.

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

<sup>22</sup> In accordance with natural gas and electricity consumption data of the equipment used for beetroot pulp drying, maximal energy consumption took place at LLC “Lanovetskiy Sugar Plant” in 2011. Natural gas combustion amounted 822 th. m<sup>3</sup>, which led to emission of 1560 tonnes of CO<sub>2</sub>.

<sup>23</sup> Maximal electricity consumption was 587 MWh resulting in emissions of 720 tonnes of CO<sub>2</sub>. This is lower than 1% of anthropogenic emissions by sources and less than 2000 tons of CO<sub>2</sub> per year, so these sources of emissions were not taken into account.



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 practise of partial settling by dried pulp for beet root supplying on these plants. 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 come back without cargo causing the emissions of GHG gases. In this case emissions of GHG gases 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 baseline scenario of the proposed project is a continuation of the existing situation before the project implementation. The activity of participants 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.

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

- CH<sub>4</sub> emissions due to anaerobic fermentation of sugar production waste (pulp).

### **Project scenario**

The project activity of participants was installation of equipment for fresh pulp treatment with the purpose of its drying. Thereby, the pulp spoilage is avoided and period of useful utilization as cattle feed increased, because of which complete useful utilization of pulp became possible that eliminates its transportation to the land fields, where due to its anaerobic fermentation landfill gases containing methane (GHG gas) would be formed.

In result of implemented activity, the moisture content of sugar plant waste was significantly reduced, 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<sub>4</sub> 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 in Figures 4 and 5

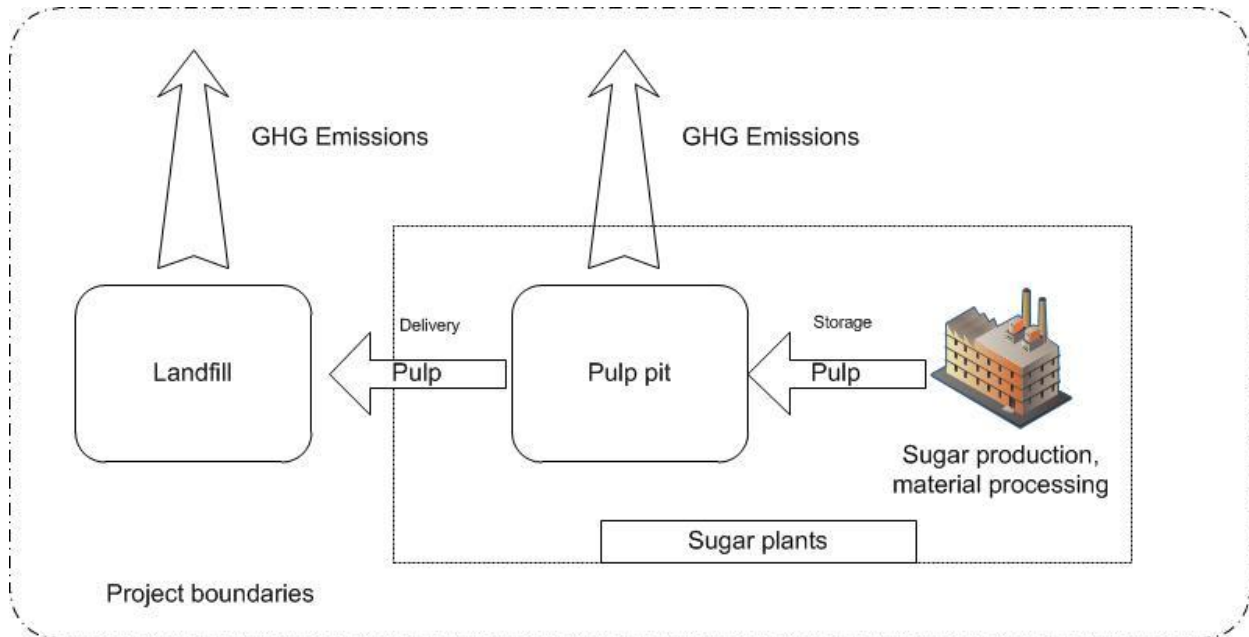


Figure 4. Baseline boundaries

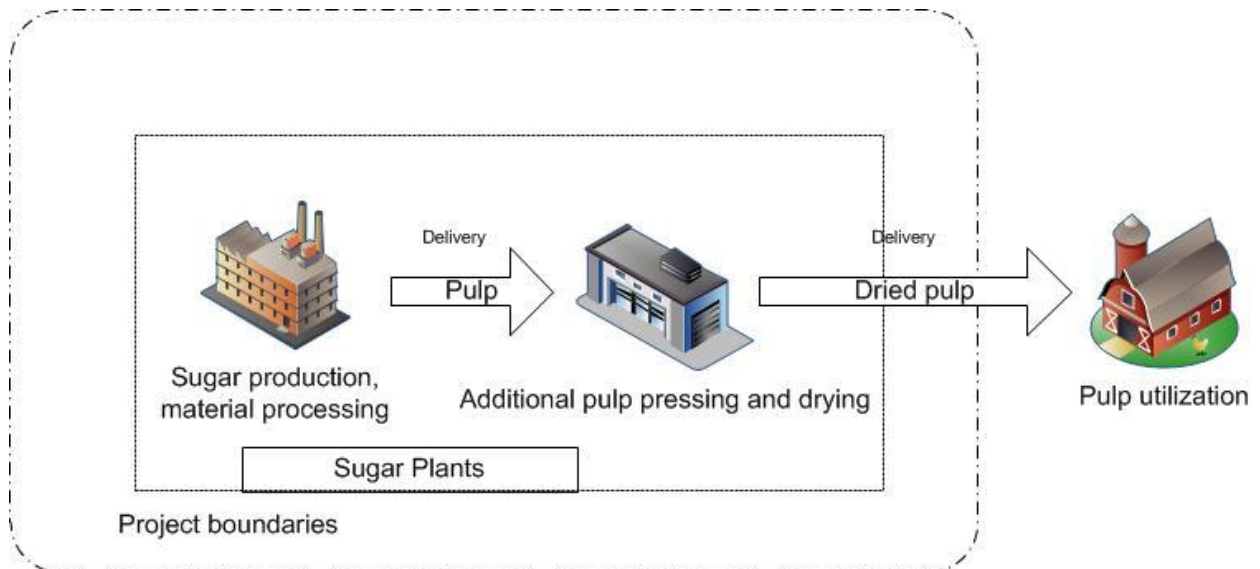


Figure 5. Project boundaries



**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: 7/07/2012.

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:

“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](mailto:nataliya.vasylieva@mtinvest.com.ua)

Position: Joint Implementation project manager

Phone/fax: +38 044 280 23 50

**SECTION C. Duration of the project / crediting period****C.1. Starting date of the project:**

Starting date of the project is January 19, 2004. This is the date of signing the contract on designing of pulp drying division Lanovetskiy Sugar Plant LLC.

**C.2. Expected operational lifetime of the project:**

The expected lifetime of the project is estimated to last until the end of 2029. Thus, the operational lifetime of the project will be 25 years or 300 months. Starting date of emission reductions generation: 01/01/2005; ending date of emission reductions generation: 31/12/2029.

**C.3. Length of the crediting period:**

Start of the first crediting period: 01/01/2008.

End of the crediting period: 31/12/2029

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

Length of the project activity before the first crediting period under the project: 3 years or 36 months (01/01/2005-31/12/2007).

Length of the part of crediting period within the first commitment period of the Kyoto Protocol: 17 years or 204 months (01/01/2013-31/12/2029).



**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<sup>24</sup> 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<sub>4</sub> emissions due to anaerobic fermentation of sugar production waste (pulp).

**Project scenario**

As a result of implemented activity, the moisture content of sugar plant waste was significantly reduced, 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<sub>4</sub> emissions due to anaerobic fermentation of sugar production waste (pulp).

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<sup>24</sup><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 Khorostkivskiy Sugar Plant LLC, 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	<i>f</i> 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	$GWP_{CH_4}$ global warming potential for methane	In accordance with UNFCCC decision and Kyoto Protocol	tCO <sub>2</sub> e/tCH <sub>4</sub>	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
P-4	<i>OX</i> oxidation factor, which characterizes the fraction of methane oxidizing in the material that covers wastes	2006 IPCC <sup>25</sup>	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	<i>F</i> volume of methane in the landfill gas	2006 IPCC <sup>26</sup>	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.

<sup>25</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf) , page 3.15

<sup>26</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf) , page 3.15



P-6	<i>DOC<sub>f</sub></i> fraction of carbon of organic origin, which can be decomposed	2006 IPCC <sup>27</sup>	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
P-7	<i>MCF</i> methane conversion factor	2006 IPCC <sup>28</sup>	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	<i>DOC</i> 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 <sup>29</sup> . The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.

<sup>27</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_2\\_Ch2\\_Waste\\_Data.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf) , page 2.14

<sup>28</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf) , page 3.14

<sup>29</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf) , page 3.13



P-9	<i>k</i> Decomposition factor of wastes (beetroot pulp)	2006 IPCC <sup>30</sup>	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
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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<sub>2</sub> equivalent):

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

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

where:

- $PE_y$ , Project GHG emissions due to project implementation in period  $y$ , tCO<sub>2</sub>e<sup>31</sup>;
- $PE_{i,biomass,y}$  Project methane emissions due to the decomposition of organic waste of the plant  $i$  at the landfill in the period  $y$ , (tCO<sub>2</sub>e);
- $i$  Project plant index;
- $n$  Number of project plants.

Project methane emissions from decomposition of organic waste at the landfill are calculated as follows:

$$PE_{i,biomass,y} = (1 - f) \cdot GWP_{CH_4} \cdot (1 - OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^y P_{i,x} \cdot DOC \cdot e^{-k \cdot (y-x)} \cdot (1 - e^{-k}), \quad (\text{Equation 2})$$

where:

- $PE_{i,biomass,y}$  Project methane emissions due to the decomposition of organic waste of the plant  $i$  at the landfill in the period  $y$ , (tCO<sub>2</sub>e);
- $P_{i,x}$  Amount of sugar plant waste (pulp), which were not sold and were disposed to the landfill, t (Parameter P-1);
- $f$  CH<sub>4</sub> fraction captured and utilized at the landfill, fraction (Parameter P-2);
- $GWP_{CH_4}$  Global warming potential for methane, tCO<sub>2</sub>e/tCH<sub>4</sub> (According to the UNFCCC and the Kyoto Protocol) (Parameter P-3);
- $OX$  Oxidation factor reflects the amount of CH<sub>4</sub> that is oxidised in other material covering the waste, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15<sup>32</sup>) (Parameter P-4);

<sup>30</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf), page 3.17

<sup>31</sup> 1 tCO<sub>2</sub>e = 1 tCO<sub>2</sub>



- $F$  Fraction of CH<sub>4</sub>, by volume, in generated landfill gas, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15<sup>33</sup>) (Parameter P-5);
- $DOC_f$  Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.13<sup>34</sup>) (Parameter P-6);
- $MCF$  CH<sub>4</sub> correction factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.14<sup>35</sup>) (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<sup>36</sup>) (Parameter P-8);
- $k$  Waste (pulp) decomposition factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.17<sup>37</sup>) (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	$W_{i,x}$ 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	-
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.

<sup>32</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>33</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>34</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_2\\_Ch2\\_Waste\\_Data.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf)

<sup>35</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>36</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>37</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)



B-3	$GWP_{CH_4}$ global warming potential for methane	In accordance with UNFCCC decision and Kyoto Protocol	tCO <sub>2</sub> e/tCH <sub>4</sub>	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 <sup>38</sup>	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 <sup>39</sup>	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 <sup>40</sup>	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
B-7	$MCF$ methane conversion factor	2006 IPCC <sup>41</sup>	fraction	e	annually	100%	Electronic and paper	The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.

<sup>38</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf) , page 3.15

<sup>39</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf) , page 3.15

<sup>40</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_2\\_Ch2\\_Waste\\_Data.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf) , page 2.14

<sup>41</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf) , page 3.14





B-8	<i>DOC</i> 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 <sup>42</sup> . The value of the specified parameter contained in the Excel calculation spreadsheet, attached to the PDD.
B-9	<i>k</i> Decomposition factor of wastes (beetroot pulp)	2006 IPCC <sup>43</sup>	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.

**D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO<sub>2</sub> equivalent):**

Baseline emissions are calculated as follows:

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

where:

$BE_y$  Baseline GHG emissions in the period y, (tCO<sub>2</sub>e<sup>44</sup>);

$BE_{i,biomass,y}$  Baseline CH<sub>4</sub> emissions from degradable organic waste of *i*-plant at the landfill in the period y, (tCO<sub>2</sub>e);

*i* Project plant index;

*n* Number of project plants.

<sup>42</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf), page 3.13

<sup>43</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf), page 3.17

<sup>44</sup> 1 tCO<sub>2</sub>e = 1 tCO<sub>2</sub>.



Baseline CH<sub>4</sub> emissions from degradable organic waste at the landfill are calculated as follows:

$$BE_{i,biomass,y} = (1 - f) \cdot GWP_{CH_4} \cdot (1 - OX) \cdot 16/12 \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^y W_{i,x} \cdot DOC \cdot e^{-k \cdot (y-x)} \cdot (1 - e^{-k}), \quad (\text{Equation 4})$$

where:

- $BE_{i,biomass,y}$  Baseline CH<sub>4</sub> emissions from degradable organic waste of *i*-plant at the landfill in the period *y*, (tCO<sub>2</sub>e);
- $W_{i,x}$  Amount of sugar plant (*i*-plant) waste, which would be disposed at the landfill in the periods *x*, *t* (Parameter B-1);
- f* CH<sub>4</sub> fraction captured and utilized at the landfill, fraction (Parameter B-2);
- $GWP_{CH_4}$  Global warming potential for methane, tCO<sub>2</sub>e/tCH<sub>4</sub> (According to the UNFCCC and the Kyoto Protocol) (Parameter B-3);
- OX* Oxidation factor reflects the amount of CH<sub>4</sub> that is oxidised in other material covering the waste, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15<sup>45</sup>) (Parameter B-4);
- F* Fraction of CH<sub>4</sub>, by volume, in generated landfill gas, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15<sup>46</sup>) (Parameter B-5);
- $DOC_f$  Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.13<sup>47</sup>) (Parameter B-6);
- MCF* CH<sub>4</sub> correction factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.14<sup>48</sup>) (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<sup>49</sup>) (Parameter B-8);
- k* Waste (pulp) decomposition factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.17<sup>50</sup>) (Parameter B-9);
- x* Period during the crediting period;
- 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)	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/	Comment

<sup>45</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>46</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>47</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_2\\_Ch2\\_Waste\\_Data.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf)

<sup>48</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>49</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>50</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)



to D.2.)							paper)	
-	-	-	-	-	-	-	-	-

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<sub>2</sub> 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<sub>2</sub> equivalent):**

Leakage in year y is calculated as follows:

$$LE_y = 0 \tag{Equation 5}$$

where

$LE_y$  Leakage due to the project realization in period y, tCO<sub>2</sub>e.



**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<sub>2</sub> 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<sub>2</sub>e);

$LE_y$  Leakage due to the project realization in period  $y$  (tCO<sub>2</sub>e);

$BE_y$  Baseline emissions in period  $y$  (tCO<sub>2</sub>e);

$PE_y$  Project emissions in period  $y$ (tCO<sub>2</sub>e).

**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:**

Collection and archiving of the information on the environmental impacts of the project will be done based on the approved EIA in accordance with the Host Party legislation (refer to 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 ton of sugar beet, which is deducted from the amount of pulp sold. Calibration interval of all the automobile scales are 1 year. Scales that are to be used for monitoring are listed in the table 12. More information will be provided in the monitoring report.
D.1.1.3. – ID B-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. Scales that are to be used for monitoring are listed in the table 12.. More information will be provided in the monitoring report.



D.1.1.1. – ID P-2 D.1.1.3. – ID B-2 <i>f</i> 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 <i>OX</i> 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 <i>F</i> 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 <i>MCF</i> 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 <i>DOC</i> 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 <i>k</i> 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.

Table 12. List of truck scales to be used for monitoring (any changes of the monitoring equipment during the project's lifetime will be reflected in the relevant monitoring report).

Enterprise	Measuring instrument	Unit	Manufacturer	Serial number	Accuracy class
Kozivskiy Sugar Plant LLC	Automobile electronic scales 60T	t	Skif LLC	3198899	1%
Lanovetskiy Sugar Plant LLC	Automated measurement system based on strain gauges C16A1C3	t	Skif LLC	02009	1.5
Borshivskiy Sugar Plant LLC	Automated measurement system based on strain gauges C16A1C3	t	Skif LLC	1516	1.5
Buchatskiy Sugar Plant LLC	Automobile scales "AC-60"	t	Skif LLC	02010	1.5
Zbarazkiy Sugar Plant LLC	Automated measurement system based on strain gauges C16A1C3	t	Skif LLC	3121766	+/- 10 kg

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

Khorostkivskiy Sugar Plant LLC 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 “Khorostkivskiy Sugar Factory” LLC 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 “Khorostkivskiy Sugar Factory” LLC 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.

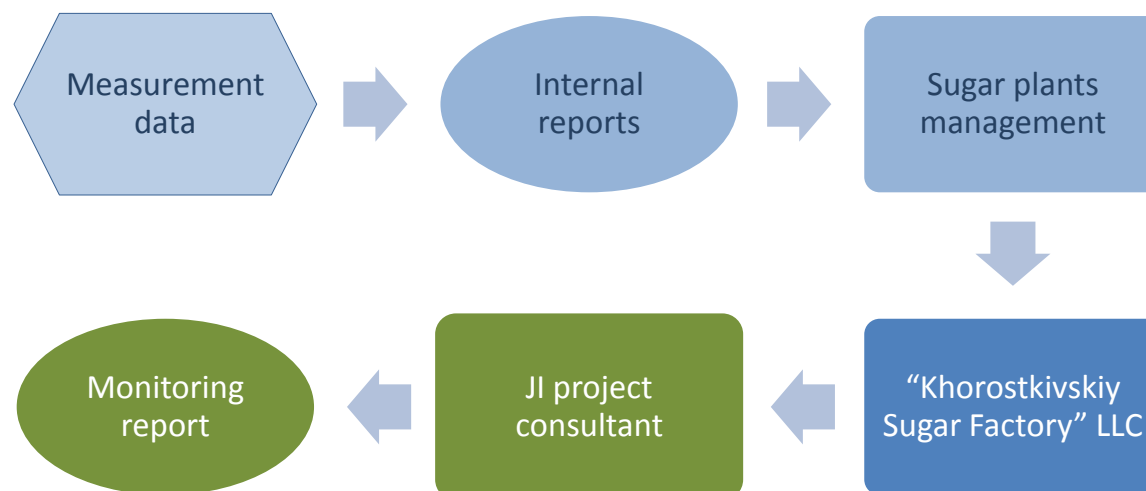


Figure 6. Monitoring flow chart.



**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 Myrnogo 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](mailto:nataliya.vasylieva@mtinvest.com.ua)

Position: Joint Implementation project manager

Phone/fax: +38 044 280 23 50

Monitoring plant is to be performed by “Khorostkivskiy Sugar Factory” LLC that is a project participant.



**SECTION E. Estimation of greenhouse gas emission reductions****E.1. Estimated project emissions:***Table 13. Estimated project emissions before the first crediting period.*

	Units	2005	2006	2007	Total
Project emissions from anaerobic fermentation of pulp	tCO <sub>2</sub> e	0	0	0	0
<b>Total project emissions before the first crediting period</b>	tCO <sub>2</sub> e	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

	Units	2008	2009	2010	2011	2012	Total
Project emissions from anaerobic fermentation of pulp	tCO <sub>2</sub> e	0	0	0	0	0	0
<b>Total project emissions during the first crediting period</b>	tCO <sub>2</sub> e	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

*Table 15. Estimated project emissions after the first crediting period (2013-2029).*

Year	Units	Project emissions from anaerobic fermentation of pulp
2013	tCO <sub>2</sub> e	0
2014	tCO <sub>2</sub> e	0
2015	tCO <sub>2</sub> e	0
2016	tCO <sub>2</sub> e	0
2017	tCO <sub>2</sub> e	0
2018	tCO <sub>2</sub> e	0
2019	tCO <sub>2</sub> e	0
2020	tCO <sub>2</sub> e	0
2021	tCO <sub>2</sub> e	0
2022	tCO <sub>2</sub> e	0
2023	tCO <sub>2</sub> e	0
2024	tCO <sub>2</sub> e	0
2025	tCO <sub>2</sub> e	0
2026	tCO <sub>2</sub> e	0
2027	tCO <sub>2</sub> e	0
2028	tCO <sub>2</sub> e	0
2029	tCO <sub>2</sub> e	0
<b>Total project emissions after the first crediting period</b>	<b>tCO<sub>2</sub>e</b>	<b>0</b>

**E.2. Estimated leakage:***Table 16. Estimated leakage before the first crediting period.*

	Units	2005	2006	2007	Total
<b>Estimated leakage before the first crediting period</b>	tCO <sub>2</sub> e	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

*Table 17. Estimated leakage during the first crediting period.*

	Units	2008	2009	2010	2011	2012	Total
<b>Estimated leakage during the first crediting period</b>	tCO <sub>2</sub> e	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

*Table 18. Estimated leakage after the first crediting period (2013-2029).*

Year	Units	Leakage from anaerobic fermentation of pulp
2013	tCO <sub>2</sub> e	0
2014	tCO <sub>2</sub> e	0
2015	tCO <sub>2</sub> e	0
2016	tCO <sub>2</sub> e	0
2017	tCO <sub>2</sub> e	0
2018	tCO <sub>2</sub> e	0
2019	tCO <sub>2</sub> e	0
2020	tCO <sub>2</sub> e	0
2021	tCO <sub>2</sub> e	0
2022	tCO <sub>2</sub> e	0
2023	tCO <sub>2</sub> e	0
2024	tCO <sub>2</sub> e	0
2025	tCO <sub>2</sub> e	0
2026	tCO <sub>2</sub> e	0
2027	tCO <sub>2</sub> e	0
2028	tCO <sub>2</sub> e	0
2029	tCO <sub>2</sub> e	0
<b>Estimated leakage after the first crediting period</b>	<b>tCO<sub>2</sub>e</b>	<b>0</b>

**E.3. The sum of E.1. and E.2.:***Table 19. Estimated total project emissions before the first crediting period.*

	Units	2005	2006	2007	Total
<b>Total project emissions before the first crediting period</b>	tCO <sub>2</sub> e	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>



Table 20. Estimated total project emissions during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
<b>Total project emissions during the first crediting period</b>	tCO <sub>2</sub> e	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Table 21. Estimated total project emissions after the first crediting period (2013-2029).

Year	Units	Project emissions from anaerobic fermentation of pulp
2013	tCO <sub>2</sub> e	0
2014	tCO <sub>2</sub> e	0
2015	tCO <sub>2</sub> e	0
2016	tCO <sub>2</sub> e	0
2017	tCO <sub>2</sub> e	0
2018	tCO <sub>2</sub> e	0
2019	tCO <sub>2</sub> e	0
2020	tCO <sub>2</sub> e	0
2021	tCO <sub>2</sub> e	0
2022	tCO <sub>2</sub> e	0
2023	tCO <sub>2</sub> e	0
2024	tCO <sub>2</sub> e	0
2025	tCO <sub>2</sub> e	0
2026	tCO <sub>2</sub> e	0
2027	tCO <sub>2</sub> e	0
2028	tCO <sub>2</sub> e	0
2029	tCO <sub>2</sub> e	0
<b>Total project emissions after the first crediting period</b>	<b>tCO<sub>2</sub>e</b>	<b>0</b>

**E.4. Estimated baseline emissions:**

Table 22. Estimated baseline emissions before the first crediting period.

	Units	2005	2006	2007	Total
Baseline emissions from anaerobic fermentation of pulp		244433	542620	662997	<b>1450050</b>
<b>Total baseline emissions before the first crediting period</b>	<b>tCO<sub>2</sub>e</b>	<b>244433</b>	<b>542620</b>	<b>662997</b>	<b>1450050</b>

Table 23. Estimated baseline emissions during the first crediting period

	Units	2008	2009	2010	2011	2012	Total
Baseline emissions from anaerobic fermentation of pulp	tCO <sub>2</sub> e	666680	819855	1014099	1242855	1503462	<b>5246951</b>



<b>Total baseline emissions during the first crediting period</b>	tCO <sub>2</sub> e	<b>666680</b>	<b>819855</b>	<b>1014099</b>	<b>1242855</b>	<b>1503462</b>	<b>5246951</b>
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Table 24. Estimated total baseline emissions after the first crediting period (2013-2029).

Year	Units	Baseline emissions from anaerobic fermentation of pulp
2013	tCO <sub>2</sub> e	1 720 053
2014	tCO <sub>2</sub> e	1 900 064
2015	tCO <sub>2</sub> e	2 049 671
2016	tCO <sub>2</sub> e	1 999 332
2017	tCO <sub>2</sub> e	2 277 348
2018	tCO <sub>2</sub> e	2 363 234
2019	tCO <sub>2</sub> e	2 434 614
2020	tCO <sub>2</sub> e	2 493 938
2021	tCO <sub>2</sub> e	2 543 243
2022	tCO <sub>2</sub> e	2 584 220
2023	tCO <sub>2</sub> e	2 618 275
2024	tCO <sub>2</sub> e	2 646 580
2025	tCO <sub>2</sub> e	2 670 103
2026	tCO <sub>2</sub> e	2 689 653
2027	tCO <sub>2</sub> e	2 705 904
2028	tCO <sub>2</sub> e	2 719 408
2029	tCO <sub>2</sub> e	2 730 631
<b>Total baseline emissions after the first crediting period</b>	<b>tCO<sub>2</sub>e</b>	<b>41 146 271</b>

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

Table 25. Estimated emission reductions before the first crediting period.

	Units	2005	2006	2007	Total
<b>Emission reductions before the first crediting period</b>	tCO <sub>2</sub> e	<b>244433</b>	<b>542620</b>	<b>662997</b>	<b>1450050</b>

Table 26. Estimated emission reductions during the first crediting period.

	Units	2008	2009	2010	2011	2012	Total
<b>Emission reductions during the first crediting period</b>	tCO <sub>2</sub> e	<b>666680</b>	<b>819855</b>	<b>1014099</b>	<b>1242855</b>	<b>1503462</b>	<b>5246951</b>

Table 27. Estimated emission reductions after the first crediting period (2013-2029).

Year	Units	Emission reductions from anaerobic fermentation of pulp
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<b>2013</b>	tCO <sub>2</sub> e	1 720 053
<b>2014</b>	tCO <sub>2</sub> e	1 900 064
<b>2015</b>	tCO <sub>2</sub> e	2 049 671
<b>2016</b>	tCO <sub>2</sub> e	1 999 332
<b>2017</b>	tCO <sub>2</sub> e	2 277 348
<b>2018</b>	tCO <sub>2</sub> e	2 363 234
<b>2019</b>	tCO <sub>2</sub> e	2 434 614
<b>2020</b>	tCO <sub>2</sub> e	2 493 938
<b>2021</b>	tCO <sub>2</sub> e	2 543 243
<b>2022</b>	tCO <sub>2</sub> e	2 584 220
<b>2023</b>	tCO <sub>2</sub> e	2 618 275
<b>2024</b>	tCO <sub>2</sub> e	2 646 580
<b>2025</b>	tCO <sub>2</sub> e	2 670 103
<b>2026</b>	tCO <sub>2</sub> e	2 689 653
<b>2027</b>	tCO <sub>2</sub> e	2 705 904
<b>2028</b>	tCO <sub>2</sub> e	2 719 408
<b>2029</b>	tCO <sub>2</sub> e	2 730 631
<b>Estimated emission reductions after the first crediting period</b>	<b>tCO<sub>2</sub>e</b>	<b>41 146 271</b>

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

*Table 28. Estimated balance of emissions under the proposed project before the first crediting period*

Year	Estimated project emissions ( tons of CO <sub>2</sub> equivalent)	Estimated leakage ( tons of CO <sub>2</sub> equivalent)	Estimated baseline emissions ( tons of CO <sub>2</sub> equivalent)	Estimated emission reductions ( tons of CO <sub>2</sub> equivalent)
Year 2005	0	0	244 433	244 433
Year 2006	0	0	542 620	542 620
Year 2007	0	0	662 997	662 997
<b>Total (tons of CO<sub>2</sub> equivalent)</b>	<b>0</b>	<b>0</b>	<b>1 450 050</b>	<b>1 450 050</b>

*Table 29. Estimated balance of emissions under the proposed project during the first crediting period*

Year	Estimated project emissions ( tons of CO <sub>2</sub> equivalent)	Estimated leakage ( tons of CO <sub>2</sub> equivalent)	Estimated baseline emissions ( tons of CO <sub>2</sub> equivalent)	Estimated emission reductions ( tons of CO <sub>2</sub> equivalent)
Year 2008	0	0	666 680	666 680
Year 2009	0	0	819 855	819 855
Year 2010	0	0	1 014 099	1 014 099
Year 2011	0	0	1 242 855	1 242 855
Year 2012	0	0	1 503 462	1 503 462
<b>Total (tons of CO<sub>2</sub> equivalent)</b>	<b>0</b>	<b>0</b>	<b>5 246 951</b>	<b>5 246 951</b>

*Table 30. Estimated balance of emissions under the proposed project after the first crediting period*

Year	Estimated project emissions ( tons of CO <sub>2</sub> equivalent)	Estimated leakage ( tons of CO <sub>2</sub> equivalent)	Estimated baseline emissions ( tons of CO <sub>2</sub> equivalent)	Estimated emission reductions ( tons of CO <sub>2</sub> equivalent)
Year 2013	0	0	1 720 053	1 720 053
Year 2014	0	0	1 900 064	1 900 064
Year 2015	0	0	2 049 671	2 049 671
Year 2016	0	0	1 999 332	1 999 332
Year 2017	0	0	2 277 348	2 277 348
Year 2018	0	0	2 363 234	2 363 234
Year 2019	0	0	2 434 614	2 434 614
Year 2020	0	0	2 493 938	2 493 938
Year 2021	0	0	2 543 243	2 543 243
Year 2022	0	0	2 584 220	2 584 220
Year 2023	0	0	2 618 275	2 618 275
Year 2024	0	0	2 646 580	2 646 580
Year 2025	0	0	2 670 103	2 670 103
Year 2026	0	0	2 689 653	2 689 653
Year 2027	0	0	2 705 904	2 705 904
Year 2028	0	0	2 719 408	2 719 408
Year 2029	0	0	2 730 631	2 730 631
Total (tons of CO <sub>2</sub> equivalent)	<b>0</b>	<b>0</b>	<b>41 146 271</b>	<b>41 146 271</b>

**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<sup>51</sup> (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.

The full scope EIA in accordance with the Ukrainian legislation has been conducted for each of the sugar plants attributed to the proposed project.

In general, the environmental impact of the project activity implementation is positive. Changing the methods of waste management reduces pollution of groundwater with products of pulp decomposition during its storage at the landfills that also significantly effects on the conditions for the growth of pathogenic flora that may also spread through groundwater. In addition, less amount of pulp anaerobic fermentation products release into the atmosphere, not only methane that in toxicology is classified as industrial poison<sup>52</sup>, but also ammonia, hydrogen sulfide and carbon monoxide.

Implementation of the project activity also has a positive social impact through removing of the concentrated odor coming from pulp pits and improving working conditions at sugar plants. Since most of the farms are located in rural areas, where the use of well water is widespread, the reduction of groundwater pollution has positive effects on health of locals.

No transboundary effects are not identified. Impacts that occur in any other country, and caused by the implementation of this project physically located entirely within Ukraine, were not identified.

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<sup>51</sup>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

<sup>52</sup><http://grigaonline.narod.ru/farma/toxicoligija.htm>



**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:**

Completion of Environmental Impact Assessment reports and positive Findings of the State Authority of Environment and Natural Resources conclude the procedure of the environmental impact assessment according to the Ukrainian laws and regulations. Each of the project poultry farms has required a working design documentation, which includes the volume of EIA, which passed environmental review and was approved by the Ministry of Environment and Natural Resources of Ukraine or by its regional department.

Statistical reporting on environmental impacts of the enterprises is performed by filling in the following statistical forms: # 2 tp-air "Report on atmospheric air protection"; # 1-waste "Waste treatment"; # 1-VT "Report on waste and package"; # 2-TP (vodgosp) "Report on the use of water".

All the above mentioned documentation is available on request of AIE or during visits to the company.





**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:	Limited Liability Company “Khorostkivskiy Sugar Factory”
Street/P.O.Box:	Zavodska Str.
Building:	building 1
City:	Khorostkiv city
State/Region:	Ternopil region
Postal code:	48240
Country:	Ukraine
Phone:	+38 044 393-47-93
Fax:	+38 044 393-47-93
E-mail:	Bochan@mriya.ua
URL:	-
Represented by:	
Title:	Deputy director
Salutation:	-
Last name:	Bochan
Middle name:	Ihorovych
First name:	Ihor
Department:	-
Phone (direct):	+38 044 393-47-93
Fax (direct):	+38 044 393-47-93
Mobile:	-
Personal e-mail:	Bochan@mriya.ua

Limited Liability Company “Khorostkivskiy Sugar Factory”:

EDRPOU Code (Code in the State Unified Register of Companies and Enterprises of Ukraine):  
35218790

KVED<sup>53</sup> types of economic activities:

10.81 Sugar production

46.36 Wholesale of sugar, chocolate and confectionery

46.71 Wholesale of solid, liquid and gaseous fuels and related products 49.41 Automobile cargo transport

52.10 Storage Industry

<sup>53</sup>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:	<a href="mailto:atumis@mail.ru">atumis@mail.ru</a>

**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:	<a href="http://www.mtinvest.com.ua">http://www.mtinvest.com.ua</a>
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:	<a href="mailto:nataliya.vasylieva@mtinvest.com.ua">nataliya.vasylieva@mtinvest.com.ua</a>

## 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:

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

where:

- $BE_y$  Baseline GHG emissions in the period  $y$ , (tCO<sub>2</sub>e<sup>54</sup>),
- $BE_{i,biomass,y}$  Baseline CH<sub>4</sub> emissions from degradable organic waste of  $i$ -plant at the landfill in the period  $y$ , (tCO<sub>2</sub>e);
- $i$  Project plant index;
- $n$  Number of project plants.

Baseline CH<sub>4</sub> emissions from degradable organic waste at the landfill<sup>55</sup> are calculated as follows<sup>56</sup>:

$$BE_{i,biomass,y} = \varphi \cdot (1 - f) \cdot GWP_{CH_4} \cdot (1 - OX) \cdot 16/12 \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^y W_{i,x} \cdot DOC \cdot e^{-k \cdot (y-x)} \cdot (1 - e^{-k})$$

where:

- $BE_{i,biomass,y}$  Baseline CH<sub>4</sub> emissions from degradable organic waste of  $i$ -plant at the landfill in the period  $y$ , (tCO<sub>2</sub>e);
- $W_{i,x}$  Amount of sugar plant ( $i$ -plant) waste, which would be disposed at the landfill in the periods  $x$ , t (Ex-post for 2005-2011; 2012-2029 – ex-ante );
- $\varphi$  Correction factor to account for model uncertainties, ratio. (Study on modeling landfill gas formation<sup>57</sup>)

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<sup>54</sup>1 tCO<sub>2</sub>e = 1 tCO<sub>2</sub>.

<sup>55</sup> 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.

<sup>56</sup> 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<sub>2</sub> equivalent.



<i>f</i>	CH <sub>4</sub> fraction captured and utilized at the landfill, fraction;
<i>GWP<sub>CH4</sub></i>	Global warming potential for methane, tCO <sub>2</sub> e/tCH <sub>4</sub> (According to the UNFCCC and the Kyoto Protocol);
<i>OX</i>	Oxidation factor reflects the amount of CH <sub>4</sub> that is oxidised in other material covering the waste, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15 <sup>58</sup> );
<i>F</i>	Fraction of CH <sub>4</sub> , by volume, in generated landfill gas, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.15 <sup>59</sup> );
<i>DOC<sub>f</sub></i>	Fraction of the degradable organic carbon that decomposes, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.13 <sup>60</sup> );
<i>MCF</i>	CH <sub>4</sub> correction factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.14 <sup>61</sup> );
<i>DOC</i>	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 <sup>62</sup> );
<i>k</i>	Waste (pulp) decomposition factor, fraction (2006 IPCC Volume 5: Waste, Chapter 3, Page 3.17 <sup>63</sup> );
<i>x</i>	Period during the crediting period: $x \in (1; y)$ ;
<i>y</i>	Period for which methane emissions are calculated.

**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:**

<b>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, Kozivskiy Sugar Plant LLC ( $i=1$ )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			
Source of data (to be) used	Kozivskiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	136858	191257	119817	63597
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	132000	173250	214500	255750
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			

<sup>57</sup> Oonk, H., Weenk, A., Coops, O., Luning, L., 1994. Validation of landfill gas formation models; EWAB 9427; NOVEM, Utrecht, The Netherlands.

<sup>58</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>59</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>60</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_2\\_Ch2\\_Waste\\_Data.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf)

<sup>61</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>62</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)

<sup>63</sup> [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5\\_Volume5/V5\\_3\\_Ch3\\_SWDS.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf)



<b>Data/Parameter</b>	$W_{i,x}$			
Data unit	Sugar production waste (pulp) that would have to be disposed to the landfill, Lanovetskiy Sugar Plant LLC ( $i=2$ )			
Description	To be monitored throughout the monitoring period			
Time of <u>determination/monitoring</u>	Lanovetskiy Sugar Plant LLC reporting data			
Source of data (to be) used	Sugar production waste (pulp) that would have to be disposed to the landfill, Lanovetskiy Sugar Plant LLC ( $i=2$ )			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	92232	142314	116206	47236
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	80000	105300	139400	172200
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>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, Borshivskiy Sugar Plant LLC ( $i=3$ )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			
Source of data (to be) used	Borshivskiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	70568	88594	34443	33017
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	70000	105000	140000	175000
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>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, Buchatskiy Sugar Plant LLC ( $i=4$ )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			
Source of data (to be) used	Buchatskiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	89241	145580	36828	27939
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	80000	104000	128000	152000
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>Data/Parameter</b>	$W_{i,x}$			
Data unit	t			
Description	Sugar production waste (pulp) that would have to be disposed to the landfill, Zbarazkiy Sugar Plant LLC ( $i=5$ )			
Time of <u>determination/monitoring</u>	To be monitored throughout the monitoring period			
Source of data (to be) used	Zbarazkiy Sugar Plant LLC reporting data			
Value of data applied (for ex ante calculations/determinations)	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
	127974	150090	141048	72783
	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
	200000	216000	224000	240000
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 04 аркушів

Заступник директора

ТОВ «Хоростківський цукровий завод»



Л.І.