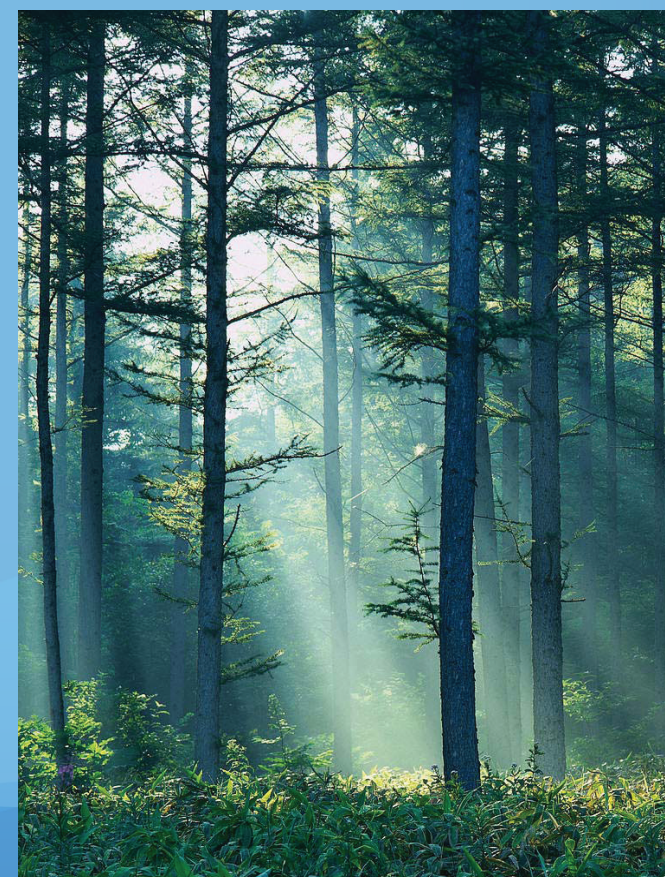




Study
Utilization of biomass potentials for production of energy in
The East Planning Region
Annexes



Beneficiary	<p>Centre for development of the East planning region</p> <p>Str. Vanco Prke 119, 2nd floor Shtip</p> <p>www.rdc.mk</p> <p>e-mail: : eastregion@rdc.mk</p>
Team Leader	<p>Prof. PhD. Strahinja Trpevski</p> <p>strahinja@nssd.com.mk</p>
Team of Experts	<p>Prof. PhD. Vesna Stojanova, economy</p> <p>Prof. PhD. Svetislav Krstic, biology</p> <p>Prof. PhD. Vlado Vukovic, agriculture and forestry</p> <p>Prof. PhD. Natasha Markovska, energy</p> <p>Ljubomir Petkovski, environment</p> <p>Roze Dimovska, agriculture</p>
Translation	Natasha Cvetkovska
Review	PhD. Denis Zhernovski

Study

Utilization of biomass potentials for production of energy in the East Planning Region

Annexes



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Annex 1. Questionnaire for individuals

Use of biomass

Questionnaire for HOUSEHOLDS

1. Settlement _____, Municipality _____
2. Area of arable land being cultivated? _____
3. Type of agricultural crops and area (please specify in hectares or acreage)
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
 - f. _____
 - g. _____
 - h. _____
4. How are plant remnants treated (used) as crops, as cattle food, they are thrown away, burned, left on the field – ploughed, composted
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
 - f. _____
 - g. _____
 - h. _____
 - i. _____
5. Should you be offered a certain price, would you sell the residues of the agriculture crops you are cultivating? (please circle)
- yes - no - don't know - I need more information

- depends on the price offered
6. Do you have interest in cultivating industrial crops for the purpose of producing biomass? (please circle)
- yes - no - don't know - I need more information

7. Types of cattle and their number

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

8. Where do you keep the cattle? (in a stable, in the open, please specify if other)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

9. What do you do with cattle-based waste? (please circle)

- we use it as fertilizer (compost it)
- we throw it away
- we sell it; other _____ (please specify)

10. What do you do with the organic waste from the communal waste? (please circle)

- we throw it away along with the remaining waste
- we compost it
- we burn it
- we use it for _____ (please specify)

11. Would you separate the organic waste from the other types of communal waste? (please circle)

- yes
- no
- don't know
- I need more information

Date _____, 2010, Questioner _____

Name and Last Name

Signature

Annex 2. Questionnaire for Industry

QUESTIONNAIRE

Wood industry, furniture

Company _____ from _____

Production of _____

Total _____ m³ wood (input)

Products _____ m³ (output)

Waste _____ m³

How is waste handled

It is used for individual needs _____ %

It is sold _____ %

It is thrown away, dumped _____ %

If you are using the waste for heating purposes, please provide the following information:

Strength of boiler _____

Year of production _____

Quantity of waste used _____ m³ /annually.

QUESTIONNAIRE for Municipalities

Municipality _____

How is the Municipal building heated? _____

Fuel used _____, Average consumption _____ per year

Total area heated _____

Central heating system (for inhabitants)

Does the municipality have a settlement with a central heating system _____

Number of connections _____, total heating area _____.

Capacity _____

Elementary and Secondary Schools

Schools with a central heating system _____

Total heated area per school:

_____	_____ m ²
_____	_____ m ²
_____	_____ m ²
_____	_____ m ²
_____	_____ m ²
_____	_____ m ²
_____	_____ m ²

Other public buildings with central heating system (Cultural Centers, Libraries, Healthcare Centers, Day care centers, Public Enterprises and other)

Total heated area per building:

_____	_____ m ²
_____	_____ m ²
_____	_____ m ²
_____	_____ m ²
_____	_____ m ²
_____	_____ m ²
_____	_____ m ²

QUESTIONNAIRE for the Foodstuff Industry

Municipality _____, Settlement _____

Quantity of organic waste _____ tons/per year

Waste treatment

It is used for individual needs, it is composted _____%

It is sold _____%

It is thrown away, dumped _____%

Need for thermal energy

Do you use thermal energy in the production process? _____

In which period do you have a need for thermal energy _____ (winter period, 6 months, throughout the year)

What is the quantity of thermal energy needed for the production process (monthly average or annually) _____.

How are buildings heated (central system _____).

Fuel used _____,

Average consumption _____ annually.

Total area heated _____.

Annex 3. Estimation of the price of wood chips deriving from woodcutting remains

•collected wood mass residue, Franco forest road	1000 den/m ³	
•transportation for 30 km per ton	250 denars/ton	
Chipper FIAT IVECO (2198 – 2418)) – 1800 denars/per hour		
50m ³ are grinded in 8 hours time period:		
–50 m ³ x 1000	=	50000
Chopper 8 x 1800	=	14400
	-	
Sub – Total		64400
Other costs 3%		1932
Total		66332
90Hm ³ (packed metric cubes) are derived from 50m ³ of branches and other remains		
or 32.5 tons of wood chips / cuttings		
Costs		
66332 / 32.5 =		2041

Transportation		250
Total denars/per ton		2291

Annex 4. Estimation of the price of wood chips deriving from firewood

Cost price of firewood		
Free on storehouse		2900
Chipper FIAT IVECO (2198 – 2418) – 2430 denars/per hour		
Loading truck	2430 denars/per hour	
50m3 are grinded in 8 hours time period		
–50 m3 x 2900	=	145000
Chopper 8 x 1800	=	14400
Loading truck		14400
<hr/>		
Loader 2 hours 250 den/hour		500
	60	
Loading of cuttings	den/m3	3000
<hr/>		
Costs		177300
125 Hm3 (packed cubic meters) are derived from 50m3 of firewood or 43 tons of wood chips / cuttings		
Costs		
177300 / 45 =		3940
<hr/>		

Transportation		250
Total denars/per ton		
		4190
Total costs	3500 - 4300 depending on type of wood	
Dried out 20%		

Annex 5

Project Proposal no. 1

Finalizing and extending the Project for production of biodiesel in the Municipality of Probistip

Brief Summery

Within the framework of the Project for production of biodiesel in the Municipality of Probistip, realised in the period of 2007 – 2009, comprehensive reasearch was made on the yields of rape by hectare, for the spring and autumn sowing season. During the research, 5 hectares of rape were planted and harvested. A reactor was purchased, but for unknown reasons, the other necessary equipment (press) for completing the production process was never purchased. Because of this, currently, the rape is still kept by the farmers who planted it and who were included in the project, which can cause resistance on their behalf in regards to projects with similar goals.

Overall Project Objective

Sustainable development of the East Planning Region

Specific Objectives

Production of biodiesel for private needs.

Increasing incomes in rural areas.

Re-cultivation of polluted land areas (indicatory).

Location: Municipality of Probistip

Project Description

According to available information, approximately 3500 hectares of farming land are polluted as a result of damage of the nearby mine. As a result, 3500 hectares remain non-arable. At the same time, the project that started recently is still not completed, even though it is a pilot project which needs to demonstrate the benefits of using renewable energies. The finalization of this project should represent an imperative for the project beneficiary, because it is the first project in this field that is being realized in the region. Cultivation of the rape is highly recommended for polluted soils, as it extracts the heavy metals from the soil and contributes to its re-cultivation. This project proposal has the purpose of increasing the capacities for processing the rape, by procurement of

appropriate equipment necessary for completing the production process and for planting parts of the polluted soil with the rape. In the long run, farmers need to be supported in their efforts in planting this type of crop on all polluted areas, but its sale will be secured only if domestic biodiesel companies start processing this type of industrial crop. This project incorporates 200 hectares of area, which are to be planted with winter crops of rape, as results indicate that winter crops do not require watering. At the same time, it anticipates forming a network for collecting used oil from larger producers of this type of oil waste, mainly from hotels and restaurants, in order to make use of this resource in obtaining biodiesel. The biodiesel is then planned to be used for the needs of the municipality, whereas part of it will be given back to the farmers in order to satisfy their needs.

Planned Activities

The following key activities are planned within the project framework:

- analysis of the technical aspects of the process (defining the necessary equipment);
- procurement of a press with a capacity of 300/h, a filtering system for the used oil with a capacity of 10 kg, appropriate storage containers, containers for collecting used oil, other additional equipment and expendable materials (in accordance with analysis);
- signing agreements with farmers, purchasing seeds, preparation of the land, planting and harvesting;
- processing current quantities of rape and obtaining raw oil;
- creating a network for collecting used oil in the nearby settlements and
- oil processing and obtaining biodiesel – ongoing production.

Timetable

Activity	Duration	months																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Analysis	1 m	■																
Procurement of equipment	8 m		■	■	■	■	■	■	■	■								
Agreements	4 m		■	■	■	■												
Sowing and harvesting	7 m						■	■	■	■	■	■	■					
Processing current quantities of rape	1 m								■	■								
Network for collecting	3 m										■	■	■					
Processing new quantities of rape	5m -													■	■	■	■	■
Oil processing	5m -										■	■		■	■	■	■	■



Press

Upon completion of the Project, the Municipality of Probistip is to undertake the work of the biodiesel plant and will continue the production. The recommendation is that the local public enterprise be involved in this Project, within which framework it may continue to function.

Project Beneficiary: Center for Development of the East Planning Region

Indicators: Quantity of biodiesel produced; area covered with rape, number of farmers involved.

Project Budget: The total project budget is estimated at 25000 euros.

Item	Costs (euros)
Training of staff	500
Procurement of equipment	14000
Procurement of seed material	1000
Expendable Materials used in the first 3 years	2000
Staff	4500
Transportation costs	1000
Other costs	2000
Total:	25000

Project Proposal no.2

Project for production of wood chips

Brief Summary

In the East Planning Region, as well as in other regions of Macedonia, firewood is the most significant fuel used for heating purposes in the winter season. Relatively large quantities of wood mass remain in the forests after woodcutting of firewood and technical wood has been made. These remains, in most part remain unutilized in the forests. In the past several years, part of the local population has started making use of small proportions of these remains. The Public Enterprise Makedonski Sumi, which is solely responsible for the management of the forests, has defined prices for this type of wood biomass. Additionally, in the processing of the technical wood, the outer strip is separated as well as larger pieces of wood, which can all be used in obtaining wood chips.

Overall Project Objective

Sustainable Development of the East Planning Region

Specific Objectives

Environmental protection – reducing wood waste ending in dumps;

Forest protection;

Reducing costs for heating energy.

Location: Malesevski Micro-Region

Brief Project Description

Wood chips, as type of biomass, can be used in the production of heating and electric energy. The Project anticipates utilization of wood remains, which remain in the forest after woodcutting of technical wood and firewood has been made. For this purpose, procurement of necessary equipment will be made for production of this of type of fuel, and for organizing the entire process. Because greater part of the forest area is located in the Malesevski Micro-Region, the project is planned to be implemented in this location. With the aim of greater incorporation of forests from

which these remains would be used, a portable shredder is planned to be procured for cutting the wood into tiny pieces in the form of “chips” (picture 8). The characteristics of this type of equipment need to be determined within the framework of an analysis and depend on the available financial resources. With the procurement of this type of shredder (Picture 36), transportation costs will decrease in relation to the immovable shredder that can be located in only one place. This is mainly due to the low compactness of the wood remains (branches, stubs, roots). The second segment of the project refers to the separation of the wood remains from the primary processing of the technical wood. The larger chunks of wood waste, as well the barks of trees will be processed into wood chips. This project is a precondition for implementation of the other project proposals, such as the transformation of the existing heating systems, i.e., their adaptation for using wood chips as fuel for the production of heating energy. In defining the capacity of the equipment, the projects for transforming the heating systems should also be taken into consideration, in order to have optimal sizing of the equipment, where the production of chips is in accordance with the actual needs. The project will enable production of appropriate fuel for boilers that use this type of biomass. In providing project sustainability, and for the purpose of reducing project costs, making use of the existing facilities for storing chips and of the existing work force, it is important that the local public enterprises be included in the realization of the planned activities. The project will also incorporate the first few months of the beginning of the production of wood chips. It enables implementation in phases, starting with an initial procurement of equipment with a small capacity, followed by procurement of equipment with greater capacities as this sector develops furthermore. Based on performed analysis, the price for one ton of wood chips should range from 32 to 38 euros.

Planned Activities

The following key activities are planned within the project:

- analysis of technical aspects of the process (defining the necessary equipment) and defining the location for storing the chips (local public enterprise);
- procurement of appropriate equipment and expendable materials (in accordance with analysis);
- signing of agreement with Public Enterprise “Makedonski sumi”;
- training on how to use the equipment;
- installation and test production of wood chips;
- making agreements with companies dealing with technical wood and
- starting with production of wood chips.

Picture 36. Shredders with various capacities



Timetable

Activity	duration	Months											
		1	2	3	4	5	6	7	8	9	10	11	12
Analysis	2 m	■	■										
Procurement of equipment	5 m			■	■	■	■	■					
Agreement with Public Enterprise "Malesevski Sumi"	3 m					■	■	■					
Training	1 m							■					
Installation and test production	1 m								■				
Agreements technical wood (industry)	3 m						■	■	■				
Starting production of chips - production	1m + 2m										■		

Project Beneficiary: The Center for Development of the East Planning Region and local self-governments involved in the project (Pehcevo, Berovo, Delcevo)

Indicators: Quantity of processed wood biomass, quantity of chips produced, quantities of wood waste ending in dumps.

Assumptions: the Public Enterprise “Makedonski Sumi” is willing to cooperate, especially in the part of collecting the remains from the woodcutting and their transportation to the forest road.

Risks: Providing funds for realization of a project for adaptation of the heating system. In order to minimize the effects of a potential risk, it is recommended that a project with lower capacities of equipment be implemented.

Project Budget: The project itself is quite flexible in relation to the financial resources necessary for its realization. Depending on the defined capacities of the equipment, and the type of equipment that will be procured, estimations range from 13000-60000 euros. As presently there are no consumers that would use this type of fuel, it is recommended that a project be implemented for production of wood chips, with a capacity of equipment for producing up to 10 m³ per hour (13000 – 15000 euros). With the number of consumers increasing, followed by an increase in the demand for this type of fuel, the capacities for production can be easily increased.

Project Proposal no. 3

Projects for production of pellets

Brief Summery

Despite interest shown by some responsible persons in private companies generating organic waste in the processing of certain agricultural products (rice peel), the possibility of using this type of waste for production of pellets has still not registered any significant activities in the direction of pallet production. The quantities of agricultural crop residues, along with the wood waste are sufficient enough for the functioning of plants for production of pellets.

Overall Project Objective

Sustainable development of the East Planning Region

Specific objectives

Environmental protection – reducing air pollution; forest protection; reduced quantities of organic waste in landfills, appropriate treatment of part of the organic waste.

Reducing costs for heating energy.

Increasing incomes in rural areas.

Location:

Malesevski Micro–Region (Pehcevo, Berovo, Delcevo) – wood palletts, proposed location is Pehcevo.

Kocansko pole (Zrnovci, Oblesevo – Cesinovo, Karbinci) – pallets from agriculture waste, wood waste and other types of waste, proposed location is Cesinovo – Oblesevo.

Brief Project Description

Wood waste in the form of tiny pieces, sawdust and dust are all generated in the process of wood processing. In most cases, this type of waste ends in local landfills where it is burned. This type of waste, should it be used, can serve as raw material in the production of pellets (Picture 9). More significant quantities of this type of waste are generated in the Malesevski Micro-Region, especially in Pehcevo, which is transported to local landfills and burned in the open.

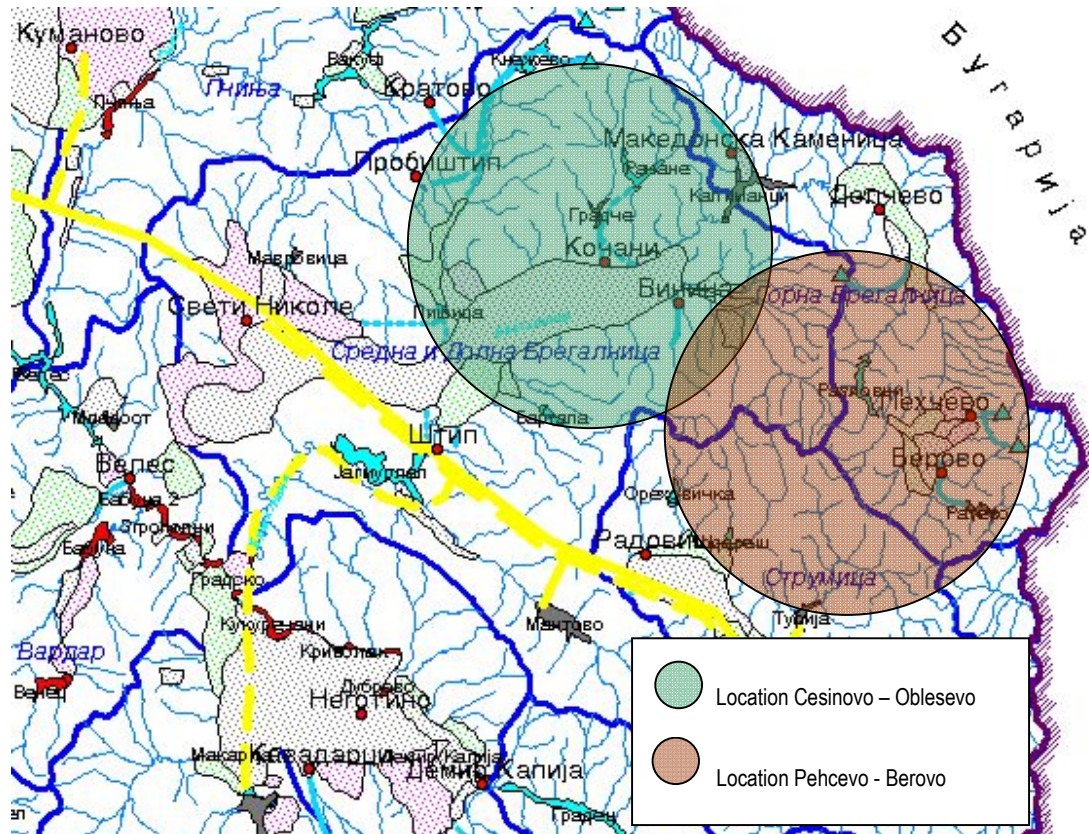
The Project Proposal consists of two sub-projects. The first sub-project is focused on establishing production of pallets, which as raw material will use the wood mass residues from the primary and secondary processing of the technical wood. The second sub-project is focused on introducing production of pallets by combining agricultural remains, wood waste deriving from processing of technical wood and remains from processing agricultural products (rice peel). Both cases involve using raw materials which currently are free of charge, and which will contribute to cost savings, mainly as a result of eliminating transportation to the landfill and their treatment there. In the meanwhile, we must not forget the effects over the environmental protection. An analysis will be conducted within the framework of the Project, on the characteristics of the wood waste that will be used in the production of pallets, as well as an analysis of the characteristics of all the input raw materials which are planned to be used in the production of pallets within the second sub-project, all with the purpose of defining the best proportion of components. A network for collecting raw materials is also planned to be developed within the framework of the project. The Malesevski Micro-Region of Pehcevo is planned as the location for the first sub-project (as a result of registered quantities of wood waste).

Previous experience shows that collecting agricultural residues (after harvesting), is cost-effective for distances of not more than 30km. Having this fact into consideration, as well as the fact that the capacities for processing the rice are mainly located in the Municipality of Cesinovo–Oblesevo, it is therefore proposed that this plant be located in the Municipality of Cesinovo–Oblesevo, while at the same time near the city of Kocani. Picture 37 displays the area most favourable for collecting the raw materials.

From the perspective of pallets distribution, more specifically, their usage, previous experience shows that it's most economical when the transportation of pallets to the users is made within 50km. An analysis will be conducted for determining the characteristics of the equipment necessary for pallets production. The equipment should be determined according to the available financial resources. The capacity of a plant for production of pallets may range from 50kg/per hour to 5 tons/per hour. The pallets may range in size from 6mm to 25mm, depending on the equipment and raw materials.

This project is a precondition for implementing the project proposal on transformation of the existing heating systems, in particular its adaptation for using pallets, as fuel for production of heating energy. In defining the capacity of the equipment, the projects for transforming the heating systems should also be taken into consideration, in order to have optimal sizing of the equipment, where the quantities of pallets produced meet the actual needs. The Project will enable production of appropriate fuel for boilers using pellets.

Picture no.37



For the purpose of achieving project sustainability and reducing project costs, as well as making use of the existing facilities for setting up the plant for producing and storing pallets as well as for using the existing work force, it is important to include the local public enterprises in the realization of the planned activities. The first few months of the beginning of the pallet production are planned to be incorporated within the project. The project also provides implementation in phases, starting with implementation of one of the sub-projects, and depending on the available financial resources, continuing with the second sub-project. Nevertheless, each sub-project can also be defined as a separate project. Based upon the elements analysed, it is estimated that the production price of one ton of pallets from wood waste (first sub-project) would range from 100 – 120 euros, whereas the production price of one ton of pallets obtained from combined raw materials (second sub-project) would range from 120-140 euros. Picture 38 displays machines with different capacities for

production of pallets. Furthermore, the procurement of a grinder is also necessary, for grinding the entire material and preparing it for production of pallets. Picture 39 displays different raw materials prepared for production of pallets. Picture 40 displays machines intended for preparation of raw materials, more specifically for grinding raw materials.

Picture no. 38 Machines with different capacities intended for the production of pallets



Picture no. 39 Raw materials prepared for production of pallets



Picture no. 40 Macines for preparing raw materials- grinding



Planned Activities

The following key activities are planned within the Project :

- analysis of the technical aspects of the process (analysis of the basic raw material base, defining the capacities of the necessary equipment) and defining the location for the plant and for storing the pallets (local PE);
- providing a location, procurement of appropriate equipment and expendable materials (according to analysis);
- creating a network for collecting the agricultural residues and organizing the collection;
- installation of the equipment and training on how to use it and
- installation and test production of pallets
- starting with production of pallets

Timetable

The proposed time framework anticipates parallel implementation of both sub-projects. The time framework, that is the implementation of these sub-projects should be in line with the actual financial and technical opportunities.

Activity	Duration	months											
		1	2	3	4	5	6	7	8	9	10	11	12
Sub-project 1													
Analysis	2 M	■	■										
Location	3 M		■	■	■								
Procurement of equipment	5 M			■	■	■	■	■					
Installation and test production	1 M								■	■			
Training	1 M								■	■			
Initial production of pellets - production	2M + 2M										■	■	
Sub-project 2													
Analysis	2 M	■	■										
Location	3 M		■	■	■								
Procurement of equipment	5 M			■	■	■	■	■					
Creating a network and appropriate logistics	6 M			■	■	■	■	■	■				
Installation and test production	1 M								■	■			
Training	1 M								■	■			
Initial production of pellets - production	2M + 2M										■	■	■

Project Beneficiary: The Center for Development of the East Planning Region and the local self-governments incorporated with the Project.

Indicators: Quantities of biomass processed from various resources; quantity of pellets produced; quantity of agricultural residue ending in landfills or burned in the open; quantities of wood wastes ending up in landfills.

Assumptions: Willingness of farmers to allow collecting of agricultural residue, those processing technical wood to continue submitting the wood waste they do not need; local public enterprises need to be open for cooperation.

Risks: Providing funds for implementing a project on transforming the heating system for using pellets. In order to minimize the effects of a potential risk, a project with lower capacities of equipment should be implemented. A long-term risk is identified in regards to the mentality of the population, in relation to submitting the agricultural residue.

Project Budget: The Project itself is quite flexible in relation to the financial resources necessary for its realization. Depending on the defined capacities of the equipment, and on the type of equipment that will be procured, estimations range from 17000 – 45000 euros. The necessary financial resources must be defined more precisely in the further development of the project concept. It must be noted that the minimum amount includes procurement of only the basic equipment with a small capacity (up to 250 kg/hour).

Project Proposal no.4

Transforming a boiler from an existing central heating in a municipal building/and or public facility (wood chips fuel).

Brief summery

To the moment of preparing this study, no activities have been realized in the East Planning Region for using wood biomass in the form of chips for production of heating energy. However, before the project starts with its implementation, it is necessary to provide production of this type of fuel, located within the vicinity of consumers.

Overall Project Objective

Sustainable Development of the East Planning Region

Specific Objectives

Environmental protection; reducing wood waste which end up in landfills; forest protection;
Reducing costs for heating energy.

Location:

Malesevskii Micro-Region – Berovo is the proposed location

Brief Project Description

The project anticipates transformation (adaptation) of the existing heating system, in one public facility (municipal building, school, health care center or cultural center), for using the wood chips in the production of heating energy. This project is in close correlation with the project on production of wood chips and it would be best if it finalized approximately the same time as the project on production of wood chips. The choice of the facility in which the adaptation would be made should be based on an appropriate analysis of the existing conditions, firstly, from the perspective of providing an available place appropriate for storing the wood chips and the technical conditions for realization of the project. If there are standard facilities (for example schools) available, then it's best to choose this type of facility because of the opportunity to replicate the project in several places. From the environmental protection perspective, it would be best to choose a facility which

uses oil for heating. It is necessary to define the need of heating energy for the entire facility, as to make proper sizing of the equipment.

Planned Activities

The following key activities are planned within the Project:

- Analysis of the facility and technical aspects of the process (defining the necessary equipment, necessary construction efforts, project development and etc.)
- Procurement of the appropriate equipment (according to analysis);
- Signing of agreement for procurement of fuel (wood chips- previous project);
- Training on how to the use the equipment;
- Construction works (if needed);
- Installation of the equipment and test period and
- Commissioning.

Timetable

Activity	duration	months											
		1	2	3	4	5	6	7	8	9	10	11	12
Analysis	2 m	■	■										
Procurement of equipment	5 m			■	■	■	■	■	■				
Agreement with supplier	0.5 m							■					
Training	1 m							■					
Construction works	6 m			■	■	■	■	■	■				
Installation and test period	1 m								■				
Commissioning	0.5 m								■				

Project beneficiary: The Center for Development of the East Planning Region and the local self-governments incorporated with the Project (Pehcevo, Berovo, Delcevo).

Indicators: Quantities of heating energy produced; reduced quantities of greenhouse gases; reduced costs for heating energy.

Assumptions: Readiness of local self-governments for implementing this type of project.

Risks: Providing investment funds for implementation of the project for adaptation of the heating system.

Project Budget: The project itself is relatively flexible in relation to the financial resources need for its implementation. Estimations (for a facility that requires a boiler of up to 80 kW with a fairly good condition of the central heating system) show that the project budget should amount to 28000 euros, depending on the selected facility, more specifically, the current condition of the facility and the system for heating, furthermore, the need for construction works, for extension works for storing the fuel, heating losses of the facility, defined capacity of the equipment as well as the type of equipment that will be procured.

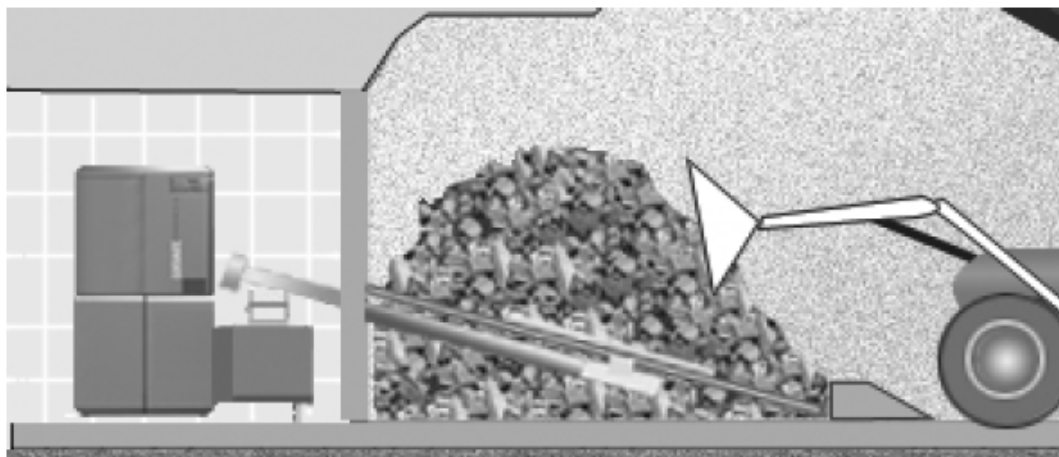
Economic analysis of a model project

An economic analysis of a project has been performed, in order to show the economic justification of the project through which a current heating system using oil would be adapted into a system for heating that uses biomass – wood chips. This project refers to the adaptation of the existing heating system in the municipal building of the Municipality of Probstip. Currently, the facility is heated by a warm water system of heating, which annually consumes 12 tons of oil. The total area of the facility heated is 960 m². According to present oil prices (47 den./liter), annual fuel cost are estimated at about 9200 euros.

In applying the method of replacing the heating strength of one type of fuel with an appropriate quantity of fuel for providing the same heating strength, we come to the result that for heating the same area with wood chips containing 30% moisture, we would need about 50 tons annually. Based on the analysis for defining the price of wood chips, shown in Chapter 3.5, the estimated price of the wood chips is 32-38 euros per ton (assuming 40 euros per ton). According to this example, the annual costs are estimated as follows:

- wood chips – 50 tons (30% moisture) x 40 euros/ton = 2000 euros
- oil - 12 tons x 760 euros/ton = 9200 euros

Annual savings are estimated at 7200 euros. Investment costs are estimated at 30000 euros. Even though this is a quite simple analysis, figures show that the entire investment will pay off in 5-6 years. In the meanwhile, other socio-economic benefits have not been taken into consideration, such as environmental benefits. The trend of rising oil prices must also be noted, meaning that in the future we can only expect for these projects to be even more efficient. Picture 40 displays one possible way of setting up the storage room with the reservoir.



Reservoir

Storehouse

Project Proposal no.5

Transforming a boiler from an existing central heating system in a municipal building/ and or public facility (fuel pellets).

Brief Summery

To the moment of preparing this study, no activities have been realized in the East Planning Region for using wood biomass in the form of chips for production of heating energy. However, before the projects starts with its implementation it is necessary to provide production of this type of fuel, located within the vicinity of consumers (project proposal no.3).

Overall Project Objective

Sustainable Development of the East Planning Region

Specific Objectives

Environmental protection; reducing the wood and agricultural waste which end in landfills; forest protection; reducing air pollution.

Reducing costs for heating energy.

Location:

Malesevskii Micro-Region – Pehcevo – wood pellets.

Kocani – pellets from agricultural waste, wood waste and other type of waste.

Brief Project Description

The project anticipates transformation (adaptation) of the existing heating system, in one public facility (municipal building, school, health care center or cultural center), for using wood chips in the production of heating energy. This project is in close correlation with the project on production of wood chips and it would be best if it finalized approximately the same time as the project on production of wood chips. The selection of the location, more specifically, the facility or facilities in which the adaptation will be made will depend on the decision which one of the two sub-projects, forming Project Proposal no.3, will be the first to be realized. The selection of the facility in which the adaptation will be made should be made upon an appropriate analysis of the existing

conditions, firstly, from the perspective of providing an available place appropriate for storing the wood chips as well as the technical conditions for realization of the project. If there are standard facilities (for example schools) available, then it's best to choose this type of facility because of the opportunity to replicate the project in several places. From the environmental protection perspective, it would be best to choose a facility which uses oil for heating. It is necessary to define the need of heating energy for the entire facility, as to make proper sizing of the equipment.

Planned activities

The following key activities are planned within the Project:

- Analysis of the facility and technical aspects of the process (defining the necessary equipment, necessary construction efforts, project development and etc.)
- Procurement of the appropriate equipment (according to analysis);
- Signing of agreement for procurement of fuel (pallets- previous project);
- Training on how to use the equipment;
- Construction works (if needed);
- Installation of the equipment and test period and
- Commissioning.

Timetable

Activity	Duration	months											
		1	2	3	4	5	6	7	8	9	10	11	12
Analysis	2 M	■	■										
Procurement of equipment	5 M			■	■	■	■	■					
Agreement with supplier	0.5 M							■					
Training	1 M							■					
Construction works	6 M			■	■	■	■	■	■				
Installation and test period	1 M								■				
Commissioning	0.5 M								■				

Project beneficiary: The Center for Development of the East Planning Region and the local self-governments within the region.

Indicators: Quantities of heating energy produced; reduced quantities of greenhouse gases; reduced costs for heating energy.

Assumptions: Readiness of the local self-governments for implementing this type of project.

Risks: Providing investment funds for implementation of the project for adaptation of the heating system.

Project Budget: The project itself is relatively flexible in relation to the financial resources need for its implementation. Estimations (for a facility that requires a boiler of up to 80 kW with a fairly good condition of the heating system) show that the project budget should amount to 22000 euros, depending on the chosen facility, more specifically, the current condition of the facility and the system for heating, furthermore, the need for construction works, extension to be made for storing the fuel, heating losses of the facility, defined capacity of the equipment as well as the type of equipment that will be procured. The necessary financial resources must be defined more precisely in the further development of the project concept.

Economic analysis of a model project

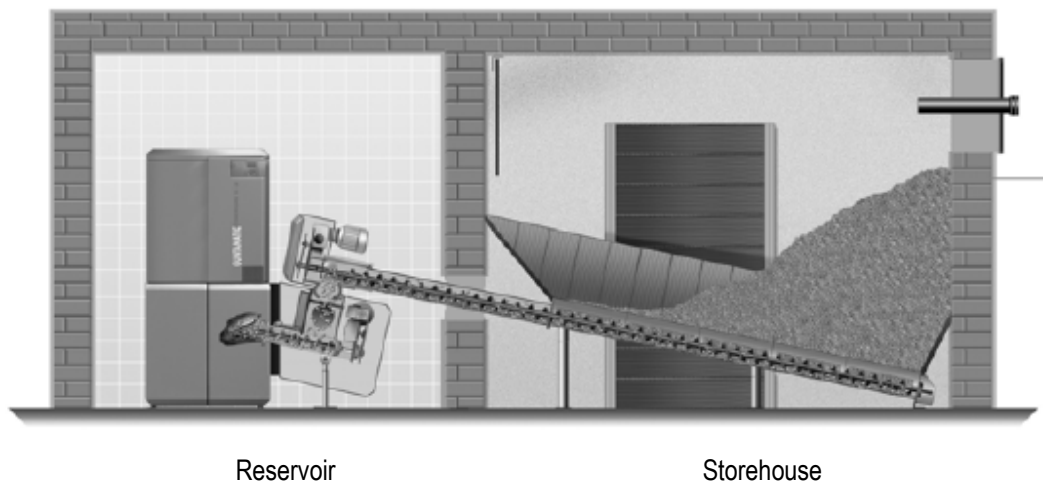
An economic analysis of a project has been performed, in order to show the economic justification of the project through which an existing heating system using oil would be adapted into a system for heating that uses biomass – pellets. This project refers to adaptation of an existing heating system in one particular school with a system for warm water heating, which annually consumes 42 tons of oil. The total area of the facility heated is 5000 m². According to present oil prices (47 den./Liter), annual fuel cost is estimated at about 32000 euros.

In applying the method of replacing the heating strength of one type of fuel with an appropriate quantity of fuel for providing the same heating strength, we come to the result that for heating the same area, the amount of pellets containing no more than 8% moisture, will be about 100 tons per year. Based on assessments of the expected price for one ton of pellets, one ton of pellets are estimated at a price of 120 euros/ton. According to this example, the annual costs are estimated as follows:

- pellets – 100 tons (8% moisture) x 120 euros/ton = 12000 euros
- oil - 42 tons x 760 euros/ton = 32000 euros

Annual savings of fuel are estimated at 20000 euros. Investment costs are estimated at 85000 euros (reservoir/ with total capacity of 300kWt). Even though this is quite a simple economic analysis, figures show that the entire investment will pay off in 6-7 years. In the meanwhile, other socio-economic benefits (new jobs, reducing import dependence, relatively stable fuel prices, etc.), as well as environmental benefits, have not been taken into consideration. The trend of rising oil prices must also be noted, meaning that in the future we can only expect for these projects to be even more efficient. Picture 41 displays one possible way of setting up the storehouse for pellets with the reservoir, with automatic filling of pallets. Picture 42 displays a reservoir using pallets, with the possibility of storing fuel.

Picture no.41



Project proposal no. 6

Pre-feasibility study for direct combustion of biomass in existing thermal power plant in Makedonska Kamenica, in combination with coal.

Current activities

Makedonska Kamenica is the only town in the East Planning Region with a central heating system. This system has 350 connections, i.e., 350 users. It is out of use since 1998. Currently, a feasibility study is being prepared for adaptation of the system, whereby wood biomass is to be used instead of coal. Based on the information received, the viability of the system is reviewed, with an installed capacity projected at 10 MW_t heating energy and 2 MW_e electric energy. The feasibility study has still not been finalized to the moment of preparing this study.

Overall Project Objective

Sustainable development of the East Planning Region

Specific Objectives

Environmental protection – reducing wood and agricultural waste which ends in landfills; forest protection, reducing air pollution.

Reducing costs for heating energy.

Location:

Makedonska Kamenica

Brief Project Description

A feasibility study will be prepared for assessing the possibilities for direct combustion of various types of biomass, along with coal, in existing thermal power plant. This technology will enable the use of different types of biomass. The biomass that will be used has to be grinded into tiny particles, that is, it can be used in its original form (waste from wood industry- sawdust, tiny particles, and tiny chips). Based on the technologies analyzed, the opportunity for direct combustion of biomass in the existing power plant is currently the most economically worthwhile technology. Even though this is a power plant which produces only heating energy, still the opportunity has been identified. Because of this, as well as the relatively low investment costs for

adaptation of current fireboxes, is the proposal for preparation of a feasibility study that will identify all possibilities for using biomass in the production of heating energy in the current fireboxes in the system in Makedonska Kamenica. The pre-feasibility study will also provide a preliminary estimation of the viability of certain technical solutions, and will define all necessary efforts for adaptation of the current system. The economic justification of such an investment depends in great deal on the current condition, not only of the reservoirs for coal incineration, but also of the condition of the entire heating system. In order not to duplicate certain analysis, this pre-feasibility study should be prepared after completing the feasibility study for adaptation of the system for using biomass, as this feasibility study will perform a comprehensive analysis and estimation of the condition of the current system and equipment which is currently out of use.

By replacing certain quantities of coal with biomass, the harmful gas emissions will decrease, which will contribute towards environmental protection. The pre-feasibility study will define all necessary measures needed to be undertaken for fulfilling legal requirements in regards to environmental protection. With certain measures, the project will be sustainable from the perspective of environmental protection. Among these measures are managing the ashes remaining from the combustion, as well as monitoring of gas emissions in the air.

Quantities of biomass

Provision of biomass is one of the basic elements in the process of planning an effort, which introduces the usage of biomass for energy purposes. Based on the results of the study, as well as of the local allocation of the accumulated biomass, the total amount of biomass which can be used in the heating system in Makedonska Kamenica ranges from 7000 to 8000 tons of wood biomass (11000-13000m³) and 3000 tons of biomass, which is actually agricultural residue (mainly rice peel). Wood biomass is biomass generated in the wood processing industry and residues from firewood cutting. According to the recommendations of the National Strategy on Energy, firewood should not be used for this purpose. Collecting wood waste from the wood processing industry is relatively simple, as this waste is already being collected and transported to existing dumps. However, a system needs to be established for collecting residues from the woodcutting of firewood, which will enable collecting and transporting the waste to the place of its preparation. Currently, rice peel is the most accessible agricultural biomass that is generated in several plants for peeling of rice, located within the vicinity of the city of Kocani.

Planned activities

The following key activities are planned within the framework of the project:

- Preparation of Terms of Reference;
- Public procurement of services for preparation of a pre-feasibility study;
- Preparation of the study:
 - Analysis of the current situation,
 - Analysis of the possible solutions,
 - Estimation of costs,
 - Recommended variations,
 - Conclusion,
 - Results presentation;

Timetable

Activity	Duration	months											
		1	2	3	4	5	6	7	8	9	10	11	12
Preparation of Terms of Reference	2 m	■	■										
Public procurement	4 m			■	■	■	■						
Preparation of the study	3 m							■	■	■			
Review	0.5 m										■		

Project Beneficiary: the Center for Development of the East Planning Region

Indicators: Study prepared; presentation held.

Assumptions: Relatively fair condition of technical elements of the existing heating system.

Risks: No risks have been identified which could have significant impact over project implementation.

Project budget: 8000 euros.

Project proposal no. 7

Feasibility study on biogas in Berovo pigfarm (or poultry farm in the village of Morodvis)

Current activities

To date, there have been no activities undertaken in this pig farm in regards to using biogas. However, in the nearby pig farm in Delcevo (presently not in function), efforts have been made over 20 years ago for making use of the biogas and production of energy. Like other projects dating from that time period regarding biogas usage, this project too did not come alive, that is, it was completely neglected. Since then, no other activities have been undertaken in this sector.

Overall Project Objective

Environmental protection

Specific Objectives

Assessing the feasibility of using biogas in the pig farm.

Defining the technical opportunities for utilizing the biogas.

Location:

Berovo

Brief Project Description

The pig farm is located in the north-western part of the Berovo Valley, next to the road Berovo-Vinica, between the villages of Smojmirovo and Macevo, and near the Bregalnica river. The farm functions with an installed production capacity of 15000 pigs per year, more specifically it has a basic herd of 750 mother pigs and 10-15 boars. The entire organization of pig breeding is performed in two phases – reproduction and raising pigs. The project anticipates the preparation of a feasibility study that will assess the viability of various technical – technological solutions for treatment of waste water, with a plant for using biogas for production of heating and electric energy. Even though there is negative experience in using biogas for production of heating and electric energy in the Delcevo farm, the numerous plants existing not only in developed but also in undeveloped countries, are evidence enough to show that utilizing biogas for production of energy is indeed sustainable. The project will make review of all technical solutions necessary for construction of such an installation. The production of biogas will be with anaerobic digestion, and

the capacity and type of the digester will be determined based on the results of the study. The study will also determine the necessary equipment and infrastructure. The average number of animals in the farm is around 8200. Using biogas in the pig farm is efficient, primarily, due to the provided heating consumption necessary in the production, i.e., pig raising. The electricity, having a preferential price, is intended to be sold. Daily, about 600m³ of biogas are produced and annually about 600MWh of heating energy and 500MWh of electric energy will be obtained. Investment costs are estimated at 700000 euros. In preparing the study it is necessary to take into account all the socio-economic benefits, as well as environmental benefits. Because a private company is the owner of the farm, this project should be a private initiative.

Planned Activities

The following key activities are planned within the framework of the project:

- Preparation of Terms of Reference;
- Procurement of services for preparation of feasibility study;
- Preparation of the study:
 - Analysis of the current situation,
 - Analysis of the possible solutions,
 - Technical analysis of at least 3 solutions,
 - Financial analysis of at least 3 solutions,
 - Socio-economic analysis of the solutions,
 - Recommended variation,
 - Conclusion,
 - Results presentation;

Timetable

Activity	Duration	months											
		1	2	3	4	5	6	7	8	9	10	11	12
Preparation of Terms of Reference	2 m	■	■										
Procurement	4 m			■	■								
Preparation of a study	7 m					■	■	■	■	■	■		
Review	1 m												■

Project Beneficiary: Pig farm in Berovo.

Indicators: Study prepared; presentation held.

Assumptions: since this is a private farm, we can assume that the owner will show interest in treating the waste water.

Risks: No risks have been identified which could have significant impact over project implementation.

Project budget: 20000 euros.