

## **BIOMASS ON RECULTIVATED STOCKPILES**

**Construction of biomass collection centre and production facility in the  
Zasavje region**

**(SUMMARY)**



Name:	REGIONALNI CENTER ZA RAZVOJ d.o.o.
Address:	Podvine 36, SI-1410 Zagorje ob Savi
Phone:	+386 (0)3 56 60 508
e-mail:	<a href="mailto:info@rcr-zasavje.si">info@rcr-zasavje.si</a>
web site:	<a href="http://www.rcr-zasavje.si">www.rcr-zasavje.si</a>
date and place:	August 2010, Zagorje ob Savi

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## **1. Main objectives of thematic study**

Project ReSOURCE engages promotion of sustainable development in post-mining regions. One of the main areas of focus are natural potentials. As such, biomass options on recultivated stockpiles were explored. Initial analyses carried out in the Zasavje region by Regional development centre as well Trbovlje-Hrastnik mining company at the beginning of the ReSOURCE project, have showed a lack of appropriate areas for biomass production on recultivated stockpiles, so additional options for biomass exploitation have been explored. In this study, options for construction of biomass collection centre and production facility are treated, rather than biomass plantations on recultivated stockpiles as initially planned. Thus this study concerns with one main question: does this option presents a true opportunity for former stockpile in the Zasavje region?

## **2. Framework for renewable sources exploitation**

Rising prices of energy products in the year 2008, followed by gas crisis at the beginning of 2009, encouraged new initiatives in exploitation of domestic wood potentials.

According to data of Forestry institute of Slovenia, there are two main large consumers on national level: Coal plant Trbovlje (TET) and Coal plant Šoštanj. Both plants exhaust up to 160,000 tons of solid wood fuels per year. In the case of Coal plant Trbovlje majority of biomass is imported and mine in closure additionally fosters exploration of new fuel options. Excavations of brown coal in Trbovlje-Hrastnik mine is planned to stop till 2015. Considering mentioned conditions the scope of the study applies Coal plant Trbovlje as key factor within this study.

Wood is also used as prevailing fuel for heat provision of individual consumers especially in rural area. According to data of Statistical office of the Republic of Slovenia, between 2004 and 2007 some 40% households in Slovenia were exploiting wood for heat provision. However, mostly unprocessed wood is used thus low efficiency of such use.

In addition, European Union new directive on renewable sources to achieve the 20-20-20 targets policy is still to be achieved in Slovenia. These are:

- A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels
- 20% of EU energy consumption to come from renewable resources
- A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

(source: [http://ec.europa.eu/clima/policies/brief/eu/package\\_en.htm](http://ec.europa.eu/clima/policies/brief/eu/package_en.htm))

Current share of renewable sources in energetic is well below 20 percent. On national level there has been also Operational program for biomass exploitation accepted (OP). The main goals of the OP follow the mentioned EU directive in

fostering exploitation of renewable sources and reduction of greenhouse gas emissions.

(source: [www.mop.gov.si/fileadmin/mop.gov.si/.../op\\_lesna\\_biomasa.pdf](http://www.mop.gov.si/fileadmin/mop.gov.si/.../op_lesna_biomasa.pdf))

### **3. Applied approach**

Good practice analysis was chosen for this thematic study. Similar project has been realized in Bosnia and Herzegovina thus some solutions were integrated into our study. Selected methodology was based on following steps of proceeding:

1. Examination of existing conditions
2. Assessment of existing conditions
3. Concept preparation
4. Concept development
5. Evaluation of thematic study results

### **4. Conditions for construction of biomass collection centre and production facility**

Recultivation of mining areas in the Zasavje region is still in progress. Analyses carried out within this thematic study indicated insufficient extent of suitable areas for biomass plantations. There is around 150 ha of suitable mining area for biomass plantations. Coal plant Trbovlje and Trbovlje-Hrastnik mining company decided to grow pilot plantation of Salix on 2 ha of this former mine area. Project has been shown viable so far but the area is too small for the economically efficient production.

On the other hand, closeness of stockpile, railway and energy facility turned out as major strength and opportunity. Team combining representatives of Coal plant Trbovlje, Trbovlje-Hrastnik mining company, strategic partner and Regional development centre was established to examine this option carefully.

Following aspects were initially processed:

- Regional development programme (especially initiatives regarding energy priorities and re-qualification of human resources of Trbovlje-Hrastnik mining company)
- National policy in the field of energetic
- EU policies
- Wood potentials in wider area (100 km radius)
- Wider wood/biomass purchase market (south-east Europe)
- Transportation options (railway connections, road infrastructure)
- Possibilities of Coal plant Trbovlje surplus heat exploitation (wood drying)

Slovenia is one of the most forested countries in the EU. Some 58,5% of total area is covered with forests (only Sweden and Finland have higher percentage). Between 2004 and 2007 around 900.000 m<sup>3</sup> of wood intended for energy consumption had been extracted annually. Within scope of energy consumption from renewable

resources, most of the exploited wood, processed into biomass had been used for heat provision (95%) and the rest for electricity generation. In 2008 some 155.000 m<sup>3</sup> of wood had been extracted within Zasavje region and surrounding municipalities (50 km radius).

(source: [www.mop.gov.si/fileadmin/mop.gov.si/.../op\\_lesna\\_biomasa.pdf](http://www.mop.gov.si/fileadmin/mop.gov.si/.../op_lesna_biomasa.pdf))

Potential purchase market of wood as well as biomass is located also in south-east Europe. In Croatia and Bosnia and Herzegovina, there are around 4.000.000 m<sup>3</sup> of unprocessed wood quantities annually. Due to costs of transportation at these relatively long distances, use of railway would be considered favourable.

Outcomes have led to conclusion which resulted in following project idea:

### **Establishment of biomass collection centre and biomass production facility (pellets, briquets) on former mining stockpile.**

Key actors and their role in realization of project idea:

- a) Trbovlje-Hrastnik coal mine
  - Provider of land - stockpile area with supporting infrastructure
  - Adequate personnel and organization of production
  - Financial investor - sources from mine closure funds
- b) Coal plant Trbovlje
  - Provision of surplus heat for drying out the wood
  - Main consumer of produced biomass
  - Financial investor
- c) Strategic partner
  - "Know how"
  - Investment preparation and final realization
  - Key personnel
  - Organization of purchase and sales market
  - Financial investor

Major national biomass distributor "Istrabenz Gorenje" appears to become strategic partner and already within this project, there was establishment contract of biomass related company signed with Trbovlje-Hrastnik coal mine. The role of Regional development centre and the ReSOURCE project proved to be as a leading initiator of these ongoing activities.

This cooperation has also led to supplementations of Regional development plan 2007-2013 (RDP). Biomass collection centre and biomass production facility on former stockpile have been included into part of RDP that deals with energy consumption to come from renewable resources.

Construction of collection centre and production facility regarding capacities is to be carried out according to "phase to phase" model. This study deals with initial phase which assumes annual production between 20.000 to 40.000 tonnes of biomass. Following phases enable enlargement to 100.000 tonnes in following phases.

Along railway, there is around 20.000 m<sup>2</sup> of land, owned by Trbovlje-Hrastnik mining company. This land turned out as suitable for construction of cargo station for wood

that could be transported to the site by train wagons. From here, there is existing transport line with transport capacity of 800 tonnes per hour (currently used for coal transportation) connected to the stockpile area of 9.2 hectare. In the final phase in which production could increase to 100.000 tonnes of biomass annually therefore additional transport line is planned for construction.

Main features of collection centre and production facility in the stockpile:

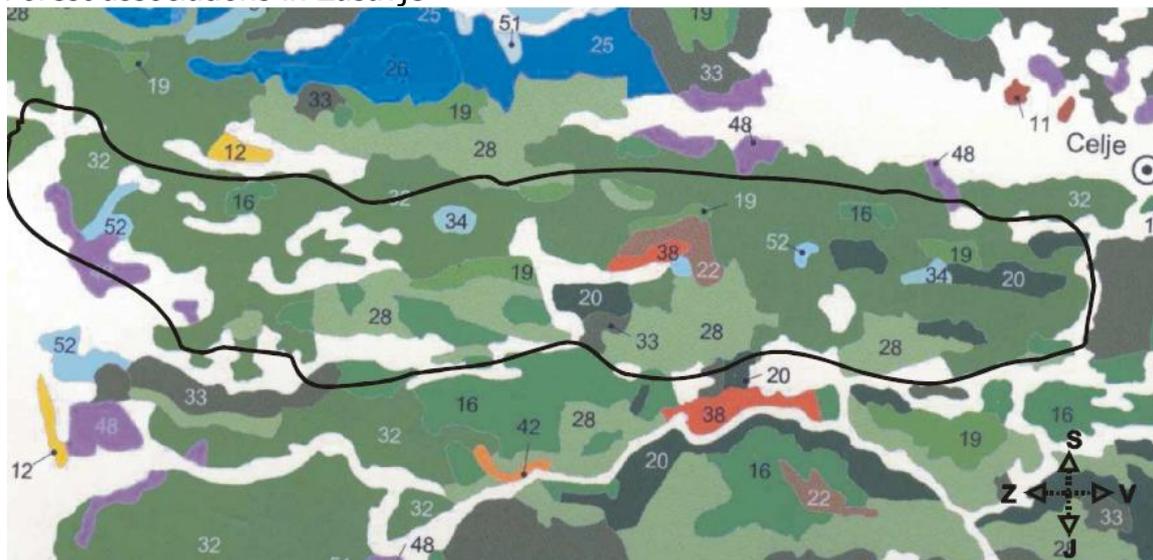
- Wood dump
- Exploitation of surplus heat from nearby Coal plant Trbovlje for wood drying (additional pipeline would be constructed between the stockpile and the coal plant)
- Wood chopping
- Silos and wood milling
- Production of briquettes
- Briquettes packing
- Production of pellets

It is estimated, that majority of wood (some 75%) would be transported by train wagons from south-east Europe (Croatia, Bosnia and Herzegovina). Wood would be uploaded to cargo station and then transported to the dump near biomass production facilities. Wood transported by road would be uploaded directly to the dump. Some 25% would come from domestic sources. Variety of unprocessed wood would be used:

- Oak
- Beech
- Fir
- Spruce
- Pine

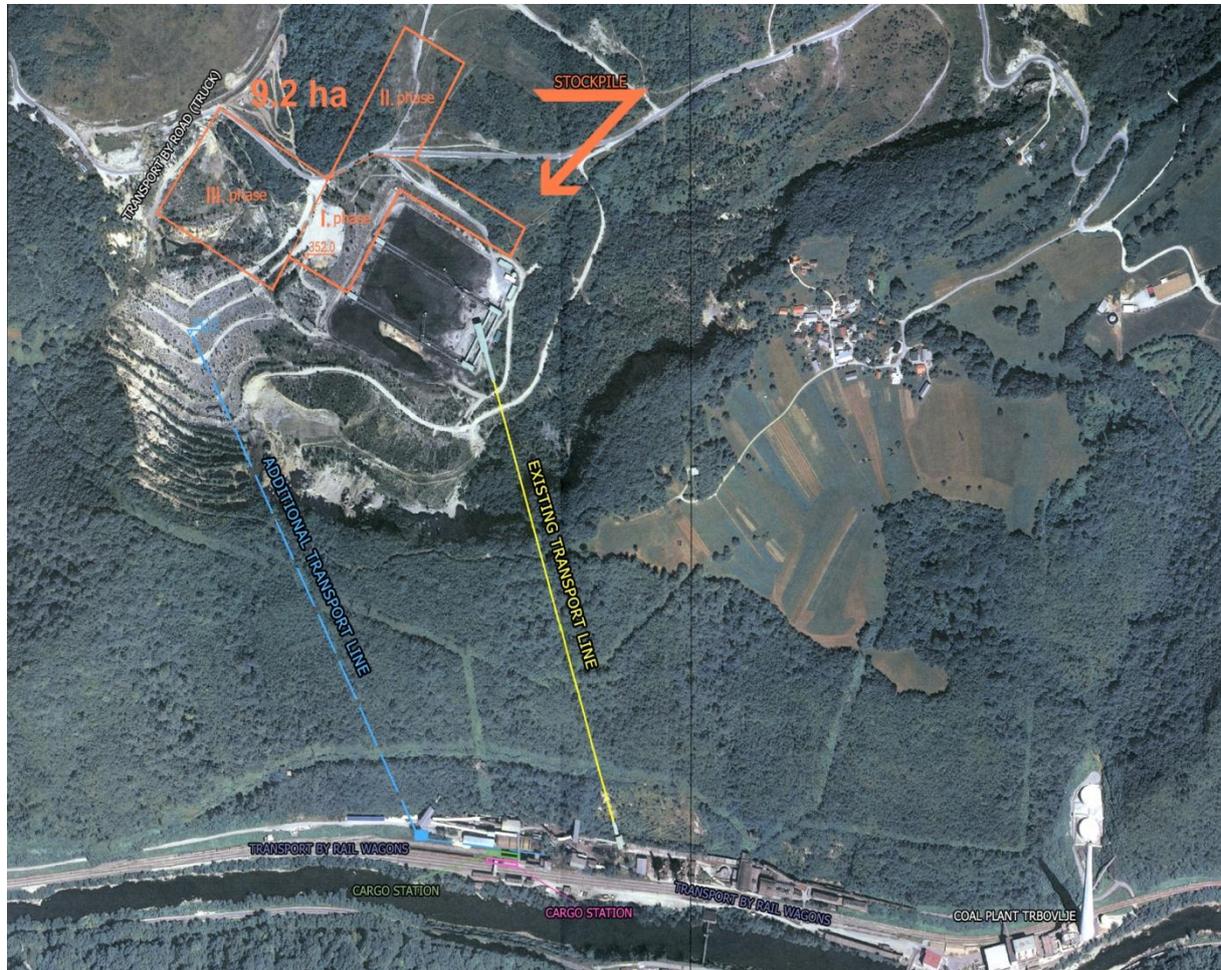
In the Zasavje region mainly beech forests prevail as can be seen by green colours on the map bellow.

Forest associations in Zasavje



(source: Vegetation map of forest associations in Slovenia)

Feasible area of project realization



To manage planned annual production, the production process should operate for 300 days per year, 24 hours per day. Production process would demand some 40 employees. It would be reasonable to re-qualificate some available human resources of Trbovlje-Hrastnik mining company due to mine closure and affinity of needed employee profiles for biomass production facility (toolmakers, woodworkers, electricians etc.) Regional development plan 2007-2013 of the Zasavje region also engages and promotes these activities as follows:

Priority 1: Economy

Programme 4: Trbovlje-Hrastnik coal mine employees requalification

Action 1: Education of employees

Action 2: Passive requalification of employees

## 5. Sales market of biomass briquettes and pellets

Main buyers of biomass products within next five years would be Coal plant Trbovlje and Ljubljana heating station. Distribution of biomass for Ljubljana heating station would be carried out by railway and for Trbovlje coal plant by existing transport line. Potential sales market seriously depends on costs of biomass briquettes and pellets distribution. Market analysis and evaluation of transportation prices which were carried out through the project resulted in the following list of potential consumers.

Slovenia	Croatia	Italy	Austria	Germany
Coal plant Trbovlje	Biomass distributors (Bauhaus, Kaufland, Baumax)	Biomass distributors (GPM, Agriplant, Chicom)	Biomass distributors (OBI)	Biomass distributors (Fischer)
Ljubljana heating station				
Biomass distributors (Merkator, Merkur, ERA Velenje)				
Households				

## 6. Key findings and results

- a) Mine closure till 2015
- b) Favorable national and EU policies in the field of renewable sources exploitation
- c) Lack of appropriate areas for biomass plantations on recultivated stockpiles (**replacement of initial focus of the study: additional options for biomass exploitation have been explored**)
- d) Closeness of stockpile, railway and energy facility (coal plant)
- e) Options for biomass collection centre and production facility (pellets, briquettes) on recultivated stockpile
- f) Key actors:
  - Trbovlje-Hrastnik coal mine
  - Coal plant Trbovlje
  - Strategic partner
- g) Technical solutions for collection centre and production facility
- h) Inclusion of project idea into Regional development plans 2007-2013
- i) Wood purchase and biomass sales market evaluation
- j) Evaluation of project activity

## 7. Transnational value of findings and results

As already mentioned, due to lack of appropriate recultivated stockpiles this biomass study has been refocused from initial objectives. Further analyses have showed some favorable circumstances for exploitation of biomass as renewable source of energy in former mining region. As such, the main result of this study is in the fact that even in the case of lack of suitable areas for biomass plantations, mining regions should seriously investigate other options for biomass exploitation.

These results were already presented within project partnership and will also be included in post-mining knowledge base targeting towards local and regional practitioners in Central Europe. In case of actual realization of biomass collection centre and biomass production facility (pellets, briquets) on former mining stockpile, there is further dissemination of good practice predicted.

## 8. Conclusion

Idea of constructing biomass collection centre and production facility follows national energy policy and has been included in Regional development plans 2007-2013. Approximately six months would be needed for preparation of necessary documentation and another year for construction of infrastructure. Collection centre and production facility could start running around 2012-2013. Estimated investment is about six million Euros.

There is one main technical question still to be answered. Exploitation of surplus heat for wood drying strongly depends on future modernization and renovation of Trbovlje coal plant. Turbine four is to be renovated till 2014. Technical plan for additional pipeline that would be constructed between the stockpile and the coal plant should consider this condition.

According to rough financial estimations there could be up to six percent return of engaged capital in the third year of collection centre and production facility operation.

This thematic study should provide firm base for thorough financial examination and potential investment preparation for biomass collection centre and production facility.

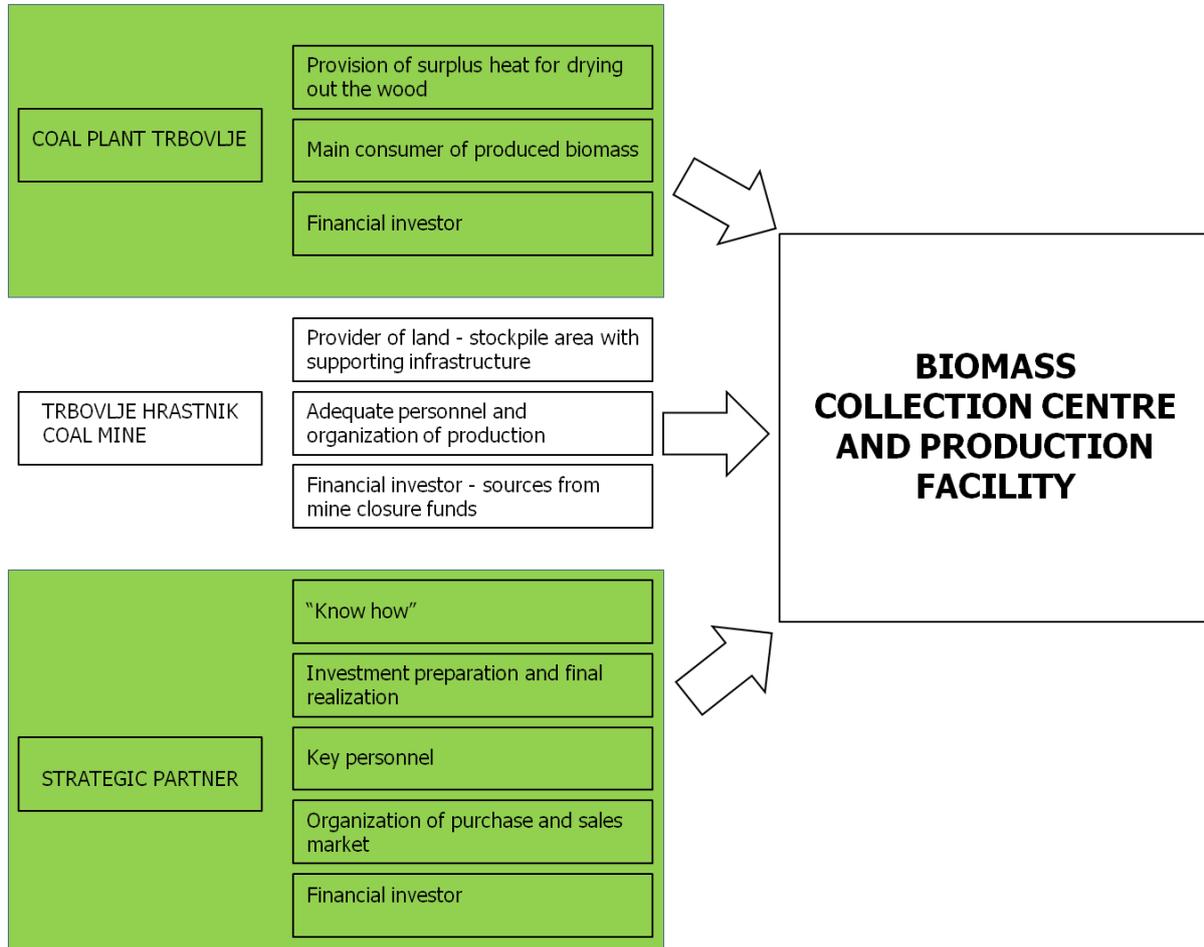
## 9. Annexes

### 9.1 Implementation time plan

CONSTRUCTION OF BIOMASS COLLECTION CENTRE AND PRODUCTION FACILITY			
ACTIONS	YEAR 1 2011	YEAR 2 2012	YEAR 3 2013
	Preparation of necessary documentation	[Green bar spanning Year 1, 2, and 3]	
Re-qualification of available human resources from Trbovlje-Hrastnik mining company	[Green bar spanning Year 1, 2, and 3]		
Site clearance	[Green bar spanning Year 1, 2, and 3]		
Construction of infrastructure	[Green bar spanning Year 1, 2, and 3]		
Start of production <sup>1</sup>			[Green bar in Year 3]

<sup>1</sup>Initial phase assumes annual production between 20.000 to 40.000 tonnes of biomass

## 9.2 Organigraph



## 9.3 Financial impacts

	RUNNING COSTS		
	YEAR 2013 (EUR)	YEAR 2014 (EUR)	YEAR 2015 (EUR)
<b>TOTAL INCOME</b>	<b>975.000</b>	<b>1.614.000</b>	<b>2.283.000</b>
MATERIAL (WOOD)	442.000	734.000	1.038.000
AMORTISATION	265.000	265.000	265.000
SALARIES, ELECTRICITY COSTS ETC.	389.000	634.000	863.000
<b>TOTAL COSTS</b>	<b>1.096.000</b>	<b>1.633.000</b>	<b>2.166.000</b>
<b>INCOME</b>	<b>-121.000</b>	<b>-19.000</b>	<b>117.000</b>

(Calculation based on: no national cofinancing, fixed price for wood etc.)

## 10. References

- a) The "20-20-20" targets, [http://ec.europa.eu/clima/policies/brief/eu/package\\_en.htm](http://ec.europa.eu/clima/policies/brief/eu/package_en.htm) (10.12. 2010)
- b) Operational program for biomass exploitation in Slovenia, [www.mop.gov.si/fileadmin/mop.gov.si/.../op\\_lesna\\_biomasa.pdf](http://www.mop.gov.si/fileadmin/mop.gov.si/.../op_lesna_biomasa.pdf) (10.12. 2010)
- c) Vegetation map of forest associations in Slovenia, <http://bijh.zrc-sazu.si/bio/SI/Zbirke/400/400.asp> (10.12. 2010)
- d) Statistical office of the Republic of Slovenia, <http://www.stat.si/eng/index.asp> (10.12. 2010)