Events

Young Researchers direct the way to Innovation in the Forest-based sector - COST Young Researchers' Forum at the 8th FTP Conference

Location	Barcelona, Spain
Date	11 - 14 March 2013
Calendar file	.vcs .ics

Following the success of the Early-Stage Researchers' Forum at the 7th FTP Conference, COST organised an Early-Stage Researchers' Forum at the 8th FTP Conference organised by the the Forest-based Technology Platform.

The **COST Young Researchers' Forum** was held on 11 and 12 March 2013 as part of the **FTP-c8 Conference** , entitled **'Inspiring Horizons – A new Strategic Research and Innovation Agenda for the Forest-based Sector'** and which took place on 12 and 13 March 2013 in Barcelona with the final day, 14 March 2013, dedicated to study tours.

The joint COST-FTP Forum gave Young Researchers the opportunity to present results of their research work and to discuss these matters with colleagues and industry representatives from all across Europe. Speakers at the COST Young Researchers' Forum were granted free access to the 8th FTP Conference.

The number of applications to the COST Young Researchers' Forum Call for Proposals was overwhelming. A total of **180 proposals were received** by the Organising Committee and evaluated by a panel of 5 Experts, who selected **20 proposals to be presented orally and 56 proposals to be presented as posters** within the programme of the COST YRF.

Jenni Rahikainen (FI) and Gianluca Tondi (AT) were elected **Best COST-FTP YRF Presentation** by the Organising Committee and by the audience, and they presented their research again at a panel session on 13 March at the FTP-c8 Conference.
Josefin Illergård (SE) received the price for the **Best COST-FTP YRF Poster** .

Available presentations and posters can be downloaded from this website.
Have a look as well at the photos and the video of the event!

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Registration

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Related links

8th FTP Conference Announcement

Call announcement and information

Event images

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Video

Conference materials

- COST YRF Booklet (PDF, 1 MB)
- COST FPS Domain and Actions (PDF, 3 MB)

Young Researchers' presentations

- Gianluca Tondi (PDF, 3 MB)
- Jenni Rahikainen (PDF, 3 MB)
- Agnieszka Jedraszak (PDF, 3 MB)
- Ali Akrami (PDF, 2 MB)

- Anda Fridrihsone (PDF, 5 MB)
- Anna Dupleix (PDF, 2 MB)
- Charalampos Lykidis (PDF, 7 MB)
- Emina Karisik (PDF, 1 MB)
- Honorata Gruszka (PDF, 418 kB)
- Joao Custodio (PDF, 10 MB)
- Federica Melone (PDF, 5 MB)
- Marion Noel (PDF, 4 MB)
- Michael Drass (PDF, 1 MB)
- Michael Schneeberger (PDF, 2 MB)
- Milena Lakicevic (PDF, 454 kB)
- Mislav Stepinac (PDF, 3 MB)
- Patrick Huber (PDF, 2 MB)
- Pauline Riviere (PDF, 5 MB)
- Tsvetelina Simeonova (PDF, 2 MB)
- Urska Kavcic (PDF, 15 MB)

Young Researchers' posters

- Josefin Illergård (PDF, 3 MB)
- Posters 1 to 6 (PDF, 8 MB)
- Posters 7 to 12 (PDF, 11 MB)
- Posters 13 to 18 (PDF, 6 MB)
- Posters 19 to 24 (PDF, 15 MB)
- Posters 25 to 30 (PDF, 10 MB)
- Posters 31 to 36 (PDF, 15 MB)
- Posters 37 to 39 (PDF, 8 MB)
- Posters 40 to 42 (PDF, 13 MB)
- Posters 43 to 44 (PDF, 11 MB)
- Posters 46 to 48 (PDF, 3 MB)
- Posters 49 to 51 (PDF, 7 MB)

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COST is supported by the EU Framework Programme Horizon 2020

Changes in levels of plant hormones (IAA and ABA) as the indicators of heavy metal pollution in poplar plant species

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INTRODUCTION

Heavy metals are severe environmental pollutants and their toxicity is a problem of increasing significance for ecological, evolutionary, nutritional and environmental reasons. Since they cannot be degraded or destroyed, heavy metals are persistent in all parts of the environment. Phytoremediation, the use of plants to extract, sequester and/or detoxify pollutants is a new and powerful "green" technique for environmental clean-up. Poplars (Populus spp.) due to their advantages (fast-growth, large biomass production, feasible reproduction, high transpiration rate and recently sequenced of P. trichocarpa etc.) present great candidate for investigation in aspect of so called dendroremediation but continued research is necessary to fully exploit their potential. Thus, an accurate assessment of plant response to heavy metal induced stress and understanding of its mechanism of acclimation are of crucial importance. Complex metabolic pathways and mechanisms which cope with stressful conditions in environment have been elucidated till now, but beside enzymatic and antioxidant responses, it is still to be investigated if plant changes in plant hormones content can be used as indicators of metabolic status of plant and give information about plant tolerance or sensitivity to applied stress. Indole-3-acetic acid, IAA, the most abundant naturally occurring auxin, controls various physiological processes in plants including apical dominance, tropism, shoot elongation and root initiation. On the other hand, abscisic acid (ABA) plays major role in seed and bud dormancy, as well as responses to water stress where levels of ABA fluctuates dramatically (increase up to 50 times) in response to environmental drought signal. Endogenous concentrations of plant hormones are regulated by three main processes: biosynthesis, degradation, and conjugation. However, in what way phytohormones are involved in mediating environmental stresses such as heavy metal stress is still not understood. This study was designed to address the following questions in poplar:

- **What is the phytoextraction potential of different poplar clones and estimation of heavy metal accumulation in harvestable plant tissue**
- **Are there changes in levels of phytohormones induced by heavy metal stress in poplar plant species and is there any dose dependance**
- **How different metal contamination and metal concentration affect plant hormone distribution and accumulation in poplars**
- **How different poplar clones respond in phytohormones changes to cooper induced stress in different plant tissue**

Experiment was established in controlled conditions in a greenhouse where poplar clones (M1 (Populus x euramricana (Dode) Guiner), B229 и Pe19/66 (Populus deltoides Bartr.)) were grown and exposed to stress for two months mediated by application of different concentrations of heavy metals (maximum allowed amounts (MAA) and (3 *MAA) for Cu^{2+} and Ni^{2+} according to national legislation).

MATERIAL AND METHODS

Leaves and roots of poplar clones were sampled after two months of exposure to heavy metal stress. Microwave assisted digestion system (Milestone, D series) with nitric acid and hydrogen peroxide was used as a pretreatment for atomic absorption analysis in flame technique (FS AAS240/GTA120, Varian) where Cu and Ni contents were determined at 324.8 nm and 232.0 nm, respectively.

To analyze plant hormone about 100 mg of lyophilized plant tissue were extracted with mixture of isopropanol and imidazole buffer pH-7 (65:35 v/v). To each sample 100 ng of heavy isotope –labeled standard ($^{13}C_6$-IAA and $^{2}H_4$-ABA) was added. After centrifugation (10000 rpm, 10 min), purification procedures were done in two steps using solid phase extraction (SPE) on amino (SAX Vac QMA, 500mg/3 ml) (elution with AcOH in MeOH) and C_{18} cartridges (Varian bond elute C18 500 mg/2.8 ml) (elution with AcCN). Methylation was carried out according to Cohen (1984) with freshly prepared diazomethane. Methanolic fraction was evaporated to dryness and resuspended in 20 µl ethyl acetate (EtOAc). Methyl esters of IAA and ABA were separated in gas chromatography coupled with mass spectrometry (GC/MS, Agilent 5975C) system and using selected ion monotoring (SIM) mode ions m/z 130, 136, 190 and 194 were tracked for identification and quantification of IAA and ABA. The endogenous plant hormone levels were calculated in accordance to corresponding peak areas of internal standard.

RESULTS AND DISSCUSION

Obtained results have shown that poplar clone Pe 19/66 was the most efficient in accumulation of Ni ions into leaves and roots, while clone M1 was the best accumulator regarding Cu ions. The dose dependence of accumulated metals is evident in both organs for all clones. In roots of poplar clone Pe19/66 both hormones, ABA and IAA, have shown significantly increased values under the top treatment of both metals, Cu and Ni. ABA levels in leaves were also significantly elevated under the top treatment of both metals. On the other hand, IAA amounts in leaves were increased under the MAA treatment with both metals, while under the tripled MAA concentration of IAA in leaves dropped. After comparison in phytohormone amounts among tested clones response to copper treatments, clone Pe 19/66 showed most dramatic changes in levels of ABA both in roots and leaves, where under the top copper concentration ABA levels were doubled.

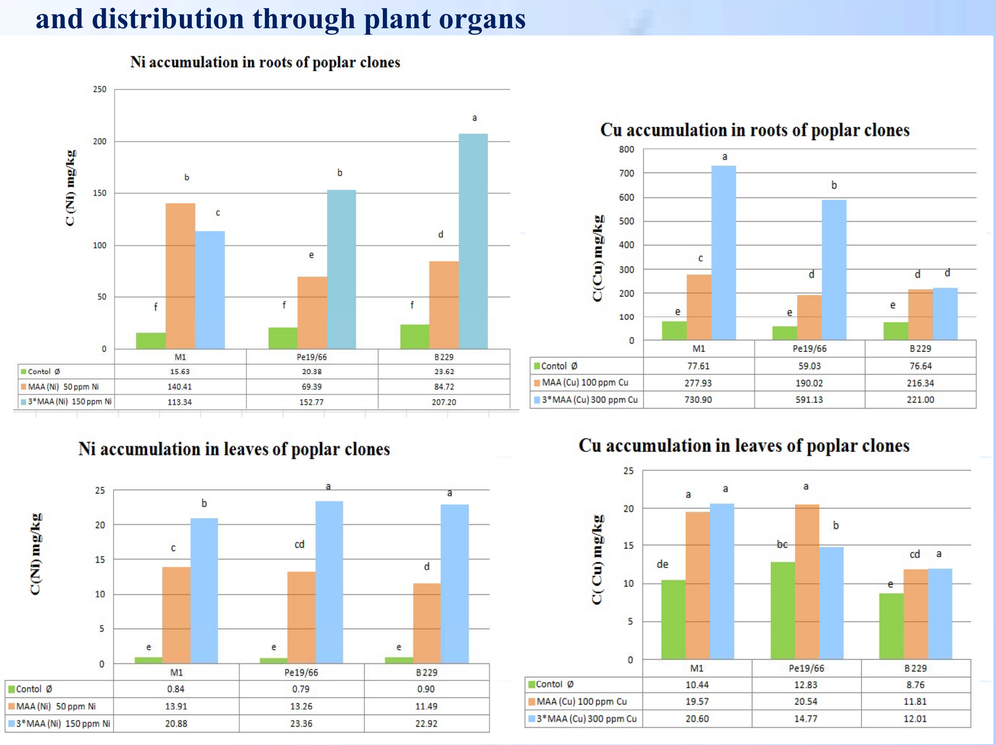
CONCLUSION

Phytohormone amounts can be used as an indicator of some particular heavy metal contamination in soil, and these parameters could be introduced in some systematic pollution estimation systems as a significant indicator of polluted areas. These parameters could be indicative in distinguishing different poplar clones according to their sensitivity to particular heavy metal. Still, problem exists in natural habitats where overlapping stress factors could be present. Beside these some further molecular analysis regarding specific gene expression are necessary.

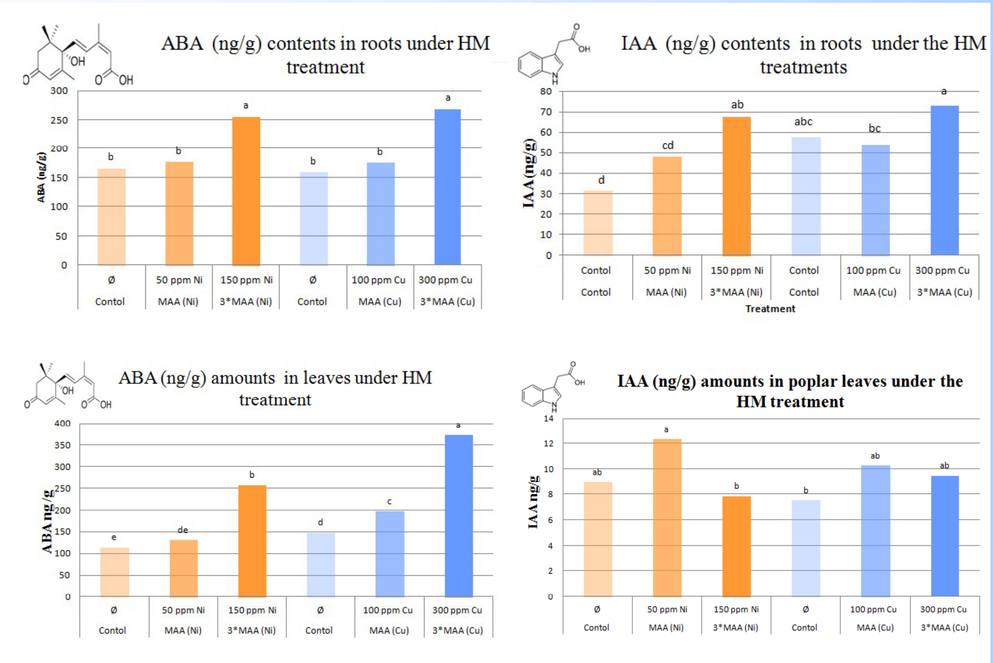
Acknowledgement
This study was supported by COST action-STSM-FP0903, IPA cross-border Cooperation Programme OXIT (HUSRB/214/036) and project III43007 financed by Ministry of Science and Education of Republic Serbia

RESULTS:

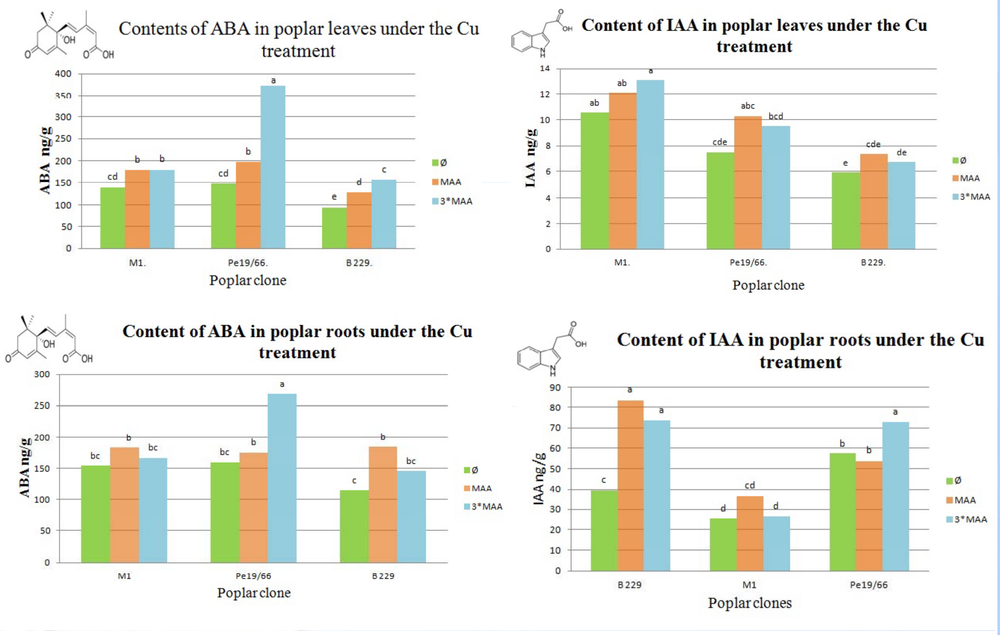
A) Accumulation of heavy metals in different poplar clones and distribution through plant organs

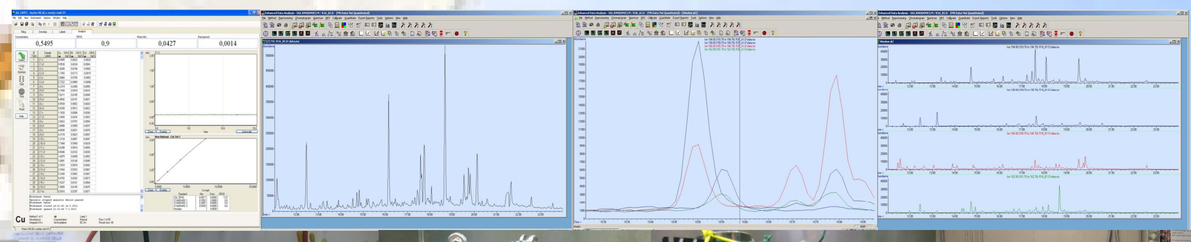


B) Effects of different metal (Cu and Ni) and metal concentration on phytohormones' contents in root and leaves of poplar clone Pe 19/66



C) Comparison of ABA and IAA amount among tested poplar clones in leaves and roots under the Cu treatment





VOC emission profile on particleboards made from softwoods

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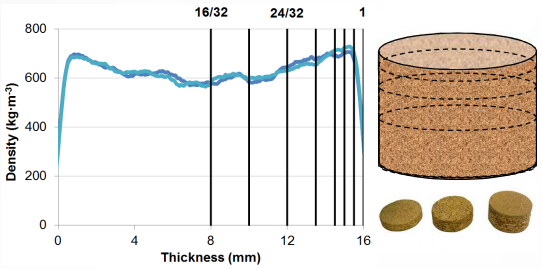
Abstract

- *Pinus pinaster* is one of the most common softwoods in Portugal, corresponding to more than 75 % of the total consumption of the sawmill industry and also widely used in the production of particleboards.
- In this work, VOCs emission from particleboards produced with *Pinus pinaster* were assessed. Samples were sanded in order to obtain the VOC profile along the distance to the surface.

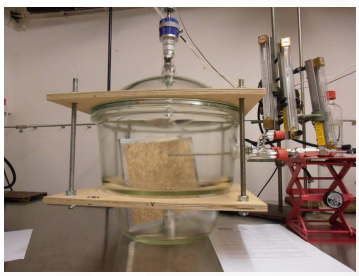
Material and Methods

- Particleboards (thickness = 16 mm (h_0), density = 650 kg.m^{-2}) were produced using *Pinus pinaster* particles blended with UF resin; Total VOC (TVOC) were evaluated according to the ISO 16000-6.



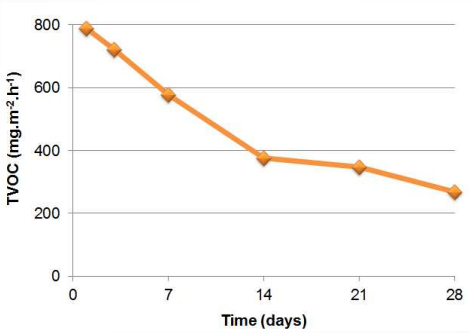
Density profile of produced boards and cutting scheme

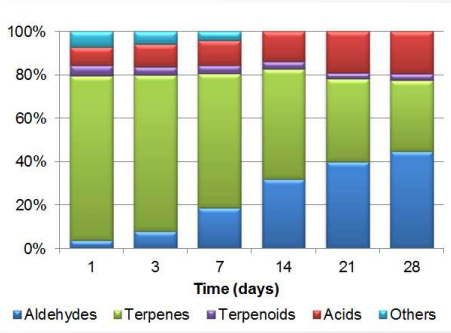
Micro-chamber tests for VOCs emission profile evaluation



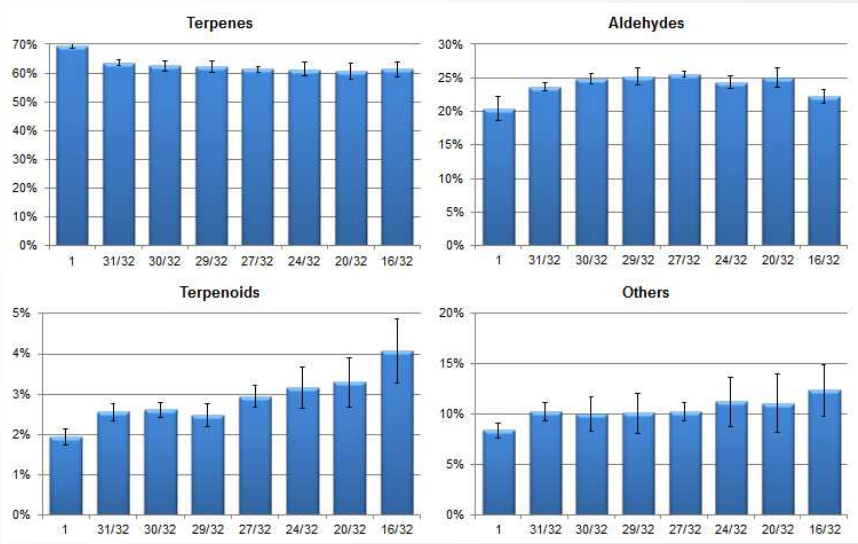
Desiccator apparatus for VOC emission

Results





Total VOCs emission over time and corresponding contribution of the different chemical species



VOCs emission profiles of the different chemical species along the distance to the surface

Conclusions

- Main VOC emission in particleboards made from *Pinus pinaster* are aldehydes and terpenes, corresponding to 80 % of total emission. In the first week after production, contribution of terpenes is predominant, while after this period, aldehydes plays a major role in emission.
- Terpenes are slightly in higher concentration at surface layer, while aldehydes are in lower concentration at surface layer and at the board center. Terpenoids increase substantially along the surface distance.
- **Next step is to evaluate the scavenging performance of additives on VOC emission**

Acknowledgement

- Nuno Costa wishes to thank FCT- Foundation for Science and Technology and Euroresinas – Indústrias Químicas, S.A. for PhD scholarship with reference SFRH/ BDE/ 33655/ 2009 and Thünen-Institut of Wood Research for allowing the scientific exchange

Economic and Environmental Evaluation of Energy Conversion of Forest Biomass Residues in Portugal

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The Forest Biomass Residues Supply Chain

Considering the need of increase the knowledge about the Portuguese strategy of forest biomass residues (FBR) to energy (heat and power), and its implications on the Portuguese climate policy, this work intends to evaluate environmental, thermodynamic and economic aspects of FBR to energy in Portugal, taking into account the undergoing energetic policy. Therefore, different scenarios of biomass to energy must be defined (considering the thermal power plants and cogeneration plants that consume FBR) and analysed in order to evaluate possible synergies between different biomass-based industries and integration of processes, and will provide information about the most appropriate strategies to achieve the goal of the Portuguese policy of FBR to energy.

To reach this objective, the following specific objectives must be addressed:

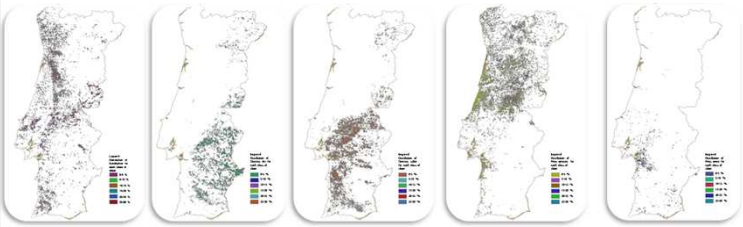
1. To evaluate if the FBR available for energy conversion can satisfy the needs of the existing and planned thermal power plants and cogeneration plants;
2. To evaluate if the location of the planned thermal plants is the most appropriate considering the spatial distribution of the FBR resources and FBR transportation options, costs and externalities;
3. To evaluate FBR to energy conversion technologies and select the most appropriate to be applied;
4. To evaluate the impact of the biomass management, harvesting, transport and energy conversion processes on air quality;
5. To estimate the carbon budget related to the biomass to energy chain for different scenarios;
6. To apply economic, thermodynamic and environmental analysis to distinct FBR to energy scenarios;
7. To define the most appropriate scenario of FBR to energy, in order to accomplish the Portuguese policy goals in a cost-effectiveness way.

Production and Harvesting | Transport | Energy Conversion | Distribution | Energy Appliance

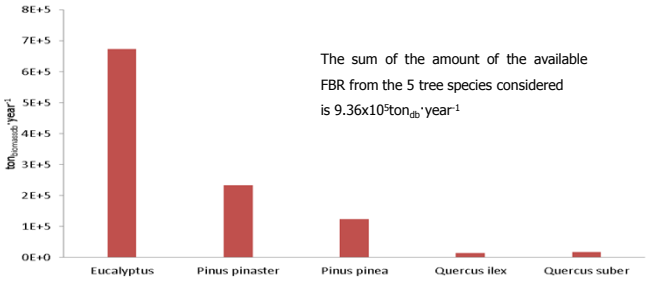
1. Biomass cost-supply curves for FBR to energy in Portugal

1.1 The Amounts of FBR available in Portugal

The spatial distribution of the trees for each specie available for biomass harvesting and timber exploitation for the existing industries; only areas with a slope below 30% were considered (based on harvesting practices and taking into account limitations associated to the land orography).



Based on information about sylviculture practices, number of trees for each specie and harvesting numeric models, the amount of FBR available from the 5 considered tree species was estimated.



The sum of the amount of the available FBR from the 5 tree species considered is $9.36x10^5 ton_{db} \cdot year^{-1}$

1.2 Logistics related to FBR to energy chain

Based on information from subtask 1.1 and on logistical and operational aspects, the amount and costs of FBR available for energy conversion was estimated.

Feeling | Processing | Transport

Emissions [$ton_{pollutant} \cdot ton_{FBR}^{-1}$] for **Feeling** and **Processing**

CO	N_2O	NH_3	NMCOV	NO_x	PM_{10},$PM_{2.5}$,TSP
$3.9x10^{-2}$	$3.3x10^{-4}$	$1.9x10^{-5}$	$1.3x10^{-2}$	$6.9x10^{-2}$	$2.4x10^{-3}$

Machines used during the Feeling and the Processing of FBR: the chainsaw; the Harvesters and the Forwarder.

Emissions [$ton_{pollutant} \cdot ton_{FBR}^{-1}$] for **Transport**

CO	N_2O	NH_3	NMVOC	NO_x	PM_{10},$PM_{2.5}$,TSP
$2.2x10^{-6}$	$8.6x10^{-9}$	$3.6x10^{-7}$	$3.8x10^{-7}$	$9.2x10^{-6}$	$1.9x10^{-7}$

FBR is loaded in transportation vehicles – Truck.

The cost related to the exploitation and transport of FBR will be estimated, taking into account:

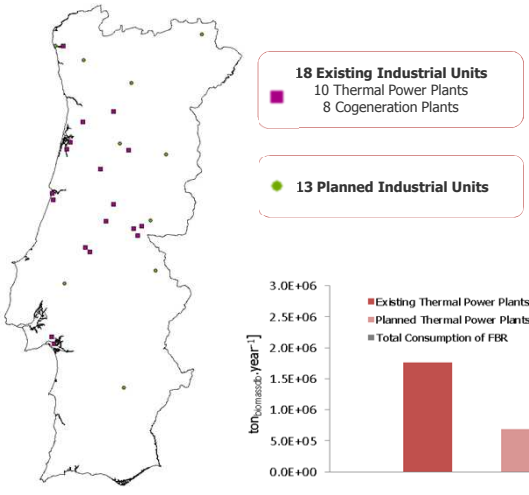
1. The costs associated with the machines used in each operation;
2. The distance travelled by the truck in order to supply the thermal power plants and cogeneration plants;
3. The fuel consumption.

2. Energy Conversion of FBR

The energy efficiency, environmental and economic impacts differ between conversion technologies. To evaluate these differences 2 distinct scenarios of FBR to energy were defined:

Baseline Biomass to Energy Scenario - includes existing thermoelectric and cogeneration plants based on FBR. This scenario assumes that no additional industrial plants based on FBR will be built.

Planned Biomass to Energy Scenario - considers the existing thermoelectric and cogeneration plants plus the 13 planned thermoelectric plants.



18 Existing Industrial Units
10 Thermal Power Plants
8 Cogeneration Plants

13 Planned Industrial Units

The existing thermal power plants and cogeneration plants need an estimated amount of $1.77x10^6 ton_{biomassdb} \cdot year^{-1}$, and the new thermal power plants $6.89x10^5$ ton(dry)biomass$\cdot year^{-1}$, that is, a total amount of $2.46x10^6 ton_{biomassdb} \cdot year^{-1}$. Comparing the FBR consumption for the existing thermal power plants and cogeneration plants, it can be concluded that the FBR available in Portugal ($9.36x10^5 ton_{db} \cdot year^{-1}$) is not enough to satisfy the needs of the existed industrial thermal power plants.

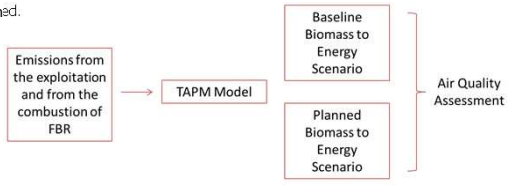
Emissions from energy conversion of FBR was estimated for the existing thermal power plants and cogeneration plants. The emissions of the atmospheric pollutants like CO, NMVOC, SOx, PM10 and PM2.5 are related to the incomplete combustion of FBR. PM emissions are partly associated with the emission of unburned compounds, which are related to operational issues. The formation of NOx in a combustion process is dependent on the presence of volatiles in the fuel (in most NH_3 and HCN), and still result of oxidation of molecular nitrogen with oxygen in the combustion air. However, since the combustion of FBR occurs at low temperatures, the influence of the molecular nitrogen for the emission of NOx is small, being more influenced by the fuel characteristics.

Emissions [$ton \cdot year^{-1}$] for **Energy Conversion** of FBR considering all existing plants

CO	SOx	NMCOV	NO_x	PM_{10}	$PM_{2.5}$
$7.7x10^3$	$3.3x10^2$	$2.2x10^2$	$6.2X10^3$	$1.1x10^3$	$9.9x10^2$

3. Air Quality Impact Assessment

To evaluate the impact on the Air quality (AQ), a numerical AQ modelling was selected (TAPM Model) and will be applied for the 2 scenarios defined.



4. Economic and Environment analysis

Cost-effectiveness analysis	Direct Costs (investment and operational related with thermal plants technologies and fuel processing)
	Externalities (air pollution related and CO_2 allowances)

The results from the economic and environment analysis of the 2 scenarios will be compared in order to conclude about the most appropriate for accomplish the goals of the distinct Portuguese strategies, namely for:

Energy (use of renewable energy source);

Climate (greenhouse gas emissions mitigation);

Air quality (air quality framework directive) policies.

ACKNOWLEDGMENT

The author acknowledge to the Portuguese *'Ministério da Ciência, da Tecnologia e do Ensino Superior'* for the financing of BIOGAIR project 'Impacts of biomass energetic recovery chain on air quality and Portuguese climatic policy' (PTDC/AAC-AMB/103866/2008). This work was also financed by FEDER through the Operational Programme Competitiveness Factor – COMPETE (FCOMP-01-0124-FEDER-008587). Thanks are extended to *'Silvimamodeiro – Exploração Florestal Ldd.*