# GOOD PRACTICES FOR RESIDENTIAL WOOD BURNING APPLIANCES

## 1 Introduction

According to the report "Energy consumption in households" (State Statistical Office, 2014) 62% of the total number of the Macedonian households consume wood as the primary energy commodity, 29% use electricity and 8% rely on heat energy from public heating system. Moreover in some regions of the country (East Region, South-West Region, South-East Region) the households with a wood fuelled device are more than 80%. Therefore the wood is the major fuel used for domestic heating in the country. The total consumption of wood in 2014 was approximately 1.3 million cubic metres, with an average consumption of 4.2 m3 in households that are heated only by wood.

According to the national emission inventory the domestic heating sector is the major emitting source for the particulate matter and the polycyclic aromatic hydrocarbons, two of the most critical air quality pollutant in the country. Due to their diffusion, the residential wood burning appliances could have a significant impact on air pollution. This document provides a short guideline concerning the good practices in choosing, conducting and maintaining the wood fuelled fireplaces, in order to reduce their impact on air pollution

## 2 Choosing the wood burning device

### *Characteristics of a sustainable wood burning device*

– **Power**: the power of the wood burning device should been calculated taking into account the area or the volume to be covered by the heating plant and considering the climate zone of the country

– **Two-stage combustion**: the device should be equipped with a primary combustion chamber and a secondary one where the exhaust gases are burnt

– **Refractory coat**: the combustion chamber should be coated with an adequate layer of refractory bricks to protect the surrounding infrastructures and minimize heat losses

– **Glass parts**: devices with limited areas of glass windows should be preferred to reduce heat losses

– **Air intake**: the air intake should be provided with a pipe connected directly outdoor, to reduce heat losses

– **Chimney connection**: a vertical connection between the chimney and the device should be preferred to horizontal one

– **Electronic management of the combustion air intake**: some modern devices are equipped with an automatic controller for the regulation of the air flow, in order to optimize the combustion

– **User guide**: The device user guide should be available including all the technical details (power, combustion efficiency, maintenance instructions etc.).

## 3 Use of wood burning device

### *How to choose wood*

**Log stoves:**

– Use only **properly dried** wood. To this aim purchase the wood in the early summer and keep it in a sunny, rain protected place

– Choose or split logs of **adequate size**: there should be a little space between the logs and the device's walls

– Store indoor the needed **daily amount** of wood in a heated room

– Try to choose logs of the **same size and diameter**, preferring the **split logs** instead of the round ones. It will improve the combustion efficiency.

**Pellet stoves:**

Pellets usually have a higher combustion efficiency than logs. Pellets need to be of high quality, made **only with virgin wood** and **free from any process residual** (glue, solvents, etc.).

## *How to light a wood-burning stove*

**The lighting process is fundamental to ensure a good combustion and a good performance of the device**

**The top down lighting method**

This method allows to light a log stove reducing the amount of smoke and unburned gases emitted in the atmosphere.

– Start by placing a row of large logs along the bottom of your fireplace, wood stove or fire pit. These will be the largest logs you use

– Next, place another row of slightly smaller logs diagonally in the other direction

– Follow this by placing a third row of even smaller wood. This row should consist of kindling which is about 3 cm wide

– Finally, place some small kindling that will easily light on top adding if needed a firestarter.

Photos: http://www.firewood-for-life.com/top-down-fire.html

## *Further recommendations for lighting*

– **Avoid to use paper** for lighting
– Ensure the **maximum flow the air intake**
– Add further logs only when there are enough **embers** at the base of the fire
– Load progressively the device with **small amounts of logs**
– If you need more or less heat, **vary the amount of wood** instead of adjusting the air intake flow
– In case of close fireplaces or stoves, **keep closed the device door** while burning.

## *Combustion tips*

**Poor combustion can be related to the emission in the atmosphere of significant amounts of air pollutant, especially dust and particulate**

– To optimize the efficiency of the device is necessary to reach a high temperature of combustion in a short time
– If the lighting is well operated the smoke disappears from the chimney top in less than 15 minutes
– If the device is producing a lot of solid, dark smoke the combustion is poor. This can be related to:

- Low quality/bad stored wood
- Dirty combustion chamber, or a sooty chimney
- Problem with the air intake.

In the last two cases the intervention of a qualified technician is needed.
– The presence of smell in the room is related to a bad combustion, with a possible emission of harmful substances from the device
– An efficient plant allows to heat your household s**aving fuel and money and reducing the emissions in the atmosphere**.

## 4 Wood combustion and health

**The wood combustion process produces several compounds, including carbon oxides, nitrogen and sulphur oxides, water vapour, unburned hydrocarbons, particles, ashes and soot.**

**Poor or incomplete biomass combustion can release in the atmosphere and in the households dangerous substances such as benzo(a)pyrene (a polycyclic aromatic hydrocarbon), included in the list of carcinogenic compounds by the International Agency for the Research on Cancer. Benzo(a)pyrene is usually adsorbed on the fine dust fraction that can penetrate deeply into the respiratory system, reaching the alveolus and the circulatory system, with adverse effects on human health.**

## How to preserve your health and the environment

The combustion of inappropriate materials in your stove is dangerous for your health and environment. The use of materials such as **plastic, painted wood and paper** in your stove can produce harmful substances that affect your household's air quality. Don't burn **waste** in your stove. Waste usually includes all the material mentioned above and can produce very harmful emissions

**The use of waste, plastic, painted wood (old furniture, wood pallets, etc.), organic garbage and other inappropriate materials, is a bad practice that can affect your health, the air quality and the proper functioning of your domestic plant.**

# USE ONLY VIRGIN WOOD IN YOUR STOVE

## 5 What can I do?

– If you're planning to purchase a new biomass device, choose it properly taking into account the **area or the volume** of your household and the **efficiency** of the stove. The device must be installed by a **qualified professional**

– Provide a **regular maintenance** of the device. **Combustion chamber cleaning** and **chimney sweeping** activities should be performed by a qualified professional at least **once a year**

– Improve the combustion process, using only **properly seasoned virgin wood**, or **high quality pellets**. The use of any other material is dangerous for your health

– Set properly the **air intake** to prevent the formation of smoke

– After lighting your device, **keep it functioning** for the entire day, also at a minimum capacity. Avoid an irregular functioning regime, because the lighting and the stopping procedures are the most polluting for the air quality

– **Avoid to put out the fire with water**. It could generate a lot of smoke and ash. Instead let the fire burn itself out. To this aim, simply separate the logs so that the fire dies down.

**Well conducted and maintained device allows to heat your house efficiently, saving fuel and money and contributing to reduce the air pollution.**

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