UNECE/FAO Forestry and Timber Section

DRAFT Workshop Report

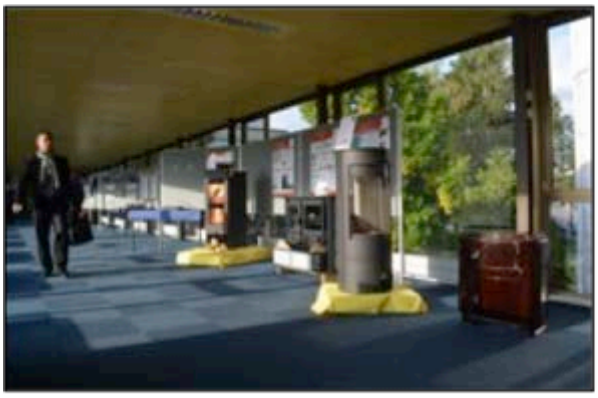
More heat with less wood

October 06-07, Palais de Nations, Geneva

Sustainable development for heating and cooking with firewood

UNECE

Food and Agriculture Organization of the United Nations



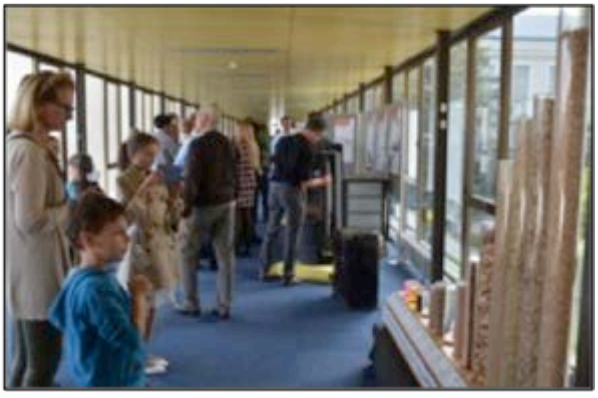


Table of content

More heat with less wood

Tables and Figures

Tables

Introduction & background of firewood in the ECE region

Wood is considered humankind's very **first source of energy**. Today, it still is the **most important single source of renewable energy**, providing over 9% of the global total primary energy supply. **Wood fuels come from multiple sources – not only forests**: trees in forests and outside forests, co-products from wood processing, post-consumer recovered wood and wood pellets and briquettes. Globally **more than two billion people** depend on wood energy for cooking and heating, particularly in developing countries, where it represents **the only domestically available and affordable source of energy**.

Figure 8 Firewood - the first source of energy.

The use of firewood for cooking and heating in households accounts for one third of global renewable energy consumption. Eastern Europe, the Balkans and Central Asia are those regions where the use of fire wood for heating and cooking is most relevant. In particular, in the rural areas fire wood is sometimes the main source of energy to the population. The population in rural areas of this region suffers from poverty, the absence of natural resources to respond to their energy demand and threats to health as a result of the combustion on low quality firewood. The collection and combustion of firewood is the first step of the UNECE's forest ecosystem services. Once the heat is generated in the stoves inside the house the comfort and generated heat has to be kept in the heated space. In many households this is hardly the case leading to energy demands of households that are significantly higher than energy demand per heated square meter in more urban areas.

The affected sectors of development work for the use of wood for heating and cooking are diverse- thermal insulation of housing, heating technology, consumer health and behavioral aspects of wood use along with ensuring a minimum quality of the natural resource wood, to name just a few. In fact, to foster sustainable development in this field is a complex task that can best be achieved by cross-sectorial efforts.

Firewood use in households

Forest & harvest

The **UNECE region is rich in forest resources** with a forest area of 1.89 billion ha – 41.4% of the global total. It is also the region with the **highest concentration of wood-based industries**. As a result of this intensive use of the forest in the UNECE region, the forest industry and other **stakeholders are concerned** with changes in market prices, supply and demand patterns, production processes, investment in the sector, rural livelihoods, climate change and biodiversity.

The firewood in this region is mostly cut manually with the support of chain saws and then transported by trucks, tractors, cars but also horses and even by hand. In many areas the forest infrastructure is in such a state that efficient forest harvesting is not possible. Most of the forests remain inaccessible and are difficult to reach. For many, the own initiative to go into the woods and collect firewood is the only option to cope with cold temperatures and respond to the energy demand for cooking the households. The forests have been used for the supply of firewood for centuries and have resulted to adapt their shape accordingly.

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Coppice forests are the predominant form of forests that can be found close to settlements that rely on the use of firewood for heating and cooking.

Storage & firewood quality

The calorific value of wood depends on the tree species and the water content of the wood. The main difference of the calorific values lying between tree species of coniferous or broadleave species, cannot be influenced a lot. Whereas, the water content can be influenced significantly by appropriate storage and drying of the wood.

Figure 9 Storage of firewood.

In most households of the target region the common practice for storage and assuring a minimum quality of the natural resource wood can be improved.

Main areas of improvement are:

1. Firewood without pollution, chemical treatment
2. Splitting and appropriate storage
3. Minimum storage time

Conversion technology

The efficiency of the combustion of the firewood depends mainly on the efficiency of the heating device, it's operation mode and the fuel wood quality. In addition, the size of the heating device should be adequate for the energy demand necessary for heating the room. Most of the households in the target region rely on the use of one heating stove that can be used for cooking and heating. In most households only a few rooms are heated, mainly the kitchen and attached rooms.

Figure 10 Types of conversion technology.

Chimneys are the "engine of the stoves" are rarely cleaned and operate below their capacity. A stuck chimney has lower drag and thus amounts of oxygen in the combustion chamber. As a result, the temperature in the combustion chambers in lower and the chemical reaction happening to the wood is incomplete. This leads to higher emissions and volatile organic compounds in the exhaust gases.

The energy efficiency of a heating device is determined by the temperature gradient between the inside temperature of the heated space and the temperature of the exhaust gases. Many stoves operate on a simple principle where the exhaust gases of the fire are directly transferred to the chimney and outside the heated space. Modern heating devices increase

the use of the heat stored inside the exhaust gases and provide more opportunities for the heat to convey to either space or water storage, included into the heating stove.

Housing and thermal insulation

Once the heat is generated it provided space heating by convection and radiation. Heat is transferred through any material and cannot be stored without losses in any device.

Very few of the housing stock in the target regions has thermal insulation to a sufficient degree. Thermal insulation can be based on natural resources, such as wood, agricultural residues as well.

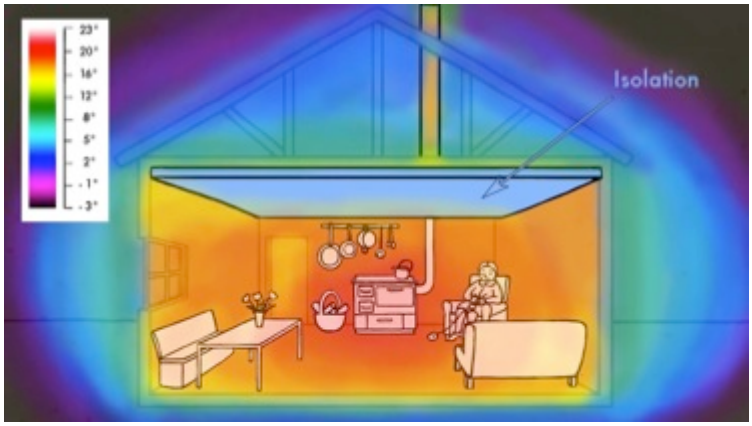

Figure 11 Thermal inuslation of housing

In the United Nations Economic Commission for Europe (UNECE) region, buildings are responsible for over one third of the total final energy consumption. Much of this energy is used by the residential sector (20–30 percent of total final consumption on average), i.e. mostly for space and water heating.

High prices for centrally-distributed energy have prompted many residents to switch to alternative and less efficient heating means such as coal or wood, increasing deprivation and environmental pollution. Also the housing sector currently maintains outdated inefficient practices, and is one of the drivers of high levels of energy consumption.

In many cities of the UNECE region buildings are still being constructed without meeting appropriate regulations, and the retrofitting of existing housing stock is lagging behind. Retrofitting existing housing stock and, in

particular, multi-family housing, was identified as a priority challenge across the UNECE region in a survey of member States.

Nevertheless, space heating and water heating are generally considered to be the areas where the opportunities for energy efficiency improvement and savings are the greatest.

The consumer and health

Did you know that each year 61 000 premature deaths are attributable to outdoor air pollution from residential heating with wood and coal in Europe, with an additional 10 000 attributable deaths in North America. It also causes ill health for many more.

Figure 12 Firewood consumption and health.

Currently, most burning of solid fuels for space heating is done in devices that incompletely combust the fuel owing to their low combustion temperature and other limitations. This results in relatively high emissions per unit of fuel, including many products of incomplete combustion such as PM2.5 and carbon monoxide (CO) – two major air pollutants.

Small-scale solid fuel combustion is also an important source of black carbon (BC) emissions. BC is a component of PM2.5 that warms the climate.

Measures are available to reduce emissions of solid fuels for residential heating in most places. Encouraging fuel switching and use of more efficient heating technologies (such as certified fireplaces or pellet stoves) can reduce the emissions from residential wood and coal heating devices. Educational campaigns can also be useful tools to reduce emissions from residential solid fuel heaters. In addition, filters may reduce health effects from indoor air pollution.

The use of solid fuels for heating is expected to persist and probably even expand, especially within the EU, in the coming decades as a result of climate policies that favour wood burning. Better alignment is therefore needed between climate and air pollution policies in many countries.

Residential heating with wood and coal is an important source of outdoor air pollution. Evidence links emissions from wood and coal heating to serious health effects such as respiratory and cardiovascular mortality and morbidity. Wood and coal burning also emit carcinogenic compounds.

If we want to tackle outdoor air pollution problems , it is important to address residential burning as an important source sector. A better understanding of the role of wood biomass heating as a major source of harmful air pollutants (especially fine particles) is needed among national, regional and local administrations, politicians and the public at large.

UNECE'S WORK

The UNECE approaches the topic of firewood use in households from various angles. The following divisions facilitate international exchange and provide guidance to member states of the UNECE:

Housing and Land Management Unit

The UNECE Committee on Housing and Land Management (CHLM) provides policy advice and expert assistance on sustainable housing development, land administration, spatial planning and energy efficiency. Since its establishment in 1947, the Committee has actively promoted building codes and standards.

Our work is based on the principles of the Geneva UN Charter on Sustainable Housing a non-legally binding document aims to support member States as they seek to ensure access to decent, adequate, affordable and healthy housing for all. The Committee works to improve housing energy efficiency and to facilitate the maintenance, management and refurbishment of existing housing stock. The Committee provides a framework for Governments to overcome barriers to energy efficiency investments in the residential sector.

Our policy recommendations focus on energy performance standards and technology integration. We embrace measures to ensure that new and existing residential buildings progressively meet higher technological standards with a goal to promote very low-energy and low-carbon technology.

Forestry and Timber Section

The joint UNECE/FAO Forestry and Timber Section monitors the state of forests in the region, helps in developing evidence-based policies for sustainable forest management and communicates information on the many products and ecosystem services provided by forests to society.

The Joint UNECE/FAO Forestry and Timber Section works with countries of the region, as well as stakeholders. This is done through the organization of meetings and events to raise awareness on specific forest-related issues, gathering experts to advise on these issues,

agreeing on appropriate actions. To provide a foundation for the above the section compiles and analyses data and disseminates this knowledge through publications and other communication material.

Wood energy is addressed in many aspects of the section's work and specifically through the advisory work of the Team of Specialists on Wood Energy, and publication of wood energy market information in the Forest Products Annual Market Review.

Sustainable Energy Division

The Group of Experts on Energy Efficiency and the Group of Experts on Renewable Energy are carrying out concrete activities in line with the Sustainable Energy for All (SE4ALL) Initiative of the UN Secretary-General, contributing to achieving two of the three objectives :

- **Double the global rate of improvement in energy efficiency.**
- **Double the share of renewable energy in the global energy mix.**

UNECE region has a tremendous potential to increase the efficiency of wood energy production, transmission and use as well as promoting the increase of renewable energy uptake, from various sources, including biomass through the exchange of information, know-how and best practice policies.

UNECE has developed a structured framework, methodology and tools on which to identify and base a menu of best practice energy efficiency and renewable energy policies and measures. On **energy efficiency**, it provides a system that encompasses the description, identification, nomenclature and classification of energy efficiency policies and measures. On **renewable energy**, the cooperative mechanism allows the exchange of best practices, high impact measures and procedures to significantly increase the use of renewable energy.

Convention on Long-Range Transboundary Airpollution

The **Joint WHO/UNECE Task Force on Health Aspects of Air Pollution** under the Convention recently published a report on *Residential heating with wood and coal: health impacts and policy options in Europe and North America.* Please follow the QR-code to consult the report.

Air pollution has significant impacts on our health, environment and economy. Pollutants in the air we breathe come from **multiple sources**, including sectors such as industry, transport , agriculture and residential heating.

Every day, air pollution causes **respiratory and cardiovascular diseases**. It also damages **vulnerable ecosystems and biodiversity** and leads to a decrease in agricultural crop and commercial forest yields. It is therefore paramount that we take action together — across sectors and national boundaries.

To improve air quality, UNECE member States signed, in 1979, the UNECE **Convention on Long-range Transboundary Air Pollution**, creating the first international treaty to deal with air pollution on a broad regional basis.

Over the years, the number of substances covered by the Convention and its protocols has been gradually extended, notably to ground-level ozone, persistent organic pollutants, heavy metals and **particulate matter**.

In a collective effort, Parties to Convention have reduced emissions of key air pollutants **by 40% to 70%** since 1990 in Europe. In 2012, Parties to the Convention broke new ground in amending the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone.

The Protocol is now the first legally binding agreement containing obligations to reduce the broader spectrum of short-lived climate pollutants (SLCPs), notably fine **particulate matter**

($PM_{2.5}$), including black carbon. This will further help in bringing about **climate and health co-benefits**.

Objectives of More heat with less wood

The objective of the workshop is to exchange experiences on how to improve wood energy applications under given socioeconomic conditions in target countries of the UNECE region (Eastern and Southeastern Europe, Russian Federation, Central Asia).

Participants are invited to develop guidance for how to facilitate the optimal use of wood as a clean and healthy source of energy for households.

On day one, the objective is the identification of the main challenges of wood energy projects for heating and cooking in households. On the second day, the goal is to identify the key characteristics of good practice wood energy projects and the role of multilateral organizations in this matter. The human health, the environment, energy efficiency of wood energy appliances for heating and cooking, sustainable housing and behavior related issues of wood use at home will be addressed.

Wood energy projects from different development organizations across Eastern Europe, the Balkans and Central Asia will be presented. The results of the discussions will be protocoled and processed by the secretariat. Day one is going to finish with a wrap up of the discussion of the working groups. The key characteristics of good practice wood energy projects for the development of a sustainable and healthy use of firewood in housing will be identified and discussed.

Improving the use of firewood in households of Eastern Europe, Balkans and Central Asia – experiences from the field

A perspective on wood energy

This text was written on the basis of the presentation "Wood Energy and influencing factors" which was presented at the workshop "More heat with less wood" by Prof. E. Zürcher, Bern University of Applied Science

Figure 13 The carbon cycle.

"A sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs". On the example of a forest this means that the rate of exploitation never exceeds the rate of regeneration. In a forest managed according to the « Plenterwald » -principle, all ages and developmental stages are mixed in the same space. The removal of an old tree gives light for the new generation and this ensures the whole forest to stay permanent. Such a stand has a growing stock (or capital) of 400 m3/ha and an increment of 10 m3/ha/year. This allows exploiting in 40 years a volume equivalent to the standing capital, without any noticeable disturbance of the forest during this period. This potential can be used without having a destroying impact on the ecosystem.

Wood can be seen as solar energy transformed in chemical energy. This process is called photosynthesis hereby light energy is converted into chemical energy by plants. With the photosynthesis carbon dioxide and water are transformed to glucose oxygen and water. This

process is crucial for all living organisms in the world as it maintains the oxygen level in the atmosphere. The biomass of 1000kg wood sequesters 1851kg of carbon dioxide therefore wood can be described as a carbon sink. Using wood as a fuel to generate energy reverses this process. With the illustrating example of 1 kg air-dried wood that contains the energy needed to heat up 170l of water from 10° C to 30° C, the amount we need to take a nice bath, one can get a feeling of the energy content of wood. The most commonly used firewood species in Central Europe is beech (*Fagus sylvatica*), which high energy content. The wood derived from hornbeam (*Carpinus betulus*) has the highest energy content.

There are several factors that determine the quality of fuel wood. A very important one is drying the wood before using it as fuel. Reducing the moisture content to a level of 12 to 15% prevents the degradation by fungi or insects. In addition this increases the calorific value noticeably. The best option is to prepare firewood in the winter or early spring. At this time of the year the wood is less sensitive to decay, the water flow within the stem is reduced, there are no fungi or insects active and drying starts at low temperatures followed by a long warmer period. Maintaining the crown of conifer trees for 2 to 3 months after felling enables a noticeable drying of the stems by slow evapotranspiration and thereby leading to a higher wood quality. Another influencing factor for the drying process of wood is lunar periods. It has been shown that felling shortly before full moon produces wood, which has a higher hygroscopic water uptake after drying than wood that has been felled shortly after full moon.

Properties that make wood precious as a building a material are a high specific heat capacity and a high insulation factor (13 to 18 times better than reinforced concrete material). That allows a good indoor climate through long-term heat storing and radiating. Moderately warm wooden walls (21° C) allow a good indoor climate with only 17° C of air temperature. For this less heating energy is needed than for warm air (20° C) in cold walls with the same subjective comfort.

In conclusion heating with wood energy can be sustainable, comfortable and healthy and building with wood can result in a decreased heating need.

Health and indoor biomass combustion

This text was written on the basis of the presentation "Health and indoor biomass combustion" which was presented at the workshop "More heat with less wood" by H. Adair-Rohani, WHO

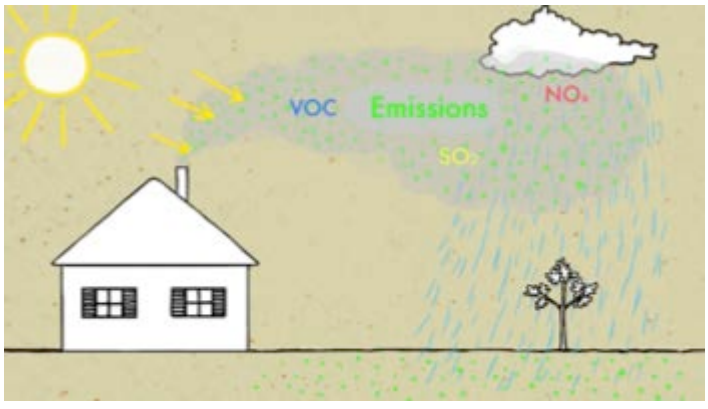

Figure 14 Emissions of biomass combustion.

Air pollution has a significant impact on health condition. It can lead to difficulties in breathing, wheezing, coughing, asthma and worsening respiratory and cardiac conditions. Particulates are one group of several other pollutants occurring in the atmosphere. Globally less than 10% of total ambient particulate matter smaller than 2.5µm ($PM_{2.5}$) comes from residential heating stoves or boilers. However, Central Europe accounts with 21% to the highest fraction globally of ambient $PM_{2.5}$ attributed to residential heating. More than half of low and middle-income households (LMICs) of European countries rely on solid fuels for heating. Especially rural areas show a larger primary reliance on solid fuels for heating. From residential biomass and coal combustion derive several health damaging pollutants as particles and gases. The released particles are: $PM_{2.5}$, black carbon (BC) and organic carbon

(OC); the released gases are: carbon monoxide (CO), nitric oxides (NOx), polycyclic aromatic hydrocarbon (PAHs), sulfur dioxide (SO_2) and volatile organic carbon (VOCs). The exposure to air pollution from incomplete combustion of solid fuels can cause various diseases like child pneumonia, low birth weights, chronic obstructive pulmonary diseases (COPD), lung cancer or cataract to name only the ones proofed by strong evidences.

To work on the improvement of air quality it has to be considered that household emissions enter ambient air, re-enter homes and lower the indoor air quality. The local ambient air quality affects the indoor air quality, so it has to be improved in order to achieve clean indoor air. Moreover, emissions derived from all multiple energy needs like cooking, heating and lighting in homes, have to be taken into account. The energy use within households carries certain risks e.g. of burns and poisoning. Approaches to minimize exposure to emissions should be developed in a way that incorporates safety concerns. Interventions need to be available and affordable, or harms may result from energy poverty. All these considerations mentioned should be integrated in developing approaches to improve the health condition in respect to indoor biomass combustion.

Taking these issues into account the WHO published a set of air quality guidelines to enhance decision-making and secure health benefits in the area of household's energy with a primary focus on LMICs. In these guidelines WHO defines emission rate targets (e.g. for PM2.5, CO etc.) which should not be exceeded. The focus should lie on emissions reductions as the evidence base for this approach is higher than for others. The implementation practicality is determined among others by design, production and standard. Some options like for instance clean fuels are relatively independent of user behavior and therefor more likely to generally improve the situation. It is recommended to not use unprocessed coal as a household fuel because it is very difficult to burn coal cleanly in homes. Further, emissions form household-use of coal are a group 1 carcinogen (IARC monograph) and coal often contains toxins (fluorine, arsenic, mercury, etc.) which are not destroyed on combustion. Another recommendation is to discourage household combustion of kerosene while further research on its health impacts is conducted. WHO promotes some interventions to improve health conditions in relation to heating, those are:

- Fuel switching by banning sale and distribution of coal
- Exchange of heater and wood stoves and replace them with certified wood stoves or other appliances
- Heating of districts with emphasis on biofuels over heating oils
- HEPA filters
- Regulation of emissions limits with Ecodesign standards for solid fuel space heaters and boilers
- Incentives to switch fuel and shift towards a pellet or wood-chip stove
- Introduce "no burn" days on voluntary or regulatory base
- Regulate the exchange of heaters

Considering the opportunities for synergies between climate policies and health, including financing– governments and agencies which develop and implement policy on climate change mitigation should consider action on household energy and carry out relevant assessments to maximize health and climate gains.

User influence on energy efficiency

This text was written on the basis of the presentation "User influence on energy efficiency" which was presented at the workshop "More heat with less wood" by F. Heesen, RWTH Aachen University

Technological approaches to make energy consumption more efficient can only develop their full potential if used in the correct manner. The behavior of the technology user can have a major impact on the final efficiency of the device. For that reason, the realized consumption of fuel can be much higher than the calculated rate. Research in the field of behavioral aspects of consumers led to the conclusion that the more complex the technology is the higher is the possibility of troublesome behaviors. User behavior is determined by multiple influences. For example can troublesome behavior be minimized by in-depth communication. A field observation of an exemplary apartment building showed that single apartments deviate considerably in comparison to all other apartments. Technologies have an influence on the user behavior and the user behavior has an influence on the efficiency of the technology. The key point to an optimal use of the technology is the communication management among all stakeholders in alignment with information and expectations.

Figure 15 User influence on firewood use.

Overview of wood energy projects

Development of a sustainable bioenergy market in Serbia

Efficient firewood utilization in households



Fields of implementation	Policy advice, biomass supply, efficient firewood use in HH

The major aim of this project is to improve the efficiency of fuel wood utilization. Wood is the main source of energy for households heating and cooking in many cities.as well as in rural areas in Serbia. Serbian households practice traditionally the use of wet wood in inefficient appliances. Furthermore, the regulative framework and supporting systems are insufficient and underdeveloped. The strategy to tackle those problems contains three major activities: to **promote efficient utilization** of wood fuels and wood-based technologies in selected pilot regions (1), to contribute to the **sustainable development of the market** for wood fuels and wood-based technologies (2) and to enhance an **enabling environment** for wood fuels and wood-based technologies (3).

So far a baseline study “Efficiency of Firewood Utilization in Households in the Pilot Regions in Serbia” was published in 2014, covering an efficiency assessment of firewood and other wood fuels as well as wood-based technologies. Moreover, an **educational guideline for end-user** (3000+ copies) was distributed in the pilot region and advertised in combination with the delivery of **educational sessions** (45), open-air **demonstrations** with manufacturers (4) and promotion of the guideline in video format for wider use.

The key to a sustainable biomass heat market is the customers’ confidence in the entire supply chain from wood fuels to the installation of efficient appliances and ongoing maintenance.

Country	Republic of Serbia
Duration	March 2013 – December 2017
Funded by	German Federal Ministry for Economic Cooperation and Development (BMZ) under the German Climate Technology Initiative (DKTI)
Implemented by	Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ)
Contact	Milica Vukadinovic, team leader Branko Glavonjic, national biomass expert
Website	http://www.bioenergy-serbia.rs; presentation

Energy efficiency and house insulation in Kyrgyzstan

More heat with less wood




Fields of implementation	efficient firewood use in HH, construction of cooking stoves, technology transfer, insulation methods, sustainable use of natural resources, traditional energy resources in Kyrgyzstan: bush vegetation, wood and dung

CAMP Alatoo is a non-profit and non-governmental organization founded in 2005 in Kyrgyzstan. It is a successor organization of the Central Asian Mountain Partnership (CAMP). CAMP Alatoo encourages a more sustainable use of natural resources with the objective to improve people's livelihoods in the mountain villages of Kyrgyzstan. To enable these process people were trained in **insulating methods** and the construction of more **efficient cooking stoves**. Easy realizable thermal insulation of houses has the potential to ameliorate the energy efficiency tremendously.

Therefore, insulation with **local material like straw and reed** was promoted. Cooking stoves in this region are mostly made out of iron. As this is inefficient the use of brick stoves is postulated instead. So far more than **200 craftsmen** were trained in the construction of brick stoves.

User-oriented home insulation and heating improvement projects at the village level have gone through the pilot phase, proved technically viable, and are ready for upscaling.

Country	Kyrgyzstan
Duration	2004 – on-going
Funded by	Swiss Agency for Development and Cooperation
Implemented by	CAMP Alatoo (before 2009 by CAMP program and by CDE Bern)
Contact	Ulan Amanturov, specialist for energy efficient building Heino Meessen, scientist, CDE at Bern University
Website	http://www.mountainpartnership.org/members/members-detail/en/c/42788/, www.cde.unibe.ch ; publication 1 and 2; presentation 1 and 2

More heat with less wood

A financing mechanism for warmer and more energy efficient Moldovan homes (MoREEFF)




Fields of implementation	Installation of more efficient technology, HH improving, heating, photovoltaic, solar water systems, biomass stoves boilers, gas boilers, heat pumps, heat exchangers, insulation, windows, financing

The MoREEFF facility aims to give householders, condominiums/associations of apartment owners, housing management companies, energy service companies ("ESCOs") or any other eligible service companies across Moldova an opportunity to realize the benefits of energy efficiency home improvements by providing them with **technical assistance, loans** and **investment incentives** through local participating banks. Eligible sustainable energy investments include: double-glazing; wall, floor, and roof insulation; efficient biomass stoves and boilers; solar water heaters; efficient gas boilers; heat pump systems; building-integrated photovoltaic systems; and heat-exchanger stations and building installations.

Up to now **1636 projects** were supported by this programme with a total amount of **incentive grants of 1.7 million €.**

The demand for home improvements is increasing as householders started to recognise the benefits of energy savings and improved comfort of living.

Country	Moldova
Duration	2011 - June 2017
Funded by	European Bank for Reconstruction and Development, European Union Neighbourhood Investment Facility, Swedish International Development Cooperation Agency
Implemented by	MoREEFF Programme Office
Contact	Boris Petkov, Maria Axenti E-mail: info@moreeff.info
Website	www.moreeff.info; presentation

More heat with less wood

Sustainable energy solutions for Georgian communities

Identification of options to improve the energy situation in Dedoplistskaro




Fields of implementation	Technology improvement, education, training,

The Dedoplistskaro municipality is the region in Georgia which is the most affected by climate change, desertification and land degradation. This projects aims to demonstrate energy efficiency measures to identify the most energy-efficient solution for local households. Therefore, local needs and opportunities were identified and **energy efficient technologies** covering insulation and stoves were promoted. These technologies proved to be the most suitable ones after scientific tests, calculations and monitoring in cooperation with the Technical University.

The energy efficient solutions were so far demonstrated in **4 communities in schools (4), a kindergarten (1) and families (32).** By spreading this approach to all families (approx. 2300) within these 4 communities the potential saving of approx. 20% of firewood would be equal to roughly 4000 m^3.

The local self-government as well as local population is not aware of strategies to improve energy efficiency or the effective use of alternative energy sources. For that reason there is a high potential to ameliorate the overall situation by promoting the results of the scientific tests concerning stoves, insulation and sustainable use of firewood in rural areas.

Country	Georgia
Duration	2008 - 2017
Funded by	German Federal Ministry for Economic Cooperation and Development (BMZ)
Implemented by	Deutsche Gesellschaft für international Zusammenarbeit (GIZ), EcoVision
Contact	Sergi Sopadze, energy project coordinator
Website	www.ecovision.ge; publication; presentation

More heat with less wood

Sustainable regional supply chains for woody bioenergy (BioRES)

Experiences from Bulgaria, Serbia and Croatia

Fields of implementation	Regional supply chains capacity building, market development, supporting verified sustainable forest management, development of the bioenergy sector, local policy, value chain development, resource efficient use of woody biomass

The overall objective of this project is the market uptake of domestic woody bioenergy supply chains by introducing the innovative concept of **Biomass Logistic and Trade Centres** (BLTCs) as regional hubs based on cooperation with European partners. This is supposed to lead to a more resource efficient use of wood energy products for households, heat and power utilities, public buildings, SMEs/industry. The three concrete aims are to establish at least **6 to 8 new BLTCs** distributed over at least 2 of the 3 countries (1), agree on sales with energy consumers in rural areas for a total of at least **8,000 tons per year** (2) of woody bioenergy products, backed by at least the same volume of delivery agreements with producers and a total of at least **12 trainers** (representatives of commercial associations of bioenergy producers or of regional energy agencies) and at least **400 potential actors along the supply chain are trained and their capacities developed** on how to implement and manage regional supply chains for quality woody bioenergy products from sustainable forestry (3).

So far **15 priority locations for new BLTCs** have been identified based on a set of criteria.

Countries	Bulgaria, Republic of Serbia, Croatia
Duration	January 2015 – June 2017
Funded by	European Union's Horizon 2020 research and innovation programme (No 645994)
Coordinated by	Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ) GmbH
Contact	Stefan Essel, project coordinator
Website	www.bioresproject.eu; presentation

Efficient use of natural resources in Kyrgyzstan and Tajikistan

More heat with less wood




Fields of implementation	Technology transfer, insulation, training

The mission of the organization is to advance the implementation of projects and programs aiming to protect the social and economic interests of the population while promoting a healthy lifestyle and preserve natural resources. In Tajikistan more than 70% of the population resides in rural areas, where no gas supply or central heating exists. Therefore, wood is the main energy source and used extensively. The traditional heating and cooking equipment is using wide chimneys, thin metal stoves, no isolation which is inefficient and requires a lot of wood during the long and harsh winters. To tackle those problems a pilot project was launched in 6 villages of Tajikistan. It strives to improve the **living standards** of the rural population, by building their capacity and knowledge on the **sustainable use of natural resources**, application of alternative sources of energy, methods of heat insulation of private and public facilities and construction of **energy efficient cooking and heating** stoves that can reduce the consumption of fire wood.

So far **12 houses have been isolated** utilizing local materials and involving local craftsmen, **180 energy efficient multifunctional stoves were installed** in the houses of the poorest families in the target region. This led to a decreased wood consumption of approx. 35% which is very beneficial for the already intensively used wood resources. A social side-effect was that women and children spent less time with the collection of firewood.

As this was a successful pilot project the organisation is now trying to enlarge the target region and wants to reach more people with this approach.

Country	Tajikistan
Duration	
Funded by	SDC of Kyrgyzstan and Tajikistan
Implemented by	NGO Nur (local partner), Alliance of Central Asian Mountains Communities (regaional implementer)
Contact	Shahboz Miralibekov, chairman of Nur
Website	http://www.agoca.kg/; presentation

More heat with less wood

Low-cost heating for low-cost housing: how to heat more and spend less – a case from Albania





Fields of implementation	Building of dwellings, energy efficiency

In Albania on average 57% of households use wood for heating, mostly in rural areas, which make up for more than 80%. There is not yet a policy to stimulate efficient use of wood heating, while recently the Parliament is discussing the law on energy efficiency in buildings. The National Housing Agency (NHA) works to provide affordable and adequate housing to low and medium-income families in Albania. In its search for innovative solutions NHA has conducted a competition for a low-cost and energy-efficient housing project to be implemented in a city located in Southeast Albania.

To analyse the situation of families that bought houses from NHA a survey was undertaken with households in dwellings built by NHA between 1995 and 2007. The outcome was that households belong to the low-income category, 100% of households use wood for heating, they heat only one room while consuming on average 300 KwH/m2/a and they consume some 12% of their income mostly for heating.

The survey concluded that households use a considerable amount of energy to heat only one room and all of the families use wood for heating as the cheapest source of energy. Therefore, improving the energy efficiency standards for the new buildings will have a **positive impact on household quality of life** and less or nothing to their economy, since they are already saving by not using energy to heat the whole apartment.

The outcomes of the survey were used as input for the new project, which is now providing **individual heating systems and chimneys for wood heating stoves**.

Country	Albania
Duration	2014-2017
Funded by	National Housing Agency and UNDP
Implemented by	National housing Agency Albania
Contact	Doris Andoni
Website	www.ekb.gov.al; presentation

More heat with less wood

Production and marketing of energy-efficient wood stoves in Tajikistan




Fields of implementation	New technology development, market establishment, training

Though Tajikistan's forests are reduced to 3% of the surface wood continues to be the most important fuel in rural areas. Deforestation is therefore a big issue and has several negative consequences like erosion, mudslides and floods. Cow dung is also widely used as fuel which reduces agricultural yields. In view of this situation the objective of this project is to establish **sustainable production** and **marketing** of more **efficient heating and cooking technologies** in the Muminobod district. To find the most suitable stove 15 models (existing and newly developed) were tested. The results of the test were the basis for the development of a prototype, which was patented in 2015. The now promoted stove saves 30% of fuel when used together with accessories such as heat exchanger or water tank, no smoke is released to the room which improves health conditions, reduces emissions and it is possible to cook, heat, bake and boil water simultaneously. These stoves are currently produced in one blacksmith workshop. With a manual that explains the production step by step this knowledge will be made available for broader usage. A promotion campaign will introduce the stove in the market. However, the stove will be sold to market conditions and via existing market structures in order to ensure sustainability.

A project starting in spring 2016 will make various energy-efficient and renewable energy options available for dwellings in order to enhance the impact and capacitate local masters and service providers. The environmental, economic and social impacts will be monitored closely.

Country	Tajikistan
Duration	2014-2016
Funded by	Grants from the City of Geneva, the Bachmann Ferster Foundation, SDC block grants east and Caritas
Implemented by	CARITAS Switzerland
Contact	Gabriele Walz, team leader Daler Domullodzhanov, EE Project Manager
Website	www.caritas.ch; presentation

More heat with less wood

Wood energy for cooking and heating



Fields of implementation	Value chain management/stablishing, energy saving technologies, microloans for thermal insulation

The sector program "basic energy supply" aims to supply energy that help poor and low income households, social institutions and small and medium businesses to meet their needs. Therefore it utilises an integrated approach which looks at **energy sources**, **applications** and **user** covering the areas **thermal energy, access to electricity** and **productive use of energy. Advice to the Ministry** for Economic Cooperation and Development (BMZ) as well as information and knowledge transfer and access to networks is provided. Further, the sector program cooperates with international actors to establish sustainable **market structures** and help build up **financial services** for producers, sellers and consumers. A GIZ internal taskforce on wood energy was established in 2013 with members from different sector-program in collaboration with Sector Network Rural Development Africa.

The challenge is that wood-based fuel is often considered as a "backward" and ecologically risky energy source, which should therefore attempt to be replaced by fossil fuels as soon as possible. To solve this problem it is necessary to adopt a holistic approach and modernize across the entire value chain. The required action is to **support target stakeholder groups** which will act as a link in the entire value chain. This can result in an image change since wood energy can be renewable, modern and profitable. Wood energy is and will remain an important part of the energy mix.

The effect of improved cooking-heating stoves on indoor air temperature will be small, in case the heated room is not insulated. Therefore, in cold mountain areas, thermal insulation of buildings takes priority over improving space heating stoves or cooking stoves to gain overall a minimum of healthy harmless and comfortable room temperatures and firewood savings.

Country	Worldwide, Tajikistan, Kyrgystan, Peru
Duration	Value chain management/establishing, energy saving technologies, microloans for thermal insulation
Funded by	Deutsche Gesellschaft für international Zusammenarbeit (GIZ)
Implemented by	Deutsche Gesellschaft für international Zusammenarbeit (GIZ) Basic Energy Service HERA
Contact	Dorothea Otremba
Website	www.giz.de/hera; presentation

Identification of obstacles

Two work groups identified the main obstacles for successful use of wood energy in households. Work group one identified the obstacles that are to be faced by development agencies; work group two addressed the obstacles that appear for consumers in households in their use of firewood for heating and cooking. Table 1 provides the results oft he identification:

Table 1 Identification of obstacles

Development agencies	Households
Financial Taxation policy Affordability for consumers High transaction costs for decentral wood energy projects	Political framework Regulation Policy incentives Lack of awareness, legal framework
Decentral vs. Central approach Informal trade Development of value chains Lack of knowledge on informal market arrangements Limited job creation along informal supply chains	Economic aspects No access to technology, ressources, market Affordability No funding instruments i.e. credit access Awareness – traditional knowledge No supply chain in place
Difficulties in determination of methodology for a baseline on positive impacts of wood energy projects	Maintenance of heating devices and chimney Other priorities
Decentral Impact assessment	Social aspects Acceptance & trust to new information campaigns Awareness Tradion and behavior that is acquainted Family decision making
Technical Standards? Security of supply of fire wood Auditing Access to heating technology in developing countries Methods of firing / processing of firewood	Technical aspects Technical understanding Maintenance, supply chains, quality control, limited access to technology, infrastrucutre
Information gap	
Lack of awareness for the relevance of the topic Strong anchorage in practice of wood use, difficult to address habits of local population Operational convenience Risk aversion in development agencies to experiment with new approaches Expert knowledge vs. local language Holistic/Systemic approach difficult to achieve for organizations that are divided into thematic divisions. Firewood in households is cross-sectoral and therefore somewhere in between thematic focus of organizations. Difficult to identify interest of local	

stakeholders that are engaged with the supply and consumption of fire wood. Forest ownership vs. demand side Ownership for households is unclear in organizations Limited influence of bottom-up approaches	

Cross-sectoral aspects of wood energy in households

The overall rating of cross sectoral cooperation in wood energy projects reached a value of 4.5, meaning that less than half of the potential that organizations might achieve is perceived to actually be captured.

The following comments show indicators of the participants for this rating:

- Fill up knowledge gap to support decision making
- Policy advocacy through best practices
- Standards legislation
- Take the initiative and acquire additional funding required
- Who can take the lead?
- More conferences like this
- Develop a task force that serves as moderator for multiple divisions
- Assemble stakeholders and clarify lead (best practice guide)
- Utility value assessment across the sectors
- Support business opportunities
- Move from demand side management towards energy efficiency
- Methodology development on cross-sectoral impact monitoring
- Promote trans disciplinary research approaches on energy efficiency in housing
- Support multi-level and multi-stakeholder dialogue

Table 2 shows what participants perceive to be working well and what doesn't in terms of cross sectoral cooperation in wood energy projects.

Table 2 Cross sectorial cooperation in wood energy projects.

What is not working well regarding cross-sectorial cooperation?	What is working well regarding cross-sectorial cooperation?
Inefficient use of wood at the current time Difficulty to assess impact of EE on natural resource consumption Technical vs. anthropocentric orientation Inadequate institutional matters Less information Lack of action for transdisciplinary activities	Increased awareness amongst int. organizations for complexity of wood energy can be observed
Few cross-sectoral projects in international cooperaration 1. Poor intergov. coordinaton 2. Lack of consistence policy 3. Weak enforcement of regulations, if	Networks with thematic focus on wood energy in households already exist

any 4. Abuse of power No or few holistic approaches Little/no identification of synergies	
Mistrust, Competition, Afraid to share knowledge Cross-sectoral means joining people which is not always easy People of the sectors are not used to work together Unclear responsibilities Old structures, i.e. silos, exist + burocratic hurdles, Ownership The "others" should deal with it More Work…more meetings	Resource and information sharing and data collection
Additional resources needed	International cooperation motivates to work together
Contradictory aims	Importance of the topic forces us to work together effectively
Sector not known for high ROI Wood energy is a marginal topic	Topic has huge potential to show good results impacts
No modeling or whole-chain analysis	Existing projects with cross-sectoral approaches
Traditional knowledge of locals – not assessed	The workshop itself is a prove that the topic is perceived to be more holistically approached
Wood energy is too complex	Some initial steps for cross sectoral cooperation could already be observed
Lack of cross-sectoral communications, methodology	Active private sector seeking for business opportunities
Interdisciplinary Different specialized terminologies	Personal engagement

Main findings and conclusions of the workshop

The main findings oft he More heat less wood workshop is that wood energy for heating and cooking in households is a very complex topic. Today, there are many organizational hurdles

that need to be taken account of in order to establish cross-sectoral cooperation on an institutional level.

This topic currently experiences an unprecedented dynamic, which should be followed up upon. In particular, because wood energy in houesholds is highly relevant and important for many people in the UNECE region. In addition, this field provides a huge potential for energy demand reduction as households energy consumption accounts for more than a third of total primary energy consumption.

Way ahead

The participants were asked to formulate some key actions for the immediate next steps. More heat less wood was stated to be a good initiative, which started a process. Potentially, the identification of a position or even institution that keeps up on the topic of wood energy in households was recommended. Tasks should built on the findings from the workshop. In general, the participants could approve the dynamics in the field exist and UNECE should take up on that, e.g. for Durban World Congress and World Forestry Congress in 2016.

Continue to raise awareness for wood energy demand

Two topics of wood energy were named to be of highest importance. First, energy and emissions and second the potential of wood as heating insulator and thereby increasing the regional value chains.

Donors were mentioned to provide funds to solve these issues in combination with the call to raise awareness on how to use available resources sustainably. Efficiency and emission aspects should be followed up on as identified to be substantial. The organization of such a workshop in the target region was found to be an activity of high benefits.

In the near future, a distribution of the recommendations from More heat less wood in English and Russian is an action identified to lead to the achievement of the abovementioned goals.

The finalization of this publication and distribution to organizations and key stakeholders.

ANNEX

I Agenda

UNECE/FAO Forestry and Timber Section

Workshop - More heat with less wood
Room XXIII, Palais de Nations, Geneva

	06.10.2015	
10.00 - 10.30	Opening by UNECE and the German Permanent Mission to the Office of the United Nations and to the other International Organizations in Geneva	Christian Bach Executive Secretary of the UNECE H.E. Ulrich Seidenberger Ambassador of Germany
10.30 - 10.50	Introduction and objectives	Florian Steierer and Frank Helbig UNECE/FAO Forestry and Timber Section
10.50 – 11.15	Wood energy in households	Ernst Zürcher Berner Fachhochschule
11.15 – 11.40	Health and indoor biomass combustion	Heather Adair-Rohani WHO
11.40 – 12.05	User influence on energy efficiency	Florian Heesen RWTH Aachen
12.05 – 12.30	Enhancing efficiency of utilization of firewood in households - experience and lessons learned from Serbia	Milica Vukadinovic & Branko Glavonjic E4Tech and University of Belgrade
12.30 - 13.00	Energy efficiency & house insulation in Kirgizstan	Heino Meesen and Ulan Amanturov Caritas Switzerland
13.00 – 15.00	Lunch break	
15.00 – 15.25	A financing mechanism for warmer and more energy efficient Moldovan homes	Boris Petkov & Maria Axenti MoREEFF
15.25 – 15.40	Introduction into group work	Florian Steierer and Frank Helbig UNECE/FAO Forestry and Timber Section
15.40 – 17.30	Group work	
17.30 – 18.00	Presentation of results from group work	
18.15	Reception at the meeting exhibition in the Passerelle	

Workshop - More heat with less wood Room XXIII, Palais de Nations, Geneva		
	07.10.2015	
10.00 – 10.15	Introduction and objectives	Florian Steierer and Frank Helbig UNECE/FAO Forestry and Timber Section
10.15 – 10.40	More heat with less wood in the light of combustion technologies	Saad Butt & Sven Schaller DBFZ
10.40 - 11.05	Sustainable energy solutions for Georgian communities	Sergi Sopadze EcoVision
11.05 – 11.30	Sustainable regional supply chains for woody bioenergy – Experiences from Bulgaria, Serbia and Croatia	Stefan Essel EU BioRES
11.30 – 11.55	Efficient use of natural resources in Kirgizstan and Tajikistan	Shahboz Miralibekov Association of rural areas Central Asia
11.55 – 12.20	Low-cost heating for low-cost housing: how to heat more and spend less – a case from Albania	Doris Andoni National Housing Agency Albania
12.20 - 12.45	Energy efficiency in the Pamirs, Tajikistan	Rustam Zevarshoev Zindagi
12.45 - 13.10	Program for insulating housing and energy efficient heating with wood	Dorothea Otremba HERA GIZ
13.10 – 15.00	**Lunch break**	
15.00 – 15.15	Introduction into group work	Florian Steierer and Frank Helbig UNECE/FAO Forestry and Timber Section
15.15 - 16.30	Group work	
16.30 - 17.00	Presentation of results from group work	
17.00 - 17.30	Closing of the workshop	Florian Steierer and Frank Helbig UNECE/FAO Forestry and Timber Section

II Participants and contacts

List of participants

More heat with less wood

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