



Contents lists available at ScienceDirect

Energy Conversion and Management

journal homepage: www.elsevier.com/locate/enconman

Implementation of the new statistics approach on final energy consumption of biomass in household sector in three countries: Croatia, Bosnia and Herzegovina and Macedonia

Vlatka Kos Grabar Robina*, Alenka Kinderman Lončarević

Energy Institute Hrvoje Požar, Savska cesta 163, 10001 Zagreb, Croatia

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Biomass consumption
Fuelwood
Energy balance
Energy statistics
Households
Survey on energy consumption

ABSTRACT

The aim of this paper is to present an improved way of collection and compilation of data about solid biomass consumption in households in order to improve accuracy of official energy statistics data. The accurate, timely and reliable energy data significantly contribute to the consistency in national energy statistics, energy balance, as well as for many other obligatory reporting procedures which are requested and prescribed by national and international standards.

When compiling energy statistics, statistics on renewables, particularly biomass consumption, it is often the most questionable as little or no available official data exists in the country. According to the international standards and definitions, solid biomass covers organic, non-fossil material of biological origin which may be used as fuel for heat production or electricity generation. In households, the most commonly used biomass are fuelwood and wood residues.

In the process of compiling national energy statistics, national institutions responsible for official energy statistics usually estimate biomass consumption based on the reports on fuelwood cuts in state forests and official biomass production, although it is known that consumption is much higher. Over the past two decades, Energy Institute Hrvoje Požar worked intensively on the energy consumption data collection and particularly on the development of the tailored-made surveying methods for different final energy consumption sectors, particularly for the household sector. The similar methods were recommended to national statistics institutes in the countries in the region when providing technical assistance in developing energy statistics.

This paper describes the survey results and methods applied for the determination of energy consumption in households and particularly biomass consumption in three selected countries: Croatia, Bosnia and Herzegovina and Macedonia, and recommendations for the further improvements.

© 2017 Elsevier Ltd. All rights reserved.

1. Introduction

Nowadays, in the context of air pollution, climate changes and energy consumption it is very important to know how much energy we use every day, every year, and what changes could we expect in the future. How much energy we will need in the next 5, 10 or 30 years? International Energy Agency (IEA) makes a comprehensive analyses every year on the final energy consumption globally. Results show that the total final consumption of energy on the global level increases year by year [1]. So, to prepare such results, as well as to make analyses and forecasts for determined period in the future, energy statistics and collection of data on energy consumption are crucial. One of the energy sources is bio-

mass. Energy from biomass, especially from fuelwood, is one of the oldest energy sources used by man, and still today is used for wide variety of energy needs such as space and water heating, cooking, generating electricity and providing process heat for industrial facilities [2]. It is considered that on the global level biomass resource potential is quite high [3]. Some studies that are trying to identify the theoretical global biomass potential as well as potential of certain country or area are done. In [4] there is analysed the geographical and technical potential of energy crops on the global level in the period from the year 2050 to the year 2100. Similar research is presented in [5] where is, inter alia, analysed energy crop potential till the year 2050. Another study deals with the assessment of the bioenergy potential using Quickscan model based on the bottom-up approach [6]. The great share of biomass comes from forests which is presented in [7]; the aim of the study was to estimate the global potential of biomass from

* Corresponding author.

E-mail address: vrobina@eihp.hr (V. Kos Grabar Robina).

forests in energy production for the year 2050. While the above mentioned studies try to evaluate the biomass potential globally, in [8] there is analysed the potential of the biomass supply on the European level as well as in [9] where there were estimated agricultural and forestry resources in 11 different countries of the European Union. As stated before, some of the studies are also dealing with the biomass potential on the country level. In [10] there is determined the potential of biomass energy sources and animal solid wastes in Turkey; it is also concluded that approximately 70% of the total amount of biomass could be used as energy source. The [11] deals with the total biomass energy potential in Turkey and gives the view of the investment models in Turkey and environmental impacts of using biomass for energy purposes. In [12] there is analysed the solid biomass energy potential in Autonomous Province of Vojvodina and it is calculated that it amounts around 0.8 Mtoe per year which, according to the final energy balance of Vojvodina, meets the requirements for fossil fuel consumption in this province. Regarding the European northern part, the biomass resources in Norway still do not have important role in energy supply as this kind of renewable energy sources in total energy supply of Norway participate with the share of 6%; there still exist a significant potential of biomass in energy production [13]. The biomass potential in Columbia is calculated with the developed methodology that was designed with the aim to clearly define the uncertainty and improve reliability of assessed biomass potential in the country; results showed that the technical biomass potential is 25% lower than previous assessment with the uncertainty lesser by one third compared to the calculations obtained with previously used methods [14]. The [15] is dealing with the biomass potential in India using land use/land cover (LULC) maps for agricultural and wastelands. Regardless of all estimated theoretical potential, it is also crucial to know what amount of that biomass is used nowadays and what will be the future consumption of this kind of energy source as biomass could also have the importance in the future development of clean energy society. As renewable energy source, its significance will increase as energy policies and strategies on the national level, as well as on the level of the continent and globally, more and more attention gives to renewable energy sources and conservation [3]. Also, some studies show that the use of biomass energy reduce the emissions of carbon dioxide (chemical formula CO_2). The study conducted on the area of Sweden shows that the replacement of fossil fuels in transport sector as well as in the electricity and heat production with the sustainably produced biomass has a great impact on the reduction of CO_2 emissions; it also concludes that the increase of the biomass use by about 125 TWh/year would eliminate more than half of the emissions generated from fossil fuels in the country [16]. The [17] deals with the biomass energy consumption in the context of environmentally sustainable development in the United States of America; the results of the conducted research indicate that the energy consumption from biomass per capita decreases CO_2 emissions per capita and increases gross domestic product (GDP) per capita. On the other hand, on the example of Greece there is presented that biomass if it is used in households for heating purposes could produce a certain amount of emissions [18]. However, in [18] it is also stated that the use of biomass for energy purposes have a lot of advantages, but it is important to use a biomass in efficient way using advanced technologies. This implies that it is important to know current and previous data on biomass consumption to adequate calculate greenhouse gas (GHG) emissions and possible decrease of emissions incurred due to the improvements in biomass consumption technologies in the future.

Benefits of biomass consumption for BRICS (the acronym for an association of five major emerging national economies – Brazil, Russia, India, China and South Africa) region, in particular the positive effect on economic growth, are presented in [19]. Another

example of the importance of biomass, especially of fuelwood, could be seen on the example of Turkey. There is almost all biomass for energy purposes used in households for heating, cleaning and cooking in rural areas of the country, and fuelwood, which represents the major source of energy in rural parts, is the fourth largest source of energy in this country [2]. In the [2] there are also given some statistical data on biomass energy consumption, especially forest biomass. This kind of data (data for the time being and those collected over past years) have significant part in the process of forecasting future energy needs from biomass. Unfortunately, determination of biomass and fuelwood consumption in a country represents a great problem in a large number of countries, in Europe and worldwide. The importance of statistical analysis in energy consumption of public building sector in China is described in [20]. As well as for public building sector, it is also important to make researches in other sectors in a country for different energy sources. Only in that way it would be possible to make energy balance of high quality which would be a base for further analyses, conclusions and making decisions, policies and strategies in energy sector.

A lot of European countries as well as Contracting Parties of Energy Community (EC) do not have harmonized statistics on energy from biomass. Also, household sector is an important consumer of biomass energy, especially fuelwood, but this amounts of energy are rarely officially reported. In order to initiate discussion about accurate biomass consumption, the Energy Community Secretariat (ECS) published [21] with the aim to present the results and conclusions of the conducted surveys on biomass consumption in Contracting Parties. The study was initiated with the main objective to improve national statistical database and harmonise renewable energy statistics according to the Eurostat methodology. The main results of the study show that assessments of the biomass consumption in Contracting Parties are much higher in comparison to the official data on fuelwood consumption in this countries. The main recommendations to national energy statistics teams were to include consumption surveys as the main tool for collection of data on energy consumption in all consumption sectors. In 2013, Statistical Office of Montenegro conducted survey with the aim to collect data on types and quantities of fuelwood which is produced and used in the country in households, public and commercial buildings. The results are available in [22] and similarly to the ECS study the results show higher consumption than previous data. Moreover, similar results for the fuelwood consumption in Greece are mentioned in [23]. There is stated that empirical studies conducted in a country show different results from the official ones. Officially published data stated that the fuelwood consumption in Greece decreased as a result of a decline in rural population, a better standard of living as well as replacement of fuelwood with other sources of energy, for example oil. On a contrary, empirically conducted data showed different results. These studies conducted in Greece indicated that there, due to economic crisis and rising oil prices, fuelwood consumption increased. So, the importance of empirical researches in gathering more accurate and reliable statistical data on energy consumption should be discussed.

Energy Institute Hrvoje Požar (EIHP) collects and compiles energy statistics in household sector and other sectors since 1995. There are several approaches applied for data collection. Data on energy supply from energy networks (natural gas, heat, electricity) to households are collected directly from energy suppliers, but data on other energy products are collected through detailed surveys on energy consumption. The first surveys on energy consumption were conducted in local/county levels in Croatia, namely in Istria County, Zadar County, Split and Dalmatia County, Lika and Senj County and others. In 2008, Institute conducted comprehensive national survey on energy consumption in

Download English Version:

<https://daneshyari.com/en/article/5012481>

Download Persian Version:

<https://daneshyari.com/article/5012481>

[Daneshyari.com](https://daneshyari.com)