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Upgrading of the solar irradiance measuring network in Croatia in frame of the EU-IPA project ENHEMS-Buildings

Josipa Kuzmić, Davor Tomšić, Alica Bajić, Igor Horvat, Zvonimir Jakopović, and Eduard Špoljar
 Meteorological and Hydrological Service, Grič 3, HR-10000 Zagreb, Croatia



kuzmic@cirus.dhz.hr

Abstract

Croatia is a very sunny country with the Croatian Littoral as one of the sunniest European regions and, consequently, solar energy has high potential in Croatia. In order to determine the amount of solar energy that can be utilised by converting it into useful heat or electricity, measurements are required. However, in the solar irradiance measurement network of Croatian Meteorological and Hydrological Service (DHMZ) there were six automatic meteorological stations equipped with instrumentation for measurement of global irradiance and only two meteorological stations for diffuse solar irradiance assessment. This was extremely sparse coverage for the country which stretches over three climatic zones - mediterranean, mountain and continental. Also, spatial distribution of stations was not adequate to have relevant irradiance information. There was thus a need for upgrading of the solar irradiance measuring network through the DHMZ network of automatic meteorological stations. In order to achieve this, ENHEMS-Buildings project funded by European Union (grant IPA2007/HR/16IPO/001-040510) was launched in April 2013.

Solar irradiance measurements



GMP	Global	Diffuse
Zagreb-Maksimir	2004	2004
Rijeka	2003	2013
Gospić	2005	2013
Zadar	2006	2013
Split-Marjan	2003	2003
Dubrovnik	2003	2013
Osijek-Čepin	2013	2013

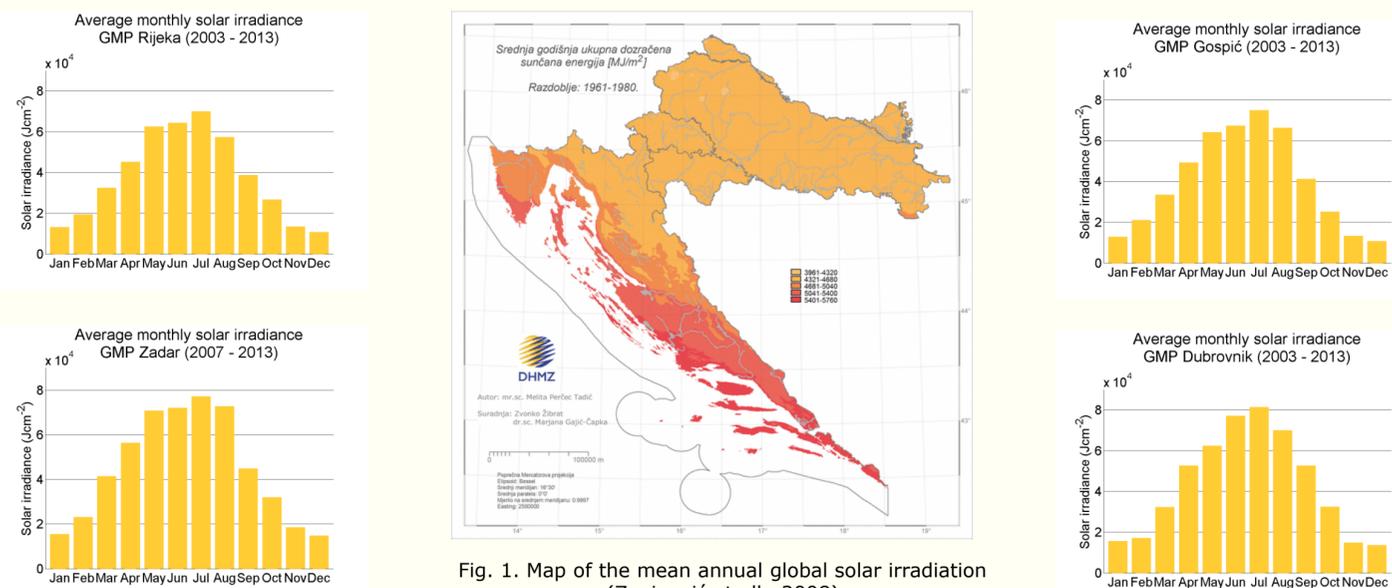
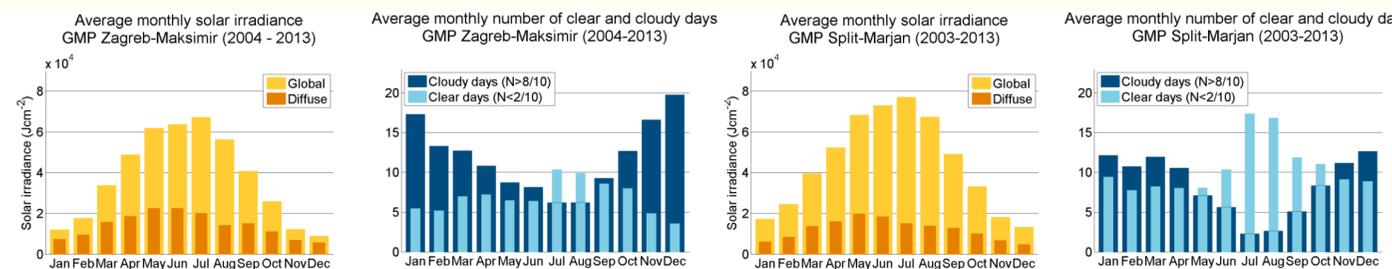


Fig. 1. Map of the mean annual global solar irradiation (Zaninović et al., 2008)



Annual courses of mean monthly global irradiation have the regular shape with a minimum in December and maximum in July according to the geographical position of the Sun. The spatial analysis shows that in continental Croatia irradiated energy on a horizontal surface is lower than along the coast. Cloud cover has great influence on the measured solar irradiance values. During winter the lower values of global irradiation on the coast are connected with increased winter cloudiness during the passage of cyclones. Because of greater cloudiness in the northern Adriatic, cyclogenic area of Rijeka has a minimum of irradiated energy and amount increases reciprocally with latitude along the coast. In inland Croatia, the decrease in annual course of global irradiation is connected with increased low cloudiness in the winter anticyclones. Since the east part of inland Croatia has been just recently (August 2014) covered with proper measurements of solar irradiance, solar irradiation map has been obtained from regression relationship between sunshine duration and cloudiness (Figure 1.). The spatial distribution of solar irradiance is mostly influenced by relief and fog in the lower, continental parts of Croatia. It was therefore important to establish measurements of solar irradiance in this part of the Croatia. ENHEMS-Buildings project has enabled equipping GMP Osijek-Čepin with instruments for measuring both global and diffuse solar irradiance.

Project ENHEMS-Buildings

Enhancement of research, development and technology transfer capacities in energy management systems for buildings

The overall objective: to establish a multiplicative transfer of engineering technology in Energy Management System for Buildings (BEMS)

- Specific objectives:
- Upgrade of the Croatian solar irradiance measurement equipment at the main meteorological stations of Rijeka, Zadar, Dubrovnik, Gospić, Osijek, Split and Zagreb
 - Upgrade of computer/software resources for the Croatian Solar Irradiation Data Base
 - Develop weather forecast services for BEMS (assessment of the required weather forecast data inputs, appropriate time and space resolution of the weather forecast and appropriate forecast accuracy for different data inputs).

The ENHEMS-Buildings Action facts

Acronym: ENHEMS-Buildings
Starting date: 2013-04-10
Duration: 24 months
Cost: 569.145,84 EUR

Grant scheme: : IPAIIC, Science and innovation investment fund, www.siif-croatia.hr
Lead institution: Faculty of Electrical Engineering
Partners: Meteorological and Hydrological Service, Elma Kurtalj Ltd., Hrvatski Telekom d.d.
Human resources: 30 persons in the project team
More information:
www.enhemsbuildings.fer.hr/en/enhems-buildings



References

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