FACULTY OF TOURISM AND HOSPITALITY MANAGEMENT
OPATIJA, CROATIA
Since 1960

WIFI Österreich
Wirtschaftskammer

T.E.I. Thessaloniki
Greece

Department of Tourism Management

UDC 911.3:338.48+:680.91(497.5)
Preliminary communication
Received: 23.09.2006

THE POTENTIAL OF USING RENEWABLE ENERGY IN SUSTAINABLE TOURISM IN CROATIA

Rade Knežević
University of Rijeka, Croatia

Abstract: This paper analyses final-energy consumption patterns in Croatian tourist destinations and it explores the potential for energy production based on renewable sources. It links the use of renewable sources in energy production with the need to promote sustainable tourism, provide energy-based amenities for tourists, and ensure environmental protection, and it focuses on solar power, wind power, the power of running water and biomass, the power of biofuel for motor vehicles, and biothermal energy as suitable sources of renewable energy. The paper also looks at the technologies used in converting renewable energy sources into energy. In closing, it suggests that a more dynamic approach should be taken in substituting fossil-based energy with renewable energy to achieve environmental and economic efficiency.
Key words: renewable energy sources, tourist destination, conversion, sustainable development.

Sažetak: MOGUĆNOSTI KORIŠTENJA OBNOVLJIVE ENERGIJE U ODRŽIVOM TURIZMU HRVATSKE. U ovom radu analizirana je struktura potrošnje finalne energije u turističkim destinacijama Hrvatske te mogućnosti proizvodnje energije na bazi korištenja obnovljivih izvora. Sudjelovanje obnovljivih izvora energije u proizvodnji energije povezano je s održivim turizmom, energetskim komforom turista i zaštitom okoliša. Podesnim izvorima obnovljive energije smatrani su Sunčeva energija, energija vjetra, energija vodotoka, energija biomase, energija biogoriva za motorne pogone i biotermalna energija. Razmotrena je i tehnologija konverzije obnovljivih energenata u energiju. U završnom dijelu rada predložena je, zbog ekološke i ekonomske isplativosti, dinamičnija supstitucija fosilne energije obnovljivom.
Ključne riječi: obnovljivi izvori energije, turistička destinacija, konverzija, održivi razvitak.

[1] **Rade Knežević**, Ph.D., Assistant Professor, University of Rijeka, Faculty of Tourism and Hospitality Managment in Opatija, Croatia.

INTRODUCTION

People began using renewable energy sources long before tourism emerged. In the early stages of civilisation, these sources included the direct power of the sun, running water, wind, waves, and the transformed energy of wood. Later, the use of coal as a staple and primary energy source and the discovery of the steam process (the steam boiler and the steam engine) brought about a great revolution in energy production. In the late eighteenth and early nineteenth century, the increasingly pervasive use of energy in production processes caused changes to the way working hours and leisure time were organised.

In the twentieth century, as energy became a key factor of every economy, great attention was placed on how to optimise its production and rationalise its consumption. The beginning of the century saw the primary use of energy sources that provide chemical energy (coal, oil, gas, oil shale) and, later on, the use of hydropower (running water, tides, waves), as well as nuclear power (uranium, thorium, deuterium oxide, lithium), radiation power (the Sun), thermal energy (geothermal, geothermic) and kinetic power (the wind).

In recent times, new energy-producing technologies are being developed and measures taken that increase the participation of renewable energy sources in energy production (Ilić, 2004).

In Croatia, the rise of tourism and its later growth are linked to the use of motor fuels, that is, transportation[2]. In tourism's early stage, most of the energy was used to provide lighting inside and around buildings, and to provide heating. Energy was also used in storing and preserving foodstuffs, preparing and serving food, and for sanitary purposes (for bathroom facilities, laundries).

Recently, the consumption of energy used in air-conditioning or for the needs of various auxiliary facilities (swimming pools, saunas, lounges) has grown considerably. About one third of all energy consumed is used in guest rooms (30 per cent of total consumption of electricity, 36 per cent of total energy used in heating, ventilating and air-conditioning, and 34 per cent of total water consumption). The cost structure of energy sources and water reveals that the most money is spent on electrical energy and water, on heating provided by municipal heating plants, on pipelined natural gas, and on power fuels (oil derivates).

NOTES ON METHODOLOGY

Energy is a key precondition to tourism processes. At a final-product level, electrical energy and heat power are the forms of energy most commonly used, while mechanical energy and solar and wind power are used substantially less.

[2] The year 1844 is generally accepted as the beginning of tourism in Croatia. That was the year Lloyd of Austria introduced a weekly steamship line Trieste-Rovinj-Rijeka to meet the growing interest of holidaymakers. The Villa Angiolina (Opatija), the first tourism establishment on the Adriatic's eastern coast, was built in the same year. The construction of the railways Karlovac-Rijeka and Rijeka-Pivka (Ljubljana) in 1873 had a great impact on further tourism development, especially in the Kvarner region and Istria.

The forms of energy used in final consumption can be divided into two groups. The first includes forms of renewable energy (solar power, the power of running water, wind power, the power of waves and tides, the sea's internal heat energy). All other forms of energy belonging to the second group are nonrenewable: fossil fuel (coal, crude oil and natural gas), nuclear power, the Earth's internal heat energy released on its surface (hot springs), the Earth's internal heat energy that is renewed in its interior through the radioactive decay of uranium and thorium, and light atoms that are needed for fusion to take place. These nonrenewable forms are finite energy sources, and their duration depends upon the intensity with which they are exploited.

The major part of final energy used in Croatia is derived from fossil-based (non-renewable) energy sources, with only a minor part derived from renewable energy sources (electrical energy from hydroelectric power plants, and heat from firewood). A large part of the end product is also imported (30 per cent of electrical energy and 40 per cent of natural gas), together with raw material used in producing power fuels (70 per cent of crude oil).

Coal is the primary energy source of fossil fuels, and its combustion releases great quantities of carbon dioxide into the atmosphere. From an ecological viewpoint, this represents the pivotal problem of using fossil fuels, because CO_2 and other emissions impact on the environment and pollute the atmosphere through greenhouse gasses.

CO_2 emissions are continuously growing in Croatia, with relative growth rates slightly exceeding the world average.

Renewable energy sources are referred to as clean sources, because the processes of converting renewable sources into useful forms of energy cause less pollution to the environment than the conversion processes of nonrenewable sources.

In addition to protecting the environment that is a prerequisite to tourism, the use of renewable sources helps to reduce the level of dependency upon imported energy sources, ensure the steady supply of energy, and enhance the potential for regional development by creating new jobs.

RESULTS

Energy consumption in Croatia's tourism sector in the mid-nineteenth century was linked to lighting inside and around buildings, and to heating. In the coastal regions, olive oil was used for lighting, and in the continental regions, whale oil, which burned in special containers. Lamps were set on racks with glass ornaments on walls to make them glow brighter. Despite the improvement made, objects continued to cast long shadows and illumination was poor. A turn for the better took place with the beginning of the industrial production of oil (1876) and kerosene. This led to the creation of the kerosene lamp equipped with a wick and glass chimney. Each lamp needed to be serviced individually. The lamps were used to light hotels, as well as main streets and squares.

Although well known in Western Europe as an inexpensive, but strong source of light, gas lighting (the Graetz lamp) was not used in Croatian tourism facilities, probably due to the lack of a pipeline grid for gas.

Further advancements in hotel lighting occurred with the use of hydropower, the development of which began in 1895 with the construction of the first hydroelectric

power plant "Jaruga" at Skradinski buk on the Krka River. The fact that a second power plant was erected in 1904 at the same location provided the Zadar tourist region with a great advantage.
Electrical lighting also provided hotels with an aesthetical dimension in which the selection of chandeliers played a large role (the chandelier hanging in the Crystal Hall of the Kvarner Hotel in Opatija consists of 33,000 pieces of crystal and weighs 1,850 kg). With the onset of the twentieth century, national standards were set in architecture by which the utility rate of electrical light (the ratio of useful to produced luminous flux) in hotels should be as high as possible (geometric forms, room dimensions, size of windows, colour of walls and ceilings).

At the turn of the nineteenth century, firewood was used in heating hotel rooms and as an energy source in preparing meals. Rooms were furnished with wood-burning ceramic-tile faced heaters but rarely with fireplaces due to the constant threat that an open flame posed. It should be noted that the construction of hotels of that time was based on solid design because of tourists coming to spend the winter on the Adriatic.

The amount of energy spent on storing and preserving foodstuffs and keeping facilities cool was small, given that refrigerating equipment (refrigerators) and cooling devices were invented at a relatively later date (1870).

Early in the twentieth century, catering establishments on the Makarska coast used ice, collected in the ice-pits found on Mount Biokovo, to refrigerate beverages (Roglić, 1931). Affluent visitors also made use of such ice-pits to cool the rooms of their summer residences built on the ranges of Gomanac and Snježnik (Knežević, 1992).

The pattern of energy consumption of 1933 indicates the gradual introduction to tourism of new forms of final energy. That same year the Savska and Primorska banats together numbered a total of 211 hotel establishments, of which 195 were furnished with electric lighting; 15, with central heating; 102, with tile faced heaters for heating rooms; and 16, with running hot water in rooms (Blažević, Knežević, 2006).

Following World War II, hotels underwent extensive reconstruction that primarily involved the installation of energy infrastructure fittings for electrical, gas and heating systems (Viličić, Franković, 1992). The energy production facilities of tourism complexes of that time were often ill suited to their intended use, either due to the energy source they used or to their technical design (Franković, Milotić, 1992).

The period 1960 – 1983 saw a very rapid increase in energy consumption in the tourism sector (energy-based amenities, neon signs, illumination of cultural heritage monuments). A drop in tourist traffic in the later part of this period (especially in 1982) was directly connected to difficulties in procuring and supplying oil. As a result of this energy crisis, the concept of low-temperature thermal energy was introduced in the pattern of tourism consumption in tourism. This concept involves providing water that is not warmer than 60^{o}C and room temperatures that do not exceed 90^{o}C (Mlinarić, 1992).
From the beginning of the privatisation process (1 May 1991) and up to the end of 2006, air-conditioning systems or other new large energy consumers (wellness centres and swimming pools) were installed in the majority of better-rated hotels. To save

energy, some hotels have installed a digital processor system (energy and water costs can be reduced by up to 30 per cent, www.energetika.net.hr). Most hotels, however, have neglected to make efforts to produce their own energy for their needs. It should be noted that the development of eco-tourism has helped to make some savings of energy in tourism. In this selective form of tourism, there are no qualitative relationships between energy consumption and the achieved level of tourism development. What eco-tourists are looking for is a zero rate of energy consumption, that is, the use of non-transformed renewable energy.

With energy becoming a major issue of planetary proportions, crucial decisions on energy production and distribution are made at an international level. The first international agreement of this kind was the Kyoto Protocol adopted in 1997, by which the signatory countries are committed to reduce the emission of greenhouse gases by 5 per cent until 2012. The Protocol also deals with energy issues. Although Croatia is a signatory country, it has not ratified the Protocol due to disagreement regarding reference rates. Of special importance is the Energy Community Treaty that Croatia signed with the EU in 2005. With this binding agreement, Croatia has accepted not only the provisions of a liberalised, customs-free and common market of electrical energy and natural gas, but also the high standards set for environmental protection and the use of renewable energy sources in the energy and traffic sector, as well as the directives on incentives to the production of motor biofuels and electrical energy from renewable energy sources.

Considering the chronology of energy production and consumption in tourism and the recently established European energy market, it is likely that the period to follow will be marked by:

- the production of renewable energy for own usage,
- the selection of the most cost-efficient renewable energy sources,
- the rational transformation of energy (energy sources into energy), and
- environmental protection as a trade-off between economic and ecological factors.

DISCOURSE

Thermo-electric power plants and heating plants are the largest sources of greenhouse gases in Croatia, followed by traffic and households, while the industrial sector takes fourth place. In countries that are more economically advanced than Croatia, however, this sector is usually ranked first in the emission of greenhouse gases. Of all the thermo-electric power plants in Croatia (the plants Sisak, Zagreb I and Zagreb II, Osijek I and Osijek II, Rijeka, Jertovac) the most ill-placed for tourism are the plants Plomin I and Plomin II, representing a kind of discontinuity, in terms of tourism, between the Kvarner region and Istria (these plants use coal as their energy source).

Preparations for the construction of a nuclear power plant at Vir were the cause of widespread spatial changes, even though construction work never began.

In addition to using energy received from thermo-electric power plants, the majority of hotels in Croatia also have their own heating plants, because it is essential that thermal energy production is located in the same place as thermal energy consumption. For the purpose of heating water, heating plants consume about 17 per cent of the total amount of energy used in hotels. The most frequently used energy source is heating oil, which,

in addition to carbon dioxide, creates large amounts of sulphur dioxide during combustion. Today it is common knowledge that the only way to preserve the eco-system and rationalise energy production is through the use of renewable energy sources (Glavač, 2003.).

The year 2002 can be considered a turning point in the use of renewable energy sources in Croatia, because this was the year a package of new energy laws came into force (Domac, 2004). The Energy Act (2004) defines renewable energy sources as sources of energy which are preserved in nature and which can partially or fully regenerate. Primary energy sources are mostly free and widely accessible sources or they represent a part of the national wealth for which concession fees are collected (water courses, geothermal water). Their energy price is considerably lower than that of fossil fuels (biofuels are the only exception, having a slightly higher production price than corresponding fossil fuels).

According to the energy-related experiences of the EU, which in Croatia are normally considered as paragons of a higher order, even naturally homogeneous regions do not always select renewable energy that comes from the same source. This is because choosing an energy source depends upon its regeneration cycle, the basic natural spatial features, the type and diversification of tourism facilities, the amount of energy required, etc.

Although Croatia is rich in renewable sources of energy, little has been done to tap into this potential. Solar power, wind power, the power of running water and biomass, the power of biofuel for motor vehicles, and biothermal energy are considered suitable renewable sources for the production of energy that could be used in tourism. Tides and waves are considered to be less suitable as sources of hydropower due to the indentedness of the coastline.

The renewable energy sources found in nature are not suitable for direct use; instead, the appropriate technological processes must be applied to transform them into final energy products that can be easily distributed and consumed.

In hotels, **solar energy** is used for heating sanitary water (central heating) and for producing electrical energy. The energy obtained from solar sources can be used to cover about 60 per cent of energy requirements in the tourist region's coastal areas, and about 30 per cent in its mountain regions. The utilisation level of solar power is especially high in hotels with swimming pools in which large volumes of water need to be heated.

In Croatian meteorology, solar energy potential is determined by the length of period that the sun shines, that is, the length of insolation. The spatial distribution of average annual insolation shows that the outer islands of the central Adriatic (Vis, Lastovo, Biševo, Svetac) are the sunniest, together with the western coasts of the islands of Hvar and Korčula, enjoying more than 2,700 hours of sunshine per year. The number of hours of sunshine decreases towards the northern Adriatic, towards inland regions and with the increase of height above sea-level. In the Dinara range, the sun shines an average of 1,700 hours, and at the Parg weather station, an average of 1,672 hours. The technology for transforming solar power into thermal energy makes use of solar thermal collectors. It is estimated that the required surface area for solar collectors in square meters is equal to the number of persons (tourists) who will be consuming the warm water produced by such equipment. These large surface areas are a drawback, because they require a lot space for proper exposure.

The progression of the sun across the sky during the day and the year is the most important factor to take into consideration when designing solar collectors. The incoming angle of the sun's rays is continuously changing and this impacts on the amount of energy absorbed. Certain locations are somewhat less favourable in terms of solar radiation (Makarska, Opatija, Rabac) due to shade caused by the local topography. Changes also take place during the winter, when the sun is low on the horizon, resulting in long, early shadows. Solar collectors are expected to become a highly significant element of architecture in tourism, considering that by 2030 there should be no new buildings in EU countries that are not 100 per cent equipped with solar power utilisation systems (www.energetika-net.hr/o-ie-29k).

Photovoltaic systems are used for the production of electrical energy from solar power. These systems represent particularly convenient energy sources on islands lacking electrical power grids. The problem of storing electrical energy (solar batteries) has still not been fully solved, so that the quality of supply depends directly upon the quantity of sunshine.

Wind power is atmospheric air moving horizontally from a location of higher density to one of lower density (kinetic energy). As a widely accessible energy source, wind has especially great potential in places where two diverse natural regions meet (sea and land) and in the vicinity of mountain passes. In these locations, there is either a constant difference in density (pressure) or the local configuration directs the movement of the wind. The energy potential of the wind is measured by its frequency, velocity and direction. For a location to be cost-efficient, calm periods should not exceed 5 per cent (the wind should blow for more than 347 days in a year), and average annual wind velocity, measured at a height of 25 metres, should amount to at least 25 km/h or 6.9 m/s. Considerably less favourable are locations where the wind blows in gusts, sometimes reaching hurricane velocities. Wind turbines are used to transform wind power into electrical energy. In practise, between 35 per cent and 45 per cent of wind power can be transformed into electrical energy. There is only one wind farm in Croatia, located in the Ravne region overlooking the town of Pag, and from the aspect of the tourist trade, it is also an important visitation point[3].

The Government's Decree on the Management and Protection of the Protected Coastal Zone (2004) has halted the further construction of wind farms along the coastline. The construction ban applies to a 1,000 metre-wide zone stretching inland, a 300 metre-wide zone into the sea, and to all the islands.

Hydropower that is produced or can be produced by utilising running water (rivers and streams) is important in Croatia. Renewable sources refer to hydroelectric power stations of small capacity. The basic rationale for this is the sustainability concept, that is, creating the least possible impact of the environment, which is closely linked to the concept of renewable energy sources. In large hydropower systems, the impact on the environment is tied to flooding river valleys and cultural heritage, relocating the population and other changes to the geographic inventory. Hydroelectric plants with reservoirs also have special importance in terms of tourism. Most of the rivers that have been turned into lakes have come to represent a positive spatial change encouraging tourism development. This in particular refers to new weekend-tourism zones that have sprung up in the broader regions of the lakes Sabljak, Lokve, Bajer and Lepenice.

[3] The wind farm was opened in 2005. It consists of seven wind turbines with a height of 49 metres and a rotor diameter of 52 metres.

Flow-through hydroelectric power stations are less important as environmental tourism resources, and their construction on the rivers of the Adriatic water systems would not be cost-efficient due to the irregular river water-levels.

In Croatia's power supply and distribution system, hydroelectric power stations account for more that 50 per cent of energy sources; in the coastal tourism region they account for more than 70 per cent.

Numerous years of operation and obsolete machinery are the basic features of Croatia's hydroelectric power stations, making imminent their reconstruction, which is likely to entail considerable environmental changes.

Biomass represents a renewable energy source of strategic importance because its conversion can be sustained throughout the year. Also, it is acceptable in terms of ecology because it enables the complete recycling of CO_2 in nature: the amount of CO_2 emitted by the combustion of biofuels is the amount consumed in the photosynthesis process needed for biomass to grow. As a source of co-generation (of thermal and electrical energy), it has great usability in the mountainous tourist region and in the Pannonian tourist region, both of which have a high growth rate of biomass. As a primary energy source, biomass includes oil-bearing plants, wood and wood products, crop reside and waste. Prior to use, these primary forms are technologically processed (briquettes) making them more caloric and easier to handle (a typical example is their use in central heating).

The main forms of liquid biofuels for motor vehicles are biodiesel and ethanol. Biofuels are ecologically accepted forms of fuel and their use in transport helps to reduce the emission of harmful substances in exhaust fumes.

The use of biofuels is particularly common in tourist destinations tilted in the direction of sustainable development. For example, public traffic in the Plitvice National Park is restricted to the perimeter of the park, while internal traffic is conducted in vehicles with electromotive traction or powered by biodiesel.

In Croatia, the raw materials used in producing biodiesel include the natural oils derived from rape, soy and sunflowers. It is notable that the combustion of this fuel releases only CO_2 and water vapour but no sulphur or heavy metals.

Maize is the main raw material in the production of bioethanol (crop waste and wood can also be used). As a motor fuel, bioethanol is used by cars running on flexible fuel. Mixed with gasoline in certain proportions, it can reduce greenhouse gas emissions by 70 per cent relative to the quantity of gasoline substituted.

Obviously, the EU objective to make biofuels account for 20 per cent of motor fuel consumption by 2020 will impact on Croatia by leading to an increase in cultivated farmland and to higher land-based income. Producing 83 per cent of the world's biodiesel, rape is the preferred crop, because it is compatible with the agricultural system in terms of biology and organisation, and it provides a sure and stable yield.

Geothermal energy is energy released on the Earth's surface in the form of warm/hot water or steam and it can be utilised in its original form or transformed into other forms of energy. Various technologies are applied in utilising geothermal energy (Ilić, 2004). In the past, the production of geothermal water was based on natural springs, while today geothermal water is also obtained from shallow wells. Worldwide, the importance of geothermal energy as a form of renewable energy is second only to that of hydropower. Major amounts are used in heating (35 per cent), in swimming pools and balneology (15 per cent), greenhouses (14 per cent), fish farms (10 per cent) and in

industries (10 per cent). Its advantages are that it is inexpensive, stable and durable, with no harmful emissions apart from water vapour.
The use of geothermal energy in medicinal purposes and for bathing has a centuries-long tradition in Croatia. Unlike the Dinara range lacking in any significant geothermal potential, the Pannonian basin has a much higher average geothermal gradient and thermal flow. The main drawback of the basin, however, is its low number of geothermal zones. In terms of temperature, these are low-temperature geothermal waters within an upper limit ranging from 90°C to 150°C (25°C - Velika near Požega, 172°C – Velika Ciglena near Bjelovar). Geothermal waters represent a primary tourism resource (potential) on which the tourist trade of the Pannonian-Peripannonian tourist region is based.
Geothermal waters are used in heating hotel rooms in spas, and in heating sports facilities. For the future development of geothermal tourism, it will be necessary to explore the strata in the vicinity of potential tourism destinations. Notably, major wells providing the hottest water have been discovered in recent years, with research based on domestic technology.

Renewable energy source do have a certain impact on the environment. For examples, solar collectors and solar energy facilities take up large areas of land and impact on the plant and animal habitat of that area. The liquid used to fill photovoltaic systems is highly toxic and there is the risk of leakage.
Some believe that the general design of wind farms makes them incongruous with the original landscape, and that birds sometimes collide with the wind turbines (although birds are capable of perceiving and dodging moving objects).
The construction of large hydro-technical facilities is the cause of the most extensive spatial changes. For example, in the older literature the lakes of Gornje Švičko and Donje Švičko are mentioned as hydrographic tourism resources, ranked second only to the Plitvice Lakes in attractiveness. Recent literature, however, usually refers to the Švičko lakes as an example of the "Aral syndrome" [4]: the lakes have dried up because the waters of the Gacka River are used to fill the artificial lake Gušić and to feed the Sklope Hydro-electric Plant.
Some geothermal sources are known to be aggressive and may cause pipelines to corrode and break.
These main negative features of renewable energy sources in terms of the environment are not a regular occurrence and they can be eliminated through technical solutions.

CONCLUSION

The consumption of energy sources and energy in Croatian hotels has followed world trends. In the early stages of tourism, local raw materials were used, together with unsophisticated lighting and heating technologies. Following this stage, the use of fossil-based energy has caused difficulties that have impacted considerably

[4] The Aral Lake Syndrome is a universal term for a failed government project. The rivers feeding the Aral Lake were diverted by canals and exploited in such a way that the level of the lake has dropped by 14 metres and its surface area by 80 per cent. Annually, the wind covers the neighbouring farmlands with about 75,000 tons of dust from the barren lakebed. After Chernobyl, this is the greatest environmental disaster in the history of humankind.

on the ecological and economic sustainability of tourism and, to a lesser degree, on its social and cultural sustainability

Energy systems in hotels today are increasingly focusing on renewable energy sources. The greater the share of renewable energy sources, the greater is the sustainability of the system. The timeframe and criteria for substituting fossil-based energy technologies with technologies using renewable energy sources are set out in the Treaty Croatia has signed with the EU. Being rich in renewable resources, Croatia should find the concept of using renewable energy sources to be a cost-efficient solution. Renewable energy sources are closely linked to their location. While the coastal tourism region could make the most efficient use of solar and wind power, the mountainous tourism region should focus on biomass and hydropower and the Pannonian-Peripannonian region on geothermal energy and biofuels.

REFERENCES

Banovac, E.: Prikaz regulatornih implikacija, Elektro, br. 1, Zagreb, 2005.

Blažević, I., Knežević, R.: Turistička geografija Hrvatske, Fakultet za turistički i hotelski menadžment, Opatija 2006.

Bregovac, Z.: Izvori arhitekture za hotele sutrašnjice, Međunarodni kongres "Hotelska kuća" '92, Hotelijerski fakultet, Opatija, 1992., str. 96-99.

Domac, J.: Obnovljivi izvori energije i njihovo značenje za Hrvatsku na putu približavanja Europskoj uniji, Obnovljivi izvori energije, Zagreb, 2004.

Franković, B., Milotić, A.: Trend u opskrbi energijom turističkih objekata Međunarodni kongres "Hotelska kuća" '92, Hotelijerski fakultet, Opatija, 1992., str. 111-125.

Glavač, V.: Uvod u globalnu ekologiju, Ministarstvo zaštite okoliša, Zagreb, 2003.

Granić, G. …(et. al.).: nacionalni energetski programi, energetski institut «Hrvoje Požar», Zagreb, 1998.

Hrvatska gospodarska komora - Sektor za turizam: Turizam u RH u 2004.g.

Ilić, M.: Obnovljivi izvori energije - kako stoje stvari, I dio 2004., www.geografija.hr

Knežević, R.: Kvaliteta prirodne sredine u planiranju razvoja turizma Gorskog kotara, Međunarodni kongres "Hotelska kuća" '92, Hotelijerski fakultet, Opatija, 1992., str. 86-95.

Mlinarić, S.: Energetski doprinos sunčeve energije u hotelskim objektima, Međunarodni kongres "Hotelska kuća" ' 92, Hotelijerski fakultet, Opatija, 1992., str. 129-139

Razvojna strategija Hrvatskog turizma, NN, br. 113/93.

Roglić, J.: Privreda i naselja Makarskog primorja, Glasnik geografskog društva, Beograd, 1931.

Sporazum o osnivanju energetske zajednice - Atena, 2005.

Uredba o uređenju i zaštiti zaštićenog obalnog pojasa , NN 128/04.

Viličić, I., Franković, B.: Energetski sustavi u turističkim objektima sutrašnjice, Međunarodni kongres "Hotelska kuća" '92, Hotelijerski fakultet, Opatija, 1992. str. 117-125.

www.hgk.hr/en/depts/tourism/turizam.pdf

Zakon o energiji, NN, br. 177/04.