

RENEWABLE ENERGY SOLUTIONS FOR TOURISM

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Abstract

This study aimed to investigate the importance of renewable energy sources usage in tourism which has a significant market power in world economy. Tourism has a big contribution to regional development and also some cons on environmental issues. To reduce the negative aspects on environment and increase the financial savings of tourism industry, renewable energy has a vital priority. Renewable energy will align the hotel areas with concept of green tourism. Financial savings through this energy also has been provided in that study. This paper also suggests an analysis for suitable sources of renewable energy usage in hotels with a sample practice.

Keywords: Renewable Energy Sources, Tourism, Environment

Introduction

Because of limitless needs of human, increasing production and consumption actions environment problems has arisen. Perceiving environmental resources as limitless and technology developed during

industrial revolution has increased the environmental pollution. World has become aware of these problems by reason of global disasters.

These inevitable accidents and disasters have changed the balance of nature for the worse. It is a reality that today sensibility to the environmental issues has increased more and more. People are conscious of these problems are affecting not only a particular area or region but also the whole world. One of the sectors that should have this sensibility is tourism. Tourism and environment is tied up with each other. For environmental issues tourism is treating the problems not just economically but in an environmentally-conscious manner.

Environmental Impacts of Tourism

Environment is physical, biological, social, economic and cultural surroundings in which human and other living beings maintain their lives in mutual interaction. In other words, environment is a part of mankind.

Beginning of the industrial revolution started in England; flue gases, war chemicals and other waste caused serious problems. Human's passionate and uncontrolled desire for production has made the world less viable place under threats like production and consumption waste materials. Tourism managers should realize that they cannot maintain their business without having sensibility to environmental issues. Because in each marketplace being environmentally-conscious creates competitive advantage for managers.

Tourism's contribution to regional development that it can be

- Growing health services,
- Educational investments
- Selling insurance
- Advertising domestic products
- Infrastructure development
- Increasing level of employment
- Balancing income and expenditure

and more subjects are influenced from its. For this reason tourism industry has to take a good position for more effective.

Tourism managements should take green tourism into consideration to sustain touristic growth. Tourism has a %10.3 market share of global income and %8.2 of total employment. So for an economy of that scale, the environment is quite important. For this reason, tourism should make investments for sustainability. We can list the goals of sustainable tourism as follows;

- Increase the awareness for tourism's contribution to economy and environment

- Support the equality in development (government support for regions)
- Sustain the quality of life of the host country
- Provide a service of good quality for visitors
- Raise and sustain the quality of environment

Tourism's Effects on Energy Consumption

World Tourism Organization (UNWTO) predicts the number of international tourists as 1.6 billion in 2020. Especially European countries are a major tourism destination, with 5 countries in the top ten most visited destinations in the world according to the UNWTO. It offers about 35% of total hotel capacity in the world and tourism is an activity that provides income, employment and economic growth as well as development aid in disadvantaged areas.

According to the researches %90 of energy consumption occurs during going and coming to destinations (%43 airway, %42 land transport, %15 sea and railways). The airway transportation is the fastest growing cause of carbon dioxide emission. Tourism sector has a %5 of worldwide carbon dioxide emission. In this regard, the EU has tagged renewable energy as a strategic alternative to help achieve proposed energy goals. These challenges can be summarized in two main ideas:

- Reduction of energy dependence of Europe (currently at about 54%).
- Evolution towards a more sustainable, cleaner energy, thus reducing emissions of greenhouse gases (GHG).

Directive 2009/28/EC establishes a common framework for the promotion of energy from renewable sources. Directive 2012/27/EU further states that member states will submit national action plans for energy efficiency. The Action Plan for Energy in the EU identifies the tertiary sector, which would include the tourism sector, as having the potential to achieve 30% savings in energy consumption by 2020.

Tourism managements consume the sources for customers extensively. Heating and cooling the rooms, chemical cleaning supplies, watering the golf courses, filling the swimming pools, heating the pools and energy used for cooking. According to United Nations' report, single tourist produces 1 kg solid waste per a day.

Renewable Energies for the Tourism Sector

Renewable energy resources are the most suitable energy forms for clean environment concept that don't pollute during the production and renew it. They use for producing energy from the hotel wastes including

organic substances and they are reducing the expenses of energy needs. The renewable energy resources are references of modern life.

To use renewable energy in a tourism company, we have to take into account where the facility is located, in order to know what resources are available. We can use these resources as noted below for the hotels:

- Solar Energy
- Biomass Energy
- Heat Pump
- Wind Power
- Geothermal Energy

If the facility is a rural hotel, there is probably biomass that can be used and possibly enough wind to harness wind energy. If the hotel is in a city, the possibility of harnessing solar energy can be analyzed. There are other issues related to the energy production that is available, such as the size of the hotel or the number of services that are offered. These issues will determine the energy consumption of the facility.

Solar thermal energy has the potential to produce hot-cold water and hot-cold air. According to the UNWTO, savings of up to 80% in hot water can be achieved, which absorbs the initial investment in a period of between two and ten years. Generating electricity from sunlight using photovoltaic cells and wind turbine. Geothermal energy heat pump is a type of technology that uses the earth as an energy source during cold weather and a heat sink in the summer.

Renewable energy resources applications used in tourism companies;

- At a hotel (50-bed capacity) in İzmir city at Turkey, %30 of thermal energy need for a year is provided with solar heating and absorption cooling systems.
- IBIS hotels group, provide an energy saving of 178 days for hot-water usage through solar energy systems.
- With recycling centers, Novotel and IBIS hotels make a profit of 46.000 Euro.
- A hotel in Turkey produce 177867 KWh electric power using 2000 m² PV system in attic of the building.
- Port Royal Sun Gate Hotel in Antalya (3500-bed capacity) saves electricity expense with an amount of 55.034 \$ through an application of heat pump from water to water.

As the operation of a hotel requires an enormous amount of energy, investment in more efficient energy sources with the contribution of renewable energy can lead to significant reductions in energy consumption, operation costs and energy bills.

Analyses of Wind Power and Solar Energy (PV) for a Random Area Wind Power

Energy produced in a year by 10 wind turbines that has specifications; instant-speed of the wind is 8 m/s and reference height is 10m, constant of friction of air is 0.1, height of wind turbine is 90m, quotient of rotor power is 0.5 and each turbine’s diameter (R) is 40m,

$$V_T = V_R \left(\frac{h_T}{h_R} \right)^\alpha$$

V_T : Theoric speed

V_R : Instant – speed of wind

h_R : Reference height

h_T : Height of wind turbine

α : Constant of friction of air

$$V_T = 9.96 \text{ m/s}$$

$$P_{ort} = \frac{1}{2} * C_p * \rho * A * V^3$$

P_{ort} : Power of wind turbine

C_p : Constant of rotor power

ρ : Density of air

A : Area of wind turbine blades

V : Wind speed

$$P_{ort} = 380243,27 \quad W$$

Energy produced in year;

$$W = P * t$$

W = Energy produced in year

P = Power of wind turbine

t = Time

$$W = 33288 \quad MW$$

Solar energy for PV Systems

In summer days, we assumed the area that has got:

- Daily solar energy average is nearly 5kWh/m²,
- Insolation time: 10 hours/day,
- Energy need 300 kWh/month
- Daily energy need for summer 16 hours/day
- Efficiency of solar cells %10

Energy for 1 m² we can calculate that;

$$E = I * \eta$$

E = Energy for m²/day

I = Solar radiation

$\eta = PV \text{ efficiency}$

$$E = 0.5 \quad \text{kWh/m}^2/\text{day}$$

Panel power per unit;

$$P_U = E/h$$

$P_U =$ Panel power per unit

$h =$ Insolation time

$$P_U = 0.05 \quad \text{kWh/m}^2$$

Daily energy need for 16 hours;

$$E_d = E_m/P_U$$

$E_d =$ Daily energy need for 16 hours

$E_m =$ Energy need for a month

$$E_d = 10 \quad \text{kWh/day}$$

Panel space for desired energy;

$$A = E_d/E$$

$A =$ Panel space for desired energy

$$A = 20 \quad \text{m}^2$$

PV Panel power;

$$P_{PV} = P_U * A$$

$P_{PV} =$ PV panel power

$$P_{PV} = 1 \quad \text{kW}$$

For specifications; daily energy need 16 hours, insolation time is 10 hours

Necessary battery capacity is

$$W = P * t$$

$$W = E_d$$

$$t = \text{Time}$$

$$P = \text{Power}$$

$$P = 0.625 \quad \text{kW}$$

$$P = V * I$$

$$P = \text{Volt}$$

$$I = \text{Current}$$

$$I = 2.84 \quad \text{A}$$

For 6 hours;

$$2.84 * 6 \quad \text{Ah}$$

Conclusion

In this study, environment and tourism relation was studied in different parameters. Use of the renewable energy systems in tourism sector are strongly recommended because of the sensibility to environmental issues.

In terms of operational costs renewable energy usage has an undeniable importance. In conclusion, renewable energy should be thought as an integral part of tourism. In respect thereof critical state, need to determine which to usage renewable energy resources. Because of each renewable energy resources has positive and negative side. For example, wind power so far at settlement because both noisy and so space.

The main importance of government politics for the installation of renewable energy resources because of the need to decrease of setup cost.

References:

- Atalay, Dilek. Konaklama İşletmelerinde Yeşil Pazarlama Uygulamaları: IBIS Otel Örneği, 2013.
- Aykan, Sevim. Konaklama İşletmelerinde Çevre Yönetimi Uygulamaları ve Algılanan Kurumsal İtibar Üzerindeki Etkisi; Kayseri ve Nevşehir Otelleri Üzerinde Bir Araştırma, 2013.
- Doğan. Isı Geri Kazanım ve Deniz Suyundan-Suya Isı Pompası Uygulaması, 2005.
- Doğan. Turizm ve Çevre İlişkisi Bağlamında Ekoturizmin Çevre Üzerine Etkileri, 2012.
- Kent, Kaptan. İzmir ilindeki Elli Yataklı Bir Otel İçin Güneş Enerjisi Destekli Isıtma ve Absorbsiyonlu Soğutma Sisteminin Teorik İncelenmesi,1999.
- TÜSİAD. Sürdürülebilir Turizm, 2012.
- Şahin, Gökçen, Arsan. Bina Enerji Performansı Simülasyonlarının Geçerliliği: BESTEST (Building Energy Simulation Test) Prosedürü, 2013. <http://www.csb.gov.tr> (26.12.2014)
- European Commission, Tourism Business Portal: Which renewable energy sources are the most appropriate for the tourism sector?,