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Renewable energy sources as a new research area in tourism¹

Abstract: The article identifies and describes a research gap in the tourism economy with regard to renewable energy sources and delineates the biggest research needs and challenges. First of all, the subject of the paper is the tourism phenomenon as a multidimensional research area. Then, the paper concentrates on the renewable energy sources (RES) market in the modern economy with particular regard to investment processes. It characterises investments and innovations in the tourism economy and presents the greatest research difficulties in this respect. The last part of the paper concerns the characteristics of a research gap in the tourism economy identified from where investments and innovations in RES meet. The summary includes effects and desired research directions related to the discussed phenomena.

Keywords: renewable energy, tourism investments, tourism innovations, research in tourism.

JEL codes: A12, E22, O13, O31, Q20, Q40.

Introduction

Modern global economic development processes show that there have been considerable changes in energy market which might imply that the third industrial revolution is underway [Jeremy 2012]. The tendency to replace fossil fuels with renewable energy carriers is likely to change many economies permanently and impact global economic processes considerably. If Germany as the biggest European economy plans to obtain 80% of their energy from renewable sources in 2050, today's EU average of 10–12% can be said to be mega-revolutionary.

Therefore, in recent years the renewable energy market has been growing at an unprecedented rate. This is related not only to modern technology development,

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but also to proposed system solutions that were originally agreed upon at EU level [REPAP 2020] and then implemented in particular member states. Poland also adopted its policy by agreeing the Renewable Energy Road Map until 2020 [Ministry 2009]. According to the EU proposals after 2020 the level of renewable energy in the EU energy mix should reach at least 20% with a target of at least 15% for Poland. Adopting the Road Map entails changes in the energy market including regulatory intervention because reaching the proposed figures would be impossible if it were not for external intervention and subsidies since renewable energy generation costs are higher than those related to producing traditional fossil fuel energy, at least for now.

Regulations for the introduction of RES will by and large relate to most economic sectors and branches [Ministry 2013]. Clearly, it will also concern the tourism economy, although impact analysis will be more complex, since the tourism economy is not a sector as indexed by the Polish Classification of Activity (PKD). At the same time, the tourism economy like RES is called a predevelopment area in the global economy. It stems not only from the scale of the phenomenon – tourism as a share of the global gross domestic product stands indirectly at almost 10% [WTTC 2012] – but also its nature – the tourism economy is based on services, information and a flexible structure [Nawrot 2012].

It must be stressed here that the projected rate of change in the modern global economy presents a challenge not only in practice but also in scientific research. The significance of the aforementioned areas means that they are the subject of numerous extensive multi-layered and interdisciplinary research studies. As much as each of these fields seems to have been explained scientifically in an adequate way, combining them may become an interesting and new research subject. A literature review conducted by the author confirms unambiguously that there is a research gap in the tourism economy to be addressed in respect of renewable energy sources, especially visible in Poland. The scarcity of knowledge and information mainly concerns development aspects, i.e. the problems of investments and innovations in the tourism economy with regard to renewable energy sources. Such a statement, however, needs to be developed and justified in order to identify research gaps in a constructive and objective way and prepare them for further research.

Therefore, the paper is an example of theoretical literature research and presents the main development trends in the tourism economy and renewable energy sources. Therefore, its aim is to identify and describe the research gap in the tourism economy with regard to renewable energy sources and pinpoint the biggest research needs and difficulties. Moreover, the paper isolates essential economic categories that are of particular interest: RES investments and innovations in the tourist market. It also aims at justifying the need to start research in these fields and conducts a literature review that will show their importance in the development of the tourism economy.

Discussion on RES as a new research area in the tourism economy should be considered in the context of basic questions about the economic reality or main functions of scientific knowledge which include [Stachak 2006]:

- Explanatory functions,
- Diagnostic functions,
- Prognostic functions,
- Practical functions.

Analysis of the particular functions enables an assessment as to whether a particular area has been researched and explained sufficiently and determines the current state of scientific knowledge in a given field.

1. Tourism as an area of scientific research

In the first place it is worth describing briefly the tourism economy from the point of view of scientific research and current research needs. Because this Journal is published for the 40th anniversary of the Tourism Department at Poznan University of Economics some statistical data will be connected with its history. In 1973, when the Department of Tourism at the Poznan Academy of Economics was set up, the number of international tourism arrivals in the world did not exceed 200 million tourists and the international tourism receipts amounted to approximately \$30 billion. In 2013, which is the Department's jubilee year, it is estimated that the number of arrivals will definitely exceed 1 billion, and the receipts will be higher than \$1.1 thousand million (Figure 1) [WTTC 2012]. It can be said that as the Department of Tourism is celebrating its 40th anniversary there is a breakthrough in the tourist market and tourism is becoming one of the most rapidly developing phenomena in the world.

Tourism as a phenomenon is of an interdisciplinary, multi-sector and multi-functional nature. There are two distinct areas of tourism impact, i.e. economic and social, but it needs to be borne in mind that the capacity of social function is extremely large and the functions often interpenetrate, hence their divisions are not homogeneous. The wide social aspect stems from the definition of tourism, according to which "in a broad sense tourism is the entirety of spatial mobility phenomena associated with a person's voluntary and temporary change of place of stay, rhythm and living environment and his or her coming into contact with the natural, cultural and social environment of the place being visited" [Przeclawski 1996, p. 30]. It is therefore possible to isolate many aspects of social and economic life which seem particularly important from the point of view of how tourism impacts the development of research activity [Alejziak 2003, 2005, Gaworecki 2007; Gołembski 2002, 2003; Wodejko 1997]: ecological, economic, educational and cognitive, cul-

tural, spatial, psychological, recreational, health-related and social, for tourism is a mass phenomenon in which almost 20% of the world population participates and the figure is bound to grow [UNWTO 2008, p. 11]. The multitude of functions and the scale of the phenomenon described earlier confirm that tourism is of interest to researchers of various scientific branches that are seemingly distant from one another, e.g. economic and medical sciences, which analyse for example the impact that a person's participation in tourism has on his or her health.

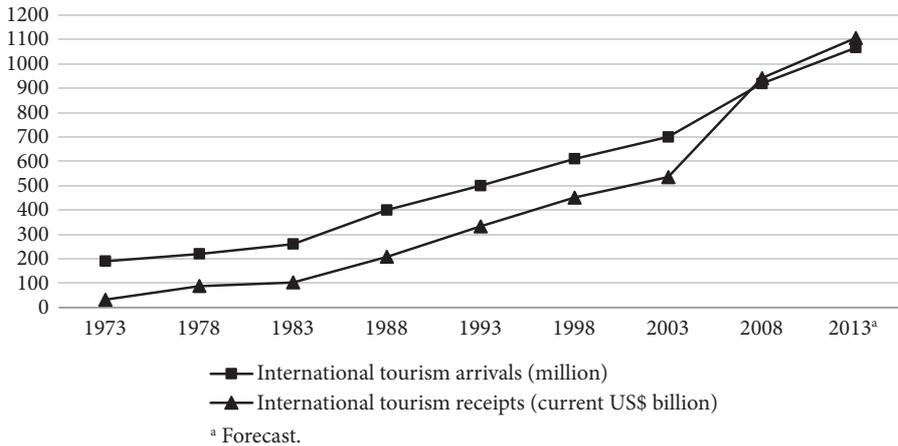


Figure 1. World tourism arrivals and growth of receipts

It is pointed out that tourism is researched in humanities and natural sciences which concentrate on economic, social, geographical, medical, psychological, philosophical and even theological issues. There are some sources that claim that research in tourism is carried out in 15 scientific disciplines [Alejziak 2005]. The paper cannot describe all of the areas because of its scope. Considering the aim of the paper, the author will pay attention mainly to social and firstly to all economic sciences. In economic sciences that generally describe efficient allocation of resources, studies of tourism concern, in practice, all levels of an economic entity:

- Global,
- Macroeconomic,
- Meso-economic – regional and branch-related,
- Microeconomic,
- Micro-micro.

These are only a few papers devoted to tourism in various levels of the economy. They also concern all three economic disciplines, namely economics, management and commodity science. Moreover, scientific research also includes a discipline called tourism economics [Wodejko 1997], which can be divided into functional

economics and thematic sections that make research more detailed. G. Gołembski [2003] isolates four thematic blocks that can be particularly used for solving current problems related to the development of tourism:

- Local economy, together with transport and logistics,
- Marketing and market analysis,
- Public and corporate finances,
- Organisation and management together with labour economics.

Therefore, it can be seen that the research interest is focused on both topics related to both the public and private spheres. Research studies include problems associated with a tourist region, companies operating in the market and demand. Research is conducted in functional and branch-related systems, with various objective, subjective, time and spatial scopes. The scale and importance of the phenomenon show its potential as an area of scientific research, although there is no consensus as to whether the topic has been exhausted or just the opposite – whether the level of scientific knowledge about tourism is sufficiently high. A detailed review of Polish research is presented in Chapter 2 by G. Gołembski.

Synthesis of all possible interactions between tourism and a chosen research area may lead one to believe that research achievements are complex and adequate, but this is not the case. Despite the high level of research activity in so many areas it can be stated that the level of knowledge about it is still insufficient and requires further research using more and more advanced methods [Alejziak 2003]. Such a state of affairs stems from several important reasons.

It needs to be highlighted at this point that there are many problems with research processes in the tourism economy which stem from its nature. It is stated that tourism is perceived as a discipline with an accentuated heterogeneous structure, which subsequently creates numerous problems. Tourism is characterised by the following features: a multifaceted and interdisciplinary aspect, diversity of forms of participation and organizational structures, flexibility and tremendous dynamics of development and strong concentration in time and space. The aforementioned features of tourism hinder research into this particular phenomenon and as a consequence tourism still remains poorly explored [Alejziak 2005].

It can therefore be concluded that research activity undertaken in the current objective scopes is still necessary. It should also be noticed that changes occurring in the modern economy create new challenges and reveal new research areas which may be of interest to tourism researchers. RES is undoubtedly one such area, the rapid development of which will have an impact on the tourism economy too. It is therefore particularly important and equally challenging to study interactions amongst the described phenomena.

The RES market, which impacts various sectors, is also characterised by a considerable degree of dispersion. This means that attempts at research into the relationship between the tourism economy are twice as difficult which explains the scarcity

of research in this respect. It can therefore be stated that despite efforts to undertake research in the field it is a relatively new research area, especially with regard to investment and innovation, which will be discussed later in the paper.

2. Renewable energy sources as fast growing multisector area in modern economy

Energy demand in the global economy is a significant challenge, especially since the increase in demand in this segment over the past 40 years has had an exponential growth. It is assumed that by 2035 energy demand will have grown by more than 30% [International 2011], which raises important concerns in the context of environmental pollution and the depletion of natural resources such as coal, oil and gas [Ligus 2010].

Renewable energy sources do not limit available resources: sun, wind, rivers or biomass. It is assumed that they remain stable and will not be depleted as long as the solar system will still work together with the Earth [Ligus 2010]. In addition, due to their renewable nature, they do not increase the share of carbon dioxide in the atmosphere which is sometimes regarded as one of the reasons for the increase in the Earth's average temperature and the associated greenhouse effect. Their use is recommended as one of the ways to reduce the negative consequences of environment exploitation and the implementation of sustainable development [Yang 2010]. In 2010 they accounted for about 8% of world energy consumption and it is assumed that this share will continue to grow to the level of 15% in 2035. What is more, total renewable energy investment reached \$257 billion in 2011, in comparison to \$220 billion in 2010 and \$161 billion in 2009 (Figure 2) [IRENA 2012]. What is crucial is that these are forecasts concerning an increase in investments in this field for the next decade. This will not be even changed by a 5% drop in RES investments in 2012. It needs to be explained at this point that the fall was mainly due to dramatically lower solar energy prices and weakened US and EU markets. What is particularly beneficial is the decrease in the prices of renewable energy installations because this means an accelerated process of implementing investments in the development of renewable energy, especially in countries with a relatively reduced purchasing power. It is even estimated that the RES market will be one of the fastest growing markets in the world and that it will impact various sectors. It is also projected that the market will have a considerable influence on the tourism economy [IRENA 2013].

The increased interest and use of renewable energy sources can also be observed in Poland. It is estimated that the share of energy produced from renewable sources in Poland amounted to about 8% of total consumption in 2010 which means 60TWh.

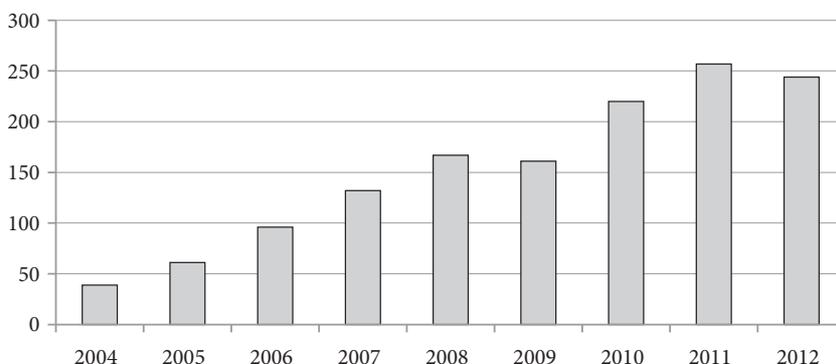


Figure 2. Global new investment in renewable energy (USD billion)

It needs to be stressed that the share will continue to grow and is estimated to reach 15% in 2020 in order to achieve the level of 20% in the European Union.

Based on current statistics it can be stated that the Polish market for renewable energy sources is not developing as fast as in other EU member states, but its growth is inevitable for several reasons:

- rising prices of traditional energy carriers prevailing in the Polish and world economies: coal, natural gas, crude oil, processed fuels, including heating oil,
- agreed targets for the use of renewable energy usage in Poland which is to amount to 15% of the share in final energy consumption. In the European Union the share is expected to stand at 20% [Ligus 2010, p.128] with the current share in Poland being 9.4%,
- a worldwide tendency to reduce the amount of greenhouse gases, including CO₂, confirmed in documents from consecutive environmental summits in Stockholm, Rio de Janeiro, Berlin, Kyoto and Johannesburg, which exerts pressure on Polish economic entities,
- financing renewable energy projects is one of the priorities of national energy economy, with additional grants from the EU which allotted 3 billion Euro only for priority 9 and 10. It should be mentioned that there are also funds from Regional Operational Programmes assigned to individual voivodeships,
- obligations with regard to the energy policy which force certain adjustments. Moreover, due to economic reasons, apart from top-down changes, bottom-up initiatives can also be expected,
- in 2013 and 2020, the cost of electricity will increase rapidly in Poland and the European Union because of the compulsory purchase of licenses for greenhouse gas emissions.

As a consequence this means investment expenditure on RES installations amounting to 27 billion Euro just in the Polish market by 2020. Considering the

fact that thousands of entities will participate in the development of the Polish renewable sources market (entrepreneurs, farmers, households), this is bound to be accompanied by relevant research both from the point of view of the consumer and the producer. The market will have a crucial entity – the prosumer, i.e. both the energy producer and consumer, especially considering the fact that a dynamic development of microinstallations and microenergetics (prosumers energetics) is projected [Instytut 2013]. Therefore, as far as the Polish renewable energy market is concerned, it is crucial to enact legislation by means of which the following aims will be achieved [Ministry 2009]:

- increasing energy security and environmental protection through, for example, efficient use of renewable energy sources,
- rational use of renewable energy sources considering the implementation of the Republic of Poland's long-term economic development policy, fulfilling obligations ensuing from international agreements and the improving innovativeness and competitiveness of the Polish economy,
- shaping mechanisms and tools for generating electricity, heat, cold or agricultural biogas in renewable energy installations,
- ensuring that end users are supplied with renewable energy, heat, cold or agricultural biogas in an optimal and sustainable manner,
- creating innovative solutions with regard to generation of electricity, heat, cold or agricultural biogas in renewable energy installations,
- creating new jobs as a result of new renewable energy installations having been commissioned,
- ensuring that agricultural and related industry by-products and waste are used for energy purposes.

First of all, the renewable energy sources act will ensure the achievement of targets related to renewable sources of energy specified in government documents adopted by the Polish Council of Ministers, i.e. Poland's Energy Policy until 2030 and the National Renewable Energy Action Plan.

Despite the scale of the phenomenon the RES market is a relatively new branch of economic activity which means that there are serious gaps in its scientific explanation and a great need for research. However, the market, like the tourism economy, is extremely challenging to examine.

Despite the development conditions the RES market is facing certain problems with regard to research that is carried out. It stems from its dispersion and multifaceted character, which means that there is a global problem with appropriate statistics in the RES market. This is the case not only in developing countries but also in those in which gathering statistical data is at the highest level. It is even believed that there are a number of areas of statistical concern that may have a growing impact on tracking the renewable share over time. Current statistics do not accurately reflect or capture the impact of [IRENA 2013]:

- traditional biomass,
- small, distributed, grid-connected power generation (e.g. small-scale PV or wind),
- off-grid and mini-grid power generation,
- direct production of solar heat (e.g. solar water heaters, solar dryers),
- differences between renewable (biogenic), waste-based fuels and other waste resources,
- the reduction of transmission and distribution losses due to distributed electricity production,
- the renewable ambient heat that heat pumps capture/transfer using small amounts of electricity,
- interregional integration of electricity or biomass trade.

Therefore, objective research difficulties will be encountered in the RES market in many areas, including the tourism economy. The question should be asked as to what research area should be of particular interest where the tourism economy and the RES market meet.

3. RES investments and innovations as a highly significant research gap in tourism

The deliberations presented above show that the next years will see a revolution in the national power industry and a breakthrough in building a renewable, energy based economy. The investment potential in the renewable power industry until 2020 amounts to 27 billion euros. According to the Institute for Renewable Energy and the renewable energy bill the share of the so-called micro-installations and microenergetics (prosumers energetics) alone may reach 10–20 billion zloty [IEO 2013]. Renewable energy producers are dispersed as opposed to those operating in the commercial power industry. Renewable energy will be developed by a great number of investors and entrepreneurs, including households, farms, agritourism farms, accommodation sites, catering facilities, transport companies and public sector entities involved in tourism development. It is also a market for dozens of installation companies, equipment producers and widely understood institutional partners (local authorities, banks, agencies), engineering and consultancy companies. It is therefore an undoubtedly innovative market of modern and intelligent electric power systems and micronetworks.

The described tendencies reveal two essential economic categories which are inextricably linked to the development of the RES market. One of them is investment which is essential for achieving the specified targets. The other is innovation since the RES market is characterised by modern technologies, specialist knowledge transfers and, last but not least, innovation diffusion. Technologies that enable the

use of renewable energy sources are modern and innovative and their use confirms that the sector's potential is innovative too. Using innovation is also associated with the implementation of investment processes which form the basis for sustained development of companies, sectors and regions. This, in turn, determines research of the RES market in the tourism economy. Therefore, it seems that further attention should be paid to the two economic categories. It happens for a reason.

In the literature of the subject issues related to investments are the basis for development economics, detailed and functional economics. Being one of the main factors behind economic growth and development investments have become the subject of deliberations in all economic trends, sectors and levels including micro-economics, mesoeconomics and macroeconomics [Hirschleifer 1970; Kamerschen, McKenzie & Nardineli 1991].

The problem of investment is also the concern of tourism industry specialists. What needs to be stressed, however, is a certain objective cognitive problem stemming from the dispersion and the heterogeneous nature of the tourism economy. It can be observed that there is a characteristic similarity to the RES market which has a certain consequence on further discussions and conclusions. Tourism investments have an exceptionally wide objective and subjective scope [Nawrot & Zmyslony 2009] and include entities operating in the private and public sectors, profit-oriented and non-profit-making investments as well as tangible and intangible projects. Therefore, the level of investment in the tourism economy in the world is approximately \$1 billion which confirms the enormous scale of this phenomenon (Figure 2) – this amount also includes RES investments, although there is no detailed information available.

For this reason research into investment in tourism requires an individual approach and it is also necessary to specify how strongly it is related to tourism which

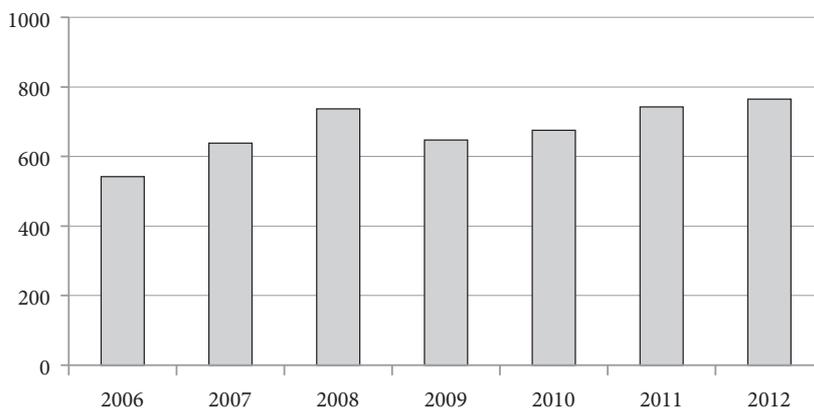


Figure 3. Tourism investments (in USD billion – nominal prices) [WTTC 2012]

determines its branch division into tourism and tourism related research. Reference literature concentrates on aspects related to programming investments, efficiency assessment and conditions of investment development in regions [Nawrot & Zmysłony 2009], international capital flow in tourism [Brown 2000; Endo 2006], and the investment impact on regional development [Forsyth & Dwyer 2003; Rosentraub & Joo 2009].

The problem of innovation is researched as often as the problem of investments which stems from the great significance attached to this economic category regarded as an additional production factor in addition to land, capital and labour, which is stated by Schumpeter and Drucker [Rogers 2003; Keller 2004]. The development of general research has resulted in extending the classic understanding of innovation as seen by Schumpeter referring to the product area and the production process to include organisation and marketing [Rogers 2003; Oslo Manual 2008]. The evolution of the definition has led to a strengthening of the development of research into the innovation diffusion process. The adaptation of the innovation theory in relation to service sectors, in turn, has stressed the role of information and knowledge in this process [Hertog 2002; Hjalager 2002; Keller 2006; Hall & Williams 2008]. This is reflected in projects related to and research into innovations in the tourism economy in which they are regarded as a major key to success that opens up new development possibilities [Poon 1993].

The development of tourism economics together with a new innovation paradigm has resulted in many works touching upon the matter meaning that it has become a global issue [Keller 2006; European Commission 2010]. At the 2003 OECD summit and the 2005 AIEST summit the problem of innovation was accepted and assumed as key to the development of tourism which triggered detailed research into the area [Keller 2004, 2006; Waiermair 2005; European Commission 2006; Hall & Williams 2008]. There are high expectations regarding innovations in the tourism economy, especially in the area of competitiveness and changes to the market structure, globalisation and tourism product life cycles as well as a new orientation of tourist regions [Keller 2004]. What is more, research works on innovation in the tourism economy tend to be specialised which seems to be a natural process with a deductive nature. One of the tendencies is to concentrate on the relationship between innovations in the tourism economy and sustainable development [UNEP 2003; Tourism 2007; UNWTO 2008; European Commission 2010; Nawrot 2012]. The problem of the use of sustainable energy in the tourism economy is becoming part of this trend. The issue has not been researched in depth yet and there is still a wide gap to be addressed as far as this is concerned.

What is important from the point of view of this paper is the fact that the problem of investment in renewable energy sources in the tourism economy is not researched very often and the existing works concentrate on identifying a range of possibilities and technical aspects [UNEP 2003; TOUREG 2010]. It needs to be

said that the regional projects mentioned do not concern many countries, including Poland. There are no results, however, relating to the level of investment, the structure of investment, the reasons why investments are made in renewable energy sources and, finally, relevant factors that hinder or increase investment demand in relation to RES in the tourism economy.

One of the few projects in which renewable energy sources and the tourism economy are researched jointly is a study under the 7th framework programme TOUREG Innovation and Tourism Knowledge. The problem of renewable energy sources, however, is not the dominant issue in the project which does not consider investment. In fact, the project mentions only groups of possibilities without considering a wider research context. When the current significance of renewable energy sources and sustainable development is taken into account, it can be stated that the existing research and cognitive gaps should be filled (Figure 4).

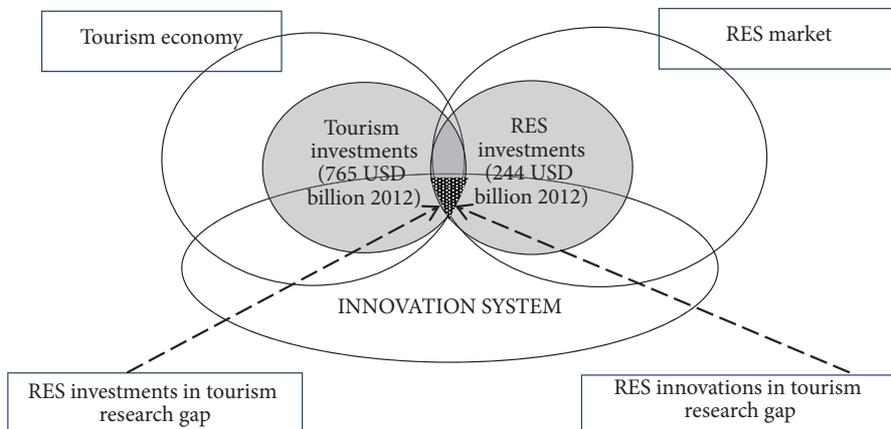


Figure 4. Renewable energy in tourism – possible research areas with regard to investments and innovations

Therefore, it needs to be said that the problem of innovation and investment in renewable energy sources in the tourism economy is new and only recognised to a small degree which means that it requires extensive research, especially in Poland. As far as this combination is concerned, the academic and practical achievements are relatively insignificant. Each of the elements as a separate issue to be researched has been looked into theoretically and empirically but the attempts to determine relationships concerning innovations and investments into renewable energy sources in the tourism economy should fill the research gap in tourism and tourism economics.

Conclusions

To summarise it should be stressed once again that renewable energy sources will be of more and more interest to Poland and the world. This will be mainly conditioned by rising prices of traditional energy carriers, Poland's obligations regarding CO₂ emission, renewable energy use indexes and subsidising the technologies, e.g. by the EU. The rapidly developing RES market will indeed have an impact on the tourism economy but the state of knowledge of the area should be regarded as insufficient, especially compared to the problem of innovation and investment. There has been no complex research as far as the suggested combination is concerned which means that researching it will fill the gap in tourism economics in the future and proves that the problem is innovative.

The paper will be followed up by research into the scope described. The legitimacy of the thematic assumptions presented in it is confirmed by the fact that they have been approved by relevant institutions in Poland². What is considered important is that the knowledge of the way in which the tourism economy operates especially in relation to its innovative potential associated with the use of natural resources in economic processes. In particular, the research gap will be filled through:

- recognising a new and, according to experts, prospective phenomenon, i.e. using RES in tourism,
- determining the volume of RES investments in the tourism economy which were of minor importance not long ago,
- examining the extent in which RES technologies are used by entities operating in the travel and tourism economy, determining the reasons behind their investment decisions in this respect and identifying factors that enhance and hinder the implementation of these decisions,
- proposing the methodology of measuring the innovation absorption capability in the area of RES in the tourism economy and creating a theoretical model to explain relationships in the market,
- developing diagrams of innovation diffusion in the tourism space.

Completing the research tasks presented will allow organised scientific knowledge of use to society to be obtained. This is the role of scientific research.

For this reason scientific research into renewable energy sources in the tourism economy seems to be extremely crucial and fulfil functions that have not been recognised so far:

² The research project supervised by the author of the paper on investments and innovations in the travel and tourism industry has been accepted and financed by the National Science Centre, Poland, under a system of financing scientific research. Detailed methodological assumptions and scientific concepts will be the subject of academic publications by the research team in the very near future.

- explanatory functions that make it possible to find and understand the state of things and phenomena occurring in the tourism economy with regard to renewable energy sources, including the investment processes occurring in the market; it is possible to recognise hidden dimensions and causes behind the state of things,
- diagnostic functions that supplement explanatory functions and that aim at explaining the cause and result relationships of discovered relations where the tourism economy and renewable energy sources meet,
- predictive functions that fit into postulate economic trends and make use of diagnostic knowledge to predict the state of things and the course of phenomena in the RES market in the tourism economy,
- practical functions that make it possible to use economic knowledge of the RES market in the tourism economy for practical purposes and the implementation of economic policies, implementing RES technologies in companies and facilitating processes of innovation diffusion in the tourism market.

To conclude it can be added that particular functions have to be implemented systematically. In other words, it is difficult to extend scientific knowledge of diagnostic or prognostic functions without fulfilling an explanatory function. It is impossible to realise the practical function of conducting an economic policy concerned with renewable sources of energy in the tourism economy without finding out about the scale of the phenomenon, investment levels and the speed of innovation diffusion. Therefore, it seems that the problems raised here will become an important research area in tourism economics and part of a trend in economic sciences and current global economy development tendencies in the future.

References

- Alejziak, W., 2003, *Perspektywy i kierunki rozwoju badań naukowych nad turystyką*, in: Gołembski, G. (red.), *Kierunki rozwoju badań naukowych w turystyce*, Wydawnictwo Naukowe PWN, Warszawa.
- Alejziak, W., 2005, *Present Status and Perspectives of Tourism Research Developmnet*, in: Alejziak, W., Winiarski, R. (eds.), *Tourism in Scientific Research*, Academy of Physical Education in Kraków, University of Information Technology and Management in Rzeszów, Kraków–Rzeszów.
- Brown, D.O., 2000, *Tourism and Foreign Investment in Africa*, in: Dieke, P.U.C. (ed.), *The Political Economy of Tourism Development in Africa*, Cognizant Communication Corporation, New York.
- Endo, K., 2006, *Foreign Direct Investment in Tourism – Flows and Volumes*, Tourism Management, vol. 27, Elsevier, pp. 600–614.
- European Commission, 2006, *Zielona Księga. Europejska strategia na rzecz zrównoważonej, konkurencyjnej i bezpiecznej energii*, Komunikat Komisji Wspólnot Europejskich, 8.03.2006, KOM (2006) 105, Bruksela, http://ec.europa.eu/energy/green-paperenergy/doc/2006_03_08_gp_document_pl.pdf [access: 12.05.2012].

- European Commission, 2010, *Europa – najpopularniejszy kierunek turystyczny na świecie – nowe ramy polityczne dla europejskiego sektora turystycznego*, Komunikat Komisji Do Parlamentu Europejskiego, Rady, Europejskiego Komitetu Ekonomiczno-Społecznego i Komitetu Regionów, 30.6.2010, KOM(2010) 352, Bruksela.
- Forsyth, P., Dwyer, L., 2003, *Foreign Investment in Australian Tourism: A Framework for Analysis*, *The Journal of Tourism Studies*, vol. 14, no. 1.
- Gaworecki, W.W., 2007, *Turystyka*, wyd. 5 zmienione, Polskie Wydawnictwo Ekonomiczne, Warszawa.
- Gołembski, G. (red.), 2002, *Kompendium wiedzy o turystyce*, Wydawnictwo Naukowe PWN, Warszawa–Poznań.
- Gołembski, G., 2003, *Turystyka jako czynnik integrujący badania naukowe*, in: Gołembski, G. (ed.), *Kierunki rozwoju badań naukowych w turystyce*, Wydawnictwo Naukowe PWN, Warszawa.
- Hall, B., 2004, *Innovation and Diffusion*, National Bureau of Economic Research, Working Paper, no. 10212.
- Hall, C.M., Williams, A.M., 2008, *Tourism and Innovation*, Routledge, Abingdon.
- Hertog, P., 2002, *Co-Producers of Innovation: on the Role of Knowledge-Intensive Business Services in Innovation*, in: Gadrey, J., Gallouj, F., Elgar, E. (eds.), *Productivity, Innovation and Knowledge in Services*, Cheltenham-Northampton, MA.
- Hirschleifer, J., 1970, *Investment, Interest and Capital*, Englewood Cliffs, Prentice-Hall, New York.
- Hjalager, A., 2002, *Repairing Innovation Defectiveness in Tourism*, *Tourism Management*, vol. 23, no. (5), pp. 465–474.
- Hong, W.Ch., 2011, *Competitiveness in the Tourism Sector*, Physica-Verlag, Heidelberg.
- Instytut Energii Odnawialnej (IEO), 2013, *Krajowy Plan Rozwoju Mikroinstalacji Odnawialnych Źródeł Energii do 2020 roku*, Warszawa, <http://ieo.org.pl/pl/ekspertyzy> [access: 10.08.2013].
- International Energy Agency, 2011, *World Energy Outlook 2011*, OECD/IEA, Paris.
- IRENA, 2012, *Financial Mechanisms and Investment Frameworks for Renewables in Developing Countries*, <http://www.irena.org> [access: 10.01.2013].
- IRENA, 2013, *IRENA Remap 2030, Doubling the Global Share of Renewable Energy, A Roadmap to 2030, WORKING PAPER*, <http://www.irena.org> [access: 10.01.2013].
- Jeremy, R., 2012, *Trzecia rewolucja przemysłowa*, Wydawnictwo Sonia Braga, Katowice.
- Kamerschen, D., McKenzie, R., Nardineli, C., 1991, *Ekonomia*, Fundacja Gospodarcza NSZZ Solidarność, Gdańsk.
- Keller, P., 2004, *Conclusions Of The Conference On Innovation And Growth In Tourism* by Prof. Peter Keller Chairman of the OECD Tourism Committee, Conference on Innovation and Growth in Tourism Hosted by the Swiss State Secretariat for Economic Affairs (SECO) Lugano, Switzerland 18–19 September 2003, OECD.
- Keller, P., 2006, *Innovation and Tourism Policy*, in: *OECD, Innovations and Growth in Tourism*, OECD Publishing, pp. 17–40.
- Ligus, M., 2010, *Efektywność inwestycji w odnawialne źródła energii. Analiza kosztów i korzyści*, CeDeWu, Warszawa.
- Ministry of Economic Affairs, 2009, *Polityka energetyczna Polski do 2030 roku, Załącznik do uchwały nr 202/2009 Rady Ministrów z dnia 10 listopada 2009 r.*, Ministerstwo Gospodarki, Warszawa.

- Ministry of Economic Affairs, 2013, *Ustawa o odnawialnych źródłach energii – projekt, wersja 2.1.0.4*, Ministerstwo Gospodarki, Warszawa.
- Nawrot, Ł., 2012, *Biomass Energy Investment in Rural Areas – Possible Application in Tourism Industry*, Actual Problems of Economics, vol. 2, no. 7.
- Nawrot, K.A., Nawrot, Ł., 2012, *Management of Tourism Development and Competitiveness of Agricultural Areas*, in: Roy, K., Kar, S. (eds.), *Development Management in the Twenty-First Century*, Nova Science Publishers, New York.
- Nawrot, Ł., Zmysłony, P., 2009, *Międzynarodowa konkurencyjność regionu turystycznego. Od programowania rozwoju do zarządzania strategicznego*, Wydawnictwo PROKSENIA, Kraków.
- Poon, A., 1993, *Tourism, Technology and Competitive Strategies*, CAB International, Wallingford.
- Rogers, E.M., 2003, *Diffusion of Innovations*, fifth edition, Free Press, New York.
- Rosenraub, M.S., Joo, M., 2009, *Tourism and Economic Development: Which Investments Produce Gains for Regions?* Tourism Management, vol. 30, Elsevier, pp. 759–770.
- Stachak, S., 2006, *Podstawy metodologii nauk ekonomicznych*, Wydawnictwo Książka i Wiedza, Warszawa.
- TOUREG, 2010, *Innovation and Tourism Knowledge*, Seventh Framework Programme, <http://www.tourisminnovation.eu/> [access: 10.01.2013].
- Tourism Sustainability Group, 2007, *Action for More Sustainable European Tourism. Report of the Tourism Sustainability Group*, European Commission's, http://ec.europa.eu/enterprise/services/tourism/doc/tsg/TSG_Final_Report.pdf.
- UNEP, 2003, *Switched on: Renewable Industry Opportunities in the Tourism Industry*, United Nations Environment Programme, United Nations Publications, Paris.
- UNWTO, 2008, *Climate Change and Tourism, Responding to Global Challenges*, World Tourism Organization and United Nations Environment Programme, Madrid.
- Waiermair, K., 2005, *Prospects for Innovations in Tourism: Analyzing the Innovation Potential Throughout the Tourism Value Chain*, in: Peters, M., Pikkemaat, B. (eds.), *Innovation in Hospitality and Tourism*, Haworth Press, Binghamton, pp. 59–72.
- Wodejko, S., 1997, *Ekonomiczne zagadnienia turystyki*, Wyższa Szkoła Handlu i Prawa w Warszawie, Warszawa.
- WTTC 2012, *Travel & Tourism Economic Impact 2012*, London.
- Yang, W., 2010, *The Development of Tourism in the Low Carbon Economy*, International Business Research, vol. 3, no. 4, pp. 212–215.