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## Sustainable Energy Management: Are Tourism SMEs in Poland ready for Circular Economy solutions?

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### ABSTRACT

As a key aspect of tourism competitiveness, sustainability plays an important role in profiling Europe as a tourism destination in key source markets. As in any other region(s), comprehensive engagement and involvement of key stakeholders plays an essential component and role in developing Europe as a sustainable tourist destination. This type of engagement and involvement requires a cross-border collaboration in order to establish a common region identity as a means of managing complex processes of globalization. The initial requirement for such an interaction is to identify appropriate relevant stakeholders for European sustainable tourism and to facilitate cross-border dialogue and interactions.

In the field of energy, it is important to take into consideration both energy sustainability and energy efficiency. Energy effectiveness can be described as the interaction between energy produced and energy induced/invested. Sustainable energy can be assessed from the perspective of consumption/production or the impact it has on the environment and society.

This study focuses on level of implementation of circular economy in the energy sector of tourist SMEs in Poland, which can be also understand as a level of implementation of ideas such as high efficiency energy systems and sustainable energy management. The area of research is Polish coastal area, which is a part of the South Baltic Region. This Region has exceptional potential for becoming a forerunner in achieving sustainable tourism goals of the EU. Utilizing the “sustainable energy theory”, the purpose of this research is to examine energy management problems with regard to sustainable development for SMEs involved in Polish tourism in the South Baltic Region.

A structured interview method was used as well as a comparative analysis method. The main conclusion is that the tourism sector in Polish part of South Baltic Region is, at different levels, ready to implement a change from linear economy in the context of energy. In the case of Poland although there are some challenges, it is still very encouraging in that people are beginning to see and view sustainable management, whatever the problems or solutions, as a core living item and not something that can be ignored or pushed aside any longer.

### Keywords:

Sustainable energy;  
Tourism SMEs;  
Energy system planning;  
Circular economy;  
Model of sustainable energy management;

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### 1. Introduction

The EU tourism development policies are mainly focused on driving Europe towards maintain its competitive position as a leading tourism destination worldwide but at the

same time developing more sustainable tourism forms. However this is only possible if tourism-related Small and Medium Enterprises (SMEs) implement sustainable management solutions in terms of both technological and

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### **Acknowledgement of value**

Sustainable energy management in Polish tourism will take its roots from the principles and concepts of the circular economy. Once the inventory of resource stocks and energy flows is established, we will co-design and shape a concept of circular tourism preserving Polish landscapes and local knowledge/cultures (Circular Economy 2.0).

Energy will where possible be of renewable sources and therefore local tourism will be planned taking into account the distribution nature of these sources. Low technologies enabling solutions with lower energy consumption will be preferred because there are more resilient.

Energy design for Polish tourism will aim at not only producing enough energy for the needs of the related activities, but will also aim at feeding and transferring extra energy back into the local network for local citizens to make use of free of cost (ecosystem benefits).

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non-technological innovations. In this regard, understanding tourism SMEs' perceptions about the challenges they face for implementing sustainable development strategies and what is required to overcome such challenges is essential. During the past thirty years, many concepts such as eco-thinking, sustainable development, sustainability, and green growth have been introduced to solve global problems, related to the prevailing increase of consumption, and mass growth-oriented production [1–4]. The CE concept covers different actions that can be taken, some of which are: introducing new technologies [5], changes in national policies [6], demonstration of good-practices [7] or influence and role of people towards changes in energy systems [8–10]. The circular economy (CE) concept, on which this article is based on, is of great interest to both academia and practitioners, because it is viewed as operational and feasible for businesses to implement sustainable development [11,12].

It cannot be traced back to one single date or author rather to different schools of thought. The CE is considered to have been introduced by the economists David Pearce and R. Kerry Turner [13], who defined a set of principles which were different from the linear 'take-make-dispose' model, based on continuous economic growth. The main aim of the circular economy is considered to be economic prosperity followed by environmental quality but its impact on social equity/equality and future generations is barely mentioned [14]. According to the European Commission [15], some of the ways to achieve resource efficiency include light-weighting, durability, efficiency, substitution, eco-design, industrial symbiosis, and leasing or renting.

According to the Ellen MacArthur Foundation [16], most approaches such as "cradle to cradle", biomimicry and blue economy have contributed to further refine the concept of CE. Thus the CE goes further than just 'eco-thinking', 'sustainable', 'green', and environmentally-friendly technologies. The CE relies on value creation through reduction, re-use, recycling and recovery of resources, enabled through new types of business models and forms of consumption that create and enhance to becoming active 'users' rather than passive 'consumers' [17]. Nowadays, there are numerous examples of activities that promote the development of business innovations, consistent with sustainable development [18].

The CE concept is an attempt to transition the product-oriented business model in which enterprises are focused on the product into a model based on services [19]. This system is often called product-service system (PSS) and it imposes upon the enterprises the product life extension, considering the fulfilment of customers' needs [18] together with solving their problems.

From the business perspective, the circular models involve both, so-called soft-changes such as:

- skills and knowledge, including entrepreneurship and capacity-building;
- organisational innovation, including integrated solutions and systems, logistics, business models, and policy supporting tools;
- social innovation, including: new production and consumption models, citizens' involvement, product service models, and design services;
- financial instruments;
- awareness, dissemination and internationalisation;

- multi stakeholder involvement, and technological innovation, including: design of materials and processes, product design, and resource management.

The aim of this article is to identify the key problems for the tourism SMEs with their energy systems and proposes solutions that can be implemented. It therefore investigates the readiness of the tourism sector SMEs from the South Baltic Region for implementation of the change from linear economy to circular economy with the specific focus on energy in Poland. The types of SMEs that are taken into account are: hotels, restaurants and spas.

The paper’s structure is as follows

- In Section 2 the role of energy in the circular economy is described and it characterizes the present level of adaption by the SMEs from the South Baltic Region relating to the rules of circular economy in the context of energy
- Section 3 describes the method of inquiry to collect the biggest challenges.
- In Section 4 the results of inquiry are presented.
- Section 5 concludes the paper.

## 2. The role of energy in the circular economy

The role and purpose of this paper is to investigate the level of readiness for circular economy and because of the fact that energy is part of circular economy it is mainly associated with energy efficiency and therefore we should also mention the known barriers to energy efficiency. These barriers are:

1. Risks (e.g. financial risk in investing in new technologies)
2. Imperfect information (lack of information and knowledge of “best practices” on technologies and solutions that may be used to improve energy efficiency),
3. Hidden costs (e.g. project inadequate to the needs of investor which affect because of additional costs, or costs that are costs of implementing the solution itself such as the training of staff),
4. Access to capital,
5. Split incentives (e.g. the need of investor/owner of the company differ from the need of employee) and

6. Fixed and bound rationality (e.g. no need towards looking for the best solution but choosing the first that meets the demands).

All of the six above mentioned barriers affect the problems involved with the implementation of changes in the energy system, and thereby are also considered in this work, SMEs [20].

CE allows for economic development while minimising the consumption of raw materials, waste production, emissions and energy losses through the creation of advanced chains of manufacturing and consumption processes in which production waste is used as raw materials [21,22].

In the case of the energy industry, the CE focus on the optimization of three basic aspects [23]:

- a. Use of energy sources - energy production
- b. Use of by-products and excess energy - cooperation between manufacturing industry and cooperation at the urban level
- c. Energy consumption by the final recipient - relation and communication with the client

Visual representation of the role of energy in CE is presented in Figure 1.

In the processes of CE, following activities can be distinguished:

- Design of manufacturing processes and services, e.g. planning of recycling of materials created in the production of energy
- Energy production, e.g. use of renewable and waste energy, energy conversion

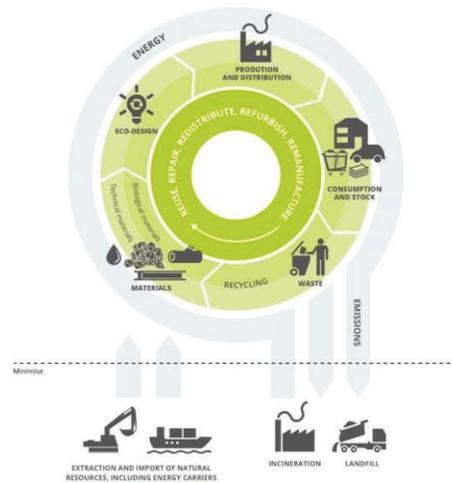


Figure 1: The role of energy in circular economy [24]

- Recovery of energy inventory, e.g. recycling of materials from generating units as energy or raw materials
- Waste disposal, e.g. disposal of unused waste

The influence of CE economy on the cooperation of the manufacturing industry and cooperation at the municipal level, for example:

- Utilization of by-products of the manufacturing industry (e.g. oil, biogas)
- The use of redundant energy created in the manufacturing industry (e.g. heat from a smelter)
- Use of ash (production of fertilizers)

In the CE processes for cooperation with the final recipient, we distinguish activities related to:

- Energy distribution, e.g. smart grid products and services
- Services, e.g. heating, electricity, lighting as a service (performance fee, e.g. 22°C home temperature), other services related to the functioning of real estate, services ensuring energy efficiency
- Final energy consumption, e.g. response to demand (e.g. reduction of demand (e.g. demand response and load reduction), bilateral exchange of electricity and heat, use of waste heat of building ventilation (e.g. from heat pumps). This is a typical demand side response (DSR) service. DSR is focused on intelligent energy use. Through demand side response services, businesses and consumers can turn up, turn down, or shift demand in real-time.
- Virtual production unit/ virtual power plant - the solution allows for reliable and easy participation of many companies on the balancing market.

It can be easily stated that ideas stand that stand behind the role of energy in circular economy are among others: high efficient energy systems, sustainable energy management and implementing technologies based on renewable sources as well as sustainable use of available resources.

It is worth noting at the end of this paragraph, that in the era of exhausting natural resources and progressing urbanization, the CE is the only viable direction for the sustainable development of the world.

## 2.1. The Status

This paper analyses the situation in Poland in this regard, observed during the implementation of Cirtoinno project, which was realised in South Baltic Region



Figure 2: Visual representation of the South Baltic Region [25]

covering areas of Sweden, Denmark, Germany, Poland and Lithuania (Figure 2) under the EU Interreg Programme.

Research shows, that there is a huge variety and disparity in the level of implementation of circular economy rules in the context of energy by SMEs from the tourism sector [26,27]. It is also not surprising that those countries with greater sources of renewable energy use with a higher level of awareness of climate change (or even climate crisis and which is more and more commonly used in literature [28]) are also the countries where the level of implementation of circular economy is higher. This is especially evident in regards to Sweden and Denmark. Accordingly the countries with lower sources renewable energy and lower awareness of climate change are also the countries with a lower level of implementation of circular economy.

In this paper the authors focused on analysing the situation of Poland. Generally it can be stated, that in Poland the level of implementation of circular economy is low. When asking business owners from the tourism sector about circular economy, the reply shows, that most often they are unaware of the term or that they do not have a clear picture as to what circular economy really is<sup>1</sup>. However in the context of energy, business owners make use of circular economy even if they are not aware of it. Poland with its continuously changing regulations and indeed changes in the energy sector may

<sup>1</sup>The statement is based on the results from the survey, which was a part of realized project, entitled Cirtoinno: Circular Economy Tools to Support Innovation in Green and Blue Tourism SMEs, Work Package 4 (Project No. STHB.01.02.00-22-0058/16), under the Interreg South Baltic Programme, 2016-2019. A model of sustainable energy management projected on the basis of design thinking approach and then tested during an advisory service among 96 tourism SMEs in the South Baltic Region, including 28 SMEs from Poland was one of the outputs. The structured interview method was used in the paper as well as a comparative analysis method

not be easy for investors although there some supporting users , especially for SMEs that can help to produce more innovative solutions in businesses as well as implementing training and workshops (for business owners and for employees) in order to increase the level of awareness of energy, climate change and solutions that can be used in hotels, restaurants and/or spas.

### 3. Methods

Having understood the general level of implementation of circular economy by the tourism-related SMEs the next step is to identify the key problems, that drive investors from implementing ongoing trends. It is also important to identify what level of awareness business owners have for solutions in circular economy concerning energy. The method chosen for collecting data is a questionnaire filled by the tourism SMEs from the South Baltic Region. Due to the specific characteristics of different countries from the South Baltic Region it was decided, that for the purpose of this paper only tourism SMEs from Poland will be addressed in the questionnaire. The aim of this part is only to present research results concerning implementation of circular economy solutions for energy in Polish enterprises situated in the South Baltic Region of Poland. The study was carried out as part of an international project Cirtoinno with projects partners from Poland, Sweden, Denmark and Lithuania in the period 2017-2019.

A structured interview method was used in the paper as well as implementing a comparative analysis method. The research was conducted in 2018 among 98 enterprises representing the tourism business. The enterprises were asked questions regarding their business model, energy (heat, cold), water, transport, flow of resources, chain of suppliers, management, water, waste management as well as questions regarding behaviour of owners, employees and clients/quest ad knowledge regarding circular economy. As the entire study is too broad to be presented here the authors have selected only parts of the results relevant to the subject of the paper. The questionnaire part regarding energy contains 16 open questions, the same for all three types of SMEs (hotels, restaurants and spas) and respectively 4, 2 and 1 additional open questions specific of the operation characteristics of hotels, restaurants and spas which gives total of 20, 18 and 17 questions respectively). The questions cover both the attitude towards circular economy methods regarding

energy for the owner and the employee as well as the behaviour, knowledge and readiness towards implementing changes for both guests and clients. Most of the questionnaires were sent to business owners who filled them in and sent back to the authors, while other conducted in the form of an interview. After that all of the answers were collected and analysed in order to find the key problems , that drive investors from implementing ongoing trends for circular economy. The type of analysis used is qualitative analysis. From all of the answers concerning the key problems in implementing circular economy solutions those that appeared most frequently were chosen and analysed. Also the areas where there is no problem in implementing circular economy solutions were identified (if existing). Description of the results is presented with the division for three groups, which are: heat, power and transport. Each of the subsections is structured first by outlining the areas where the level of readiness is high (if existing) and thereafter describing the areas where the challenges are similar for all three different types of SMEs and finally the challenges that are specific for the SME type (if existing). At the end of each subsection there are listed solutions for the companies that can be used to turn the company into one that works in line with circular economy in the context of energy.

### 4. Results

#### 4.1 Heating

In this section, thermal energy will be described as well as the energy needed for hot water supply. In the region of heating there is no area where the level of readiness for implementing circular economy is high. It is observed that most companies are only aware of how much they pay for heating and for hot water and what is the source of heating, that they are using (district heating or individual heating). In most cases replies from the questionnaires indicated that their desire is to pay less for heating and hot water but that they also lack of knowledge on how to achieve this. Which is an example of “Imperfect information” barrier to energy efficiency. One of the biggest challenges mentioned by the companies was for the amount of investments that needs to be made in order to improve the energy system and increase energy efficiency. Even with financial help from support programs it still resulted in that in most of the cases the costs of such changes where still too great for the companies.

And that is barrier of “Access to capital”. Another challenge observed for all three types of SMEs was their unawareness as to the kind of changes, which should and/or could be made. Unfortunately the information which can be found in this area (eg. online) is often misleading. The challenge, and also example of “Imperfect information” is to understand the needs, such as: heating demand, hot water demand, resources available onsite and harnessing the system.

The following challenge, that companies face are the different kinds of problems concerning the building itself. Most of the changes in the energy system of the building need some level of additional construction work to be carried out. It was pointed out by some companies, that

there are cases, in which they are not the owners of the building and not the decision making parties and it is a challenge to persuade these parties to implement changes, which is a clear case of “Split Incentives”. In the case of old buildings construction work is not an easy task since it could well include for example: adding building insulation or installing renewable energy generation units, e.g. in Gdańsk Old Town it is not possible to install any photovoltaic panels on the roofs of old buildings.

The specific challenge for hotels is to optimize the usage of energy, which to a large extent is dependent on and influenced by their guests. It is not easy to control the energy usage of guests and that can be seen as a “Risk”

| Changes requiring a low level of investment  | Changes requiring a high level of investment  |
|--|---|
| <ul style="list-style-type: none"> <li>- Understanding bills, analysing thermal energy consumption and costs related to thermal energy and aiming to reduce thermal energy consumption</li> <li>- Identifying and verifying the main heat consumption and aiming to reduce the amount of energy consumed</li> <li>- Posting up and displaying information in appropriate places on how to use thermal energy more responsibly</li> <li>- Carrying out an energy audit</li> <li>- Selection of an operator offering energy produced from RES</li> <li>- Posting up and displaying information in appropriate places on how to responsibly use resources</li> <li>- Installing aerators limiting water consumption</li> <li>- Identifying the possibilities of reducing heat loss in a building</li> </ul> | <ul style="list-style-type: none"> <li>- Purchasing devices of thermal energy production from renewable sources as well as becoming a prosumer</li> <li>- Using an intelligent thermal energy management system</li> <li>- Purchasing new water-consuming equipment (e.g. dishwashers, washing machines)</li> <li>- Modernizing the building in terms of reducing heat loss through e.g. utilizing building insulation</li> <li>- Thermo-modernisation, achieving a zero or positive energy output of a building</li> </ul> |

**4.2 Power**

As in the case of heating there is no area for power observed where the level of readiness to implement circular economy is high. Similarly, it is observed that most of the companies are aware of how much they pay for electricity. However in most cases they were not aware of how much electricity they were using every month/year and what’s more in some of the com-

panies there was even the problem of interpreting the electricity bills, which is a clear case of “Bounded Rationality”.

Similarly, the challenges faced by the companies were for example: a lack of funds (“Access to capital” for carrying out changes in the energy system as well as the problem of the energy system being highly depend on the behaviour of guests.

| Changes requiring a low level of investment  | Changes requiring a high level of investment   |
|--|--|
| <ul style="list-style-type: none"> <li>– Interpreting bills, analysing electricity consumption and electricity costs and aiming to reduce electricity consumption</li> <li>– Identifying and verifying the main source of energy consumption and aiming to reduce the amount of energy consumed</li> <li>– Posting up and displaying information in appropriate places on how to responsibly use resources</li> <li>– Carrying out an energy audit</li> <li>– Selecting an operator offering energy produced from RES</li> </ul> | <ul style="list-style-type: none"> <li>– Purchase of devices producing electricity from renewable sources as well as becoming a prosumer</li> <li>– The use of an intelligent electrical energy management system</li> </ul> |

### 4.3 .Transport

Transport in the tourism sector may not seem obvious when talking about hotels, restaurants and spas, but during the questionnaire, stage authors realized that it plays a big role in these businesses. It is required for various purposes, e.g. transportation of goods needed for business operation, transportation of guests as well as in the entertainment for the guests.

It is worth mentioning, that transport is the only sector where the level of knowledge was shown to be high. From analysing responses in the questionnaire it can be seen that business owners (or managers) are aware of the different solutions, which may be used and that most of them also understand how they have been using these solutions in their businesses.

There is one main challenge that is faced by all three kinds of business types and that is the lack of funding/

funds that can be used for investments (“Access to capital”). There is a huge difference between vehicles that run on petrol or diesel and the e-vehicles and most of the time the costs of choosing a more ecological solution is too high. Also, when it comes to investing in solutions for entertainment for guests the biggest challenge is the cost.

The other challenge that was mentioned by certain companies was the requirement for power for the solutions that fit in circular economy, which is a good example of “Rissk” and “Hidden Costs”. On the one hand the cost of power in Poland is increasing leading to another problem for these companies. On the other hand, some of the companies are located in places where they must work using their own generators, which again generates and leads to further costs.

There are no challenges observed in the questionnaires specific for the business type.

| Changes requiring a low level of investment  | Changes requiring a high level of investment  |
|--|---|
| <ul style="list-style-type: none"> <li>– Providing relevant information in visible places on how to use transport more responsibly</li> <li>– Enabling the use/rental of environmentally friendly equipment: e.g. bicycles / scooters</li> </ul> | <ul style="list-style-type: none"> <li>– Changing the main means of transport to those using organic/bio fuels</li> </ul> |

### 5. Conclusions

Despite having a high potential of contributing to their local community, it’s natural resources, it’s economic advancement, and sustainable development, Polish tourism SMEs may not only suffer from challenging

economic choices but also decisions that they have to make based on energy management trade-offs. When analysing inquiry responses it can be observed that there are all of the six barriers to energy efficiency occurring, and they are: risks, imperfect information, hidden costs,

access to capital, split incentives and fixed and bound rationality.

One can conclude that the most frequently mentioned challenges for Polish tourism SMEs were a lack of resources such as financial and human, lack of expertise and resources for proper energy management activities, lack of entrepreneur's awareness and interest in their sustainable practices, lack of in-house know-how and lack of established Polish guidelines on sustainable practices.

There are some innovations, developments and trends which will most likely influence the work of sustainability tourism businesses in 2019-2020.

One of them is the spreading, re-distribution of "over tourism" from the current most popular cities in South Baltic Region to the less popular smaller towns, rural areas and villages. This will impact the holiday experience of 99% of domestic and international tourists, which will become a major concern for many tourism managers on how to manage their hotels, spas and restaurants in a sustainable way in regard to technological and non-technological "soft" issues of running their businesses.

Sustainable tourism has awakened consumer's sense of responsibility in relation to being eco-friendly and conscious with the hope, that this will only grow and help drive behavioural change across a range of environmental issues. The role of technology and how it can assist in delivering effective tourism management solutions is also essential. Technology is a tool to be used and is not the answer in itself. However, we are already seeing the effective use of circular solutions to influence flows of visitors in and to some destinations. The opportunity to monitor the energy use in real time can ultimately assist capacity management and with open access to data this could help plan visitor flows and improve supply chain management.

The main conclusion is that the tourism sector in South Baltic Region is ready and well prepared and equipped on different levels for implementing the change from linear economy to circular economy in the context of energy. In the case of Poland the biggest challenge (that was mentioned in all of the receive questionnaires) is the lack of capital to implement circular economy solutions. It is worth to know that in Poland there are some challenges but at the same time and what is encouraging is that the people are beginning to see sustainable management, whatever the problems or solu-

tions, as a core living item and not something that can be ignored or pushed aside any longer.

Authors would like to mention that that the trend of research in circular economy regarding energy and level of implementing circular economy solutions (e.g. high efficient energy systems and sustainable energy management) is a new subject. Research described in this paper was the preliminary research which goal was to identify key problems in implementation circular economy solutions. Authors plan to perform research which will include more technical view of the problems as well analysis of the real example of implementing circular economy solutions.

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