



Publisher

<http://jssidoi.org/esc/home>



PROJECT MANAGEMENT IN THE RENEWABLE ENERGY SOURCES INDUSTRY IN POLAND - IDENTIFICATION OF CONDITIONS AND BARRIERS

Michał Igielski

Gdynia Maritime University, 81-87 Morska St., 81-225 Gdynia, Poland

E-mail: m.igielski@wznj.umg.edu.pl

Received 11 February 2023; accepted 8 May 2023; published 30 June 2023

Abstract. The article aims to identify the conditions accompanying the project management process in the renewable energy sources (RES) industry. The author will also try to reveal the key barriers and problems associated with this process in the surveyed business entities. In addition to the analysis of the literature, the author chose as another research method a survey in the form of a structured interview with project managers and their employees - the survey was conducted in 2021 in 44 purposively selected enterprises of the SME sector, which are based in Poland and implement this type of project (a total of 254 people took part in the survey). After analysing the literature on the subject and the survey results, keeping in mind its pilot nature, the author listed ten determinants that impact the management of RES projects. According to the author, they significantly affect the project's result and generate the main problems and dysfunctions that project teams encounter.

Keywords: project; project management; project management considerations; renewable energy sources

Reference to this paper should be made as follows: Igielski, M. 2023. Project management in the renewable energy sources industry in Poland - identification of conditions and barriers. *Entrepreneurship and Sustainability Issues*, 10(4), 135-151. [http://doi.org/10.9770/jesi.2023.10.4\(9\)](http://doi.org/10.9770/jesi.2023.10.4(9))

JEL Classifications: M10, M12, Q42

1. Introduction

Renewable energy sources (RES) are nowadays the main alternative to fossil fuels and, at the same time, are seen as an essential contributor to halting dangerous climate change on the planet. Their use in national energy balances is not only a manifestation of the implementation of guidelines resulting from agreements at the global level. Still, it is also a common sense and economically conditioned action (Młynarski, 2019).

Renewable energy sources, mainly those based on natural forces, have exceptional potential for meeting the population's growing electricity needs. They are not depleting; their use does not burden the environment - to such a significant degree - as fossil fuels do; they allow decentralised energy production and, therefore, close to the

consumer (which does not require the transmission of energy over long distances), they enable efficient development of rural areas with limited access to the electricity grid (Tomaszewski, 2020).

Organisations that choose to implement these alternative energy sources are moving toward project-based management, emphasising personnel and excellent communication between the various segments of the operation. A project is defined as the totality of activities that allow the organisation of work in a way that leads to the achievement of the set goal. Many factors help or hinder the achievement of this goal. Efficient management coupled with effective communication is the basis for successful project management, i.e., achieving all set goals.

Regardless of which view of the project we choose and which model we use, the most significant attention is paid to teamwork and good internal and external communication. The organisation of projects and project teams is becoming a compulsion for forward-looking companies. On the other hand, due to the increasing globalisation of business, the short life cycle of RES products, increasing competition and high integration in the outcome of customers, management through project implementation in the RES industry is becoming not only a factor in the success of the company, but even part of the strategy for building competitive advantage.

Hence, the subject of this article is to analyse the management of projects that use renewable energy sources in Poland, with a particular focus on the conditions of this process and its dysfunctions.

2. Theoretical background

An important direction in management science is the concept of Project Management, which has been popularised worldwide since the 1960s. However, it was only in the 1990s that this new management concept, which has been applied to run unique businesses, gained many supporters in Europe. This happened due to contacts with developed companies that used and are applying project management in practice and due to global organisations' popularisation of this subject.

Project management is not limited to special, spectacular, high-profile ventures but is an approach with an expanded structure of applications. Examples of this expanded project management use include research or training projects.

In defining the concept of project management, a system formula can be used, which in this case is defined by the distinguishing features:

- objectives and scope of the project;
- planning;
- organisation of project teams;
- effectiveness of the project;
- project implementation technique;
- control of the course of the design process and implementation work.

In most cases, organisations (enterprises, offices or associations) are organised (structured) so that it is possible to carry out their typical routine activities effectively. These structures usually result from the functions performed by the organisation or the products offered.

Project management is, therefore, an extremely complex issue. For ease of reference, we can distinguish the types of activities included in project management, which the author has presented in Table 1.

Table 1. Description of the types of tasks included in project management.

Operational activities (primary)	Managerial activities (management)	Supporting activities (auxiliary)
<p>Include the translation of the inputs possessed into the realisation of the project objective - the reference is the implementation of the project based on the satisfaction of specific needs and/or the solution of a particular problem (the European Commission emphasises the problem approach).</p> <p>A distinction is made between operational activities, consisting of preparing a description of the subject of the project (e.g., project documentation, technical documentation) and administrative activities, consisting of the material implementation of the subject of the project.</p>	<p>They focus on harmonising operational and support activities</p>	<p>Include goal setting, planning, organising, motivating, coordinating and controlling.</p>

Source: own study based on Bradley (2012) and Quinn (2017).

With the above overview, we can observe the rank and importance of project management. Thanks to this, we will always have access to the most critical information, which will help us more easily make decisions and pursue predefined goals. The info mentioned includes data on the progress of the initial plan (Jones, 2017).

To sum up, the diverse subject of project management includes three main problem areas (Martini, 2015):

- functional project management (project cycle management);
- institutional project management (project manager and project team);
- personal project management (qualifications and range of skills, distribution of competencies).

In turn, the term project can be used to describe a project implemented within a specific organisation which is new, unusual, and different from routine activities - that the organisation has never encountered before. The statement that a project is carried out within an organisation does not mean that people from outside or other organisations cannot participate. The situation in which a single organisation implements a project is the primary situation considered in this work. Multiple organisations can also carry out projects on a partnership basis, by individuals, or even a single person (Pawlak, 2017). The very concept of the word project comes from the Latin theorem *proiectus*, meaning to advance/progress forward/forward. According to the author, it can be translated as finding and presenting a way to solve a task/problem to be implemented in the future.

Conversely, there is usually a consensus on interpreting this concept in the literature. However, the very popular and frequently cited opinion of American authors can raise (and raises for the author of this article) fundamental doubts. In Table 2, the author has compared what he considers to be basic definitions of the term in conjunction with its main elements.

Table 2. Description of the types of tasks included in project management

No.	Distinguishing features	Definition
1.	goals and scope of the project	According to the Project Management Institute, a project is an undertaking of a temporary nature, the purpose of which is to create a unique product (produce a product or provide a service). "Temporariness" is understood here as a closed period in which a specific project sentence will be implemented. "Uniqueness" is the distinctive position of the designed product belonging to a given class (group) of assortment.
2.	objectives and scope of the project, planning	J. D. Frame (2011) believes that a project is oriented toward some goal, involves the coordinated undertaking of related activities over time (it has a beginning and an end) and is characterised by uniqueness.
3.	objectives and scope of the project, planning, effectiveness of the project, control of the course of the design process, implementation work	In German Project Management, project characteristics include goal orientation, one-time nature, complexity, interdisciplinarity, organisational separation, and significance (Witzel, 2013).
4.	objectives and scope of the project, planning, effectiveness of the project, controlling the course of the process	R.K. Wysocki (2015) defines a project as a sequence of unique, complex and interrelated tasks with a common goal intended to be completed within a specified period, without exceeding a set deadline, under established requirements.
5.	objectives and scope of the project, planning, organisation of project teams, effectiveness of the project, project implementation technique, process control	H. Kerzner (2005) defines the concept of a project as a project concerning which objectives, required resources, deadlines for execution, costs, and level of quality have been given. In addition, he stresses that projects, in general should be distinguished by their uniqueness.

Source: own study

The author believes that exposing uniqueness (uniqueness) in the definitions of a project, and on the other hand, treating it as an individual (one-time) task, is a fundamental limitation of the scope and type of projects that, in practice, are attributed to the term project.

In addition to the fact that a project is, as a rule, a new and unusual undertaking, it also has distinctive characteristics, such as:

- A specific goal can be achieved in its implementation, and a clearly defined result can be obtained. Such a result may be, for example, a new product, device, or organisational form. This result is also referred to as the system that is built under the project.
- It has a specific start and end date and specific phases - so it is a time-limited project.
- During its implementation, various resources are used: human, financial, materials, equipment, premises, information, etc. These resources are generally limited.
- A project is often separated organizationally from other activities carried out within an organisation.
- It has a specific organisational structure.
- The project involves many people and/or organisational units.
- It is often an extensive and complex undertaking.
- The tasks carried out as part of the project should be characterised by a high degree of innovation.
- The project implementation is usually associated with uncertainty from the point of view of the material solution of the problem (the shape of the system that will be created under the project) and risk. In general, this uncertainty decreases successively as the work progresses.
- The nature of the project changes from one phase to the next, and lines of demarcation between phases can be identified. There are many projects in business practice characterised by wide variation. However, it is possible to

group them systematically and based on an established methodology according to characteristic features (Table 3).

Table 3. Division of projects by subject criterion

No.	Type of project	Description
1.	research projects	Are represented by scientific, experimental and development work in all fields of knowledge. Examples of projects include research on technical topics: - product value analysis, - reliability theory, - development of measurement apparatus, - quality control. There are particular problems in human resource management, for example, evaluation of the formation of human relations in the organisation, the use of working time, and analysis of the physical and mental workload of personnel.
2.	technical projects	Very often, they are a development of research projects. They present design solutions for products and manufacturing technologies - for example, projects for the modernisation and equipment of industrial plants, investment projects, and projects for production automation and management computerisation.
3.	manufacturing projects	Are integrated technical and organisational solutions. Their field is operational systems, for example: - organisation and operation of the production process, - a system of supply, transportation, traffic protection, - monitoring organisation, - production controlling model, - organisation of workstations, - logistics systems.
4.	management systems projects	They are divided into economic and organisational: 1. Economic system projects are developed at various levels of economic management, primarily in terms of development strategy. They refer not only to economic and financial issues, but their scope also includes solutions for strategic and marketing management systems, production management, personnel management, price management, and cost management. 2. Organisational systems projects mainly concern the company's organisational structure, task management, distribution and economic cooperation. In addition, this group includes virtual and network organisation management system projects, quality management and information management also belong here. Concerning the company, management system projects can be considered in a broad and narrow sense: - in a broad sense, these projects synthesise development concepts of market ventures (product-market formula), organisational solutions, technical and production projects and others. - in the narrow sense, management system projects relate, for example, to the diversification of the profile and assortment of production, changes in the organisation of the manufacturing process, and new work systems - the scope of projects refers only to sectional solutions.

Source: own study based on M. Pawlak (2011), K. Frączkiewicz (2021) and R. Marek (2010).

In summary, based on the information cited above, which shapes the definitions of project and project management that occur in the literature, we can conclude that virtually all of them contain common features, such as:

- purpose;
- time;
- budget/finance;
- planning/design;

- organising;
project team/people/employees.

They differ only in the authors' approach regarding the rank and importance of the above issues in terms of project management in practice.

When discussing projects involving the renewable energy industry, the starting point is to determine what the industry is based on and what it involves.

The slowly depleting stock of conventional fuels and the growing need to increase the intensity of environmental protection efforts are two of the main driving forces behind the introduction on an increasing scale of modern technologies that use natural energy resources.

In the literature, we can find many definitions of renewable energy sources, which boil down to the same. Therefore, for this article, let's assume that renewable energy sources include all energy sources whose use for the production of heat energy and electricity is not associated with their long-term scarcity - their resources are easily renewable. Renewable energy sources are mainly water energy, wind energy, solar energy, geothermal energy, as well as biomass (Table 4). Natural processes produce electricity and heat, and the entire process does not contribute to the emission of environmentally harmful substances. RES are, therefore, clean energy, safe and friendly to the planet (Mirowski, 2016). This is in line with the definition in the Energy Law of 2006, which defines renewable energy sources as sources that use the following in the conversion process: wind energy, solar radiation, geothermal energy, waves, currents and tides, river fall, energy derived from biomass and landfill biogas.

Table 4. Types of renewable energy sources

No.	Source	Description
1.	Water energy	This source is most often used in hydropower plants to produce electricity. For this purpose, water turbines are required, which, when moving, create mechanical energy that goes to hydro generators. There, in turn, it is converted into electricity.
2.	Solar energy	Solar energy has become one of the most undistributed renewable sources, thanks to photovoltaics. Photovoltaic panels mounted on the roof of a building or the ground capture solar radiation and transform it into electricity directed to electrical outlets in homes, businesses, farms or other structures of choice. Solar energy can also be used for heating purposes. This requires solar collectors, which heat water in tanks through a heating medium and heat exchanger. This solution prepares domestic hot water and supports central heating operations.
3.	Wind energy	Renewable energy sources can also use wind energy in the conversion process. To generate electricity, special wind turbines are set in motion by the wind, generating mechanical energy. For electricity to be produced it must first go to the device, which is a generator
4.	Biomass - biodegradable matter	Renewable energy sources can also be talked about in the case of biomass. Biomass is all kinds of matter, such as products and waste from agricultural or forestry production, which is biodegradable. It can be used to create solid, gaseous and liquid fuels. It is most often used to produce heat energy when biomass is burned. The heat generated can, in turn, be used to produce electricity.
5.	Geothermal energy	Geothermal energy is energy from inside the earth. It can be used both to produce electricity and to produce thermal energy, including for heating purposes. To obtain it, it is necessary to drill wells. A technology that uses heat energy from the ground is ground source heat pumps, which can be used to provide heating for a building and to heat domestic hot water.

Source: own study based on Hymon (2022) <https://hymon.pl/co-to-jest-oze-jakie-sa-rodzaje-zrodel-energii-odnawialnej/>

In turn, the division of renewable energy sources can be made according to the type of usable energy produced from them - some sources we can convert to usable energy only in the form of thermal energy (for example, low and medium-temperature geothermal waters), and other sources in the form of electricity (for example, hydroelectric, wind turbines). The latter is abbreviated as RES-E (Renewable Energy Sources-Electricity). Below in Table 5 are those renewable sources from which we can obtain electricity, according to the classification of the European Commission's Directorate-General for Energy and Transport and the International Energy Agency - IEA.

Table 5. Types of renewable energy sources

Sorts of RES - E	Directorate	IEA
Biogas of agricultural origin Landfill gas Fermentation gas from wastewater	Biogas	Bioenergy (including waste energy)
Bioenergy (including waste energy) Forest products (wood) Forest production waste (bark, lumber waste, etc.) Agricultural products (energy crops) Waste from agricultural production (including substances of plant and animal substances, e.g., straw)	Solid biomass	
Biodegradable waste (municipal and industrial)	Biological waste	
Electricity from geothermal		
Small hydropower plants (<10 MW) Large hydropower plants (>10 MW)	Small Hydropower Large Hydropower	Hydropower
Photovoltaics	Photovoltaics	
Electricity from solar collectors	Electricity from solar collectors	
Tidal energy Tidal wave energy	Tidal and wave energy	
Onshore wind energy	Wind Energy Onshore	
Offshore wind energy	Wind Energy Offshore	

Source: own study based on Mirowski, 2016.

Renewable energy resources are practically unlimited, but as we can see, their potential is dispersed, and their use of them requires higher capital expenditures. That is why today, the investment costs of generating eco-energy are even higher than that of obtaining and processing fossil fuels. The reason is the still globally controlled top-down prices of energy carriers. The cost-effectiveness of applying technical solutions that use renewable resource energies can be justified when the prices of all energy carriers are liberalised and eco-fuels are fully charged for environmental degradation (Zimny, 2014).

However, one of the main priorities of energy development in the coming years is the development of renewable energy sources. Rational use of energy from renewable sources (water energy, wind energy, solar radiation, earth energy, i.e. geothermal energy and biomass) is one of the essential components of sustainable development with measurable environmental and power effects. The increase in the share of renewable energy sources in the fuel and energy balance of the world contributes to improving the efficiency of use and saving energy resources, improving the environment by reducing emissions of pollutants into the atmosphere and water, and reducing the amount of waste generated. Therefore, supporting the development of these sources is becoming an increasingly severe challenge for all countries of the world and Europe in particular, as reflected in many EU programs (Borgosz-Koczwara & Herlender, 2018).

In summary, the use of renewable energy sources, due to their advantages, not only those related to environmental protection, has become a fundamental priority for EU action in the field of energy. We should stop looking at the implementation of RES projects only through the prism of fighting global warming or levelling CO₂ production. This is also an opportunity for the development of local environments, where by using resources that have been available for many years, new jobs are created, social ties are strengthened, and, after all, what is also very important - ultimately, the cost of living is reduced.

In addition, the increase in the exploitation of renewable energy allows greater independence from the supply of imported energy, enables more robust diversification of supply sources, and contributes to the creation of distributed energy, which will be based on locally available raw materials. This will increase energy security and reduce transmission losses due to the possibility of locating close to the consumer. And this, after all, influences the formation of the country's energy balance, which translates into increased electricity security (Ignarska, 2013).

Issues related to RES projects implementation are widely discussed in the contemporary scientific literature (e.g. Yuksel, 2018; Rodin & Moser, 2021; Maestre et al., 2021; Othman & Khallaf, 2022; Vasquez-Ordonez et al., 2022; Manceroova & Tuyet, 2022). The impact of project management conditions and stemming barriers still need sufficient attention (Boonstra, & Reezigt, 2023; Calderon-Tellez et al., 2023; Soderberg, & Liff, 2023; Shava & Vyas-Doorgapersad 2023). This research intends to fill in this gap by investigating a Polish case.

3. Research Methodology and data

The research involved people managing a Renewable Energy Sources (RES) project - project managers and project team members from public institutions, associations and enterprises. This choice was dictated by the fact that external as well as internal factors influence the management of this type of project, and therefore the author took into account:

- the institution in which they work, that is, its legal form, organisational structure and size;
- individual variables, that is, education, age, gender;
- career variables, that is, their position, work experience, length of service, and knowledge of their work.

In turn, the choice related to the analysed group of organisations was based on the author's observations over the past three years and his personal experience implementing and managing RES projects. In addition, it is also due to legal regulations.

The entire research process was carried out based on the fact that RES project management can be conditioned by (e.g. Aghdaie et al., 2020):

- the organisational structure of the entity in question;
- nature of the organisation;
- the size of the organisation;
- the number of members of the project team;
- their knowledge and experience, and the manner and type of employment for the project position.

The research does not consider micro-enterprises, i.e. institutions employing up to 9 people, usually established only to implement a given project. Their entire staff are project employees only, and organisations that only implement their first project - they have yet to implement any others before and therefore have no experience and reference points.

Due to this fact, the sample size for the study was assumed to be 118 organisations operating in Poland which are implementing at least one RES-related project and have also implemented at least one such project before. In the end, the author induced only 44 organisations to participate in the study, despite making contact and sending a request to 218. Unfortunately, the research sample did not reflect the assumed characteristics of the entire group for the country. Therefore, the presented research results cannot be a total set for Poland - they provide a basis for expanding the research process in the future, and for the time being, can only be treated as a pilot study.

Organisations and project teams that participated in the survey:

- 9 public institutions;
- 23 enterprises;
- 12 associations;

A total of:

- 52 project teams - in 8 organisations, there were two teams;
- 44 project team managers (in organisations that had two projects, one person managed two projects);
- 210 employees of the teams.

Given the research problem of identifying conditions and barriers (problems or dysfunctions) of RES project management, the author chose a survey questionnaire as the primary research tool - he took into account, of course, the distinguished two groups of respondents and prepared two separate questionnaires for each of them. The different content of the questions in the two questionnaires was included.

- the different roles that representatives of the selected groups have in the implementation of the project;
- different participation in the decision-making process;
- different problems in daily work;
- very often highly different knowledge, experience and skills.

Of course, both questionnaires asked questions to indicate the conditions affecting daily work, identify the barriers present during project implementation, or place their project in the organisation where it is implemented. In the survey questionnaires, the author included different types of questions:

- closed alternative;
 - closed filtering ones;
 - closed ones that use a nominal and ordinal scale;
 - determining the rank of importance of the topics under consideration;
 - semi-open in the form of conjunction;
 - so-called "control" tests, which allow checking the sincerity of the respondent's answers;
 - "Stein's Self-Portrait" test - used to identify the needs of respondents and examine the level of expectations;
- questions to identify dehumanising factors - used to identify communication issues or roles in the overall management process.

When analysing the results of the study, taking into account individual variables, in the group of managers and employees of project teams, the following characteristics could be noted:

- the predominance of women over men - 58.4% to 41.6%;
- the largest group was between 31 and 50 years of age - 61.4%;
- the majority of the group had a university degree - 83.4%;
- as many as 76.3% of the respondents were new employees hired for the project;
- 23.7% had previously worked for the organisation in positions not related to the implementation of RES projects;
- only 35.4% of respondents had experience in implementing similar projects;
- only 18.7% of respondents had acquired knowledge of RES project implementation (courses, training, postgraduate studies, first or second-degree studies).

Significantly, the above structure was not influenced by the place of employment of respondents from both the group of managers and the group of project team workers, which means that the structure of project employment is not influenced by the type of organisation in which the project is implemented.

4. Results

In the first stage of the research, the following determinants of RES project management were identified (alphabetically):

1. Project team members (their selection to the team).
2. Resources and tools available during project implementation.
3. The person of the project manager.
4. Project planning.
5. Distribution of roles and relevant competencies - proper involvement.
6. Flow of information.
7. Strategic management of the project.
8. Strategic management of the organisation.
9. Organisation structure.
10. Cooperation with institutions responsible for the implementation of RES in Poland.

The importance and relevance of the above-identified determinants for each group of respondents are presented in percentage terms in Figure 1 below - it shows which determinants are the most specified and most important for different groups of people involved in the implementation of RES projects.

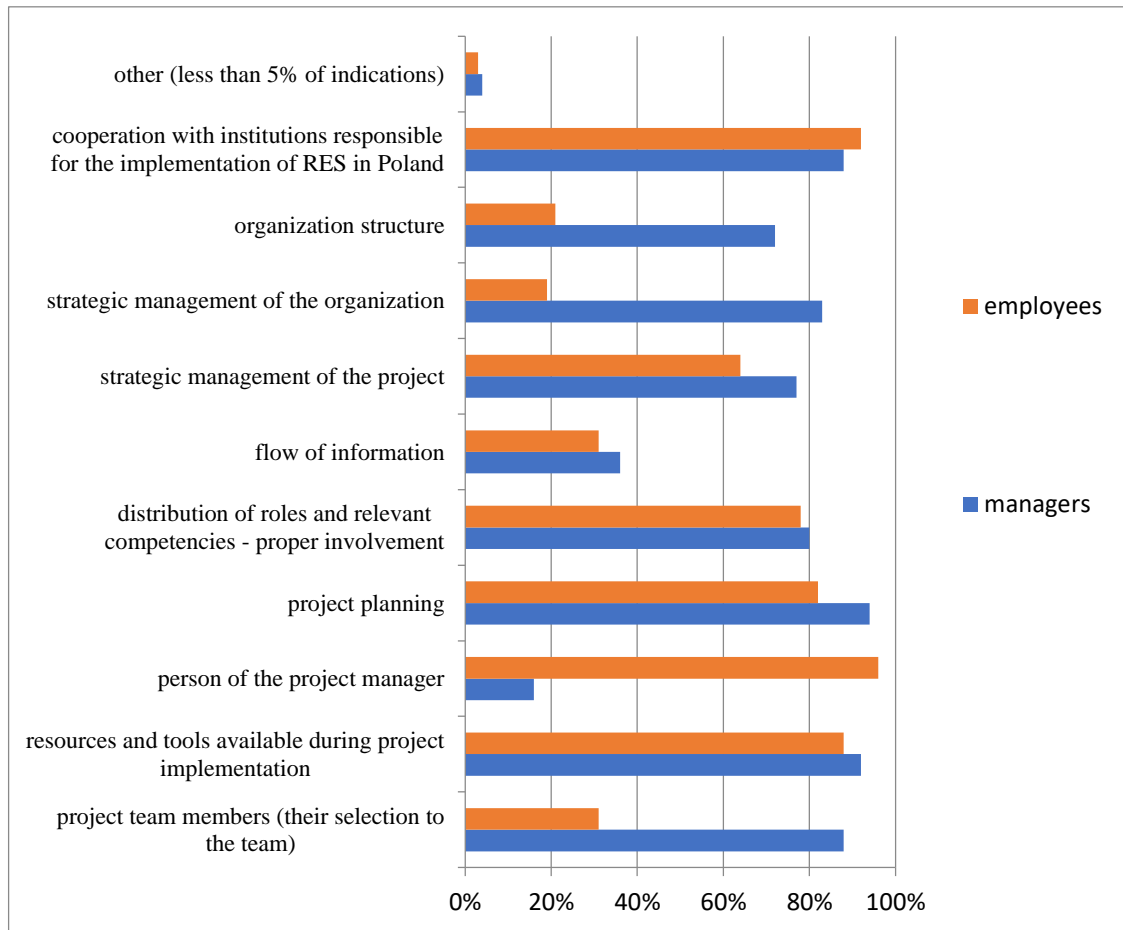


Figure 1. Weight of identified determinants for two groups of respondents

Source: own study

However, we can see discrepancies when emphasising the importance of specific determinants mentioned by the two groups of respondents. If, in the case of the issue of conditions related to the project manager and people in the project team, the discrepancy is justified and is due to the place occupied in the structure of the project, then in the case of conditions related to the organisation (one's workplace), it is surprising to see so few voices of project employees. In the author's opinion, this is a result of the low level of knowledge of basic concepts of organisation and management held by this group of respondents and the fact that they do not realise the strength of the influence of these factors on the project they are implementing. In other cases, on the other hand, the opinions are already much more similar, which means a high impact of the mentioned conditions on the work of all those directly involved in project management. Confirmation of this opinion can be seen in the very high percentage of answers given, exceeding 80% in almost all cases. In addition, all complications accompanying the performance of project tasks have their source precisely within the organisation and do not contrary to appearances and widely accepted opinions, arise from the external environment. In addition, in making the above analysis, it is imperative to note that most people cannot determine whether a given condition is external or internal. This confirms the author's opinion as to their knowledge of management processes.

The determinants described and listed in this way were also accompanied by the dysfunctions indicated by the respondents specific to each determinant - the second stage of the research (Table 4).

Table 4. Dysfunctions associated with each conditionality

No	Conditioning	Dysfunctions
1	Project team members (their selection to the team)	<ul style="list-style-type: none"> - poor selection of employees for the project team - lack of training for project team staff - very high staff turnover - filling one person in two positions in two projects - including project managers
2	Resources and tools available during project implementation	<ul style="list-style-type: none"> - lack of methods and tools for project management - lack of mechanisms for monitoring the resources held - projects implemented are not consistent with the organisation's profile and strategy - too many projects implemented at once - the inadequacy of adopted project cost estimates (budgets) to the intended results
3	The person of the project manager	<ul style="list-style-type: none"> - filling one person in two positions in two projects - lack of competence - lack of experience
4	Project planning	<ul style="list-style-type: none"> - extended project schedules (leaving too large time buffers) - erroneous resource planning - long waiting time for management decisions (even more than six months) - results in changing project realities.
5	Distribution of roles and relevant competencies - proper involvement	<ul style="list-style-type: none"> - lack of definition of roles and responsibilities for units or individuals outside the project - lack of ongoing participation of top management in project management - low morale of project staff - need for more support from boards of directors.
6	Flow of information	<ul style="list-style-type: none"> - lack of information on the status of the project - lack of information flow channel with other departments of the organisation involved in project activities - lack of cooperation and information transfer between project teams working simultaneously - lack of databases left after the end of the project - often replacement of personnel - no lessons learned
7	Strategic management of the project	<ul style="list-style-type: none"> - poorly prepared projects - projects implemented are not linked to each other - lack of coordination of overall activities undertaken in all projects - duplication of project activities performed - rivalry between project teams simultaneously implementing projects.
8	Strategic management of the organisation	<ul style="list-style-type: none"> - treating projects secondarily - lack of experience in project implementation - insufficient resources - lack of integration of the project team into the organisation
9	Organisation structure	<ul style="list-style-type: none"> - lack of project structure - prevalence of functional structures - misalignment of the organisation with the ongoing projects - inability to link the work of all units in an organisation to project activities
10	Cooperation with institutions responsible for the implementation of RES in Poland	<ul style="list-style-type: none"> - lack of information flow channels - low level of knowledge in the staff employed there - lack of standards in project management developed by these institutions - an influx of conflicting information on project implementation - lack of unified laws and standards for all areas of operations - high frequency of changes to existing laws and standards.

Source: own study.

In summing up the above data, it is necessary to add that the respondents mapped all the dysfunctions occurring to individual conditions. Hence, there may be doubts about the validity of such an association. However, based on the answers given in this way, which are simply the result of the difficulties constantly encountered in work, they significantly impact the management of the RES project. In addition, for this work and a better understanding of such sensitive issues, the author decided to cite the main problems (Figure 2) that arise in the daily work of the respondents. According to the work's author, only a concrete example taken from practice can illustrate a given situation most optimally.

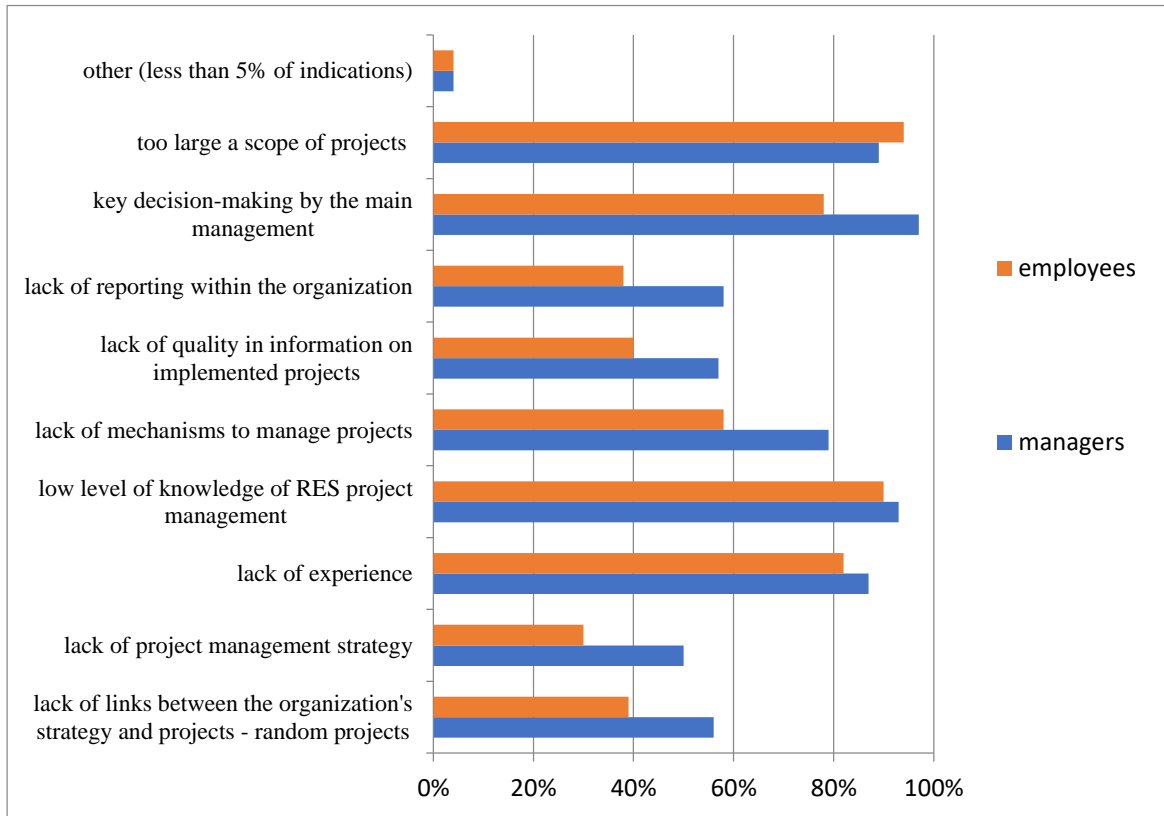


Figure 2. Problems occurring during the management of a RES project

Source: own study.

In summary, it can be noted that the results of the author's research presented above are as identical as possible to the project management considerations contained in the world literature and lead to efforts to improve the following areas:

- adapting the organisational structure to the implementation of RES projects;
- managing the organisation through project management;
- optimisation of the information flow process during project management;
- external and internal flow (information management);
- managing the competencies and skills of project team members,
- “bottleneck management”;
- project planning;
- proper selection of roles, competencies and responsibilities in the organisation during project management;
- optimisation of procedures and tools of institutions responsible for implementing RES systems in the country.

5. Discussion

In the 21st century, companies, to gain a sustainable competitive advantage, must respond quickly to the intense and unprecedented environmental changes. They are to be helped by project management, which, as the article's author wrote, is an extensive, multifaceted and interdisciplinary issue.

In the scientific literature, we can find many definitions of project and project management, and we can note an inevitable evolution of views that emphasise their different aspects. However, even though the concept of RES project management (the very concept of their general implementation is more than 60 years old) is not so new - many attempts to apply it to traditional entities have failed to meet the expectations of their boards or even the market itself. The reasons for failure that occur are due, as indicated by the conditions discussed earlier, which, according to the author, can be divided into four leading and basic categories:

1. Psychological.
2. Organisational.
3. Market-based.
4. Cultural.

To sum up, it doesn't matter whether we are talking about determinants or their dysfunctions; everything revolves around practically the same main aspects which are:

- lack of tools and resources;
- the wrong people in the wrong positions, performing the wrong tasks;
- a virtually non-existent flow of information;
- an ill-defined or overlooked area of project planning;
- strategic project management approach;
- the negative impact of the project company on its management;
- shallow cooperation with institutions responsible for renewable energy sources in Poland - practically none.

But it was coming back to project management in the RES industry, which today is responsible for giving the right prompts in the development process, stimulating knowledge transfer and diffusion. At the same time, it is supposed to support organisational learning and, consequently, lead to the development of dynamic capabilities. After all, nowadays, it is not only the bundle of resources that counts in building competitive advantage but also capabilities. Consequently, mechanisms by which organisations can develop these capabilities and reconfigure resources are essential. This confirms that dynamic capabilities, built on knowledge and linked to an entrepreneurial orientation, lie at the heart of generating new products, processes or services.

The rapid development of the green energy sector in the coming years seems inevitable, especially for European Union member states. It is, therefore, worth considering what consequences it will carry. Undoubtedly, the consequences for the state budget are essential. One can forecast an increase in budget revenues from VAT, due to the increased number of investments related to developing the green technology market. In addition, increased state budget revenues may result from developing enterprises and subsequent employment growth. A decrease in budget revenues is also likely inevitable due to reduced excise tax revenues and less exploitation of fossil fuels. The development of the RES sector will positively impact the labour market. This is especially true for industries involved in producing equipment for renewable energy and the construction industry due to increased demand for construction services related to the construction of new generating units and the modernisation of existing ones. Employment growth can also be forecast in banking due to the development of programs to finance green energy investments. Human capital will shift from traditional sectors to highly innovative ones, consequently contributing to developing a knowledge-based economy (Ignarska, 2013).

The importance of the topics discussed above is undoubtedly due to the drive to build an information society and a knowledge-based economy. This is a priority activity for any country that intends to compete effectively in international markets in the future. For Poland, the vision of continuing the current economic assumptions based on a very cheap labour force is becoming more and more elusive, as increased emigration, as well as demographic changes, have caused the significant labour surpluses that have existed in the labour market so far are rapidly beginning to turn into shortages that are difficult to level. The changing relationship between supply and demand in the labour force segment in such a situation inevitably means an increase in production costs. The only way out of the "crisis" in such an economic situation is to break the barrier of cheap labour resources, which at the same time leads to the path of sustainable development, by transforming the structures of the economy to be less sensitive to fluctuations in the number of labour costs. One should strive to modernise the economy, which includes a much more significant component of technical progress - to a knowledge-based economy.

In conclusion, despite the many obstacles investors in the renewable energy sector may face, there is a basis for seeing a brighter future for the industry, especially in the long term. A mix of market consolidation and optimism may characterise the target year of 2030. The RES sector should emerge as a critical component of the long-term development of global economies.

Conclusions

The practice of project management in the RES industry in Polish conditions boils down only to managing individual projects, the managers of which are only responsible for adhering to the budget, schedule, reporting and final results planned to be achieved. This results from the need for existing links between the organisation's strategy and the implementation of RES projects and between the project management strategy and the adopted corporate management strategy. And yet the selection and management of the project itself, already at the planning stage, should be done following the planned strategy of the enterprise and in the form of a typical activity.

This means that the management of RES projects in the surveyed enterprises is carried out, bypassing the concept of project management, which, due to its characteristics, is ideally suited as a tool for project teams. Unfortunately, with a guarantee of applying this concept, it is possible to develop a standardisation of the project management process in the organisation, that is, to guarantee reproducible quality.

In turn, the selection of project team members, including the manager, also raises concerns - it should be done through the prism of their competence in close connection with the determination of the appropriate involvement, that is, roles and place in the structure of the company. The lack of such standards often leads to a situation in which the project team leader cannot efficiently manage more projects without prioritising individual projects and properly allocating strategic resources. This raises the question of how project teams can perform different tasks at different hierarchical levels in the organisational structure of the surveyed companies.

Besides, in the author's opinion, all enterprise employees should participate in the project / feel like they are participants. This will cause the disappearance of barriers to cooperation between them and the project team. This also applies to the top management, who must do more than participate in the project in emergencies.

Ultimately, it seems very important to cooperate with public institutions managing renewable energy sources in each country, which will result in uniform procedures.

In summary, considering the above conclusions of the survey, it is worth extending it to a larger group of companies that implement RES projects - this will undoubtedly reduce the very high convergence of opinions provided and expand the practical directions of change. This will allow us to thoroughly verify the assumptions

about the universality of the above conclusions and observations and to put into practice standards that will be helpful in the future.

References

- Aghdaie, M.H., Hashemkhani Zolfani, S., Cavallaro, F., Varzandeh, M.H.M., Derakhti, A., & Pamucar, D. (2020). Decision Making on Exigent Issues in Organisations: a Case Study on R&D Projects. *Transformations in Business & Economics*, Vol. 19, No 2 (50), pp.114-137.
- Boonstra, A., & Reezigt, C. (2023). A Complexity Framework for Project Management Strategies. *Project Management Journal*. <http://doi.org/10.1177/87569728221142229> Early Access JAN 2023
- Borgosz-Koczwara, M. & Herlender, K. (2018). Bezpieczeństwo energetyczne a rozwój odnawialnych źródeł energii (Power security and renewable energy sources). *Energetyka*, 3, 194-197. <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-article-BPS1-0031-0041>
- Bradley, K. (2012). *Podstawy metodyki Prince 2 (Basics of Prince 2 methodology)*. Warszawa (Polska): Centrum Rozwiązań Menadżerskich CRM.
- Calderon-Tellez, J.A., Bell, G., Herrera, M. M., & Sato, C. (2023). Project management and system dynamics modelling: Time to connect with innovation and sustainability. *Systems Research and Behavioral Science*, Early Access JAN 2023 <http://doi.org/10.1002/sres.2926>
- Energy Law 2006 - Ustawa z dnia 10 kwietnia 1997 r. (Dz.U. z 1997 r. nr 54, poz. 348) z późniejszymi zmianami (stan na dzień 23 czerwca 2006). <https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=wdu19970540348>
- Frąckiewicz, K. (2012). *Zarządzanie projektami informatycznymi. (IT project management)* Wrocław (Polska): Oficyna Wydawnicza Politechniki Wrocławskiej.
- Frame, J.D. (2011). *Zarządzanie projektami w organizacjach (Project management in organizations)*. Warszawa (Polska): WIG.
- Hymon (2022) <https://hymon.pl/co-to-jest-oze-jakie-sa-rodzaje-zrodel-energii-odnawialnej/>
- Ignarska, M. (2013). Odnawialne źródła energii w Polsce (Renewable energy sources in Poland), *Poliarchia*, 1, 57-72. <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-438f04e3-644b-41ec-8887-7ca92807982c>
- Jones, R. (2017). *Zarządzanie projektami. Sztuka przetrwania (Project Management. The art of survival)*. Warszawa (Polska): MT Biznes.
- Kerzner, H. (2005). *Zarządzanie projektami (Project management)*. Gliwice (Polska). Helion.
- Maestre, V.M., Ortiz, A., & Ortiz, I. (2021). Challenges and prospects of renewable hydrogen-based strategies for full decarbonisation of stationary power applications. *Renewable & Sustainable Energy Reviews*, 152, Article Number 111628 <http://doi.org/10.1016/j.rser.2021.111628>
- Mancerova, T.F., & Tuyet, N.A. (2022). Structure and Organization of Regional Renewable Energy Cluster in Vietnam. *Science & Technique*, 21(1), 82-88 <http://doi.org/10.21122/2227-1031-2022-21-1-82-88>
- Marek, R. (2010). *Zarządzanie projektem logistycznym. Wybrane zagadnienia (Logistics Project Management. Selected issues)*. Gdynia (Polska): Akademia Morska w Gdyni.
- Martini, E. (2015). *Dotacja i co dalej? (The grant and what comes next)*. Warszawa (Polska): Twigger.
- Mirowski, T. (2016). Odnawialne źródła energii do wytwarzania energii elektrycznej (Renewable energy sources for electricity generation), *Polityka energetyczna*, 9, 597-610. <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-article-BPB2-0029-0029>
- Młynarski, T. (2019). Unia Europejska w procesie transformacji energetycznej (The European Union in the process of energy transition). *Krakowskie Studia Międzynarodowe*, 16(1), 1-44. <https://repozytorium.ka.edu.pl/handle/11315/27080>

Othman, K., & Khallaf, R. (2022). Identification of the Barriers and Key Success Factors for Renewable Energy Public-Private Partnership Projects: A Continental Analysis. *Buildings*, 12(10). Article Number1511 <http://doi.org/10.3390/buildings12101511>

Pawlak, M. (2017). *Zarządzanie projektami (Project management)*. Warszawa (Polska): PWN.

Project Management Institute <https://www.pmi.org/learning/thought-leadership/megatrends>

Quinn, R. (2017). *Profesjonalne zarządzanie (Professional management)*. Warszawa (Polska): PWE.

Rodin, V., & Moser, S. (2021). The perfect match? 100 reasons why energy cooperation is not realised in industrial parks. *Energy Research & Social Science*, 74, Article Number 101964 <http://doi.org/10.1016/j.erss.2021.101964>

Shava, E., & Vyas-Doorgapersad, S. (2023). Inclusive participation in information and communication technologies (ICTs) processes for smart services in the city of Johannesburg, *Insights into Regional Development*, 5(1), 26-40. [https://doi.org/10.9770/IRD.2023.5.1\(2\)](https://doi.org/10.9770/IRD.2023.5.1(2))

Soderberg, E., & Liff, R. (2023). Reframing practice through policy implementation projects in different knowledge contexts. *International Journal of Project Management*, 41(2), Article Number 102452 <http://doi.org/10.1016/j.ijproman.2023.102452>

Tomaszewski, K. (2020). Odnawialne źródła energii w Polsce – perspektywa lokalna i regionalna (Renewable energy sources in Poland - local and regional perspective). *Rynek Energii*, Nr 4(149), <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element/baztech-91fd6274-ff29-46f2-a389-1d49b8e7ad42>

Yuksel, I. (2018). The South-Eastern Anatolia Project Factor on Water Management And Energy Demand In Turkey. *Fresenius Environmental Bulletin*, 27(1), 246-253

Vasquez-Ordonez, L.R., Lassala, C., Ulrich, K., & Ribeiro-Navarrete, S. (2022). Crowdlending for renewable energy projects: key factors to improve performance. *Academia-Revista Latinoamericana De Administracion*, 35(2), 223-238. <http://doi.org/10.1108/ARLA-07-2021-0135>

What is a renewable energy source? What are the types of renewable energy sources? (2022) <https://hymon.pl/co-to-jest-oze-jakie-sa-rodzaje-zrodel-energii-odnawialnej/>

Witzel, M. (2013). *Pięćdziesiąt kluczowych postaci w zarządzaniu. (Fifty key figures in management)*. Londyn (Anglia): Routledge.

Wysocki, R.K. (20015). *Efektywne zarządzanie projektami (Effective project management)*. Gliwice (Polska): Helion.

Zimny, J. (2014). *Odnawialne źródła energii w budownictwie niskoenergetycznym (Renewable energy sources in low-energy construction)*. Kraków: (Polska). Polska Geotermalna Asocjacja.

Data Availability Statement: More information and data can be obtained from the author on a reasonable request.

Mchał IGIELSKI Ph.D., Gdynia, Maritime University. Research interests: human resources management, entrepreneurship, competitiveness

ORCID ID: <https://orcid.org/0000-0003-4680-3733>

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810

