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Management of eco-innovative projects based on example of a selected commune

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ABSTRACT

Promotion and contribution to innovative activity, including eco-innovations is one of the main objectives of the European Union (EU). An example of such actions may be certain investments in photovoltaic installations in particular communes.

***Keywords*:** eco-innovations, investment projects, commune

1. INTRODUCTION

Progress of civilization brings an increase in energy consumption. It is supported by improvement of methods for converting energy into electricity, thermal and mechanical energy. Conversion of energy from the technologies that are employed currently causes significant problems, which include exhaustion of conventional fuels supply, and a considerable increase in environmental pollution, what results in, among other, acid rains, smog, greenhouse effect or the hole in the ozone layer. It leads to changes in organizational management systems. One direction of these changes is to attract attention to the ecological context of management by shaping ecological awareness and introduction of the sustainable development concept into operation of today's enterprises.

In this case, it will be necessary to employ ecological innovations, which will not only improve the economy, but also exert some positive influence on the surrounding environment. The table below lists arguments, which prove the advantages from application of such innovations.

Table 1. Arguments for eco-innovations.

Argument	Characteristics
Less pollution and waste:	effectiveness reduces pollution. Pollution is simply useful resources in a wrong place and time.
Improved life quality:	eco-innovation technologies not only reduce consumption of resources, but they always improve the quality of brought advantages.
Social responsibility and jobs:	increased share of "human capital" in the economy, and decreased utilization of resources, enabling to avoid unemployment.
Competitiveness:	thanks to new and better technologies employed in processes and products.
Market attractiveness and advantages for business:	effective products and processes will be launched on the market easily, as they are cost-effective, and they do not need any legal regulations to be issued by the government. Better public image is beneficial for business.
Profitability:	from the financing point of view, savings in the scope of resources, resulting from reduced consumption of resources and energy are more attractive than purchase and utilization of resources.
Lower risk:	caused by management, storage and treatment of toxic waste at and outside the place of their generation, and improvement in conditions for workers and consumers, in terms of health and security.
Effective utilization of a limited developmental capital:	for development of an innovative infrastructure. Production facilities for energy-efficient light bulbs can be purchased instead of new power plants.
International security:	competitive fight for limited resources can intensify international conflicts. Actions for effectiveness can prevent development of such tensions.

Source: Kozłowski S: Przyszłość ekorozwoju. Wydawnictwo KUL, Lublin, 2007, p. 317.

As presented in the table above, the eco-innovations result in an increase in effectiveness for resources and energy utilization. It means that the same goods and services can be obtained with a reduced amount of materials.

Promotion and contribution to innovative activity, including eco-innovations is one of the main objectives of the European Union (EU). Toady's task for the EU member states is to

introduce preventive measures, which will cover both energy saving and replacement of its traditional carriers with such solutions that do not cause strong degradation of the environment. EU set an objective to be reached by 2010, assuming that the share of renewable energy sources in the total energy balance of the EU member states would grow to 12% gross, and and in the electricity to 22.1%. It have also been assumed that 2050 will be a breakthrough year, when the electricity consumption will not only be minimized, but it will be obtained completely from renewable energy sources. According to the objectives set by the European Community, also in Poland share of renewable energy in electricity production is increasing year by year, what is presented in the table below.

Table 2. Share of renewable energy in electricity production in Poland.

Years	Share in %
2010	6.9
2011	8.0
2012	10.4
2013	10.4
2014	12.5

Source: own work on the basis of Local Data Bank: https://bdl.stat.gov.pl/

Keeping in mind the increase in share of the renewable energy in electricity production in Poland, presented in the table, it can be noticed that it becomes increasingly more common, widening the circles of interested entities.

2. PHOTOVOLTAIC INSTALLATIONS AS AN EXAMPLE OF ECO-INNOVATIONS

The most environmentally-friendly type of energy is direct sunlight. It reaches the Earth in two forms: visible radiation (light), which is applied in photovoltaic devices, and infrared radiation (heat), which is acquired by a specially constructed absorber. Devices for sun energy transformation can be applied widely in Poland if only technological development of such resources is accompanied by a drop in prices. While observing last 30 years, it can be noticed that the photovoltaic industry is developing intensively, and the annual growth rate reached 34%. Photovoltaics, similarly to wind energy, is the most dynamically developing technology for conversion of energy coming from renewable sources. A greater increase of interest in photovoltaic installations within the global economy is caused among others by the fact that they directly transform sunlight into electricity, with no noise, pollution and other factors, which exert negative changes in the environment. It is also significant that the cost of photovoltaic modules and cells remains on a constant decrease. Plenty of countries realized policy supporting development of the renewable energy sources, at the same time promoting

programs that are devoted to photovoltaics. This results in much greater cost-effectiveness of the investment in this field.

The devices that carry out this direct transformation of sun radiation energy into electricity are called photovoltaic cells. Also a name photocells or PV cells can be encountered, and when it comes to a colloquial language, they are called solar batteries. The photovoltaic effect, i.e. transformation of electromagnetic radiation into direct current electricity was discovered and described in the first half of 19th century. With the flow of time, the photovoltaic cells have improved, their prices have dropped and they have become more common. Photovoltaic cells are utilized in numerous aspects of human life and their business activity. They belong to basic sources that power space crafts, and when it comes to the Earth, they can be utilized e.g. to power watches and calculators, devices located in inaccessible territories or within areas without any energetic infrastructure (radio and telephone transformer stations, automatic meteorological stations, alarm spots on highways). The photovoltaic modules have been recently applied increasingly more often in powering commercial and residential buildings as well as large urban agglomerations. They are called solar roofs or solar facades. The principle of operation of such installation is demonstrated in Fig. 1:

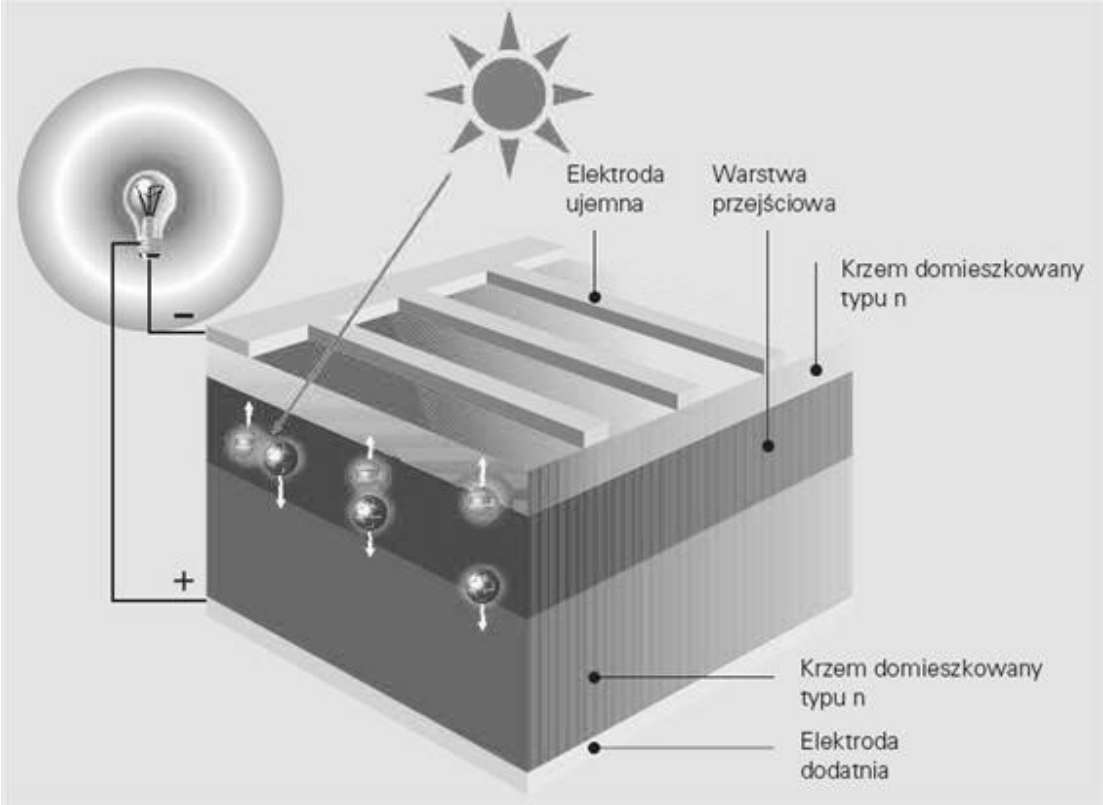

Fig. 1. Operation principle of a photovoltaic installation
Source: Viessman Climate of innovation: *Seria fachowa- Fotowoltaika*. Viessman Wrocław 2013, p.7.

When sunlight drops on the photovoltaic modules, the solar cells release electrons. Positive or negative charge carrier are accumulated at the electric connections, triggering

production of direct voltage between the front and back side of the cell. This effect arises without any chemical or mechanical reactions, which is why the system elements do not wear off or need maintenance. Direct current generated by the photovoltaic generator is transformed by the inverter, i.e. the device for powering the grid, in active current conforming with the grid's specification. Application of such solar batteries have been developing quite dynamically, and they are specified as the most environmentally-friendly solution of solar energy transformation.

3. MANAGEMENT OF INVESTMENT PROJECTS BASED ON EXAMPLE OF PHOTOVOLTAIC INSTALLATIONS INTRODUCTION IN KAMIENNA GÓRA COMMUNE

The Kamienna Góra commune occupies the souther area of the Lower Silesian province. Its territory is surrounded by the city of Kamienna Góra, which however is not included in the commune, thus it constitutes a separate territorial unit - a municipality. Both the rural commune and the municipality of Kamienna Góra are included in the Kamienna Góra district.

There is a state border with the Czech Republic several kilometers to the south of Kamienna Góra. Attractiveness of the commune is governed by its advantageous location at the state route No 371, and planned express route S-3. Local industry is based mainly on processing and excavation of local mineral resources, among others dolomites, ceramic clays or amphibolites. The commune area hosts facilities characterized with significant economic potential, representing chemical and motor industry. In general, there are more than 500 economic entities operating within the commune.

Presence of areas that are interesting both in terms of climate and landscape is a stimulus for further development of the tourist base, and an incentive for pro-ecological actions, whose task is to protect the natural environment. Therefore, there are undertakings resulting from the spatial development plan, which cover e.g. construction of a gas network, modernization of local boiler plants, extension of waste treatment facilities and water sewage systems[1]. One of the operational objectives of the Kamienna Góra commune is "improvement of natural environment quality".

The environmental resources pose a basis for human functioning, and influence the life quality, and pose a resource for the economy. Both the protection and improvement of the natural environment quality pose crucial aspects, which is why they are reflected in challenges and developmental objectives. Limitation of exhaust fumes emission and improvement of energetic effectiveness in Poland have become a challenge to be faced by Kamienna Góra. This effectiveness is significant not only for protection of valuable environmental and natural resources, but it also contributed to real savings. Therefore, the commune supports all actions intended to realize the ecological objectives.

The local government plans to undertake actions in terms of thermal modernization of public utility facilities, utilizing technologies of renewable energy sources. Furthermore, it also plans to support various energetic solutions, among others photovoltaic farms, which will be environmentally-friendly. The current program, which certainly corresponds to the

[1] http://www.gminakamiennagora.pl/19-lorem-ipsum.html - access 03.04.2016

operational objectives of the commune is called "Prosumer photovoltaic installations in the Kamienna Góra commune". This project is an undertaking of the commune, which consists in preparation of so-called "photovoltaic micro-installations" in private residential buildings, which will generate electricity from solar radiation. Two requirements must have been met in order to implement the project: there must have been submissions from at least 100 residential buildings from the commune territory, and the funds must have been obtained from the EU Regional Operational Programme for the Lower Silesian Commune 2014-2020.

The project can be participated by each resident of the Kamienna Góra commune, i.e. each natural person, who is an owner or co-owner of a residential building located within the territory of the Kamienna Góra rural commune. A conditions for participation in the project is utilization of the photovoltaic micro-installation only for the needs of the given household, followed by a regulated legal status of the real property and no financial arrears of the resident towards the commune.

The local government applied a series of resources in order to promote the project and encourage the residents to take part in it. There is a tab on the commune's website, devoted to photovoltaics, where detailed information together with terms and regulations of participation in the project are published. The promotion was also realized in the form of brochures, and a meeting for residents of Kamienna Góra, where a series of advantages flowing from participation in the programme were presented.

The first argument was visible contribution made by the residents in environmental protection, as photovoltaic installations save natural resources and reduce burden with harmful substances. Another argument was cost-effectiveness of the undertaking, consumption of energy for one's own needs, promotional programmes and EU funding. Furthermore, photovoltaic installations are designed to last for decades of exploitation, and thanks to a simple principle of operation they are highly reliable.

The last advantage is improvement of real property attractiveness, what is positively reflected in its value. Apart from presentation of all of those advantages, the residents were also demonstrated the course and manner of the project implementation during the meeting (Fig. 2).

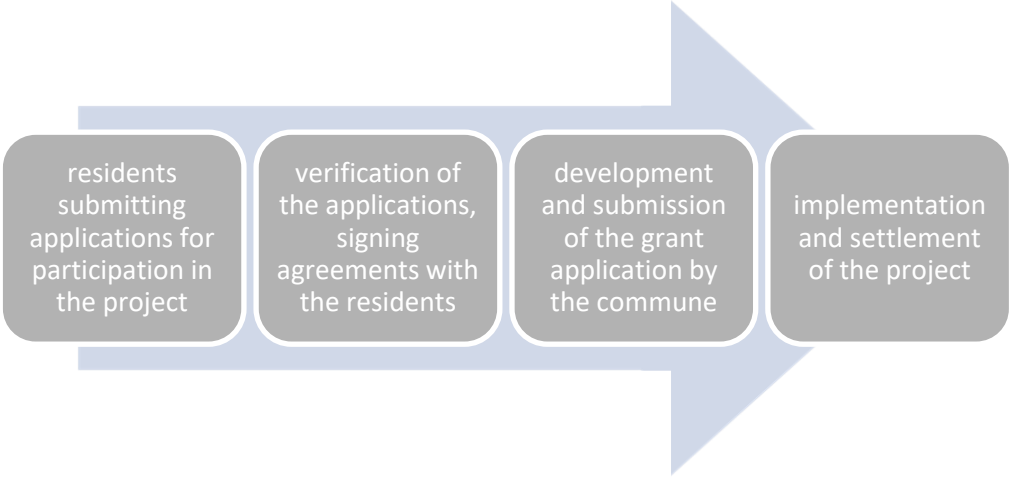

Fig. 2. Course and implementation of the project
Source: Own work on the basis of data provided by the Kamienna Góra commune

According to the above scheme, the course and implementation of the project is planned to take place at four main stages. the first stage, related to submission of applications by the residents, who are willing to take part in the project is already completed. 152 applications were submitted to the commune. It means that one requirement has been met. Another stage, which has started recently, is verification of submitted application and conclusion of agreements with the residents. This stage also comprises of audits in the residential buildings and development of individual functional and utility programmes. Afterwards, the commune needs to draw up and submit an application for funding the project from EU funds. The last stage covers implementation and settlement of the project, which is to take place before 2018. Each resident, who takes part in the project must cover a part of its costs. A cost estimate for a resident of Kamienna Góra participating in the undertaking i presented in Fig. 3.

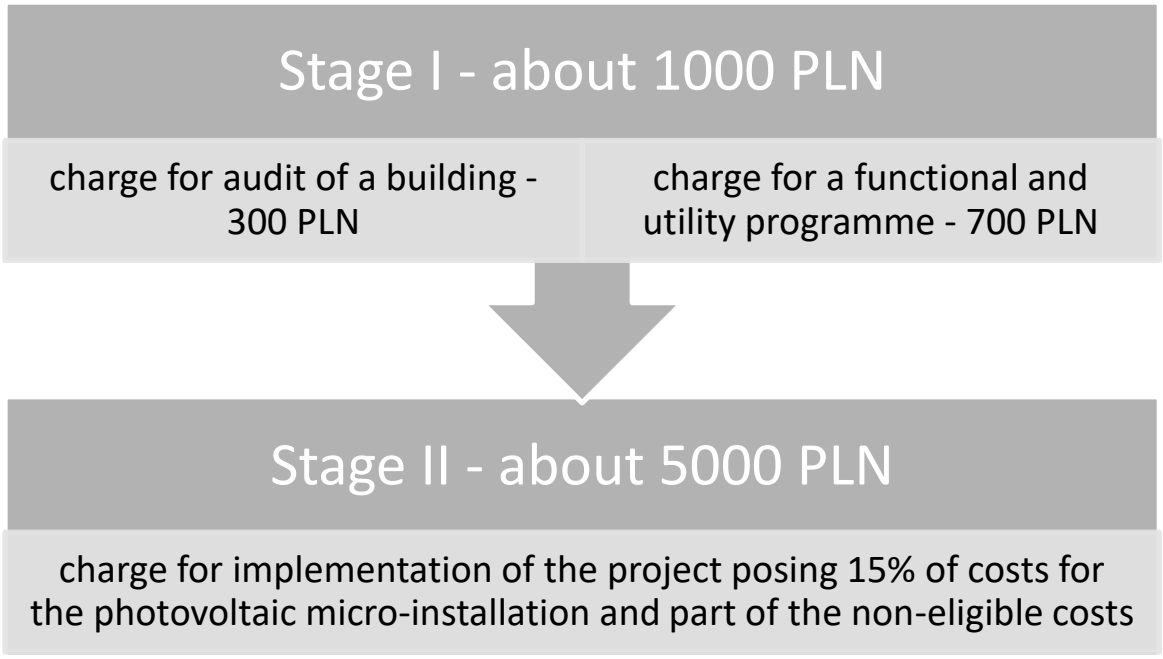

Fig. 3. Estimated costs for a project participant
Source: Own work on the basis of data provided by the Kamienna Góra commune

According to the above figure, the estimated total costs of the photovoltaic installation will reach about 6000 PLN per participant. The first stage is related to charges both for the building audit and preparation of the functional and utility programme. The second stage covers a fee for implementation of the projects, which is a part of costs for the photovoltaic-installation and non-eligible costs, related to technical and administration service and additional construction works.

The remaining costs, i.e. 85% of the costs for the photovoltaic installation would be covered from the EU fund. Of course this is just an estimation of financial resources as the final level of charges will depend on a series of conditions, e.g. power of a particular photovoltaic micro-installation, results of tendering procedures and bidding processes for preparation of necessary technical documentation and assembly of photovoltaic installations in the buildings, or the necessity to carry out additional construction works.

4. CONCLUSIONS

Actions undertaken by the commune in the scope of realization of investment tasks will allow to achieve the assumed objective, i.e. application of photovoltaic micro-installations to a broader extent. The investment project should include information on the planned investment, outlays necessary for its realization, sources of financing, criteria and methods of effectiveness and risk evaluation, investment process participants and results flowing from the investment.

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