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# THE ANALYSIS OF STRATEGY TYPES OF THE RENEWABLE ENERGY SECTOR

Adam Sulich[1,2], Adam Grudziński[2]

[1] Wroclaw University of Economics, Faculty of Management, Computer Science and Finance, ul. Komandorska 118/120, 53-345 Wroclaw, Poland
[2] Wroclaw University of Science and Technology, Faculty of Computer Science and Management, ul. Wybrzeże Wyspiańskiego 27, 50-370 Wroclaw, Poland

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## Abstract

Environmental goals can be essential for the realization of modern organization strategies, especially in the case of renewable energy sector company's development in Poland. The aim of this article is to discover different strategies formulated by Polish energy supply companies as a result of the green management. The tools to analyse this type of management and to indicate the common direction of undertaken activities are the SWOT analysis and the Hellwig's taxonometric method. These common points can be described by some factors which are related to the creation of green jobs and the reduction of environmental impact. This analytical study explains and describes possible strategies types, which were implemented in companies of studied sector. Therefore, multicriteria analysis of strategy measurement indicators method was used in this article. Performed analysis can open future research area to examine greening of other sectors.

Keywords: green management, the renewable energy sector, Hellwig's method, proecological strategy, green strategy, Polish companies, green jobs

## INTRODUCTION

Sustainable development covers the concept of needs, in particular needs of the world's poor, to which overriding priority should be given and the idea of limitation imposed by the state of the technology and social organizations on the environment's ability to meet present and future needs (Sulich, 2018). Sustainability is the ability to continue a defined behaviour for an unlimited or unspecified period of time what creates some concept of life quality (Brundlandt, 1987). Therefore, environmental sustainability is the ability to maintain rates of renewable resources harvest, pollution creation and non-renewable resource depletion that can be continued – in durability aspect. Secondly, economic sustainability is the ability to support a defined level of economic production indefinitely. Then the social sustainability is the ability of a social system, such as country, to function at defined level of social well-being. Nowadays, many publications concern the problems of sustainable development and sustainability in certain sectors of economy. Some of these sectors are more involved than ever in scientific discussion about development of so called "green economy" (Ryszawska, 2016). Then the energy sector, is especially involved because of renewable energy sources can influence prices not only energy but also all goods and services, and has an impact on social wellbeing. This new paradigm of development, the sustainable development, refers not only to the balance between social and economic aspects but also environmental dimension (Brundlandt, 1987). Although the idea of sustainable development is relatively new, it is a subject of scientific discussion since late 70s (Barbier, 2012; Ryszawska, 2016). However, the actions taken, since United Nations Conference

on Environment and Development in 1992, has not brought any measurable results (Olszak and Mach-Król, 2018; Ostasiewicz, 2015; Sulich and Zema, 2018). Disparities and inequalities became more visible due to socio-cultural dimension to treat the environment as source of goods and waste reservoir (Grudziński and Sulich, 2018a). Then ecological problems became social and then economic problems (Barbier, 2012; Finkbeiner *et al*., 2010), and global economy went through financial crisis in 2008 (Michalski, 2012). What is worse, economic growth is still considered through prism of natural resources exploitation (Finkbeiner *et al*., 2010). Additionally, progressive environmental degradation completely disrupts in social-economy-environment system (Dyllick and Hockerts, 2002) and leads to the environmental crisis.

The lack of results of sustainable development implementation possibly may be caused by the non-strategic approach. The main problem is to translate goals of sustainable development into language of management and processes to create a green management branch among economic sciences. So far, many strategies have been developed and described (Krupski, 2007). Some of them can be distinguished as strategies at the national level as well at the enterprise level (Grudziński and Sulich, 2018b). Furthermore, these strategic goals have to regard to all aspects of sustainable development. The objectives in corporate or national strategy are aimed to involve improvement of the environment or minimize an anthropopressure, and if so, it can be described as a green management. However, the development of single strategy itself does not bring results, the action is required (Grudziński and Sulich, 2018b). Then when measurement of strategy implementation process is not possible, it is not strategic management.

The most important in a strategic management is the implementation of the strategy. There are several tools to implement the strategy (also the green one). Many companies apply Balanced Scorecard to implement the sustainable strategy (Dyllick *et al*., 2001; Grudziński and Sulich, 2018b). Therefore, scientific research should be directed not to develop a strategy but to study its implementation qualitative and then quantitative.

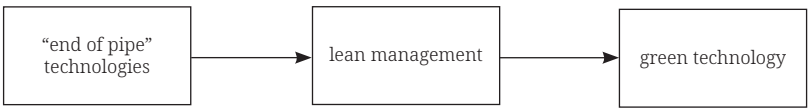
Renewables in Poland in 2017 contributed 15% of total electricity output in the country due to regulatory barriers. "Offshore wind and smaller capacity projects, which face potentially lower regulatory restrictions pose a potential upside to this outlook" (Fitch Solutions, 2018). Renewable energy suppliers belong can be seen as the green sector companies or Environmental Goods and Services Sector (Rutkowska-Podołowska *et al*., 2016). Although these companies belong to this part of economy, the question is: if they have a strategy related to sustainable development goals (Sustainable Development Solutions Network, 2014). Therefore, the aim of this article is to discover different strategies formulated by Polish energy supply companies as a result of the green management both by qualitative and quantitative research.

## The Green Strategies Development

The implementation of the green strategies has begun in the previous century and it was a part of a technological progress, which has provided a new eco-friendly solutions (Rogall, 2009). This shift also forced companies to leave the so called the brown economy (Ryszawska, 2016), and to support change towards green economy. Because a brown economy was based on usage of fossil fuels, which became main source of ecological, then social and finally economic problems. Therefore, some leaders learned, that enterprises harboured in old system have the worst impact on the environment. First technologies of the "end of pipe" were developed as the result of early strategies, then their development led to green technology (Fig. 1).

Primarily, the strategies of enterprises ware based on the reduction of pollution emission. For example, Texaco (a company from fuel sector), "invested three times the book value of the company in environmental compliance" (Hart *et al*., 1996). There are many reasons why firms want to leave this type of strategy. The most important of them is to increase process productivity (Rogall, 2009), because it is considered that pollution and waste are a sign of low process efficiency. This theory is based on total quality management philosophy, and had an impact on lean management strategies. Moreover, achievement of the green objectives requires the creation of the new, proecological organizational culture (Laloux, 2015). Therefore, implementation of the environmental policy should take place through a continuous improvement cycle (Gorczyca, 2011; Hamrol, 2007). Also, there is a change in organization management style (Laloux, 2014, 2015) which can be also reason that green organizations use the green technology strategy.

In the research by Hart (Hart *et al*., 1996) there is also an example of companies group from Standrad and Poor's, which in a short period of time (1–2 years), obtains a costly competitive advantage




1: *Strategy impact on technology improvement*
Source: Autors' own elaboration

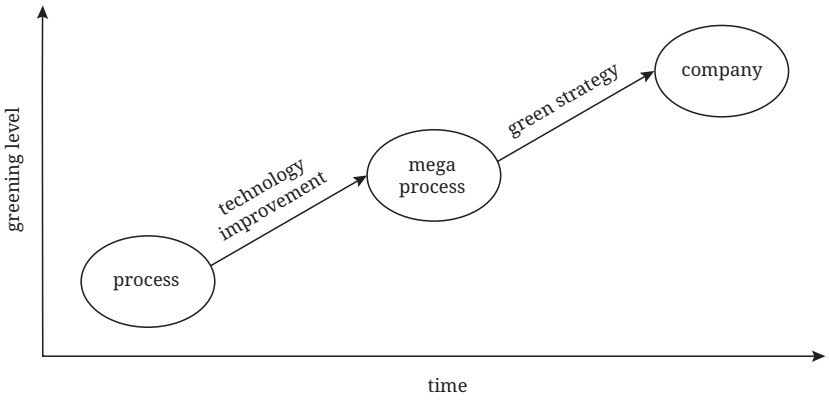
by reducing the emission of pollution. However, in this case, it is not possible to indicate a strategic approach. The strategy is much more than planning future activities (Hart *et al*., 1996). Since the 90s in the strategic planning, it has been possible to observe extending of the time horizons (Krupski, 2007). Therefore, modern enterprises should operate in a more system way. Reducing a pollution emission in not enough to obtain a competitive advantage in a wider range of time. Furthermore, strategic initiatives in firms should be taken in many wider areas. It needs to emphasize that reduction of pollution is still a key issue because it is associated with the reduction of anthropopressure (Demków and Sulich, 2017). However, from a financial perspective, the initial reduction of pollution yields the greatest results (Hart *et al*., 1996; Rutkowska *et al*., 2017). Though, when the degree of emission approaches zero pollution, capital expenditures grow in a significant way. It is associated with an ever-deeper change of the enterprise. Undoubtedly, technological or process changes require more financial expenses than material changes (Laloux, 2014; Rutkowska *et al*., 2017).

In addition to the reduction of pollution, it is also necessary that the result of the main business process (product of service) is environmentally friendly. What is more, it is essential from a systemic point of view. Therefore, the company should have not only clean processes but also clean products (Rutkowska *et al*., 2017). This include a progressive change (Fig. 2) from process greening towards a green and sustainable company (Laszlo, 2008).

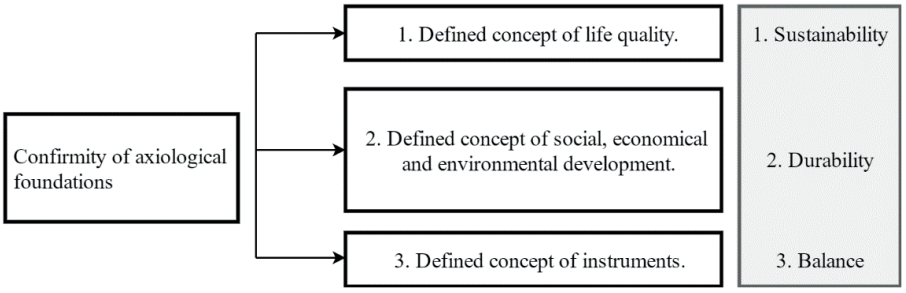
Complementing the green strategy should be the attitude of the whole company to sustainable development aimed on its sustainability, durability and balance (Fig. 3). It is possible to indicate some strategies due to method of achieving the balance between the natural environment and organization or business environment (Krupski, 2007). In this approach is visible the paradigm of organizational balance and sustainability of its development.

Henry Mintzberg described five definitions of strategy as: plan, pattern, position, ploy, perspective. These can be assigned to the group of strategies as: isolation, redundancy and adaptation.

Isolation strategy is based on minimalization of interactions between (business) environment and organisation. There is a significant decrease of number of interactions between surrounding, which simplify management in the organization (Kulhánek and Sulich, 2018). This strategy increases the stability of the organizational system. It is related also to the interaction of organization with the environment. Nowadays, it is hard to imagine a global isolation strategy. Locally, however, unreliable suppliers and bad creditors are isolated (Kuik *et al*., 2019). This type of strategy is related to the "end of pipe" technologies and strategies, and




2: *Stages of company greening towards sustainable organisation*
Source: Autors' own elaboration




3: *Three main streams of sustainable development*
Source: Sulich, 2017

an effort of companies to be in compliance with emission law regulations.

The redundancy strategy is based on maintaining an excess of various resources by the organization. These resources allow organizations to survive in discontinuities and avoid short-term adaptation. Thanks to the excess allowing to restore balance at the interface between the system and the environment, the system is able to function efficiently in a partially independent manner, both from the initial knowledge and the possibility of later obtaining reliable information about the environment (Krupski, 2007). This type of strategy is combined with the lean management strategy, which is an answer to the pressure of competitors, and step further than previous strategy based on compliance and isolation.

Another possible way to adjust external balance is the strategy of adaptation. Adaptation as a system category stands differently defined in the subject literature. The most popular system emerges from the adaptive system. It is a system capable of changing with changes in its environment and/or in its internal state, diminishing its effectiveness in pursuit of one or more goals defining its function, reacts or responds by changing its own state and/or the state of its surroundings, to increase its effectiveness because of this goal or goals. Thus, adaptability is the ability of the system to change or change its environment when it has changed, or the environment has changed to the detriment of the system and to change in this way to regain at least some of the lost effectiveness (Kulhánek and Sulich, 2018). Although there are different strategies towards the business environment, the strategy related to the natural environment should be based on the sustainable development and most possible greening of the organization.

Therefore, in this article, we consider the hypothesis that the common points of the green strategy of enterprises from the renewable energy sector are increasing financial efficiency and reduction of anthropopressure, based on the green technology.

## Development Conditions of the Renewable Energy Sector

The objects of research were Polish renewable energy sector companies which are branches of main energy suppliers in Poland. Following the renewables sector's restructuring and the consolidation of the Polish power market, four key vertically integrated players have emerged in the country: Polska Grupa Energetyczna (PGE), Tauron Polska Energia, Energa and ENEA, all of which hold stakes in Poland's renewable energy market (Gorczyca, 2011). The formulated problem was to research their eco-branches different strategies towards sustainability and support of transition to the green economy. The qualitative method was used and then quantitative research – the Hellwig method was implemented.

First step was to indicate the common points of the renewable energy sector companies' strategies based on the renewables' accessibility in Poland (Tab. I). The source of the data for this analysis were secondary data obtained from Fitch Solutions report (Fitch Solutions, 2018).

There are some strong trends which support a development of renewable energy sector in Poland such is fact that country is largest beneficiary of European Union capital and support which is also a negative aspect causing over reliance on this funding to "drive construction growth" (Fitch Solutions, 2018).

Although the climatic conditions support wind power plants, according to the data of the Energy Regulatory Office, at the end of 2018, 770 hydropower plants were in operation in Poland with a total capacity of 966 MW (Kowalczyk, 2012). Compared to 2017, there was an increase of nearly 15 MW. In Poland, water has been the dominant source of energy produced from renewable sources but the report prepared by Fitch Solution stress on non-hydro renewables industry (Fitch Solutions, 2018).

Presented in Tab. I analysis suggests that there is a huge possibility for the future development of the renewable sector in Poland in the upcoming years. "In policy documents, such as the *Poland's Energy Policy until 2030* and *the National Action Plan in the Field of Renewable Energy*, hydropower development is expected to be mainly based on the use of existing damming to produce electricity. The list drawn up by the National Water Management shows that in Poland there are over 14,000 damming structures (with a damming height above 0.7 m) owned by the State Treasury. The degree of utilization of these damming structures for hydropower is only 4.5%" (Kowalczyk, 2012). It is possible that capital groups which consist on companies which were examined on this study each has individual vertical integration strategy, and due to fact, they mostly belong to the Poland State Treasury, they participate in common projects and cooperate with each other. Furthermore, favourable legislative changes (prosumer energetics) make more and more households interested in renewable energy sources (e.g. photovoltaic panels). This creates a new customer segment for which must be develop a new strategy consider the new role of the client in the process (Zaleski, 2015).

Development conditions for the Polish renewable energy producers are complex, but the generally relay on external environment (opportunities and threats) than internal conditions for Poland. To combine this observation with described green strategies development, quantitative research was performed among Polish companies which belong to renewable energy sector.

I: *The SWOT analysis of the renewable energy sector in Poland*

| Strengths | Weaknesses |
|---|---|
| Climatic conditions favour wind power generation, particularly Polish offshore in the Baltic Sea;<br>Strong renewables growth over the past few years;<br>Renewables targets are in place, as Poland is a signatory of the UN Framework Convention on Climate Change;<br>A high number of skilled workers in the construction sector and growing number of green jobs;<br>There is quite a big space for the development of existing hydropower plants. | Poland remains heavily reliant on coal for electricity generation and has the EU's largest coal reserves, resulting in high carbon dioxide emissions;<br>The latest version of the 'RES Act' introduced a new bidding model, which places much higher demands on future projects in terms of efficiency and quality;<br>Over-reliance on EU funding to drive construction growth;<br>Regulatory instability was a pronounced trend in the Polish renewables market over the past few years;<br>There are only 770 water plants and more than 81% of the existing technical potential of water in Poland is left unused. |
| **Opportunities** | **Threats** |
| The Baltic Sea stands out as a possible high-yield region for wind-power generation;<br>The Polish renewable market is less saturated than other markets in Western Europe;<br>Poland is the largest beneficiary of EU capital and support for infrastructure investment;<br>Potential regulatory changes could revive the market;<br>Poland's new renewable energy law could provide at least some regulatory certainty;<br>Following Poland's accession to the EU, its construction industry has gained access to structural and cohesion funds;<br>Poland is committed to renewable energy targets - defined by its EU obligations - will see the country aiming to raise its share of renewables to 15% of energy production by 2020;<br>Poland could see increased development of small-scale household renewables technologies, which are supported by government. | Development of nuclear power, if approved could further limit Poland's renewables potential;<br>Considerable administrative barriers and unfavourable regulatory framework slow the development of renewables;<br>Wavering support for renewable energy and the uncertain regulatory environment has long been a key concern;<br>Ongoing deterioration in the relationship with the EU;<br>Various legislative restrictions on renewables development;<br>Reduction in domestic construction companies, combined with several European contractors leaving the market;<br>The government is unlikely to sanction any EU climate package that risks pushing domestic electricity prices higher;<br>Poland's coal industry will remain strategically important for the country's economy, which could lead to continued prioritisation of coal-fired generation over renewables. |

Source: (Fitch Solutions, 2018)

## MATERIALS AND METHODS

The Hellwig's method is a taxonometic method to indicate differences between examined objects which divide the into four groups (Grudziński and Sulich, 2018c; Kasztelan, 2016; Rutkowska *et al.*, 2017). This method allows a comparison between selected companies from renewable energy sector providing grounds for classifying them into uniform groups characterized by a similar level of particular indicators. The features are standardized according to the formula:

$$z_{ij} = \frac{x_{ij} - \overline{x_{ij}}}{s_j}, \tag{1}$$

where: $i$ – is object number, $j$ – feature number, $s$ – is standard deviation. Such transformed features are subject of calculations of taxonomic distances between the investigated factors values and reference model. This distance is calculated according to the formula:

$$d_i = \sum_{j=1}^{m} \left| z_{ij} - z_{0j} \right|. \tag{2}$$

Obtained $d_i$ values are used to compute Hellwig's synthetic measure of green economy impact as a result of implemented green strategy:

$$z_i = 1 - \frac{d_i}{d_0}. \tag{3}$$

The $z_i$ indicator assumes values within the range [0;1], whereas values closer to the model and are associated with high level of the investigated object. Obtained values $z_i$ were arranged in linear manner in four groups:

$$\text{I.} \quad z_i \geq \overline{z} + s_z, \tag{4}$$

$$\text{II.} \quad \overline{z} \leq z_i < \overline{z} + s_z, \tag{5}$$

$$\text{III.} \quad \overline{z} - s_z \leq z_i < \overline{z}, \tag{6}$$

$$\text{IV.} \quad z_i < \overline{z} - s_z. \tag{7}$$

where: $\overline{z}$ is arithmetic mean, $s_z$ – standard deviation. Then values of $z_i$ indicators were calculated and compared in Tab. II.

II: *Basic indicators for monitoring the implementation of energy policy in 2016*

| No. | The name of the indicator (x) | PGE | Tauron | Enea | Energa |
|---|---|---|---|---|---|
| 1 | Production of electric energy from renewable energy sources (TWh) | 2.30 | 1.30 | 0.54 | 1.25 |
| 2 | Number of clients (mln) | 5.17 | 5.47 | 2.50 | 3.00 |
| 3 | Share of total production of electric energy in Poland (%) | 33.00 | 25.00 | 13.00 | 15.00 |
| 4 | Renewable energy source installation power (MW) | 2189.00 | 459.00 | 443.00 | 1396.30 |
| 5 | Annual volume of $CO_2$ emissions (mln tons) | 15.00 | 13.90 | 12.37 | 2.68 |

Sources: Author's own elaboration based on companies' integrated reports

III: *Statistical analysis of chosen indicators for leading energy sector companies in Poland in 2016*

| | x1 | x2 | x3 | x4 | x5 | $z_i$ indicator value |
|---|---|---|---|---|---|---|
| PGE | 2.30 | 5.17 | 33.00 | 2188.972 | 15.00 | 1.00 |
| Tauron | 1.30 | 5.47 | 25.00 | 459.00 | 13.90 | 0.37 |
| Enea | 0.54 | 2.50 | 13.00 | 443.00 | 12.37 | 0.36 |
| Energa | 1.25 | 3.00 | 15.00 | 1396.25 | 2.68 | 0.71 |
| Module of average value | 1.34725 | 4.035 | 21.5 | 766.0833 | 10.98582 | - |
| Standard deviation | 0.724037 | 1.502764 | 9.291573 | 545.799 | 5.644265 | - |
| Coefficient of variation | 53.74188 | 37.24322 | 43.21662 | 71.24538 | 51.37775 | - |

Sources: Author's own elaboration based on companies' integrated reports presented by companies

Results of calculations and statistical analysis were presented in Tab. III, where variables from x1 to x5 are observed indicators.

## RESULTS AND DISCUSSION

According to the *Poland Renewables Report* there are two categories which allow assess the situation in this sector in years 2016 and 2017 (Fitch Solutions, 2018). These categories are total electricity generation and electricity generating capacity. Both of them are based on strong and weak aspects of the renewable energy sector development. Moreover, capacity indicators present possibility of the development of this sector based on hydro-powered and wind powered facilities which can generate much higher amounts of "green energy". Because of the uncertainty of these group there were excluded from the adopted Hellwig's method. In the Tab. II there are five important indicators based on the *Poland Renewables Report* related to the electricity generation years 2016 and 2017.

There are also important indicators in each of these categories as presented in Tab. IV. For the purpose of the research their dynamics are presented as a percentage change in year to year relation.

Results of final calculations for each energy supply companies in Poland were performed according to the Hellwig's method. The data from the capital groups which consist renewable energy branches were used to compare them with the synthetic calculated development value. In Tab. V final results are presented and suggest that there are some common points of strategies of between capital groups development, because none of company were classified as the worst.

IV: *Values of chosen indicators dynamics in measurement of renewable energy sector development in Poland*

| Indicator [GWh] | 2016 [% y/y] | 2017 [% y/y] |
|---|---|---|
| Total energy generation | 2.717 | 1.550 |
| Hydropower | 0.451 | 0.450 |
| Non-hydropower | 3.435 | 3.292 |
| Wind | 10.921 | 10.112 |
| Solar | 0.990 | 1.730 |
| Biomass and Waste | 5.200 | 4.900 |

Source: own elaboration based on (Fitch Solutions, 2018)

V: *Hellwig's method calculation results*

| Group | $z_i$ indicator values | Capital group name |
|---|---|---|
| IV | 1.00 | Polska Grupa Energetyczna (PGE) |
| III | 0.71 | Energa |
| II | 0.37 and 0.36 | Tauron, Enea |
| I | - | - |

Source: own calculations results

Multicriteria analysis based on renewable energy generation indicators (as in Tab. II) presented that energy sector branches' development is very similar. Although the subject of the research were renewable energy supply companies, it is

important to notice that they are branches of the bigger companies, which mainly rely on the coal and belong to the "brown economy" strategies of their prosperity.

Presented in the research results suggest that big energy suppliers are closed in the so called "middle development trap" and they are focused on isolation strategies. As capital groups these companies realise own internal vertical integration strategies. None of want to be a leader in the renewable technology, although their branches are dedicated to this issue. The branches creates therefore green jobs (Sulich and Zema, 2018). The reason of this situation is mostly politically motivated although there is existing infrastructure which renewable energy generation capacity is decreasing very fast (Fitch Solutions, 2018; Kowalczyk, 2012). Therefore, only partially we can confirm the proposed hypothesis in this article. Due to the large share of state capital in analysed companies only main trend direction in particular strategies it can be clearly distinguished. The activities under the strategies of the analysed companies are similar in the area of gradual transition to renewable energy sources (which reduces anthropopressure and increase financial efficiency). However, the use of these sources is too small, and there is no possibility to reveal an unambiguous strategic approach in this area

In the literature exists also different division based on corporate responses to environmental pressures (Grudziński and Sulich, 2018a; Simpson, 1991; Sulich and Rutkowska-Podołowska, 2017). The first group are the companies that have been forced to improve their environmental performance as a result of some well-publicized event or in result of some outstanding environmental accident acts as a catalyst and induces the company to take some action in the field (Loknath and Azzeem, 2017). The second group are the ones that have been able to exploit the opportunity created by the arrival of the green consumer to gain competitive advantage (Simpson, 1991). The third group include companies that have moved beyond compliance, and have incorporated their environmental strategy into their overall business strategy (Loknath and Azzeem, 2017; Simpson, 1991).

Similarly to the three element conceptual model of strategies there are describes also other four elements models of business categories (Roome, 1994). These four categories are: indifference, offensive, defensive and innovative. Indifferent companies are those that have low environmental risk and even less environmentally based opportunities for growth (Loknath and Azzeem, 2017; Roome, 1994). Offensive companies are those that have considerable potential for exploiting environmentally related market opportunities, and include companies that manufacture pollution control equipment etc. (Loknath and Azzeem, 2017; Roome, 1994; Simpson, 1991). Those adopting a defensive strategy are companies like the chemical companies, which gave high environmental risk and cannot afford to ignore environmental issues, or their very survival could be at stake (Krupski, 2007; Loknath and Azzeem, 2017). The innovators are those that have high environmental risk and also a lot of environmentally-based opportunities for growth (Loknath and Azzeem, 2017).

The single-minded pursuit of growth and scale can produce impressive top-line revenues and good impressions. However, executives can discover that, along the way, organizational issues – including siloed functions, redundant capabilities across business units, and gradual mission creep as functions take on added responsibilities – have impeded greater profitability. Lack of one fully planed strategy is visible, due to existence of only few common points coming out rather forced changes than planned actions in Polish renewable energy sector.

## CONCLUSION

Based on the qualitative analysis and quantitative results for Polish renewable energy sector companies in 2016, it is possible to name organisations' profiles according to their green strategy types. The first group are companies with isolation strategy type. Then are organisations which just response to the requirements of market and law. The third group take action to adapt to the changes in the business environment. Then are companies which prefer cooperation to gain their competitive advantage and act beyond expectations. This approach is difficult in Poland if the development of the renewable energy slowed down although there are natural conditions which support investment in this economy sector.

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Contact information

Adam Sulich: adam.sulich@ue.wroc.pl
Adam Grudziński: 228420@student.pwr.edu.pl