

Article

Strategic Analysis of Energy Security. Methodological Aspects of the Scenario Approach

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Abstract: This article presents the research results related to the methodology of threat analysis to implement in energy security. In the conducted studies, the world's output in scenario planning and the most famous cases of global security and technology scenarios were analysed. These projects were the Lisbon Group analysis, Shell's scenario planning concepts, and the US National Intelligence Council's long-term analysis. In this way, I demonstrated the limitations of a scenario-based view of the issues under study, resulting mainly from considering only one type of environment. The formulated conclusions made it possible to build the author's model of the strategic analysis process for the energy security sector. It goes beyond scenario analysis, complementing it with the sector, portfolio, and integrated analysis methods. The strategic analysis built in this way takes into account the achievements of many scientific disciplines, namely, technology, security, strategic management, foresight, international relations, and military. The multidisciplinary knowledge used to build the proposed concept will allow one to consider the increasing complexity of the global environment. Only such a scientific approach nowadays allows practical analysis and planning in the long term. Areas of special attention in strategic analysis, which constitute directions for developing research methodology, are indicated.



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1. Introduction

This paper proposes to draw attention to the need for a broader view of energy security. Accordingly, following Ross Ashby's assumption [1] that the answer to the increasing complexity of phenomena should be an equally complex applied approach, the achievements of various sciences and their methodologies have been drawn upon. This broader view was based on two key assumptions.

First, many countries have security sciences. They are not narrowly perceived as a safety but more broadly as security, hence their inclusion in the social sciences. Therefore, the achievements of these sciences cannot be ignored when considering the issue of energy security. Such disregard for the context of phenomena and processes in the political, economic, and social spheres locks system designers into a model that becomes detached from reality. Security is not only a quantitative and technical view based on calculating reliability, efficiency, and others. After all, the "feeling" of safety experienced by people and societies determines the amount of investment in a given safety-related technology, which directly determines its development. The sense of safety is difficult to examine and measure, but it can be considered in the analyses and shaped. That is what the security sciences do and what a strategic analysis of energy security should include.

Secondly, it is assumed that even engineers in charge of basic systems must take account of not only purely technical considerations but also management issues (when analysing and planning), which include not only quantitative models but also a qualitative approach (the stochastic subsystems of an organisation are made up of both people and the organisation's goals and values) [2]. Therefore, the possibility of using a threat forecasting

methodology based on the management achievements in the form of strategic analysis and security sciences in the form of studying cases of the best-known forecasts of global developments was assessed. The strategic analysis allows one to reach further into the future than forecasts, as it considers the environment more broadly using a logical process of qualitative inference from each distinct type of environment. Although strategic analysis is known mainly from management and international relations, its implementation in these two areas radically differs. The first case is a detailed methodology based on many methods and techniques of both quantitative and qualitative nature. Qualitative is mainly inference based on quantitative data. The strategic analysis methods are either applied singly or constitute an elaborate logical process. In the case of international relations, qualitative analysis is generally conducted descriptively. The concept of the Copenhagen School has been adopted as a valuable model of such strategic analysis of sectoral security [3]. Nonetheless, a significant part of such analysis is called “strategic” only because it relates to the problems of this level but does not stand out in any specific methodology [4]. The same is done in other areas of social life [5,6].

Under such methodological conditions, there appears the area of strategic analysis in security, which by the considered issues should be contained between management and international relations. The consideration of the energy security sector additionally forces one to focus on the technological aspect, which also directs one’s attention to technological foresight. Foresight is a proven methodology for the technological sphere and, more recently, the social one. However, it does not consider the importance of the political and economic spheres, as it does not use a methodology specific to those sciences. Therefore, attention is drawn to the validity of applying strategic analysis appropriate to political science and management. Besides, many similarities should be noted between foresight research and scenario planning (methods used), with foresight being of a consultative nature.

For the research conducted, a thesis about the limited usefulness of the scenario approach to the study of contemporary energy security was formulated due to two main reasons. The first one is related to focusing attention only on one type of environment, which already at the initial stage of the analyses limits the scope of the problems considered. It contradicts the basic principles in scenario planning of a balanced approach that avoids making judgments too early. The second reason is that energy security, considered broadly from a social science perspective, is one of the primary security sectors. In the scenario approach, the focus on the macro-environment comes at the expense of sectoral analysis, which requires a different scientific approach as it examines a different type of environment and, therefore, uses non-identical methods (sectoral methods). The logical consequence of such the formulated first thesis is the other one presuming that strategic analysis, preferably carried out following a process derived from strategic management, will be the most appropriate methodology for investigating threats and opportunities for energy security. An extended strategic analysis process covering all basic types of environments will reduce the limitations of scenario approach and foresight studies.

2. Materials and Methods

Several levels (contexts) of theoretical reference were adopted in connection with the attempt to take a multidisciplinary approach to anticipate energy security and propose a strategic analysis for this purpose. The theoretical framework proposes the inclusion of key security concepts in international relations. For the analyst and planner in energy security, the politician is the superior. It means that the scenario-building researcher must be able to function within each school. The proposed weighting towards constructivism and, within this approach, towards the Copenhagen School is due to two reasons. Firstly, it is the only concept that has proposed a methodology for strategic analysis and can therefore be referred to. Secondly, it is the only one to propose taking all sectors, including energy, equally seriously. Realism focuses on politics and military power, while liberalism on economics (market freedom, competition) and politics (freedom and human rights). Critical theories subordinate other security sectors to a particular idea.

At the intermediate level of theoretical deliberation, one of several schools of the strategy was selected because of studying long-termism. Strategy in security, political science, international relations, and management and business constitutes a research area related to thinking about the distant future. At that level, the evolutionary school well described in strategic management and, more recently, security has been advocated. It is positioned in opposition to the classical school of strategy. The choice of the school was based on the need to take account of the influence of multiple processes and actors. It had its methodological consequences in the form of the research methods used, namely, the literature and document review and case study.

The classical school of strategy, called planning or rational, is based on a formalised, disciplined, and detailed planning process [7,8], in which quantitative methods [9] are used, a stable environment is considered, and constant increments of indicators are made [10]. The result of a strategy shaped in this way is a structure [11] that, in the heyday of this school (the 1960s), was hierarchical, with a clearly defined most significant role for top management [12].

Foreshadowing of the coming changes to such strategic thinking could be seen in the economy in 1973, when a paradigm shift in strategic planning took place after the oil crisis [13,14]. The rational and quantitative basis of this model of thinking was fundamentally negated. The increasing complexity and dynamism of the global environment forced a change to an evolutionary approach, taking the influence of multiple forces and actors, resulting in a resultant strategy [15,16] and taking qualitative strategic research into account [17]. Centralisation from the classical model was primarily replaced by decentralisation. A similar process can be observed in security, albeit shifted by more than a decade due to the collapse of the bipolar world order in the late 1980s and early 1990s [18]. Consequently, the monolith of the classical concept of strategic planning had to be gradually crushed by deepening differentiation and divergence [19].

An essential feature of the evolutionary school is its descriptiveness, which means that its strength is in analysing the dynamic environment, while its weakness is in formulating proposals for a specific strategy. The scenario approach to analysing the environment (scenario analysis) is beneficial in explaining phenomena. Therefore, the case study, which is widespread in both management and international relations, is the characteristic research method for the evolutionary school of strategy.

2.1. The Scenario Approach—An Analysis of the Literature and Models

The scenario approach is one of several primary schools of strategy in management and security sciences. Strategic analysis is also based on the assumptions of that school, as the analysis of the macro-environment based on scenarios is original and still one of the most important. When considering scenario planning, one should note the more frequent reference to and comparison with strategic planning [20,21].

The emergence of systems thinking in the years of the Second World War and the early 1950s (operations research, game theory, quantitative planning) initiated the appearance of the scenario approach as a response to the shortcomings of the former and constituting its development [22]. Scenario planning was first applied (and developed) in the United States at the Rand Corporation as part of H. Kahn's research into options for future global conflict between the US and the USSR, and repeated was in the 1960s to study the consequences of the Vietnam War. In 1967, H. Kahn and A.J. Wiener published a classic of this trend: *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years*, the first ever-so bold scenario analysis with a scientific basis going back to the new century [23].

The first to use the term scenario about how to capture the future was H. Kahn, who distinguished forecasting from creating images of the future [22] (pp. 13–14). Then, a scenario was defined as a possessed or shaped and developed ability of “pluralism” and holism of thinking that opens the way for building multiple and possible concepts of the future based on the created plots, storyline, and guided narrative [24].

The scenario approach is primarily a proposal for an evolution in thinking which initiates people (analysts, planners, and decision makers) to ask questions instead of giving quick answers like in forecasting [13] (p. 4). It, in turn, builds a belief that although events may be unexpected, it does not mean that they are random [13] (p. 105). Such an attitude creates a “scenario culture” that embraces analysts and everyone in the organisation, including, or perhaps especially, its management. It represented a reorientation in many people’s minds towards understanding the complexity of the structure of the discussed phenomena and the uncertainty that accompanies investigating the environment and the future [13] (pp. 18–19).

Scenario planning is inherently accompanied by the conviction that it should be treated as a process of continuous learning and knowledge acquisition based, for example, on the model by D. Kolb [13] (pp. 37–38). The concept of continuous learning is based on grasping the future by using a map of connections and couplings between entities and phenomena. Without this ability, the idea of a scenario planning school cannot be mastered [20] (pp. 3–21) [14] (pp. 12–18, 141–157).

There are numerous characteristics and typologies of scenario planning schools, although the most widespread is that made by G. Ringland [22] (p. 15). T.J. Chermack distinguishes between the Royal Dutch/Shell and Global Business Network, the French school, the Futurist group, the Wilson and Ralston concept, and the Lindgren and Bandhold approach [25].

However, among the many concepts that have emerged in scenario planning, two have played a significant role. These are the GBN and SRI models [26]. The first was presented in P. Schwartz’s *The Art of the Long View* as developed and elaborated by the Global Business Network (GBN) [27]. It encapsulates the scenario planning process in eight distinct phases of the macro-environment study. P. Schwartz presented a detailed description of the scenario thinking model, in which an apparent influence can be seen in H. Kahn’s theoretical area and P. Wack’s functional area. In this model, one can notice the later characteristic assessments of critical forces for the macro-environment based on the STEPE (Society, Technology, Economics, Politics, Environment) typology [27] (pp. 100–108, 122–134).

In turn, the second model was developed by B. Ralston and I. Wilson at the Stanford Research Institute (SRI) and initially presented in 1975 at the annual meeting of the American Association for the Advancement of Science (AAAS) [24] (p. 3). It was extended from the GBN by taking a more remarkable account of micro-environmental and key decision-making factors in addition to macro-environmental forces, but without a separate methodology proposed [24] (pp. 39–177). According to that concept, three or four scenarios should be constructed based on considering key forces and factors in a situation of uncertainty. The identified scenarios must differ significantly from each other to describe the future multivariate environment. It positions them in opposing parts of the analysis area, giving it an amoeba-like shape. A point close to the edge of this shape is considered extreme, representing a completely different environment from the others [24] (pp. 122–124).

Further development of the scenario approach was to pay more attention to a different environment than the macro-environment. It required an equal consideration of two types of environments: the contextual environment and the closer environment, called transactional. In this case, the former environment consists of agents and actors called “arbiters” who set the boundaries and rules of our organisation. The response to this type of threat is to build the resilience systems so often referred to in National Intelligence Council (NIC) reports in the US [28]. The transactional environment is the part of the environment that influenced the organisation under study. Organisations’ strategies influence the transactional environment, although testing strategic concepts is performed on contextual environment scenarios [13] (pp. 4, 105, pp. 113–116). The environment is based on the OSPA (the Oxford Scenario Planning Approach) model addressed by A. Wilkinson and K. Heijden. The model considers the imperfections of scenario planning developed at the Shell Company, which allowed the interpretation of what happened on 11 September 2001

and the financial crisis in 2008. The model is based on critical constructivism [29]. It corresponds to the sectoral (energy as a sector) approach to security in security sciences. For that reason, it should be the starting point for building a process of strategic analysis of energy security.

Figure 1 shows how the OSPA model captures the environment.

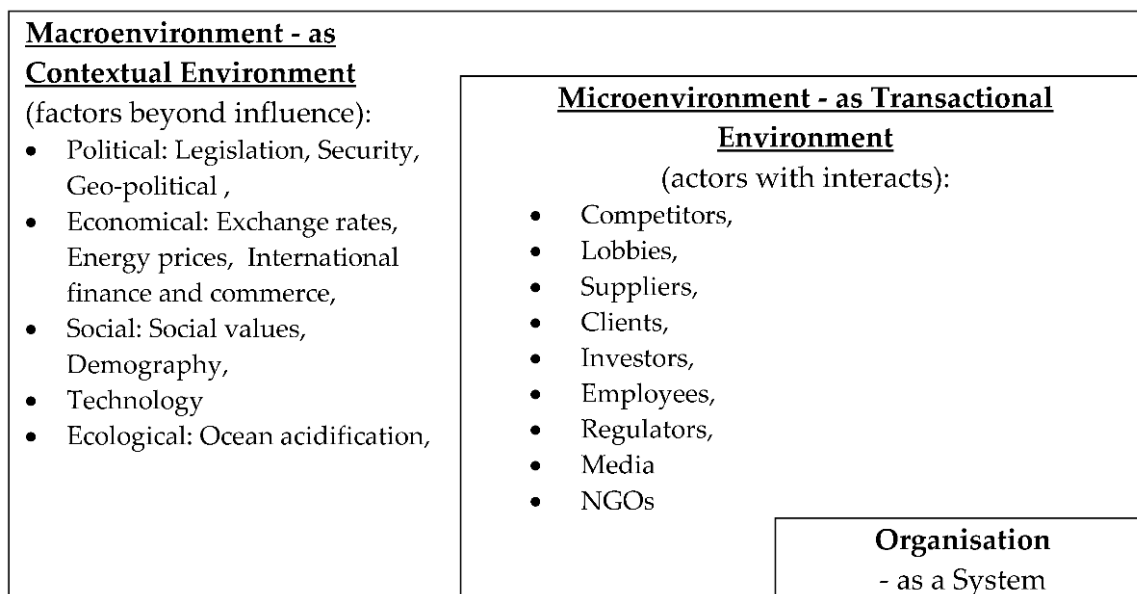


Figure 1. Analysis environments in the Oxford model (OSPM). Source: [29] (p. 12).

After identifying the main types of environments considered in the scenario approach, it is reasonable to analyse the methods used to study them. These methods result from both the type of scenarios used and the analyses that complement them, e.g., PEST, SWOT, and others.

The classic division of scenarios is based on the typology proposed over 40 years ago by C. Ducot and G. Lubben. When using a matrix, four basic types of the scenario were distinguished: descriptive, normative, exploratory, and anticipatory [30]. The authors of the Oxford model include some of the most significant contemporary methods of scenario building, which take into account critical trends and schools of thought [29] (pp. 146–149):

- The deductive method, in which the 2×2 matrix form of “driving forces” plays an important role;
- The inductive method, based on capturing “weak signals”;
- The abductive method as a balance between the inductive and deductive method. The balance was achieved by using both deductive elements of the environment structure and building several scenarios inductively;
- The normative method, based on a preferred, often imposed future, building a path to reach the assumed vision;
- The incremental method as an incremental view of the “official future”, changing the already cautious patterns of planning and studying the organisation’s future;
- Alternative futures based on the four social models of J.A. Dator [31]—stable social growth, social decline, conservative society, and transformational society;
- The Critical Scenarios Method, based on four levels of Causal Layered Analysis. According to Sohail Inayatullah, it involves making synchronised changes at all levels to create a new coherent future. The first level is quantitative trends (exaggerated and used for political purposes) as the official/public description of events. The next levels are social causes (including economic, cultural, political, and historical factors), discourse analysis, and the influence of metaphors and myths;

- The perspective-based approach is primarily the model for assessing integrated uncertainty by M.B.A van Asselt, J. Rotmans [32]. Uncertainty management and assessment integrating different approaches to uncertainty analysis are fundamental in this model.

Finally, nowadays, two distinctive approaches are most often identified among the very many scenario typologies: the deductive approach as a future backward coverage and the inductive approach as a future forward coverage [20] (pp. 19–20).

The deductive approach, being more structured, is more commonly used. It involves constructing at the outset a picture of scenarios arising from the juxtaposition of several end states and then fitting detailed data to this picture. Once the nature of each scenario has been determined, it is filled with content in the form of selected data held or just received. The process of completing the structure built at the beginning is based on two primary ways. The most common variation of deductive scenario building is a 2×2 matrix with two key structural variables (key trends or key drivers). In such a matrix, two extremely different values of two juxtaposed criteria generate four fields (types) of scenarios [13] (pp. 236–254). Figure 2 shows this way of building scenarios deductively for the global situation within the Global Trends project. The adoption of the area of economics and politics as determinants of the two criteria for scenario building is an excellent example resulting from the overarching liberal approach to security. The “Islands” scenario is based on assumed slow or no global economic growth, while “Orbits” is based on increased rivalry and competition between powers. The “Communities” scenario shows an increase in local governments and private actors

| | | | |
|---|---------------|--|----------------------------|
| | | Influence of the degree of competition between great powers on the stability of states and regions | |
| | | Insignificant | Significant |
| The impact of the restructuring of the global economy on the economic slowdown | Significant | Scenario ISLANDS | Scenario ? |
| | Insignificant | Scenario COMMUNITIES | Scenario ORBITS |

Figure 2. Scenario matrix. Source: [28] (pp. 46–61).

The second most popular deductive scenario building technique is to isolate a limited number of events that will significantly impact the future. It is an “event tree”, similar to a decision tree. By asking questions and providing answers, four outcomes are produced in the form of scenarios. The exemplary application of this technique in “The Mont Fleur Scenarios” is shown in Figure 3. It concerns a broad political consultation concerning the future in the form of an attempt to answer the question, “What will South Africa be like in the year 2002?” The project involved a specially selected diverse group of 22 prominent politicians, academics, businesspeople, and social activists representing different political and social views. Dozens were developed and eventually reduced to a few scenarios describing what might have happened in the country over ten years (1992–2002). The four scenarios finally constructed involved four questions and agreed answers. The following problems were considered [13,33]:

- If no agreement was reached, the scenario was called the “Ostrich”;
- If the transition got bogged down, the scenario was called “Lame Duck”;
- If the policies were populist, the “Icarus” scenario showed the quick development followed by the collapse;
- If all these hurdles could be taken, the future would develop in the “Flight of the Flamingos”.

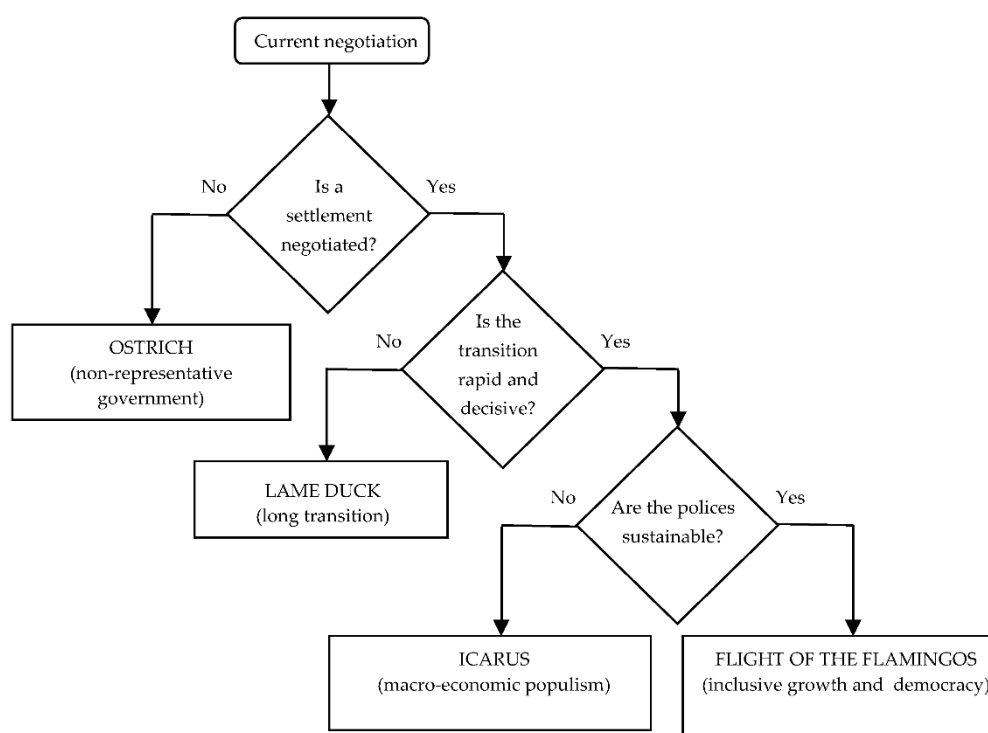


Figure 3. Mont Fleur Scenario structure. Source: [13] (p. 244).

Scenarios built using the inductive method consist of arranging data sequentially so that the scenario structure emerges independently. In this process, events occur first, and a logical structure emerges from their chronological linking. When further progress is considered no longer possible, the resulting scenario structure is given a name. K. Heijden warns against the temptation to evaluate such scenarios into bad and good (optimistic and pessimistic), because it may suggest at this stage to focus on one of them. It, in turn, violates the recognition of all scenarios in some way as equally likely [13] (pp. 237–239).

The inductive method is most often implemented in two ways: simplified brainstorming and an “official future” technique. The latter technique seems very useful from a practical point of view. It allows the management to be involved, making it possible to change the cautious planning patterns of planning x that already exist in the organisation [25] (p. 129).

The scenario planning methods and techniques presented focus on the macro-environment. However, it is increasingly common to see attempts to go beyond the analysis of just this type of environment [26] (pp. 55–84). In this case, the other methods of strategic analysis are added. The simplest development of the scenario method is the additional assessment of already built concepts of macro-environment. For example, a categorisation of the actors and stakeholders in the project under consideration is carried out [13] (p. 262). It is shown in Figure 4.

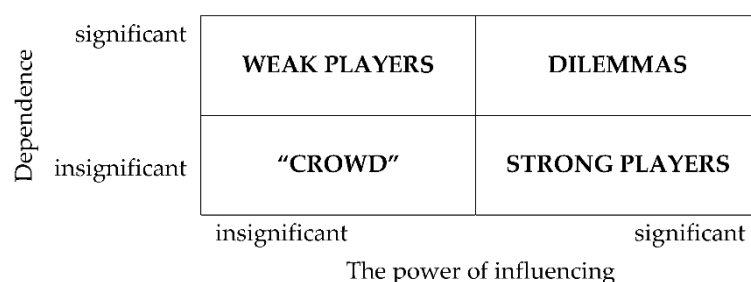


Figure 4. The actor–stakeholder matrix. Source: [13] (p. 262).

The presented matrix is already an example of a variation of stakeholder analysis, which is essentially concerned with studying the micro-environment [34].

In recent years, scenario planning has been increasingly extended to include new methods similar to foresight projects. However, even if the number of new methods is growing, the focus is still on the macro-environment and less on stakeholders and a reduced organisation's assessment [26] (pp. 55–84). The concept promoted by T.J. Chermack's scenario research is conducted as an external analysis and an internal analysis. The external one is based on STEEP, De Bono Hats, SWOT analysis, and forecast support, which is treated with some distance. In contrast, the internal one is based on SWOT analysis, interviews with experts, questionnaire surveys, observations, and desk research [25] (pp. 101–125).

The most extensive scenario planning methodologies include M. Godet's proposals based on analysing the structure (Micmac method), actors (Mactor method), morphology, and expert interviews. This concept is characterised by a thorough analysis of the complex network of stakeholder relationships. According to M. Godet, the process of scenario planning implementation can be put in the form of sequentially applied methods and activities or techniques, which makes it similar to strategic analysis [34] (pp. 120–129, 263–270). It is presented in Table 1.

Table 1. The scenario method according to M. Godet. Source: [34] (p. 122).

| Stage | Method | Activities |
|--------------------------------|---------------------------------|---|
| Prospective workshops | Strategic Prospective workshops | <ul style="list-style-type: none"> • The problem formulated • The system examined |
| Structural Analysis | Micmac | <ul style="list-style-type: none"> • Search for key variables • Retrospective • Trends • Key actors |
| Analysis of actor's strategies | Mactor | <ul style="list-style-type: none"> • Strategic stakes and objective • Actor's position • Balance of power |
| Morphological analysis | Morphol | <ul style="list-style-type: none"> • Scanning the field of possible • Preferences or exclusions • Selection criteria |
| Expert inquiries | Smic-Prob-Expert | <ul style="list-style-type: none"> • Key questions for the future • Probabilised sets of hypotheses |
| Building Scenarios | Scenarios | <ul style="list-style-type: none"> • Paths • Images • Forecast |

In scenario planning, as in foresight, Delphi studies play an important role. Most often, they occur as an auxiliary method to scenario analysis. As a process of seeking a consensus of experts' opinions on events that may occur in the future, it cannot be useful for forecasting complex processes such as those considered by scenarios. Delphi uses the "two heads better than one" principle. It allows one to gather opinions from specially selected experts on problems on which knowledge is not available. It is done through formalised questionnaires that ensure anonymity to other experts. Feedback is used to revise the version of the questionnaire sent in the next round. The opinion commonality ends the cycle of repeated rounds [35].

In scenarios, it seems crucial to build a narrative by "describing hypothetical developments constructed to attract attention" based on a "step-by-step" description of the occurrence of a certain vision of the future. However, some authors exclude the Delphi method from scenario planning and assign it to forecasting [22] (pp. 33–35).

2.2. Advantages and Disadvantages of the Scenario Approach—Case Study

In this more than 50-year history of scenario planning, a considerable collection of cases can be included for analysis—from the Rand Corporation, but also at the Stanford Research Institute, Royal Dutch Shell during the 1973 Fuel Crisis, with the drawing of the “Limits to Growth” by the Club of Rome [22] (pp. 15–16). The development of scenario planning went from the security sphere, through the economic sphere (Shell, McKinsey, Global Business Network) to the area of social projects (social consequences of the Vietnam War), regional and national in Norway, Canada, Finland, Guatemala, Scotland, and South Africa [22] (pp. 117–118). The Global Trends scenario analyses carried out around the world by NIC are interesting cases [28].

Among the many such scenario analysis and planning events, the most famous have been selected. In the energy sector, it is probably the situation of the fuel crisis in the 1970s and the wave of environmental problems in the same sector in the following decades of the 20th century. Two cases were also selected for the consideration of security and development issues, where the energy sector plays one of the most important roles—the Lisbon Group and the American NIC.

2.2.1. Case Study 1973. What Is Wrong with Shell Scenario Oil Planning?

Advantages

One of the most studied classic examples of scenario planning is Royal Dutch Shell (Shell) in the late 1960s and early 1970s. It is an important case because it concerns the energy sector—the fuel segment. The analysis of the applied model is based on evaluating its effectiveness during the biggest fuel crisis to date in 1973 and its usefulness in the following decades of the 20th century.

The source of the success of this method should be sought in the transfer of “good practices” based on sound science in this area from the Rand Corporation to Shell. The sources of knowledge about the model are mainly P. Wack, Heijden, A. Wilkinson, and T.J. Chermack’s studies. The approach in the Shell Company to scenario planning was to build scenarios without their probability gradation and evaluation into bad and good. The scenarios provided a model of the environment in which different project options were tested. These were not purely macro-environmental scenarios, as some of them regarded natural forces and processes in the economic, resource, and international trade spheres. In effect of such a simulation, the project that best met the basic scenarios’ conditions was the variant recommended to the management. At the request of P. Wack, following the example of scenarios carried out at the Rand Corporation, factors resulting from human decisions were taken into account, including the behaviour of actors, i.e., political actors. It allowed the construction of six scenarios, the first of which assumed the impact of politicians’ decisions on oil prices. Following that scenario, oil-producing countries refused to further increase production beyond a certain level [13] (pp. 5–6). If one were to take the probability criterion, it would be the least likely scenario at the time. However, the Yom Kippur War outbreak in autumn 1973 resulted in processes and decisions by Arab countries that fit precisely into that scenario. Consequently, changes discussed and tested much earlier involving most of the company began to be implemented. After such signals, it was the only corporation that avoided such a crisis by reducing investment in key activities. Other companies took too long to understand the situation and then adapted their activities. This delay cost the other companies a great deal and allowed Shell to distance itself from its rivals for many years. One of the Strategic Business Units (SBUs) involved in maritime transport was the only one in Shell that did not use scenarios. As a result, it did not manage to reduce its investment in the sector and joined the ranks of those affected by the crisis [13] (pp. 5–7).

Disadvantages

Shell’s planning team was constantly trying to modernise and develop its scenario planning methodology after the fuel crisis. It was to be manifested by the very serious

inclusion of environmental issues in the scenarios built in the late 1980s. One of the basic ones included environmental protection as a priority. It was accompanied by frequent discussion of this issue at briefings and meetings [13] (p. 8). Although scenarios were built and discussed that considered the impact of environmental factors, this did not avoid the Brent Spar decommissioning crisis [36]. Although Shell's responses were rational, based on science, with government support and in line with existing regulations, technological and environmental standards—they ended in failure and withdrawal. Shell, like some politicians, had to conform to the rules of conduct imposed by the media and Green Peace [36] (pp. 95–104). Scenario planning failed because it could not take advantage of the complex and irrational game and the not entirely green and safe solutions enforced by Green Peace. Evaluations of this situation point to the need to study through methods other than scenario planning another equally important environment—the micro-environment. The strengths of scenario planning relate to the study of the macro-environment. Outside it, it becomes of little use. More appropriate in this case would be the Stakeholders Analysis Approach, and other methods specific to the analysis of entities rather than trends.

2.2.2. Case Study 1995. What Is Wrong with Lisbon Scenarios?

When examining examples of scenario-based approaches, it was deemed appropriate to subject a project entitled *Competitive Frontiers* to such analysis. It was authored by the Lisbon Group, which aimed to develop new global social contracts [37]. That case was chosen for two reasons. The first one was related to the thesis that in a document with dominant economic features, other research methods, apart from scenario ones, related to competition analysis should be applied. Additionally, critical were the outlined time limits of those forecasts until 2020, which, as in the following case analysing *Global Trends*, made it possible to assess the accuracy and correctness of the methods used.

Based on the analysis of quantitative data concerning various spheres of human life, key future trends were identified in the *Competitive Frontiers*. They were created after regarding data such as global exports and production, capital flows, the growth in the number of strategic alliances, the distribution of strategic alliances in the field of technology, the impact of deregulation on GDP, the relationship of GDP with employment growth, export growth rates for individual countries, research and development costs, and the share of regional trade flows in world trade in industrial goods.

Ten basic assumptions about key trends were constructed [37] (pp. 77–83):

1. The world economy triadication—The domination of North America, western Europe and Southeast Asia;
2. A widening differentiation of population growth in its different parts;
3. The intensification of privatisation, deregulation and liberalisation of the economy in developed countries;
4. Deepening the division of the world into integrated countries and rejected countries;
5. The technical and organisational revolution;
6. The increasing degree of networking of the largest enterprises in the world;
7. The explosion of a new mass wave of unemployment;
8. Progressing the “greening” of industry forced by imposed restrictions on competitiveness;
9. The growing importance of urban regions in the globalisation of the economy;
10. The oscillation of public authorities between market economy and protectionism.

The identified assumptions in the form of trends were reduced to two criteria building a scenario matrix. The first criterion was the degree of complexity—from localism and fragmentation to globalisation and integration. The second one defined the nature of governance—from market-based to mixed, cooperative forms of economy. The matrix thus constructed allowed six scenarios to be distinguished, resulting from the different intensity of the parameters considered on the vertical and horizontal axes. Three scenarios leaned towards the logic of fragmentation and three towards the logic of integration [37] (pp. 80–83).

The apartheid scenario assumes that the most developed regions and countries will disconnect from the rest of the world that will face poverty, inadequate and outdated structures, and various types of local conflicts. The world will be organised within the competitive and economic wars of the Triad system, of which the national competitiveness system will be a critical element. Experts considered this scenario as a picture of the future with a low probability index. The survival scenario refers to a situation in which each company, city, region, country, or social group will defend and promote its comparative advantages and position. The technology race and technology wars will introduce a high degree of instability. The driving force will be a focus on one's survival, achieved by the failure of others. The scenario was already mainly in operation at the time of its development and was written with a high probability of further implementation. The *pax triadica* scenario results from achieving a state of equilibrium between the three most developed regions of the world, i.e., North America, western Europe and Japan, and the so-called "little dragons" of Southeast Asia. It assumes that the richer and more developed the Triad members are, and the more they cooperate, the greater the benefit for other countries and, at the same time, the stability of the world. There will be a reduction in the arms race and more significant mobilisation of scientific and technological potential for civilian purposes, although military spending will remain high. Some scenario elements have been in operation for a long time [37] (pp. 80–83).

The bearable scenario of an integrated global world assumes that global problems are so enormous that the only way to deal with them is to design new global rules and strategies and create such mechanisms, procedures, and institutions to enable effective global governance. However, the probability of such a scenario occurring is extremely low. The GATT scenario is based on a world economy operating under the rules of the General Agreement on Tariffs and Trade. It assumes the free movement of goods, services, capital, and people globally, which requires radical changes in many areas of international policy. Nonetheless, experts found the scenario unlikely. The scenario of a regionalised global economic system is based on two levels of integration. The first level comprises regions on continents, such as the European Union or the North American Free Trade Area (NAFTA), while the second level is global, based on cooperation between different integrated regional entities. According to the Lisbon Group, it is a very likely picture of the future [37] (pp. 84–88).

Disadvantages

The presented process of scenario building based on the consideration of key assumptions (trends) indicates the focus of attention only on the macro-environment. Nevertheless, the quantitative data available to the expert team would provide an excellent basis for research in the micro-environment, which seems more appropriate for analysing the title "competition". Although a deductive method of scenario building was adopted, key trends should be created in an inductive way, which can best be done using a micro-benchmark study. The competitiveness analysis has not benefited from the analysis of the competitive environment and the methods inherent in this environment, e.g., sectoral analysis. Moreover, the mechanisms of competition result mainly from the actions of the largest enterprises and their relations with state entities.

2.2.3. Case Study 2035. What Is Wrong with Global Trends 2035?

The choice to analyse the US intelligence community document *Global Trends. Paradox of Progress* [28] was made since it is no longer recent. A new version replaced it a few months ago, but only the analysis of the previous one allows the methodology used to be verified.

Advantages

The advantage of the completed project is the use of multiple methods. Based on historical analysis since 1945, issues, countries, and people were prioritised for interview. Then, a two-year study of key trends and uncertainties covered more than 35 countries

and interviewed more than 2500 people. Many meetings were held with hundreds of natural and social scientists, political and social leaders, religious leaders, diplomats, development experts, business and industry representatives, representatives of youth, civil society organisations, and the women's movement worldwide. An exciting solution to give the conducted undertakings the character of foresight projects was to consult the received research results and complement them with numerous opinions obtained through social media and future conferences and workshops [28] (p. 49, pp. 70–71).

In addition to the five-year regional analysis, the report analyses global key trends over several years. It is carried out according to the subject criterion resembling the PEST method, where spheres such as social (How People Live), technological (How People Create and Innovate), economic (How People Prosper), ideas and identity (How People Think), political (How People Govern), and security (How People Fight, Terrorism) are considered [28] (pp. 159–226). The above list of factors is essentially a STEP-type analysis implemented from a global perspective [17] (pp. 42–46).

In the scenario analysis, key trends that have a global impact and generate strategic paradoxes were extracted from the interviews. Analysing those regional trends in historical and global terms allowed the development of principles for the emergence of their dynamics. The assessment of the extracted trends was made from two time perspectives: a short-term five-year time frame (2016–2021) related to political tenure in the US, and a long-term one up to the eponymous year of 2035. These trends were assessed in terms of the changing nature of power, governance, management, and cooperation. It was intended to identify why and how global dynamics are becoming more complex and challenging to assess. Analytical simulations related to the key international actors' behaviour were therefore conducted. Their influence on the trends in the world's regions and globally in international relations, security, and the economy was thus examined. Assumptions regarding the complete absence of decisions or appropriate personal, political, and business decisions in the face of the conditions caused by these trends were formulated. Three scenarios of the distant future in a 20-year perspective were constructed on the ground of the selected and evaluated key trends: Island, Orbit, and Communities. Each scenario identifies decision points that can lead either to exploiting opportunities or succumbing to threats. Under such conditions, governments can adopt two strategies (to resist the trend—authoritarian countries; to delegate power to other actors—liberal countries) [28] (pp. 70–71). The matrix technique of scenario generation was not used [29] (p. 116) [13] (pp. 214–215). Separation using the criterion of levels (global, regional, and national relations) of the issue under consideration was used in the perspective of the next 20 years [28] (p. 47):

- Resulting from dynamics in individual countries. Thereby, the problem question is being formulated: How will governments and society renegotiate mutual expectations and create political order in an era of intensified change, marked by influential individuals and a rapidly changing economy? The answer is the “Island” scenario;
- Resulting from the dynamics of relations between countries. The problem question formulated here is: How will the great powers, together with selected groups and individuals, develop concepts of competition and cooperation? The answer is the “Orbit” scenario;
- Resulting from the complexity of global problems determined by long-term and short-term trade-offs. The problem question formulated here is: To what extent will states and other non-state actors prepare in the near term for complex global problems such as climate change and the development of disruptive technologies? The answer is the “Communities” scenario.

The overarching assumption is that none of the scenarios are pre-determined but only most accurately characterise the specific nature of the problems that decision makers will face in the coming years. It fits with the classic scenario assumptions built in Shell.

The “Island” scenario is based on a narrative led by an economist “recalling” the last 20 years since the global financial crisis in 2008. He lists several fundamental trends that

will affect the economic sphere. The last trend mentioned is puzzling, related to a global pandemic in 2023 [28] (pp. 50–52). The described effects of this phenomenon provide a very accurate forecast of the problems currently facing the global community during the COVID-19 pandemic: *The global pandemic of 2023 dramatically reduced global travel to contain the spread of the disease, contributing to the slowing of global trade and decreased productivity* [28] (p. 51).

The “Orbit” scenario is based on the memoirs of a National Security Advisor, who assesses the international environment at the end of the US President’s second term in 2032. An interesting theme explored in this future story is the first use of nuclear weapons in a conflict between India and Pakistan since 1945 resulting from a fight over access to water [28] (pp. 54–55).

The “Communities” scenario is based on the narrative of the mayor of a major Canadian city from the perspective of 2035, reflecting changes over the past two decades [28] (p. 58). It addresses the rise of sub-state and non-state actors, showing how rising public expectations open space for local government and private actors to act. The development of information technologies mainly dictates the changing conditions of governance [28] (p. XI, 61).

The methodology used is in line with the core tenets of the evolutionary school [13] (pp. 46–49) [29], as decisions on the choice of an adequate strategy for the scenario considered were left to the recipients—those governing, managing, commanding, and advising them. The report is, therefore, an analytical study, not a planning study. It does not propose a strategy but only presents scenarios understood as pictures of the future of the international environment.

One of the essential features of scenario planning, which is learning to respond dynamically to changes in the environment [13] (pp. 51–65) [20] (pp. 3–21), is also evident in the document analysed. It is particularly true of the chapter entitled *What the Scenarios Teach Us: Fostering Opportunities Through Resilience?* Its main message is that scenarios highlight the critical paradox that the same trends that increase risk in the near term can generate opportunities in the longer term. The condition for that is to build resilience to growing disruption and uncertainty. The resilience of societies, nations, and states is thus understood as planned action aimed at long-term investment in infrastructure, knowledge, and relationships to cope with surprises of an economic, environmental, social, and cyber nature. It is an approach that, given the lack of impact on such a distant environment and future, points to a range of actions aimed instead at preparing in advance for its impact by building adequate capacity [28] (p. XI).

Disadvantages

The momentum behind the research is impressive. Thousands of experts from dozens of countries and a similar number of institutes and universities worldwide received support from the world’s most powerful intelligence potential. This was predictive research, but historical analysis carried out for the period since the Second World War. All this was subject to assumptions that were not, however, consequently followed and not entirely consistent. The transition from the description to the proposal of concrete solutions was too quick and straightforward. It probably resulted in an oversimplification in the analysed report of the recommendations for responding to the key trends identified and the scenarios constructed. Such actions focused only on a two-state approach—either reacting or not reacting, or supporting the process or suppressing it. It oversimplifies such a complex future. Given the report’s stated logic of paradoxes, the entire range of actions between the two alternatives was utterly ignored. The authors remained anchored in the content from the previous project *Global Trends 2030. Alternative Worlds* [38], as thinking in terms of the 2012 alternatives was not replaced with thought based on the 2017 title paradox. The simplification was trivial, since the paradox was flattened again to an alternative [28] (p. 75).

The second major limitation of the evaluated project was the shallowing of the regional analysis. It was treated as a complement to the global one and derived from the assumptions of a several-year analysis. That set the tone for assessing regions, which was not based on a separate—different—methodology appropriate for this analysis level. Again, as for previously assessed analyses, there was a lack of methods other than those focused on scenario building. In the report, one can notice the STEP method, Delphi, trend analysis, scenario analysis, individual interviews, and simulation. All this points to a deductive approach to globalisation, i.e., showing only how it influences other factors rather than finding out what will shape it in many years (inductive approach). For this reason, methods appropriate for studying this kind of environment—regional—were not applied. Probably, M.E. Porter's model of five Driving Forces or M.E. Porter's Diamond adjusted to the conditions of such analysis would have been a more appropriate choice of methods used. Sectoral methods of strategic analysis could be a beneficial research concept independent of the scenarios, and thus verifying them.

The report shows the significant influence not only of many politicians but also of several academics. These are most probably A. Wilkinson and M.D. Toft. The former is the Secretary-General of the World Energy Council. She has forecast for the OECD and has formed the global scenarios team at Royal Dutch Shell and British Gas. She is the author of the monograph *The Essence of Scenarios: Learning from the Shell Experience* [24] and developed the OSPA (the Oxford Scenario Planning Approach) together with K. van der Heijden. Apart from its undoubted advantages, the model does not help to identify methods appropriate for each environment [29] (pp. 116–119). On the other hand, as a political scientist, M.D. Toft is a prominent researcher on the impact of religion, demography, and security. Her research has examined the growing political influence of religion on politics [39]. It is apparent in the report by drawing attention to the growing role of religious movements on the processes taking place in individual states (nationalisms). That may also explain the accurate prediction of the retreat processes from democratisation in, for example, Hungary and Poland. However, these advantages were accompanied by a disadvantage in reducing other directions of detailed research. Again, one can notice, as in previous case studies, the research limitation generated by the dominance of the scenario approach. Trends dominated the constructed picture of the world's future in a perspective of several years, causing the neglect of a deeper regional analysis based on investigating numerous actors and groups of their impact. The asset of singling out the pandemic as one of the several most essential threats by 2022 back in 2016 was not used to the fullest by not analysing the micro-environment. One more time, it is a clear case of disregarding the classic and most important principle of scenario planning. It has opted, despite making other declarations, to concentrate on one type of environment. It is the same as if only one environment scenario was considered, focusing attention and dispatches on it.

2.3. What Is Wrong with Scenario Planning?

Even though the scenario method is one of the best for studying macro-environments, it is insufficient for capturing the entire environment. The growing environmental complexity resulting from the increasing diversity and fragmentation of the studied areas indicates the need to apply simultaneous or consecutive analyses of different types/levels of the environment using different research approaches specific to those environments. The three cases analysed found it insufficient to apply the scenario approach as the primary approach. Basing such responsible analyses mainly on the study of one type of environment indicates the neglect of others, which most often results in a “white spot” in the forecast. The Shell example shows that even taking account of relevant factors (e.g., ecological) is insufficient if the analysis is done using them as the decisive scenario method. The NIC example shows that even specifying the analysis sectors (in this case, regions) is not enough if we study them properly (scenario analysis cannot be the only or the dominant one). The example of the Lisbon Group, on the other hand, shows that even analyses in which economic problems are dominant are not appropriate when only scenarios are used.

The solution to the mentioned methodological shortcomings in studying the environment is a methodology that not only notes and distinguishes different types of environments, but also applies appropriate methods to the nature of the specific environment.

3. Discussion

As shown in the analysis of the basic concepts of scenario planning (H. Kahn, P. Wack, K. Heijden) and the case studies (Shell, Lisbon Group, NIC), an excessive focus on one type of environment in the constructed forecasts can be limited by the balanced approach, which was after all so often declared in the assumptions of the scenario school. The new approach should draw attention to several types of environments, namely, the macro-environment, micro-environment, competitive environment, the sector and the system itself, and through this apply a larger set of strategic analysis methods. Foresight studies and strategic analysis implemented in management were considered as noteworthy solutions.

3.1. From Foresight to Strategic Analysis

One of the methodologies that allows one to consider several types of environments without too much preference for one of them is strategic analysis. It can be a part of strategic planning (as its essential and usually first stage), or it can function independently. However, no clear distinction has been made so far between foresight and strategic analysis. Both areas have standard methods, but also many specific ones of their own. When looking for proper methods to be included in the constructed (proposed) strategic analysis of energy security, one cannot rely only on its variety used in management and economics. Ensuring the sustainability of the approach may be fulfilled by also referring to the foresight achievements.

Among many studies on foresight projects, it was decided to pay attention to the proposal of a well-known propagator of this methodology, Rafael Popper. He specified and analysed the collection “33 Foresight Methods” [40,41]. Table 2 presents their classification due to the type of research strategy adopted.

Table 2. 33 Foresight methods. Source: [40,41].

| Qualitative Methods: | Quantitative Methods: | Semi-Quantitative: Methods |
|--|--|--|
| <ul style="list-style-type: none"> • Literature Review • Expert Panels • Scenarios • Brainstorming • Interviews • Surveys • Backcasting • SWOT • Citizens Panels • Workshops • Essays • Genius Forecasting • Morphological Analysis • Relevance Trees • Role play/Acting • Scanning • Science Fictioning • Simulation and Gaming • Wild Cards | <ul style="list-style-type: none"> • Trend Extrapolation • Benchmarking • Bibliometrics • Time Series Analysis • Modelling • Patent Analysis | <ul style="list-style-type: none"> • Delphi • Key/Critical Technologies • Cross-impact Analysis • Multi-criteria analysis • Polling/Voting • Quantitative scenarios • Roadmapping • Stakeholder Analysis |

Although it is not the latest study on foresight, the Global Foresight Outlook 2007 analyses several hundred foresight projects, indicating, among other things, the most frequently applied research methods and techniques. It allowed a list to be built of the most popular methods for 2004–2007 [41] (p. 18). The research commissioned by the Euro-

pean Commission (Table 3) showed certain tendencies in the attention paid to individual methods [42].

Table 3. Frequency of use of methods in foresight projects. Source: [42] (p. 74).

| Type of Method | Number of Cases 2004–2008 | Percentage Share for 2004–2008 |
|--------------------------------------|------------------------------|-----------------------------------|
| Literature Review | 477 | 54% |
| Expert Panels | 440 | 50% |
| Scenarios | 372 | 42% |
| Trend Extrapolation | 223 | 25% |
| Future Workshops | 216 | 24% |
| Brainstorming | 169 | 19% |
| Other Methods (Benchmarking, Patent) | 157 | 18% |
| Interviews | 154 | 17% |
| Delphi | 137 | 15% |
| Questionnaire/Survey | 133 | 15% |
| Key Technologies | 133 | 15% |
| Environmental Scanning | 124 | 14% |
| Essays | 109 | 12% |
| SWOT Analysis | 101 | 11% |
| Technology Roadmapping | 72 | 8% |
| Modelling and simulation | 67 | 8% |
| Backcasting | 47 | 5% |
| Stakeholder Mapping | 46 | 5% |
| Cross-impact Analysis | 36 | 4% |
| Bibliometrics | 22 | 2% |
| Morphological Analysis | 21 | 2% |
| Citizen Panels | 19 | 2% |
| Relevance Trees | 17 | 2% |
| Multi-criteria Analysis | 11 | 1% |
| Gaming | 6 | 1% |
| Total | 886 | |

For the conducted research, it is advisable to narrow down the analysed set of methods to the most frequently used ones, as presented in Tables 2 and 3.

Although it concerns data from more than ten years ago, the presented research proved that the most frequently used method was the literature review and SWOT analysis, followed by brainstorming, expert panels, and scenarios. The Delphi method was ranked further down [41] (pp. 20–25).

In other studies on SMEs, it was found that the available set of methods in foresight projects is systematically applied in a differentiated way. Trends in world research indicated the popularity of the 12 most frequently used methods in this type of enterprise [43]: expert interviews, expert Delphi, the scenario method, trend analysis, environment analysis, Internet/media analysis, patent/technology analysis, roadmapping, simulations, brainstorming methods, issue management, and an early warning system.

The focus on specific methods used in foresight studies is similarly narrowed down in the *UNIDO Technology Foresight Manual*. Then, such a list includes the following methods: Delphi, scenario, brainstorming, critical technologies, roadmap, SWOT and STEP(V) [44].

Adopting the distinction, which is vital in social sciences, between the method and technique (there are various techniques for implementing a specific method), it is possible to indicate the methods used in strategic analysis from the presented set. These include scenarios, STEP, cross-impact analysis (CIA), trend extrapolation, stakeholder analysis (maps and matrix) and SWOT. The others identified in foresight as methods are only techniques used within strategic analysis. For example, Delphi, individual interviews, questionnaire interviews, expert interviews, brainstorming, simulations, etc., are techniques used in almost every method. Thus, it is shown that foresight projects for constructing strategic analysis propose few new methods. In terms of the methods used, one can see a remarkable similarity between foresight and scenario planning. It points to the same set of limitations for foresight as were shown for scenario planning. However, the considerable number of methods aimed at the comprehensive consultation of the evaluations carried out in foresight results in a higher-degree acceptance of the proposed solutions to the defined problems.

3.2. From Strategic Analysis in Management to Strategic Analysis in Energy Security

Strategic analysis in management is seen in two main ways. The first one, very superficial and unfortunately very widespread, consists of basic methods, usually STEP or scenario analysis and SWOT. However, it is not uncommon to see strategic analysis based on only one method. The main feature of a good strategic analysis, namely its comprehensiveness, cannot be fulfilled in this manner. Besides, in this type of strategic analysis there is no differentiation of the examined environment, which is necessary according to M. Jo Hatch's postulate to apply two views on the environment—a centric and a balanced (network) one [2]. In principle, strategic analysis is very similar to scenario analysis itself; indeed, it is identical to it. It does not reduce the limitations of the scenario approach.

The second approach to strategic analysis in management is more elaborate. It involves carrying out a more complex study of one type of environment. In this case, the typology of the environment under study includes the macro-environment, micro-environment, the sector, and organisation. In turn, it requires the design of an analysis process in which more methods are used. As a rule, such analysis is carried out using one of the four basic approaches:

- The rational planning school, for example, the concepts of H.I. Ansoff;
- The evolutionary or learning school, for example, Mintzberg's concepts;
- The competitive or positional school, for example, the strategic analysis concepts by M.E. Porter;
- The resource or competence school.

The application of even several methods within a strategic analysis conducted in accordance with one presented strategy school determines the treatment of one type of environment as dominant. For example, M.E. Porter, within the positional school, proposes the use of the following methods: Five Driving Forces Analysis, Life Cycle Analysis, and Strategic Group Maps, which are methods of sector studies. Only Value Chain Analysis allows, apart from the sector, one to take the evaluation of the company into consideration. R.M. Grant proposes similar methods, also narrowing the focus to the sector.

The proposed concept of strategic sector security analysis should avoid the limitations in the presented scenario planning concepts (Kahn, Wack, Heijden) and case studies (Shell, Lisbon Group, NSC). Therefore, the necessary completion of the scenario analysis should take into account the wide range of foresight and strategic management methods presented.

4. Conclusions

The adopted concept of the environment and, more specifically, the separation of its types is decisive for the structure of the strategic analysis and the degree of its com-

prehensiveness and complementarity. For the analysis of each type of environment, a different research approach should be used; in this case, a different strategy school. The starting point for the typology of the environment is adopted in economics and management due to the degree of expansion and available research methodology. The most distant macro-environment is seen as a set of trends and processes. Strong connotations with macroeconomics can be seen here. The micro-environment, like microeconomics, is seen as a set of actors (people, organisations, companies). For practical reasons, the micro-environment is often narrowed down to a set of entities forming the competitive environment, which, according to M.E. Porter's model, the main element is the sector and its immediate environment [45]. The last environment of analysis is the organisation (entity, enterprise, state actor, etc.). As in the study of the environment, it is most reasonable to adopt different approaches to investigating an organisation. Consequently, different methods should allow for different approaches to the study of the entity. The concepts of strategic security analysis were based on this assumption resulting from the literature analysis and case study.

4.1. Selection of Methods Forming the Strategic Analysis of Energy Security

The selection of methods forming the strategic analysis of energy security should be conducted according to the criterion of the type of environment studied [46]. In turn, the type of environment determines the applied research approach in the form of the strategy school. From the point of view of building the research process, other typologies of strategic analysis methods in management are less useful [47]. Therefore, the reassessment was made related to the division of strategic analysis methods due to the type of environment studied. Among the most commonly encountered methods of strategic analysis there can be listed [48–50]:

- Micro-environment research methods—narrowed down to industry and sector—Porter's Five Forces, Experience Curves Life Cycle Analysis, Portfolio Analysis;
- Methods for examining the organisation's strategic potential—Reengineering, Benchmarking, Critical Success factor, Outsourcing, Balanced Scorecard, Core Competences, Porter's Value Chain Analysis, Pareto Analysis;
- Integrated or integrating methods—SWOT, TOWS/SWOT and SPACE.

The conducted literature analysis, case study and assessment of the possibilities of foresight and strategic analysis in management enabled a set of methods to be built that can be used in strategic analysis. Table 4 presents the comparison of the set of characteristic methods for strategic analysis in security and management and for scenario planning and foresight studies. The compilation formed the basis for proposing a strategic energy security analysis process.

The summary presented in Table 3 shows that the strategic analysis carried out for energy security needs, which would be aimed at improving the shortcomings of scenario planning and foresight, should be extended by sectoral analysis methods [51,52].

4.2. The Proposal for the Strategic Energy Security Analysis Process

The structure of the strategic analysis process of energy security should include the following four stages and types of analysis: macro-, micro- or sectoral, system (organisation or entity), and integrative for the previous ones. Each of the stages requires a varied research approach resulting from a different school of strategy. It, in turn, determines a type of strategic analysis methods employed. Table 5 presents the proposed strategic analysis process based on the elimination of the limitations of the scenario, sectoral, and resource-based approaches. The process combines the achievements of strategic management, security, international relations, foresight, and scenario planning. The proposed process allows the use of conclusions of the previous stages of analysis.

Table 4. Methods used in strategic analysis of energy security.

| Type of Environment | Type of Strategy School | Method of Strategic Analysis | Area of Interest | | | |
|---------------------------------|--|---|-------------------|-----------|----------------------|------------------------|
| | | | Scenario Planning | Foresight | Analysis in Security | Analysis in Management |
| 1. Macro-environmental analysis | Rational approach | Trend Extrapolation | | | X | X |
| | | Strategic Gap Analysis | | | X | |
| | | Cross-impact Analysis (CIA) | | X | X | X |
| | Scenario approach | STEP (PEST) Analysis | X | X | X | X |
| | | Scenario Analysis | X | X | X | X |
| | | Environmental Threat Opportunity Profile (ETOP) | | | | X |
| 2. Micro-environmental analysis | Competitive approach | Stakeholders Analysis | X | X | X | X |
| | | Sector Gap Analysis | | | | X |
| | | Sector Profile | | | | X |
| | | Experience Curve | | | | X |
| | | Five Driving Forces Model | | | X | X |
| | | Strategic Group Maps | | | X | X |
| | | Portfolio Methods | | | X | X |
| 3. Analysis of the organisation | Competency- or resource-based approach | Strategic balance | | | | X |
| | | Porter's Value Chain | | | X | X |
| | | Process Analysis—Reengineering | | | | X |
| | | Function Analysis—Outsourcing | | | | X |
| | | Balanced Scorecard | | | | X |
| | | Economic and Financial Analysis | | | | X |
| | | Pareto Analysis | | | X | X |
| 4. Integrated analysis | | Key factors—Benchmarking | | | X | X |
| | | SWOT Analysis | X | X | X | X |
| | | TOWS/SWOT Analysis | | X | X | X |
| | | SPACE Analysis | | | | X |

Table 5. Proposed concept for strategic analysis of energy security.

| Method | Methods and Techniques | Activities and Results |
|--|--|--|
| 1. Macro-environmental Analysis | | |
| 1.1. PESTE Analysis | Future Workshops Brainstorming | Selecting factors in each of the political, economical, social, technological, and ecological spheres. |
| 1.2. Scenarios Analysis—deductive and inductive approach | Delphi method Trend Extrapolation Strategic Gap Analysis | Identification of key trends in a deductive manner. |
| | | Assessment of the factors in the five STEPE spheres for the type and strength of influence and probability. Identification of key trends in an inductive way. |
| 1.3. Cross-Impact Analysis (CIA) | Delphi method Expert Panel | Examination of interactions between key trends. Identification of the most problematic trends. |

Table 5. Cont.

| Method | Methods and Techniques | Activities and Results |
|--|---|--|
| 1.4. ETOP Analysis | Expert Panel Future Workshops | Division of key trends into threats and opportunities—building the data for SWOT/TOWS analysis. |
| 2. Micro-environmental/Sectoral Analysis | | |
| 2.1. Stakeholders Analysis | Stakeholders' maps Delphi method | Identification of possible stakeholders. Identification of the strongest stakeholders. |
| | Stakeholders' matrix Expert Panel | Identification of the most important stakeholders. Grouping into subject, players crowd, referees. |
| 2.2. Five Driving Forces Model (the five driving forces of the sector) | Brainstorming | Identification of groups influencing the sector: suppliers, buyers, new entrants, substitutes, regulators, media, NGOs. |
| | Delphi method | Identification of influencing characteristics. |
| | Expert Panel Game | Scoring/weighting of impacts on the sector. |
| 2.3. Strategic Group Maps | Trend Extrapolation, Strategic Gap Analysis, Game | Identification of groups of actors within the sector. Grouping and defining situations according to criteria that constitute the characteristics of the sector. |
| 2.4. Identification of the sector's features | Sector profile | Identification of key features of the sector. |
| | Experience Curve | Identification of opportunities for the effect of experience in the sector. |
| | Analysis of the Life Cycle of the Sector | Determination of the phase the in which the sector is. It is a necessary parameter for the portfolio matrix. |
| 2.5. Portfolio methods | BCG matrix | Sector situation—life cycle criterion/share. |
| | GE matrix | Sector situation—the criterion of position/attractiveness. |
| | ADL matrix | Sector situation—life cycle criterion/position. |
| | Hofer matrix | Sector situation—life cycle criterion/position. |
| | Technology matrix | Sector situation—life cycle criterion/position. |
| 2.6. Sector scoring | Expert Panel | Based on the conclusions 2.3.–2.5. the sector assessment. Building the data for SWOT/TOWS analysis. |
| 3. Internal analysis of the entity | | |
| 3.1. Process Analysis | Reengineering | Identification of key processes. |
| 3.2. Function Analysis | Outsourcing | Identification of key and non-key functions. |
| 3.3. Value Chain | Delphi method | Identification of key functions, activities, and processes. |
| 3.4. Key factors | Benchmarking | Building the data for SWOT/TOWS analysis. |
| 4. TWOS/SWOT integration analysis | | |
| 4.1. SWOT Analysis | Expert Panel Delphi method | Weighted valuation across four fields (opportunities and threats, strengths and weaknesses) of data from 1.4, 2.6, 3.4. |
| 4.2. TOWS/SWOT Analysis | Delphi method | Evaluating the influence of these four groups of factors on each other in two directions—constructing eight matrices. |
| | Expert Panel Game | Identification of the matrix with the strongest influence. Assigning the selected matrix to a type of strategy. Description of this strategy taking 1.4, 2.6, 3.4. into account. |

In addition to the scenario methods, sectoral, portfolio, and the entity itself methods play a significant role in the proposed strategic analysis. Through them, the scenario analysis can constitute an essential stage of the more complex studies on strategic conditions.

Among the proposed four types of strategic analysis of energy security at each stage, key methods can be distinguished, that is, those whose implementation in the case of very limited time (e.g., crisis situation) or technical resources or human capacity, is essential.

The scenario analysis is, as such, a key method for the strategic analysis of the macro-environment. Given the aforementioned constraints, it is best to implement it in a deductive manner. In more comfortable situations, it will be advisable to compare the conclusions of the two basic types of scenario building.

In micro-environmental or sectoral analysis, the Five Driving Forces Model is a basic method for strategic analysis of the competitive environment. It considers the competitive forces affecting the sector [53] and four forces affecting it—two threats of new entrants and substitutes and two bargaining powers of customers and suppliers. A sixth force—government—is sometimes added to the model. For strategic security analysis, the model should additionally include other forces not included by M.E. Porter. The case of Shell and the Brent Spar platform indicates the need for experts to consider the seventh and eighth force—the media and environmental organisations. Using the output of Global Trends, one should pay attention to one more forces—social organisations (religious and local). The model should be considered as key in micro or sectoral analysis. The valuation, in this case, is made subjectively by selected experts following the principles described by the author of the model—M.E. Porter [45].

In turn, the Sector Life Cycle Analysis seems to be particularly practical for examining the energy security sector, where different technologies and ways of obtaining and transmitting energy are subject to strong cycles of change [54]. The Sector Life Cycle Analysis should be an introduction to the use of portfolio methods. Portfolio methods analyse the dynamics of changes in the behaviour of the sector entities graphically [55]. Most frequently, in a matrix built on one dimension of competition, the recurring parameter is the Sector Life Cycle and the other, depending on the type of matrix, concerns the degree of the sector's growth, the degree of mastery of the critical success factors in the sector or the level of achievement of a specific technology. In the field of security, such an adaptation of portfolio methods has already been made, e.g., about terrorist threats.

The Porter's Value Chain is the basic method for analysing the strategic potential of entities in strategic analysis. By examining the organisation's functions in a manner similar to graphs and networks, it allows one to identify those of them, or their elements, which are malfunctioning and negatively influencing the whole system. The undeniable advantage of the model is its direct link to the sector entities on the same principles as the analysis carried out within the organisation [56]. An entity is part of a chain that creates a specific value for the sector, just as its internal functions generate value (or loss) for the entity. A not insignificant advantage of the model is that it combines a functional approach with a process approach in studying systems, which reduces the time of the entity's strategic analysis [45].

The three areas of attention and modification of the discussed methods for strategic analysis make it possible to sufficiently consider the requirements of the analysis of the sectoral environment, which are not fulfilled in most such analyses carried out for the purposes of security research.

The proposed process of strategic analysis concludes the fourth stage related to the integration of research carried out in all the identified environments. The key method included in this type of analysis is the TOWS/SWOT analysis. It is an extended version of the popular SWOT method based on conclusions from scenarios, sectoral analysis, and internal analysis of the entity. As a result of complex expert assessments, the TOWS/SWOT analysis allows one to determine the type of recommended strategy (selection of one of the four basic strategies). The refinement of that choice is the implementation of the SPACE analysis after the TOWS/SWOT method, which enables a more precise definition of the strategy from the set of nine strategic options.

4.3. Key Strengths and Limitations of the Proposed Strategic Analysis of Energy Security

There is a need to consolidate numerous and often scattered partial studies, both quantitative and qualitative, through qualitative research in such a complex environment. The presented proposal of strategic analysis in security makes it possible, in the form of

analyses of individual types of environments connected by a logical process, to indicate the most significant (key) phenomena in each of them and then combine such formulated conclusions into a single assessment. The condition for that is using contextual thinking postulated in the scenario planning school. Hence, the starting point here is scenario thinking, and the proposed concept is about its development. It consists in applying different research approaches to the analysis carried out at individual levels. The distinguished types of environments should determine the levels of the research view. The undeniable advantage of such a process is reducing uncertainty by cross-fertilising the conclusions of various types of strategic analysis. Besides, it should be noted that the proposed strategic analysis process can be applied in each of the security-related approaches imposed by policy makers. In such a case, the limitations of a particular security school are reduced by an extended strategic analysis in the area of such deficiencies.

The complexity of the process determining the high demands on analysts should be considered as the main limitation of the proposed strategic analysis. Each type of strategic analysis requires a different type of specialist. In this case, another threat emerges; that is, high requirements should be formulated for people coordinating the work of those teams. The quality of these people's work largely determines the quality of the entire analysis.

4.4. Directions of Further Research on the Proposed Strategic Analysis Process

Therefore, attention should be directed to the popularisation and, to some extent, adaptation of several methods hitherto completely unknown in security. The set can be much more numerous, but the adaptation of basic models and methods of sector analysis derived from management should be considered sufficient. These can include Porter's Five Driving Forces model, and Sector Life Cycle Analysis, which initiates the implementation of portfolio methods such as BCG, GE, McKinsey, ADL, and maps of strategic groups. Other methods used in management are too "economical" and attempts to apply them are doomed to failure. Among the methods used to analyse the potential of an entity, Porter's Value Chain appears practical, as it provides a direct link to the analysis of the sector and the competition.

Concerns about the too "economic" dimension of analysis coming from management have proved unfounded. The reason is that the specific nature of energy security allows the use of many management methods, which other security sectors, such as social, cultural, political, or even environmental, do not allow. Therefore, a strategic analysis process was constructed based on a process derived from management. A balanced approach in the proposed energy security strategic analysis model ensures the inclusion of a scenario approach in the investigation of the macro-environment (contextual environment), a competitive approach in the study of the sector and a resource or competence approach in the study of the entity. The system approach is used to apply integrated methods, which link the results of examining specific areas. The proposed model of strategic analysis of energy security allows one to reduce the limitations of the scenario approach and foresight research while being able to use most of the already used and known methods.

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References

1. Ashby, R. *An Introduction to Cybernetics*; Chapman & Hall: London, UK, 1961; ISBN 0412056704.
2. Hatch, J.M.; Cunliffe, A.L. *Organization Theory: Modern, Symbolic and Postmodern Perspectives*, 3rd ed.; Oxford University Press: Oxford, UK, 2013; pp. 90–198, ISBN 978-019-964-037-9.
3. Buzan, B.; Waever, O.; Wilde, J. *Security. A New Framework for Analysis*, 1st ed.; Lynne Rienner Publishers: London, UK, 1998; ISBN 978-155-587-784-2.
4. Howard, M. The Strategic Approach to International Relations. *Br. J. Int. Stud.* **1976**, *2*, 67–75. [\[CrossRef\]](#)
5. Smith, R.A.; Lyons, K. A strategic analysis of goals scored in open play in four FIFA World Cup football championships between 2002 and 2014. *Int. J. Sports Sci. Coach.* **2017**. [\[CrossRef\]](#)
6. Cardoso, G.; Santos, E.M.; Kiflie, Y.; Woldemichael, K.; Wilson, S.; Lemma, W. Strategic analysis of tuberculosis prevention and control actions in Brazil and Ethiopia: One size fits all? *Int. J. Public Health* **2017**, *62*, 305–315. [\[CrossRef\]](#) [\[PubMed\]](#)
7. Ansoff, H.I. *Strategic Management*; Palgrave Macmillan: London, UK, 1979; ISBN 978-1-349-02971-6.
8. Andrews, K.R. *The Concept of Corporate Strategy*; Irwin: Homewood, IL, USA, 1987; ISBN 978-0-870-94983-8.
9. Ackoff, R.L. *Scientific Optimizing Applied Research Decision*; John Wiley and Sons: New York, NY, USA, 1962; ISBN 0898746612.
10. Ackoff, R.L. *A Concept of Corporate Planning*; Wiley—Interscience: New York, NY, USA, 1969; ISBN 9780471002901.
11. Chandler, A.D. *Strategy and Structure: Chapters in the History of the American Industrial Enterprise*; Martino Fine Books: Eastford, CT, USA, 2013; ISBN 978-1614275084.
12. Ansoff, H.I. *Corporate Strategy*; McGraw Hill Book: New York, NY, USA, 1965.
13. van der Heijden, K. *Scenarios. The Art of Strategic Conversation*; John Wiley & Sons: Chichester, UK, 2005; pp. 3–10, ISBN 0-470-02368-6.
14. Wilkinson, A.; Kupers, R. *The Essence of Scenarios. Learning from the Shell Experience*; Amsterdam University Press: Amsterdam, The Netherlands, 2014; ISBN 978-90-8964-594-4.
15. Mintzberg, H.; Waters, J.A. Of Strategies, Deliberate and Emergent. *Strateg. Manag. J.* **1985**, *6*, 257–272. [\[CrossRef\]](#)
16. Lindblom, C.E. The Science of “Muddling Through”. *Public Adm. Rev.* **1959**, *19*, 79–88. [\[CrossRef\]](#)
17. Stonehouse, G.; Campell, D.; Hamil, J.; Purdie, T. *Global and Transnational Business*, 2nd ed.; John Wiley & Sons: Chichester, UK, 2004; p. 23, ISBN 978-0-470-85126-5.
18. Lepgold, J. NATO’s Post-Cold War Collective Action Problem. *Int. Secur.* **1998**, *23*, 78–106. [\[CrossRef\]](#)
19. Michta, A.A. NATO Enlargement Post-1989: Successful Adaptation or Decline? *Contemp. Eur. Hist.* **2009**, *18*, 363–376. [\[CrossRef\]](#)
20. Fahey, L.; Randal, R.M. Integrating Strategy and Scenarios. In *Learning from the Future. Competitive Foresight Scenarios*; Fahey, L., Randal, R.M., Eds.; John Wiley & Sons: New York, NY, USA, 1998; p. 27, ISBN 0-471-30352-6.
21. Lindgren, M.; Bandhold, H. *Scenario Planning. The Link between Future and Strategy*, 2nd ed.; Palgrave Macmillan: New York, NY, USA, 2009; pp. 118–145, ISBN 978-1-349-36782-5.
22. Ringland, G. *Scenario Planning. Managing for the Future*, 2nd ed.; John Wiley & Sons: Chichester, UK, 2006; p. 15, ISBN 978-0-470-01881-1.
23. Kahn, H.; Weiner, A.J. *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years*; Macmillan: New York, NY, USA, 1967; ISBN 978-0025604407.
24. Ralston, B.; Wilson, I. *The Scenario-Planning Handbook. Developing Strategies in Uncertain Times*; Thomson South-Western: Mason, OH, USA, 2006; pp. 15–16, ISBN 978-0-324-31285-0.
25. Chermack, T.J. *Scenario Planning in Organizations. How to Create, Use, and Assess Scenarios*; Berrett-Koehler Publishers: Oakland, CA, USA, 2011; p. 9, ISBN 978-1-60509-413-7.
26. Cairns, G.; Wright, G. *Scenario Thinking, Preparing Your Organization for the Future in an Unpredictable World*, 2nd ed.; Palgrave Macmillan: Cham, Switzerland, 2011; p. 25, ISBN 978-3-319-49066-3.
27. Schwartz, P. *The Art of the Long View, Planning for the Future in an Uncertain World*; Currency Doubleday: New York, NY, USA, 1991; ISBN 0-385-26732-0.
28. National Intelligence Council, Global Trends. Paradox of Progress; NIC 2017-001; January 2017; pp. 65–69. Available online: <https://www.dni.gov/files/documents/nic/GT-Full-Report.pdf> (accessed on 29 June 2021).
29. Ramirez, R.; Wilkinson, A. *Strategic Reframing. The Oxford Scenario Planning Approach*; Oxford University Press: Oxford, UK, 2018; pp. 12, 40–41, ISBN 978-0-19-882066-6.
30. Ducont, G.; Lubben, G.J. A typology for scenarios. *Futures* **1980**, *12*, 53. [\[CrossRef\]](#)
31. Dator, J. *A Noticer in Time. Selected Work, 1967–2018*; Springer: Cham, Switzerland, 2019; p. 42, ISBN 978-3-030-17389-0.
32. van Asselt, M.B.A.; Rotmans, J. Integrated assessment: A growing child on its way to maturity. *Clim. Chang.* **1996**, *34*, 327–336. Available online: <https://link.springer.com/article/10.1007/BF00139296> (accessed on 20 June 2021).
33. The Mont Fleur Scenarios. What will South Africa be like in the year 2002. *Deep. News* **1992**, *7*, 1.
34. Godet, M. *Creating Futures. Scenario Planning as a Strategic Management Tool*, 2nd ed.; Economica: London, UK, 2006; pp. 263–266, ISBN 2-7178-5244-1.
35. Dalkey, N.C. *The Delphi Method: An Experimental Study of Group Opinion*; RM-5888-PR; The Rand Corporation: Santa Monica, CA, USA, 1969. Available online: https://www.rand.org/pubs/research_memoranda/RM5888.html (accessed on 27 July 2021).
36. Regester, M.; Larkin, J. *Risk Issues and Crisis management. A Casebook of Best Practice*, 4th ed.; Kogan Page: London, UK, 2008; ISBN 978-0-749-45107-3.

37. The Group of Lisbon. *Limits to Competition*; The MIT Press: Cambridge, MA, USA, 1995; ISBN 978-0262515733.
38. National Intelligence Council. Global Trend 2030s. Alternative Worlds; NIC 2012-001; December 2012. Available online: https://www.dni.gov/files/documents/GlobalTrends_2030.pdf (accessed on 10 June 2021).
39. Toft, M.D.; Philpott, D.; Shah, T.S. *God's Century; Resurgent Religion and Global Politics*; W.W. Norton & Company: New York, NY, USA, 2011; ISBN 978-0-393-06926-6.
40. Popper, R. Foresight Methodology. In *The Handbook of Technology Foresight*; Georghiou, L., Cassingena, J., Keenan, M., Miles, I., Popper, R., Eds.; Edward Elgar: Cheltenham, UK, 2008; pp. 44–88, ISBN 978-1-845-42586-9.
41. Popper, R.; Keenan, M.; Miles, I.; Butter, M.; Sainz, G. *Global Foresight Outlook 2007*; European Commission—European Foresight Monitoring Network: Brussels, Belgium, 2007; p. 20. Available online: [Projects.mcrit.com/foresightlibrary/attachments/article/1066/efmn.global.foresight.outlook_Popper.et.al.2007.pdf](https://projects.mcrit.com/foresightlibrary/attachments/article/1066/efmn.global.foresight.outlook_Popper.et.al.2007.pdf) (accessed on 20 June 2021).
42. *Mapping Foresight Revealing How Europe and Other World Regions Navigate into the Future*; SDME 7/21 B-1049; European Commission—European Foresight Monitoring Network: Brussels, Belgium, 2009; p. 74, ISBN 978-92-79-13110-3. Available online: <https://op.europa.eu/en/publication-detail/-/publication/3fab185a-16fa-491e-bceb-41a8d9972f06> (accessed on 20 June 2021).
43. Jannek, K.; Burmeister, K. Corporate Foresight in Small and Medium-Sized Enterprises. *Foresight Brief* **2007**, 101. Available online: www.foresight-platform.eu/wp-content/uploads/2011/04/EFMN-Brief-No.-101-Corporate-Foresight-SME.pdf (accessed on 29 July 2021).
44. *UNIDO Technology Foresight Manual, Organization and Methods, Vol 1*; United Nations Industrial Development Organization: Vienna, Austria, 2005; p. 108. Available online: https://www.ams-forschungsnetzwerk.at/downloadpub/unido_volume1_unido_tfores_manual.pdf (accessed on 21 July 2021).
45. Porter, M. *Competitive Strategy. Techniques for Analyzing of Industries and Competitors*; Free Press: New York, NY, USA, 1998; ISBN 978-0684841489.
46. Pillkahn, U. *Using Trends and Sceenarios as Tools for Strategy Development*; Publicis Corporate Publishing: Erlangen, Germany, 2008; pp. 418–436, ISBN 978-3-89578-304-3.
47. Zanono, A.B. *Strategic Analysis. Process and Tools*; Routledge: London, UK, 2012; pp. 18–47, ISBN 978-1-138-203090-9.
48. Wayland, M.S.; McDonald, W.G. *Strategic Analysis for Healthcare. Concepts and Practical Applications*; HAP—Health Administration Press: Chicago, IL, USA, 2016; ISBN 978-1-56793-731-0.
49. Strategic Analysis Tools, Topic Gateway Series No. 34, The Chartered Institute of Management Accountants. Available online: https://www.cimaglobal.com/Documents/ImportedDocuments/cid_tg_strategic_analysis_tools_nov07.pdf (accessed on 19 July 2021).
50. Rudnicki, W.; Vagner, I. Methods of strategic analysis and proposal method of measuring productivity of a company. *Małopolska Sch. Econ. Tarnów Res. Pap. Collect.* **2014**, 2, 175–184. Available online: <http://cejsh.icm.edu.pl/cejsh/element/bwmeta1.element.desklight-1f3e5d27-3aa2-4367-90f4-4e04c765b2ee> (accessed on 30 July 2021).
51. Rumelt, R. What in the World is Competitive Advantage. *Policy Work. Pap.* **2003**, 2003, 105.
52. Porter, M.E. The Five Competitive Forces that Shape Strategy. *Harv. Bus. Rev.* **2000**, 5, 57–71.
53. McGee, J.; Thomas, H.; Pruett, M. Strategic Groups and the Analysis of Market Structure and Industry Dynamic. *Br. J. Manag.* **1995**, 6, 257–270. [CrossRef]
54. Cabeza, L.F.; Rincon, L.; Vilariño, V.; Perez, G.; Castell, A. Life cycle assessment (LCA) and life cycle energy analysis (LCEA) of buildings and the building sector: A review. *Renew. Sustain. Energy Rev.* **2014**, 29, 394–416. [CrossRef]
55. Edelkina, A.; Karasev, O.; Klubova, M. Linking the Scientific and Technological Company to Market Demand: A Portfolio Matrix Approach. *High. Sch. Econ. Res. Pap.* **2015**. WP BRP 43/STI/2015. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2636807 (accessed on 30 July 2021).
56. Hergert, M.; Morris, D. Accounting data for value chain analysis. *Strateg. Manag. J.* **1989**, 10, 175–188. [CrossRef]