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SCENARIOS IN REGIONAL PLANNING – THEORY AND PRACTICE IN POLAND

Abstract. It is important to recognise future conditions in planning because it primes future actions. Scenarios are useful prognostic tools, especially when the social and institutional behaviour plays a crucial role. The aims of the paper are: (1) to indicate the roles and the place of scenarios in the strategic plan building process; (2) to analyse and evaluate the application of scenarios in regional planning in Poland; (3) to transpose the research results on scenarios in local planning for their application in regional planning. There are a few documents in which scenarios are applied: three strategies for regional development and two spatial development plans for regions. The author analysed the scenarios in all of those documents and offered some recommendations transposing the effects of previous research from local to regional planning.
Keywords: forecasting, regional planning, scenarios, strategic planning, voivodeships.

1. INTRODUCTION

Planning primes future actions. Therefore, future conditions should be considered in regional planning. The plan should account for not only the current but also the upcoming problems. Furthermore, a recognition of the future is very important in the planning process. Identification of the future is especially important in strategic planning, due to its long-term prospect, and also in spatial planning, which at the regional level is often also strategic.

The future should be considered on an objective basis. To accomplish that, certain forecasting methods can be applied. A scenario method is seen as one of the most useful forecasting methods, especially when the social and institutional behaviours play a crucial role (Chojnicki, 1988). Scenarios could help reduce uncer-

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tainty, make the future more clear, or even build structures based on an uncertain image of the future. That is their main task. In some publications, scenarios are not considered forecasts (e.g. Chermack *et al.*, 2001; Godet, 2006), but in others, they are (Scott Armstrong, cited in Stoner & Wankel, 1986; Kania-Gospodarowicz, 1993; Cieślak, 1997). The author of this paper considered scenarios as a kind of a forecast.

There are many definitions of a scenario. The oldest and one of the best was formed by Kahn and Wiener who defined a scenario as a possible, often hypothetical, sequence of events constructed in an internally consistent way for the purpose of focusing attention on causal processes and decision points (cited in Torrieri & Nijkamp, 2005). In many definitions such words as: *stories, series of stories, series of events* are key words (Chermack *et al.*, 2001; Vleugel, cited in Torrieri & Nijkamp, 2005). The author defined a scenario as an ordered description of a possible or desirably predicted future of an investigated object, constructed with a logical sequence of events and processes.

The word *scenario* is often misused, especially when used to describe any set of hypotheses (Godet, 2000), or future variants of states (images, situations). Taking into account the meaning of the term *scenario* used to describe a certain process (sequences of events), it is claimed that the description of a future state could be considered as an element (a single scene) of a scenario only if the state is elaborated by a logical description of a course of events. If it is formed in one's mind only, such scenarios could be called *hidden*. The description of a state (image, vision) determined without thinking in terms of cause and effect but considered as coherent assumptions could be regarded as *quasi scenarios* (Sołtys & Lendzion, 1999).

Scenarios have been used in strategic planning mostly in business, but also in corporations, public institutions, and territorial entities, including regions. The literature concerning scenarios in regional planning is dominated by publications on scenarios in specific regions, including recommendations from experiences in these regions (e.g. Dodson & Sipe, 2002; Soliman, 2004; Petrov *et al.*, 2011; Delavare, 2014). Many publications apply to a city region (e.g. Kwartler, 2002; Pfaffenbichler, 2002; Docherty & McKiernan 2008; Oanaa, P. L. *et al.*, 2011; von Wirth *et al.*, 2013). Generalizations are less common (e.g. Klasik, 1986; Batty, 2002; Avin, 2016). Some theoretical aspects of the scenario method discussed on the basis of literature relating to the issue of urban planning (Stojanović, Mitković, Mitković, 2014) or general land-use planning (Xiang & Clarke, 2003) also refer to regional planning. Güell presented a territorial foresight method based on scenario design. That method has been applied in Spain at the national, regional and local levels.

The aims of the paper are to:

1. Indicate the roles and the places of scenarios in the strategic plan building process;
2. Analyse and evaluate the application of scenarios in regional planning in Poland;

3. Transpose the research results on scenarios in local planning for their application in regional planning.

Methodological issues, not the content regarding any specific regions (identified voivodeships within the Polish administrative division), were the main object of the author's interest.

The methods used in the presented research included a study of the literature, and generalisation of own experiences. Those were applied as the methods for achieving Aims 1 and 3, and for preparing the criteria for the analysis and evaluation of empirical cases for achieving Aim 2. The evaluation was made according to the following criteria:

– the place and the role of the scenarios,
– the manner of using scenarios, especially the approach to using them from the point of view of choosing one scenario for further works on the strategy, or a lack thereof,
– the number and kind of scenarios as well as the criteria for their differentiation,
– the methods of scenario building and the manner of their presentation,
– the answer to the question whether the causal relationship is shown.

Interviews with planners were an additional research method. The extent of the research included scenarios applied in the strategies for the development of regions, and in the spatial development plans for regions (SDPR), listed in the Chap. 2.

2. THEORY OF THE SCENARIO METHOD

The scenario method provides a multi-step procedure for systematic studies of the future, mainly by constructing images of future states and situations, as well as sequences of events leading to such states. The method consists a specific combination of various methods applied individually for each forecasting task, but there are some common principles that are shared by individual methods. Experience supported by a detailed analysis of the results obtained during experiments using the method is one of the factors determining the choice of the appropriate method and establishing rules (Komorowski, 1988; Cieślak, 1997).

Godet (1985, 1994) distinguished two general sets of scenario development methods. One of them, classified as heuristic, comprises "writing a scenario" in a word-formulated form in the creation process, using intuition. The second set is classified as formal, algorithmic. In more recent literature three dominant techniques or major approaches are distinguished: intuitive logics, probabilistic modified trends (PMT, belonging to quantitative methods), and the French approach

of *La prospective* – blending both above-mentioned approaches (Bradfield *et al.*, 2005). The author believes that the classification of scenario methods should also include quantitative methods other than PMT, including, among other, formal models of spatial simulations, e.g. cellular automata. Thus, the simplest division of scenario methods into: qualitative (intuitive logic), quantitative, and mixed can be proposed.

Many types of scenarios can be distinguished, depending on specified criteria. Ducot and Lubben (1980) distinguished two pairs of types, according to two criteria, which together yielded combinations, as shown below in Tab. 1.

Table 1. The basic types of scenarios

Scenario	Exploratory	Anticipatory
Descriptive	*For the given causes – What can be the next effect?*	*For the given effects – what could be their causes?*
Normative	*For the given measures – What can be the goals achieved?*	*To achieve given goals – what measures could be taken?*

Source: Ducot & Lubben, 1980 (p. 53) with a few changes.

Descriptive scenarios describe objectively possible events, *normative* scenarios are formulated with respect to preferred values (Ducot & Lubben, 1980; Radzikowska, 1997). Images of the future in those scenarios may be both desirable and feared (Durance & Godet, 2010). *Exploratory* scenarios help determine the possible logical sequence of events leading from the initial situation into the future. *Anticipatory* scenarios result from future images of an object; that type of a scenario, which is created by way of writing "backwards", discovers the probable sequences of events linking the present and the future (Ducot & Lubben, 1980; Klasik, 1986; Radzikowska, 1997). Both of those scenarios can be constructed assuming the intervention of a controlling unit into the course of events or assuming a lack of any essential (strategic) intervention (Sołtys, Lendzion, 1999).

Based on the probability or the scale of preference, *central* and *peripheral* scenarios can also be distinguished. Within peripheral scenarios, *marginal* (*border, extreme*) scenarios may be identified. In pairs, they are often called: *optimistic* and *pessimistic,* or *positive* and *negative,* or scenarios of *opportunities* and *threats.* They may define the range of the development of a territory (Kołodziejski, 1991). Among the descriptive scenarios, the central one is the most probable scenario. Among the normative scenarios, the central one is the *most desired* scenario. The remaining scenarios in both groups are peripheral (Klasik, 1993).

The scenarios can be applied at different stages of the strategic plan building process, according to various roles they play in that process. Their place in the overall process is shown in Fig. 1.

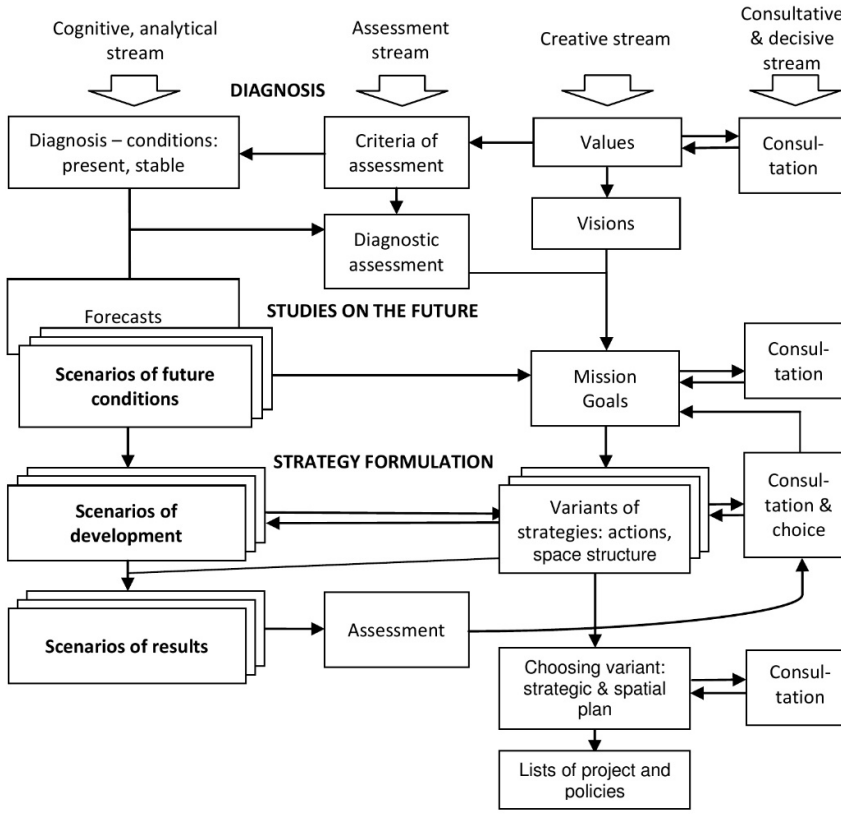

Fig. 1. Strategic plan building process

Source: Sołtys, 2008; 2014.

The stage of the study into the future is often called *forecasting*. Some variants of the strategic plan building process lack that stage. *Scenarios of future conditions* help recognize the possible scope of future conditions for changes, and also recognize any other potential problems. The conditions for the changes are determined by the outer situation, and the aspects inside the territory that have an influence on its development. To recognize that, the most adequate scenarios are the exploratory, descriptive scenarios. In some cases, descriptive, anticipatory scenarios can be applied to find out if the hypotheses that concern the future are likely and, if they are, in which situations.

At the stage of formulating a strategy, one of the main roles of *scenarios of development* is the formulation of possible development variants in which steering actions are reflected. The other roles of scenarios apply to various aspects of development:

1. Verification of the reality and conditions for the achievement of strategic solutions planned without an application of the scenarios;

2. Recognition of phases in the development of socio-economic and spatial structures appearing at various stages in the development process and the assessment of those structures in terms of:

a) The degree of harmony and goal achievement,

b) The susceptibility to further changes and flexibility concerning various development options,

c) The extent to which they favour the utilisation of opportunities and avoidance of threats;

3. Analysis of possible evolutionary paths of the territory, in order to:

a) recognize critical moments at which alternative developmental paths form, and define the last possible moment for strategic decision making that would decide about the choice of a further path,

b) recognize the distribution over time of the necessary expenditures, and the obtained effects for optimization of the investment project order,

c) recognize future problems (to seek solution to those);

4. Verification of the efficiency of the proposed policy.

Scenarios of results identify results of strategies and other variants of changes in order to assess them, e.g. regarding the goal achievement (Sołtys, 2014).

At the strategy formulation stage, most of the mentioned scenario types can be applied:

1. Exploratory – created for each scenario of conditions. Those scenarios can be built as descriptive scenarios, which enables predictions of more probable processes or normative scenarios of a desired future, which enables one to achieve a higher level goal;

2. Anticipatory, normative – starting from desired, consistent future structure images (designed without the application of a scenario) as the structures that best achieve the goals.

Scenarios enable planners to discover that some structures designed without using scenarios are difficult to achieve due to the formation of defective stage structures and the powers of processes that enforce unwanted changes. Exploratory scenarios reveal the possible states conflicting with the purposes and the processes leading to them, which can contribute to a search for preventive measures (Sołtys, 2014).

3. APPLICATION OF SCENARIOS IN REGIONAL PLANNING IN POLAND

Scenarios are rarely applied in regional planning in Poland. With a total of 16 regions in Poland, they have been prepared only in 5 in the plans listed in the Tab. 2. There are also: a vision, and a description of threats in the Łódź region, which

are similar to scenarios and they were also considered in the article. In the Spatial Development Plan for the Pomorskie region, there are models of regional spatial structure prepared as the results of various interventions into the processes shaping the space. Those models were prepared in a manner resembling the building of scenarios, so they were also considered in the article.

Table 2. Regional plans including scenarios or similar elements

Region	Kind of plan	Year of adopting the plan	Number of scenarios	Comments
Dolnośląskie	SDPR	2014	2	2 sentences only
Łódzkie	SDPR	2014	–	Vision and threats describing – similar to scenarios
Małopolskie	SDPR	2011	4	Number includes the basis scenario
Mazowieckie	Strategy	2013	4	–
Podkarpackie	Strategy	2013	3	–
Pomorskie	Strategy	2012	4	–
Pomorskie	SDPR*	–	4	Models of the spatial structure as effects of the variant interventions into the processes shaping the space – similar to a scenario

*SDPR – Spatial development plan for region

Source: Paturalska-Nowak (main designer), 2010; Korzeń & Wałęga (main designers), 2014; Sepioł (main designer) *et al.*, 2017; Sejmik, 2012; 2013a; 2013b.

In the Spatial development plan for the Małopolskie region, the scenario method was described using the following elements:

– Trends (22 variables in 5 fields, for each variable: assessment in 4 categories, description of the dynamics of trends, and the proposed reaction);
– Base scenario (without changes to the policy);
– Three alternative scenarios;
– Impact of the scenarios versus desirable vision – comparison;
– Assessment considering which reforms and regional actions are needed for the execution of the scenario leading to the desirable results.

Three alternative scenarios have been prepared: (A) Metropolitan development; (B) Development of regional centres; (C) Development of local centres. Those scenarios are described in a table in four fields:

– Demographic: scale and model of migration, population growth rate ordered by the type of settlement structures (e.g. metropolitan areas, regional centres, small towns);

– Functional: access to higher level services, intraregional disparities;
– Economic: economic development, efficiency;
– Environmental: demand for energy, transport, and land.

For each of those fields there are between 1 and 5 variables, totalling 11 to 14 variables for each scenario. Some variables are the same for each scenario; some are not, e.g. some location-specific ones. The base scenario is defined as being similar to one of the alternative scenarios. Using only the tabular record of the content it is not possible to show any cause-and-effect relationships.

The planners assumed that the most probable territorial development of a region will be similar to scenario A, which is indeed economically effective, but unfavourable for the majority of its inhabitants, and for the greater part of its territory. Also some elements of scenario C offer high implementation plausibility due to their support of current trends and spontaneous processes. The authors believe that spatial development policy of Małopolskie should be based on the preference for scenario B, which has the most advantages and relatively few disadvantages. At the same time, not only does it differ the most from the simple continuation of trends, but sometimes even requires them to be discontinued. That means that it requires the most decisive public intervention. What is more, it requires a certain revolution of the minds regarding the idea that not everything has to be located in Cracow, that a certain package of deglomeration and valuation, including symbolic activities, is needed. Scenario C carries the most serious threats in the form of Małopolskie losing its competitive position (Sepioł, 2017).

In the Spatial development plan for the Dolnośląskie region, the following scenarios were considered:

– Favourable conditions for the socio-economic development of the region, and favourable development conditions in Poland and the EU;

– Harmonizing the development of the region in the situation of negative development trends in Poland and in Europe, as well as reducing investment opportunities, and carrying out modernisation activities.

The adoption of national strategic documents is the basis for choosing scenario 1 for visions and further considerations.

In the spatial development plan for the Łódzkie region, the vision of spatial development, resembling a scenario, was developed. Two phases were defined:

– In the first phase, it was assumed that the existing polarisation of development would increase, and the most dynamic development and concentration of development factors will take place in Łódź and the Łódź Agglomeration;

– In the second phase, in the long-term perspective, it was assumed that the socio-economic growth of the central part of the region, through diffusion, would stimulate the development of the remaining area of the region. There would appear a significant increase in the potential of large urban centres that

would play the role of regional growth poles, and prevent the marginalisation and peripheralisation of areas outside the Łódź Agglomeration (Paturalska-Nowak, 2010).

A text concerning the threats which might negatively affect the fulfilment of the vision is also similar to a scenario.

In the strategy for the development of the Mazowieckie region, four scenarios were developed, defined as a combination of values of two variables: competitiveness and cohesion – as in Fig. 2.

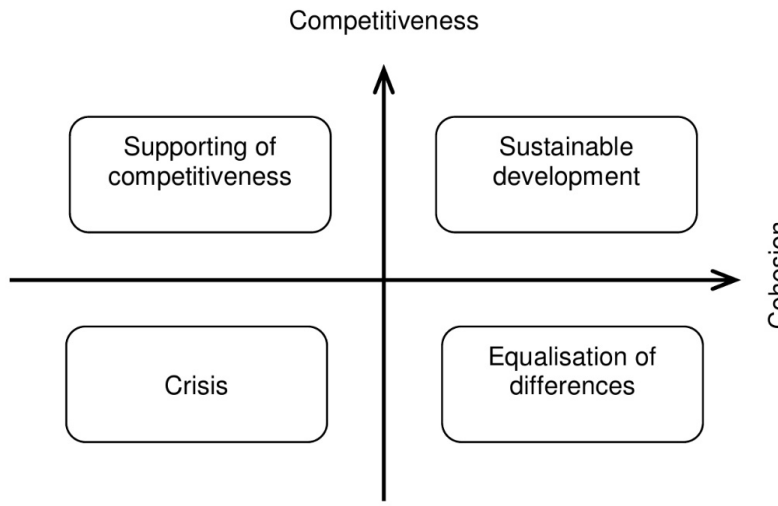

Fig. 2. Definition of the scenarios in the strategy for the development of the Mazowieckie region
Source: Sejmik Województwa Mazowieckiego, 2013, p. 46.

Each scenario was defined in text and in a table. The centre–peripheries relations were revealed. Some causal relationships were indicated in the text. Trends were described in the tables in the following fields: industry & production, economy, space & transport, society, environment & energy, and culture (Sejmik Województwa Mazowieckiego, 2013).

In total, there are 7 to 16 variables in each scenario. Some of them are the same for some scenarios and values, some of which are specific.

In the strategy for the development of the Podkarpackie region, development factors (9 external and 5 internal) were indicated, but the authors stated that the programming of regional development based on forecasting the impact of so many factors is not rational. In that situation, based on the use of the Delphi method, three main development factors were established as in Tab. 3. Three scenarios were developed, defined as a combination of values of those three factors as in Tab. 3.

Table 3. Definition of the scenarios in the strategy for the development of the Podkarpackie region

Variables	Scenario of opportunities	Intermediate scenario	Scenario of threats
Investment (external & internal)	+ (increases)	– (no change)	– (no change)
External funds for development	+ (high)	+ (high)	– (high volume not available)

Source: Sejmik Województwa Podkarpackiego, 2013, modified by the author.

The scenarios were described in points 13 to 20. Each point consisted of one, sometimes two sentences. In most points, more than one variable was described. In most points, causal relationships between variables were indicated.

On the basis of the analysis of the external and internal situation of the region, it was assumed that real and possible development of the region is based on the scenario of opportunities, which is the most desirable one. It predicts stable, sustainable, and harmonized socio-economic growth of the region. That scenario was the basis for outlining the vision of the region's status in 2020.

In the strategy for the development of the Pomorskie region, four scenarios were defined as a combination of the values of two variables: funds for development, and transport accessibility (Fig. 3). In many sentences, causal relationships between variables were indicated.

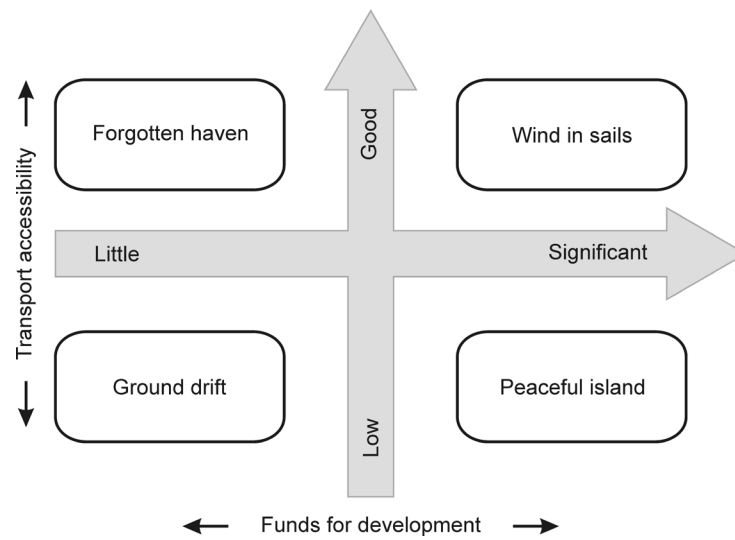

Fig. 3. Definition of the scenarios in the strategy for the development of the Pomorskie region
Source: Sejmik Województwa Pomorskiego, 2012, p. 19.

Those scenarios were considered in the vision envisaged in the spatial development plan of the Pomorskie region. The dilemma of the scale of the intervention by national and regional authorities into the processes shaping the space was considered for the best, most desirable scenario called "wind in sails". Three approaches were considered: passive, reactive, and active. The effects of those approaches were analysed by building three hypothetical models of the regional spatial structure, treating the model of the present structure as a starting point. The effects were described (mainly as processes) and presented in the cartographic form as the models of spatial structures. The active approach and its corresponding model were chosen (Sejmik Województwa Pomorskiego, 2016). The process of analysing the effects of the three approaches, and building spatial models was similar to creating scenarios.

4. SCENARIO EVALUATION AND DISCUSSION

The analysed scenarios do not fully fit the definition of a scenario. They describe states and processes, yet altering throughout a whole scenario, without any changes the trends or stages of the described processes (apart from the assumptions for a vision similar to very short scenarios in the Łódzkie region), and especially without sequences of events presented in a timeline. There are only short sequences of events in many separate sentences; the longest sequence contains three events. The biggest number of linked events in one sentence is equivalent to four (three of those events affect the fourth one). The most causal relationships were presented in the Podkarpackie region, many were also indicated in the Pomorskie, and less so in the Mazowieckie region. There were no causal relationships in the Małopolskie region due to a tabular layout. It is not always possible to recognize which contents are the result of intuitive simulations of processes as logical sequences of events, and which are rather authors' opinions about the future, adjusted to the character of a given scenario. The deficiency of sequences of events may result from the fact that more synchronous processes than diachronic events are described in the texts analysed. That deficiency is not a serious weakness (apart from the non-compliance with the definition), because the scenarios were created and have fulfilled their roles in creating the strategies. However, had there been more sequences of events, the scenarios would have been more convincing and it would have been easier to formulate strategic actions, as incorporated in the series of events leading to the goals. Presumably, we have to accept a less restrictive approach to the definition, especially that: a scenario is sometimes defined as a vision of the future (Klasik (ed.), 1993), and the deficiency of the sequences of events occurs in many scenarios created at the local level.

The place of all scenarios analysed in the plan building process is between the diagnosis (in some documents named otherwise) and the formulation of goals. In the: Podkarpackie, Pomorskie, and Dolnośląskie regions there is also a vision between formulating scenarios and goals.

Those are scenarios of both future conditions and development, therefore they combine two kinds of scenarios presented in Fig. 1. In most scenarios, it is assumed (or it is possible to guess) that those were scenarios with a strategy, but not yet described. In the Mazowieckie and Pomorskie regions some directions of politics are mentioned. The scenarios do not directly serve the formulation of strategic actions embodied in the sequences of events due to the lack of those sequences.

The roles of the scenarios are described in the analysed plans. In Małopolskie, the scenarios are used for comparing their impact and expected vision, and then they help to assess which reforms and regional actions are needed for the execution of the scenario leading to the expected vision (Sepioł, 2017). In the Podkarpackie region, the scenarios were the basis for outlining the vision of the region (Sejmik, 2013). In the Mazowieckie region, the strategic goals have been subordinated to the priorities of regional development, expressed in the sustainable development scenario. The authors of the strategy stated that in order to achieve the goals, the possible changes of the conditions of development described in other scenarios should be considered, with particular emphasis placed on the scenario of supporting competitiveness (Sejmik, 2013). In the Pomorskie region, the roles of scenarios were described as support for strategic decision-making and optimal targeting of interventions in a manner leading to the fulfilment of the most expected directions of changes in the region. That would allow to maximize positive effects, regardless of how the key factors affecting the situation would form in the Pomorskie region (Sejmik, 2012).

No scenario was used to assess the stage structures (apart from the Łódzkie region), and evolutionary paths because there are no long-term event sequences presented in the timeline as an evolutionary path.

The approach to the use of scenarios consisting of choosing or not them varied between the regions. In the Dolnośląskie region, referring to the national planning documents, an extremely positive scenario was chosen for further consideration, with the realisation that some tendencies and problems from the negative scenario might appear. In the Podkarpackie region, too, the desired scenario was chosen as the basis for the formulation of the vision, recognizing it as real and possible. On the other of the spectrum, the best scenario in Małopolskie was assessed as the most different from the current trends, requiring strong public intervention.

One of the greatest problem applies to the use of scenarios and a strategic approach in public planning (strategic, including spatial). The reason for the problem is that: a good strategic plan should be flexible and open to various future sce-

narios. It means that in a strategic plan it is necessary to create strategy variants (or main strategy and contingency strategies) – for various scenarios. It is common, though, that one strategy is prepared for a scenario chosen as the most probable or the most desirable. Especially in a spatial plan, one state of structure must be determined, variants and conditional statements are undesirable, mainly due to legal provisions, according to which the plans for smaller territorial units must be compatible with the plan for a larger territorial unit.

It is, however, possible to include uncertainty without using scenarios. According to a Polish legal act (Ustawa, 1993), the spatial development plan of a region should be evaluated at least every four year. If the conditions indicate that there is a need for a change, the plan is updated. A similar method is used for a regional development strategy. Applying that way is probably one of the reasons why scenarios are very rarely applied in regional planning.

There are two scenarios in the Dolnośląskie region, three scenarios in the Podkarpackie region, and four scenarios in every other region (including a basic scenario in Małopolskie). The number of scenarios from three to four is recommended in literature for intuitive logic methods (e.g. Bradfield *et al.*, 2005).

There are various types of scenarios (from the point of view of the scale of their preference) and their definitions. In the Dolnośląskie region, two extreme scenarios were considered. In the Podkarpackie region, the most common differentiation was applied (the scenario of opportunities, an intermediate scenario, and a scenario of threats), but in the intermediate scenario the values of variables were not average, but there were combinations of positive and negative features (values of the variable). In other regions, the criteria for the differentiation were even more interesting – intermediate scenarios in Mazowieckie and Pomorskie were not called intermediate and they were also defined by combinations of positive and negative values of the variables. The following variables defining scenarios in the Podkarpackie and Pomorskie regions were partly similar or even the same: funds for development and transport accessibility. In the Małopolskie region, the kind of developing settlement centres (metropolitan, regional or local) was the criterion for scenario differentiation.

The methods of scenario building were described only partially, as a main procedure. In most of the regions, the procedure included phases: determining the variables, creating their combinations, defining scenarios, and the main phase: essential creating (writing) of scenarios. The specific methods for that final phase were not described, but it is obvious that the intuitive logic method was applied, and that the scenarios called exploratory in the theory were created. As it was stated at the beginning of this chapter, thinking in terms of cause-and-effect supported to various degrees the creation of scenarios, mainly for fragments of them. The scenarios were created by planners and consulted as part of the strategy consultation process. Minor changes were introduced as a result of consultations.

For the recording of scenarios and their presentation in the Małopolskie region, only a table was used for all the scenarios altogether. In the Mazowieckie region, scenarios were described in a text in sentences and tables, a separate table for each scenario. In the Podkarpackie and Pomorskie regions, there was only text, in Podkarpackie in points; most points contained only one sentence, sometimes 2–3 sentences. In the Dolnośląskie region, there was only a short piece of information: one sentence for one scenario. Each of those manners of presenting scenarios has advantages and disadvantages. One table for all scenarios is a good way of comparing them. It makes similarities and differences between the scenarios more legible, but it is not possible to show the causal relationships in a table. On the other hand, a running text is worse for comparing scenarios and better for describing causal relationships, but not the best. Those relationships are not exposed. There are also other ways of presenting (flowcharts and cartographic images), but none of them was used in the analysed documents. Flowcharts are the best way for showing the causal relationships.

5. RECOMMENDATIONS

The recommendations for regional planning are possible on the basis of the result of the Research Project[1] at the level of a gmina (community, municipality), and later experiences. The methodological concept developed in this project was then improved (Sołtys, 2008; 2014). The latest scenario development according to this concept, with some simplifications, was made in 2017 as part of the Foresight for Płock (not published). Many elements of this concept can be transposed from local to regional planning.

The merits of the recommended methodological concept include using the same set of variables for each scenario variant. The first phase of the recommended procedure – the structural analysis of a given spatial system – includes a selection of the variables, and defines relations between them. It allows one to understand the mechanics of change. The variables are seen as the features describing the elements of a territorial system and its surrounding, which can take different states and which are significant to the development of the system. Significant changes of variables are defined as events. The next steps in the structural analysis are: ordering of variables (recognition of influential, intermediary, and dependent) and identification of key variables (Sołtys, Lendzion, 1999). For simplification, the relationships between variables can be identified only for key variables – strongly aggregated or the most significant.

[1] KBN 7T07F02914 *Scenarios as an element of a method for description of conditions and directions in local territories' spatial development,* 1998–99, Jacek Sołtys, co-investigator Jacek Lendzion, Gdansk University of Technology, Faculty of Architecture (Sołtys, Lendzion, 1999).

Making assumptions is the next phase of the procedure. Some of the assumptions are general, describing the character of scenarios (e.g. optimistic, pessimistic, sustainable development, or metropolitan development). Remaining assumptions depend on the type of scenarios, for example, in exploratory ones, hypotheses for states of the independent variables can be made (Sołtys, 2014). States of variables constituting assumptions should form coherent, probable combinations.

The phase of scenario construction is multi-level and comprises:

1. Construction of the so-called main lines of the scenarios – sequences of events using a small number of key variables;
2. Review, evaluation, and verification of the main lines based on various criteria, e.g. probability and importance, for showing a range of possible developments;
3. Selection of several main lines that are quite probable, different from each other, and most characteristic with regard to the range of problems and possible actions;
4. Development of full scenarios (rather quasi-scenarios than proper ones) containing all variables, for the chosen main lines, by intuitively defining states or variables, or the direction of their changes.

The final phase of the proposed method includes the analysis, comparative review, and scenario verification (Sołtys, Lendzion, 1999). The methods for recording scenarios depend on their type, the phase of the procedure, and the goal of the recording (Tab. 4). Draft scenario recording depends mainly on the subjective preferences of the authors. In other cases, clarification of records is very important. In the planning practice, tables and descriptions of scenarios in a running text are the most common (Sołtys, Lendzion, 1999).

Table 4. Methods for recording scenarios according to their goals

Goal	Methods for recording scenarios	Specific considerations for use
Draft	Flowcharts Tables with text Tables with chart overview	Scenario formulation by author or team of authors Verification, improvement
Presentation:	Several methods for recording used in parallel and including:	
– main lines	– charts and graphs	Illustration of scenario ramification
	– tables	Making the differences more legible
	– text description in sentences – flowcharts	Description, illustration of the cause and effect relationship
– expanded scenarios	– tables – text description in sentences	Description of states of variables
	– maps	States of spatial structures

Source: Sołtys, 2008; 2014.

Cartographic images are an appropriate tool for creating spatial development scenarios. They can illustrate stage states only (especially through series of images) or also illustrate processes: e.g. settlement nodes growing fast or slow, areas of urbanisation and depopulation, areas of rapid or slow economic growth, and areas of regress. In flowcharts and cartographic images, the graphic distinction of elements as influential and dependent makes scenarios easier to understand. The influential elements may be further diversified according to subjects that manage them. Dependent elements may also be diversified by indicating their connection to the proper influential elements (Sołtys, 2014).

One element of the recommended concept has been observed in most documents analysed, that is making assumptions defining the character of scenarios by combinations of states of independent variables. The principle of using the same set of variables was only partially fulfilled – most variables (but not all) were the same in each scenario variant in the regions. There were no structural analyses, and no main lines. One of the reasons for those deficiencies was the fact that the flow of information from science to planning practice was poor. The flow occurred mainly through the participation of scientists in planning, and the use of the best-known literature. The low-edition literature is unknown. The flow of information and methodical concepts occurs mainly at the local or regional level, and less frequently between them.

Labour intensity is an obstacle disabling some methodological concepts. For example, the application of the full method described by Godet (2010) takes 12-18 months. Complexity is another obstacle. Creating chains of events by considering all relations between various variables is impossible without a computer aided support.[2] Therefore, building sequences of events is recommended as limited to key events creating main lines.

Apart from the concept described above, there are other methods and tools of preparing and applying scenarios for cities and regions, for example the one described by Oanaa *et al.* (2011), von Wirth *et al.* (2013), Avin (2016), Güell, and The Futures Academy. Stojanović, Mitković & Mitković (2014) stated that there is a whole spectre of methods and tools with no general guidelines for the implementation of the appropriate method in urban planning. The methods are flexible, and can be adapted to the specific task situation. That statement may also be appropriate for regional planning. Based on literature, Amer, Daim & Jetter (2013) stated that consistency and plausibility are the most important scenario validity criteria, which are the deciding conditions for assessing the credibility of scenarios. Creativity and relevance are also important criteria. There are formal tools for analysing consistency and plausibility, but they are specific for quantitative methods. Plausible "scenarios should represent a logical path from the present and past

[2] Using quantitative methods when many relations between variables are non-deterministic is a separate complex problem not discussed in this article.

[…] A good scenario should […] be relevant to the issues of interest, colorful and surprising, and it should bring a new perspective to the problems. It should also describe the generic different futures rather than variations of the same theme" (Stojanović, Mitković, Mitković, 2014, p. 89).

From a practical standpoint, it is important for a method to be effective and efficient (scenarios arise at a given time), and to serve a purpose that depends on the place and role in the planning process. "[…] the insights and learning arising from the process are more important that the reliability of the content of the end product, the scenarios" (Bradfield *et al.*, 2005, p. 806). This results from the fact that the role of scenarios is not to predict the most probably future, but to reduce complexity (Stojanović *et al.*, 2014) and uncertainty, as well as to provoke thought raising awareness of the possible future variants (Sołtys, 2014).

6. CONCLUSIONS

Scenarios are rarely applied in regional planning in Poland: out of 16 regions, they were prepared in 5. Those scenarios did not fully meet the definition because of the lack of the sequences of events presented on a timeline. The scenarios were formulated using the intuitive logic method. The place of the scenarios in the plan building process is between the diagnosis and goals formulation. Those were scenarios of both future conditions and development. They described both the surroundings and the internal situations in the regions. In most regions, there were four scenarios. Many of the scenarios were defined in an interesting way: especially in the intermediate ones, the values of variables were not average, but there were combinations of positive and negative values of the variable. In some regions, one scenario was chosen for development, in some not.

There were methodological problems of using scenarios, both in regional and local planning. For each variant of a scenario, the proper variant of a plan should be prepared. In the practice of planning, commonly one variant of a plan is prepared.

It is recommended to apply the following elements of scenario methods:

– Using the same set of variables for each scenario variant, identifying relations between at least key variables (the most significant, strongly aggregated), and preparing the so-called main lines of the scenarios as sequences of events using a small number of key variables;

– Using various methods for scenario recording and presentation, e.g. tables for comparing scenarios, flowcharts for showing the causal relationships, and series of cartographic images for scenarios of spatial development.

The following future research would be desirable:

– Empirical – critical analysis and assessments of scenario application in the practice of regional planning in other countries;

– Theoretical – systematisation of empirical cases, modification of the methods, and searching for new methods, e.g. quantitative.

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