Trajectories of the Development of Small Towns in Terms of the Urban Resilience Concept — the Demographic Dimension

Barbara Konecka-Szydłowska

Adam Mickiewicz University in Poznań, Poland

Abstract

The paper aims to determine the trajectories of the development of small towns in terms of the urban resilience concept in a demographic dimension. It makes it possible to answer the question of how towns adapt to contemporary socio-economic processes. The subject of the research is a set of small towns in Wielkopolskie Voivodship. The period of the study involves the years 2003–2016 which enables us to grasp the changeability of development conditions related to transformation, globalization, and integration processes as well as the economic crisis. The research is conducted with the use of indexes of change dynamics with a fixed basis. Analysis provides for a diversified size structure of small towns, their location and administrative functions performed. In 2003–2016 the trajectories of the resilience of Wielkopolskie small towns were diversified. The basic criterion influencing their course is the size structure of a given center and its location, whereas administrative functions are of minor significance. The smallest towns (of a mixed type — i.e., roller-coster with elements of avant-garde type) seem the most resistant to external disturbances, have a higher degree of resilience and thus adapt better to contemporary socio-economic changes in the demographic dimension. An important external disturbance which clearly modifies the values of the selected indexes of resilience and vulnerability dynamics as well as the course of the trajectories of the development of towns with a diversified size structure was an economic crisis strengthened by globalization and integration processes.

Keywords: urban resilience, demographic dimension, trajectories of development, small towns, Wielkopolskie Voivodship

JEL: J00, J11, R00, R23

Introduction

The concept of "resilience" was introduced to regional and local development as part of the discussion on determinants and objectives of sustainable development and the adaptation to climate change (Simmie and Martin 2010). However, the application of this concept quickly became wider, and "resilience" started to be generally interpreted as the ability of entities — e.g., towns, to escape the imbalance state or a development shock caused by various factors (Drobniak 2014). In terms of local development, these factors include the following disturbances: the system transformation going on since 1989, globalization, integration, and the economic crisis which was the consequence of the global financial crisis (Bartosiewicz and Marszał 2011; Drobniak 2015; Foster 2006; Heffner 2008; Parysek 2005).[1] A new research concept of "urban resilience" provides, based on the

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1. See also: Członkostwo Polski w Unii Europejskiej a rozwój małych miast — ujęcie przestrzenne. Problemy Rozwoju Miast, no. 3, year 2014; Funkcjonowanie miast małych w systemie osadniczym Polski w perspektywie 2033 r. — rekomendacje dla KPZK. Ekspertyza wykonana w ramach Eksperckiego Projektu Koncepcji Przestrzennego Zagospodarowania Kraju do roku 2033 (EP KPZK). K. Heffner, MRR, Warszawa 2008.

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analysis of a town's development path, a way of determining the level of resilience and vulnerability of the town's economy to occurring disturbances. The logic of the evolutionary approach of the urban resilience is that towns evolve continuously under the influence of various external factors and change their development paths (Batty, Barros, and Alves 2004). A resilient town adapts or constantly improves its long-term development paths. Likewise, a vulnerable town remains closed in old structures decreasing its level of path development (David 2005; Martin 2010; Martin and Sunley 2006). In the source literature, the issue of urban resilience as a method for studying resilience and vulnerability of towns was applied in the works of, for example Hill et al. (2012) while analyzing American towns, Drobniak et al. (2014), devoted to the study of European industrial towns, Drobniak (2015) in the research on selected large Polish towns, Drobniak and Plac (2015) devoted to the investigation of the resilience of post-industrial towns of the Górnośląska agglomeration, Sucháček (2016) on the resilience of Czech towns, or Konecka-Szydłowska (2018) describing the resilience of the small county centers of Wielkopolskie Voivodship. It should be emphasized that the issues discussed most often so far have been those of the resilience of towns in an economic aspect with only certain references to the demographic dimension.

This work aims to present the trajectories of the development of small towns in terms of the urban resilience concept in the demographic dimension. An assumption has been adopted that the demographic situation of a given center is mainly the derivative of transformations occurring in the town's economy. Therefore, the analysis of a demographic situation makes it possible to a large extent to answer the question of how the economy of small towns adapts to contemporary processes of socio-economic changes.

The main subject of the research is a set of 89 small towns in Wielkopolskie Voivodship, considered against the background of the entire regional system of towns. Due to the lack of complete statistical data, the analysis excludes four small towns which were granted town rights in 2014–2017. The investigated period is relatively long, because it involves the years 2003–2016. The adopted time horizon enables us to capture the changeability of the factors of local development related to the processes of the system transformation, globalization, integration, and the economic crisis. The scheme of the research procedure includes the following stages:

- a general characteristic of the system of Wielkopolskie Voivodship towns
- the determination of the resilience and vulnerability of small towns in a demographic dimension
- the identification of the trajectories of small town development and an attempt to classify them according to the degree of the influence of socio-economic processes

The study into the resilience of small towns in the demographic dimension is conducted with the use of indexes of change dynamics with a fixed basis. The analysis takes into consideration the diversified size structure of small towns, their location, and administrative functions performed.

1 System of towns in Wielkopolskie Voivodship

The level of population development in Wielkopolskie Voivodship is determined by the population size and its dynamics. Wielkopolskie Voivodship has 3,4 million[2] of inhabitants (as of the year 2016) and belongs to the moderately populated voivodships (the population density is 116 inhabitants per km^2 with the national average of 123 inhabitants per km^2). The urbanization level of Wielkopolskie Voivodship determined by the number of towns and the share of town inhabitants in the general population is closely related to the population size. In 2016 there were 112 towns in Wielkopolskie Voivodship with a polycentric pattern of five hierarchic levels.[3] The highest position in the hierarchy is held by Poznań—the capital of the voivodship—a node of national importance, supra-regional centers are Kalisz and Ostrów Wielkopolski; regional ones are

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2. [In the journal European practice of number notation is followed—for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style).—Ed.]

3. See: Wielkopolska 2020. Zaktualizowana Strategia Rozwoju Województwa Wielkopolskiego do 2020 [Wielkopolskie Voivodship Development Strategy up to 2020]. M. Borówka et al., Zarząd Województwa Wielkopolskiego, Poznań, 17 grudnia 2012, [@:] http://wrpo.wielkopolskie.pl/system/file_resources/attachments/000/000/516/original/Zaktualizowana_Strategia_RWW_do_2020.pdf?1432662783.

Gniezno, Konin, Leszno and Piła, The next levels include the sets of county towns (28) and local centers (77 towns). In the system structure of Wielkopolskie towns a sub-system of the Poznań agglomeration towns — i.e., of the Poznań county[4] is clearly distinguished. This sub-system involves 11 towns — i.e., the main town — Poznań, performing a nodal function and 10 towns in the direct influence zone of Poznań, closely linked with it functionally. Two of these towns: Luboń and Swarzędz are medium-sized, the remaining eight are small towns with less than 20 000 inhabitants, including six with less than 10 000.

In terms of size, the regional system of Wielkopolskie towns can be considered in the pattern of three size classes. They include: a class of large towns (over 100 000 inhabitants), a class of medium-sized towns (20 000–100 000) and a class of small towns (up to 20 000) with a diversified internal structure. It should be emphasized that among the 112 towns of Wielkopolskie Voivodship, only two belong to the class of large towns with the highest socio-economic potential: Poznań (545 700) and Kalisz (103 400). These towns jointly account for 34% of the voivodship's urban population. The class of medium-sized towns consists of 18 which account for 36,5% of the total voivodship urban population. In this class, five towns belong to the size range from 50 to 100 000 inhabitants, the remaining 13 towns have from 20 000 to 50 000 inhabitants. The class of small towns is the most numerous, because it comprises 92 centers, but accounts for only 29,5% of the total voivodship urban population. This class is internally diversified and consists of four size sub-classes: towns with 10 000–20 000; 5 000–10 000; 2 000–5 000 and towns up to 2 000 inhabitants (tab. 1). The most numerous group of small towns of Wielkopolskie Voivodship includes towns from 2 000 to 5 000 inhabitants which account for nearly 7% of the urban population. In 2016 in Wielkopolskie Voivodship there were 41 such centers. The ratio of the population of the small town — Chodzież (19 299 inhabitants) to the smallest one — Dobra (1 427) is 13,5 : 1.

Tab. 1. The population of Wielkopolskie towns in size classes in the years 2000 and 2016

Town size (population)	2000			2016			Dynamics of population 2000–2016[b]
	Number of towns	Popu-lation	Share in total (%)[a]	Number of towns	Popu-lation	Share in total (%)[a]	
Over 100 000	2	692 358	35,8	2	649 053	33,9	93,7
50 000–100 000	5	364 415	18,8	5	357 936	18,7	98,2
20 000–50 000	13	331 204	17,1	13	340 949	17,8	102,9
10 000–20 000	17	253 153	13,1	18	264 300	13,8	104,4
5 000–10 000	22	153 342	7,9	21	150 386	7,9	98,1
2 000–5 000	39	122 337	6,3	41	132 139	6,9	108,0
Up to 2 000	11	19 316	1,0	11	18 859	1,0	97,6
Total	109	1 936 125	100,0	112	1 913 622	100,0	98,8

Source: Own calculation based on data published by Central Statistical Office of Poland
[a] Share in total urban population
[b] Year 2000 = 100

In the years 2000–2016 there were minor changes in the number of particular size classes of towns, the largest in the class of small towns which grew from 89 to 92 centers. An increase in the number of small towns resulted from granting town rights (Konecka-Szydłowska 2015). In the last period town rights were granted to: Dobrzyca (in 2014), Chocz (in 2015), Jaraczewo (in 2016), and Opatówek (in 2017), which caused an increase in the number of towns to 113 (the state in 2018). In the years 2000–2016, the population of small towns rose from 548 148 to 565 684 (the dynamic indicator at the level of 103,2%) and at the same time the share of the population of small towns in the total urban population increased from 28,3% in 2000 to 29,5% in 2016.

In the system of Wielkopolskie towns there is a hierarchy compliant with the three-tier administrative division of Poland, effective since 1 January 1999: a voivodship center, county and commune centers. Poznań, capital of the voivodship and the seat of self-government authorities, performs the

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4. In this work the Poznań agglomeration area is identified with the Poznań County area (Kaczmarek 2008).
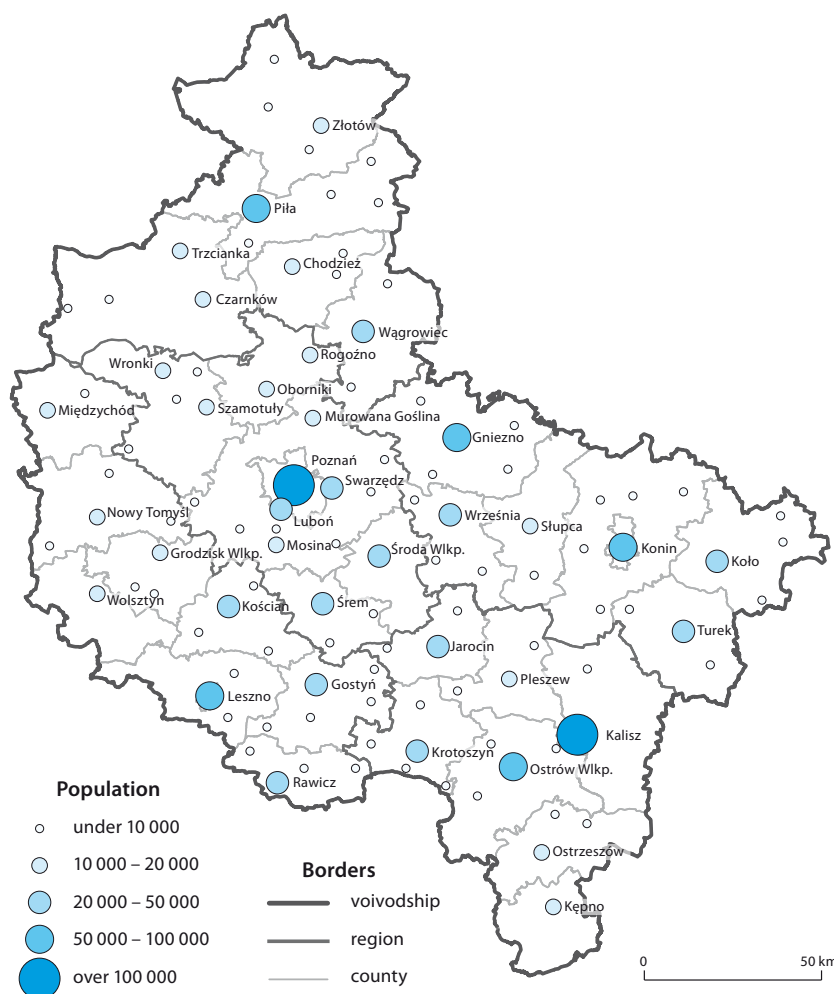
Fig. 1. Distribution and size of towns in Wielkopolskie Voivodship

most important administrative functions in the voivodship. There are 35 counties at the administrative level of the second tier including four county towns: Poznań, Kalisz, Konin, and Leszno. The remaining 31 are land counties which have their seats in both large and medium-sized towns and often small ones belonging to the size class of 10 000–20 000 inhabitants. In Wielkopolskie Voivodship 14 small towns perform the function of a county center, including two such centers in the Czarnkowski-Trzcianecki county (Konecka-Szydłowska 2009, 2016).

2 Attributes of the resilience and vulnerability of towns in the demographic dimension

In the research on resilience and vulnerability of towns within the urban resilience concept use is made of the assumption based on the systems approach. A town is understood as a complex, multidimensional system with adaptive capabilities (Drobniak 2015; Lang 2011). Such a system has certain attributes (characteristics) allowing entities (towns) to escape the imbalance state caused by various external factors. Currently, these factors include the following disturbances causing changes in urban systems already mentioned in the article: the system transformation, globalization, integration, and an economic crisis. In reference to the source literature, one can list specific attributes of an urban system (described by appropriate indicators) which can be applied in the process of measurement and assessment of the resilience and vulnerability level of towns in the economic or demographic dimension (Drobniak 2014, 2015; Godschalk 2003; Klein, Nicholls, and Thomalla 2003; Sucháček 2016; Walker and Salt 2006). The urban resilience as a complex and multidimensional system can be determined by the combination of the following attributes: adaptiveness, cooperation, variety, efficiency, redundancy and co-dependence. Their high value affects positively the urban

resilience level in the dimension analyzed and indicates its stronger immunity to external disturbances. Assuming that the attributes of urban vulnerability can be defined as the antonyms of resilience attributes, their set can be the following: inadequacy, fragmentation, excessive specialization, inefficiency, shortage, and divergence. A high value of the attributes of vulnerability indicates the susceptibility of a town to disturbances generated by the environment and negatively affects the urban resilience level in the dimension discussed. The urban resilience in the demographic dimension can be associated with the ability of a town to solve problems so as to make it possible to achieve a long-period of success – for example by the regeneration of human resources after the experienced disturbance—i.e., the disturbance which changed the previous demographic development path or by the maintenance or return to the state prior to the external disturbance (Drobniak 2015).

Particular attributes of urban resilience and urban vulnerability can be further described by appropriate partial (simple) indicators of inferential character. The inferential indicator is a certain real property (observable feature), which determines, i.e. gives an empirical sense to, an unobservable property of conceptual objects. The indicator method applied commonly in socio-economic geography is thus a way of a realistic conceptualization of reality (Babbie 2004; Czyż 2016; Nowak 2007). The urban resilience indicators are treated as the counterparts of so-called positive indicators, that is development stimulants; in turn, vulnerability indicators correspond with negative indicators—development destimulants. In the case of stimulants an increase in the indicator value is assessed positively and in the case of destimulants negatively. Destimulants are indicators of undesirable events from the demographic, economic, social or ecological point of view and are the symptoms of irregularities in the development process (Appenzeler 2011; Czyż 2016).

In order to assess the resilience and vulnerability level of Wielkopolskie small towns in the demographic dimension, traditional and commonly accessible indicators of dynamics with the fixed basis describing selected attributes of resilience and vulnerability were used (Drobniak 2014, 2015; Hill et al. 2012). The years 2003–2016 were selected as a comparative period. It is assumed that during this period the investigated towns were exposed to various influences from the surroundings, both positive and negative which were related to the processes of the system transformation, globalization, integration, and the economic crisis. It ought to be noted that the choice of indicators (especially in terms of urban vulnerability) was limited to a greater extent. First, it was determined by their logical dependence in relation to the attributes of resilience and vulnerability in the demographic dimension, and second, it resulted from the accessibility of long-term statistical data concerning the urban centers investigated.

Finally, in the research on the demographic resilience and vulnerability of Wielkopolskie small towns, a set of eight indicators assigned to a certain extent in a subjective way to selected attributes were used:
- the attribute of redundancy
  - dynamics of the population
  - dynamics of the birth rate per 1 000 inhabitants
  - dynamics of the registered number of persons per 1 000 inhabitants
- the attribute of efficiency
  - dynamics of the share of the working age population
  - dynamics of the number of married couples per 1 000 inhabitants

The attribute of redundancy indicates that town structures in the demographic dimension have the ability to ensure the additional elements of the system in case they started to disappear, were defective or temporarily unstable due to various external factors (e.g., an economic crisis). The attribute of efficiency is connected with the fact that town structures in the demographic dimension are competitive (effective) and have proper population potential ensuring constant development in the economic and social dimension as well:
- the attribute of shortage
  - dynamics of the death rate per 1 000 inhabitants
  - dynamics of the persons resigning from permanent residence per 1 000 inhabitants
- the attribute of inefficiency
  - dynamics of the share of the post-working age population

The attribute of shortage indicates that town structures in the demographic dimension lose the ability to ensure additional elements of the system as a result of a defect or temporary destabilization caused by various external factors (e.g., an economic crisis). The attribute of inefficiency is connected with the fact that town structures in the demographic dimension lose the competitiveness and population potential enabling effective development in the economic and social dimensions.

The analysis of the urban resilience and urban vulnerability in the demographic dimension takes into account a diversified size structure of small towns, their location and administrative functions performed. The diagnosis of the resilience and vulnerability of towns was conducted in the following sets of Wielkopolskie small towns: towns up to 2 000 inhabitants, 2 000–5 000 inhabitants, 5 000–10 000 inhabitants, 10 000–20 000 inhabitants, small towns of the Poznań agglomeration, and small county towns. Additionally, for comparative purposes, the resilience of the remaining voivodship towns with over 20 000 inhabitants (i.e., medium-sized and large towns, was examined).

3 Resilience and vulnerability indexes

The average indexes of the dynamics of resilience indicators of Wielkopolskie small towns were determined jointly in relation to two attributes: redundancy and efficiency, as expressed by five indicators. Resilience index in year t was defined as the average dynamics of five indicators:

$$(1) \qquad\qquad Y_t = \frac{1}{5} \sum_{i=1}^{5} x_{it},$$

where: Y_t is resilience index in year t, and x_{it} is dynamics of i-th indicator in the year t.
In the years 2003–2016 in the selected sets of Wielkopolskie towns, mean values of resilience indexes are diversified (tab. 2). In the entire period the highest mean values of resilience indexes were reported for the set of the smallest towns with up to 2 000 inhabitants — the mean indexes of dynamics at the level of 117. The lower mean indexes of the dynamics of resilience indexes at the level of 107–108 appeared in the sets of towns from 2 000 to 5 000 and from 5 000 to 10 000 and in small towns of the Poznań agglomeration. Whereas in the remaining sets of towns with over 10 000 inhabitants including small county towns, the mean indexes of the dynamics of resilience were the lowest and fluctuated from 95 to 118 (with an average of 104). A point of concern is that in the final period of the analysis, the values of indexes of dynamics did not recover to those in the initial period investigated. However, attention should be paid to the processes occurring during the transformation, which were observed in the direct vicinity of small county towns, related to the phenomenon of "micro-suburbanization," which, among other aspects, caused the change in demographic structures of rural areas adjacent to the county center (Heffner 2016; Kajdanek 2012; Konecka-Szydłowska 2012).

What is characteristic of all the sets of towns analyzed is a systematic decrease of the resilience index, clearly visible since 2010, which can be interpreted as the consequences of the economic crisis accompanied by globalization and integration processes. The results of these processes, as shown in other studies, can be phenomena related to a decrease in the number of marriages, birth rates and a limited inflow of people, which in consequence brings a general reduction in the population, including people of working age. For instance, a departure from familism, connected — e.g., with a decrease in the number of marriages and births results from the sense of insecurity in relation to economic conditions and lack of the state's support.[5] In turn, significant demographic changes consisting in the shift from high mortality, a short life span and large families to a longer life span, an aging population and families with a small number of children are ascribed to transformation and globalization processes (Kołodko 2009).

The mean indexes of the dynamics of vulnerability of Wielkopolskie small towns were determined in the same way as in the case of the resilience indexes — jointly in relation to the two

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5. See: Analiza kontekstualna i przyczynowa zmian rodziny i dzietności. Report by M. Duszczyk, A. Fihel, M. Kiełkowska, A. Kordasiewicz, and A. Radziwinowiczówna, Uniwersytet Warszawski, październik 2014, MIG/AGEING Studia i Materiały, no. 2, [@:] http://migageing.uw.edu.pl/wp-content/uploads/sites/36/2014/12/SiM_02.pdf.

Tab. 2. Resilience index in the analyzed sets of towns in the years 2003–2016

Town size (inhabitants)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Up to 2 000	100	114	113	122	134	131	127	119	117	114	110	112	113	114
2 000–5 000	100	104	106	113	121	113	118	111	106	108	102	100	99	98
5 000–10 000	100	104	106	114	123	119	117	113	107	107	103	103	102	104
10 000–20 000	100	99	104	110	118	116	115	108	104	100	98	98	97	98
Small towns of Poznań agglomeration	100	103	106	114	124	119	119	110	109	105	105	103	103	102
Small county towns	100	99	103	109	116	113	113	107	101	98	96	97	95	96
Over 20 000	100	98	104	107	114	112	112	108	103	100	99	98	99	99

Tab. 3. Vulnerability index in the analyzed sets of towns in the years 2003–2016

Town size (inhabitants)	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Up to 2 000	100	99	101	104	111	102	97	104	105	107	115	111	109	112
2 000–5 000	100	104	100	109	113	106	105	104	106	107	115	115	117	116
5 000–10 000	100	103	101	109	110	105	106	106	109	110	111	110	115	114
10 000–20 000	100	101	102	112	115	109	110	109	111	112	123	119	124	126
Small towns of Poznań agglomeration	100	106	106	111	111	107	104	105	108	106	114	109	115	113
Small county towns	100	101	103	112	117	109	111	110	113	113	125	120	126	127
Over 20 000	100	102	101	109	115	109	110	110	114	116	121	119	122	123

attributes: redundancy and efficiency, expressed by three indicators. The vulnerability index in year t was defined as the average dynamics of three indicators:

$$(2) \qquad Y_t = \frac{1}{3} \sum_{i=1}^{3} x_{it},$$

where: Y_t is vulnerability index in year t, and x_{it} is dynamics of i-th indicator in the year t. In the years 2003–2016 in the selected sets of Wielkopolskie Voivodship towns mean values of vulnerability indexes are diversified (tab. 3). Similarly, as in the case of the indexes of resilience, the most favorable (in this case relatively the lowest) indexes of vulnerability were reported in the set of the smallest towns — their mean index of dynamics was 105. In the sets of towns from 2000 to 5 000 and from 5 000 to 10 000 and small towns of the Poznań agglomeration, the indexes of the dynamics of vulnerability were less favorable, because they fluctuated in the entire period at the level of 108. In the towns with over 10 000 inhabitants, including small county towns, mean indexes of the dynamics of vulnerability were the highest and on average were at the level of 112. The growth of mean values of the indexes of dynamics was affected by systematically increasing indicators of dynamics of the share of the post-working age population which is indicative of population aging in larger towns. Similarly, unfavorable processes were observed in medium-sized and large towns in Poland (Drobniak 2016).

During the economic crisis in 2008–2010 in all the sets of towns a favorable trend of a decrease in the value of indicators was observed, then after 2011 their regrowth was noted. In the case of vulnerability indexes, the crisis was a peculiar "buffer." because it temporarily reduced and slowed the dynamics of these indicators whose growth from the demographic point of view should be considered unfavorable.

4 Development trajectories and the typology of towns in the demographic dimension

A synthetic summary of the analyses is given by trajectories of the development of small towns together with an attempt at their typology determined by the degree of influence of external disturbances on the resilience and vulnerability level of centers in the demographic dimension.

The calculation of mean values for demographic resilience indexes (variable x in the graph), and also mean values for vulnerability indexes (variable y), makes it possible to capture long-term development trajectories for particular towns. Trajectories presented in this way allow, on the one hand, analysis of the development dynamics and, on the other, make it possible to try to put a given urban center into the following categories of towns (types of towns):

- An avant-garde town, with a high value of resilience indexes and a low value of vulnerability indexes—these types of resilience trajectories can be considered immune to external disturbances.
- A roller-coaster town, with a high value of resilience indexes, and also a high value of vulnerability indexes—this type of the resilience trajectory shows high changeability in the demographic situation of a town which is strongly influenced by external disturbances, nevertheless it regains previous parameters.
- A sunken town, with low values of resilience indexes and at the same time high values of vulnerability indexes—this kind of unfavorable combination of dynamic indicators shows that a given urban center usually faces demographic stagnation after external disturbances.
- An island town, an example of an urban center when both resilience and vulnerability indexes have low values—it is a town with a relatively closed economy which is not affected to a significant extent by external disturbances.
- A mixed-trajectory town shows the features of different categories of towns—e.g., in the first period a center exhibits features typical of a roller-coaster town, and then of an avant-garde town (fig. 2) (Drobniak 2012, 2014, 2015; Konecka-Szydłowska 2018; Sucháček 2016).
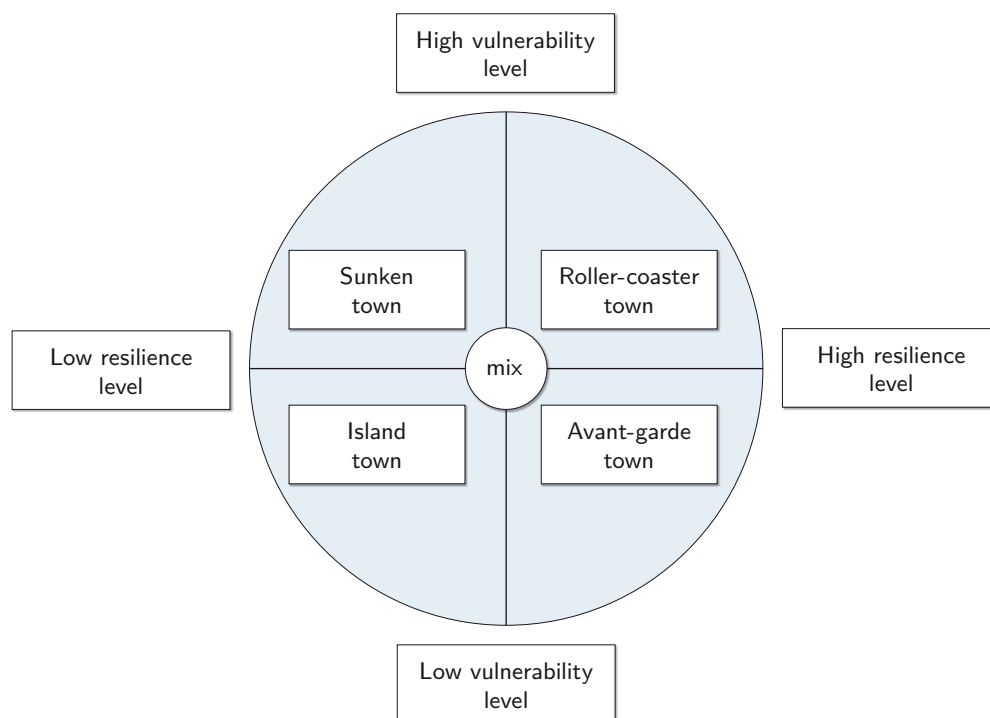

Fig. 2. Categories of towns by the level of resilience and vulnerability indexes.
Source: Own study based on Drobniak (2014) and Sucháček (2016)

The conducted analysis of the resilience and vulnerability of Wielkopolskie small towns in the demographic dimension allows us to state that small towns adapt to contemporary socio-economic changes to varying degrees. Distinct development trajectories of Wielkopolskie small towns as well as their typology are a synthetic picture of differences (fig. 3). Generally, on the basis of the obtained trajectories three main types of towns can be distinguished:

- A one-element type comprising the smallest towns with up to 2 000 inhabitants. It is a mixed type with the dominating features of a roller-coaster town with elements of an avant-garde one. High values of resilience indexes (110–134) are indicative of a roller-coaster town, but so are also high values of vulnerability indexes (over 110). This kind of resilience trajectory shows the high
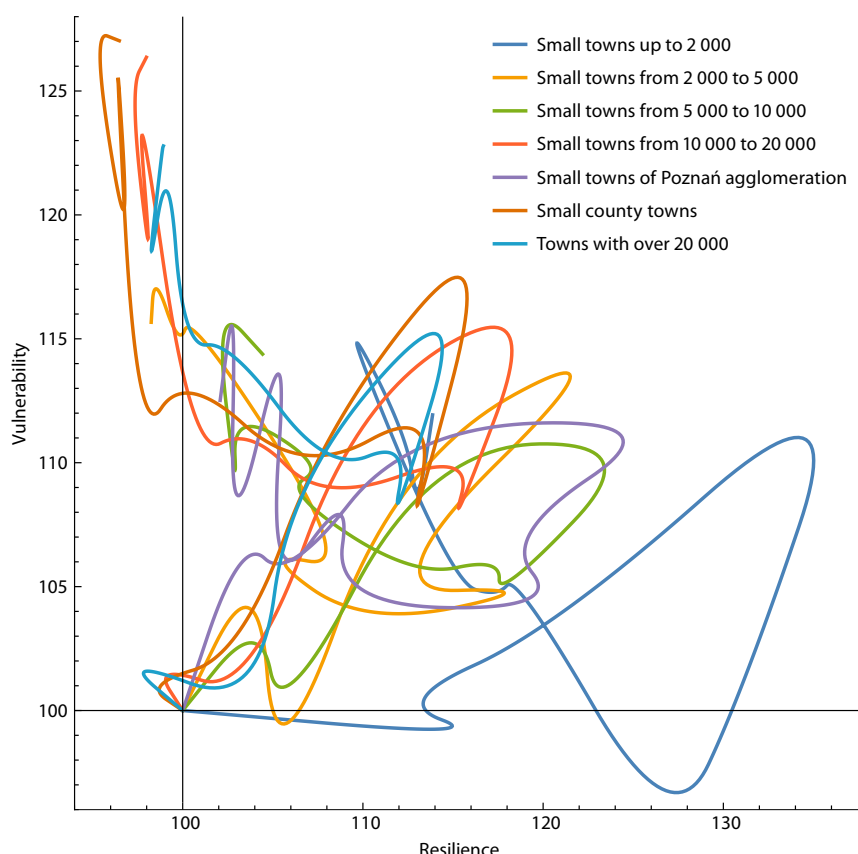
Fig. 3. Development trajectories of Wielkopolskie small towns in the demographic dimension in the years 2003–2016

Note: Horizontal and vertical lines, intersecting at (100, 100) point, delimit four sectors of town categories (see fig. 2)

changeability in the demographic situation of a town which is strongly influenced by external disturbances, nevertheless it regains previous parameters. The smallest towns temporarily also show features typical of an avant-garde town and then display relatively high values of resilience indexes and low values of vulnerability indexes (below 100), which is indicative of their temporal high resilience in the demographic dimension and immunity to external disturbances.

- A three-element type comprising small towns from 2 000 to 5 000; 5 000 to 10 000 and the set of small towns situated in the Poznań agglomeration. The sets of towns mentioned exhibit high values of resilience indexes (periodically over 115), but also high values of vulnerability indexes (periodically over 110). These are features typical of a roller-coaster town, which is subject to strong external disturbances, nevertheless it regains previous parameters, which is indicative of a certain instability of its demographic situation.

- A three-element type comprising mainly towns from 10 000 to 20 000 inhabitants, a set of small county towns, which to a large extent is included in the previous set, and the remaining towns of Wielkopolskie Voivodship with over 20 000 inhabitants, i.e. medium-sized and large towns. This is a mixed type because in the initial stage (2003–2004) it displays features of an island town for which both resilience and vulnerability indexes have low values (fluctuate at the level of 100) and which are not significantly affected by external disturbances. In 2005–2012 the sets of towns mentioned represent a roller-coaster town, and since 2013 a sunken town type, with low values of resilience indexes (below 100) and at the same time high values of vulnerability indexes (over 120). This kind of unfavorable combination of dynamic indicators shows that a given urban center usually faces demographic stagnation after external disturbances.

Conclusions

The applied research concept of "urban resilience" is a relatively new approach employed in the diagnosis of changes in towns occurring under the influence of external socio-economic factors.

The conducted empirical verification of resilience and vulnerability indexes in the demographic dimension of Wielkopolskie small towns produces the following results and recommendations:

- In 2003–2016 the trajectories of resilience of small Wielkopolskie towns are diversified. The main criterion influencing their course is the size structure of a given center and its location, administrative functions performed are of minor importance. The smallest towns (of a roller-coaster mixed type) seem the most resistant to external disturbances, have a higher degree of resilience and thus adapt better to contemporary socio-economic changes in the demographic dimension. Small towns from 2 000 to 10 000 inhabitants and located in the Poznań agglomeration display an average level of resilience in the demographic dimension and towns with over 10 000 inhabitants, especially at the end of the investigated period, show a higher level of vulnerability and worse adaptation to external disturbances in the demographic dimension. It should be remembered, however, that each of the selected sets can include centers with other development trajectories than "maternal" ones.

- It is difficult to unequivocally state if in the economic dimension the smallest towns also display a relatively high level of resilience, and larger ones with a less favorable demographic situation demonstrate lower resilience in the economic dimension. This question requires subsequent research and in-depth complex analysis with the use of the indicators describing resilience attributes in the economic dimension.

- The economic crisis, strengthened by globalization and integration processes, the influence of which is visible in 2008–2010 for the attributes of vulnerability and since 2010 for the attributes of resilience, is a significant external disturbance clearly modifying the fluctuation of selected values of indexes of the dynamics of resilience and vulnerability and the course of the development trajectory of towns with a diversified size structure.

- It would be interesting to conduct a complex analysis of development processes of small towns in the demographic and economic dimension with the use of the "urban resilience" concept for small towns located in other regional settlement systems. It would provide a comparison of the course of their development trajectories in both dimensions and determine the degree of similarity in this field.

- It is advisable, if long-term statistical data are accessible, to extend the temporal range of the analysis of urban resilience and vulnerability and its systematic continuation in order to track future urban development paths.

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