



You have downloaded a document from  
**RE-BUŚ**  
repository of the University of Silesia in Katowice

**Title:** Can Depopulation Create Urban Sustainability in Postindustrial Regions? A Case from Poland

**Author:** Anna Runge, Iwona Kantor-Pietraga, Jerzy Runge, Robert Krzysztofik, Weronika Dragan

**Citation style:** Runge Anna, Kantor-Pietraga Iwona, Runge Jerzy, Krzysztofik Robert, Dragan Weronika. (2018). Can Depopulation Create Urban Sustainability in Postindustrial Regions? A Case from Poland. "Sustainability" (Vol. 10 (2018), Art. No. 4633), doi:10.3390/su10124633



Uznanie autorstwa - Licencja ta pozwala na kopiowanie, zmienianie, rozprowadzanie, przedstawianie i wykonywanie utworu jedynie pod warunkiem oznaczenia autorstwa.



UNIwersYTET ŚLĄSKI  
W KATOWICACH



Biblioteka  
Uniwersytetu Śląskiego



Ministerstwo Nauki  
i Szkolnictwa Wyższego

Article

# Can Depopulation Create Urban Sustainability in Postindustrial Regions? A Case from Poland

Anna Runge \*, Iwona Kantor-Pietraga, Jerzy Runge, Robert Krzysztofik  and Weronika Dragan

University of Silesia Department of Economic Geography, 60 Będzińska street, 41-200 Sosnowiec, Poland; kantor.pietraga@interia.pl (I.K.-P.); jerzy.runge@us.edu.pl (J.R.); robert\_krzysztofik@interia.pl (R.K.); weronikadragan@interia.pl (W.D.)

\* Correspondence: anna.runge@us.edu.pl

Received: 4 October 2018; Accepted: 3 December 2018; Published: 6 December 2018



**Abstract:** Many towns and cities in the world experience the process of urban shrinkage. This may be observed in localities of different types and of all sizes, including a large group of post-industrial towns and cities of Central and Eastern Europe. One of the districts affected by the urban shrinkage process is the Katowice conurbation in Poland, which may serve as a good example to consider the potential for introducing the idea of sustainable development. In this perspective, sustainability is considered as a specific challenge within the progress of regional transformation, but also a target concept for a large urban region to be followed throughout the evolution and at particular stages of the change. In the discussed region it is all the more important because it is followed by phenomena related to post(industrialism), relatively high pollution levels compared with the European average and a polycentric system of settlement. This paper states that the current urban policy implemented in the Katowice conurbation does not seem to have any palpable effect reversing the trend of depopulation in the region, which seems to stem from the fact that numerous initiatives undertaken in the area are ‘illusory’ and often unnecessary and unjustified. This also applies to activities embracing and fostering the idea of sustainability. With regard to the latter issue, the main concern refers to overinvestment and wasting the measures to reduce low emissions and to make savings in the heat supply system for residential buildings. The Authors proposed a new vision for the transformation of the region. It will respond to the current and expected needs of the residents, while making allowances for multidimensional sustainable development, particularly in terms of housing policy and spatial development. This concept primarily focuses on a new balance between the areas covered by low-rise and high-rise buildings and the reorganisation of the structure of the local economy.

**Keywords:** urban planning; sustainability; depopulation; urban redevelopment; Katowice conurbation

## 1. Introduction

Urban shrinkage is one of the key challenges of urban policy in many European countries [1–3], especially when it affects large metropolises. Poland is no exception in that respect. Two large metropolises—Katowice and Łódź [4–6]—currently experience this phenomenon. In addition, a significant decline in the number of residents is recorded in several dozen other towns with populations ranging from 50 to 500 thousand [7–9]. Polycentric urban regions always represent a particular case of shrinkage, where this process is seen in several locations simultaneously. Where does this uniqueness come from? It results from the fact that potential successes of the policy aimed at slowing down the progress of depopulation in one town may be destabilized by an uncontrolled situation in other neighbouring localities [10].

On account of the competition between towns, other localities do not have the chance to restore their economic and demographic potential enjoyed two or three decades earlier. Such phenomena are manifested in Katowice conurbation in the post-industrial era. In this context, the title question of this paper may be contentious: is it possible to plan any urban region in such a reality to ensure its sustainability? Based on the experience from such projects implemented in various places of the world it seems feasible, especially if such concepts are gradually introduced and above all—with active participation of local communities [11–14].

Since the current depopulation processes and demographic forecasts indicate that urban shrinkage in the Katowice region will progress, it is necessary to recognize a plan for the long-term mitigation of this process, but based on a concept outlining the future size and spatial structure of the region. Both views, i.e., on the size and structure of the region, should be subject to the idea of creating sustainable areas [15–17].

However, in the context of the idea of a lasting sustainable city [18–20], the answer to the above question is extremely difficult with reference to a considerably shrinking city. The difficulty lies in a more important question, namely whether the city will survive at all as a metropolis, or will it be reduced to local centre level? In such a case, the vital social aspects of urban sustainability are dramatically undermined by questions about the future existence of a city or a region [21,22].

In the sphere of external conditions the most important obstacle in this respect was the departure from regional planning in Poland in the 1980s. The internal factors comprise local particularity, and the absence of subregional management structures and information about resources, structures and property. As a result, many urban centres stricken by depopulation focus on expanding housing in their development strategies [23]. According to research findings [24,25] covering Poland and Central Europe, the challenges in terms of built environment transformation contingent on demographic processes are significant.

In response to such assumptions and in view of the idea of sustainable development, the authors address the need of adjusting the spatial structure of the region to the existing demographic phenomena and real social needs of future generations. In this case, the balance should take into account both various activities and the specific form of the site under consideration [26–28].

Spatial aspect of sustainable development being the subject of this paper plays a special role in industrial and postindustrial regions. First of all, this results from the fact that such areas require substantial expenditure on land decontamination and reduction of pollution. Additional challenge in shrinking and polycentric regions include reducing the uneconomical policy of land usage, additional measures aimed at improving the attractiveness of space and cost of public transport [29,30].

## 2. Methodology

This assumption of paper is that the core of urban sustainable development should not be the taboo policy on the one hand, revalued planning guidelines on the other [24,31,32]. In a region where the traditional industry is still operating, development planning based on untrue facts and non-existent phenomena seems to be particularly intriguing by itself. This paper discusses the issue of structural changes in a large post-industrial region as a starting point for devising a new concept of its future in consideration of the idea of sustainable development. This idea embraces the following attributes:

- development compliant with environmental principles,
- harmony of the development and actual socio-economic phenomena, and
- compatibility of development with endogenous and exogenous potential.

To achieve this goal, first of all the selected demographic and economic characteristics of the region as well as particular indicators of environmental threats have been analysed.

The model of regional transformation is based on the analysis of population indicators such as density and dynamics, labour market and unemployment, the structure of dwelling types distribution and land use. The results of these analyses were compared with the findings of studies on the

preferences of young families with children regarding their favoured living conditions [33] and assumptions of local masterplans and urban development strategies. Citizens' preferences were collated using the question about the type of buildings and districts preferred by young families. The place of residence of all citizens aged 0–18 was estimated using the PESEL database, assuming that they live together with their parents. In the next stage, these locations were verified in relation to different types of buildings: single-family housing (detached), small multi-family buildings of 2–7 flats, larger blocks and inner-city tenements with 8 to 27 flats, and blocks of flats with 28 flats and more.

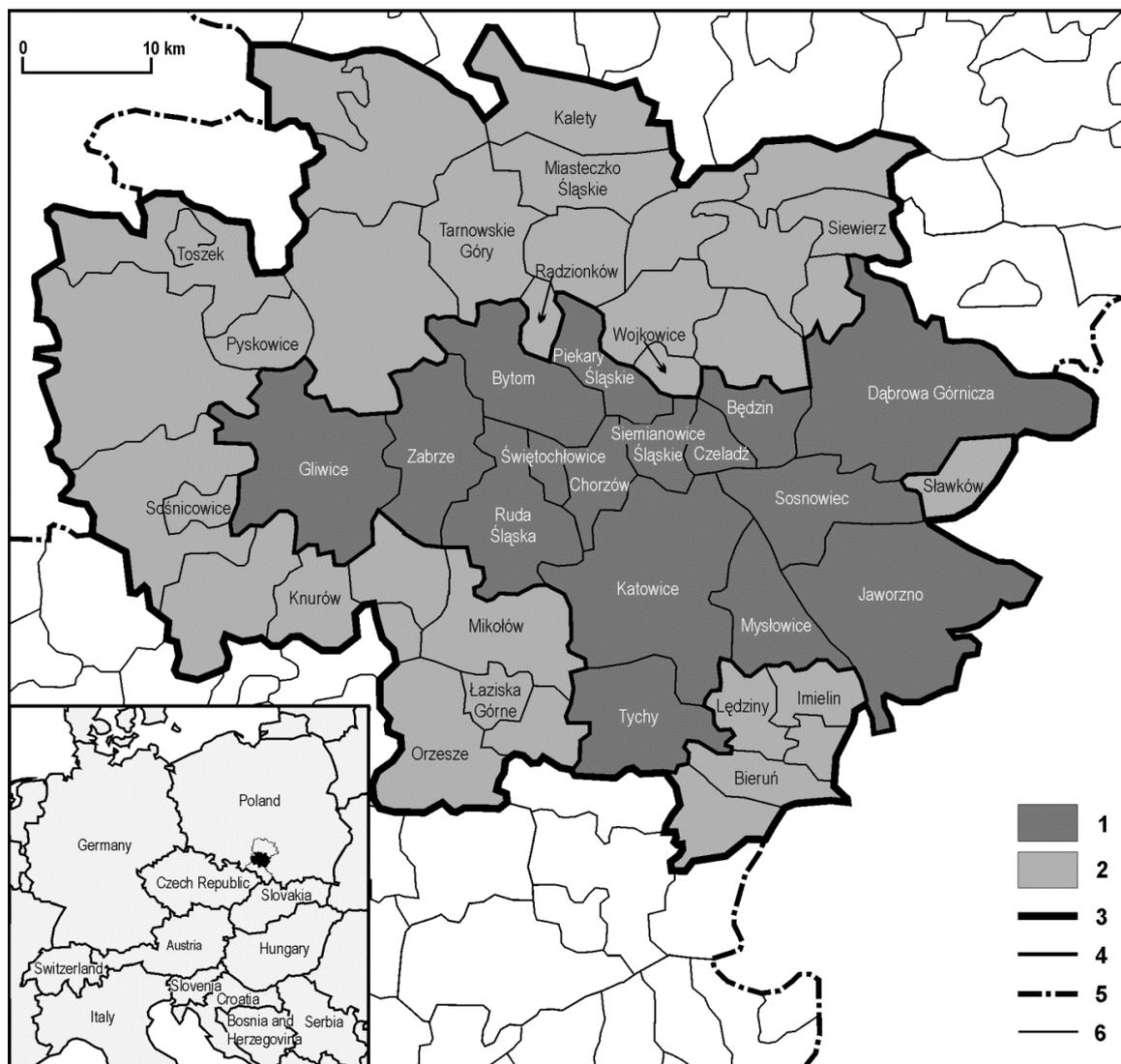
The answers to the question about the preferred place to live for young families were confronted with the actual principles of urban planning. The correspondence of the residents' expectations and assumptions of development plans was of particular importance. A critical analysis of this relationship and the assumption that the region will lose at least 700,000 residents by 2050 served as a basis for formulating the recommendations regarding the modifications in the spatial structure of the Katowice conurbation in the following decades.

Taking into account the socio-economic situation of the region and the individual spatial phenomena existing therein, a model of the expected development of the functional structure of the region has been proposed. However, within the proposed model special consideration has been given to the sustainable development elements within urban regions which were defined in S. Lehmann's green town planning [34] as: 'building intensity, including increased density and improved standard of existing districts', whereas in the subET classification (Sustainable Built Environment Tool) [35] they are defined as 'Usability'. With regard to the latter concept, special consideration was given to issues such as 'Housing density', 'Diversity of Housing Types' or 'Diversity of Uses'. These concepts served as a theoretical and explanatory reference for processes which are rarely observed but to a greater extent expected in the Katowice region.

### 3. The Katowice Conurbation

The Katowice conurbation is located in Upper Silesia and partly in Zagłębie Dąbrowskie, and it comprises a total of 37 towns and 10 formally rural units [36]. It is the largest urban post-industrial region in Central Europe (3707 km<sup>2</sup>). In 2018, it was inhabited by 2,012,000 people, with an additional 564,000 residing in the peripheral zone. Population density in this area was 695 persons/km<sup>2</sup>, of which 1485 persons/km<sup>2</sup> in the core. Even today the region is one of the most important European areas of coal and iron mining and other traditional industries. These industries were the main factors which contributed to establishing the region in the nineteenth century and its dynamic development in the twentieth century. As mentioned earlier, the core of the Katowice conurbation comprises 16 towns. The largest urban centre is Katowice with 280,000 residents. The population of other towns ranges from 50,000 to 180,000 residents. In the peripheral zone there are 17 medium-size and small towns and formally rural municipalities (Figure 1).

Due to its economic specificity, Katowice region is also one of the most degraded metropolitan areas in Europe. Although with the closure of many obsolete industrial plants since the 1990s the condition of the natural environment has improved in comparison with the period of socialist industrialization, there are still many challenges left unaddressed: low—and industrial pollution (PM 2.5 and PM 10), mining damage, brownfields, and pollution of some rivers to name just a few [37]. According to the WHO data, the average annual PM 2.5 and PM 10 pollution rate in cities of the Katowice conurbation is 40–50 ug/m<sup>3</sup>. In cold months, it exceeds 150 ug/m<sup>3</sup> for more than 100 days.



**Figure 1.** The administrative map of the Katowice conurbation in Poland. Explanations: 1—core of the Katowice conurbation, 2—peripheral zone of the Katowice conurbation, 3—conurbation’s limits, 4—border of the core area, 5—border of province, 6—borders of administrative units. Source: By authors on the base of [36].

The spatial structure of the region reveals its extremely polycentric character. However, the transition to post-industrial development and accompanying urban shrinkage, as well as the ‘flexible’ urban policy in terms of spatial planning result in a spatial chaos effect. Centres of over 20 medium-size and larger towns are located in a space dominated by blocks of flats dating back to the socialist era, industrial areas, numerous post-industrial brownfields, green areas established in the 19th century, brownfields or old workers’ settlements and, to a lesser extent, by housing estates of low-rise buildings established in the late twentieth and early 21st century. This varied urban landscape is significantly disintegrated by substantial depreciation of housing, communal, and industrial and transport infrastructure. Only in a few cases, mainly in Katowice and Gliwice, does this type of landscape contrast with a fragmented modern urban space. The political and economic transformation has also changed the region in social terms. The liquidation of some coal mining and metallurgy industries resulted in a specific psychological and financial trauma, primarily among adolescent generations of children and youth [38]. In the 2000s, this trauma became a foundation for negative demographic trends—emigration and low birth rate. However, urban shrinkage in this region is of a more complex nature [6,39].

The key factor was the political and economic transformation which replaced the existing socialist system with capitalism and restored the market economy in place of the centrally-planned economy. The impact of the transformation was so significant that it resulted in the liquidation of over half of the existing jobs (mainly in industry), and only partially compensated those with new jobs (mainly in services). Consequently, in the 1990s and 2000s the average unemployment rate in the region grew to around 15–20% (Figure 2).

The second important factor of the demographic decline were the phenomena associated with the second demographic transition. Certainly, those changes have been experienced not only in Poland, but also in many other countries.

The third factor stimulating the depopulation process was the economic and spatial factor, manifested by the specific connections between the key economy in this region, i.e., mining and metallurgy, and the urban specificity of the towns formed by these branches. The economic transformations in the region resulted in a dramatic rise in unemployment followed by the whole range of its social consequences. Nevertheless, the implemented restructuring processes which covered also some of the brownfield areas turned out to be successful in the economic aspect. In 2018, unemployment in the region fell to around 6%, and is one of the lowest in Poland and CEECS (Figure 2).

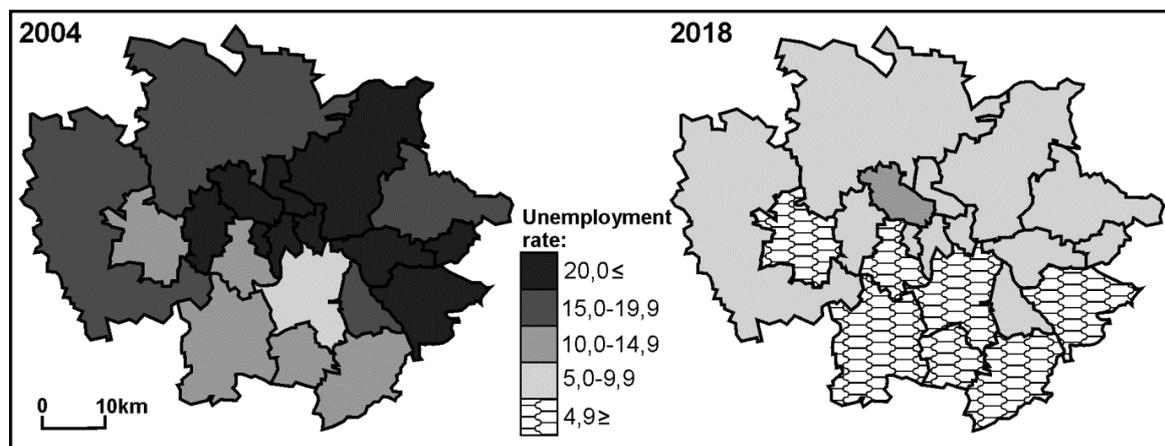


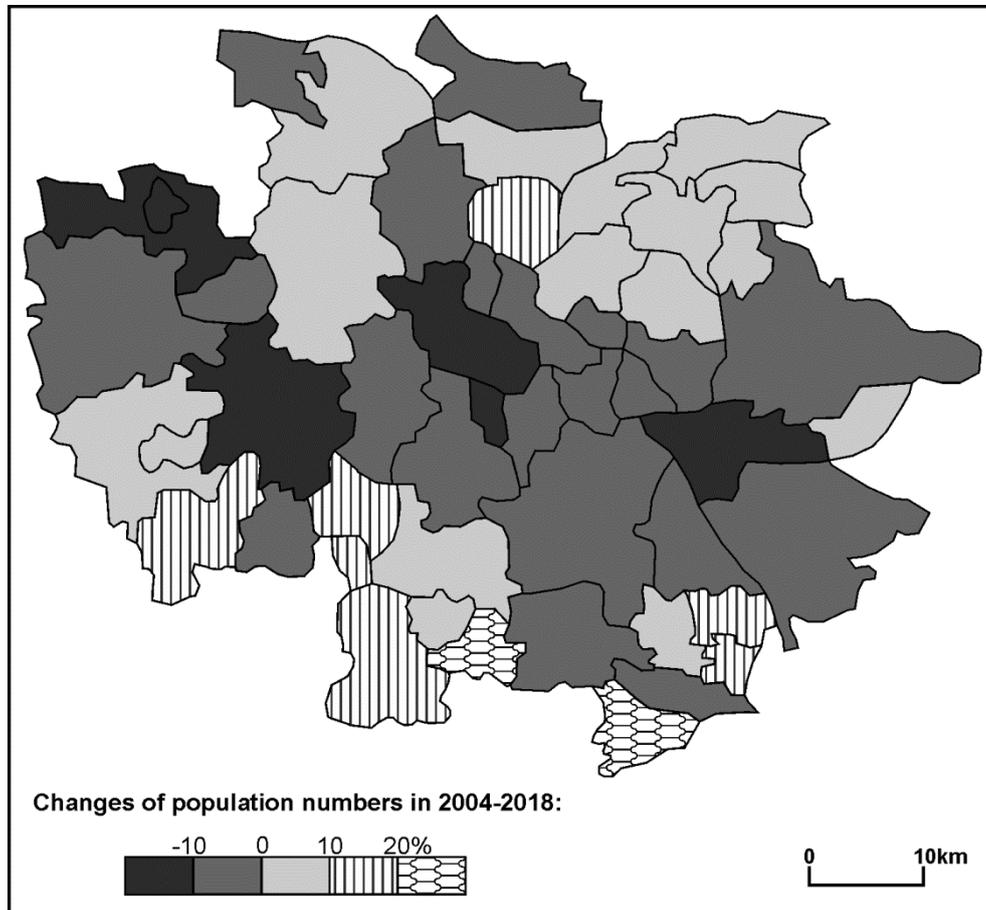
Figure 2. Unemployment rate in the Katowice conurbation, 2004 and 2018. Source: authors, on the [40].

Partial successes in the local labour market, however, are not followed by significant changes in the arrangement of residential areas in the region. This is due to low salaries on average, which do not drive strong demand for housing, especially more expensive residences. Cheap buildings and the expected low housing prices thus create a vast market for inexpensive and ‘accidental’ development. The spatial structure of cities is also disorderly—there are many brownfields and inner-city underdeveloped spaces.

#### 4. Economic Success is no Remedy for Depopulation

As mentioned below, problems in the labour market have been just one of several reasons for depopulation. They were followed by demographic problems in the aftermath of the second demographic transition [8]. Paradoxically, the progressing depopulation could be treated as a factor enhancing the region’s recovery from the crisis. A decreasing working age population reduced the unemployment rate. However, 2017–2019 is the borderline of a new period in the economic evolution in the region, when the decline in the number of residents will result in a shortage of workforce for the surging number of new jobs. This phenomenon is already occurring, and the average unemployment rate in the region is around 5–6%. New jobs do not attract employees, as depopulation is now more and more determined by social and demographic factors as well as spatial circumstances (negative perception of the urban space of post-industrial cities). They are so strong and enduring that every 5 years some towns with populations of 150–200-thousand lose 10,000 residents. In 1989–2018, most of

the large and medium-sized towns in the Katowice conurbation lost about 20% of their population (and 8–12% in 2004–2018), and in the case of townships that were split into several separate settlements that figure may be even up to 40% (Figure 3). With this trend set to continue, by 2040 the population will amount to 30–60% of the number as of 1989 [37,40].



**Figure 3.** Population changes in the Katowice conurbation, 2004–2018. Source: authors, on the base of data from Statistical Office in Katowice.

Moreover the share of the post-working-age population in the Katowice conurbation is growing, and the average number of children in a family is only approx. 1.2. Considering the overall decrease in the number of residents, other rapid changes include ageing trends and occupational structure with more and more employees having higher education, as well as the loss of jobs in the traditional industry. Therefore, part of the urban infrastructure and housing is simply unnecessary, and this problem is deemed to aggravate over the following decades.

Those changes demonstrate that the Katowice conurbation region is beset with a demographic mismatch. As shown above, it is progressing in various dimensions and this mismatch will intensify in the future. The phenomenon is a warning sign and even a clear barrier to sustainable development. Why is that? Since the 1990s, i.e., following the first phase of the socio-economic transformation, policymakers and local stakeholders have maintained the view that it is necessary only to repair the effects of the current situation. Voices advocating the redefinition of the region, where several large factories were being closed each year and 15–20 thousand residents were moving out, were virtually ignored. Moreover, some of the implemented remedial actions not only failed to notice depopulation, but even indicated the need to provide thousands of completely new places of residence. In the area of the entire conurbation, as many as 32 out of 33 towns have no master plan of demolition of unnecessary buildings, liquidation of redundant storeys in some buildings, or complete reconstruction

of dysfunctional housing estates. These seemingly standard activities widely implemented in other countries (Stadtumabu Ost; Liverpool) in shrinking cities were initially regarded as political taboo and later morphed into a 'Let's leave it for the future', 'there is no need to worry about it now' approach.

This is the consequence of the absence of reasoning and regional action, as well as an excessive focus on local initiatives. The immediate proximity of other, often larger towns, functioning historically until 1945 as separate settlements (in Poland and in Germany), and later subjecting the towns to centrally-planned processes of territorial incorporation, external economic policy, migration flows, eradicating local identity, etc., has not been conducive to integration processes between individual localities. Despite being situated within the Katowice conurbation, the residents and often local authorities mentally distance themselves from widespread activities devised to serve the entire conurbation.

## 5. Between the Policy of Taboo and Illusion

One of the fundamental assumptions underpinning urban sustainability is the wise and practical development of residential areas [41]. Unfortunately, the measures implemented in the towns of the Katowice conurbation under the principle of sustainable development, with the exception of several cases, have ended in a failure so far. Many activities also proved unnecessary. Supporting new high-rise buildings (so-called blocks of flats) in the vicinity of similar but older structures, and what is particularly important here—more and more unnecessary—may serve as a good example. These new developments often cause an increase in urban congestion, and consequently deterioration of living conditions.

Accommodating the residential housing structure to the declining population is difficult but inevitable. With depopulation already on record, it seems sensible to tailor the residential development mainly to the needs of the so-called creative class, innovators in the field of economics, new technologies, animators of social and cultural life, in order to retain local business, intellectual and artistic elites, or even attract them from outside.

Meanwhile, the transformation of the increasingly stranded city centres is unsatisfactory. The governance model based on the agreement between local authorities and developers fuels the unfavourable structure of services and commerce in city centres (spacious shopping centres located in the outskirts). It will undoubtedly be aggravated by the so-called '*lex developer*' introduced in August 2018 as an amendment to the act on spatial planning, favouring even more the liberty of developers in the urban space, which unfortunately is often detrimental. Apart from the surroundings of local administration buildings, institutions and selected parts of streets with restaurants, the centres of most towns and cities are not the preferred destination for residents. Their agony is aggravated by the relatively small tourist traffic and mentioned large shopping centres built in the city outskirts.

Many errors in urban policy arise from dilemmas such as whether the elitarian model shall be adopted in the city transformation process (with the initial, spectacular development of one or two districts, at the expense of reducing resources and ventures in other districts), or the egalitarian model (proportionate development of the entire city) would be more suitable. Decision-makers' ad-hoc actions and lack of coordination in the directions pursued in the process of change ultimately result in the absence of visible transformation throughout the city. On the other hand, any projects successfully implemented virtually disappear in the still depreciated urban space.

Conversely, the modernization and thermal modernisation of residential blocks dating back to the 1970s–1980s is generally welcome both in the Katowice region and all over Poland. Paradoxically, however, although most of these modernisation projects are perceived positively, they are implemented in the type of dwellings affected by the strongest depopulation and ageing processes, which in some cases will probably be demolished in the near future. Ill-founded planning of that process results in irrational expenditure, while those funds could be invested in an otherwise plausible policy of reducing emissions generated by residential buildings. Although the renovation and thermal modernisation of large blocks of flats is worthwhile also in the context of sustainability [42], many activities

carried out in the discussed region should be evaluated negatively. There are two reasons for this paradoxical situation: firstly it should be noted that heavy air pollution with urban pollutions in the Katowice conurbation in the autumn and winter season is caused by individual dwellings heated with low-quality hard coal, brown coal, coal flotation rubbish and even by burning rubbish, whereas in large apartment blocks heat is supplied from modernized or relatively modern large thermal power plants. Of course, this does not mean that the blocks should not undergo thermal upgrading [43]. The problem lies in that within 15–20 years some of them will have to be demolished as they will be abandoned as a result of the depopulation process. This second issue specifically emphasizes the core of wasting financial resources, and organizational measures employed in view of reducing urban pollutions. Since there are no explicit plans about which buildings should be demolished, all blocks of flats are undergoing thermal modernisation.

The above examples stipulate that the development of a large urban region may experience some illusory processes. They result from the belief that they will bring population decrease to a halt. On the one hand, they stem from the implementation of ultimately ineffective measures aimed primarily at increasing the aesthetic image of space, and ‘fighting’ urban pollutions. On the other hand, however, striving to obtain a short-term positive effect is emphasized with no purpose in mind, or even wasting money and resources (modernization of buildings which will become vacant in a decade or so, the fight against low pollutions but not at their source, i.e., where they are generated to the greatest extent). Another aberration is the modernisation of housing estates in the proximity of land contaminated with lead and other heavy metals. This specific inertia is particularly surprising as sufficient experience in that respect is available, as well as substantive know-how and numerous implemented solutions and actions taken and good practice in that domain already at hand [16,44–47].

The remedy for this situation would be to acknowledge the depopulation trends in the regional transformation process and include them in the plans for the region’s development [23]. In this case, the most sensible response would be a strategic plan for the region considering a smaller population in the future. With this in mind, the attention of stakeholders should be focused on those projects that will be effective in various time perspectives. However, it would require a completely new master plan for the entire region and its towns. It would be advisable, as many of the current assumptions underpinning city master plans are based on wish-politics rather than real politics. The problem, however, is that local self-governments reject the vision of the smart shrinkage for obvious reasons. It is easier for them to maintain the taboo due to the fact that as they declare in the media many negative phenomena have a national or supra-regional nature, and therefore it is possible to convince the public that it is the government, applicable law, parliament, ‘traditions’, the difficult history of the 20th century’ that is to blame. Despite the fact that such targeted allegations are not completely unsubstantiated, it should be noted that the external problems are addressed only to cover the denial or passivity in relation to emerging local problems.

One of the most important distinguishing features of the Katowice conurbation development is its polycentric nature. On the one hand, it may be perceived as a limiting factor, while on the other it provides some possibility to determine the so-called new opening for development assuming that there would be political consent for the smart shrinkage in the case of sustainability in (post-) industrial regional planning [48–50]. What direction should be adopted for these changes to progress?

## 6. Planning the Future of the Katowice Conurbation

Taking into account the specific polycentric layout of the Katowice conurbation, as well as problems and challenges identified in that area, creating a new image of the region seems to be the proper course of action. Planning the future of the Katowice conurbation must take into account external and internal conditions, including the identification of the extent and determination of those factors which need to be eliminated, require modification, reinforcement or softening. Without this, it is wishful thinking rather than a proper action plan. The new image of the region should be manifested in several key features.

First of all, the plan should prevent further depopulation. An adequately planned space would allow for the depopulation process to be mitigated and maintain the number of residents at a certain level. A conducive factor would be a tailored space designed to respond to certain social and environmental needs. Currently, it is neither customised nor compatible with the social and individual needs of the new generations. Many buildings are unnecessary, dysfunctional, and do not meet the aesthetic and technical expectations of potential (especially young) residents.

This plan should be implemented on the basis of aligned national demographic policy with local policy in this domain. The tax, social and organisational benefits combined could become a driver stabilizing the population change. Although all towns offer various forms of support for their residents, there are still numerous challenges to be addressed in that regard. For instance, the redistribution and flexibility in social housing policy. An element of particular importance will also be the transition from the policy aimed at retaining the residents to the strategy of attracting new citizens for example through the system of information points in regions with limited potential of economic activation.

Secondly, a properly developed space would be sustainable, which in this case means balancing human and environmental interactions, but also improving the relations between the community and individual residents [20,51,52].

This postulate is already partially implemented. There are more and more revitalized, modernized spaces with visible natural components, modern, harmonious and well designed, also in line with the principles of sustainable development and green urbanism. Unfortunately, these are only rare enclaves in the region. Therefore, the course of reconstruction of towns within the region should be reinforced following a linear-point model, assuming that it will become a zone of diffusion of new and sustainable spaces. The plan for implementation of this postulate should derive from the newly created The Uppersilesia-Basin Metropolis (GZM Metropolis). The regional policy should also focus on demolition of shanty buildings, abandoned spaces and the revitalization of brownfields as an administrative duty of local governments, not just a loosely treated task.

Thirdly, this plan should take into account important conditions of modern urban development, including globalization of the economy, regional specialization, inter-city competitiveness, realistic forecasts of future population, and technological changes. In the discussed region these conditions are not obvious in spatial planning practice. According to the analyses of planning and strategic documents all towns within the Katowice conurbation many phenomena and processes still come as a 'surprise' for part of planners and are not taken into account in spatial and strategic planning [23]. Some of them have quite positive effects. For example, the rapid decline in unemployment, high dynamics of land management in some brownfields.

An important element of the region's transformation should also be the induction of the objects or spectacular spaces similar to those which gave rise to the Bilbao effect [53]. This is the task for local governments as well as the authorities of GZM Metropolis.

And last but not least, this development must be driven by sustainability challenges constituting a part of knowledge, action and activation [54–56]. Currently, many activities related to the reduction of low pollutions are more a result of the availability of EU funds and programmes than of a deep conviction that sustainability is worthwhile as such. The strategic objective of local governments should therefore be the initiatives of broader support for spatial reconstruction of towns consisting of:

- development of the reconstruction concept of conurbation as a region,
- development of the reconstruction concept of towns and urban districts in more detail,
- contribution to the reconstruction of particular parts of towns (utilities in investment areas with brownfields treated as a priority, coordination and strategic management of the policy of demolition of private dwellings, whereas additionally financing the demolition of municipal facilities),
- setting a rigorous functional framework based on sustainable development with regard to technologies used in the construction of all types of buildings, promotion of passive and zero-emission buildings, reconstruction of transport systems based on low-emission transport, especially in the immediate vicinity of residential areas, increasing the share of green areas and forests etc.

Taking into account the above issues, the authors propose replacing the image of the urban-industrial region still perceptible in the landscape of the conurbation with the concept of an urban-suburban region. Nowadays, the characteristic features of the landscape of the discussed region include:

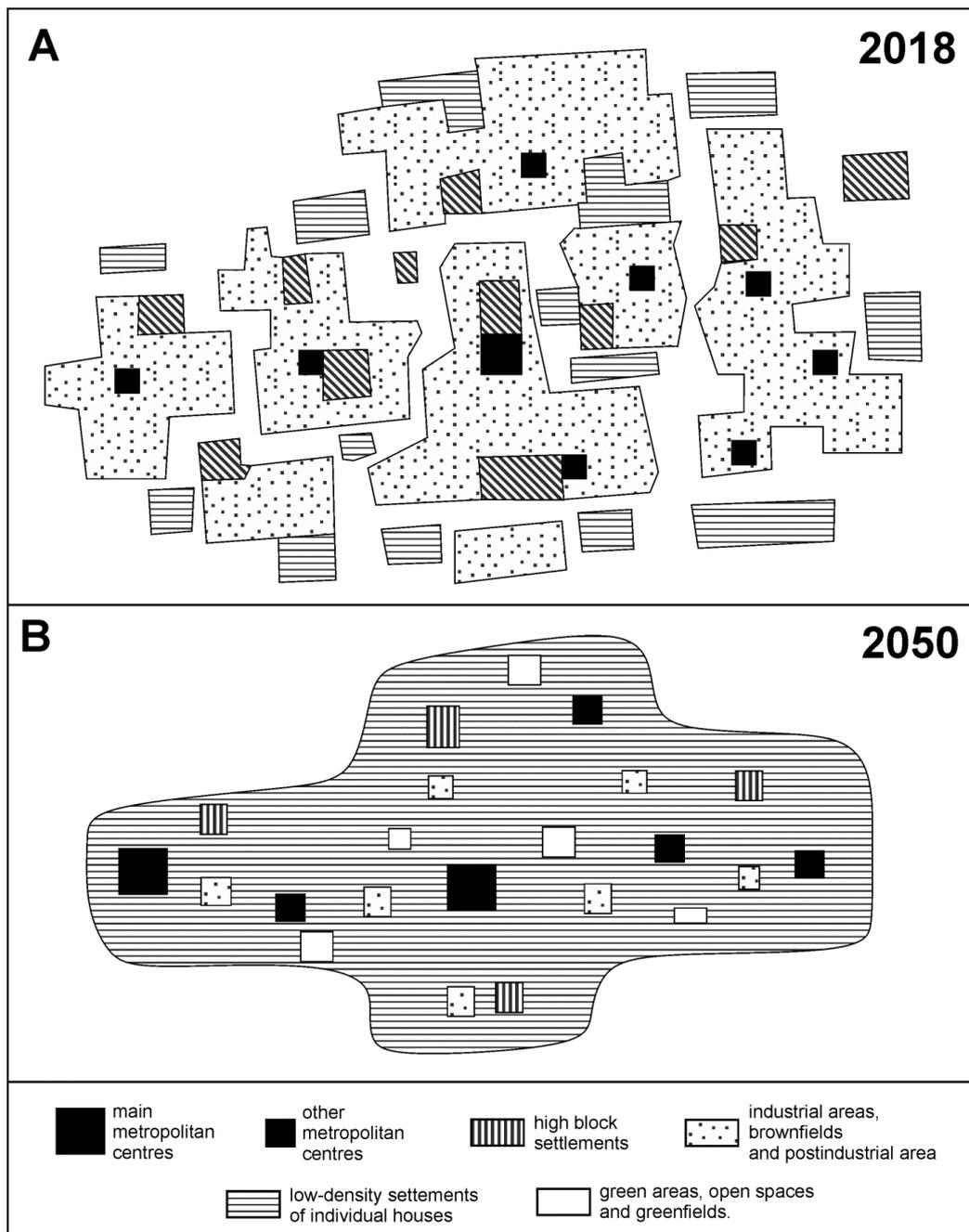
- (a) A predominance of towns with 100–200 thousand population and a network of smaller towns of 30–100 thousand residents,
- (b) a dozen or so inner-city districts constituting strongly separated centres of the majority of these localities,
- (c) a ‘chessboard’ arrangement of residential areas with dense and high-rise buildings (blocks of flats and tenement houses), city centres, industrial and mining areas, green areas, functionally derelict areas (including a significant share of brownfields) (Figure 4).

Taking into account the demographic, economic and spatial trends under consideration, as well as the expected sustainable development model, by 2050 the region should be perceived as follows:

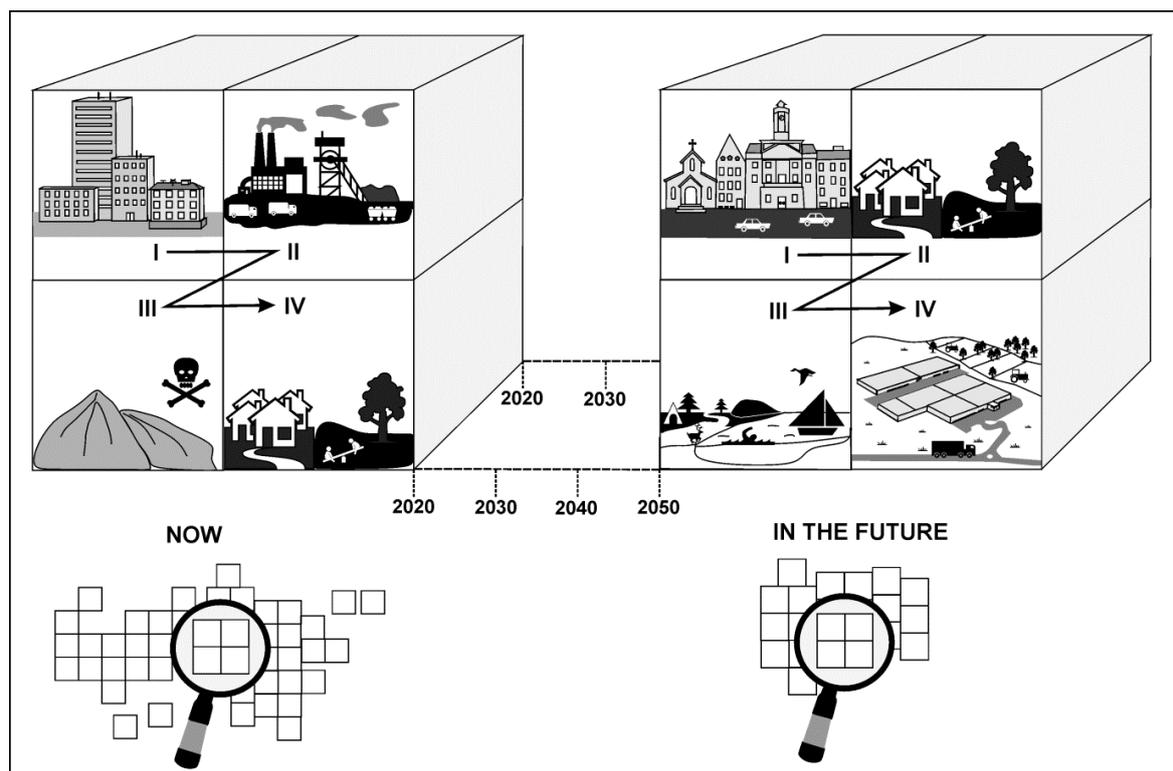
- (a) a conglomerate of three types of town: medium—50–100 thousand residents, smaller—from 5000 up to 30,000 residents, and small municipalities below 5000;
- (b) with inner-city districts in large towns of regional importance (Bytom, Chorzów, Gliwice, Katowice, Sosnowiec, Zabrze) and especially in Katowice as a supra-regional centre;
- (c) area of dynamic plasma-like development of the suburban area (low rise buildings, detached housing, sustainable settlements, green and recreation areas, urban agriculture zones) with sites serving other functions (aforementioned downtown districts, small areas of high-rise buildings, modern industrial zones and large-area services);
- (d) space arrangement including the following land development models: urban agriculture, green infrastructure, urban village or tenants’ plots areas [57–59];
- (e) areas of concentration of modern industry and supra-regional services, including tourist and logistic services;
- (f) leisure and landscape tourism zones including in the particular cultural and natural heritage of the region: post-industrial and industrial tourism, technical monuments, advantages of the local anthropogenic lake district, advantages of Silesian culture. (Figure 5).

The new model of the Katowice conurbation would allow the region’s core population to be sustained at around 0.8–1.0 million (over 2 million people in 2017). In this form, the region would provide convenient residential conditions in the area offering metropolitan institutions, but at the same time giving the comfort of living in a harmonious landscape and sustainable environment in terms of particular components. The advantages of the upland and hilly landscape, currently surmounted by a high-rise housing estates skyline, are still not an exploited asset of the conurbation. The natural assets also include also a great area of forests (largely developed as a result of natural succession on brownfields), numerous anthropogenic lakes with good recreational infrastructure, and many medium and small river valleys enriching the local landscape. The upland scenery also provides the opportunity to experience the panorama of the nearby Carpathians.

The effects of the implemented initiatives should include residential and residential-commercial zones with two fundamental principles—sustainability and privacy. The concept of sustainability should be manifested in the social dimension of human existence in an urbanized environment. On the other hand, privacy shall be treated in terms of the individual needs of residents in their place of residence and neighbourhood, as well as the individualization of basic life needs. The aspect of privacy was defined in research conducted by the authors of this paper in 2017. This type of development is already implemented in the region (Katowice, Sosnowiec, Gliwice, Tychy). Unfortunately, such housing estates are rather scarce, and in the case of many buildings the requirement of sustainability is not fulfilled.



**Figure 4.** Model of the expected spatial layout of the Katowice conurbation. Key: (A) spatial layout model in 2018; (B) spatial layout model in 2050. Source: authors.



**Figure 5.** Directions of changes in the prevailing functions of space in the Katowice conurbation, 2018–2050. Source: authors.

## 7. Discussion

At this point, one should refer to the question about urban development in the form of a green and sustainable city [60]. The perspective on that otherwise justified issue changes in a situation whereby the implementation of the concept of a sustainable and green city is proposed for an urban region experiencing the advanced urban shrinkage process and still manifesting post-industrial characteristics and even remnants of traditional industry. Can such a region be sustainable at all? Are these trends not contradictory and mutually exclusive? One may attempt to answer this question referring to similar sites, although not identical ones.

In Europe, the most adequate form is conurbation Ruhrgebiet region, both in terms of mining and industrial origins, as well as the consequential contemporary polycentric type of settlement [61]. However, in the Ruhrgebiet region the de-industrialisation processes commenced 20–30 years earlier. In many cities of the region the urban shrinkage phenomenon has also been observed [62,63]. Does the Katowice conurbation have any reasonable chance to become a model of the urban region described in the previous chapter five or six decades after having lost its industrial functions? Or it would instead transform into an area similar to the one observed in the Ruhr region? The response should consider the fact that despite many similarities, there are two fundamental differences between these two regions, and both of them are of a demographic nature. Firstly, the population of Ruhrgebiet is nearly three times larger. In addition, the rate of demographic decline in the Katowice conurbation is much higher than in the Ruhrgebiet. In the Katowice conurbation all towns record progressing depopulation, and the balance of external migration is constantly negative. In contrast, the demographic decline in many cities in the Ruhr region is at least partially offset by the inflow of new residents [64]. Some differences may also be observed in the spatial redistribution of the population in the peripheral zone, and the formation of suburbs [65]. Given the specificity of the Katowice conurbation, even with regard to a similar Ruhrgebiet region it needs to be considered what forces would be conducive to the future spatial and functional transformation of the region and which should be suppressed?

The dispersion of competencies regarding planning activities is an important obstacle to creating a coherent vision of change, particularly as in many municipalities the principles of sustainable development remain only in declarations, mostly for financial reasons. They are inscribed in urban strategies and master plans, but they are not implemented at all or largely neglected. A newly established (2017) self-government body—the Uppersilesian-Basin Metropolis (GZM—Górnośląsko-Zagłębiowska Metropolia) may help overcome this problem as one of its goals is the integration of urban policy in the domain of spatial planning. The likelihood is even greater as at this management level there is full understanding of the importance of sustainable development as a basis for future activities in the region. The first two large projects undertaken by GZM include modernisation and development of public transport, especially railways, low-emission or electric bus transport, and fighting against smog.

Although both these issues are important from the perspective of sustainable development, the basic challenge is the new organization of space, where low-emission transport and the measures aimed at reduction of smog are of particular importance. The new design of urban space should therefore be the competence of GZM Metropolis supported by grassroots activities within individual towns, integrating solutions proposed by the regional government and national policy (e.g., ‘Mieszkanie+’ [‘A flat+’] programme). In the latter case, what is expected are the clarifications regarding the analysed region and addressing the support for the construction of smaller residential buildings and proper brownfields development, demolition of substandard dwellings and abandoned blocks of flats.

In the efforts to transform both regions in the proposed direction, the question remains about realistic chances for that process to succeed [66]. With reference to the Katowice conurbation, the basic initiatives aimed at facilitating the process of achieving the socio-economic and spatial sustainability goals have already been mentioned. What is more, in some places the process of transformation has already ‘spontaneously’ begun. It is observed as the so-called ‘internal suburbanisation’ process, which consists in building up intra-urban greenfields and brownfields, as well as undeveloped spaces between neighbouring towns with dwellings characteristic of suburban areas. However, these phenomena are different than the ‘zwischenstadt’ model [67] or interplaces [68].

Another complication, although of a more organizational nature, is also the local self-government policy enhancing multi-family housing, including the construction of further 10-storey and higher buildings. This applies to virtually all the towns discussed, and Katowice in particular.

New large blocks of flats are built in the region, because these are new and relatively cheap developments. The paradox is that the buyers of apartments in such blocks of flats also move out from similar blocks, though slightly older. They do not want to live in them anymore for functional and aesthetic reasons, however, they cannot afford buying apartments in low-rise buildings that would be the most attractive option for them. Thus a certain impasse occurs—unwanted old apartments are exchanged for unwanted but acceptable new ones. The more so, because some of these new blocks of flats are controversial from the perspective of sustainable development. They are often built in former green areas, too close to existing buildings (e.g., in Gliwice, Katowice), and even replacing traditional low-rise tenement housing which would be more profitable after restoration than when demolished and redeveloped as apartment blocks (e.g., in Sosnowiec). These issues are acknowledged both at local and regional level, nevertheless local governments of shrinking towns adopted a policy of non-interference in the activity of developers and investors. This is partly due to the fact that the prices of apartments and thus the profits from the sale of real estate are the lowest in Poland. These problems of the sustainable development of a shrinking region could be remedied by the proposed plan for the strategic directions of the region’s transformation together with the outlined package of actions and main stakeholders defined.

In the Katowice region, the plans and tasks referred to in the previous chapter are not limited by any material organisational constraints. Most of them are also low-cost or enjoy participatory financing. For example, a substantial part of the price of a small real estate is the cost of land. If a municipality decided to participate in the development of a brownfield area owned by that municipality, the cost of

such a property could be significantly reduced. It would also be reasonable to consider cooperation with a state institution, e.g., the National Fund for Environmental Protection. The possibilities of 'functional' governance in the region are significant and the following options may be taken into account: GZM, municipal governments, state administration, private investors, groups of residents and NGOs. Moreover, numerous projects implemented under regional cooperation program (e.g., 'Contract for the Katowice Province') turned out to be successful and may serve as the so-called best practice. These include the reconstruction of the economic structure of towns primarily within the Katowice Special Economic Zone framework. Sosnowiec, Gliwice and to some extent other towns present positive effects of such a cooperation.

Potential threats to these projects include only sluggishness or indecisiveness at both stages of planning and implementation. Eventually, it seems that 'where people live' is far less important especially given the availability of tolerable blocks of flats, rather than the situation of dramatically high unemployment recorded 10–15 years ago which forced local governments to actively engage in creating new and modern economic zones. Potential local conflicts and competition for financial support, participation in investment, directions of regional development, the scale of demolitions or the endurance of material heritage should also be considered as potential threats.

Among the most significant obstacles to implementation of the above assumptions has been and still remains the town leaders' conspiracy of silence concerning the depopulation taboo. It is definitely caused by the fear of discouraging domestic and foreign enterprises to invest in those towns. Undoubtedly, this argument was irrefutable during the period of high unemployment over a decade ago. Paradoxically, the depopulation of the region has contributed to the reverse trend on the labour market. Currently, there are significant and growing shortages of workforce recorded in the region, particularly in the sector of manufacturing and basic services. One of the effects of these changes is the constant growth in wages and salaries. However, this fact should be taken with some scepticism as one of the additional arguments in favour of the adopted solution is a decrease in the number of apartments followed by the improvement in the comfort of residential dwellings. Therefore, the declining number of residents who, however, gradually have more disposable income is assumed as a fundamental basis for the adopted plan.

## 8. Conclusions

Contemporary concepts of a sustainable city channel its development towards harmonious relations between the elements of the environment and the local community [15,69–71]. The implementation of urban development plans and development strategies is oriented—at least in theory—in the same direction. Obviously, in practice some adequate initiatives have to be modified if they prove impossible to implement for various reasons [72,73]. Such a process of shaping urban space also takes place in Poland. However, it is accompanied by the policy of 'flexible adjustment of reality' based on an often negative 'fait accompli policy'. The attribute of 'flexibility' in the urban policy of shrinking cities causes many distortions and so-called bad compromises [31]. Its final result is spatial chaos, overinvestment, appalling landscape or commonplace territorial conflicts and hardly acceptable social and spatial contrasts. In this context, urban policy in the shrinking post-industrial regions such as the Katowice conurbation discussed herein is of particular importance. Permanent depopulation, the unfavourable image of the region, polycentrism, and numerous environmental threats mean that the region in fact needs to undergo a radical transformation of its characteristics.

The paper proposes a model for the functional and spatial development of the Katowice conurbation based on demographic forecasts up to 2050 drawn up by the Central Statistical Office, which anticipates a decrease in the population by at least 40% relative to 2016. The data of forecast for the Katowice conurbation and many other Polish regions are underestimated [74]. Data regarding registration PESEL database, as well as local studies of Authors indicate that the actual number of inhabitants in the region is smaller than the one reported by the GUS from 5 to 15%. Hence, the forecasted demographic decline is underestimated. It also demonstrates that undertakings

implemented based on the number of residents in the framework of the policy of wishful thinking while ignoring the actual demographic forecasts (Statistical Office in Warsaw) grossly violate the idea of sustainable development in its entirety. Designing a region for 2 million residents while its expected population is likely to be half of that figure appears to be not only wasteful, but also to a certain extent an action to the detriment of local society and the environment. The reconstruction model for the post-industrial region proposed in the paper captures the idea of sustainable development and a realistic assessment of economic and infrastructural transformation. This model is also consistent with the findings from the authors' research on social expectations with respect to the preferred place of residence and type of dwelling, according to which detached buildings in the vicinity of well-developed urban centres prevailed. Privacy in this case also entails the beneficial social and environmental impact. Actually, these expectations are not far different from the declarations revealed in other studies concerning other types of urban areas areas [29,75–78].

The privacy of housing estates in this case may also contribute to the creation of basic urban tissue in the region. This tissue should be more coherent and compact. This is particularly important because the depopulation process affecting the current polycentric systems may deepen their energy and transport inefficiency. Therefore, the proposed model of transformation refers to urban space in both the horizontal and vertical dimensions. This model also constitutes an argument in the discussion on the nature of the transformation of post-industrial regions, shrinking regions, and regions affected by socialist-era planning.

The paper identifies also the stakeholders of structural and spatial changes who are expected to draw significant benefits from the new image of the region. Since the model described in this paper offers many opportunities for development which definitely outnumber the threats related with its implementation, the authors believe that this paper will be a starting point for more than only academic debate on the functional changes in one of the largest (post)industrial areas in Europe.

The authors of this paper are also aware of the radical nature of the proposed changes, which in the case of such complicated urban systems as the Katowice conurbation may give rise to doubts of many kinds. On the other hand, however, further chaotic, often unplanned, and essentially pointless activities will only pretend to address the efforts to curb depopulation and create a sustainable region.

**Author Contributions:** A.R. and I.K.-P. conducted the modeling, performed the analysis, and drafted the manuscript; J.R. designed the study, interpreted the results; R.K. and W.D. contributed ideas during analysis and interpretation, and edited the paper.

**Funding:** We have no fundings.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

1. Turok, I.; Mykhnenko, V. The trajectories of European cities, 1960–2005. *Int. J. Urban Policy Plan.* **2007**, *24*, 165–182. [[CrossRef](#)]
2. Haase, A.; Bernt, M.; Großmann, K.; Mykhnenko, V.; Rink, D. Varieties of shrinkage in European cities. *Eur. Urban Reg. Stud.* **2013**, *12*, 86–102. [[CrossRef](#)]
3. Wolff, M.; Wiechmann, T. Urban growth and decline: Europe's shrinking cities in a comparative perspective 1990–2010. *Eur. Urban Reg. Stud.* **2017**, *25*, 122–139. [[CrossRef](#)]
4. Stryjakiewicz, T.; Ciesiółka, P.; Jaroszewska, E. Urban shrinkage and the post-socialist transformation: The case of Poland. *Built Environ.* **2012**, *38*, 197–213. [[CrossRef](#)]
5. Spórna, T.; Kantor-Pietraga, I.; Krzysztofik, R. Trajectories of depopulation and urban shrinkage in the Katowice Conurbation, Poland. *Espace Popul. Soc.* **2016**, 6102. [[CrossRef](#)]
6. Krzysztofik, R.; Kantor-Pietraga, I.; Runge, A.; Spórna, T. Is the suburbanisation stage always important in the transformation of large urban agglomerations? The case of the Katowice conurbation. *Geogr. Pol.* **2017**, *90*, 71–85. [[CrossRef](#)]
7. Śleszyński, P. Demographic changes in the functional urban areas in Poland, 2000–2010. *Geogr. Pol.* **2013**, *86*, 169–170. [[CrossRef](#)]

8. Kantor-Pietraga, I. *Systematyka Procesu Depopulacji Miast na Obszarze Polski od XIX do XXI Wieku*; Uniwersytetu Śląskiego: Katowice, Poland, 2014.
9. Musiał-Malago, M. The process of urban shrinking in Poland. *Stud. Miejsk.* **2016**, *24*, 92–106.
10. Hudec, O.; Urbančíková, N. *Spatial Disparities Based on Human and Social Capital. World Cities and Urban Form. Fragmented, Polycentric, Sustainable?* Jenks, M.D., Kozak, P., Eds.; Routledge: New York, NY, USA; London, UK, 2008; pp. 113–128.
11. Evans, J.; Jones, P. Rethinking sustainable urban regeneration: Ambiguity, creativity and the shared territory. *Environ. Plan. A* **2008**, *40*, 1416–1434. [[CrossRef](#)]
12. Turcu, C. Local experiences of urban sustainability: Researching Housing Market Renewal interventions in three English neighbourhoods. *Prog. Plan.* **2012**, *78*, 101–150. [[CrossRef](#)]
13. Freytag, T.; Gössling, S.; Mössner, S. Living the green city: Freiburg’s Solarsiedlung between narratives and practices of sustainable urban development. *Local Environ.* **2014**, *19*, 644–659. [[CrossRef](#)]
14. Zhang, Q.; Yung, E.H.K.; Chan, E.H.W. Towards Sustainable Neighborhoods: Challenges and Opportunities for Neighborhood Planning in Transitional Urban China. *Sustainability* **2018**, *10*, 406. [[CrossRef](#)]
15. Berardi, U. Sustainability assessment of urban communities through rating systems. *Environ. Dev. Sustain.* **2013**, *15*, 1573–1591. [[CrossRef](#)]
16. Zheng, H.W.; Shen, G.; Song, Y.; Sun, B.; Hong, J. Neighborhood sustainability in urban renewal: An assessment framework. *Environ. Plan. B* **2016**, *44*, 903–924. [[CrossRef](#)]
17. Fang, X.; Zhou, B.; Tu, X.; Ma, Q.; Wu, J. “What Kind of a Science is Sustainability Science?” An Evidence-Based Reexamination. *Sustainability* **2018**, *10*, 1478. [[CrossRef](#)]
18. Costanza, R.; Patten, B.C. Defining and Predicting Sustainability. *Ecol. Econ.* **1995**, *15*, 193–196. [[CrossRef](#)]
19. Capello, R.; Nijkamp, P. In search of sustainable human settlements. *Ecol. Econ.* **2002**, *40*, 151–155. [[CrossRef](#)]
20. Vojnovic, I. (Ed.) *Urban Sustainability: A Global Perspective*; Michigan State University Press: East Lansing, MI, USA, 2013.
21. Du Pisani, J.A. Sustainable development—Historical roots of the concept. *Environ. Sci.* **2006**, *3*, 83–96. [[CrossRef](#)]
22. Rahman, A.U. Urban sustainability through strategic planning: A case of metropolitan planning in Khulna city, Bangladesh. *J. Urban Manag.* **2016**, *5*, 16–22. [[CrossRef](#)]
23. Runge, A.; Runge, J. Polityka lokalna i regionalna w świetle depopulacji—na przykładzie województwa śląskiego. In *Wyzwania Dla polityki Rozwoju Regionalnego*; Szlachta, J., Legutko-Kobus, P., Eds.; Studia KPZK PAN: Warszawa, Poland, 2017; pp. 133–150.
24. Haase, A.; Nelle, A.; Mallach, A. Representing urban shrinkage—The importance of discourse as a frame for understanding conditions and policy. *Cities* **2017**, *69*. [[CrossRef](#)]
25. Radzimski, A. Involving small landlords as a regeneration strategy under shrinkage: Evidence from two East German cases. *Eur. Plan. Stud.* **2018**, *26*, 526–545. [[CrossRef](#)]
26. Schneider, A.; Woodcock, C.E. Compact, Dispersed, Fragmented, Extensive? A Comparison of Urban Growth in Twenty-five Global Cities using Remotely Sensed Data. *Pattern Metrics Census Inf. Urban Stud.* **2008**, *45*, 659–692.
27. Haapio, A. Towards sustainable urban communities. *Environ. Impact Assess. Rev.* **2012**, *32*, 165–169. [[CrossRef](#)]
28. Modarres, A. Commuting, energy consumption, and the challenge of sustainable urban development. *Curr. Opin. Environ. Sustain.* **2017**, *25*, 1–7. [[CrossRef](#)]
29. Næss, P.; Vogel, N. Sustainable urban development and the multi-level transition perspective. *Environ. Innov. Soc. Transit.* **2012**, *4*, 36–50. [[CrossRef](#)]
30. Cutini, V. Conurbations and resilience. When growth makes us fragile. *TEMA J. Land Use Mobil. Environ.* **2017**, *10*, 5–24. [[CrossRef](#)]
31. Bernt, M.; Coach, C.; Haase, A.; Cocks, M.; Grossman, K.; Cortese, C.; Krzysztofik, R. Why and how does(n’t) urban shrinkage get onto the agenda? Experiences from Leipzig, Liverpool, Genoa and Bytom. *Int. J. Urban Reg. Res.* **2014**, *8*, 1749–1766. [[CrossRef](#)]
32. Haase, A.; Rink, D.; Grossmann, K. Shrinking cities in post-socialist Europe: What can we learn from their analysis for theory building today? *Geogr. Ann. Ser. B Hum. Geogr.* **2016**, *98*, 305–319.
33. Krzysztofik, R. (Ed.) *Demography; Report about the Condition of Polish Cities*; National Institute for Spatial Policy and Housing: Krakow, Poland, 2018.

34. Lehmann, S. Green Urbanism: Formulating a Series of Holistic Principles. *Sapiens* **2010**, *3*, 1–17.
35. Clements-Croome, D.; Marson, M.; Yang, T.; Airaksinen, M. Planning and Design Scenarios for Liveable Cities. In *Encyclopedia of Sustainable Technologies*; Elsevier: Amsterdam, The Netherlands, 2017; pp. 81–97.
36. Krzysztofik, R.; Runge, J.; Spórna, T. *Delimitacja Regionu Górnośląsko-Zagłębiowskiej Metropolii “Silesia”*; Opracowanie dla GZM: Katowice, Poland, 2011. Available online: <http://www.obserwatoriummiasto.us.edu.pl/raporty-i-analizy/> (accessed on 4 December 2018).
37. Plan Zagospodarowania Przestrzennego Województwa Śląskiego 2020+. Available online: <https://planzagospodarowania.slaskie.pl/> (accessed on 10 September 2018).
38. Cottle, T.J. *Hardest Times: The Trauma of Long Term Unemployment*; University of Massachusetts Press: Amherst, MA, USA, 2000.
39. Krzysztofik, R.; Runge, J.; Kantor-Pietraga, I. *An Introduction to Governance of Urban Shrinkage. A Case of Two Polish Cities: Bytom and Sosnowiec*; WNoZ Uniwersytet Śląski: Sosnowiec, Poland, 2012.
40. Statistical Office in Katowice. Available online: <http://katowice.stat.gov.pl/en/> (accessed on 8 September 2018).
41. Tosics, I. European urban development: Sustainability and the role of housing. *J. Hous. Built Environ.* **2004**, *19*, 67–90. [[CrossRef](#)]
42. Häkkinen, T.; Ruuska, A.; Vares, S.; Pulakka, S.; Kouhia, I.; Holopainen, R. *Methods and Concepts for Sustainable Renovation of Buildings*; VTT Technical Research Centre of Finland: Espoo, Finland, 2012.
43. Chodkowska-Miszczuk, J.; Szymańska, D. Modernisation of Public Buildings in Polish Towns and the Concept of Sustainable Building. *Quest. Geogr.* **2014**, *33*, 89–99. [[CrossRef](#)]
44. Karol, E. Tools for Measuring Progress Towards Sustainable Neighborhood Environments. *Sustainability* **2009**, *1*, 612–627. [[CrossRef](#)]
45. Kreutz, S. Urban Improvement Districts in Germany: New legal instruments for joint proprietor activities in area development. *J. Urban Regen. Renew.* **2009**, *2*, 304–317.
46. Bourdic, L.; Salat, S.; Nowacki, C. Assessing cities: A new system of cross-scale spatial indicators. *Build. Res. Inf.* **2012**, *40*, 592–605. [[CrossRef](#)]
47. Sharifi, A.; Murayama, A. Viability of using global standards for neighbourhood sustainability assessment: Insights from a comparative case study. *J. Environ. Plan. Manag.* **2015**, *58*, 1–23. [[CrossRef](#)]
48. Waldron, D.; Miller, D. *Regenerative Sustainability at the Neighborhood Scale*; University of British Columbia: Vancouver, BC, Canada, 2013.
49. Coafee, J.; Lee, P. *Urban Resilience. Planning for Risk, Crisis and Uncertainty*; Palgrave Macmillan: London, UK; New York, NY, USA, 2016.
50. Verovsek, S.; Juvancic, M.; Zupancic, T. Widening the Scope and Scale of Sustainability Assessments in Built Environments: From Passive House to Active Neighbourhood. *Acad. J. Interdiscip. Stud.* **2018**, *7*, 129–135. [[CrossRef](#)]
51. Wheeler, S.M.; Beatley, T. (Eds.) *The Sustainable Urban Development Reader*; Routledge: London, UK; New York, NY, USA, 2004.
52. Talen, E. Urban and Regional Sustainability. In *Handbook of Regional Science*; Fischer, M.M., Nijkamp, P., Eds.; Springer: Berlin, Germany, 2014; pp. 1071–1083.
53. Sobala-Gwosdz, A.; Gwosdz, K. “Katowice effect”? Regeneration of the site of the former Katowice coal mine through prestige cultural projects. *Urban Dev.* **2017**, *56*, 27–40. [[CrossRef](#)]
54. Lombardi, P.; Trossero, E. Beyond energy efficiency in evaluating sustainable development in planning and the built environment. *Int. J. Sustain. Build. Technol. Urban Dev.* **2013**, *4*, 274–282. [[CrossRef](#)]
55. Bird, K. Neighbourhood Sustainability Assessment: Connecting Impact with Policy Intent. Master’s Thesis, Simon Fraser University, Burnaby, BC, Canada, 2015.
56. Cole, R.J.; Robinson, J.; Westerhoff, L. Regenerative sustainability: Rethinking neighbourhood sustainability. In *Pragmatic Sustainability—Theoretical and Practical Tools*, 2nd ed.; Moore, S.A., Ed.; Routledge: New York, NY, USA, 2016; pp. 208–226.
57. Jabareen, Y.R. Sustainable Urban Forms: Their Typologies, Models, and Concepts. *J. Plan. Educ. Res.* **2006**, *26*, 38–52. [[CrossRef](#)]
58. Mendes, W.; Balmer, K.; Kaethler, T.; Rhoads, A. Using Land Inventories to Plan for Urban Agriculture: Experiences from Portland and Vancouver. *J. Am. Plan. Assoc.* **2008**, *74*, 435–449. [[CrossRef](#)]

59. Pelorosso, R.; Gobattoni, F.; Ripa, M.N.; Leone, A. Second law of thermodynamics and urban green infrastructure. A knowledge synthesis to address spatial planning strategies. *TEMA J. Land Use Mobil. Environ.* **2018**, *11*, 27–50. [[CrossRef](#)]
60. Campbell, S. Green Cities, Growing Cities, Just Cities? Urban Planning and the Contradictions of Sustainable Development. *J. Am. Plan. Assoc.* **1996**, *62*, 296–312. [[CrossRef](#)]
61. Basten, L. “In-betweens” in Time and Space: The Governance of Suburbanisms in the Ruhr. *Old Europe, New Suburbanization Governance, Land, and Infrastructure in European Suburbanization*; Phelps, N.A., Ed.; University of Toronto Press: Toronto, ON, Canada; Buffalo, NY, USA; London, UK, 2017; pp. 158–182.
62. Schwarze-Rodrian, M. *Ruhr Region Case Study. Remaking Postindustrial Cities. Lessons from North America and Europe*; Carter, D.K., Ed.; Routledge: New York, NY, USA; Abingdon, UK, 2016; pp. 187–209.
63. Hänsgen, D.; Lentz, S.; Tzschadel, S. *Deutschlandatlas. Unser Land in 200 thematischen Karten*; WBG: Darmstadt, Germany, 2010.
64. Krummacher, M.; Waltz, V. Ruhrgebiet: Migration und Stadtentwicklung in einer altindustrialisierten Region. Herausforderungen, Versäumnisse, “best-practice“-Beispiele. In *Migration und Stadt*; Schmals, K.M., Ed.; Springer: Leverkusen, Germany, 2000.
65. Blotevogel, H.H.; Schickhoff, I. Suburbanisation in Densely Populated Areas with Several Foci: The Example of the Rhine-Ruhr Industrial Area. The take-off of suburbia and the crisis of the inner city. In *Proceedings of the International Symposium in Munich and Vienna, Vienna, Austria, 8–12 October 1984*; Heinritz, G., Lichtenberger, E., Eds.; Franz Steiner Verlag Wiesbaden GmbH: Stuttgart, Germany, 1986; pp. 74–98.
66. Coenen, L.; Benneworth, P.; Truffer, B. Toward a spatial perspective on sustainability transitions. *Res. Policy* **2012**, *41*, 968–979. [[CrossRef](#)]
67. Sieverts, T. *Cities without Cities. An Interpretation of the Zwischenstadt*; Spon Press: London, UK, 2003.
68. Phelps, N.A. *Interplaces. An Economic Geography of the Inter-Urban and International Economies*; Oxford University Press: New York, NY, USA; Croydon, UK, 2017.
69. Milder, J. Sustainable Urban Form. In *Sustainable Urban Environments: An Ecosystem Approach*; van Buren, E., van Bohemen, H., Itard, L., Visscher, H., Eds.; Springer: Dordrecht, The Netherlands, 2012; pp. 263–284.
70. Lin, K.W.; Shih, C.M. The Comparative Analysis of Neighborhood Sustainability Assessment Tools. *Environ. Plan. B Plan. Des.* **2016**, *45*, 90–105. [[CrossRef](#)]
71. Angelidou, M. Shortcomings to smart city planning and development. Exploring patterns and relationships. *TEMA J. Land Use Mobil. Environ.* **2017**, *10*, 77–93. [[CrossRef](#)]
72. Gatrell, J.D.; Jensen, R.R.; Patterson, M.W.; Hoalst-Pullen, N. (Eds.) *Urban Sustainability: Policy and Praxis*; Springer: Cham, Switzerland, 2016.
73. Boyle, L.; Michell, K.; Viruly, F. A Critique of the Application of Neighborhood Sustainability Assessment Tools in Urban Regeneration. *Sustainability* **2018**, *10*, 1005. [[CrossRef](#)]
74. Śleszyński, P. Współczesne i prognozowane uwarunkowania demograficzno-migracyjne w rozwoju miejskiego systemu osadniczego Polski. *Konserw. Wiedzy Mieście* **2016**, *1*, 97–106. [[CrossRef](#)]
75. Neuman, M. The Compact City Fallacy. *J. Plan. Educ. Res.* **2005**, *25*, 11–26. [[CrossRef](#)]
76. Choguill, C.L. Developing Sustainable Neighborhoods. *Habitat Int.* **2008**, *32*, 41–48. [[CrossRef](#)]
77. Karuppanan, S.; Sivam, A. Social sustainability and neighbourhood design: An investigation of residents’ satisfaction in Delhi. *Local Environ.* **2011**, *16*, 849–870. [[CrossRef](#)]
78. Batty, M. Urban Regeneration as Self-Organization. *Arch. Des.* **2012**, *215*, 54–59.

