land

MDPI

Article

The Smart Village Concept and Transport Exclusion of Rural Areas—A Case Study of a Village in Northern Poland

Sandra Żukowska [1], Beata Chmiel [2] and Marcin Połom [1,*]

[1] Division of Regional Development, Institute of Socio-Economic Geography and Spatial Management, Faculty of Social Sciences, University of Gdansk, Bażyńskiego 4, 80-309 Gdansk, Poland
[2] Department of Transport Economics, Faculty of Economics, University of Gdansk, Armii Krajowej 119/121, 81-824 Sopot, Poland
* Correspondence: marcin.polom@ug.edu.pl

Abstract: The aim of the article is to present transport accessibility in rural areas in Poland, with a particular emphasis on the problem of transport exclusion. The following research methods were used in the study: literature review, statistical data analysis and GIS analysis. The article presents a transportation picture of rural areas and identifies the main problem issues related to the insufficient accessibility of public transport. The conducted analyses show a significant alienation of the study area which results from underdeveloped public transport and road infrastructure, including pedestrian and bicycle routes. Measures taken by local authorities in this regard show awareness of the problems of the local community, but those authorities do not take sufficient action. The transport exclusion of inhabitants of the analyzed area can be reduced by developing pedestrian and bicycle infrastructure connecting villages with the existing railway network, characterized by a high frequency of trains.

Keywords: smart village; GIS analysis; public transport

Citation: Żukowska, S.; Chmiel, B.; Połom, M. The Smart Village Concept and Transport Exclusion of Rural Areas—A Case Study of a Village in Northern Poland. *Land* **2023**, *12*, 260. https://doi.org/10.3390/land12010260

Academic Editors: José Luis Gurría Gascón and Ana Nieto Masot

Received: 15 November 2022
Revised: 9 January 2023
Accepted: 12 January 2023
Published: 16 January 2023

1. Introduction

Development differences between urban and rural areas are systemic and deeply rooted in the history of regions [1]. An increase in interest in rural development can be observed in recent years, both in the scientific literature and in the public debate [2]. There are noticeable differences in the approach to defining smart villages between Europe and Asia, Africa, and the Americas [3]. They concern smart areas where new solutions—policies and strategies—are implemented. In Europe, the main focus of researchers has been on social innovation, to the exclusion of environmental issues. In Poland, a revolution in the approach to rural development occurred after joining the European Union, when Poland was confronted with the realities of market and international competition. The problems of rural areas were exacerbated by a collapse of regional transport [4] and, among others, liquidation of the socialized sector [5], which led to an increase in unemployment, digital exclusion, limitation of access to public services or deterioration in the quality of life [6].

Regional transport includes individual and collective transport. The latter is most often realized as part of public services (public transport). Infrastructure, transport distribution and transport in the public and private formula are among the main factors of regional growth [7]. In the case of Poland, the issue of public transport is associated with the political changes of the 1990s related to the so-called "post-communist transformation", which significantly contributed to changing the mechanisms of supporting residents in terms of providing them with access to public transport, especially in smaller towns [8]. Similarly, its role was becoming less important every year along with a fall in prices of passenger cars. Owning them still marked a high social status in many countries. Persons forced to travel exclusively by public transport, especially regional transport, have to face many problems—poor quality of transport, mismatch between the offer and the

actual needs, high fares, or frequent changes in timetables. Most of them result from an inadequately implemented transport policy by local and regional authorities [9–11].

Villages are characterized by significant problems related to the dispersion of access to transport services and to the resulting transport poverty and poor quality of public transport. As a result, this leads to a decline in passenger numbers in rural areas [12,13]. Inhabitants of villages are exposed to a much higher risk of social exclusion and the related deterioration in the quality of life [14] especially as regards the group of young and elderly people [13,15]. Inaccessibility of rural areas in terms of transport translates into lower education, difficulties in access to public services, as well as limited social bonds. Transport-excluded villages may become so-called enclaves of poverty and social collapse [13]. In such places, residents experience stress related to social exclusion, including addiction, aggression, or depression [16]. This is also linked to the increased number of suicides among male farm workers—this is already a serious social problem [17]. Counteracting social exclusion in rural areas should be largely based on measures related to counteracting transport poverty, which can bring many benefits to local communities [18].

The research addressed completes the knowledge of the implementation of the smart village concept in Central and Eastern European countries (CEE). During the political transition, rural areas found themselves in a difficult situation—high unemployment, risk of poverty, social problems, or migration to larger cities. Research shows that after almost 30 years, rural areas of CEE countries are still facing problems, including mobility. The collapse of regional transport and the neglect of infrastructure is a serious problem today. The analysis presented in this article, supported by a literature review and a case study, provides a framework for local authorities to take action to improve transport accessibility. However, it should be noted that the most important action remains at the national level, which is able to stimulate local action. The article synthesizes the benefits of the smart village concept through examples of how the concept has been implemented in European countries, particularly in CEE countries. The benefits were supported by a case study that can provide a framework for change in strategic planning for local authorities.

The research aimed to analyze transport accessibility in Poland, with particular emphasis on rural areas, and to present a case study of a selected place characterized by significant social and transportation alienation. Opportunities to counteract this phenomenon were presented, thanks to original solutions based on the concept of smart villages. The study involved a critical analysis of statistical materials concerning the subject of transport availability in Poland. In the context of the conducted analysis, data for rural areas were presented, with particular emphasis on the region in northern Poland. The work is completed with the case study with original solutions and recommendations of an applicatory nature. The paper ends with conclusions listing detailed determinants of the emergence of transport exclusion in rural areas and key opportunities to counteract this phenomenon.

2. Rural Development Issues and the Smart Village Concept

Rural development is a complex process. It concerns the improvement of the quality of life and economic well-being of people living in rural areas. This development is generally realized through the implementation of socio-economic programs and infrastructure projects.

Although the concept of rural development, also sustainable rural development, has existed in the current discourse for decades, it is noticeable that it has been addressed with particular interest in recent years [4]. The main reason for this is the growing awareness of both the problems faced by rural areas in view of the various challenges, including especially those of a climatic nature. Rural areas also play an important role in global development. It is also important to even out development disparities between urban and rural areas.

The literature on rural development issues is abundant with research that focuses primarily on a few key research areas. These include studies on disparities in access to basic needs (e.g., water, food), services (e.g., electricity, education, health care) or the labor

market. If rural residents do not have access to basic needs or services, this has serious consequences, such as higher rates of disease or mortality among residents compared to urban areas. For rural areas, activities aimed at building new infrastructure, both linear and point-to-point, are also important. New road or rail infrastructure can be critical to rural socio-economic development and poverty reduction. It is particularly important for those facing social exclusion, a classic example of which is transport exclusion, which strongly distinguishes rural from urban areas. For rural communities, the lack of access to various services or a better labor market is influencing increased migration to cities, thus contributing to the depopulation of rural areas [19]).

For several years now, rural areas have also become the main beneficiaries of various policy measures at various levels aimed at their sustainable development, as exemplified by the European Union. Sustainable development policies are based on taking integrated action in three key areas of human functioning: economic, social, and environmental areas. Policy makers have recognized that bottom-up actions are beneficial and necessary as they support the development process, but that a top-down (systemic) approach is needed, in terms of guiding development, financial support frameworks, monitoring and evaluation.

Currently, the development of rural areas is shaped by the European Union policy and by national and regional activities. An increase in interest in the countryside results partly from trying to counteract the depopulation of these areas, and partly from seeing a threat of the socio-economic collapse of rural areas. Many villages in Poland are depopulated, and the remaining residents—usually the oldest ones—live without access to basic services, including grocery stores and health care [20].

"A long-term Vision for the EU's Rural Areas—Towards stronger, connected, resilient and prosperous rural areas by 2040" [21] is a strategic document in the field of rural development, according to which the main factors in rural growth are actions to improve the quality of the environment and digitalization. This document sets out the directions of rural development in four categories: community, resilience, communication, and perspectives. Another important document is "A Farm to Fork Strategy", which focuses on the aspect of healthy food and resilience to climate change. Although it emphasizes the agricultural dimension of rural areas, this strategy concerns the European community in general—it indicates equal access to cheap, local, and healthy food. This is recognized as a fundamental right of every human being. Both documents are part of the strategy of the "European Green Deal" [22], whose main objective was to transform Europe into the first climate-neutral continent by the end of 2030.

Rural policy primarily focuses on climate resilience and an improvement in the population's quality of life. However, these assumptions cannot be fulfilled without a systemic approach, i.e., an action plan. Today's rural areas need development strategies just as much as cities do [23]. However, due to their different nature, it should be an action plan adapted to the nature of a village, i.e., its diversity. Rural areas in CEE countries are characterized by slightly different problems than in Western Europe, which significantly affects the effectiveness of European strategies implemented in CEE countries. Rural areas of CEE countries are much poorer and the problem of poverty there is multidimensional, as poverty is a result of the transformation process [24]. The proposed idea of 'smart villages' is such a concept. Like its urban counterpart, it is characterized by a systemic approach, treating the rural area as a coherent whole. Smart villages are defined as rural communities that use an innovative approach and technologies in order to increase their resilience, quality of life and development opportunities in the field of economy, social development, and participation, health, and communication [25–27]. Based on an in-depth analysis of literature on rural development and the quoted definitions, the concept of smart villages is presented in the form of a development model focused on activities concerning five basic categories: Resilience, Mobility, Community, Perspectives and Digitalization (Table 1) [25–27].

Table 1. Model of smart villages (own study, based on [25–27]).

Category	Features
Resilience	implementation of pro-ecological measures and solutions, production, and high availability of local food, strengthening hard and soft skills among the inhabitants of rural areas of working and pre-working age
Mobility	ensuring collective and individual public transport in rural areas, including micromobility, e.g., rural bicycle systems or the mobility-as-a-service concept (MaaS), modernization of existing road and rail infrastructure and construction of new connections
Community	actions to build a cohesive and active rural community, social participation
Perspectives	actions to build a cohesive and active rural community, social participation
Digitalization	ensuring access to the Internet, including for elderly people and people threatened by digital poverty or social exclusion; digitalization of public services

The model distinguishes five categories, key from the point of view of rural development: resilience, mobility, community, perspectives, and digitalization (Table 1). There are some similarities to the traditional approach to the smart city concept in six areas; however, being newer [26,27], the smart villages concept significantly updates the original assumptions of six areas, also on the basis of the pandemic experience associated with COVID-19 which verified the traditional approach to smart development.

Currently, the interest in an innovative and ecological approach to development issues is growing, but as regards rural areas, fragmentation of activities can be noticed [27]. These are usually initiatives by the agricultural sector to build a new business model that would link agriculture with trade or services. Such initiatives include the "The Farma Brezany" company from Slovakia, producing pellets out of horse manure or the herbal garden "MAJNIKA" from Slovenia [28–30]. Activities related to producing food, breeding farm stock, strengthening local communities and developing tourism dominate [31]. The smallest share of innovation concerns transport in rural areas. There are only few such initiatives: the Austrian "FUMObil", i.e., electric buses reaching every village in the region, a system of rural cargo bikes in Burgsteinfurt in Germany or a system of shared electric cars from France [32]. The German experience highlights the necessity of co-creation and implementation of IoT solutions in rural areas. The 'Digitales Dorf Bayern' project was primarily aimed at improving the quality of life of local residents through access to information and services on a mobile app [33]. In the Czech Republic, in contrast, the implementation of smart villages was based on the cooperation of three thematic areas—environment and energy, agriculture and education. The aim of the policies implemented was, for example, to ensure efficient energy use in buildings, improve energy and transport infrastructure, educate about energy, or support the development of alternative energy [34].

The issue of transport exclusion is complex, which results in low interest from both private entrepreneurs and local authorities. There is no doubt that efficient, accessible, and safe transport determines the well-being of the rural population [35]. Without providing public transport services, it is impossible to build a resilient and equal society. Globally, the smart village concept is rarely associated with public transport, which may be due to different considerations. In Europe, however, public transport is an important component of smart villages [36]. Poorly functioning public transport contributes to social exclusion, exacerbation of poverty and unemployment, and a reduction of development opportunities for young people from rural areas. It should be noted that the issue of mobility, especially infrastructure, is a critical point in the implementation of the smart village concept. Above all, there are very different levels of development between countries and regions. At the same time, in many places' infrastructure investments should precede the implementation of innovations [23].

It should be noted that the issue of mobility in rural areas in general has been marginalized in order to promote mobility in urban areas. There was a greater focus on improving mobility in cities or suburban areas closely related to the city than in villages, especially peripheral ones. The fundamental difference primarily results from the distance and the

condition of connections to broadly understood service centers, such as shops or workplaces. For example, in rural areas, insufficient distribution of transport connections is a common problem. Rural areas are also characterized by an increased number of bottlenecks, i.e., an underdeveloped and inefficient (transport) system which is a serious obstacle to mobility. In order to counteract this, specific strategies are needed to increase the sustainable mobility of rural communities [29]. It is worth noting that the smart village model means not only actions taken top-down by rural decision-makers, such as a local government, but also active participation of the rural community in these activities [37].

The issue of the development of mobility in rural areas should be approached using a more diverse formula than in the case of shaping mobility for urban areas. In particular, this is due to differences in the distance between the city's borders and access to the necessary needs, and in the case of rural areas to relatively more distant locations of desired services. The population density, which affects the economic efficiency of transport, is also important. In the case of rural areas, the level of subsidies for transport services must often be higher than in the case of cities. The smart village model pays special attention to mobility in the context of its role of sharing [35]. Shared mobility can be one of the basic solutions to combat social and transport exclusion in rural areas. Simultaneously, it can be a cheaper alternative to traditional public transport. It can be defined as a set of practices aimed at changing private ownership to temporary ownership or sharing different means of transport, most often individual—bicycles, scooters or passenger cars [35]. Examples of shared mobility services include, but are not limited to, rural/urban bicycle systems, social networks for the exchange and sharing of individual means of transport or supporting other members of rural communities in increasing their mobility [35,38]. Car ownership depends largely on place of residence and income. The most common car owner is a rural resident with a relatively high income [39]

First of all, the model of sustainable mobility in rural areas should point to three basic components, which include (1) making available and sharing one's own resources, among others sharing private means of transport, such as passenger cars or bicycles, (2) making available and sharing trips with a shared means of transport, carpooling, voluntary activity in the field of increasing mobility or safe hitchhiking, and (3) efficient transport services, which include, among others, increasing the flexibility and efficiency of the trip by designing and setting out flexible and resource-efficient door-to-door routes [35,40,41]. The issues of mobility in rural areas are connected with the issue of limited intra-regional communication, the issue of forced motorization and high degree of residents' self-organization in the field of mobility. This problem is so vital in socio-economic and environmental terms that more attention should be paid to it. Statistics show that in rural areas men dominate in the proportion of passenger vehicle drivers. Women, the elderly or people with disabilities are exposed to the effects of social exclusion, due to their low mobility determined, among others, by their lower incomes preventing them from obtaining a driving license and buying a private means of transport or due to cultural conditions [42]. Mobility patterns and their distribution by gender are also key in this aspect. Statistically, it is women who are less mobile than men when it comes to the use of cars for daily mobility. This is due, among other things, to historical and cultural issues or also financial issues related to access to a car—driving-license course, purchase of a car [42]. Shared mobility, as shown in the presented model, is one of the solutions to this problem. It can support the sustainable inclusion of the rural community in social life or the improvement in the residents' private situation by creating better earning opportunities.

3. Materials and Methods

The main research methods applied in the study include the analysis of existing and secondary data [43]. The data used to conduct the meta-analysis are of both a quantitative and qualitative nature. The scope of research activities is based on modelling, processing, and critical analysis of national and international literature on the subject. The distribution of the research process is presented in Figure 1.

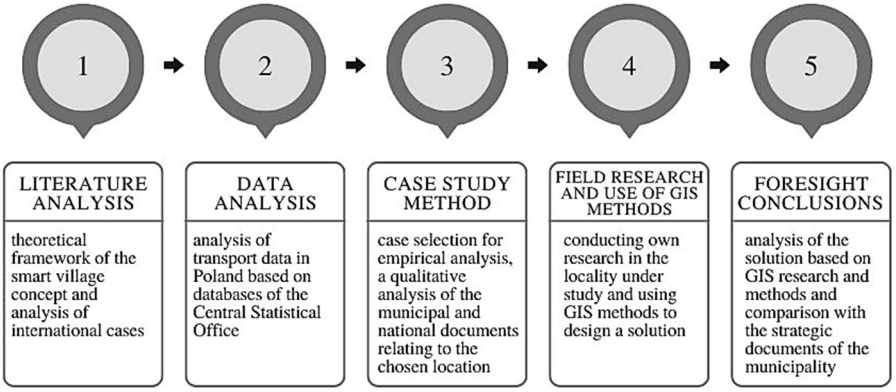

Figure 1. Research methodology in the subsequent phases.

Scientific publications and specialized reports as well as public statistical data have been taken into account. The literature analysis was based on databases: Google Scholar, EBSCO, and Wiley. The literature review focused on Central and Eastern Europe and Poland. Items were selected on the following keywords—smart village, intelligent village, transport exclusion, social exclusion, transport poverty. The literature was then reviewed for relevance to the subject of the paper and a working report was produced. It included information on defining keywords in the literature. First of all, these statistical data were published by Statistics Poland (GUS) in the form of an open database called the Local Data Bank (LDB). Statistics Poland is part of government administration in Poland whose primary task is to collect, process and share statistical data that cover the majority of public and private life in the country [44]. Data are aggregated by fields which include—population, national censuses, territorial division, transport, and communication. The indicated statistical data were expanded with statistical resources from the Regional Statistics database, which primarily focuses on an in-depth data set for particular regions [44]. Statistics for the northern region of the country were used for the purposes of this study.

The study also used an analysis of the spatial data using GIS tools (Geographic Information Systems) to illustrate transport accessibility in the form of cartographic studies. In this modelling, the Topographic Objects Database [45] was used. According to the Regulation of the Minister of Development, Labor, and Technology of 27 July 2021, it is a database that collects information covering the spatial location of topographic objects in the scale of 1:10 000, contained in the applicable state spatial reference system [46]. First of all, they are of a vector character, and for the needs of this study, in order to visualize and analyze, a set of categories of objects in the form of a transportation network and territorial division units was used. The analysis of the GIS spatial distribution was supplemented with the conducted field study in the form of, among others, measurement of the time needed to cover a specific distance or spatial inventory.

In addition, the article uses the case study method. Several factors influenced the choice of the specific location [47]:

- Own observations,
- Proximity to the Tri-city agglomeration, which is the largest development center in northern Poland,
- Good accessibility of regional railways, but lack of metropolitan railways,
- Lack of bus connections.

The case study Głuszyno is located between two regional towns: Słupsk and Lębork. The village is also located in the vicinity of a large urban center, i.e., the Tri-city agglomeration. Głuszyno has direct railway connections with the agglomeration (regional railway) but is not served by the metropolitan railway. Despite a good rail connection, residents face a lack of accessibility to the railway station. The access road to the station is missing, as is a pedestrian walkway and cycle path. Hence, the case of the village of Głuszyno stands out compared to other villages, but this does not mean that it is only here that residents

have difficulties in accessing public transport. The village of Głuszyno can be considered a clear case, which nevertheless draws attention to a problem common in the countries of Central and Eastern Europe, which, after the transformation process, face the problem of rural alienation. Based on the field research and the qualitative analysis of the Potęgowo Municipality Development Strategy, a model solution for improving transport accessibility to the railway station was created.

4. Results

4.1. Transport Exclusion in Poland

The issue of transport exclusion in CEE countries dates back to the 1990s, i.e., the beginnings of systemic transformation towards a free market economy [48,49]. This period was characterized by a high level of inflation, a high unemployment rate and numerous changes in legal regulations. The collapse of the communist state caused an economic crisis of unprecedented strength, which led to significant impoverishment of the population and numerous problems of state-owned companies. As a result of the changes, many people found themselves in a difficult financial situation—on the verge of poverty. Simultaneously, the entire transport system changed, and many local communities were deprived of access to the nearest town or village, which can be defined as transport exclusion.

Of particular importance for creating the phenomenon of transport exclusion in rural areas in Poland was the underdevelopment of individual motorization and the inefficiency of public transport (regional bus transport and rail transport). Before the socio-political transformation in Poland, the availability of goods such as cars was significantly limited and regulated by the state [49]. As a result, one had to wait for several years for a factory-new car, if the state had given permission to buy it. Access was mainly available to those associated with the state apparatus that exercised power and control in the country. The vehicle market was very limited. This was a common policy applied in the countries of the Soviet Eastern Bloc. It was aimed at controlling all spheres of life of the population by the State, including in particular their movement. After 1989, when it became possible to buy vehicles imported from the second-hand market from abroad, many Poles wanted to own their own car. The second reason for the significant dynamics of the growth of transport exclusion in rural areas was the failed reforms of the State Motor Transport Company (PPKS)—the main bus operator in Poland, as well as the suspension of railway traffic on local routes [50,51]. The main reason for traffic restrictions on railway routes was related to the maladaptation of the rolling stock to the volume of passenger flows. In the system of central financing of public transport, the economic efficiency of such services was not effectively verified. In the reality of the free market system, it was a challenge to maintain public transport services at the current level of supply [50].

Transport exclusion can be depicted in a broader perspective as an implication of the risk of poverty and transport inaccessibility, which can lead to transport poverty. The lack of transport affects the general lack of access to goods, services, good education, entertainment and culture and a sufficient number of social interactions [52,53]. The deficit of these factors means that people affected by such understood transport exclusion lose their autonomy, i.e., their decision-making capacity, and consequently also development opportunities. This results in social exclusion (Figure 2). Rural communities are particularly vulnerable to these processes, as they are much more affected by the negative consequences of the lack of public transport or of not owning cars. Analyses also conclude that rural residents tend to spend more on mobility than urban residents [54].

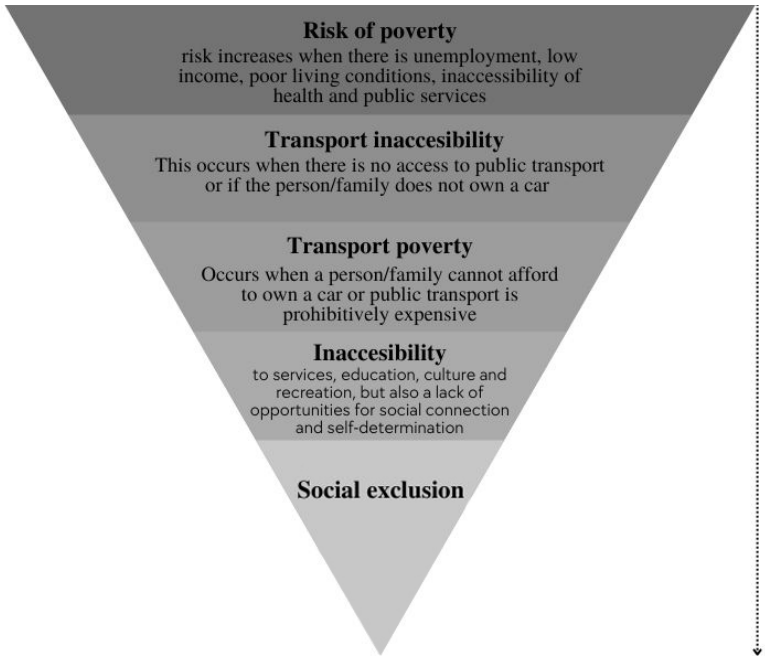

Figure 2. The relationship between a risk of social poverty, transport inaccessibility, and social exclusion (own study, based on [1–3,5,15,52,53]).

Available data shows that CEE countries are poorer than Western and Northern European countries. Data for 2005, 2008, 2012, 2016 and 2020 were taken for the analysis. Countries with unavailable or incomplete data were omitted; these included Romania and Croatia. Luxembourg, which could distort the results of the study due to its small size, was also deliberately excluded. The cumulative data is presented in a Pareto chart to illustrate the difference between CEE and Northern and Western Europe (Figure 3). Between 2005 and 2020, it was among the CEE population that there were by far more people unable to afford emergency expenses. They were therefore relatively low-income people with no financial surplus. The highest proportion of such people was recorded in Bulgaria at 77%, Latvia at 71%, Lithuania at 66% and Poland at 63%. In comparison, the countries with the lowest proportion of people without a financial surplus are Sweden at 14%, Portugal at 19%, Ireland at 23% and Belgium at 23%. Inability to afford emergency expenses correlates with the risk of poverty and social exclusion. In the event of a job loss or other sudden event, an individual or family may face poverty.

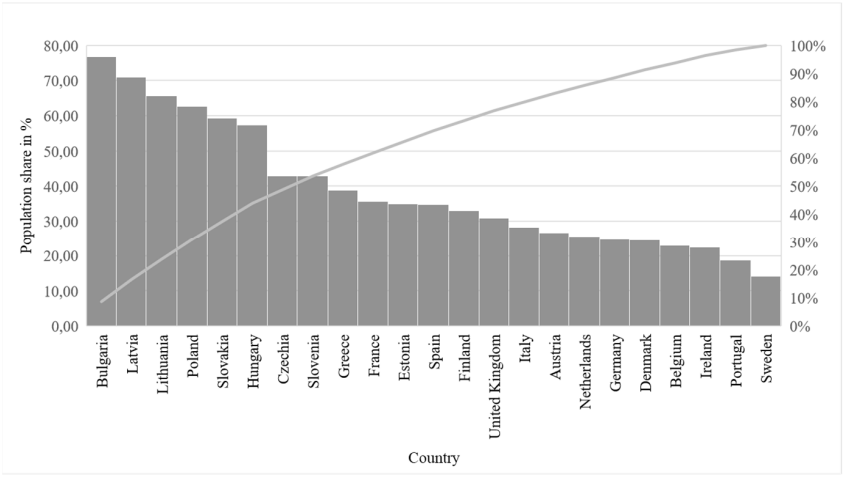

Figure 3. Share of people unable to meet emergency financial needs between 2005 and 2020 (in %) [55].

In Poland, there is a decline in public transport in regional terms—underinvestment in rail and bus transport is noticeable in reducing the number of connections or closing them [56–58]. This process is widely commented on and has become a subject of public and political debate at the national level.

The decrease in the length of operated railway lines clearly indicates a collapse of the Polish railways [59] (Figure 4). Unprofitable connections are closed down, and development can only be observed in urban and regional railways—including new international links, e.g., with Berlin. The policy of regress in railway connections appeared during the period of transformation and so-called wild privatization, when the state-owned PKP company (Polish State Railways), which is a subject managing the railway infrastructure in Poland [60], was artificially divided into several companies, including PKP Cargo (freight transport), PKP Przewozy Regionalne (regional passenger transport) and PKP Intercity (long-distance passenger transport) [19,61,62]. Along with the collapse of rail transport, there is a significant increase in interest in road transport. Numerous investments in this respect have significantly improved the conditions on Polish roads.

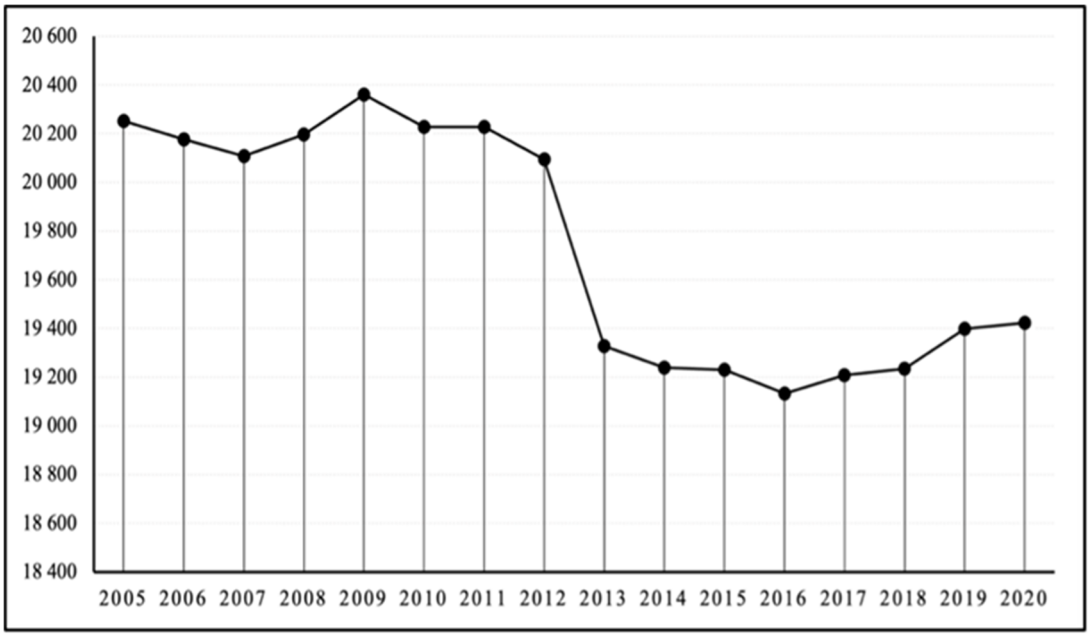

Figure 4. Length of operated railway lines in Poland in the years 2005–2020 in km (own study, based on [45]).

In 2005, only 60 percent of roads in Poland were hard-paved, while in 2020 it was almost 70 percent of all roads (Figure 5). The improvement in the surface quality and extensive modernization have contributed to the diversion of passenger traffic to roads, largely due to the phenomenon of the so-called forced motorization. A lack of alternatives in the form of rail and bus links or their mismatch with passengers' expectations has led to a significant increase in the number of passenger cars. This intensifies a phenomenon of congestion, especially in cities and in highly urbanized (metropolitan) areas.

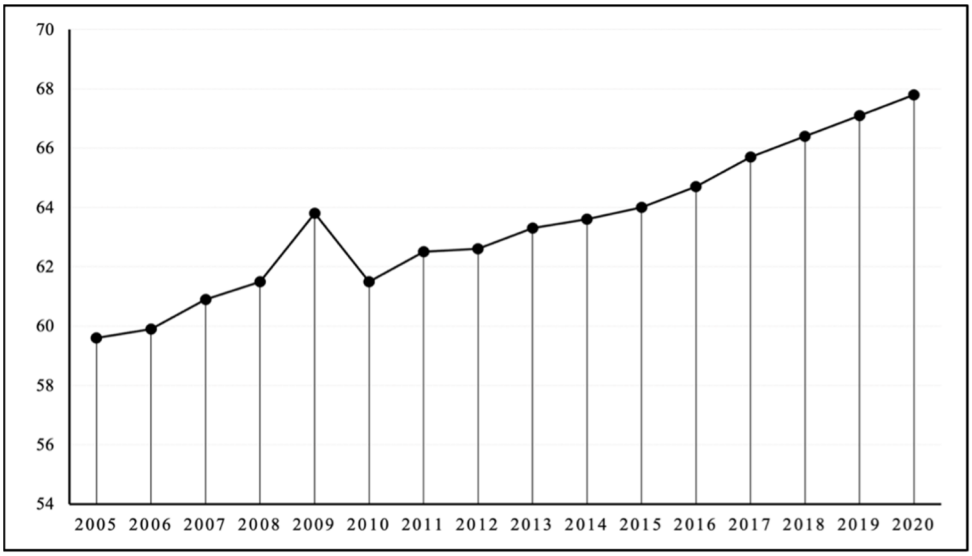

Figure 5. Hard-paved roads in Poland in 2005–2020 in % (own study, based on [45]).

Transport exclusion has a negative impact on local communities: it generates additional costs of maintaining an individual means of transport, contributes to the exclusion of some people from social and cultural life, and may also be a cause of unemployment or of a lack of access to public services.

In Poland, it is much easier to get to work by one's own means of transport than by public transport (Figures 6 and 7). Only urban transport can be an example of well-functioning public transport, while in the rest of the country travel to work is more efficient by car. This is mainly due to the lack of adequate rail and bus connections and the poor quality of offered services. The situation regarding access to the place of education or health care centers is similar. Transport accessibility is much worse in less urbanized areas, where the offer of services is linked with access to a bus or train stop as the main determinant of the choice of public transport [63,64].

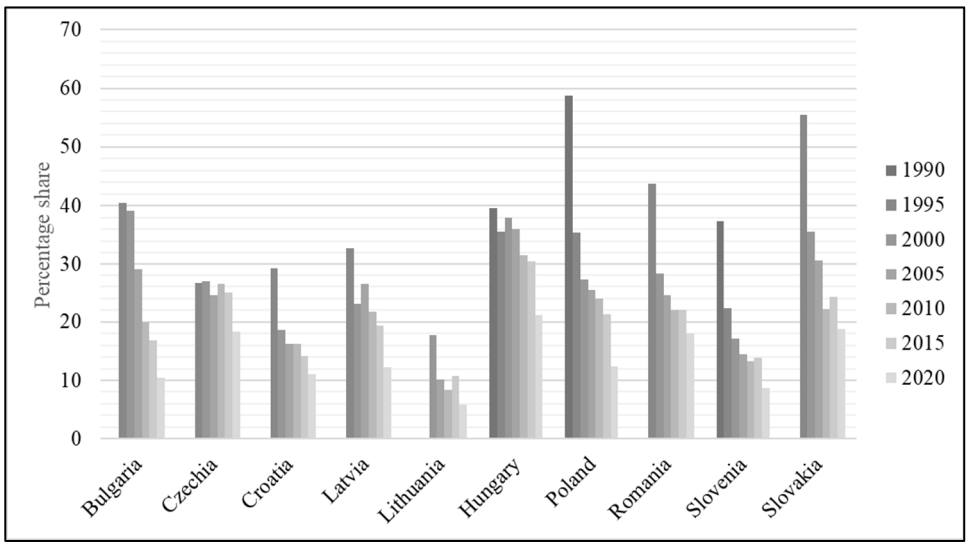

Figure 6. Passenger transport by public transport (trains, motor coaches, buses, and trolley buses) [55]. Data on public mass transit passenger transport between 1990 and 2020 was analyzed. Passenger transport by public transport in CEE countries has been steadily declining. During the system transformation, the highest share of passenger transport was recorded in Poland, at 59%. However, by 2020 it was already 12%. The same is being observed in other CEE countries. The decline in passenger transport by public transport is almost halved or more (Poland).

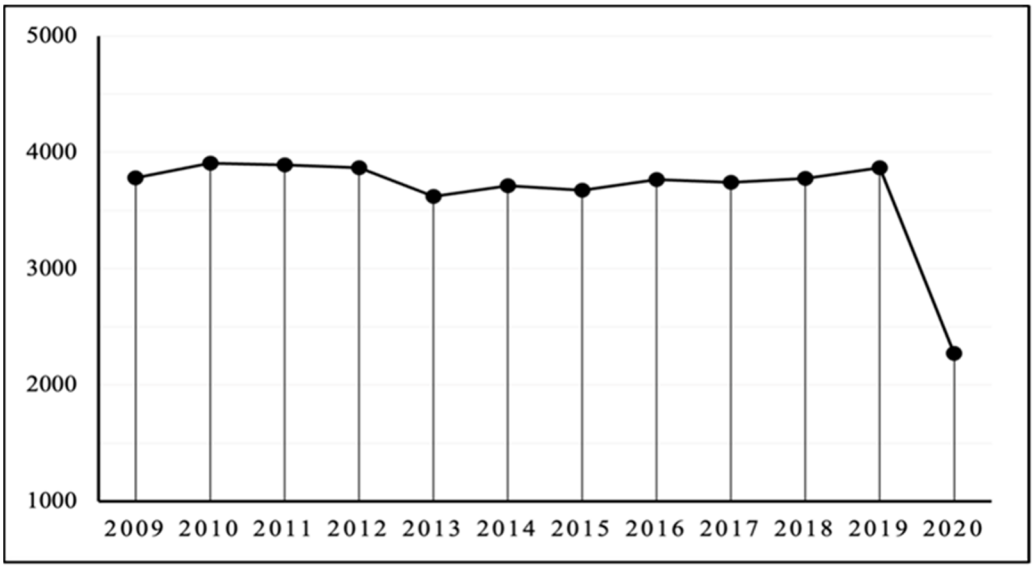

Figure 7. Passenger transportation by urban public means of transport between 2009 and 2020 in Poland in millions of people (own study, based on [45]).

4.2. The Issue of Transport Exclusion of Rural Areas in Poland

Nowadays, one can observe an increasing interest in the issue of rural development. In Poland, accession to the European Union in 2004 was a turning point. Until then, the policy had focused on the modernization and development of the agri-food sector, but in recent years more and more attention has been paid to rural development in the spatial sense. Therefore, the village ceases to be perceived as a place with typically agricultural functions. Departure from the agricultural character of rural areas broadens the typical concept of development of these areas due to the complexity of rural space [65]. Therefore, the policy should be flexible and responsive to the needs of different groups of stakeholders.

The distribution of the spatial structure of Poland indicates the dominant role of rural areas (Figure 8). Studies of the typology of Polish functional areas take into account the division of regions due to access to cities by means of transport [66–68]. If the travel time to the nearest urban center exceeds 90 min, then such rural areas can be classified as areas requiring aid in development processes [69]. Analyzing the degree of urbanization in Poland, one can see that it is strongly historically conditioned [70].

During the transformation in Poland at the turn of the 1980s and 1990s, many villages lost their significance. This led to a social collapse, followed by a reduction or closure of public transport links, which only exacerbated the negative effects of the transition to the market economy [70]. Currently, highly urbanized—metropolitan—areas play a significant role [71,72]. They are characterized by a network of interdependencies between several cities which are connected by the common market of labor, education, trade, and services [73,74]. A growing process of suburbanization can be observed around metropolitan areas, which is also associated with a change in the landscape of rural areas [75,76].

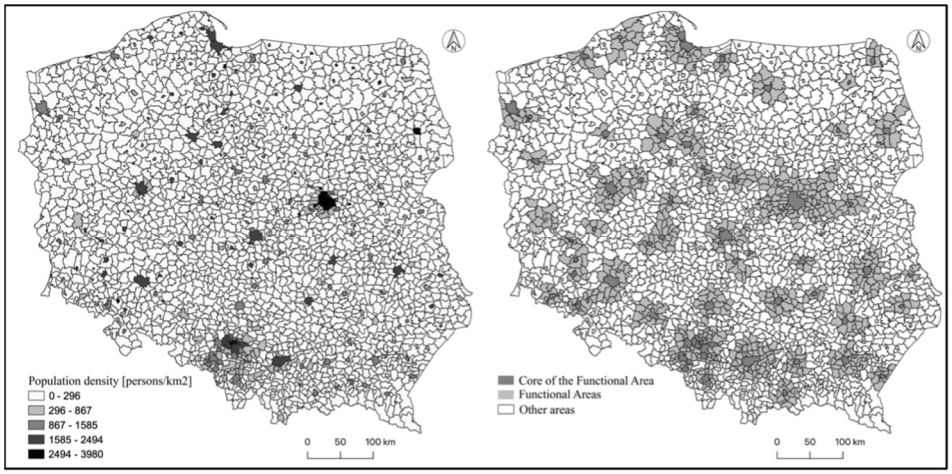

Figure 8. A map of spatial distribution of population density in 2019 and impact zones of urban functional areas in Poland (own study, based on [45,72]).

In 2021, 40 percent of the population lived in rural areas [77,78]. This results from a much greater dispersion of population than in urban areas, which is one of the most important causes of problems of local communities [78]. In 2016, in Poland, 5.5 percent of the rural population over 16 years of age did not visit a doctor due to lack of transport, and 27.9 percent of people living in rural areas are at risk of poverty and social exclusion [78]. The characteristic element of transport exclusion is not the distance between the analyzed places and cities, but the interdependence of road infrastructure, economic costs of transport, frequency of trips and its availability [78].

In 2010, Ustawa o publicznym transporcie zbiorowym [Eng.: Act on Public Collective Transport] [79] was adopted, in which local governments were obliged to develop a Sustainable Development Plan for Public Transport, commonly referred to as a transport plan. Despite this obligation, not all local governments prepared such plans [80]. Moreover, the amendment to the Act of 2018 did not lead to a real change in the availability of public transport in rural areas. Such a situation results, among others, in an increasing number of passenger cars and deepening social exclusion mainly affecting people with low incomes and elderly persons [81]. In consequence, this leads to forced motorization, also called transport poverty [82]. It is a situation in which having a car is necessary to meet the basic needs of a family while simultaneously absorbing a much larger part of the household budget than the family is able to spend on it. Thus, these are people who would use public transport if they had the opportunity.

The largest decrease in transport in Poland concerned bus transport lines on a regional scale (Figure 9). In practice, this was the main cause of the collapse of extra-urban bus transport and the cutting off of the smallest villages from any form of public transport. It was, therefore, replaced by private cars.

Railways is a mode of public transport which despite the closure of connections still operates relatively well; its importance is highest in the Pomeranian Voivodeship. In 2020, 37.3 million people used this form of transport [83]. Almost 80 percent of all transport is made by Fast Urban Rail (PKP SKM), which, however, concerns transport within the Gdansk agglomeration. Electrified railway routes occur unevenly, because their highest density is in the eastern and southern parts of the Pomeranian Voivodeship [84].

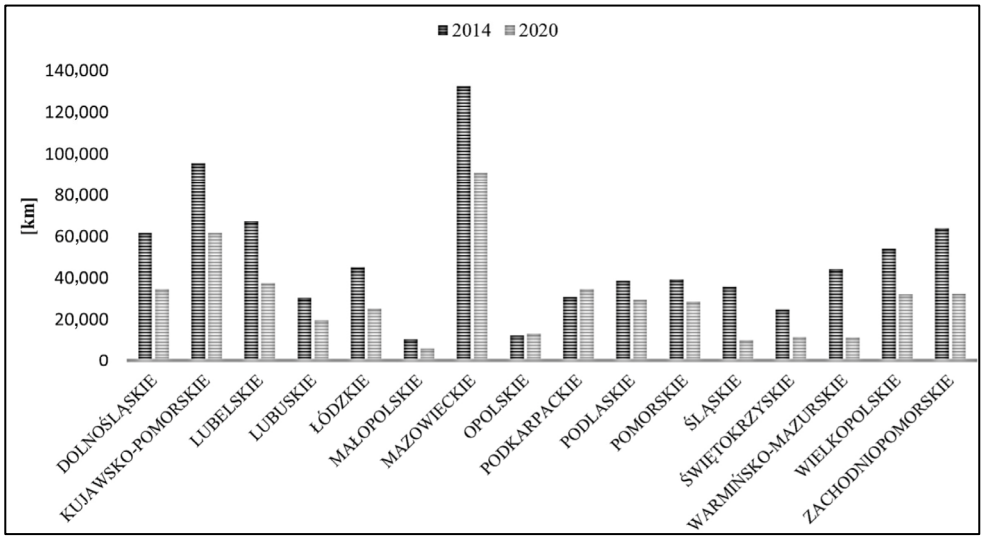

Figure 9. The length of regional bus lines broken down by voivodships in the years 2014–2020 in km (own study, based on [45]).

4.3. An Example of Transport Exclusion in Northern Poland—The Case Study of Głuszyno

4.3.1. Basic Information

Głuszyno was selected as the subject of research due to many years of participatory observations by the study authors. Knowledge of the problems of the local community and a noticeable lack of local authorities' actions inspired the authors to attempt a deeper analysis of the case. The village of Głuszyno, which is well situated in relation to the railway infrastructure, is struggling with the problem of transport exclusion, which is a rare situation, hence the need to conduct a detailed study of the conditions responsible for this situation.

The specificity of the selected case study is all the more interesting from a scientific point of view because the northern region of the country, in this case the Pomeranian Voivodeship (especially its northern part), is characterized by high spatial accessibility from the point of view of both road and rail [85]. Compared to the country, the Pomeranian Voivodeship definitely stands out in terms of the implementation of transport investments.

Głuszyno is a village located in the north-western part of the Pomeranian Voivodeship, in northern Poland (Figure 10). It is part of the Słupsk District and the Potęgowo Commune. It is a peripheral village, located between two urban centers of a regional nature—Słupsk and Lębork. It is also an extension of the development of the Gdansk agglomeration between Wejherowo and Lębork as an edge zone of the Gdansk metropolis, and Słupsk [86,87]. The demographic structure of the village clearly indicates the feminization of the community, where 51.2 percent are women and 48.8 percent are men [88]. The distribution of the population's age structure is significantly dominated by people of working age (over 63 percent), the next group being people of pre-working age (29 percent) and post-working age (over 5 percent). In terms of activity, it is a town of a typically agricultural character.

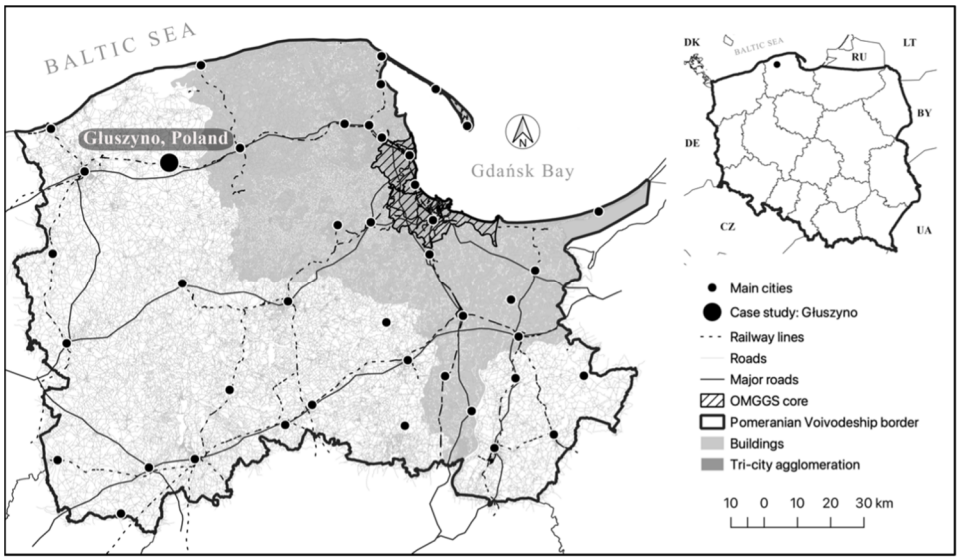

Figure 10. General accessibility to Głuszyno compared to the northern region of Poland—Pomeranian Voivodeship (own study, based on [19,26,76]).

4.3.2. Analysis of Transport Accessibility

Transport access to the village takes place in two forms—local or rail access (Figure 11). Local access takes place via a local road Głuszyno–Głuszynko (route No. III). This route poses a serious threat to pedestrian and bicycle traffic due to the lack of dedicated infrastructure. In the case of passenger cars, sharp bends and poor condition of the surface pose a particular threat. It should be noted that the distance from Głuszyno to the nearest public service center—the town of Potęgowo—is only 5 km. National expressway S6 from Szczecin to Tricity is to the south [86,89]. It is possible to access it via Potęgowo (route No. IV), so the analyzed place is located near a supra-regional transport corridor [87]. It should be emphasized that the village, despite its peripheral location, has a beneficial transport location in comparison to rest of the commune, thanks to being situated in the vicinity of one of the most important transport routes in the northern part of the country. Since 2015, the local government of the Potęgowo Commune has been providing public transport services (so-called public district transport) [90]. Activities undertaken in the field of the implementation of public transport services are not included in the strategic document which is the basic tool for shaping the development policy: Strategia Rozwoju Gminy Potęgowo do roku 2020 [Eng.: Development Strategy of the Potęgowo Commune until 2020] [91]. This illustrates a certain contradiction in the activities of the local government, as the issues related to transport, especially in rural areas, should be characterized by a high priority of intervention. On this basis, it can be concluded that the activities in this regard are undertaken fragmentarily, not systemically. The analyzed village is situated along the Potęgowo–Głuszyno–Głuszynko–Grapice–Rzechcino–Potęgowo bus route. This transport is carried out by a private carrier. It operates once a day on Tuesdays and Fridays, except on public holidays [92]. Bus transport is also realized by another carrier—PKS Słupsk. There are two routes: Głuszynko–Słupsk and Głuszynko–Lębork [93]. This transport enables a potential and direct connection with the two largest regional centers in the immediate vicinity—Słupsk and Lębork. The basic problem, however, is that in no way do these links meet the residents' transport needs related to access to public services.

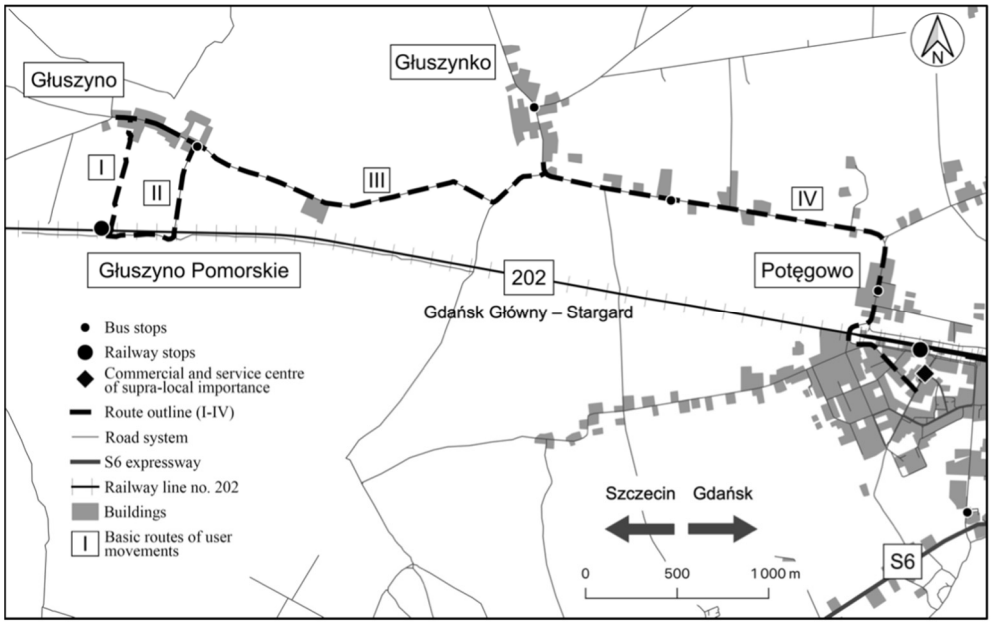

Figure 11. Road and rail accessibility to Głuszyno (own study, based on [45,92]).

The problem in the case of this access link results from the ineffective timetable of arrivals and departures which are characterized by a low correlation in terms of planning the itinerary. For example, the Głuszynko–Słupsk bus departs from this village at 7:40 a.m. The travel time to Słupsk takes over 2 h (estimated arrival time—about 10:00 a.m.). Departure from Słupsk on the same day takes place only at 10:04 and takes more than 50 min. In this case, it should be noted that this connection does not respond in any way to the basic need for efficient mobility. Another example is the Głuszyno–Lębork bus (through Słupsk). In this case, the transport is also provided once a day at 10:04 a.m. and takes over three hours. The main problem of this connection is that this transport is offered only in one direction (to Lębork), while there are no return buses from Lębork to Głuszynko. This is also an example of the paradox of designing inefficient transport connections by private carriers that cannot be linked to other modes of transport.

The inhabitants of Głuszyno compensate for the lack of good access to road transport by public and private means by using rail transport (routes I and II). This is the only form of transport that allows efficient mobility. Rail transport is also a form of "green transport", which has a low degree of negative environmental impact. The Głuszyno Pomorskie railway stop is situated to the south of the village of Głuszyno [91] along railway line No. 202. The transport provided on this route is realized on the section Gdansk Główny–Stargard Szczeciński. There are plans to expand the railway line with an additional track (the current line has only one track, and thus it is susceptible to traffic disruptions) [85]. The railway line is used both for passenger and cargo transport on a domestic west–east route [84]. Despite the noticeable willingness to develop railway infrastructure in this region, there is a process of suppressing the connection, especially on the section Słupsk–Lębork [94–97]. The main carrier operating the route is POLREGIO [98]. From Monday to Friday, this carrier's trains stop 24 times at the Głuszyno Pomorskie station (12 stops in the direction of Słupsk and 12 stops in the direction of Lębork). Comparing the presented road transport (public and private) with rail transport, there is a fundamental difference in the accessibility of both of them. It should be remembered that both modes of transport offer a different scale of accessibility and opportunities to meet the residents' needs. Road transport is characterized by the lack of a systemic approach to designing an appropriate transport schedule that would correspond to the residents' basic everyday needs in terms of access to public and private services located outside the village borders, while rail transport allows the village residents to travel much faster and on a more regular basis; however, it

primarily serves to reach the regional centers (Lębork and Słupsk). Głuszyno Pomorskie railway station is located only about one km from Głuszyno. The station does not have basic facilities, for example, ticket machines to purchase of a ticket. The station is equipped with a sheet metal shelter, which is leaky and poses a danger to users. Its design does not really protect travelers from adverse weather conditions. Residents do not have access to a well-functioning bus service. They can use rail transport, but access to the railway station is difficult despite the short distance from the village center. Since this situation is unusual, the need for a deeper analysis of the special case of the village of Głuszyno should be emphasized. Transport exclusion is not a marginal phenomenon, and an in-depth analysis of the selected case may contribute to a better identification of local problems and barriers to the implementation of solutions aimed at further development of public transport.

For the purposes of empirical analysis, a field study was conducted in the form of a spatial inventory. It took place in December 2021. The study concerned a possibility of covering the route from the railway station to the village and back. The degree of accessibility of the route was checked, and the time to cover the route by persons without mobility problems and without luggage was measured. For the purposes of the study, two routes were identified: one leading through a decapitalized, cobbled local road (route No. II), and the other leading across a cultivated field, more precisely along an informal path trodden by residents (route No. I).

4.3.3. Spatial Inventory

The conducted spatial inventory allowed numerous shortcomings of both routes to be nticed. In the first case, accessibility via a local road (route II) is determined by the weather (Figure 11). With significant precipitation, it is impossible to use this route on foot, by bicycle or by car, due to the road structure. It runs under a railway overpass; in addition, it has been significantly deepened in order to allow agricultural machinery to pass under it. In the autumn-winter or early spring, this route converts into an anthropogenic watercourse, where the underpass under the railway is completely impassable due to its flooding, which is related to the layout of the nearby terrain. On average, it took over 20 min to cover the route.

In the second case, due to the conditions of the first one, the official route—a significant depreciation and a significant length of time needed to cover it—residents more often chose an informal route leading through the muddy terrain of a cultivated field (route No. I). It is also the shortest route from the village to the railway station. It takes about 10 min to cover it, but the route leads through muddy farmland. Part of the route is particularly dangerous, leading through an illegal crossing of railway tracks. The route, provisionally called "leading through the field", illustrates the classic scheme of developing space by its users who designed this fragment of space in a natural way, thus clearly indicating which route is the best for them despite numerous shortcomings related to the conditions, which include, among others, the lack of a safe and well-lit pedestrian route. Instead of the necessary infrastructure that would facilitate the residents' movement, they only have a narrow well-trodden path in the field. The presented solution fits into the classic approach of social exclusion related to limited access to public transport.

The problems of the local community of the Potęgowo commune were presented in the Social Report, which is an element of the Development Strategy of the Potęgowo Commune for the years 2015–2022 [Pl.: Strategia Rozwoju Gminy Potęgowo na lata 2015–2022] [91]. As part of building the development strategy, a survey was conducted on the residents' quality of life, in which 155 persons participated. In the conducted survey, respondents pointed to the dominant role of the passenger car as the main means of transport and described the quality of roads in the municipality as bad and very bad. It follows that the problem of forced motorization occurs in the commune and is even common due to poorly functioning public transport. However, the actions of local authorities indicated in the document focus on the construction and modernization of road infrastructure and bicycle paths, omitting activities in the field of developing public collective and individual transport.

Both characterized routes are dangerous for users, especially in the fall–winter period. They prevent, among others, persons with reduced mobility from moving safely. Despite the proximity of a railway line on which passenger trains operate relatively often, the train stop is difficult for some residents to reach. The state of the infrastructure contributes to the problem of forced motorization. The phenomenon is also reflected in local analyses of the intervention of local authorities.

5. Discussion

In the priorities and strategic objectives of the development of the Potęgowo Commune, actions aimed at counteracting social exclusion are indicated. Transport exclusion, as exemplified by Głuszyno, is one of the identified types of such exclusion [89]. However, this problem has not been adequately addressed in this strategy in terms of both infrastructure investment and social action.

Considering the information provided in the Municipal Status Report [89], investment activities in the municipality are largely concentrated in the place of its seat, i.e., the village of Potęgowo. The investment activities of the Municipality of Potęgowo are concentrated in six areas, such as the construction of heating infrastructure, road investments, construction of rural canalizations, construction of public utilities, construction of lighting and water supply systems. For example, although the investment activity of the municipality is overwhelmingly focused on road investments (almost 40% of the total investments [92]), none of the investments have been realized in the village of Głuszyno so far. In addition, based on data from the Central Statistical Office, from 1995 to 2020 there is a negative migration balance in the Municipality of Potęgowo with an average of −36 persons/year, definitely with a rural-urban and rural-foreign direction [45]. The commune is also in the lead in terms of the value of the average negative migration balance against the background of the Pomeranian Voivodeship (migration balance indicator). The long-term negative migration balance clearly indicates the yearly noticeable outflow of population from the settlements in the commune to neighboring larger cities, such as Słupsk, Lębork or the cities of the Tricity agglomeration. The main determinants of external migration are access to better quality services, satisfaction of needs (not only the basic ones but also those of a higher order), improvement of the quality of life and economic situation.

It is also worth noting that in the conducted social study, whose subject scope included the level of quality and satisfaction with life, residents pointed to the poor level of organization of collective transport or public transport and the poor and very poor quality of roads [93]. Respondents pointed out poor and too poor quality of communication services, poor and deteriorating condition of roads and difficult access to public services (e.g., health care facilities). In order to counteract this problem and to shape a sustainable village, it is necessary to take actions that should focus primarily on three key smart categories (Table 1), namely mobility, community, and prospects. Investment in these areas will generate long-term benefits:

- an increase in the quality of life of the rural population,
- development of services in rural areas (commerce, education, leisure, culture),
- development of business and attraction of new investors,
- increased accessibility to health services for rural residents,
- and increased life chances for rural children and young people

Infrastructure investment is necessary to ensure economic growth, but it is not the only factor. Equally important are (1) human resources and social participation, (2) openness, (3) ensuring legal transparency, (4) investment in other areas [99].

This model can constitute a starting point and a basis for strategic programming of sustainable rural development. Strategic planning in rural areas should take place with the support of the local community and with the involvement of all stakeholders [100]. Thus, infrastructure investments only make sense if they are preceded by a public consultation and planning process, taking into account the needs and expectations of stakeholders.

In addition to local conditions, the susceptibility of rural communities to innovation is important [101].

In terms of mobility, one should focus on modernizing the road and rail system and initiating new connections due to the poor technical condition of the local road infrastructure. It should be the responsibility of the local government to provide users with means of public and individual transport, including micromobility, for example, with the use of a system of rural bicycles (cargo bicycles). Mobility solutions based on sustainable development and low-carbon solutions should complement this. An example are eco-friendly autonomous vehicles that use alternative power supply technologies [102]. This is directly linked to the area of prospects. Actions to increase users' access to transport will result in improved access to services—education, work, health, or culture. In terms of community, initiatives should be based on actions to build a coherent and active rural community, in which participation will be an integral part affecting development activity.

Therefore, the following steps should be taken in Głuszyno. Firstly, it is necessary to fully take into account the infrastructural problems of the village in strategic investment activities and the multi-annual financial forecast of the municipality, with particular emphasis on accessibility for people with disabilities and the elderly. Secondly, coordinated planning and investment activities should be conducted for the development of a comprehensive spatial development plan for the village which would take into account alternative access to rail transport for users and promote the sustainable development of local mobility. In the scope of investment activities, the users' choice regarding the preferred route of access from the village to the nearby railway station and the residents' participation in the development activities of the local government should be taken into account in accordance with the idea of "designing by the users themselves", who themselves "provisionally" choose the best solution for them [102]. Based on the analysis of the strategic document of the Potęgowo Commune, which includes the analyzed village, it was indicated that there are no local leaders and that there is a low share of social inclusion and bottom-up social initiatives. The local government should place greater emphasis on the social activation of residents and take steps to select local leaders from among the residents of municipalities who would represent the village interests on the forum of the commune as well as integrate the rural community, since coherent rural communities are the basis for building sustainable villages. Actions to integrate the local community and stimulate social activity have an inspirational impact on the character and success of development. Activity to increase local ties and strengthen territorial identity will further consolidate this. Integrated policymakers' actions are needed to strengthen the socio-economic fabric of rural areas in terms of mobility and social inclusion. These actions should be included in analytical documents or as separate studies, for example, in the form of a mobility strategy for rural areas. Strategic studies on increasing mobility should primarily be developed at the local level in cooperation with the local community, where there are so-called white transport spots, i.e., areas that are affected by transport exclusion. Currently, European countries do not have uniform guidelines on this issue, which strongly affects the alienation of rural communities. Therefore, in order to better identify and analyze the problem situation, strategies and policies should be characterized by an individualized approach. The approach to building sustainable development based on the smart village model means not only hard investment activities, among others, in terms of improving accessibility, but also building rural identity and strengthening social ties and cooperation. The latter is necessary in the case of residents' participation and preparation by them, together with decision-makers, of a coherent vision of the development of rural areas and communities. This cooperation may also serve to prototype and test alternative means of transport which should be precisely chosen in order to counteract exclusion in a broader perspective.

In addition, actions are also needed to improve the state of development and facilities at the railway station, taking into account a new footbridge on the tracks, the location of a new shelter or a monitoring and lighting system to increase the users' safety.

6. Conclusions

The presented case study of Głuszyno fits into the classic example of a village affected by the problem of transport exclusion in CEE. This is not an isolated case, because Polish villages are struggling with a significant problem of social exclusion. This is mainly due to the process of economic transformation in the 1990s. At that time, many villages were cut off from the existing public transport, in particular bus transport, and many jobs were lost. Investments have been accumulated in areas of large cities and agglomerations [1]. This case is also special due to the fact that, despite the location of the seat of the municipality—Potęgowo—near the main transport route of national importance, which in principle should ensure good access to it, it is characterized by a significant degree of transport inaccessibility. The village has also been affected by unfavorable changes, including, above all, the lack of new investments in public infrastructure: roads, stops and parking lots. The proposed direction of rural development is based on the concept of smart villages, in which five key areas related to rural development can be distinguished in accordance with the idea of sustainable development. The aim of this concept is to improve the inhabitants' quality of life, which in the case of rural areas is often associated with improving the functioning of public transport.

Summing up the results of the research, it can be concluded that transport exclusion and forced motorization are not isolated phenomena, as they result from the poor process of shaping mobility by local authorities and gross underinvestment in public transport. In Poland, many local authorities insufficiently recognize the problem of transport exclusion and its long-term effects, which include social exclusion. The conducted field study and GIS analyses clearly indicate that public transport, although a public service, is not available to everyone. In particular, women who are less likely to have a driving license or their own car are at risk of transport exclusion and its consequences, so they are forced to use public transport, which, especially in rural areas (regional transport), is characterized by low quality, including a mismatch of the offer with the currently raised transport needs and maladaptation of vehicles for people with special needs [85]. This can only be counteracted by implementing appropriate policies and strategies at the local level, as action taken at the national level may be insufficient in view of the diversity of rural areas and their specific needs and circumstances. Rural development strategies should take into account issues related to shaping mobility, including improving the functioning of public transport (individual and collective) and shaping residents' new behaviors taking into account other forms of transport: carpooling or systems of rural bicycles.

The results of the study allow determining the causes and effects of transport exclusion and allow linking it to the problem of social exclusion. Both of these issues pose a serious threat to the development of rural areas, not only in Poland, but also in other countries, especially post-communist ones, which have undergone a transformation towards a free market economy. Rural areas are more affected by poverty (subsistence) than urban areas, as indicated by the GI–I index: the highest level was achieved by farm households [103]. Therefore, it can be concluded that rural areas currently need to be transformed towards smart and resilient villages. This was also particularly emphasized by the COVID-19 pandemic, which caused a deterioration in the quality of life of the population through significant socio-economic problems, including an increase in poverty or unemployment rates [104]. In particular, rural development should take into account the area of residents' mobility as a factor in decisions on shaping healthy local communities based on high accessibility to public services, including transport and access to a diversified labor market.

Author Contributions: Conceptualization, S.Ż., B.C. and M.P.; methodology, S.Ż.; software, S.Ż.; validation, S.Ż., B.C. and M.P.; formal analysis, S.Ż. and B.C.; investigation, S.Ż., B.C. and M.P.; resources, B.C.; data curation, S.Ż.; writing—original draft preparation, S.Ż. and B.C.; writing—review and editing, M.P.; visualization, S.Ż. and B.C.; supervision, M.P.; project administration, S.Ż.; funding acquisition, not applicable. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: https://stat.gov.pl/banki-i-bazy-danych/ (accessed on 10 November 2021).

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Bernard, J. Where Have All the Rural Poor Gone? Explaining the Rural–Urban Poverty Gap in European Countries. *Sociol. Rural.* **2019**, *59*, 369–392. [CrossRef]
2. Bernard, J.; Contzen, S.; Decker, A.; Shucksmith, M. Poverty and Social Exclusion in Diversified Rural Contexts. *Sociol. Rural.* **2019**, *53*, 353–368. [CrossRef]
3. Gerli, P.; Marco, J.N.; Whalley, J. What makes a smart village smart? A review of the literature. *Transform. Gov. People Process Policy* **2022**, *16*, 292–304. [CrossRef]
4. Wang, Q.; Luo, S.; Zhang, J.; Furuya, K. Increased Attention to Smart Development in Rural Areas: A Scientometric Analysis of Smart Village Research. *Land* **2022**, *11*, 1362. [CrossRef]
5. Rosner, A.; Stanny, M. Przemiany struktury społeczno-zawodowej ludności wiejskiej. In *Ciągłość i Zmiana: Sto Lat Rozwoju Polskiej Wsi*; Halamska, M., Stanny, M., Wilkin, J., Eds.; Instytut Rozwoju Wsi i Rolnictwa Polskiej Akademii Nauk: Warszawa, Poland, 2019; pp. 119–146.
6. Gray, D.; Shaw, J.; Farrington, J. Community transport, social capital and social exclusion in rural areas. *Area* **2006**, *38*, 89–98. [CrossRef]
7. Babin, A.; Tutunaru, S.; Covalenco, I.; Babina, E. Smart infrastructures for rural areas—Best practices and suggested actions for Moldova. In Proceedings of the Central and Eastern European eDem and eGov Days, Budapesta, Hungary, 5–8 May 2021; pp. 127–137. [CrossRef]
8. Halamska, M.; Stanny, M. Temporal and spatial diversification of rural social structure: The case of Poland. *Sociol. Rural.* **2021**, *61*, 578–601. [CrossRef]
9. Taylor, Z.; Ciechański, A. Systemic transformation and changes in surface transport companies in Poland: A synthesis after twenty-five years. *J. Transp. Geogr.* **2018**, *70*, 114–122. [CrossRef]
10. Taylor, Z.; Ciechański, A. Organizational and Ownership Transformation in Poland's Urban Transport Companies. *Transp. Rev.* **2010**, *30*, 407–434. [CrossRef]
11. Taylor, Z.; Ciechański, A. Property transformation of the PKP enterprises after the 1990. *Commun. Rev.* **2008**, *47*, 3–13.
12. Bell, S.; Montarzino, A.; Aspinall, P.; Peneze, S.; Nikodemus, O. Rural Society, Social Inclusion and Landscape Change in Central and Eastern Europe: A Case Study of Latvia. *Sociol. Rural.* **2009**, *49*, 295–323. [CrossRef]
13. Noack, E.M. *Out and About or Trapped at Home? Transport-Related Accessibility in Rural Europe. Qualitative Studies on Women in Scotland and Elderly People in Germany, Their Mobility and Perspectives on Rural Living*; Cuvillier Verlag: Göttingen, Germany, 2012.
14. Guzik, R. Public transportation and spatial accessibility in rural areas of Switzerland. *Transp. Geogr. Pap. Pol. Geogr.* **2016**, *19*, 16–49.
15. Gainaru, T.A. Reducing the risk of poverty and social exclusion of young people in rural areas. *Ann. Univ. Craiova Econ. Sci. Ser.* **2019**, *2*, 125–128.
16. Dewald-Kaufmann, J.F.; Wustenberg, T.; Barton, B.B. Dynamics of the immediate behavioral response to partial social exclusion. *Sci. Rep.* **2021**, *11*, 1853. [CrossRef]
17. Roy, P.; Hočevar, D.K. Listening to a Silent Crisis: Men's Suicide in Rural and Farming Communities in Slovenia. *Rev. Za Soc. Polit.* **2019**, *26*, 241–254. [CrossRef]
18. Mortazavi, H.; Akbarzdeh, M.A. A Framework for Measuring the Spatial Equity in the Distribution of Public Transportation Benefits. *J. Public Transp.* **2017**, *20*, 44–62. [CrossRef]
19. Renukappa, S.; Suresh, S.; Abdalla, W.; Shetty, N.; Yabbati, N.; Hiremath, R. Evaluation of smart village strategies and challenges. *Smart Sustain. Built Environ.* 2022; *ahead-of-print*.
20. Richer-Kaźmierska, A.; Lechman, E.; Necel, H. *Starzenie się Społeczeństwa Wyzwaniem dla Pomorskich Gmin*; Fundacja Promocji Inicjatyw Europejskich: Gdańsk, Poland, 2015.
21. European Commission. A Long-Term Vision for the EU's Rural Areas—Towards Stronger, Connected, Resilient and Prosperous Rural Areas by 2040. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:345:FIN (accessed on 10 December 2021).
22. Wolf, S.; Teitge, J.; Mielke, J.; Franziska Schütze, F.; Jaeger, C. The European Green Deal—More Than Climate Neutrality. *Intereconomics* **2021**, *56*, 99–107. [CrossRef]
23. Kormann-Hainzl, G.; Lovasz-Bukvova, H.; Hölzl, M. Are Smart Villages Just Smaller Smart Cities? Call for a Region-Type-Specific Approach to the Smartification of Communities. In Proceedings of the Central and Eastern European eDem and eGov Days Conference, Budapest, Hungary, 5–8 May 2021; Facultas Verlags-und Buchhandels: Vienna, Austria, 2021; pp. 115–125.
24. Butkus, M.; Matuzevičiūtė, K.; Raupytė, K. Effects of Remittances on Poverty: Evidence in CEE Countries. *Organ. Mark. Emerg. Econ.* **2020**, *11*, 69–82. [CrossRef]

25. Kalinowski, S.; Komorowski, Ł. *Rosa, Koncepcja Smart Villages*; Przykłady z Polski; Instytut Rozwoju Wsi I Rolnictwa Polskiej Akademii Nauk: Warszawa, Poland, 2021.
26. Ilie, N.M.; Oprea, I.A.; Turcea, V.C.; Părnuș, A.R. New Dimensions of Rural Communities' Development in Romania—Smart Village Concept. *Sci. Pap. Ser. Manag. Econ. Eng. Agric. Rural Dev.* **2022**, *22*, 425–435.
27. Komorowski, Ł.; Stanny, M. Smart Villages: Where can they happen? *Land* **2020**, *5*, 151. [CrossRef]
28. ENRD Newsletter 2019. Available online: https://enrd.ec.europa.eu/news-events/newsletter/2019_pl (accessed on 12 December 2021).
29. Cambra–Fierro, J.J.; Pérez, L. (Re)thinking smart in rural contexts: A multi-country study. *Growth Chang.* **2022**, *53*, 868–889. [CrossRef]
30. ENRD Newsletter 2021. Available online: https://enrd.ec.europa.eu/news-events/enrd-newsletter/2021_pl (accessed on 14 December 2021).
31. Nowicka, K. Turystyka w dokumentach strategicznych gmin wiejskich województwa pomorskiego. *Stud. Obsz. Wiej.* **2019**, *53*, 63–76. [CrossRef]
32. ENRD Newsletter 2020. Available online: https://enrd.ec.europa.eu/news-events/newsletter/2020_pl (accessed on 14 December 2021).
33. Hanninger, L.M.; Laxa, J.; Ahrens, D. A roadmap to becoming a smart village-experiences from living labs in rural Bavaria. *Ejournal Edemocracy Open Gov.* **2021**, *13*, 89–109. [CrossRef]
34. Hlaváček, P. The implementation of smart energy into transformation of the rural area: The use of public policies for smart villages development. *Int. J. Energy Econ. Policy* **2021**, *11*, 1–6. [CrossRef]
35. Porru, S.; Misso, F.E.; Pani, F.E.; Repetto, C. Smart mobility and public transport: Opportunities and challenges in rural and urban areas. *J. Traffic Transp. Eng.* **2020**, *7*, 88–97. [CrossRef]
36. Zavratnik, V.; Kos, A.; Duh, E.S. Smart villages: Comprehensive review of initiatives and practices. *Sustainability* **2018**, *10*, 2559. [CrossRef]
37. Ogryzek, M.; Krupowicz, W.; Sajnóg, N. Public Participation as a Tool for Solving Socio-Spatial Conflicts of Smart Cities and Smart Villages in the Sustainable Transport System. *Remote Sens.* **2021**, *13*, 4821. [CrossRef]
38. Pieczonka, J. Jakość życia na obszarach wiejskich według młodzieży w kontekście podejmowania decyzji o miejscu rozpoczęcia aktywności zawodowej. *Pr. Nauk. Uniw. Ekon. We Wrocławiu* **2016**, *425*, 125–140.
39. Fiorello, D.; Martino, A.; Zani, L.; Christidis, P.; Navajas-Cawood, E. Mobility data across the EU 28 member states: Results from an extensive CAWI survey. *Transp. Res. Procedia* **2016**, *14*, 1104–1113. [CrossRef]
40. Berger, G.; Feindt, P.H.; Holden, E.; Rubik, F. Sustainable Mobility—Challenges for a Complex Transition. *J. Environ. Policy Plan.* **2014**, *16*, 303–320. [CrossRef]
41. Battino, S.; Lampreu, S. The Role of the Sharing Economy for a Sustainable and Innovative Development of Rural Areas: A Case Study in Sardinia (Italy). *Sustainability* **2019**, *11*, 3004. [CrossRef]
42. Miralles-Guasch, C.; Melo, M.M.; Marquet, O. A gender analysis of everyday mobility in urban and rural territories: From challenges to sustainability. *Gend. Place Cult.* **2016**, *23*, 398–417. [CrossRef]
43. Czarniawska, B. *Social Science Research: From Field to Desk*; SAGE Publications: Los Angeles, CA, USA, 2014.
44. Główny Urząd Statystyczny. Available online: https://stat.gov.pl (accessed on 10 November 2021).
45. BDOT10k. Available online: https://bdot10k.geoportal.gov.pl (accessed on 18 December 2021).
46. Rozporządzenie Ministra Rozwoju, Pracy i Technologii z dnia 27 lipca 2021 r. w Sprawie Bazy Danych Obiektów Topograficznych Oraz Bazy Danych Obiektów Ogólnogeograficznych, a Także Standardowych Opracowań Kartograficznych. Available online: https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20210001412/O/D20211412.pdf (accessed on 12 November 2021).
47. Hammersley, M.; Gomm, R.; Foster, P. 12 Case Study And Theory. In *Case Study Method*; SAGE Publications Ltd.: London, UK, 2009; pp. 234–259.
48. Hayden, J. *The Collapse of Communist Power in Poland. Strategic Misperceptions and Unanticipated Outcomes*; Routledge Taylor & Francis Group: New York, NY, USA, 2005.
49. Taylor, Z. Railway closures to passenger traffic in Poland and their social consequences. *J. Transp. Geogr.* **2006**, *14*, 135–151. [CrossRef]
50. Bański, J.; Stola, W. *Przemiany Struktury Przestrzennej i Funkcjonalnej Obszarów Wiejskich w Polsce*; PAN Instytut Geografii i Przestrzennego Zagospodarowania: Warszawa, Poland, 2002.
51. Bäckman, O.; Nilsson, A. Pathways to Social Exclusion—A Life-Course Study. *Eur. Sociol. Rev.* **2011**, *27*, 107–123. [CrossRef]
52. Lucas, K. Transport and social exclusion: Where are we now? *Transp. Policy* **2012**, *20*, 105–113. [CrossRef]
53. Bański, J. *Przestrzenny Wymiar Współczesnych Procesów na wsi*; t. 9, PTG.; PAN Instytut Geografii i Przestrzennego Zagospodarowania: Warszawa, Poland, 2005.
54. Utzig, M. Struktura wydatków konsumpcyjnych ludności wiejskiej i miejskiej w Polsce. *Handel Wewnętrzny* **2016**, *1*, 161–171.
55. Eurostat. Available online: https://ec.europa.eu/eurostat/web/main/data/database (accessed on 5 January 2023).
56. Bocheński, T. Analiza porównawcza ruchu pociągów pasażerskich w Polsce w latach 2010 i 2020. *Pr. Kom. Geogr. Kom. PTG* **2021**, *24*, 69–82. [CrossRef]
57. Koziarski, S. Kierunki modernizacji sieci kolejowej w Polsce. *Pr. Kom. Geogr. Kom. PTG* **2017**, *20*, 7–30. [CrossRef]
58. Połom, M.; Goliszek, S. Transport in Poland during the period of accession to the European Union. *J. Geogr. Politics Soc.* **2017**, *7*, 41–49.

59. Król, M.; Taczanowski, J.; Kołoś, A. The rise and fall of Interregio. Extensive open-access passenger rail competition in Poland. *Res. Transp. Econ.* **2018**, *72*, 37–48. [CrossRef]
60. Ustawa z dnia 8 Września 2000 r. o Komercjalizacji i Restrukturyzacji Przedsiębiorstwa Państwowego "Polskie Koleje Państwowe", Dz. U. 2000 Nr 84 poz. 948. Available online: https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20000840948/U/D20000948Lj.pdf (accessed on 16 November 2021).
61. Rosik, P.; Pomianowski, W.; Kołoś, A.; Guzik, R.; Goliszek, S.; Stępniak, M.; Komornicki, T. Bus accessibility of polish gminas. *Transp. Geogr. Pap. Pol. Geogr. Soc.* **2018**, *21*, 54–64.
62. Kwarciński, T. Dostępność transportowa na obszarze o niskim popycie na usługi transportowe. *Logistyka* **2014**, *2*, 162–169.
63. Istota Wykluczenia Społecznego Związanego z Transportem. Available online: https://www.researchgate.net/publication/278027484_Istota_wykluczenia_spolecznego_zwiazanego_z_transportem/citations (accessed on 16 November 2021).
64. Analiza Relacji Funkcjonalno-Przestrzennych Między Ośrodkami Miejskimi i ich Otoczeniem. Available online: https://www.obserwatorium.malopolska.pl/wp-content/uploads/2020/04/raport-syntetyczny_fina\T1\l-1.pdf (accessed on 26 November 2021).
65. Dostępność Komunikacyjna i Relacje Przestrzenne w Województwie Kujawsko-Pomorskim. Available online: https://www.researchgate.net/publication/353380493_Dostepnosc_komunikacyjna_i_relacje_przestrzenne_w_wojewodztwie_kujawsko-pomorskim (accessed on 22 November 2021).
66. Bański, J. Współczesne Typologie Obszarów Wiejskich w Polsce—Przegląd Podejść Metodologicznych. *Przegląd Geogr.* **2014**, *4*, 441–470. [CrossRef]
67. Koncepcja Przestrzennego Rozwoju Kraju 2030. Available online: https://www.wzs.wzp.pl/sites/default/files/files/19683/89272000_1412985316_Koncepcja_Przestrzennego_Zagospodarowania_Kraju_2030.pdf (accessed on 19 November 2021).
68. Bański, J. *Geografia Polskiej Wsi*; PWN: Warszawa, Poland, 2006.
69. Świątkiewicz, A.; Połom, M.; Puzdrakiewicz, K. Changes in the Spatial Development of a Satellite Town under the Impact of a Metropolitan City—Evidence from Pruszcz Gdański (Poland). *Land* **2021**, *10*, 800. [CrossRef]
70. Functional Urban Areas by Country. Available online: https://www.oecd.org/cfe/regionaldevelopment/functionalurbanareasbycountry.htm (accessed on 20 November 2021).
71. Gałka, J.; Warych–Juras, A. Suburbanization and migration in polish metropolitan areas during political transition. *Acta Geogr. Slov.* **2018**, *58*, 63–72. [CrossRef]
72. Szmytkie, R. The impact of residential suburbanization on changes in the morphology of villages in the suburban area of Wrocław, Poland. *Environ. Socio-Econ. Stud.* **2020**, *4*, 24–43. [CrossRef]
73. Komornicki, T.; Śleszyński, P. Typologia obszarów wiejskich pod względem powiązań funkcjonalnych i relacji miasto-wieś. *Stud. Obsz. Wiej.* **2009**, *16*, 9–37.
74. Nowak, M. Polskie obszary metropolitalne-Problemy definicyjne. *Samorz. Teryt.* **2010**, *3*, 18–28.
75. Pělucha, M. Smart Villages And Investments To Public Services And ICT Infrastructure: Case Of The Czech Rural Development Program 2007–2013. *Eur. Countrys.* **2019**, *11*, 584–598. [CrossRef]
76. Rosner, A.; Stanny, M. *Socio-Economic Development of Rural Areas in Poland*; EFRWP; IRWiR PAN: Warsaw, Poland, 2017.
77. POLAND—The SMARTA Project. Available online: https://ruralsharedmobility.eu/insight-papers/poland/ (accessed on 22 November 2021).
78. Guzik, R.; Kołoś, A. Dostępność obszarów wiejskich do miast powiatowych w Polsce transportem publicznym w 2019 r. *Przegląd Geogr.* **2021**, *93*, 181–206. [CrossRef]
79. Obwieszczenie Marszałka Sejmu Rzeczypospolitej Polskiej z dnia 25 czerwca 2021 r. w Sprawie Ogłoszenia Jednolitego Tekstu ustawy o Publicznym Transporcie Zbiorowym, Dz. U. 2021 poz. 1371. Available online: https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20210001371/U/D20211371Lj.pdf (accessed on 23 November 2021).
80. Chaberko, T.; Kretowicz, P. Ustawa o publicznym transporcie zbiorowym a popyt na przewozy użyteczności publicznej. *Transp. Miej. I Reg.* **2011**, *10*, 28–34.
81. Wykluczenie Transportowe—Strategie, Metody, Działania. Sesja 18 III KPO. Available online: https://bip.brpo.gov.pl/pl/content/panel/sesja-18KPO-wykluczenie-transportowe (accessed on 24 November 2021).
82. Żmuda-Trzebiatowski, P. Dostępność transportowa a partycypacja w aktywnościach, ubóstwo oraz zagrożenie wykluczeniem społecznym. *Autobusy Tech. Eksploat. Syst. Transp.* **2016**, *12*, 754–759.
83. Urząd Transportu Kolejowego. Available online: https://www.utk.gov.pl (accessed on 24 November 2021).
84. Parol, A.R. Dostępność transportowa wybranych ośrodków miejskich Pomorza Środkowego z uwzględnieniem zjawiska wykluczenia komunikacyjnego. *Pr. Kom. Geogr. Kom. PTG* **2021**, *24*, 19–35. [CrossRef]
85. Strategia Rozwoju Województwa Pomorskiego 2030. Available online: https://pomorskie.eu/wp-content/uploads/2021/04/Za\T1\łącznik-do-uchwa\T1\ły_SWP_376_XXXI_21_SRWP2030_120421.pdf (accessed on 24 November 2021).
86. Polska w Liczbach. Available online: https://stat.gov.pl/files/gfx/portalinformacyjny/pl/defaultaktualnosci/5501/14/13/1/polska_w_liczbach_2020_pl.pdf (accessed on 16 December 2021).
87. Strategia Obszaru Metropolitalnego Gdańsk–Gdynia–Sopot do Roku 2030. Available online: https://www.metropoliagdansk.pl/upload/files/Strategia%20OMGGS%20do%20roku%202030.pdf (accessed on 5 December 2021).
88. Raport o Stanie Gminy Potęgowo za 2020 rok. Available online: https://www.potegowo.pl/sites/default/files/rapor_o_stanie_gminy_za_2020.pdf (accessed on 16 December 2021).
89. Obszar Metropolitalny Gdańsk–Gdynia–Sopot. Available online: https://www.metropoliagdansk.pl (accessed on 6 December 2021).

90. Kontynuujemy Lokalny Transport Publiczny na Terenie Gminy. Available online: https://www.potegowo.pl/pl/aktualnosc/kontynujemy-lokalny-transport-publiczny-na-terenie-gminy (accessed on 18 December 2021).
91. Strategia Rozwoju Gminy Potęgowo do Roku 2020. Available online: https://www.potegowo.pl/sites/default/files/pliki/gmina/link_strategia_gminy_potegowo.pdf?51 (accessed on 16 December 2021).
92. Gmina Potęgowo. Available online: https://www.potegowo.pl (accessed on 18 December 2021).
93. PKS Słupsk. Available online: https://pks.slupsk.pl/pl (accessed on 18 December 2021).
94. Strategia Rozwoju Gminy Potęgowo na Lata 2015–2022. Available online: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjxqfjpktz1AhXgAxAIHUXyCgUQFnoECAkQAw&url=https%3A%2F%2Fbip.potegowo.pl%2FDownload%2Fget%2Fid%2C27048.html&usg=AOvVaw0skHQe9BNscU9baFxzGnew (accessed on 20 December 2021).
95. SKM—Szybka Kolej Miejska. Available online: https://www.skm.pkp.pl (accessed on 8 December 2021).
96. SKM Trójmiasto Żegna się ze Słupskiem. W Sobotę Wyruszył Pociąg Specjalny. Available online: https://dziennikbaltycki.pl/skm-trojmiasto-zegna-sie-ze-slupskiem-w-sobote-wyruszyl-pociag-specjalny/ar/12752525 (accessed on 8 December 2021).
97. SKM Likwiduje Połączenia Dogodne dla Podróżników. Available online: https://gp24.pl/skm-likwiduje-polaczenia-dogodne-dla-podroznikow/ar/4791999 (accessed on 10 December 2021).
98. POLREGIO. Available online: https://www.polregio.pl/pl/ (accessed on 20 December 2021).
99. Elbakidze, M.; Dawson, L.; Andersson, K.; Axelsson, R.; Angelstam, P.; Stjernquist, I.; Teitelbaum, S.; Schlyter, P.; Thellbro, C. Is spatial planning a collaborative learning process? A case study from a rural–urban gradient in Sweden. *Land Use Policy* **2015**, *48*, 270–285. [CrossRef]
100. Adamowicz, M.; Zwolińska-Ligaj, M. The "Smart Village" as a Way to Achieve Sustainable Development in Rural Areas of Poland. *Sustainability* **2020**, *12*, 6503. [CrossRef]
101. Faisal, A.; Kamruzzaman, M.; Yigitcanlar, T.; Currie, G. Understanding autonomous vehicles: A systematic literature review on capability, impact, planning and policy. *J. Transp. Land Use* **2019**, *12*, 45–72. [CrossRef]
102. Kadir, S.A.; Jamaludin, M. Universal Design as a Significant Component for Sustainable Life and Social Development. *Procedia Soc. Behav. Sci.* **2013**, *85*, 179–190. [CrossRef]
103. Szarfenberg, R. *Nierówności i Ubóstwo a Uczestnictwo Polski w Unii Europejskiej (Inequality and Poverty and Poland's Participation in the European Union)*; Uniwersytet Warszawski: Warsaw, Poland, 2015.
104. Kalinowski, S.; Łuczak, A.; Koziołek, A. The Social Dimension of Security: The Dichotomy of Respondents' Perceptions during the COVID-19 Pandemic. *Sustainability* **2022**, *14*, 1363. [CrossRef]