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Structural and functional mechanisms of sustainable rural development in Kazakhstan through corporate social responsibility

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Abstract

The aim of this study is to highlight the importance of corporate social responsibility (CSR) in strengthening the interaction among society, local entrepreneurship, the state, and rural residents within the framework of the structural and functional model (SFM). The study covers a 12-year period from 2010 to 2021 and focuses on data from the Zerendy and Korgalzhyn districts of the Akmola region, located in Northern Kazakhstan. The factors affecting the decline in the rural population were studied using spatial-temporal data, comparative analysis, correlation, and regression methods. Among the 45 indicators describing demographic, social, and economic factors, four key indicators were identified as directly influencing changes in the rural population of the two districts: the number of rural settlements with schools, the number of rural settlements with healthcare facilities, the number of hospital beds, and the number of doctors in rural areas. Integrating the SFM with the CSR mechanism enables the achievement of potential socio-economic outcomes for rural residents. To effectively implement programs aimed at improving rural living standards, curbing population decline, attracting young professionals, and developing local agricultural entrepreneurship, Kazakhstan should focus on structural mechanisms for implementing corporate social responsibility (CSR) through agricultural cooperatives.

Keywords: CSR, Rural areas, Rural population, Social engineering infrastructure.

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1. Introduction

Developing new models for sustainable rural development is a pressing issue for many developed and developing countries. The scientists explain this for several reasons. Harbiankova and Gertsberg [1] identify this topic as one of the under-researched areas in the scientific literature, particularly when compared to urban planning in the context of rural development. Buitelaar and Van der Krabben [2] analyze the development disparities between urban and rural areas, highlighting the factors contributing to the weak research on rural development. Irungu et al. argue that the limited innovative potential in rural areas and the lack of research on their development complicate the conduct of studies [3]. The scarcity of scientifically grounded comprehensive models for sustainable rural development is a significant challenge, particularly in developing countries like Kazakhstan.

Kazakhstan has developed socio-economic programs and national projects at various levels necessary for developing rural areas. According to the Bureau of National Statistics [4], as of the beginning of 2025, 37% of the total population, or 7.5 million people, live in rural areas. Despite Kazakhstan's significant potential in agriculture, the quality of life in rural areas remains considerably lower compared to urban areas [5]. Moreover, the dispersed location of rural settlements poses substantial challenges in delivering state social services and ensuring a decent standard of living and sustainable development. Nevertheless, rural territorial entities are lagging in terms of socio-economic development. Many states have created conditions for the development of local entrepreneurs and increased their CSR to regulate such problems in rural areas [6]. As a result, the villagers were provided with stable jobs, increased income and access to essential goods, and improved the social and engineering infrastructure [7].

Unfortunately, in most of the cited studies and rural development programs, the impact of corporate social responsibility (CSR) on the quality of life and income of rural residents, the development of rural infrastructure, and the increase and diversification of agricultural production has been explored. However, the mechanism through which CSR influences rural population migration remains one of the least studied topics, and in developing countries such as Kazakhstan, research in this area is especially lacking. This study is one of the few empirical studies aimed at rural development in Kazakhstan through integrated interaction between authorities, business sectors, and society within the CSR framework.

The experience of CSR in developing Asian countries, including Kazakhstan, is at an early stage of development [8]. The culture and knowledge of CSR are primarily inherent in several large companies that participate in international business communication and mineral development [9]. These companies implement CSR culture in different ways. In Kazakhstan, CSR is known only as a one-time charitable activity aimed at protecting the environment. Only four large companies support a few social institutions (education, public administration) in the main cities of Kazakhstan (Astana, Almaty, Shymkent) [8]. Nevertheless, regulating socio-economic problems in rural areas through CSR culture is not popular. Local entrepreneurs, sponsors, and patrons who have achieved effective indicators within the framework of state-supported projects for entrepreneurial activity in Kazakhstan make a small contribution to improving the socio-economic situation of their villages.

For the development of rural areas in Kazakhstan through the CSR mechanism, *it* is most appropriate to begin with regions that possess high agricultural potential. In 2023, Akmola Region ranked third in Kazakhstan in terms of agricultural production volume [10]. Despite the high agricultural potential across the country, the rural population continues to decline year after year. In response to this challenge, the Akmola Region has initiated the diversification of its agricultural sector. In 2023 alone, 46 meat farms and 5 dairy farms were established in the region. As a result, meat production reached 168 thousand tonnes, milk production rose to 350 thousand tonnes, and egg production increased to 608 million units [11]. Furthermore, the construction of seven specialized dairy farms is planned, which will enable an additional 32 thousand tonnes of milk to be processed annually. However, as global experience suggests, without the development of a robust Corporate Social Responsibility (CSR) mechanism that fosters cooperation among society, business, and the state, improving the quality of life in rural areas is likely to remain a persistent and unresolved issue.

2. Literature Review

2.1. Theoretical Foundations of Sustainable Rural Development

Peng [12] argues that sustainable development cannot be achieved in a society where significant disparities exist between the development of rural and urban areas. Newsham and Rowe [13] highlight that, currently, many rural regions across the world face pressing issues such as population decline, demographic contraction, aging, the outmigration of economically active groups, and insufficient diversification of rural economies. As Zealous [14] notes, people consider employment opportunities and the diversity of job offers in the labor market when choosing a place to live. Additionally, Feridhanusetyawan emphasizes the importance of income-generating opportunities that meet basic needs, while Wolday and Böcker [15] underline the significance of access to and the quality of social and engineering infrastructure, as well as the availability of leisure activities. These challenges are also relevant to many rural areas in Kazakhstan. Therefore, as Harbiankova and Gertsberg [1] point out, the development of a sustainable rural development strategy should be based on best practices, taking into account the specific characteristics of rural settlements.

Many studies identified environmental, social and economic aspects as structural elements for the sustainable development of rural areas [16, 17]. In addition, some research described the developing factors for rural regions' industrial prosperity, ecological survival, rural civilization, effective management and quality of life Shi and Yang [18]. Straka and Tuzová [19] proposed fourteen of the most common indicators influencing the development of rural areas, which are: registered unemployment rate; housing; birth rate; average gross salary; number of enterprises; share of employed population; number of registered cars; share of households connected to the internet; education index; average; Migration balance per 100 inhabitants [19]. Although these factors are essential for developing rural areas, they did not become a unique mechanism

for forming a close relationship between "society-business-state". The lack of systematic communication between these structures, which are the leading institutions of society, cannot but affect the dynamic development of rural areas of Kazakhstan [9].

2.2. Theories of Corporate Social Responsibility

In many states, CSR has been used as a comprehensive mechanism for the sustainable development of rural areas, as well as improving the social and economic situation of the rural population and regulating demographic and environmental problems [7, 20, 21].

CSR, a structural component of the economic institution, acts as a strengthening mechanism for the socio-economic situation of society. Just as any other institution of society contributes to the development of the entire society, CSR contributes to the creation of society's social and economic engine [22]. This is because different components of society play specific roles that ensure the system's proper functioning. CSR is pragmatically formulated as a response of businesses to the problems of society, and it is also known as an element of structural changes affecting the strategies of firms and the structure of the industry [23]. Different structures that are formed through social relations between people are aimed at the stability of society. The father of the theory of British structural functionalism, Radcliffe-Brown, developed the theory that various social institutions consist of many structures with norms that allow society members to form social stability [24]. In most developed countries, the state is leading in developing social responsibility through institutional, informational, organisational and managerial tools and education. Thus, business structures, including food enterprises, have the opportunity to develop CSR [25].

Based on these studies, we assume that the proposal of the CSR factor as a component of the structural and functional model will be one of the successful approaches for developing rural regions of Kazakhstan. The introduction of this factor shows the relationship between individual phenomena, improves several indicators, gives results, and creates opportunities for sustainable socio-economic and ecological development of rural areas [17, 26]. Therefore, considering the world experience of rural development in the process of globalisation, the importance of developing a structural and functional model of rural development in Kazakhstan within the framework of CSR was recognised. In some studies, part of the profit of large corporations was considered for investing in CSR as an essential mechanism for solving problems in social and engineering infrastructure in rural areas of the state [27-31]. The concept of CSR originated in the USA in the 1950s and became widespread in the early 1970s. At that time, the USA faced many social problems, such as poverty and unemployment [32]. The result was a significant drop in dollar prices [33]. From 1980 to 2000, corporations began to realize their responsibility to society. Corporate Social Responsibility (CSR) aims to create well-being in the interests of all stakeholders, including shareholders, employees, customers, the environment and society [34]. Thus, CSR plays a vital role in developing all sectors of the economy as one of the directions of rural development. Many researchers interpret CSR as a concept in which an enterprise takes responsibility for its influence in all aspects of its activities on customers, employees, their families, the local community, shareholders and the environment and encourages attention to the interests of society [35-37].

Enterprises operating in rural areas use their labor resources and social infrastructure. This combination can manifest in business investments in rural development [38]. The need to develop rural areas within the framework of corporate social responsibility (CSR) is explained by the following: creation of infrastructure and household services and communications; raising the level of education, as well as health standards and living conditions; creation of employment opportunities in various industries [39-41]. Rural development within CSR is widely used in India. This is because more than 67% of the total population of India lives in rural communities where basic amenities and infrastructure are lacking. To address this problem effectively, the government of India encourages private sector participation in rural development projects. Thus, according to the Companies Act of 2013, Indian corporations must invest 2% of their profits in the social sphere of rural areas within the framework of CSR [27]. According to Pradhan and Akhilesh, CSR actions have a positive impact not only on rural development but also on their business [42].

3. Materials and Methods

3.1. Research Methodology

That is why, as noted in this study's introductory and theoretical sections, we consider the CSR factor to be a driving force for the sustainable development of rural areas. At the same time, we identify this factor as an integral element of the structural and functional model for the development of rural areas in Kazakhstan.

In accordance with this, our study proposes the CSR factor as one of the constituent elements of the structural and functional model. Thus, for the sustainable development of rural regions of developing countries such as Kazakhstan, it is possible to form a systematic link between "society, business, and the state." Our study collected data from 97 rural settlements of Zerendy (79) and Korgalzhyn districts (18) from the Akmola region, located in the northern part of Kazakhstan. In this study, we identified that the obsolescence of social and engineering infrastructure in rural settlements and a scarcity of permanent jobs caused migration flow and depopulation; we determined the reasons for the significant lag between the quality of life of the rural and urban populations and proposed CSR as a comprehensive device to regulate these problems, as well as presented it as a critical element of the structural and functional model. Consistent with the purpose of the study and the state strategic documents, we attempted to adapt the structural and functional model as a comprehensive device for the sustainable development of rural areas in Kazakhstan's northern, eastern, and central regions.

3.2. Data Source

Economically and geographically, Kazakhstan is divided into Central, Western, Eastern, Northern, and Southern regions. As indicated in the introduction, the regions are further divided into 17 regions and 170 districts. Among these regions, we

first chose the Akmola region, which is considered the most promising, taking into account its proximity to the capital of Kazakhstan, Astana, and the number of inhabitants. There are 17 districts in the Akmola region [4].

The study was conducted in two districts of the Akmola region near large cities. One is the densely populated Zerendy district, and the other is the Korgalzhyn district, which has a small population (Figure 1). The data were collected from 79 rural settlements of Zerendy and 18 from Korgalzhyn districts. The total number of rural settlements in which the study was conducted is 97.

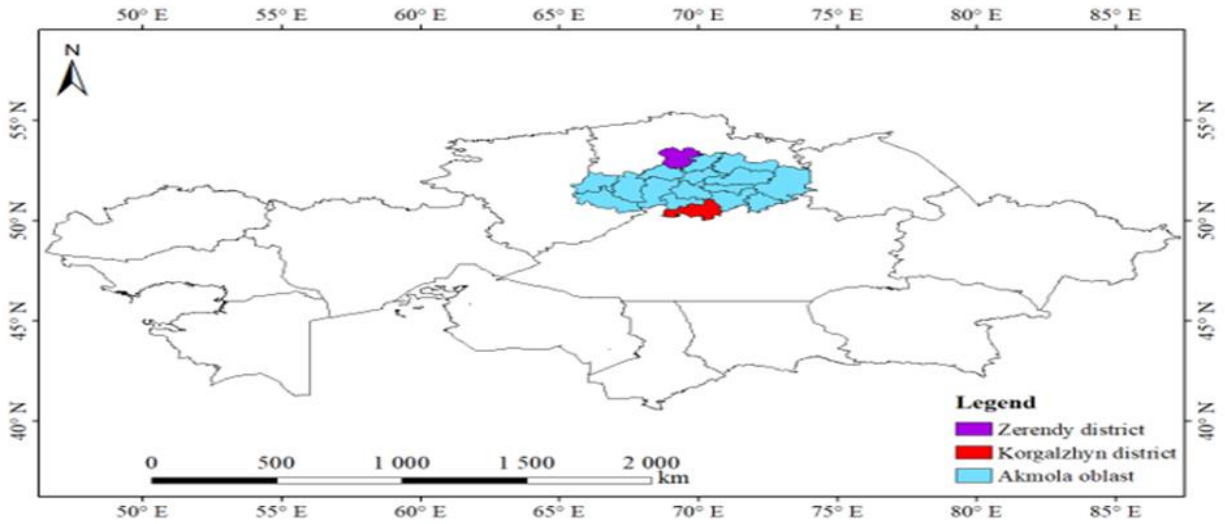


Figure 1.
Cartogram of Zerendy and Korgalzhyn districts in the Akmola Region of Kazakhstan

Zerendy district is one of the largest resort areas of the Akmola oblast, located near the regional center of the city of Kokshetau. In terms of population, it is one of the region's top three out of 17 districts. Forests, picturesque places, clean reservoirs, mineral springs, a sanatorium and resort area, guest houses, children's health resorts, a ski base, and a natural national park are suitable for developing the tourism and sports industry. Agriculture is represented by livestock (meat and meat products, milk and dairy products), poultry (poultry meat, food eggs), and crops (flour, potatoes, vegetables, vegetable oil).

Korgalzhyn District is in the lake-steppe (wetland) zone and is rich in fish, bird nests, waterfowl, and migratory animals. Rare pink flamingos are found in its reservoirs. In terms of land area, this is 19.1% more than in the Zerendy District. There is an average of 109.9 hectares of land per inhabitant. However, the population of the district ranks penultimate in the Akmola region. Compared to the Zerendy District, the population is 4.3 times smaller. Therefore, the problem of social and engineering infrastructure in this area is more complex.

Despite the differences between the districts, a common problem for both is the depopulation of the rural population caused by migration. The strategic document on the development of rural areas in Kazakhstan states that this process depends on changes in the composition of land resources and social, economic, and demographic factors [5]. In this regard, Kazakhstan has been improving measures to stabilize migration for many years. Nevertheless, in the northern part of Kazakhstan, there is a trend towards a decrease in the number of rural populations [4]. The declining and aging population creates new problems. The decline in the employable population leads to instability in the labor market and increases social pressure on the state [43]. In this study, we identified the influence of social, economic, and demographic indicators on the population's decline. To achieve this, we found out what exactly affects the decline in the population of Zerendy and Korgalzhyn districts among social, economic, and demographic indicators by using spatiotemporal data. It helps to process massive data and objects for a given period and visualize them by mapping.

3.3. Methods

3.3.1. Spatiotemporal Data

The method of spatiotemporal data was used to verify the scientific validity of the structural and functional model of rural development within the framework of Corporate Social Responsibility. Using this methodology, demographic (4 indicators), social and engineering (22 indicators), economic (14 indicators), and environmental (5 indicators) factors in these districts of the Akmola region of Kazakhstan were divided into groups, and a comprehensive analysis was carried out within the framework of the data for the period from 2010 to 2021. As a result, the factor indicators influencing the annual decrease in the population in rural areas were scientifically substantiated. The density of connections between factor indicators was calculated using the correlation method.

The Government of Kazakhstan is concerned about the year-on-year decline in the rural population in the northern regions, which is necessary to maintain a balanced population in all areas and effective land development. Therefore, we used the correlation method to demonstrate the close relationship between rural population decline and social, engineering, economic, demographic, and environmental factors.

The study uses social, economic, demographic, and environmental indicators since there is an extensive statistical database covering all rural regions of Kazakhstan and reflecting the state of social and engineering, economic, demographic, and ecological development.

3.3.2. Time Series

To describe the reasons for the population's decline from year to year in the Zerendy and Korgalzhyn districts of the Akmola region, the time series method was used [44]. The reliability, homogeneity (distribution relative to the average level) and compliance with the normal distribution law of the collected initial data were checked. The nature and peculiarity of the dynamic range, based on calculating the average degree, characterizes each indicator. Average dynamic indicators are not limited to identifying general or particular trends characteristic of short-term and long-term periods; they are considered a tool for the comparative study of indicators in different periods of the space-time interval. Using the method of aggregated constant period series, average values of districts were calculated for individual indicators of social and engineering infrastructure. When analyzing time series, the following indicators are calculated: absolute increase (decrease) (Δyi); growth factor (decrease) or growth rate (ti); increase rate (growth rate) - ti'; the absolute value of one percent gain on Ai. [45]. The average absolute increase (decrease) is determined by calculating a simple arithmetic average between successive absolute increases.

Average indicators of a series of dynamics, including the average absolute increase (decrease)

$$\overline{\Delta}_y = \frac{\sum \Delta y}{n} = \frac{y_n - y_0}{n} \qquad 1)$$

Where, $\overline{\Delta_y}$ - the average level of change in the series over the study period; Δy - changes in the level of the series over the study period; y_0 - the initial level of the series; y_n - the final level of the series; n - number of given periods.

$$y_t = a_0 + a_1 \qquad (2)$$

Where, $У_t$ - theoretical degrees of a series of dynamics; t – time symbol, usually periods are denoted by an ordinal number. a_0 и a_1 – Parameters of the trend equations.

$$\begin{cases} na_0 + a_1 \sum t = \sum Y \\ a_0 \sum t + a_1 \sum t^2 = \sum Yt \end{cases} \qquad (3)$$

Where, У- actual (empirical) levels of the series; n - their number; t-chronological time indicators (ordinal number of the period or moment of time); a_0, a_1 и a_2, etc. – parameters of trend equations [45].

The trend of the population decline in the Zerendy and Korgalzhyn districts on average for each year was justified by employing these formulas.

3.3.3. Multivariate Correlation and Regression Analysis

The most promising method for analyzing and evaluating various structures of demographic and migration processes is a comprehensive assessment that includes a system of absolute and relative indicators and multivariate correlation-regression analysis, which makes it possible to identify relationships between indicators and analyze the dynamics of their development [46]. Thus, it is essential to propose possible ways to regulate it, identifying the most critical factor influencing population change in the selected regions (according to the Pearson correlation coefficient, Formula 4) [44] factors influencing population's decline in rural areas were identified, functional relationships were calculated as well as the mutual density between the factors:

$$r_{xy} = \frac{\sum (x_i - \bar{x}) \times (y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \times \sum (y - \bar{y})^2}} \qquad (4)$$

Where xi - values taken by the variable X; yi - values taken by the variable Y; $\overline{x}$ and $\overline{y}$ - the arithmetic mean for the variables X and Y. The value of the correlation coefficient varies from 0 to 1. The closer its value is to 1, the closer the relationship. If the coefficient has a positive (+) value, then there is a direct relationship between the indicators, a negative (-) value, then the relationship between the indicators is inverse. We prefer values (close to 1) that show the strongest possible relationship in the study [47].

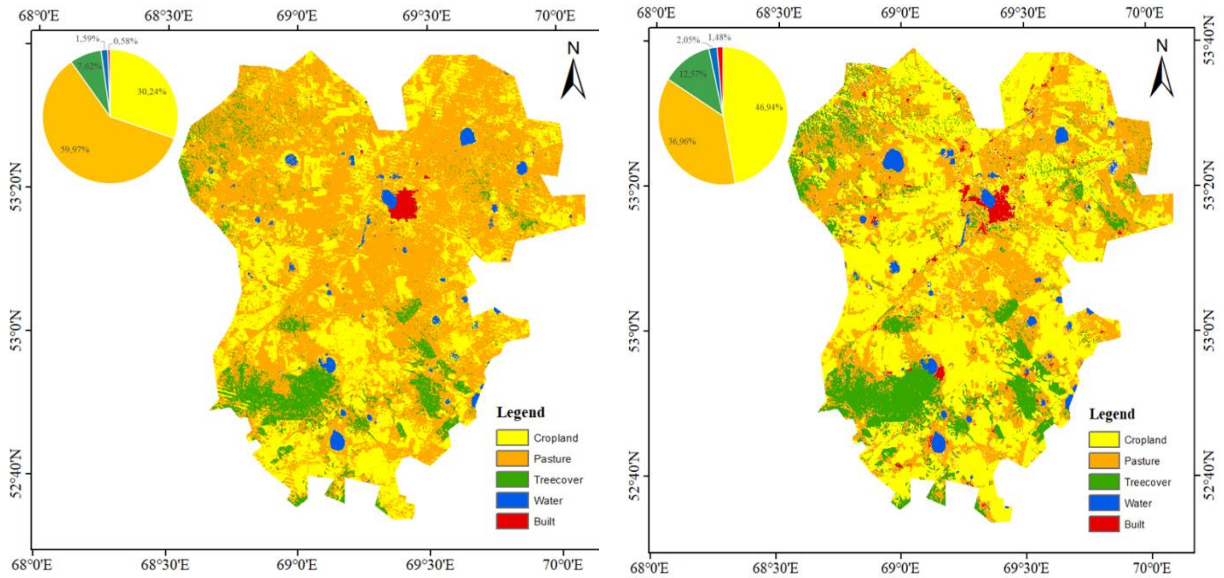
3.3.4. Material

For the scientific substantiation of the parameters influencing the integrated development of rural areas, the initial data on 45 indicators were summarized, including demographic, social, engineering, economic, and environmental factors of two districts (Zerendy and Korgalzhyn) in the Akmola region of Kazakhstan. The data covered the period from 2010 to 2024.

4. Results

4.1. Spatial and Temporal Data Method

The spatiotemporal data method revealed the influence of environmental factors on the decline in the rural population (Figure 2 and Figure 3).

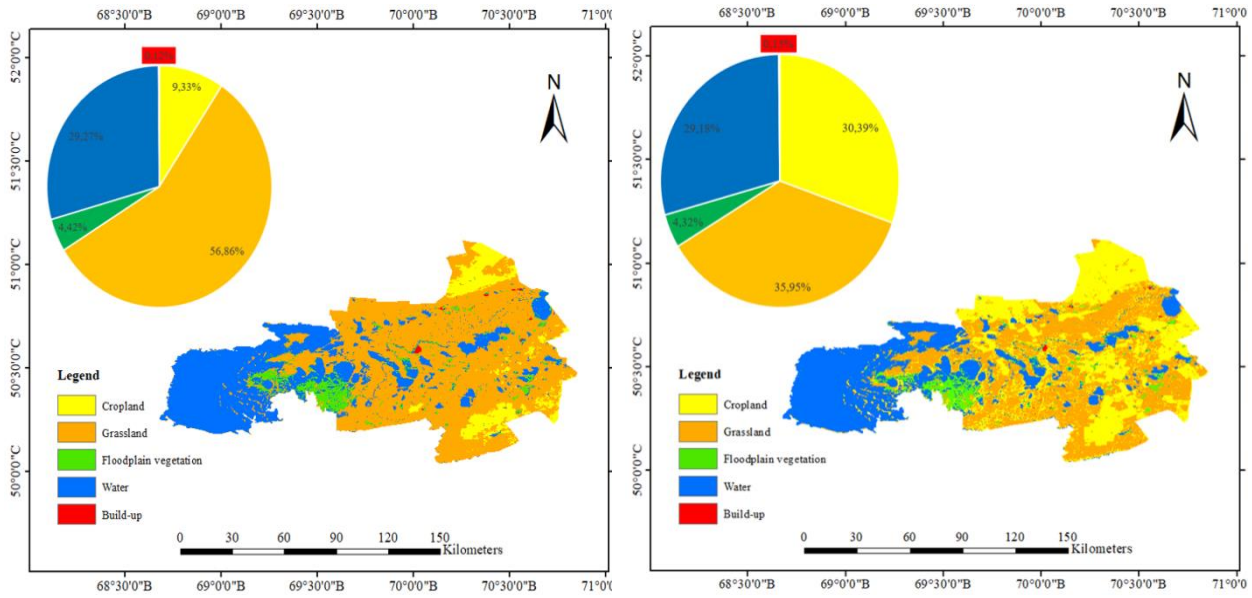


(a) Zerendy_2010 (b) Zerendy_2023

Figure 2.
Cartograms of Zerendy district.

The main reason is the reduction in the proportion of grazing land in the two districts. In particular, in 2023, in the Zerendy district, compared to 2010, the area of the forest fund increased by 4.9%, water fund lands by 0.46%, and shares of other lands by 0.9%. This is directly related to the fact that this is a resort area. However, during this period, the share of pastures decreased by 21.01%. On the contrary, the share of arable land increased by 10.7% (Figure 2).

This situation has been evidenced in the Korgalzhyn district with no significant changes in forest, water reserves and other places. However, from 2010 to 2023, the share of arable land in this area increased by 21.06%, and vice versa, the share of pastureland decreased by 21.03% (Figure 3).



(a) Korgalzhyn_2010 (b) Korgalzhyn _2023

Figure 3.
Cartograms of Korgalzhyn district.

According to spatial and temporal data changes, these areas are also experiencing significant changes in economic performance. Despite the decrease in pastureland in the regions, the number of livestock and the indicators of small and medium-sized businesses and industrial products have increased. In particular, the number of cattle has increased threefold in Zerendy and more than once in Korgalzhyn district, respectively. The number of sheep, goats, and horses has also

experienced growth. The number of households is also increasing (almost threefold in the Korgalzhyn district). Due to the inflationary situation, the financial indicators of the districts do not provide an accurate assessment of the economic situation. These conditions cannot increase household income. For this reason, many economically active workers migrate to large cities to obtain a stable income. Thus, the population in the districts is steadily declining (Table 1).

4.2. Comprehensive Analysis of Average Annual Changes in Population in the Regions

The average absolute increase (decrease) [45] was determined by calculating the simple arithmetic average between successive total increases (formula 1):

- Zerendy district: -489 persons;
- Korgalzhyn district: - 218 persons.

To assess the dynamic changes in the population in Zerendy [48] and Korgalzhyn [49] districts, we used the trend equation in the form of a straight-line function (Formula 2). In two districts, from 2010 to 2024 (for 15 years), there was a decrease in the population, births and deaths (Table 1).

Table 1.
Determination of the dynamics of the trend of population decline in Zerendy and Korgalzhyn districts using minimum squares.

Years	У		t,	t^2	У*t		$У_t = a_0 + a_1 t$ $У_t = 41787 - 476t$	$У_t = a_0 + a_1 t$ $У_t = 10326 - 212t$
	Population at the end of the year, people		Order of the year		Zerendy	Korgalzhyn		
	Zerendy	Korgalzhyn					Zerendy	Korgalzhyn
2010	40 229	9 755	1	1	40229	9755	41311	10114
2011	40 146	9 574	2	4	80292	19148	40835	9902
2012	39 972	9 505	3	9	119916	28515	40359	9690
2013	39 920	9 464	4	16	159680	37856	39883	9478
2014	39 779	9 421	5	25	198895	47105	39407	9266
2015	39 497	9 377	6	36	236982	56262	38931	9054
2016	38 784	8 890	7	49	271488	62230	38455	8842
2017	38 580	8 844	8	64	308640	70752	37979	8630
2018	38 682	8 815	9	81	348138	79335	37503	8418
2019	38 097	8 660	10	100	380970	86600	37027	8206
2020	37 445	8 616	11	121	411895	94776	36551	7994
2021	35 505	7 449	12	144	426060	89388	36075	7782
2022	35 086	7 306	13	169	456118	94978	35599	7570
2023	34 574	7 058	14	196	484036	98812	35123	7358
2024	33 390	6 708	15	225	500850	100620	34647	7146
Total	468365	110007	120	1240	4 424 189	976 132	569685	129 450

Source: The calculations were performed by the authors based on reference materials provided by the Akim Offices of Zerendy and Korgalzhyn districts.

Based on the data in Table 1, we compose a system of normal equations and thus determine the parameters of the linear function (Formula 3):

-Zerendy: $\begin{cases} 12a_0 + 78a_1 = 468365 \\ 78a_0 + 650a_1 = 3001003 \end{cases}$; $a_1 = -476$; $a_0 = 41787$.

-Korgalzhyn: $\begin{cases} 12a_0 + 78a_1 = 110007 \\ 78a_0 + 650a_1 = 698339 \end{cases}$; $a_1 = -212$; $a_0 = 10326$.

$a_1 = -476$; $a_0 = 41787$. Consequently, the trend equation is: Уt =41787-476t, that is, over the past 15 years, the population of the Zerendy district has decreased on average by 476 people annually. Using this equation, it is possible to calculate the theoretical level of the downward trend in the number of rural settlements over the years between the spatial and temporal period (interpolation method).

In particular, the theoretical level of the population of the Zerendy district for 2021: $У_{2021}$ =41787-476*12 = 36075 people. Thus, it is possible to calculate the theoretical risk level of population decline even for the next 3-4 years (extrapolation method):

- Zerendy district: $У_{2029}$ =41787-476*19, and the risk of decreasing to 32743 people.
- Korgalzhyn district $У_{2029}$ =10326-212*19, and the risk of a decrease to 6298 people.

The population forecast for Zerendy and Korgalzhyn districts up to 2029 highlights the necessity for the state to adopt well-considered and comprehensive policy decisions regarding these regions. Given the projected population decline and the challenges associated with rural depopulation, such as workforce shortages, infrastructure underutilization, and socio-

economic stagnation, strategic intervention is required to ensure balanced regional development and the sustainability of rural settlements.

4.3. Correlation-Regression Analysis

In order to identify the specific factors contributing to the population decline in the Zerendy and Korgalzhyn districts, a correlation-regression analysis was conducted on 45 indicators related to sustainable development factors, including social, economic, and demographic dimensions, as presented in Table 2. (Formula 4).

Table 2.
Correlation coefficient of factors affecting the decline in the population the Zerendy and Korgalzhyn districts

Group	Indicators	Coefficient determined by the density of factors connection (r)	
		Zerendy (Rz)	Korgalzhyn (Rh)
Demography	Born	0.80	0.03
	Deceased	0.24	0.39
	Arrived	-0.38	-0.67
	Dropped out	-0.67	-0.37
Social and engineering sphere	Number of rural settlements	*	0.793
	Number of unemployed	0.46	0
	Fixed unemployment rate	0.3	-0.38
	Number of preschool (kindergartens, mini-centers) institutions	-0.34	-0.38
	Number of children in preschool institutions	0.29	-0.72
	Number of rural settlements with schools	0.83	0.95
	Number of model schools	0.01	0.94
	Schools in adapted buildings	-0.72	0.75
	Number of students	0.7	-0.68
	Number of rural settlements with healthcare facilities	0.82	0.87
	Number of beds for patients	0.65	0.78
	Number of doctors	0.94	0.84
	Number of medical workers	0.36	0.67
	Number of libraries in rural areas	0.8	0
	Number of clubs in rural areas	0.76	0.3
	Houses of culture of rural settlements	0	0
	Total length of roads	-0.77	-0.85
	Hard surface roads (asphalt)	-0.57	0.84
	Gravel roads	-0.78	0.14
	Number of rural settlements with centralized water supply	-0.74	*
	Number of rural settlements with decentralized water supply	0.38	*
	Number of rural settlements using transported water	*	*
	Average monthly salary	-0.87	-0.91
Economic	The total production of the region amounted to	-0.79	*
	Volume of industrial production	-0.98	-0.69
	The volume of gross agricultural output	-0.82	-1.00
	Gross crop production	-0.92	*
	Gross livestock production	-0.91	*
	Investments in fixed assets	-0.91	0.01
	Number of livestock:		
	- Cattle. including:	-0.86	-0.65
	- Cows	-0.24	-0.82
	- Sheep and goats	-0.78	-0.88
	- Horses	-0.82	-89.00
	- Pigs	-0.13	0.71
	- Birds	-0.87	-0.09
	Number of registered SMEs	- 0.83	- 0.72
	Number of operating SMEs	-0.90	-0.78
	Number of people employed in operating SMEs	-0.85	- 0.82
	Output of products by SMEs	- 0.93	- 0.84
	Business entities	-0.87	-0.97

Source: The calculations were performed by the authors based on reference materials provided by the Akim Offices of Zerendy and Korgalzhyn districts [48, 49].

Correlation-regression results of close links between population indicators in Zerendy and Korgalzhyn districts and spatial and temporal data in Zerendy [48] and Korgalzhyn [49] districts, as well as demographic, economic, social and engineering, and environmental factors, can be characterized as follows.

Indicators in the group of demographic factors that can affect population decline have different meanings in the two areas. Indicators reflecting the strong relationship between population decline and demographics showed a robust relationship in one area and a weak one in another. For example: 1) birth rates-Rz=0.80, Rh=0.03; 2) retirement rates: Rz= -0.67, Rh= -0.37. When considered logically, the economic factors that can affect the decline in the population in rural areas include the number of economic entities, the volume of production, and the state of the agricultural industry. In these areas, the population is declining despite the growth of economic indicators for 12 years (2010-2021). In particular, in both districts there is a very close inverse relationship between population decline and the following indicators: industrial output (Rz= -0.98; Rh= -0.69); the volume of gross agricultural output (Rz= -0.82; Rh= -1.00); the number of livestock (for all types: Rz=-0.78 - (-0.86)); Rh= -0.65 - (-0.89)); increase in indicators of the number of economic entities (Rz= -0.87, Rh= -0.97); number of registered SMEs (Rz= -0.83, Rh= -0.72); number of operating SMEs (Rz= -0.90, Rh= -0.78); number of people employed in active SMEs (Rz= -0.85, Rh= -0.82); output by SMEs (Rz= -0.93, Rh= -0.84).

The result of the study identified several indicators belonging to the social and engineering factors as the main reason for the annual population decline in rural areas. We used the results of Table 2 to assess which demographic, social and engineering and economic factors have the highest impact on the decrease in the population of the studied areas. We selected indicators ($r \geq 0.5$) in Table 2, which show a very close relationship between the population and factor indicators, and showed it in Table 3. Interestingly, the result of the study showed that the decrease in the population in the districts might be due to a decrease in the number of rural areas with schools and hospitals and a small number of beds required to receive sick people, an insufficient number of doctors and medical personnel.

Table 3.
Factors of social engineering infrastructure, reflecting a close relationship with the decline in the population of Zerendy and Korgalzhyn districts.

Infrastructural factors affecting the decline in the population of rural areas (X)	The coefficient determined by the density of the connection of factors (R)	
	Zerendy district	Korgalzhyn districts
Number of rural settlements with schools	0.83	0.95
Number of rural settlements with healthcare facilities	0.82	0.87
Number of beds for patients	0.65	0.78
Number of doctors	0. 94	0.84

Source: The calculations were performed by the authors based on reference materials provided by the Akim Offices of Zerendy and Korgalzhyn districts [48, 49].

The main factors influencing the decline in the population of these two districts (Zerendy and Korgalzhyn) are the number of rural settlements with schools (Rz=0.83; Rh=0.85) and the number of rural settlements with health care institutions (Rz=0.82; Rh=0.87) is decreasing from year to year. At the same time, a standard indicator characteristic of the two districts under consideration is a decrease in the number of beds for patients in hospitals (Rz=0.65; Rh=0.78) and the number of doctors (Rz=0.94; Rh=0.84). Interestingly, all these indicators belong to the group of socio-engineering factors.

5. Discussion

5.1. CSR Partnership for Rural Development

In this study, demographic, social, engineering, economic, and environmental factors were analyzed to identify the leading indicator affecting the decrease in the number of rural residents, and the CSR factor was shown as a component of the structural and functional model of rural development. Based on the correlation regression analysis of this study, the factors influencing the decline in the population of rural areas of Kazakhstan (in the example of the Zerendy and Korgalzhyn districts) are analyzed comprehensively, and the following results are determined for each factor.

Despite the population density of the Zerendy and Korgalzhyn districts, the indicators of demographic factors affecting population decline have different values in the two districts. From a logical point of view, the birth rate should be high in an area with a large population (Zerendy). However, in the Zerendy district, the birth rate in 2021 compared to 2010 decreased by 27%; on the contrary, in Korgalzhyn, it increased by 20%. There is a close relationship between the population and birth rates and outflow in the Zerendy and Korgalzhyn districts; conversely, there is no such connection between these indicators. Therefore, it is impossible to draw a general conclusion on demographic indicators that may affect the annual decline in the population in rural areas.

The assessment of economic factors influencing rural population decline revealed that increases in production volumes (both financial and physical) and the growing number of economic entities have not curbed the outmigration to cities. In both Zerendy and Korgalzhyn districts, there is no positive correlation between population size and economic indicators. A likely reason is the limited number of promising rural settlements in Kazakhstan that offer stable employment and industrial infrastructure [4]. As a result, economically active rural residents continue to migrate to urban centers in search of stable income.

Trends in changes in social and engineering infrastructure indicators that directly affect the decline in the population of districts have been identified; these include an insufficient number of beds for patients and a lack of doctors and medical personnel. Therefore, to maintain a stable population level in rural areas, it is essential to create production sites, considering the level of specialization of the rural regions and implementing measures to increase the population's income level. To

achieve this, it is better to address social (labor market) and social engineering infrastructure issues.

Currently, the CSR mechanism is being gradually implemented in Kazakhstan through agricultural cooperatives. From a strategic development perspective, it is advisable for Kazakhstan to initiate comprehensive measures aimed at enhancing the living standards of rural populations and encouraging youth engagement in rural areas by promoting the multi-sectoral development of agricultural cooperatives, particularly in the areas of marketing, service provision, and advisory support. A specific example of this can be observed in the case of Rodina LLP, located in the Tselinograd district of the Akmola region.

Agrofirma Rodina LLP, located in the Tselinograd District of Akmola Region, serves as a notable example of effective integration between agricultural production and rural social development. Over the past decade, the enterprise has made significant investments in social infrastructure, including the construction and operation of a 25.5 km centralized water supply system, 42.7 km of heating networks, 20 km of street lighting, and 15 km of paved roads. All residential buildings within the central estate have been connected to the central heating system, and all three associated villages are fully supplied with centralized water services.

The company independently finances the repair, maintenance, and acquisition of essential resources for social and cultural facilities. As a result, these facilities are consistently recognized as exemplary at the district and regional levels. Through this approach, Rodina LLP has accumulated extensive experience in combining agricultural development with initiatives aimed at improving the quality of life for rural residents and ensuring stable socio-economic conditions for their families.

Rodina rural district has been officially recognized as the best in the Akmola Region, while the village of Rodina has repeatedly received the title of "Best Settlement of the Region [50]. Statistical data further indicate positive dynamics in the Tselinograd district, demonstrating growth not only in the absolute numbers of population and business entities but also in key structural indicators of rural development [4] (Table 4).

Table 4.
Socio-economic indicators of the Tselinograd district of the Akmola region.

Year	Population	Entities	Num. of entities per capita	Small	Middle	Large	CSR	CSR per capita
2010	58 746	443	0.75	411	22	10	291	0.50
2015	66 661	614	0.92	571	37	6	402	0.60
2020	81 124	1 242	1.53	1 214	18	10	852	1.05
2021	84 051	1 324	1.57	1 299	15	10	929	1.10
2022	80 826	948	1.17	925	16	7	660	0.82
2023	82 151	931	1.133	906	17	8	698	0.85

As shown in Table 1, the rural population of the Tselinograd district in the Akmola region has demonstrated steady growth between 2010 and 2023. This increase is primarily attributed to migration inflows driven by the population's pursuit of higher wages, improved social conditions, quality education, and well-developed social and engineering infrastructure.

This growth may also reflect the increasing influence of corporate social responsibility (CSR). Therefore, CSR could play a significant role in addressing the socio-economic challenges of other rural areas with declining populations, such as the Zerendy and Korgalzhyn districts examined in this study.

Overall, unless the large-scale rural-to-urban migration trend is mitigated, achieving sustainable rural development in Kazakhstan will remain a complex challenge. In this context, expanding CSR initiatives and increasing the number of socially responsible enterprises could help reduce labor migration from rural settlements to major cities.

5.2. Structural-Functional Model (SFM)

In a number of countries, as indicated in the research methodology, the structural elements of the sustainable development of rural areas most often included are: labor resources, production volumes, social infrastructure, and social development [19], anthropogenic factors, and natural and climatic conditions [51], investments [52, 53]. Based on these factors, we proposed the CSR factor from a new angle, that is, to supplement the constituent elements of the structural and functional model of rural development with CSR. This study makes a significant contribution to theory for gradually developing Central Asian economies, including by expanding the development mechanisms of rural regions in the north of Kazakhstan with the CSR factor. For implications, it will make it possible to make effective proposals for strengthening the economic policy of the developing countries of Central Asia through clear targeting measures in the field of sustainable development of rural settlements, increasing the competitiveness of agricultural production, environmental sustainability, and improving the quality of life of the rural population (Figure 4).

In Figure 4, we showed the possibilities that can be achieved if the CSR factor is considered a vital element of the structural and functional model of rural development (SFM) for the sustainable development of rural regions of Kazakhstan. As noted in the introductory and theoretical sections, where capital, resources, people and other issues cannot be interconnected, "management" becomes the main competitive advantage [48].

This concept is especially characteristic of Kazakhstan. Using this model, the state can regulate this situation by putting the private sector and civil society first and implementing «management» activities.

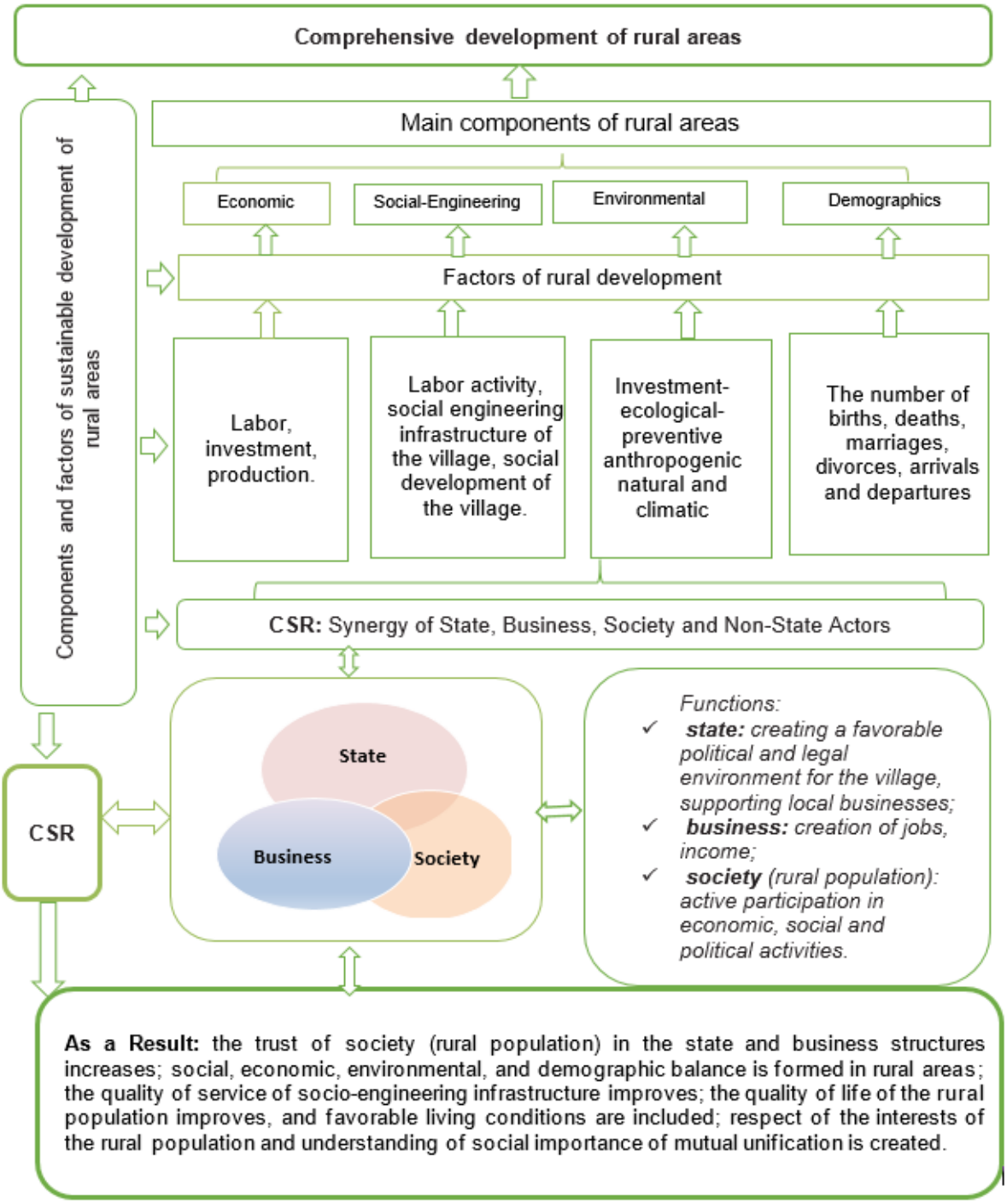


Figure 4.
Structural and functional model of Integrated Rural Development and results achieved within the framework of the CSR factor.
Source: own elaboration.

The proposed model will provide basic needs for rural residents through a partnership of three sectors. As a result, the stable growth of the population in rural areas will be maintained.

As shown in Figure 4, the three sectors (state, business and society) must have a common goal to make policies and programs effective and sustainable. Thus, in the structural and functional rural development model, the state creates a favorable political and legal environment, the private sector creates jobs and incomes, and civil society facilitates political and social interaction by mobilizing groups for economic, social, and political activities. As a result, the CSR factor will contribute to the development of rural areas in Kazakhstan.

6. Conclusion

Rural settlements in Kazakhstan are characterized by scattered and small settlements according to the geographical settlement system. In this context, full financing of social activities is necessary through state funding. Therefore, it is recommended that the Government of Kazakhstan implement a comprehensive mechanism for rural development. This mechanism could involve CSR, primarily through agricultural cooperatives, as small-scale farms may not yield effective

results using this mechanism. Furthermore, the state should incorporate CSR as a key mechanism in rural development and socio-economic growth programs. The CSR factor must become the driving force for rural development, playing a central role in shaping the systemic relationship between «society-business-state». The impact of Corporate Social Responsibility (CSR) on the sustainable development of rural areas can be demonstrated through three levels:

Basic Level: Businesses are expected to diligently fulfill their primary obligations, including the payment of wages, timely remittance of taxes and insurance contributions, adherence to labor and environmental laws, ensuring safe working conditions, and striving to create new job opportunities.

Human Capital Development Level: This level focuses on developing partnership-based relationships that take into account the interests of employees. It includes involving employees in business ownership, investing in human capital through training, retraining, and professional development, and making social investments by improving working conditions and the living standards of workers.

Highest Level: This level involves charity and sponsorship activities. Additionally, interaction with local authorities, supporting youth organizations, and promoting the creative and intellectual potential of employees are also part of this level.

Thus, CSR could be one of the key elements of the structural-functional model based on rural area development. However, in the structural-functional model, the following points must be considered: the independence of some business entities may be limited, as this model requires the launch of large-scale business projects, taking into account the level of specialization of rural areas, and necessitates centralized management, which limits the freedom of some independent small farms. Despite these shortcomings, this model could be one of the most promising directions for developing business in rural areas. However, the diversity of the rural economy must also be considered, and research in this area continues.

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