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BRIDGING THE GAP: SUSTAINABLE INFRASTRUCTURE AND INCLUSIVE ENVIRONMENTS FOR POLAND'S AGEING POPULATION UNDER THE FENIKS PROGRAMME

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ABSTRACT: The article aims to evaluate the potential impact of the European Funds for Infrastructure Climate and Environment Program 2021–2027 (Feniks Program) on the spatial determinants of older people's situation in Poland, particularly in light of climate change adaptation. The evaluation focuses on those Program priorities that can effectively address institutional discrimination against older people and minimise the risks associated with the adverse effects of climate change on this demographic. This study employs a mixed-methods approach, combining quantitative analysis of demographic data from sources such as Eurostat and GUS (period: 2002–2022) with qualitative evaluations of policy documents. The research focuses on assessing regional variations in the ageing process and the effectiveness of Feniks Program priorities in addressing these variations. In the demographic analysis, comparisons were made across all EU countries and regionally for differences between provinces in Poland. Due to its nationwide nature, the potential impact of Feniks is analysed for the entire country. The program's focus on energy modernisation, water management, and green infrastructure has the potential to significantly improve the living conditions of the elderly and combat the negative impact of climate change on their situation. Investments in energy-efficient buildings, urban adaptation projects, and circular economy initiatives are crucial. The program prioritises less developed regions and urban areas most affected by demographic ageing and climate change challenges. The Feniks Program is well-positioned to enhance the quality of life for Poland's ageing population by addressing key infrastructure and environmental challenges. The Program provides separate measures targeting urbanised areas, which is particularly important given the increasing number of older people in cities. However, the success of these initiatives depends on effective implementation and continuous monitoring to ensure inclusivity and sustainability. Future research should focus on the long-term impacts of these projects and explore additional measures to support the elderly in adapting to climate change.

KEYWORDS: ageing population, sustainable infrastructure, inclusive environments, climate change adaptation, EU funds

JEL: I31, J11, J14, R11

WYRÓWNYWANIE SZANS: ZRÓWNOWAŻONA INFRASTRUKTURA I WŁĄCZAJĄCE ŚRODOWISKA DLA STARZEJĄCEGO SIĘ SPOŁECZEŃSTWA POLSKI W RAMACH PROGRAMU FENIKS

ZARYS TREŚCI: Celem artykułu jest ocena potencjalnego wpływu Programu Fundusze Europejskie na Infrastrukturę, Klimat i Środowisko 2021–2027 (Program Feniks) na przestrzenne uwarunkowania sytuacji osób starszych w Polsce, w szczególności w świetle adaptacji do zmian klimatu. Analiza skupia się na priorytetach programu, które mogą skutecznie przeciwdziałać instytucjonalnej dyskryminacji osób starszych oraz minimalizować ryzyko wynikające z negatywnych skutków zmian klimatu dla tej grupy demograficznej. W badaniu zastosowano podejście mieszane, łączące ilościową analizę danych demograficznych, pochodzących m.in. z Eurostatu i GUS (okres: 2002–2022), z jakościową oceną dokumentów strategicznych. Badanie koncentruje się na ocenie regionalnych różnic w procesie starzenia się oraz na skuteczności priorytetów programu Feniks w radzeniu sobie z tymi

różnicami. W analizie demograficznej porównano sytuację między wszystkimi krajami UE oraz przeanalizowano różnice regionalne między województwami w Polsce. Ze względu na ogólnokrajowy charakter programu, jego potencjalny wpływ oceniono w skali całego kraju. Skoncentrowanie programu na modernizacji energetycznej, gospodarce wodnej oraz zielonej infrastrukturze ma potencjał, by znacząco poprawić warunki życia osób starszych oraz przeciwdziałać negatywnym skutkom zmian klimatycznych. Kluczowe są inwestycje w energooszczędne budynki, miejskie projekty adaptacyjne oraz inicjatywy związane z gospodarką o obiegu zamkniętym. Program nadaje priorytet słabiej rozwiniętym regionom oraz obszarom miejskim, które są najbardziej dotknięte wyzwaniami związanymi ze starzeniem się społeczeństwa i zmianami klimatu. Program Feniks jest dobrze przygotowany do poprawy jakości życia starzejącego się społeczeństwa w Polsce, koncentrując się na kluczowych wyzwaniach infrastrukturalnych i środowiskowych. W szczególności istotne są działania skierowane na obszary zurbanizowane, co ma duże znaczenie, biorąc pod uwagę rosnącą liczbę osób starszych w miastach. Sukces tych inicjatyw zależy jednak od skutecznego wdrożenia oraz stałego monitorowania, by zapewnić ich inkluzywność i zrównoważony rozwój. Przyszłe badania powinny skupić się na długoterminowych efektach projektów oraz rozważyć dodatkowe środki wspierające osoby starsze w adaptacji do zmian klimatu.

SŁOWA KLUCZOWE: starzejące się społeczeństwo, zrównoważona infrastruktura, inkluzywne środowisko, adaptacja do zmian klimatu, fundusze UE

4.1. Introduction

In the past decade, the challenges associated with the global ageing trend have garnered significant attention from scholars, policymakers, governments, and civil society organisations. This demographic shift, characterised by declining fertility rates and increasing life expectancy, has led to a growing proportion of individuals aged 65 and older, surpassing the number of children under five years of age. The European demographic evolution, also evident in Poland, presents opportunities and challenges for social and economic structures. On a broader scale, while increasing longevity contributes positively to economic growth by potentially expanding the workforce with experienced individuals, it simultaneously exacerbates the strain on economic systems (Kryńska, Szukalski 2013). The higher proportion of elderly individuals means increased demand for health care, pension support, and social services. A proportional increase does not match this demand in the working-age population, threatening sustained economic growth with the dynamic growth of welfare public expenditure (Alina et al. 2013; Temsumrit 2023). The necessity for a more comprehensive approach aiming to create and manage inclusive, healthy environments tailored to the needs of the elderly is being strengthened by climate change challenges.

Climate change refers to the long-term shift in the average weather pattern that can define the Earth's local, regional, and global climates. Key indicators include

rising land and ocean temperatures, rising sea levels, and extreme weather events (Bryant et al. 2022). Climate change can potentially affect human health, disrupt the lives of individuals, and harm economic sectors. People aged 65 and over are particularly vulnerable to their effects. Their advancing age and the prevalence of special needs increase their vulnerability to climate stressors and threats. Older adults with chronic illnesses, functional impairments, or those receiving long-term services and support are at high risk for adverse health outcomes. They may experience disruptions to critical services during climate events and in the long term (Michalak et al. 2022). This requires a horizontal strategy for allocating public funds, including EU structural funds, to address the multifaceted impact of an ageing society on climate change challenges.

In the context of climate change and an ageing society, the issue of discrimination against older people is gaining specific importance, particularly regarding access to public infrastructure and the distribution of public expenditure. Age discrimination (ageism) refers to the unequal treatment of individuals based on age, resulting from stereotypical views and prejudices about their characteristics, skills, or competencies. Ageism can manifest as positive discrimination, which privileges a particular age group, or negative discrimination, which results in worse treatment (Szatur-Jaworska, Szukalski 2014). Among the various forms of harmful discrimination characterised by Szukalski (2015), invisibility, neglect, and, in some cases, segregation will be of primary importance when analysing the impact of public policies on older people. Consequently, older individuals either lack access to these services or face significant barriers. In extreme cases, this neglect can lead to segregation, social isolation, and a deterioration in the quality of life for older people.

Therefore, planning public programmes that are sensitive to ageism is essential. Global ageing and climate change intersection highlight the importance of developing infrastructures and environments responsive to these dual challenges. Projects funded by European structural funds play a crucial role in this context. By incorporating horizontal EU principles, they also serve as a tool for positive institutional discrimination that enhances the situation of specific social groups, including older people (Szukalski 2008). In Poland, the Fenix Programme can exemplify a proactive approach to addressing the issues of ageing and climate change. By focusing on energy modernisation, circular economy initiatives, access to clean water, and urban adaptation to climate threats, the programme may create environments promoting older populations' health, safety, and economic security.

This article aims to evaluate the potential impact of the Fenix Programme on the spatial determinants of older people's situation in Poland. The assessment considers the dynamics of the ageing process, which varies significantly in terms of space and time. Identifying these changes makes it possible to determine which regions in Poland are ageing the fastest, and which are characterised by the highest age index and, therefore, require a distinct approach in allocating funds

related to counteracting the adverse effects of climate change. The study focuses on two Programme priorities related to climate change: Priority 01 – Support for the energy and environmental sector from the Cohesion Fund, and Priority 02 – Support for the energy and environmental sector from the European Regional Development Fund (ERDF).

4.2. Statistics on ageing population

The literature defines the concept of the old society in various ways. According to the scale adopted by the UN, society is considered demographically old when the percentage of people 65 years and older is greater than 7%. However, the World Health Organization (WHO) uses a different threshold, considering 60 years as the defining age for older adults globally due to variations in life expectancy. (Łobodzińska 2016). Considering the article's aim of describing a European country experiencing a systematic increase in life expectancy, the study uses age 65 as the threshold for demographic old age.

The issue of an ageing society is reflected in statistical data showing a clear upward trend. Eurostat's "Ageing Europe" report provides empirical evidence that demonstrates a marked increase in the proportion of the population over 65 (Eurostat 2020). This demographic burden, measured by the ratio of dependents to the working-age population, has profoundly risen within the European Union from 2003 to 2022, as depicted in Figure 1. Such an increase is consequential, bearing significant implications for social security, health care provision, and the sustainability of public finances across the EU's Member States.

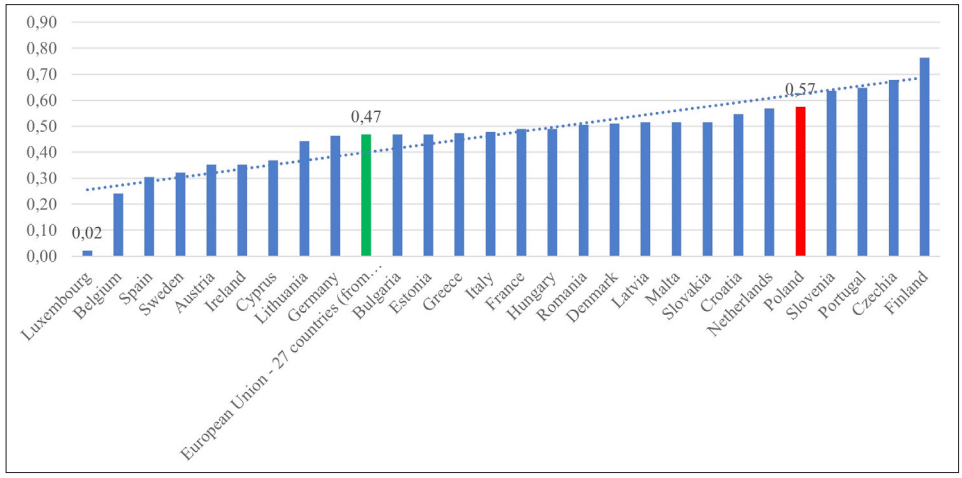

Figure 1. Average increase in demographic burden over the years 2003–2022

Source: Original analysis based on data from the Eurostat database.

The data reveals substantial disparities among EU countries. Finland's demographic burden has surged by 0.76, indicating a significant growth in the non-labour force segment. Conversely, Belgium reports a lower increment of 0.24, potentially reflecting more robust economic conditions or effective demographic management strategies. Poland's figures align with this varied landscape, registering an increase of 0.57, a noteworthy indicator of the challenges that an expanding dependent population poses. This trend in Poland, reflective of broader demographic shifts, strains the labour market and welfare systems, intensifying the old-age dependency ratio.

The trajectory of Poland's ageing population further manifests in the rise of the 65+ demographic from 12.8% in 2003 to 19.9% in 2023, as shown in Figure 2. This trend is set to continue, with projections suggesting that by 2050, the elderly will constitute 40% of Poland's total population (GUS 2021b).

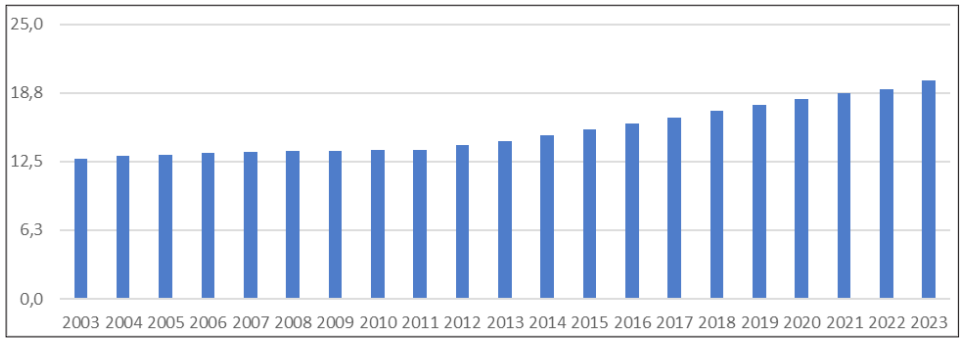

Figure 2. The proportion of the population aged 65 years and more in Poland
Source: Original analysis based on data from the Eurostat database.

According to forecasts routinely compiled by Eurostat, the ascending trend in the number of older individuals is expected to continue until 2060, as demonstrated by Figure 3. This pattern aligns with Eurostat forecast indicating that Poland's population is expected to experience a substantial increase in the old-age dependency ratio, with a shrinkage of the total population by 23% by the end of the century (Eurostat 2024). The implications for Poland are far-reaching, necessitating strategic planning to address the challenges of the ageing population. A 2022 study examining 131 municipalities within the Małopolska voivodeship found that 71% of the surveyed entities considered demographic changes as posing a significant challenge. As identified by this research, the primary concerns associated with the ageing population include insufficient financial resources, reduced municipal revenues, a deteriorating situation in the local labour market, decreased potential for family care, increased health care expenditures, and the need for enhanced social assistance services. Furthermore, the study highlighted

that the implications of an ageing demographic extend beyond financial aspects, necessitating a reevaluation and adjustment of the spectrum of local activities (Maj-Waśniowska, Jedynak 2020).

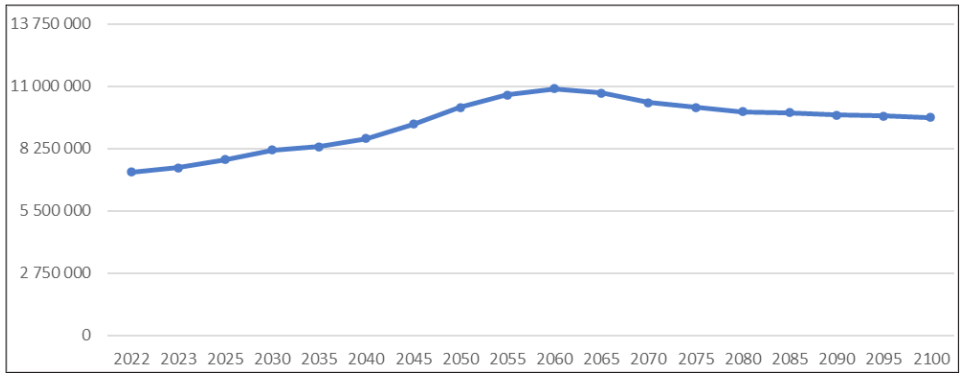

Figure 3. Forecast of the number of elderly people in Poland until 2100
Source: Original analysis based on data from the Eurostat database.

In concluding this data analysis, it is essential to address the issue of age discrimination across EU countries. Research in this area shows differences in the European societies' perceptions of ageism. According to a study based on the Special Eurobarometer 437, Poland has the lowest perceived discrimination against older people, while France was the most ageist country for people aged 55 and over. The Czech Republic ranked second highest in ageist position (Rychtaříková 2019). Different results were observed when examining experienced discrimination among Europeans aged 62 and over based on data from the European Social Survey 2008 (van den Heuvel, van Santvoort 2011). Excessive discrimination was experienced in the Czech Republic, Slovakia, Bulgaria, and Greece, but not in France or the United Kingdom. The lowest level of experienced age discrimination was observed in Sweden, Denmark, and Norway, while Poland had an average score. Nevertheless, in research related to professional performance, Poland and Denmark were identified as countries where older workers were more likely to be assessed as lacking motivation and new technological skills (Stypińska, Nikander 2018). European funding mechanisms represent a significant resource for addressing this enduring concern. They primarily focus on building effective mechanisms to counteract discrimination in European labour markets (Kryńska, Szukalski 2013). In the context of a changing climate, it is also vital that other EU programmes do not ignore the increasing number of older people and their needs.

4.3. The spatial aspect of Poland's ageing demographic

Poland's ageing population poses a complicated range of issues characterised by significant spatial and temporal variations. In the last two decades, the number of people over 65 years old has increased by 50%, adding approximately 2.5 million people to this group (Table 1). By contrast, the total population of Poland decreased by 3.69% in this period. This demographic shift has been most pronounced in the Pomorskie and Lubuskie voivodeships, while the Podlaskie voivodeship has experienced the slightest change.

Table 1. The dynamics of population growth 65+ in Poland in the years 2002–2022

Regions	Population aged 65 and over					Change (%) 2002 = 100
	2002	2007	2012	2017	2022	
Poland	4 887 675	5 131 376	5 487 713	6 520 247	7 353 455	50,45
Dolnoslaskie	377 747	389 493	414 053	513 657	588 315	55,74
Kujawsko-Pomorskie	245 707	258 800	283 088	344 397	392 631	59,80
Lubelskie	306 236	310 818	324 238	370 647	412 548	34,72
Lubuskie	113 859	119 025	129 968	164 764	192 552	69,11
Łódzkie	382 196	382 280	404 170	467 972	517 973	35,53
Małopolskie	415 433	440 368	473 819	548 055	612 428	47,42
Mazowieckie	730 294	754 029	797 222	925 286	1 034 365	41,64
Opolskie	132 886	146 092	149 300	174 652	190 622	43,45
Podkarpackie	260 911	273 090	290 315	338 262	381 967	46,40
Podlaskie	169 021	175 395	179 680	199 981	220 117	30,23
Pomorskie	247 173	268 989	296 336	368 212	426 265	72,46
Śląskie	576 811	644 358	691 124	816 757	897 806	55,65
Świętokrzyskie	186 887	189 392	198 742	229 634	256 634	37,32
Warmińsko-Mazurskie	157 573	167 819	179 247	219 259	256 855	63,01
Wielkopolskie	388 360	404 159	448 514	549 449	634 087	63,27
Zachodniopomorskie	196 581	207 269	227 897	289 263	338 290	72,09

Source: Original analysis based on data from the GUS database.

There has also been a significant increase in the share of older people (aged 65 years or more) in the total population of Poland. This trend also recognises considerable spatial diversity (Table 2).

Table 2. Changes in the share of people aged 65 or more in the total population (in %) during the period 2002–2022

Regions	Year					Change (%) 2002 = 100
	2002	2007	2012	2017	2022	
Poland	12,79	13,46	14,24	16,96	19,47	52,25
Dolnoslaskie	13,00	13,53	14,21	17,70	20,37	56,64
Kujawsko-Pomorskie	11,87	12,53	13,50	16,53	19,56	64,76
Lubelskie	13,94	14,35	14,97	17,43	20,38	46,18
Lubuskie	11,29	11,80	12,70	16,20	19,65	73,98
Łódzkie	14,66	14,96	16,01	18,90	21,78	48,57
Małopolskie	12,83	13,43	14,13	16,16	17,86	39,17
Mazowieckie	14,24	14,53	15,04	17,18	18,77	31,82
Opolskie	12,52	14,09	14,78	17,64	20,23	61,49
Podkarpackie	12,39	13,02	13,63	15,89	18,37	48,22
Podlaskie	14,00	14,71	14,99	16,88	19,25	37,56
Pomorskie	11,32	12,17	12,94	15,84	18,08	59,68
Śląskie	12,19	13,84	14,97	17,96	20,65	69,43
Świętokrzyskie	14,42	14,85	15,60	18,40	21,78	51,04
Warmińsko-Mazurskie	11,03	11,77	12,36	15,29	18,80	70,41
Wielkopolskie	11,57	11,93	12,95	15,75	18,15	56,81
Zachodniopomorskie	11,58	12,25	13,24	16,96	20,62	78,08

Source: Original analysis based on data from the GUS database.

The Zachodnioporskie voivodeship faces the most significant challenges related to the ageing society, where both a high pace of the population ageing process and over 20% share of older people in the total population are observed. The Lubuskie voivodeship experiences a similarly high dynamic, although the share of older people did not exceed 20% here. Also noteworthy are the Łódź and Świętokrzyskie voivodeships, which record the highest old age rate in 2022. Małopolska is in a relatively good situation, with the old age rate still below 18%, and the change dynamics there shows average values compared to other voivodeships.

The growing number and share of older people within the Polish society poses various economic challenges. The data presented in Figure 4. shows a substantial increase in the old-age dependency ratio, meaning post-working age population per 100 working-age population. All voivodeships have seen an acceleration of this process within the past two decades, which has not been balanced by the

proportional increase in the pre-working age population (Eurostat 2020). The Łódzkie, Świętokrzyskie, and Śląskie voivodships stand out in this regard, as they are currently recording the highest old-age dependency ratio – approximately 45 people in post-working age per 100 working age. Furthermore, taking into account the scale of the increase of this indicator over the last two decades, special attention should be paid to the Zachodnioporskie, Lubuskie, and Warmińsko-Mazurskie voivodeships, where the ratio of people of post-working age to people of working age has increased by more than 80%. In these regions, the challenges associated with the demographic burden and the pace of this change are currently most significant and require appropriate social and economic policies.

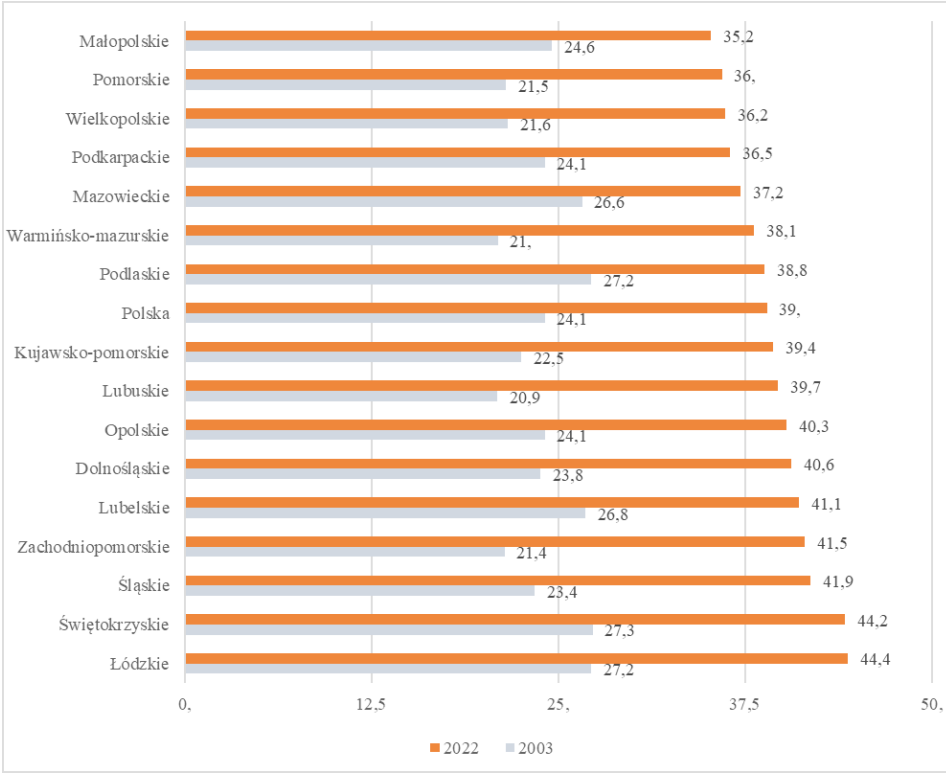

Figure 4. Changes in the old-dependency ratio in Poland

Source: Original elaboration based on data from the GUS database.

The spatial distribution of elderly individuals residing in urban and rural areas also holds significance within the context of climate change and the analysed Feniks Programme. Understanding where elderly populations are concentrated supports planning and implementing climate change adaptation and mitigation

measures. Urban areas, for instance, may require strategies different from those in rural areas, such as enhanced urban greening or cooling centres to reduce heat stress.

The data presented in Table 1 underscores the demographic shifts towards the ageing population in Poland, with significant variances between urban and rural distributions across regions.

Table 3. Population 65 and over will be living in urban and rural areas in 2022

Voivodeship	Population 65 and over living in urban areas		Population 65 and over living in rural areas	
	number	%	number	%
Śląskie	713,619	79	184,187	21
Zachodniopomorskie	251,632	74	86,658	26
Dolnośląskie	434,567	74	153,748	26
Pomorskie	307,039	72	119,226	28
Lubuskie	134,299	70	58,253	30
Mazowieckie	705,812	68	328,553	32
Łódzkie	348,622	67	169,351	33
Warmińsko-Mazurskie	168,905	66	87,950	34
Kujawsko-Pomorskie	257,795	66	134,836	34
Podlaskie	135,726	62	84,391	38
Wielkopolskie	388,503	61	245,584	39
Opolskie	111,614	59	79,008	41
Małopolskie	334,164	55	278,264	45
Świętokrzyskie	130,506	51	126,128	49
Lubelskie	208,294	50	204,254	50
Podkarpackie	178,649	47	203,318	53

Source: Original analysis based on data from the GUS database.

Urban areas experience more significant demographic ageing compared to rural areas. Śląskie and Mazowieckie stand out with the highest total elderly urban population, indicating a significant demand for age-related services and infrastructure. The ageing process is also noticeable in large cities that lost their voivodeship capital status after the 1999 administrative reform, but also in Łódź, Szczecin, Kielce, Katowice, and Opole, which currently hold this status (Majdzińska 2021). On the other hand, a significant portion of the senior population resides in rural areas in the Podkarpackie and Lubelskie regions. As

a result, these regions must implement various methods to combat the exclusion of the elderly from locations not close to systemic assistance.

While the socio-demographic aspects of the ageing population phenomenon are recognised and surveyed at the global, national, and regional levels, the spatial diversity of age discrimination does not receive equal research attention (Szukalski 2015). In Poland, there is some sporadic research at the local or regional level (e.g. the aspect of discrimination of older people was mentioned in a study on the situation of people over 45 in the Lublin region or a diagnosis of groups at risk of discrimination carried out for the city of Bydgoszcz). However, the issue is examined mainly as a general, often national, challenge. According to the results of the 2015 and 2018 nationwide Social Cohesion Survey, both the percentage of people who expressed the opinion that people over 65 years old are a discriminated group in Poland (definitely yes or probably yes) as well as the percentage of people who have directly come into contact or witnessed discrimination in Poland against people aged 65 are decreasing (GUS 2021a).

4.4. The European Funds for Infrastructure, Climate, Environment 2021–2027 Programme

Poland's economic landscape has been significantly shaped by its integration of EU funds. Approximately 8.4% of average annual GDP growth in the period 2004–2020 was the result of projects co-financed by EU funds (Kalinowski et al. 2019; MFiPR 2022). This capital infusion has been pivotal in fostering economic expansion and infrastructural development.

During the 2021–2027 EU financing period, Poland has implemented nine national and sixteen regional programmes jointly funded by European allocations. These initiatives cover a variety of sectors, including innovation-led economic strategies, human capital enhancement, regional development (particularly in the underdeveloped eastern regions), digitalisation, food aid for impoverished populations, and fisheries and marine policy. The most substantial budgetary allocation has been designated to the European Funds for Infrastructure, Climate, Environment Programme with a commitment of 113.4 billion PLN. The Feniks Programme's strategic objectives are multifaceted, aiming to strengthen Poland's energy autonomy, advance the utilisation of renewable energy resources, reinforce environmental protection, ensure the provision of sustainable transport, improve health care facilities, and preserve and promote the nation's cultural heritage.

Contrary to the extensive discussion about the accessibility and impact of health, culture, and heritage projects on marginalised groups, projects focused on energy security and climate change infrastructure adaptation have been comparatively under-explored. This discrepancy is attributed to the absence of direct end-users in such investment projects. However, the Feniks Programme is

expected to benefit individuals who will ultimately use energy-efficient buildings, climate-resilient urban infrastructure, and advancements from circular economy practices. Considering the escalation in the elderly population, this demographic is assumed to represent a considerable portion of the Feniks Programme's end-users.

Moreover, the Feniks Programme mandates the creation of equitable conditions, expressly prohibiting discrimination based on age, gender, disability, sexual orientation, identity, race, ethnicity, religion, or belief. National and EU directives reinforce this mandate, compelling all participating institutions, applicants, and beneficiaries to uphold equal opportunity and anti-discrimination principles.

Elderly people are among the groups most vulnerable to climate change, at risk of energy poverty, and displaying little flexibility in adapting to changes. Therefore, the analysis presented in this article delves into the potential impact of the Feniks Programme on the senior population, focusing on areas such as energy, climate adaptation, water stewardship, circular economy practices, and the environment. These topics are associated with the Feniks Programme's Priorities I and II.

4.5. Analysis of the Feniks Programme's potential effects on senior citizens

Impact in the area of energy

The Feniks Programme funds various areas, focusing on the energy sector. The Programme emphasises the transition to green energy and improving energy utilisation efficiency. It addresses the issue of energy poverty in the context of ecological transition, which involves the ability to obtain and use green energy.

In Poland, the challenge of energy accessibility impacts approximately 10.8% of the population (Gov.pl 2023). Due to financial difficulties, these individuals struggle to meet all their basic needs and often face tough choices between purchasing medication or food and paying electricity and heating bills. This issue is especially challenging for older individuals (Mashhoodi 2021).

The budget structure of senior households comprises a relatively large proportion of expenditures that cannot be reduced, or reduction may have adverse effects on the quality of life or health risks (Bakalarczyk 2021). These expenses primarily include health care costs, heating/cooling a residence, access to hot water and clean air, and the renovation and modernisation of the energy system.

The energy poverty experienced by elderly individuals is often closely linked to extreme economic hardship. The Institute of Labour and Social Affairs stated that the subsistence minimum in 2021 was a monthly income per person of 692 PLN, and for pensioners, it was 637 PLN (Kurowski 2021). In 2021, 1.6 million people in Poland lived below this limit, including 246,000 seniors. According to the

Central Statistical Office report, the risk of extreme poverty among people aged 65 and over has fallen to 3% compared to 4.4% in 2020. However, this decline may not indicate a permanent trend, as forecasts show that the share of older people in the population of the less privileged is growing (GUS 2022c).

Projects funded by the Feniks Programme will impact the housing conditions of Poland's residents, including the elderly. People at risk of poverty in this regard exhibit at least ten out of thirty poor living conditions, such as inadequate housing quality, the lack of durable goods, and the inability to meet various material and non-material needs due to financial constraints. In 2018, nearly 5% of people aged 65 and over experienced poverty or poor living conditions. The problem was much more prevalent among older people living alone (around 8% compared to around 3% in multi-person households). Additionally, approximately 8% of older people lived without a bathroom, toilet, or running water (CSO 2021a). Figure 5 shows the distribution of the various determinants of poor housing conditions for older people compared to the general population (GUS 2021a).

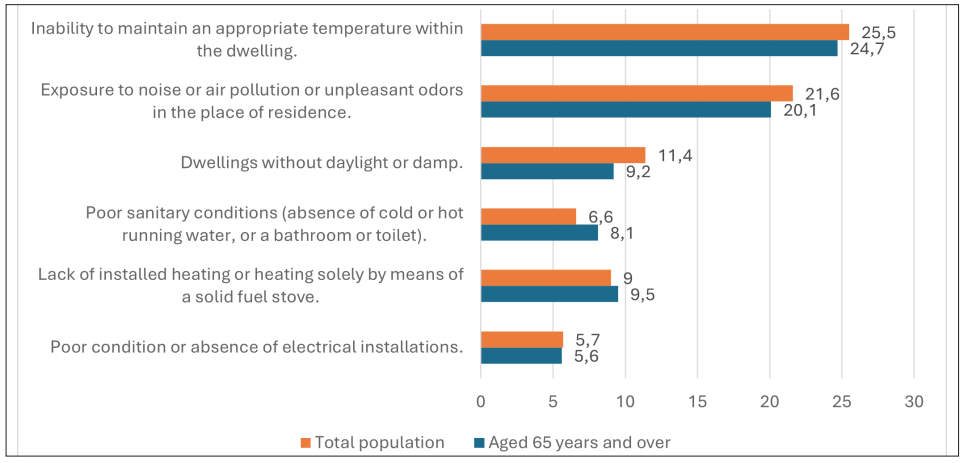

Figure 5. The percentage of people experiencing housing poverty in 2018

Source: Original analysis based on data from the Central Statistical Office in Poland.

The Feniks Programme aims to enhance the energy efficiency of multi-family residential buildings, contributing to their residents' living conditions. Upgrading heating systems will help maintain optimal indoor temperatures and reduce energy costs. As a result, this can positively impact the health and financial well-being of elderly residents. However, this outcome may not apply to the majority of Polish seniors. According to the Polsenior study, 82% of the elderly in Poland reside in single-family homes, and only 15% in apartment buildings. Moreover, the majority do not wish to relocate from their current dwellings despite the high living costs and various inconveniences (Błędowski et al. 2021).

In addition, more than a quarter (28%) of older Polish adults live alone, and it is precisely such people who are most vulnerable to various dimensions of poverty, including energy poverty. Therefore, a more significant influence on improving seniors' situation could come from the "Clean Air" campaign, co-financed by the Feniks Programme, which focuses on modernising energy systems in single-family houses. The campaign subsidises individuals with incomes below specific, annually-established thresholds. However, even a slight exceedance of the income threshold disqualifies them from support (Kaliszewska 2022). The exclusion effect could also be related to any obligatory financial contribution required from elderly campaign beneficiaries. According to the latest report by the Social Insurance Institution (March 2022), the most significant percentage of pensions (16.6%) fell within the range of 2000.01 to 2400.00 PLN gross. As many as 314.9 thousand individuals received pensions lower than the guaranteed minimum, and 18.8 thousand received benefits below 400 PLN per month (ZUS 2023).

The Feniks Programme is expected to positively impact individuals at risk of age discrimination through projects related to the energy modernisation of public utility buildings, particularly hospitals and clinics, which are widely used by the elderly. In 2020, an analysis of outpatient advice in Poland showed that individuals aged 65 and over received 17.6% more consultations than their share of the population for primary health care. For specialised advice, this difference was 10.9% (GUS 2020). The modernisation of long-term care facilities could also benefit older patients. In 2020, individuals aged 65 and over made up 77.9% of all recipients of this type of care (GUS 2020). Financial support from the Feniks Programme is anticipated to enhance the functional quality of facilities, thus elevating the inhabitants' comfort levels. Reducing operational costs for buildings will undoubtedly enhance the financial efficiency of health centres, potentially improving the quality and variety of the provided health services.

The Feniks funding is also available for medium and large enterprises to improve energy efficiency in their facilities. This will positively impact the working conditions provided by these companies. Adequately heated or cooled workplaces and reduced exposure to polluted air are particularly important for older employees, whose health needs related to the natural ageing process are more significant. In 2020, individuals over 50 constituted nearly 30% of the entire workforce in Poland, among which 16.8% belonged to the group with established rights to pension or disability benefits (PARP 2021). The demographic burden and the active ageing concept will probably increase the number of older people in the labour market, making it necessary to create work environments that are friendly to this age group (Kryńska, Szukalski 2013).

Similarly, the positive impact of the Feniks Programme on groups at risk of age discrimination can be expected from projects related to renewable energy and high-efficiency congregation technologies. Energy generated from solar,

wind, hydro, marine, and geothermal power or even biomass does not pollute the environment like electricity generated from fossil fuels. As a result, it does not cause smog, which is a significant threat to the health of the elderly. The World Health Organization stresses that smog increases the risk of cancer. In addition, PM2.5 penetrates the circulatory system, leading to heart disease, especially in individuals aged 65 and older. Seniors living in areas with polluted air might experience accelerated ageing of the nervous system, increasing the risk of developing Alzheimer's or Parkinson's disease. Global studies have also indicated a strong correlation between two major ambient air pollutants – namely PM2.5 and ozone – and increased mortality in senior populations aged 65 and above (Shin et al. 2021).

In conclusion, it is essential to highlight that educational campaigns on energy transformation will hold particular significance for the elderly. It will be crucial to demonstrate the benefits of implemented energy innovations and provide preventive education against the problem of unfair market practices, which often victimise the elderly in this area. According to the findings of the Supreme Audit Office's 2018 audit, most complaints received by the consumer supervisory body and the Consumer Federation involved the application of unfair market practices by energy companies, especially in the context of contract signings outside of company premises. The most frequent victims of such dishonest activities were the elderly, aged 65 and over, who trusted the salesperson and signed electric energy sales contracts without any prior review. Despite contracting under a mistake, they did not undertake actions to rescind the agreement. This resulted from the expiry of the statutory fourteen-day period for effective and cost-free cancellation of contracts signed off-premises and the obligation to pay a one-time penalty ranging from 600 to 2,000 PLN. The elderly also refrained from pursuing their cases in court due to the lengthy process and associated stress. Consequently, dishonest entrepreneurs felt impunity and generated revenue from selling electric energy at higher prices or from unjustifiably high penalties for early termination of temporary electric energy sales contracts (NIK 2018).

Impact in the area of climate change and natural disasters area

Among the numerous consequences of climate change, the most perilous for the elderly health is elevated temperatures and resulting heatwaves, along with extreme weather events (Michalak et al. 2022). Heatwaves pose a particular danger to the elderly, as they often suffer from comorbidities and take multiple medications, diminishing the body's capacity for thermoregulation and increasing vulnerability to thermal stress. Moreover, many older individuals experience appetite disorders, resulting in insufficient fluid intake and consequently leading to dehydration. The occurrence of heat waves results in an increased mortality rate

among the elderly population. Women over the age of 75 and individuals with cardiovascular diseases are at the highest risk (Michalak et al. 2022).

One of the primary objectives of the Feniks Programme is to modify urban areas to address climate change and counter the urban heat island (UHI) effect, which poses a threat to the well-being of elderly residents. This phenomenon involves a significant increase in urban temperatures compared to surrounding suburban areas and intensifies the experience of thermal stress. Research conducted by the Polish Academy of Sciences indicates that the UHI effect has a significant impact on increasing the frequency of heatstroke cases and exacerbates chronic respiratory and circulatory diseases. This effect mainly affects the elderly, individuals with disabilities, and socially-excluded persons (Coates et al. 2014). Moreover, due to often encountered financial constraints and limited mobility, many older individuals cannot leave cities during hot periods for cooler rural areas, thus remaining exposed to exceptionally high temperatures (Gosik 2015). Especially hazardous for them are poorly designed urban settlements with a minimal amount of urban greenery, which protects against high temperatures (Błażejczyk 2014).

Considering those facts, it is essential to emphasise the positive impact of the Feniks projects related to blue and green infrastructure (BGI) on the situation of the elderly. BGI is critical in adapting cities to climate change and combating the UHI effect. They represent a strategic integration of natural and semi-natural environments within urban settings to enhance ecosystem services and improve resilience against climate change's negative impacts. BGI not only contributes to mitigating climate change effects but also significantly enhances the living conditions of the elderly. Such environments offer recreational opportunities and health benefits, contributing to older residents' physical and mental well-being. The significance of these investments is supported by the rate of the ageing process in urban areas, which has accelerated more rapidly than in rural areas. Since 1995, the ageing index in cities has surpassed that of rural areas, with figures in 2008 being 98.6 and 75.4, respectively (Kurek 2011). Therefore, it is also imperative to ensure the accessibility of new green and blue spaces. Eliminating architectural barriers and adopting universal design principles are essential steps to ensure that everyone, including those with limited mobility or health issues, can enjoy the benefits of updated urban areas (Kreutz 2024).

Projects aiming to mitigate the adverse effects of natural disasters are also crucial from the perspective of climate change and elderly individuals. Seniors are especially vulnerable to severe weather events such as floods, hurricanes, and violent storms. Many of them are unable to ensure their safety independently, including making evacuation decisions, securing their home or apartment, or fleeing from danger. Moreover, older individuals use modern devices or media less frequently than younger people do; therefore, communications about the risk of extreme events distributed by the Governmental Security Centre may also be

inaccessible to them (Błażejczyk 2014). Projects that improve rescue or crisis management systems will, therefore, be highly important.

Among elderly individuals, there is also a higher incidence of psychological trauma following experiences such as hurricanes, floods, or severe storms. Additionally, in areas affected by flooding, beyond the direct risks of drowning and injury, there always exists a health and epidemiological threat, which, due to the diminished immune response, poses a particular danger to the elderly. Another issue for this group, induced by flooding, is the risk of lacking access to medical assistance. The extent of this threat is illustrated by the example of the United States, where, during Hurricane Katrina, over 200,000 elderly individuals with chronic diseases were displaced or isolated due to flooding and were unable to access medical care or receive their prescribed medications (Bryant et al. 2022). Another hazard is drought, which is associated with the risk of a drinking water shortage, posing a significant danger to the metabolism of the elderly (Michalak et al. 2022). Hence, projects focused on preventing natural disasters or developing safety systems tailored to various social groups will significantly enhance the well-being of older individuals.

Impact in the area of water management systems

The Feniks Programme also subsidises projects related to modernising water and sewage systems as well as drinking water delivery systems. Access to high-quality drinking water and sanitation infrastructure defines a fundamental standard of living and directly impacts human health. This relationship is particularly significant in the case of older people. Due to certain diseases and the intake of specific medications, older adults are more susceptible to dehydration. Therefore, regular hydration determines their health, and disconnection from a drinking water source can pose a severe threat. The quality of water is also crucial. Contaminated water can lead to gastrointestinal problems and, in the long term, affect the development of many diseases (e.g. parasitic diseases) (Weis, Menne 2015).

Direct access to the water supply network and contemporary sewage treatment facilities that meet current regulations is essential for providing high-quality water. In Poland, the population utilising sewage treatment facilities has been increasing gradually – from 53% in 2000 to 75% in 2021. Between 2000 and 2021, the share of cities served by sewage treatment plants increased from 91% in 2000 to 99.8% in 2021. The number of rural municipalities served by wastewater treatment plants has also increased yearly – in 2021, it was 1,978, i.e. five more than in 2020 (GUS 2022a). Further interventions, including projects funded by the Feniks Programme, aimed at increasing access to high-quality water and modern wastewater treatment plants, will positively impact older people's quality of life and health needs.

Impact in the area of circular economy

The impact on elderly groups may also occur in relation to the Feniks Programme's circular economy projects. This includes, for example, the construction, expansion, or modernisation of local infrastructure for selective waste collection. The new publicly accessible infrastructure, along with associated products and services, should comply with the accessibility principles defined in the European Accessibility Act (Directive on the Accessibility Requirements for Products and Services Text with EEA Relevance 2019). Adapting the new infrastructure to the needs of people with varying degrees of mobility and capability ensures that older individuals can actively participate in activities such as proper waste segregation. This is particularly important because a 2023 survey by Kantar Public on behalf of the ProKarton Foundation found that elderly people give waste segregation higher priority compared to younger people.

The Feniks Programme also funds projects to support food banks and food-sharing organisations. Although the primary goal of such projects is to minimise food waste, as a consequence, food-sharing solutions will aid individuals who are unable to meet their basic needs independently. As mentioned, due to limited income and numerous fixed expenses, older adults often must restrict their fundamental needs, including food-related ones. This is demonstrated in the latest Poverty Report developed by the Spring Association, which describes the stories of Polish seniors living in deplorable conditions, with budgets allowing only for one meal per day (the extreme poverty threshold for a retiree is 22 PLN per day) (Sadzik et al. 2023). Additionally, according to BIG InfoMonitor, only two age groups – namely individuals aged 45–54 and retirees – experienced increased arrears and the number of debtors from March 2020 to June 2023. Despite the indexation of pensions and disability benefits in 2022 and 2023 being among the highest in recent years, it was not enough to offset the significant price increases for retirees. According to the Central Statistical Office, the prices of food and non-alcoholic beverages in July 2022, compared to the same month in 2021, increased by 15.3%. Additionally, the costs of maintaining a home or apartment also rose, with fuel increasing by 131.2% and gas by 44.9% (GUS 2022b). Consequently, 80% of study participants aged 65 and older acknowledged that "they manage their food to not waste even a single zloty". However, even drastic food savings are often insufficient, making older individuals the primary beneficiaries of food bank assistance (BIGInfomonitor 2022).

Impact in the area of environmental protection

Environmental preservation and the development of green infrastructure are the final areas of impact examined in the Feniks Programme in relation to the challenges faced by the elderly. The World Health Organization reported that

various forms of ecosystem degradation leading to biodiversity loss severely threaten human health. Food security and nutrition, access to energy sources, pharmacology development, and freshwater quality and availability are at risk. Pollution of air, water, or soil accumulates in the human body and deteriorates its condition over the years. The effects of these processes are most severe for chronically ill individuals, worsening the condition of various organs and systems. Pregnant women, children, and elderly individuals are particularly vulnerable (WHO 2015).

Considering these threats, projects aimed at increasing biodiversity will positively impact the living conditions of people of all ages, including the growing population of the elderly (Małuszyńska et al. 2018). The initiatives financed by the Feniks Programme comprise the minor green and blue infrastructure; the maintenance and development of tourist trails and educational paths, observation towers, boardwalks, anti-erosion fences; as well as the construction, expansion, or modernisation of the educational base of national parks. The accessibility of these investments will affect the inclusion of people of different ages and levels of mobility and physical ability. The minimum requirements in this regard are defined in the European Accessibility Act. Implementing these standards is not only a necessity to fulfil legal obligations but also a response to the needs of older individuals who highly value spending time outdoors as a form of leisure.

Nature walks are one of the most popular recreational activities among Polish seniors. According to studies by the Central Statistical Office in 2018, approximately 57% of older adults went for walks or rested outdoors at least once a week or more frequently, and nearly 11% of individuals did so twice or three times a month (GUS 2021a). Enabling elderly individuals to visit national parks and other natural sites will also positively impact their health. Spending time in nature improves the mental health of the elderly, lowering the risk of stress and increasing life satisfaction. The research showed that lower stress and higher satisfaction are more closely related to being in natural environments such as forests, lakes, seas, and urban green spaces rather than to physical activity or being around other people. Other places such as homes, gardens, balconies, or local streets did not have the same effect (Wyles et al. 2017). Additionally, studies have also found that older adults in Poland often consider time spent in nature to be one of the best parts of their day (Jarosz 2023). Hence, informational and promotional activities that encourage seniors to use trails and educational attractions in urban and national parks are of paramount importance.

Compared to their rural counterparts, urban elderly residents have substantially fewer opportunities for regular contact with nature. Studies conducted in the United Kingdom demonstrate that the ability to take a walk in a park or even a smaller green square positively influences people's quality of life and health (Wyles et al. 2017). Therefore, initiatives related to the "de-concretisation" of

cities and the restoration of biodiversity are of immense importance in improving the situation of older adults. This is especially relevant considering that in Poland, over 66% of individuals aged 65 and older reside in urbanised areas.

4.6. The spatial distribution of the Feniks Programme's funds

The Feniks Programme is implemented at the national level, which involves making crucial investments to achieve strategic objectives at both the national and supra-regional levels. Territorial strategies and mechanisms complement the primary scope of the Programme's intervention. They will be applied where the nature of the investment and the existence of appropriate implementation instruments justify their use. The Programme's Priority I and II have been allotted a budget of 11 865 917 064 EUR (including EU contributions and national funds). Priority I funding distribution does not anticipate any territorial targeting. As such, evaluating the geographical allocation of funding will not be feasible until all calls for proposals have concluded. The exception is Action 01.02, dedicated to mitigating the effects of climate change. Under this Priority I Action, funding will be possible only for projects submitted by 44 cities – including the capital city of Warsaw – that took part in the national programme titled "The Development of Urban Adaptation Plans for cities with more than 100,000 inhabitants." The total allocation for this Action is 560 061 637 EUR (MFiPR 2023).

In Priority II, a broader diversity of beneficiaries is envisaged. In addition to public administration, entrepreneurs and non-governmental organisations are eligible to participate in the Programme. Moreover, the project selection criteria will consider the promotion of cost-effectiveness, PM emission reduction, the most polluted areas, the reduction of greenhouse gases, and the promotion of projects with the greatest contribution to combating energy poverty. For Priority II, it is also anticipated that expenditures will be settled according to a pro-rata mechanism, based on the following methodology:

- more developed region (Warsaw metropolitan area): 1/17 (one region out of seventeen regions of Poland), i.e. 5.88% of allocation;
- transition regions (the Wielkopolskie and Dolnośląskie voivodeships): 2/17 (two regions out of seventeen regions of Poland), 11.76% of allocation;
- less developed regions (the Mazowiecki regional district and the remaining 13 voivodeships): 14/17 (fourteen regions out of seventeen regions of Poland), 82.35% of the allocation.

The spatial allocations for the different areas of intervention funded under Priority II are shown in Table 4.

Table 4. The Feniks Programme's Priority II budget allocation

Area of intervention in Priority II of the Feniks Programme	The Feniks Programme's budget allocation (Euro)		
	Less developed regions	Regions in transition	Better developed regions
Energy (including the development of energy efficiency, the reduction of greenhouse gas emissions, renewable energy)	2 917 764 705,00	416 823 530,00	208 411 765,00
Climate change adaptation and disaster risk prevention and resilience	1 158 246 264,00	165 463 752,00	82 731 876,00
Access to water and sustainable water management	148 235 294,00	21 176 471,00	10 588 235,00

Source: Original analysis based on data from the Feniks Programme's document (Program FEnIKS_21-27, 2023).

Under the "Climate change adaptation and disaster risk prevention and resilience" area, support will be provided for projects implemented in medium-sized towns, i.e. those with populations over 20,000, and in towns with populations between 15,000 and 20,000, which are county capitals. Medium-sized cities will exclude cities losing socioeconomic functions, located in the eastern provinces – financed under the European Funds for Eastern Poland Programme 2021–2027 (Program FEnIKS_21-27 2023). Additionally, funds for urban areas will be available for 44 cities that participated in the project "Developing adaptation plans to climate change in cities with more than 100,000 inhabitants", as well as the city of Warsaw.

At this stage of the Feniks Programme's implementation, it is challenging to assess the spatial distribution of the funds. However, the focus on underdeveloped regions and cities with well-thought-out plans to address climate change suggests that the funds will be allocated to the areas that need them the most, including regions experiencing significant demographic pressures.

4.7. Conclusions

The demographic shift towards the ageing population in Poland presents formidable challenges, necessitating a comprehensive and coordinated approach at the regional level. The spatial distribution of the ageing population is a critical factor in devising effective climate change adaptation and mitigation strategies. A holistic methodology that considers the varied needs of the elderly in both urban

and rural settings is imperative. The European Funds for Infrastructure, Climate, Environment Programme emerges as a potentially effective tool in this context, specifically designed to address these complexities.

This article's objective was to evaluate the potential impact of the Fenix Programme on the spatial determinants of older people's situation in Poland. The conducted analyses prove that the Feniks Programme holds the potential to enhance the quality of life for the ageing population through investments in sustainable infrastructure. The Programme's funds are distributed centrally and allocated based on predetermined selection criteria, which partially stem from notable regional determinants. At this stage of the Programme's implementation, we can assume that its spatial impact on the elderly's situation will mainly be national. Additionally, the Programme will emphasise less developed and urbanised regions, as specified in the Programme's parts related to urban adaptation to climate change.

Priority II is structured to allocate a significant portion (up to 82%) of resources to the least developed regions, including those voivodeships with the highest ageing indexes. This strategic focus on the most vulnerable regions is essential for fostering inclusive and sustainable development in the face of demographic changes. The Programme does not specify the criteria for rewarding regions with the highest ageing rates. Therefore, it will be up to the authorities and other eligible entities in the Pomorskie, Lubuskie, Zachodnioporskie, as well as Łódzkie and Świętokrzyskie voivodeships (which have the largest share of people over 65 in the total population) to determine their success in applying for funding from the Feniks Programme. Each voivodeship has the chance to positively impact the situation of their elderly citizens within the following Programme areas:

- addressing energy poverty by modernising energy systems in multi-family residential and single-family homes – the Programme's efforts, including the "Clean Air" campaign, aim to reduce energy costs and improve living conditions, thus offering substantial support to seniors living below the poverty line or in homes lacking basic amenities;
- investing in energy efficiency enhancements in hospitals, clinics, and enterprises – these initiatives may contribute to a better quality of health services and create healthier working environments for older employees;
- investing in modernising water and sewage systems and drinking water delivery systems, as these are crucial components of the quality of life and health of the elderly population;
- integrating circular economy solutions, particularly in waste management, which significantly benefits elderly individuals by enhancing accessibility and inclusion – adapting new infrastructure, such as selective waste collection points, ensures that older individuals can actively participate in environmental sustainability practices, such as waste segregation;

- supporting food banks and food-sharing organisations as a direct and positive impact on elderly individuals facing or at the risk of poverty – by addressing the dual challenges of food waste and food insecurity, these initiatives provide crucial assistance to seniors struggling with limited income and rising living costs;
- focusing on environmental preservation and biodiversity as well as renovating natural areas for better accessibility – these initiatives are especially advantageous for vulnerable groups, such as the elderly, who are more severely affected by environmental pollution due to reduced bodily functions and chronic illnesses; enhancing the accessibility of natural spaces through the Feniks Programme is essential for promoting inclusivity and supporting the mental health of older adults; initiatives that improve the architectural accessibility of national parks and other natural areas enable elderly individuals, especially those with limited mobility, to engage in outdoor recreational activities, which are linked to reduced stress and increased life satisfaction.

Funding from the Feniks Programme is also designated for cities with populations of over 20,000. The goal is to help these cities adapt to climate change. These projects are crucial due to the growing number of elderly individuals in urban areas. Eliminating the UHI effect and increasing green spaces in cities can significantly improve the quality of life for older residents. Investments in BGI offer a great chance to offset these effects by making metropolitan areas more ageing-friendly and climate-change-resilient. However, it is essential to ensure that new infrastructure is easily accessible, as research indicates that this is a critical factor for older individuals to utilise these areas (Pielesiak 2017).

Integrating ageing as a cross-cutting issue in public finance cannot be overstated. Moreover, the consistent increase in the share of post-working-age people in Poland's regions highlights the need for comprehensive planning and policy development to address the challenges of the ageing population. This demographic shift also underscores the importance of integrating ageing population dynamics with broader societal issues, including climate change resilience and sustainability. In essence, successfully integrating ageing society considerations into the European Funds for Infrastructure, Climate, Environment Programme can help Poland manage the economic implications of the ageing population and foster an environment that supports healthy and active ageing.

Realising the identified Feniks Programme's potential depends on the funding allocation to projects. Future studies are encouraged to explore the longitudinal effects of the Feniks Programme's projects on elderly people's well-being, with a particular emphasis on fostering sustainable and inclusive investments and environments. Future research should aim to uncover the successes and

shortcomings of the Feniks Programme's final results and identify gaps in meeting the needs of the elderly. It should also propose improvements in policy-planning to enhance the elderly population's resilience to climate change and ecological shifts. This requires an approach that goes beyond the current practices of those responsible for implementing Structural Funds. Specifically, in the case of infrastructure-related programmes, it is essential to analyse their spatial final impact on different social groups in detail.

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