Dorota **MURZYN**

CLIMATE CHANGE ADAPTATION AND INNOVATION – TOGETHER OR APART? THE EXAMPLE OF THE EUROPEAN UNION COHESION POLICY IN POLAND

Dorota MURZYN (ORCID: 0000-0003-2032-8401) – University of the National Education Commission, Krakow

Correspondence address:
Podchorążych Street 2, 30-084 Kraków, Poland
e-mail: dorota.murzyn@uken.krakow.pl

ABSTRACT: This article is an attempt to contribute to the discussion on the potential of (transformative) innovation for the design and implementation of climate change adaptation solutions and strategies. The aim of this study is to examine how climate change adaptation issues are addressed in the strategic documents of Poland and its regions, and whether and to what extent cohesion policy funds promote the use of innovation in climate change adaptation activities. The author reviews the most important strategic documents at the national and regional level and analyses cohesion policy expenditure (implemented in 2014-2020 and planned for 2021-2027). Based on the analyses carried out, the author concludes that although the level of integration of climate change adaptation issues into development strategies in Poland and its regions is increasing, the innovative potential is hardly being used in this regard, and the concrete actions under the cohesion policy in the areas of climate change adaptation and innovation take separate directions and are only to a limited extent linked.

KEYWORDS: climate change adaptation, innovation policy, EU cohesion policy

Introduction

Adaptation to climate change, alongside mitigation, is becoming an increasingly urgent priority for the EU and Member States. Given this urgency and the systemic nature of climate resilience, new ways to support adaptation are being considered. One of these is to use the potential of innovation to design and implement climate change adaptation strategies and solutions. In particular, the potential for transformative innovation in this area has been recognised (European Commission, 2024). European efforts towards climate change adaptation strategies and initiatives in Member States are supported by a wide range of EU-level regulations and funding sources. Given that both climate change and innovation are high priorities on the EU's agenda, and that the Union's most important investment policy is cohesion policy, it is worth looking at whether, and to what extent, the actions taken under this policy link these two elements. Poland was taken as an example because it is by far the largest beneficiary of cohesion policy funding among member states and the vast majority of the country's climate change adaptation funding comes from EU sources.

The aim of this paper is to examine – in the context of EU experience – how climate change adaptation issues are addressed in the strategic documents of Poland and its regions, and whether and to what extent cohesion policy funds in Poland promote the use of innovation in climate change adaptation activities. The following main hypothesis was therefore formulated: in Poland and its regions, the level of integration of climate change adaptation issues into development strategies is increasing, but the innovative potential is hardly being used for climate change adaptation activities. A subsidiary hypothesis was also formulated: EU cohesion policy actions in the areas of climate change adaptation and innovation take separate directions and are only to a limited extent linked.

The verification of the hypotheses was carried out using the method of document analysis (development strategies of Poland and individual voivodeships, cohesion policy programme documents) – in order to identify the directions of activities in the area of climate change adaptation and innovation; and on the basis of the analysis of data on the value of projects implemented under cohesion policy in the financial perspective 2014-2020 in the area of climate change adaptation, as well as planned for 2021-2027.

Literature review: innovation for climate change adaptation

Adaptation to climate change is one of the two (along with mitigation) main strategies for responding to the problem of human-induced climate change. While mitigation most often involves actions to reduce or prevent greenhouse gas emissions from human activities, adaptation is understood as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC, 2007). Adaptation involves, therefore, actions to reduce vulnerability, increase adaptive capacity, and respond to emerging opportunities.

The growing global attention to the need to intensify adaptation efforts goes together with the growing involvement of international organisations in this issue. In the Bali Action Plan, adopted at the 13th COP, under the auspices of the United Nations Framework Convention on Climate Change, adaptation was identified as one of the four pillars of climate action, along with mitigation, technology and finance (UNFCCC, 2007). The Intergovernmental Panel on Climate Change also acknowledged that addressing adaptation challenges is crucial for sustainable development and that it depends on policies and cooperation at all levels, including national and regional levels (IPCC, 2007). In recent decades, a number of other international organisations with mandates in different areas, such as the OECD (2006) and the World Bank (2019), have responded to the challenge of climate change adaptation. Intensive action on climate change adaptation is also being taken by the European Union. The European Commission adopted a new EU climate change adaptation strategy in 2021 (European Commission, 2021), and the European Environment Agency has a major role in assisting Member States with its implementation.

Climate change adaptation strategies encompass a range of measures aimed at addressing the impacts of climate change and enhancing resilience. Mainstreaming climate change adaptation into development planning has been promoted as an effective way of responding to climate change. Policy goals derived from long-term visions and national development strategies are translated into action

DOI: 10.34659/eis.2025.92.1.841

plans and budgets (Lebel et al., 2012). Given the importance of the issue and the increasing urgency, new ways of promoting adaptation are being considered. One is to use the potential of innovation to design and implement climate change adaptation strategies and solutions.

There has been a shift in innovation policy thinking for some time now, due to the limited effectiveness of traditional approaches in addressing societal challenges, including those related to climate change. One solution is a mission-oriented innovation policy, as it can have an important role to play in delivering better quality growth while tackling grand challenges (Mazzucato, 2018; Boon & Edler, 2018). It aims to guide far-reaching transition processes towards sustainability by encouraging innovation to accomplish specific missions, whether societal or industrial (Hekkert et al., 2020). In such an approach, the mission is usually a grand challenge, also of a social nature – and climate change meets such criteria. The mission-oriented innovation policy represents a shift towards addressing societal challenges through innovation, emphasising dynamic capabilities, clear societal goals, and coordinated public investments. Recent literature emphasises the importance of public participation in the socioeconomic transformations required for attaining missions (Wiarda et al., 2023) and cooperation between various stakeholders (Wanzenböck et al., 2020).

Together with the search for answers on how to use science and technology to address societal needs and sustainable and inclusive societies at a more fundamental level than the previous framework, yet another approach emerged – transformative change and transformative innovation policy (Schot & Steinmueller, 2018; Haddad et al., 2022). Transformative innovation policy encompasses a variety of policy frameworks that seek to use the potential of technology and innovation to address societal challenges. It requires a broad mix of research and innovation policies, inclusive co-creation processes, and targeted, process-oriented, and multi-instrumental policies to achieve systemic transformation (Ghosh et al., 2021; Diercks et al., 2019). The potential added value of transformational innovation and how it can help support and advance climate change adaptation has been noted at the European Union level (European Commission, 2024). It is a response to the EU's climate change adaptation strategy, the belief that "climate change is having such a pervasive impact that our response to it must be systemic" (European Commission, 2021).

Research methods

In order to identify directions for activities in the area of climate change adaptation and innovation in Poland, the development strategies will be analysed first – at the national and 16 voivodship level.

There are different approaches in EU Member States to formulating and implementing climate change adaptation policies. They include National Adaptation Strategies, National Adaptation Plans, Sectoral Adaptation Plans or Regional Adaptation Plans. In Poland the basis for the implementation of climate change adaptation measures is the Strategic Adaptation Plan for Sectors and Areas Vulnerable to Climate Change to 2020 with the perspective by 2030 (Polish National Strategy) adopted in 2013. Among the strategic documents currently in force, attention should also be drawn to other strategies and plans that directly address climate policy issues. The most important of them are: 2030 National Environmental Policy – the Development Strategy in the Area of the Environment and Water Management (adopted in 2019), National Energy and Climate Plan 2021-2030 (adopted in 2019), Energy Policy of Poland until 2040 (adopted in 2021), Drought Effects Counteracting Plan (adopted in 2021), Flood Risk Management Plans (drawn up for the entire area of Poland). Polish National Strategy indicates the need to set adaptation directions at the regional level in regional development strategies. The most important strategic documents at the regional level are the regional development strategies prepared by each voivodship. In addition, climate issues may be addressed in other strategic and planning documents, in particular, they are present in the environmental protection programmes that the voivodships are obliged to prepare.

It is worth noting that a large part of the adaptation measures identified in Polish National Strategy are being implemented at the local level. There is a special role for cities where the adverse effects of climate change accumulate, indicating the need to include adaptation in the programming of development activities, such as through the development of municipal adaptation plans (especially for the largest cities). Most cities with more than 100,000 inhabitants already have urban climate change

DOI: 10.34659/eis.2025.92.1.841

adaptation plans, more and more smaller towns are also deciding to prepare them. However, these actions and plans are not the subject of this study. The research is also not focused on those strategy documents that target mitigation rather than adaptation measures (eg. air protection programmes and territorial fair transformation plans).

As regards innovation strategy the most important strategic document is the Productivity Strategy 2030, adopted in 2022 (as an update, complement and development of the Strategy for Innovation and Efficiency of the Economy in force until 2020). At regional level, the most important strategic documents in this respect are the regional innovation strategies.

An analysis of EU cohesion policy programming documents in Poland (Partnership Agreement, operational programmes – national and regional) was then carried out to see how these policy documents translate into concrete actions and funding for climate change adaptation and innovation issues. The industrial transformation towards a green economy is determined, among other things, by the European Union activities, which set some trends in this area. Data on projects co-financed by the EU cohesion policy has been retrieved in May 2024 from the Kohesio project database (maintained by the European Commission) and from the database maintained by the Polish Ministry of Development Funds and Regional Policy (when converting the values from PLN to EUR, the exchange rate of 6.05.2024 was used: 1EUR=4.3294PLN). The data covers all projects implemented under the financial perspective 2014-2020.

Results of the research

The Strategic Adaptation Plan for Sectors and Areas Vulnerable to Climate Change to 2020 with the perspective by 2030 (Ministry of the Environment Republic of Poland, 2013) is a multi-sectoral national strategic policy document for the period 2013–2030. It indicates the objectives and directions of adaptation actions to be taken in the most vulnerable sectors and areas. One of the objectives of this strategy is to stimulate innovation conducive to climate change adaptation. It has been defined to correspond to the strategy for innovation from the point of view of adaptation, however, the indicated courses of action, to date, have not taken real shape. The Strategy for Innovation and Efficiency of the Economy (Ministry of the Environment Republic of Poland, 2013), which was in force until 2020, identifies climate change as one of the biggest challenges and emphasises the need to adapt to it. However, the strategy does not plan actions that explicitly would target the use of innovation for climate change adaptation. The later and now current Productivity Strategy 2030 (Uchwała, 2022) sets out the directions for the industrial transformation that Poland is undergoing, and among these, the circular economy and the low-carbon economy (as part of the transformation to a climate-neutral economy) were identified as key areas. However, looking at the provisions of the strategy, it is apparent that if any specific actions in this regard are mentioned, they are more in the nature of mitigation than adaptation to climate change. This may be because there are close relations between adaptation and mitigation processes, and they are also funded from the same sources (Dubel, 2016). Moreover, in Polish strategic documents, climate is often combined with the area of energy, hence energy efficiency as a priority for action.

It is worth noting that eco-innovation appears as one of the lines of intervention in the Productivity Strategy 2030. The aim of this area of action is to create a market – a demand, but above all a supply of innovative solutions to improve resource efficiency, reduce waste generation and negative impact on the environment, as well as enabling the substitution of non-renewable resources by renewable ones. Therefore, these are activities which are aimed at increasing the innovativeness of Polish enterprises in terms of products and processes with a smaller negative or positive impact on the environment. The competitive advantages of Polish companies are created in the production of goods, which are more and more willingly purchased by conscious consumers or directly promoted under the climate and environmental policy.

At the regional level, climate change adaptation and innovation are addressed differently in policy documents. The current strategies (with a view to 2030) were analysed, as they address climate change adaptation to a much greater extent than previous strategies. In all 16 regional development strategies, climate change adaptation is mentioned as a challenge in the diagnostic section. When it came to formulating strategic and operational objectives, only a few voivodeships (łódzkie, opolskie,

DOI: 10.34659/eis.2025.92.1.841

podkarpackie, pomorskie, śląskie, świętokrzyskie) set objectives related to climate change response (although not always adaptation, sometimes mitigation or both processes combined). Sometimes, building the resilience of a region's population, urban infrastructure and economy to the negative effects of climate change also appears as one of the directions for action under other objectives (kujawsko-pomorskie, małopolskie, mazowieckie, podlaskie, warmińsko-mazurskie, wielkopolskie). There are also some voivodeships that do not distinguish actions in this direction in their strategies (dolnośląskie, lubelskie, lubuskie, zachodniopomorskie). In all strategies, the areas of climate change adaptation and innovation are addressed separately – in different objectives and actions. In innovation-related priorities, climate change issues appear very rarely and almost never explicitly, more often, it is about eco-innovation (dolnośląskie, wielkopolskie, łódzkie) or support for the development of the low-carbon or circular economy (lubuskie, podkarpackie, podlaskie, pomorskie, śląskie, świętokrzyskie, warmińsko-mazurskie).

The implementation of climate change adaptation objectives set out in national policy documents and regional development strategies is ensured at the regional level through environmental protection programmes. Each voivodeship has highlighted the need for climate change mitigation and adaptation in its programme, but none refer to the use of innovation in this regard. Innovation development and industrial transformation are indicated in the environmental programmes of several regions only under the objective of transition to a circular economy. The same kind of approach can also be seen in regional innovation strategies, which do not explicitly refer to climate change adaptation; there is rather a general reference to the need to protect the environment, develop the circular economy and eco-innovation.

In order to see how these policy documents translate into concrete action and funding for climate change adaptation and innovation issues, cohesion policy spending in Poland will be analysed. The issue of climate change mitigation and adaptation has been placed among key priorities of cohesion policy since the past programming period (2014–2020). Cohesion policy funds are also the main source of funding for investments related to combating climate change in Poland (Murzyn, 2022). In 2014-2020 the expenditures on air protection and tackling climate change constitute only approx. 1.67% of the total environmental expenditures in Poland. The share of European funds in co-financing environmental policy is very high: 58.67% on average, in the case of spending for air protection and tackling climate change, even higher: 64.32% (in 2016 and 2017 over 80%). However, expenditure under the cohesion policy thematic objective 'Climate change adaptation & risk prevention' represents only 3.5% of the total in the area of 'Greener, carbon-free Europe' for Poland (ca. 1.3 bln EUR).

Cohesion policy funding for the thematic objective 'Climate change adaptation & risk prevention' was available at national level – under the Infrastructure and Environment programme (POIŚ), with projects funded by the Cohesion Fund (CF), and at regional level – under the regional operational programmes (RPO), with projects funded by the European Regional Development Fund (ERDF). Most funds were allocated to the following regions: śląskie, pomorskie and dolnośląskie, and the least to the regions: opolskie, lubelskie, podlaskie (fig. 1). Most of the funding was provided by the national programme, with only some voivodeships (wielkopolskie, opolskie, łódzkie) being primarily beneficiaries of regional programmes, which is also a demonstration of the policy of the regional authorities to allocate adequate resources to this thematic area.

When looking at these projects and their descriptions in the database, it is noticeable that none of them emphasise links to innovation. In terms of the thematic scope of these projects, flood protection (37%) and rainwater management and water retention (35%) accounted for the largest share (Figure 2).

DOI: 10.34659/eis.2025.92.1.841

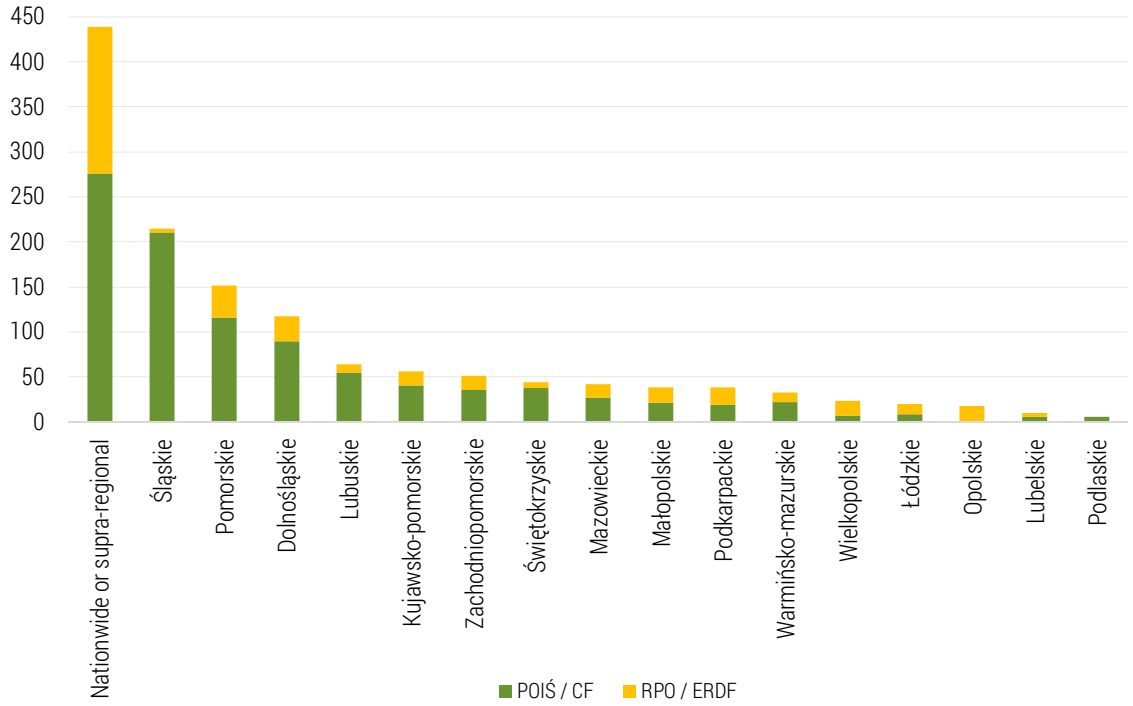

Figure 1. Distribution of EU cohesion policy funds for climate change adaptation and risk prevention under the cohesion policy in Poland in 2014-2020 (mln EUR)

Source: author's work based on data from the Ministry of Development Funds and Regional Policy (2022).

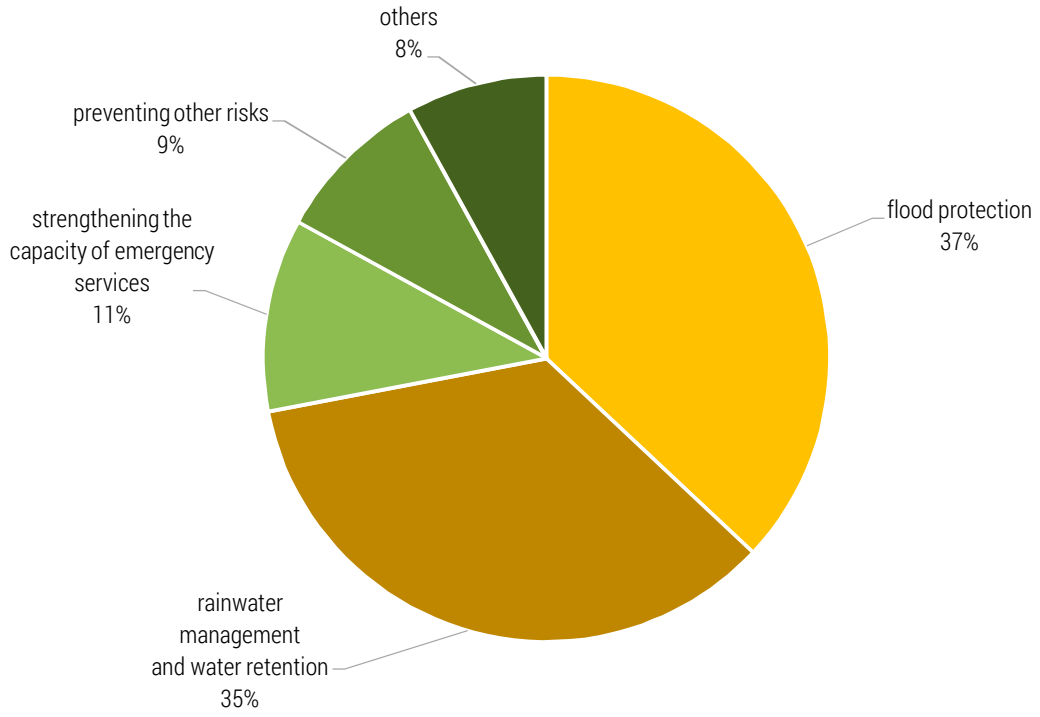

Figure 2. Directions for the climate change adaptation actions financed under the cohesion policy in 2014-2020 in Poland (%)

Source: author's work based on data of the Ministry of Development Funds and Regional Policy (2022).

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On the other hand, under the thematic objective 'Strengthening research, technological development and innovation', some activities were carried out in the area of 'Infrastructure for research and development, technology transfer and cooperation in enterprises focusing on low-carbon economy and climate resilience'. However, these accounted for a small proportion of all projects under this objective (around 2%) with less than EUR 280 million in ERDF funding. Analysing the European Commission's databases, one can come to the same conclusion. Of the more than five hundred projects implemented under the 'Climate change adaptation and risk prevention' theme, not a single one referred to innovative activities. On the other hand, under the theme 'Research and innovation', only 11 projects (out of more than 15,000) dealt with climate change to some extent, another 16 projects with eco-innovation (European Commission, 2024). To sum up, analysing the projects that were implemented in the 2014-2020 period in Poland in the areas of both climate change adaptation and innovation, there is very little synergy between these two themes.

In 2021-2027, the amount planned for climate change is expected to increase to at least EUR 77.2 billion, which is roughly 25% of total cohesion policy, a significantly higher share than previously, which should ensure a stronger contribution to the delivery of climate policy outcomes. Poland itself is obliged to contribute 30% of the ERDF, i.e. around EUR 14.4 billion, and 37% of the Cohesion Fund, i.e. around EUR 4.2 billion, towards expenditure to achieve the climate goals. According to estimates, the share of Poland's Cohesion Fund expenditure on the climate target will be around 60% (Ministry of Development Funds and Regional Policy, 2022). In addition, Poland is obliged to allocate at least 25% of its total ERDF funding (approximately EUR 11.4 billion) to the 'Smarter Europe' objective.

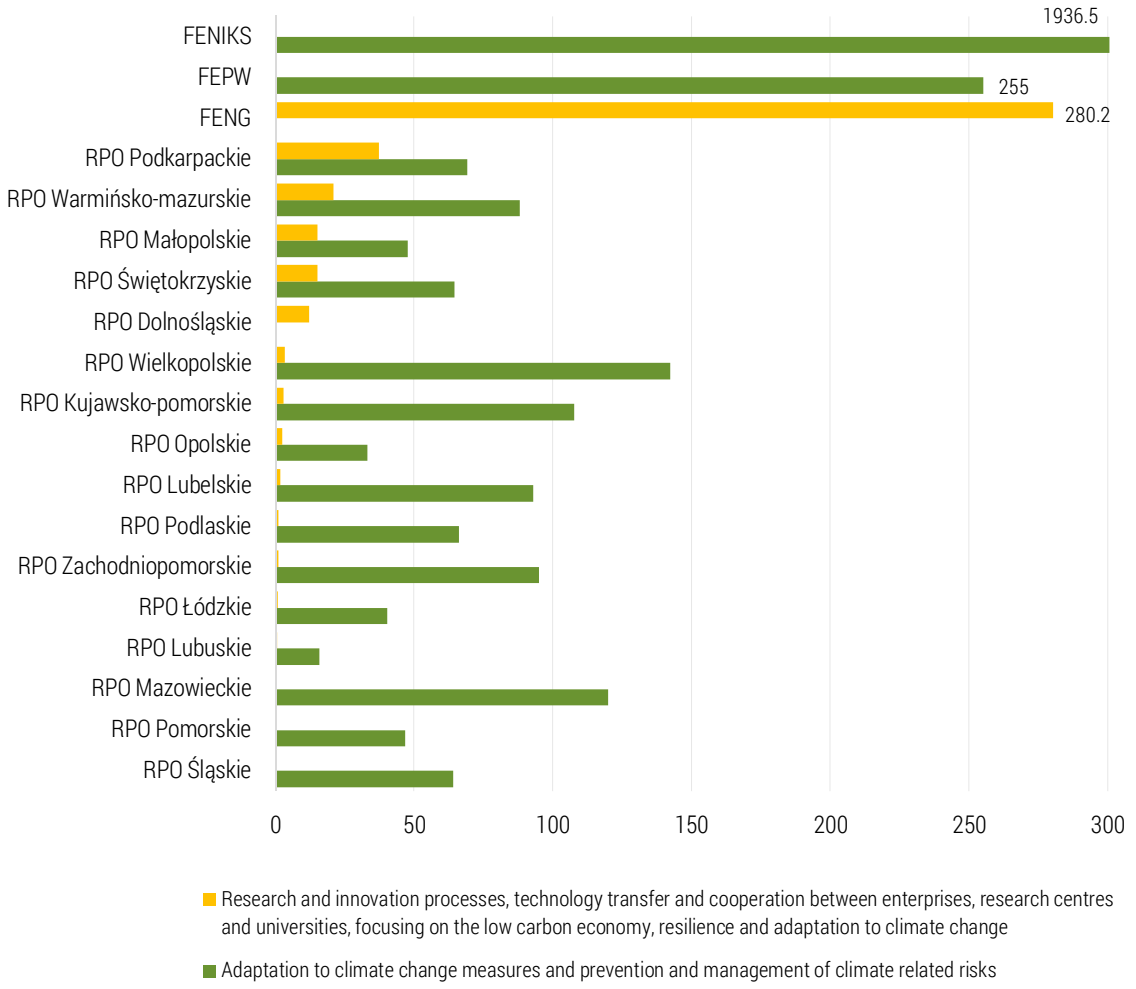

Figure 3. Allocation of EU cohesion policy funds for research and innovation focusing on the low carbon economy, resilience and adaptation to climate change in Poland in 2021-2027 (mln EUR)

Source: author's work based on the detailed descriptions of the programmes' priority axes.

DOI: 10.34659/eis.2025.92.1.841

In the provisions of the Partnership Agreement for the implementation of the Cohesion Policy 2021-2027 in Poland, some kind of synergy between climate change (although not necessarily climate change adaptation itself) and innovation can be noted. The innovation-oriented objective recognises that the productivity growth of the economy is also supported by the transformation towards a circular economy and that this requires innovative approaches and the development of modern technologies especially in the use of recycled materials and waste management. The climate-focused objective, on the other hand, highlighted the need to develop new technologies to foster the transition to a circular and low-emission economy.

It is interesting to examine the intervention field: "029 Research and innovation processes, technology transfer and cooperation between enterprises, research centres and universities, focusing on the low carbon economy, resilience and adaptation to climate change", as it most closely integrates innovation and adaptation issues. The figure 3 presents the financial allocations of cohesion policy for this area of intervention in the various national and regional programmes in Poland compared to expenditure on intervention categories related to climate change adaptation (058, 059, 060). Such expenditure has been planned at national level under the programmes: European Funds for Infrastructure, Climate, Environment (FENIKS), European Funds for Smart Economy – FENG, European Funds for Eastern Poland (FEPW), and a the regional level under regional operational programmes (RPO).

In general, spending on research and innovation in the area of climate change adaptation is several tens of times less than spending on 'traditional' activities in this area, mainly related to infrastructure investment. Moreover, even the largest planned allocation for intervention category 029 (within the national programme FENG) applies to projects in the area of low-carbon and produced with renewable energy hydrogen and support for the implementation of socio-economically significant research and development in an innovative procurement model. The use of low-carbon energy sources and technological solutions is essential for accelerating carbon dioxide reductions, thereby contributing to climate change adaptation (Seo, 2015). At the level of the regions, on the other hand, the situation is very mixed: there are voivodeships that have planned a considerable part of the allocation for intervention category 029 (podkarpackie, warmińsko-mazurskie, małopolskie, świętokrzyskie, dolnośląskie), but also those that have not done so at all (śląskie, pomorskie, mazowieckie).

Discusion and Conclusions

Climate change adaptation measures should be mainstreamed not only in intervention areas such as environment, water management, and energy security, where the direct impacts of climate change are more readily visible, but should be approached more systemically, and the transformative change should be considered as the ultimate goal. Climate change adaptation can also be given greater consideration in innovation policy, with measures to encourage businesses to seek innovative solutions in this field. Transformative innovation policy has the potential to fundamentally transform the ways of thinking and operation in advancing transformative change. It is designed to enable transformations in economies and societies, aligning with the impending climate emergency (Ghosh et al., 2021). However, it poses challenges in the management of uncertainty and complexity, requiring a balanced attention to ecosystem features and holistic policy impacts on the ecosystem and society at large (Könnölä et al., 2021). Moreover, the balance between adaptation and mitigation is crucial, and decisions on industrial strategy, urban planning, and infrastructure investment have a strong bearing on future vulnerability to climate change (Fankhauser, 2017).

There seems to be a lack of synergy between climate change adaptation and innovation policy in Poland and Polish regions so far. Although the level of integration of climate change adaptation issues into development strategies is increasing, the innovative potential is hardly being used for climate change adaptation activities. These documents more often highlight the need for innovative solutions to improve resource efficiency. Based on the analysis, it should be noted that although in the vast majority of documents the necessity and inevitability of taking adaptation measures have been noted, not every document contains clear proposals on how to implement them.

Actions related to climate change adaptation and energy transition are supported by the cohesion policy instruments, which are aimed at implementing the EU policy set out in the European

DOI: 10.34659/eis.2025.92.1.841

Green Deal pact. By analysing the programming documents of cohesion policy in Poland and the previous experience in the use of funds, it can be noticed that actions in the areas of climate change adaptation and innovation take separate directions and are only to a limited extent linked. This is partly related to the division of competences in public administration units. As a rule, climate change adaptation issues are the responsibility of environmental departments. The lack of synergy with innovation policy is also the result of silo thinking, as the departments dealing with the economy (and its innovation) are oriented towards efficiency in general. More attention has been paid to circular economy solutions that contribute to sustainable production and sustainable consumption. The circular economy has already moved to the operational level, hence it is easier for policymakers and entrepreneurs to think and act about such issues, with climate change adaptation not yet happening (Murzyn, 2024). The circular economy is at the same time one of the national smart specialisations, moreover, some voivodeships have also indicated it as their specialisation. Drawing on the experience of using innovations to transform towards a circular economy can help harness their potential also for climate change adaptation and green transformation.

From the above analyses, some recommendations emerge for public institutions responsible for setting adaptation and innovation policies. It is important to integrate approaches, policy instruments, and nexus thinking in developing effective climate change adaptation strategies. Climate change adaptation should also be given greater consideration in innovation policy, with measures to encourage businesses to seek innovative solutions in this field (e.g. through tax breaks or increased investment in R&D in climate adaptation technologies). There is a need to define better synergies between funding sources, including under different EU cohesion policy programmes. They can also be directed towards capacity-building initiatives and the creation of cooperation mechanisms to unite stakeholders in promoting innovation for climate change adaptation.

Acknowledgements

This research is a follow-up to previous studies, particularly those carried out in collaboration with the Joint Research Centre, supported by the European Commission, the partial results of which have been published in: Murzyn, D. (2024). *Transformative Innovation for better Climate Change Adaptation – Case Study: Mazovia – Stare Babice, Poland.* https://data.europa.eu/doi/10.2760/86121.

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Dorota MURZYN

ADAPTACJA DO ZMIAN KLIMATU I INNOWACJE – RAZEM CZY OSOBNO? PRZYKŁAD POLITYKI SPÓJNOŚCI UNII EUROPEJSKIEJ W POLSCE

STRESZCZENIE: Artykuł jest próbą wniesienia wkładu w dyskusję na temat potencjału (transformacyjnych) innowacji w projektowaniu i wdrażaniu rozwiązań i strategii w zakresie adaptacji do zmian klimatu. Celem opracowania jest zbadanie, w jaki sposób kwestie adaptacji do zmian klimatu są uwzględniane w dokumentach strategicznych Polski i jej regionów oraz czy i w jakim stopniu fundusze polityki spójności UE promują wykorzystanie innowacji w działaniach adaptacyjnych do zmian klimatu. Autorka dokonuje przeglądu najważniejszych dokumentów strategicznych na poziomie krajowym i regionalnym oraz analizuje wydatki w ramach polityki spójności (realizowane w latach 2014-2020 i planowane na lata 2021-2027). Na podstawie przeprowadzonych analiz autorka dochodzi do wniosku, że choć poziom uwzględnienia kwestii adaptacji do zmian klimatu w strategiach rozwoju Polski i jej regionów wzrasta, to potencjał innowacyjny w tym zakresie jest wykorzystywany w niewielkim stopniu, a konkretne działania w ramach polityki spójności w obszarach adaptacji do zmian klimatu i innowacji obierają odrębne kierunki i tylko w ograniczonym stopniu są ze sobą powiązane.

SŁOWA KLUCZOWE: adaptacja do zmian klimatu, polityka innowacyjna, polityka spójności UE

DOI: 10.34659/eis.2025.92.1.841