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Crisis Management in the Event of a Natural Disaster

Zarządzanie kryzysowe w obliczu klęsk żywiołowych

ABSTRACT

The article examines the preparedness of societies, states, and emergency services for the dynamically increasing number and intensity of natural disasters occurring in regions with different levels of technological development. The significance of this problem results from the accelerating effects of climate change, global demographic growth, and the rapid expansion of infrastructure, all of which contribute to a rising frequency and diversity of extreme events. The research aimed to

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identify the main factors shaping disaster risk, assess the capacity of national and international systems to respond to emerging threats, and analyse possibilities for reducing the social and economic consequences of these phenomena. The study employs the comparative system method supported by literature analysis and selected case studies, enabling a cross-regional evaluation of institutional preparedness and resilience mechanisms. The conducted analyses allow the formulation of the thesis that the global number of disasters will continue to grow, and that states and international structures must continuously adapt their preparedness systems to new threat profiles, taking into account even low-probability, high-impact events. The article contributes original insights into the challenges of disaster management under conditions of structural global change and highlights the cognitive and practical value of strengthening awareness, improving planning processes, and enhancing coordination between national and international actors.

Keywords: natural disasters; crisis management; critical infrastructure; Ireland; South America; resilience

INTRODUCTION

Natural disasters are not a new phenomenon for humanity. However, demographic pressure combined with environmental degradation means that the functioning of states, societies, and individuals is increasingly susceptible to such threats. At the same time, this susceptibility depends to a large extent on the degree to which society is saturated with modern technologies, and currently large-scale natural disasters necessarily imply humanitarian disasters.[1]

The starting point for the considerations in this article is the assumption that the intensity and frequency of natural disasters have increased significantly compared to the preindustrial era, and research results indicate that this increase is ongoing and will accelerate.[2] This is indicated by the fact that from the 1980s to the beginning of the 21st century, the number of natural disasters in the world has doubled.[3] This is due to both climate change and the growth of the world's population. Although earthquakes, floods, droughts, extreme winds, snowstorms, storms, ice storms, fires, volcanic eruptions, meteorites, and other cosmic impacts, landslides and epidemics are natural processes that have been shaping the Earth's landscape and society for millennia, for them to cause a natural disaster, there must be an interaction with

[1] M. Hajder, M. Nycz, L. Jasiura, *Katastrofy naturalne i technologiczne*, Rzeszów 2014, p. 11.

[2] P. Wrochna, *Ryzyko ekologiczne jako ryzyko społeczne. Na ile „rzeczywista" jest katastrofa klimatyczna?*, "Annales UMCS sectio I (Philosophia–Sociologia)" 2018, vol. 43(1), p. 198.

[3] O.F. Al Kurdi, *A Critical Comparative Review of Emergency and Disaster Management in the Arab World*, "Journal of Business and Socio-economic Development" 2021, vol. 1(1), p. 24.

human-made elements such as settlements, agriculture, and infrastructure.[4] Therefore, not every extreme natural phenomenon can be defined as a natural disaster that occurs as a result of the presence of this phenomenon in an area with a significant potential for losses – human or economic.[5]

All these factors mean that societies and crisis management and rescue systems must adapt to new conditions and prepare for a new scale of threats, some of which are still unknown.[6] The main objective of the article is to present solutions, experiences, and trends concerning ensuring public safety within crisis management systems in the context of natural disasters. Therefore, the authors decided to examine how and with what effectiveness societies and relevant services respond to natural disasters and how they are prepared for them and to propose a research hypothesis that crisis management systems must adapt to the new scale and number of natural disaster threats. To verify this hypothesis, a comparative systemic method, an analysis of the subject literature, and case studies were used. In order to examine similarities and differences in crisis management around the world, the authors decided to analyze the threats and challenges associated with them in Ireland and South America.

CRISIS MANAGEMENT AND CRITICAL INFRASTRUCTURE IN THE FACE OF NATURAL DISASTERS

Crisis management (according to Article 2 of the Polish Crisis Management Act[7]) is defined as the activity of public administration bodies, which is an element of managing national security, and consists of preventing crisis situations, preparing to take control of them through planned actions, responding in the event of crisis situations, eliminating their effects, and restoring resources and critical infrastructure.[8] An extremely important element of crisis management is the preventive factor,

[4] M.T. Chaudhary, A. Piracha, *Natural Disasters – Origins, Impacts, Management*, "Encyclopedia" 2021, vol. 1(4), p. 1101.

[5] Z.W. Kundzewicz, P. Matczak, *Zagrożenia naturalnymi zdarzeniami ekstremalnymi*, "Nauka" 2010, no. 4, p. 77.

[6] M. Karpiuk, *Glosa do wyroku Naczelnego Sądu Administracyjnego z dnia 12 lutego 2018 r. (II OSK 2524/17)*, "Studia Iuridica Lublinensia" 2019, vol. 28(1), p. 188. See also K. Kaczmarek, M. Karpiuk, J. Kostrubiec, *Security of the Eastern Border of the European Union: The Politico-Legal Aspects*, "Revista Jurídica Portucalense" 2025, vol. 38(1), p. 196; J. Kostrubiec, M. Karpiuk, D. Tyrawa, *The Status of Municipal Government in the Sphere of Ecological Security*, "Hungarian Journal of Legal Studies" 2024, vol. 65(2), pp. 169–170.

[7] Act of 26 April 2007 on crisis management (consolidated text, Journal of Laws 2023, item 122, as amended).

[8] K. Kaczmarek, E.M. Włodyka, M. Czuryk, *The Status of Government Administration in the Sphere of Crisis Management*, "Prawo i Więź" 2025, vol. 59(6), p. 659.

which protects against both the threat itself and its effects.[9] The definition of crisis management allows us to distinguish four phases: prevention, preparation, response, and reconstruction.[10] This concept includes the activities of public administration bodies related to responding to a threat resulting in the occurrence (or possibility of occurrence) of a crisis situation. However, it should be remembered that, since in the case of natural disasters, there is little or no possibility of preventing them, the only thing that can be done is to minimise their negative effects. It is also important to educate society and prepare it in advance for threats. This is important because modern societies are largely dependent on the proper functioning of critical infrastructure, which may be destroyed or whose functioning may be seriously disrupted in the event of a natural disaster.[11]

Critical infrastructure is defined, according to Article 3 (2) of the Polish Crisis Management Act, as systems and their components that are crucial for the security of the state and its citizens and also serve to ensure the proper functioning of the state and society. It includes: a) supply of energy, energy resources and fuels; b) communications; c) information and communication technology (ICT) networks; d) finances; e) food supply; f) water supply; g) health care; h) transport; i) rescue; j) ensuring the continuity of public administration; k) production, storage and use of chemical and radioactive substances, including pipelines of hazardous substances.[12]

European critical infrastructure, as stated in Article 3 (2a) of the Polish Crisis Management Act, should be understood as systems and their functionally related objects, including buildings, devices, and installations that are key to the security of the state and its citizens and serve to ensure the efficient functioning of public administration bodies, as well as institutions and entrepreneurs. This infrastructure includes systems: 1) supplying energy, energy raw materials and fuels – including electricity, crude oil and natural gas; 2) transport – covering road, rail, air, inland waterway transport, ocean shipping, short-sea shipping and ports, located in the territory of EU Member States, the disruption or destruction of which would have a significant impact on at least two Member States.

It is worth noting here that all elements of critical infrastructure are interconnected, albeit not equally, and the failure of one causes disruptions in the functioning of the others. At the same time, it should be emphasised that the element without which the others cannot function is the power grid. Therefore, its damage as a result

[9] M. Karpiuk, *Crisis Management vs. Cyber Threats*, "Sicurezza, Terrorismo e Societa" 2022, vol. 16(2), p. 116.

[10] M. Czuryk, K. Dunaj, M. Karpiuk, K. Prokop, *Prawo zarządzania kryzysowego. Zarys systemu*, Olsztyn 2016, p. 21.

[11] Cf. K. Kaczmarek, M. Karpiuk, A. Spaziani, *Use of Artificial Intelligence in Public Sector: Threats and Prospects*, "Studia Iuridica Toruniensia" 2025, vol. 36.

[12] M. Czuryk, *Cybersecurity and Protection of Critical Infrastructure*, "Studia Iuridica Lublinensia" 2023, vol. 32(5), p. 45.

of a natural disaster can disrupt the proper functioning of societies. This applies especially to those whose functioning is based on access to modern technologies. In the case of power grids, wind has a positive effect on the transmission capacity of the network by cooling the cables, and is also necessary to generate energy from wind farms. However, excessive wind speeds cause damage to overhead networks and pose a threat to the stability of electricity supplies. Extreme weather phenomena, such as tornadoes, violent storms, or hurricanes, pose a direct threat to electricity supplies. They cause damage to the transmission infrastructure and large losses and interruptions in the supply of energy to end users.[13] In the event of a catastrophic force, this can be considered a natural disaster, and the destruction of transmission networks caused by such an event can pose a direct threat to the life, health, and property of many people. The reason is that all other elements of the critical infrastructure are supplied with electricity. In addition to strong winds, power grids can also be damaged or destroyed in the event of an earthquake, extreme rainfall, heat, drought, severe frost, or even a meteorite impact.

Due to the negative effects of natural disasters, which can significantly limit the functioning of the state, critical infrastructure, which is responsible for the proper functioning of many strategic sectors, should be adequately protected. According to Article 3 (3) of the Polish Crisis Management Act, critical infrastructure protection should be understood as all actions aimed at ensuring the functionality, continuity of operations and integrity of critical infrastructure in order to prevent threats, risks, or weak points and to limit and neutralise their effects and quickly restore this infrastructure in the event of failures, attacks, and other events disrupting its proper functioning. Public administration must be prepared for the destruction or disruption of critical infrastructure, especially since it has a large amount of data.[14]

Such administrative bodies should therefore adequately protect the systems, facilities, devices, installations and services under their supervision. Unfortunately, as this is not always possible, they should be prepared for emergency situations by introducing solutions in the event of non-operation, or improper or partial operation of critical infrastructure. Local government structures and institutions have a special place in the implementation of such tasks.[15] At the same time, it should be taken

[13] B. Sobik, *Analiza przyczyn wystąpienia zagrożenia bezpieczeństwa dostaw energii elektrycznej w sierpniu 2015 roku w Polsce oraz sposoby zapobiegania takim zdarzeniom*, "Zeszyty Naukowe Instytutu Gospodarki Surowcami Mineralnymi i Energią Polskiej Akademii Nauk" 2018, no. 103, p. 195.

[14] E.M. Włodyka, *Implementation of e-Government and Artificial Intelligence in Polish Public Administration*, "TalTech Journal of European Studies" 2024, vol. 14(2), p. 128.

[15] J. Knopek, E.M. Włodyka, *Obraz partycypacji organizacji pozarządowych w tworzeniu polityk publicznych w województwie zachodniopomorskim*, "Przegląd Zachodniopomorski" 2020, vol. 35(1), p. 103. Cf. M. Czuryk, *Jurisdiction of the Voivode in the Field of Crisis Management*, "Studia Iuridica Lublinensia" 2025, vol. 34(2); K. Kaczmarek, M. Karpiuk, *Współpraca polsko-niemiecka w obszarze*

into account that all natural disasters facilitate the spread of false information, which can then be used by hostile entities to achieve their own political goals.[16]

The methods of responding to crisis situations and crises caused by natural disasters depend largely on the country and region of the world, along with factors such as the level of economic development of the country and the resources it has, its institutional capacity, geographical location, or culture. It is also important to consider what threats a given region is most exposed to. It should be emphasised that the procedures should take into account all possible events.[17] Even those that have not yet occurred in a given region, but whose probability is greater than zero. There are also studies whose results indicate that the lack of adaptation to the new number and quality of natural disasters can result not only in the inhibition of progress, but also in its reversal.[18]

Threats that are of a specific nature and significant intensity very often require the use of extraordinary measures. Such measures may be applied in the event of the introduction of a state of natural disaster.[19] Article 2 of the Polish Act on declaring a state of natural disaster[20] indicates that a state of natural disaster may be declared in order to prevent the effects of natural disasters or technical failures bearing the characteristics of such an event and to eliminate them. Article 3 thereof defines a natural disaster as a natural disaster or technical failure, the effects of which threaten the life or health of a large number of people, damage to property on a large scale or the environment over large areas. In addition, such events must require levels of assistance and protection that can be effectively provided only through the use of extraordinary measures, in cooperation with various bodies and institutions and specialist services and formations operating under uniform management. This provision also provides more specific, separate definitions of the terms "natural catastrophe" and "technical failure". A natural disaster is therefore an event related to the action of natural forces, in particular atmospheric discharges, seismic

zarządzania kryzysowego na przykładzie województwa zachodniopomorskiego oraz Meklemburgii-Pomorze Przednie i Brandenburgii, "Przegląd Zachodniopomorski" 2025, vol. 40.

[16] K. Kaczmarek, M. Karpiuk, C. Melchior, *A Holistic Approach to Cybersecurity and Data Protection in the Age of Artificial Intelligence and Big Data*, "Prawo i Więź" 2024, vol. 50(3), p. 110; M. Karpiuk, J. Kostrubiec, *Provincial Governor as a Body Responsible for Combating State Security Threats*, "Studia Iuridica Lublinensia" 2024, vol. 33(1), pp. 109–110.

[17] K. Kaczmarek, *Bezpieczeństwo państwa wobec współczesnych zagrożeń*, "Prawo i Więź" 2025, vol. 58(5), p. 569.

[18] H. Ritchie, P. Rosado, M. Roser, *Natural Disasters: How Many People Die from Disasters, and How Are These Impacts Changing Over Time?*, 2022, https://ourworldindata.org/natural-disasters#introduction (access:15.10.2025).

[19] M. Czuryk, *Activities of the Local Government During a State of Natural Disaster*, "Studia Iuridica Lublinensia" 2021, vol. 30(4), p. 111.

[20] Act of 18 April 2002 on declaring a state of natural disaster (consolidated text, Journal of Laws 2025, item 112, as amended).

shocks, strong winds, heavy atmospheric precipitation, prolonged occurrence of extreme temperatures, landslides, fires, droughts, floods, ice phenomena on rivers and the sea and lakes and reservoirs, the mass occurrence of pests, plant or animal diseases or infectious diseases of people or the action of another element. In turn, a technical failure is defined as a sudden, unforeseen damage or destruction of a building, technical device or system of technical devices causing an interruption in their use or loss of their properties.

The most frequently mentioned causes of errors in crisis management, including in the event of natural disasters, in the literature are the following: a lack of appropriate preparation and planning; insufficient communication; insufficient use of technology; the centralisation of decisions, ignoring local resources and knowledge; a lack of flexibility (rigid adherence to procedures without taking into account the dynamics of the situation); and, finally, insufficient community involvement.[21]

In the case of crisis management, natural disasters, the protection of the population is of fundamental importance.[22] According to Article 2 (1) of the Polish Act on the protection of the population and civil defence,[23] the protection of the population should be understood as a system consisting of public administration bodies performing tasks aimed at ensuring the safety of the population by protecting the life and health of people, along with property, including animals, the infrastructure necessary to meet living needs, cultural assets and the environment in a dangerous situation, as well as the entities performing these tasks and the resources required for the protection of the population. The structure of the population protection system has been built on the basis of existing resources and mechanisms in order to use them effectively. The basic role in this system is played by the Polish State Fire Service, local volunteer fire brigades, crisis management structures, the emergency notification system, the State Emergency Medical Services, and medical facilities. Non-governmental organisations also occupy a special place in this system.[24]

In order to properly address the above issues, it is necessary to analyse crisis management in individual cases of natural disasters.

[21] CE Interim, *Największe błędy w zarządzaniu kryzysowym. Najczęstsze błędy i jak ich unikać*, https://ceinterim.com/pl/najwazniejsze-bledy-w-zarzadzaniu-kryzysowym (access: 11.12.2024).

[22] Cf. M. Karpiuk, *The Provision of Safety in Water Areas: Legal Issues*, "Studia Iuridica Lublinensia" 2022, vol. 31(1).

[23] Act of 5 December 2024 on the protection of the population and civil defence (consolidated text, Journal of Laws 2024, item 1907, as amended).

[24] E.M. Włodyka, *Functioning of Local Government Units in the Light of the Law of 5 December 2024 on Civil Protection and Civil Defence*, "Ius et Securitas" 2024, vol. 2(2).

IRELAND AND THE THREAT OF NATURAL DISASTERS – A CASE STUDY

Given its geographical position as an island in the North Atlantic Ocean on the western periphery of Europe, Ireland has suffered many weather-based natural disasters throughout its history.[25] Curiously, due to the effects of another type of catastrophic natural disaster – the Great Famine of 1845–1849 caused by the spread of potato blight – it remains the only European country whose current population is still lower than it was in the mid-19th century.[26] However, recent population increases during the last three decades – due to both immigration and natural growth – have resulted in further demographic pressure in large urban conurbations centred on Dublin and Cork on the island's eastern and southern coasts.[27] Although the rest of the country is much more sparsely populated, especially as one moves west, the reliance of people living there on modern technologies and government-provided energy is just as great as elsewhere.

Due to its relative geological stability, Ireland is fortunate not to be considered a high-risk country regarding major geohazards and rarely experiences any seismic activity. In terms of other hazards, such as landslides, the island may be regarded as a benign environment in comparison with many other countries. Where they do occur, landslides affect remote highland areas with steep rocky slopes covered by looser water-logged layers of peat.[28] In terms of coastal erosion, Ireland's rocky, sparsely inhabited west coast features some of the highest cliffs in Europe, which are usually the first place to receive the severest battering when Atlantic storms roll in, often serving as a shield for areas further inland.

However, the above-mentioned ever-increasing dependence on modern technologies in regions such as the west of Ireland – one which has always been susceptible to threats such as severe Atlantic storms and various kinds of flooding – means that when natural disasters do occur, formerly more self-reliant individuals and communities find themselves helpless until outside, usually government help comes along.[29] Although the number of human injuries and fatalities resulting from nat-

[25] L. Shields, D. Fitzgerald, *The 'Night of the Big Wind' in Ireland, 6–7 January 1839*, "Irish Geography" 1989, vol. 22(1), p. 31; J. Sweeney, *A Three-Century Storm Climatology for Dublin 1715–2000*, "Irish Geography" 2000, vol. 33(1), pp. 4–9.

[26] E. Flaherty, *Assessing the Distribution of Social-Ecological Resilience and Risk: Ireland as a Case Study of the Uneven Impact of Famine*, "Ecological Complexity" 2014, vol. 19, p. 43.

[27] J. O'Driscoll, F. Crowley, J. Doran, M. O'Shaughnessy, D. Meredith, Z. Zimmermann, *Is Rural Ireland Really Dying? What the Facts and Figures Tell Us*, 4.11.2024, https://www.rte.ie/brainstorm/2022/0720/1311198-rural-ireland-population-cso-census-2022 (access: 28.1.2025).

[28] R. Creighton (ed.), *Landslides in Ireland: A Report of the Irish Landslides Working Group*, Dublin 2006, p. 5.

[29] W. O'Connor, A. Wrona, R. Riegel, *Schools with Power Can Reopen Tomorrow If 'Safe To Do So' as 278,000 Customers Still Without Electricity*, 26.1.2025, https://m.independent.ie/irish-

ural disasters has greatly decreased when compared with the past, the damage not only to electrical power generation and distribution networks but to the panoply of electronic appliances and devices – now including expensive electric vehicles – in many homes, businesses, and state-run institutions has greatly increased the financial costs incurred by governments and individuals. In short, the cost of repairing the damage and destruction of natural disasters to modern technologies – many of which did not even exist two or three decades ago – and the homes and buildings which have complex modern technological systems often built into them, is a major factor in discussing the impact of natural disasters in the modern world. In fact, for decades now, the insurance industry has been highlighting the rising financial costs associated with such events and often requires that extra coverage is taken out to include groundwater flooding and damaged electronic goods.[30] For example, following the Great Storm of 16 October 1987, which traversed south-east England, the British insurance industry predicted losses of £10B due to future storms over the next decade. Indeed, the Irish Insurance Federation subsequently reported that a storm that hit the country on Christmas Eve 1997 had generated insurance claims totalling £45M. Just over a year later, however, a storm that occurred on 26 December 1998 more than doubled this figure to over £100M.[31] Fast forward to today and this trend is reflected in a huge rise in insurance premiums for homeowners and businesses in the UK located in areas believed by insurance companies to be at risk of flooding or storm damage, with the Association of British Insurers stating that it paid out a record £573M in claims for weather-related damage in 2023, an increase of 36% on the previous year (£421M).[32]

This case study, therefore, focuses on the west of Ireland, which is not only vulnerable to severe storm damage due to its proximity to the Atlantic Ocean and the Gulf Stream, but also the fact that much of it lies on a Karst landscape where the limestone bedrock beneath the soil contains voids leading to gradual ground subsidence or sudden collapse, causing sinkholes. In wintertime, especially, this subterranean world of caverns and channels forming a natural underground drainage system frequently proves incapable of sufficiently draining itself, resulting in severe and extensive groundwater flooding at the surface. Generally speaking, sustained rainfall is required over long periods for this occur, often appearing discontinuous

news/schools-with-power-can-reopen-tomorrow-if-safe-to-do-so-as-278000-customers-still-without-electricity/a1205920424.html (access: 28.1.2025).

[30] M. Jenkin, *Does Your Insurance Cover Damage Caused by Bad Weather?*, 8.12.2025, https://www.which.co.uk/news/article/does-your-insurance-cover-damage-caused-by-bad-weather-aTYfU6C0gaFr (access: 31.1.2026).

[31] J. Sweeney, *op. cit.*, p. 2.

[32] Association of British Insurers, *Weather Damage Insurance Claims Worst on Record*, 15.4.2024, https://www.abi.org.uk/news/news-articles/2024/4/weather-damage-insurance-claims-worst-on-record (access: 31.1.2025).

temporary lakes in fields and known locally as turloughs. Depending on the amount of rainfall that has filled up the caverns below, they can last for weeks or even months.[33]

As groundwater flooding seems to have increase in Ireland in recent decades – with the winter of 2015/2016 having been especially bad – efforts have been made by the Irish government such as Geological Survey Ireland to better understand, map and monitor groundwater flood events. With this in mind, it established the GWFlood project in 2016 to gather more data and create accurate flood maps.[34] This subsequently led to a newly established GWClimate project, which is developing tools to forecast such floods and assess the potential impacts of climate change on groundwater flooding (and groundwater drought).

On a global scale, the International Red Cross has long identified flooding as a threat that could affect almost 100 million people a year.[35] Given that Ireland faces a threat in this regard not only from coastal flooding and river flooding but also from groundwater flooding, its government agencies have developed appropriate management plans in order to deal with such emergencies.[36] Indeed, flooding was ranked first among the risks listed in the National Risk Assessment conducted by the Irish government's Office of Emergency Planning in 2021.[37] The year 2017–2018 also witnessed three different kinds of flooding events – pluvial (rain), fluvial (river) and coastal (tidal) flooding.[38]

Given that the island of Ireland is politically divided into two separate jurisdictions – Northern Ireland and the Republic of Ireland – cross-border cooperation between analogous agencies has been established in order to unify approaches to tackling such challenges.[39] Ireland's emergency management agencies also operate within an EU framework known as the Union Civil Protection Knowledge Network as part of the European Commission Directorate-General for European Civil Protection and Humanitarian Operations, whose remit is to "encourage co-

[33] P.J. Morrissey, P. Nolan, T. McCormack, P. Johnston, O. Naughton, S. Bhatnagar, L.W. Gill, *Impacts of Climate Change on Groundwater Flooding and Ecohydrology in Lowland Karst*, "Hydrology and Earth System Sciences" 2021, vol. 25(4), pp. 1924–1925.

[34] T. McCormack, O. Naughton, R. Bradford, J. Campanyà, P. Morrissey, L. Gill, M. Lee, *GWFlood Project: Monitoring, Modelling and Mapping Karst Groundwater Flooding in Ireland*, Geological Survey Ireland Report, 2020.

[35] D. McClean, *World Disasters Report 2010: Focus on Urban Risk*, 2010, https://www.ifrc.org/document/world-disasters-report-2010-focus-urban-risk (access: 28.1.2025), pp. 39–40.

[36] Government of Ireland, *A Framework for Major Emergency Management*, 2006; R. Lawlor, *Met Éireann's Flood Forecasting Centre: Progress on Establishing the Flood Forecast Centre and How We Worked during Storm Ellen*, Met Éireann 2020; Government of Ireland, *Protocol 10: Multi-Agency Response to Flood Emergencies*, 2024.

[37] C. McMullan, E. Tully, M. Stanley, *National Risk Assessment*, Government of Ireland, 2021.

[38] Government of Ireland, *Review Report on Severe Weather Events 2017–2018*, 2019.

[39] F. Joyce, J. McCaffrey, *Emergency Management on the Island of Ireland – Recent Cross-Border Developments*, "Administration" 2015, vol. 63(3), p. 41; eidem, *Cross-Border Emergency Management Group*, Presentation to Annual MEM Conference, October 2021, p. 25.

operation between Member States for preventing and protecting against man-made or natural disasters".[40] Ireland is also a participant in using data and images from the Sentinel-1 SAR satellite as part of the EU's Copernicus programme in order to monitor groundwater flooding in the country.[41] Therefore, given the enormous and ever-growing potential repair costs involved resulting from flooding events – not only to individuals and insurance companies regarding private property but to governments footing the bill for damage or destruction of public infrastructure – having appropriate emergency management plans in place is essential.

SOUTH AMERICA – CRISIS MANAGEMENT CHALLENGES IN THE FACE OF NATURAL DISASTERS

When considering the issue of natural disasters in South American countries, it is necessary to take into account the climatic, geological, tectonic and demographic characteristics of this continent and its diversity in these respects. This continent stretches through all climatic zones from the equatorial, which covers more than half of the surface of South America, through the tropical, subtropical, temperate, to the circumpolar in the southern extremities. This implies the types of natural disasters that occur in individual countries and regions of this continent. However, the common denominator for the entire region is that in recent years there has been an increase in the frequency of natural disasters such as droughts, fires, floods and landslides. In addition, the countries of the region are exposed to earthquakes, tsunamis, volcanic eruptions and, in the northern part of the continent, hurricanes and tropical storms. While disasters with tectonic causes do not show any particular quantitative changes over time, those that can be associated with climate warming are more frequent and more intense. As an example, the fires in Brazil, the balance of which at the end of 2024 confirmed that they had burned over 300,000 square kilometres of the country's surface. This was 80% more than the year before.[42]

Another example of events with probable anthropogenic causes is that in the last days of December 2024, off the coast of Chile, between Arica and the Gulf of Arauco, intense episodes of waves were recorded, with waves reaching four meters

[40] F. Bloch, *Union Civil Protection Knowledge Network*, Presentation for Major Emergency Management Webinar, European Union, October 2021, p. 2.

[41] O. Naughton, T. McCormack, R. Bradford, J. McAteer, *Groundwater Flooding in Ireland Using Sentinel-1 SAR*, [in:] *The Ever Growing Use of Copernicus Across Europe's Regions: A Selection of 99 User Stories by Local and Regional Authorities*, 2018, https://www.copernicus.eu/sites/default/files/2018-10/copernicus4regions.pdf (access: 28.1.2025, pp. 174–175.

[42] N.G. Gortázar, *Los incendios se disparan en Brasil y en 2024 quemaron una superficie equivalente a Italia*, 22.1.2025, https://elpais.com/america/2025-01-22/los-incendios-se-disparan-en-brasil-y-en-2024-quemaron-una-superficie-equivalente-a-italia.html (access: 29.1.2025).

high. This phenomenon, which is abnormal in the summer season, was one of the most intense events since 2015, in which the waves began to increase, and also had a significant impact on the retreat of the beaches. Experts point out that solving this problem is essential due to the fact that 60% of the population lives less than 50 kilometres from the coast not only in that region, but globally. This also requires adapting crisis management systems to this type of event.[43] At the same time, many researchers point out that almost a quarter of the continent's population lives in cities located in coastal areas due to their accessibility, presence of water, fertile soils, morphology and favourable climate.[44]

A common feature of the entire region is that all Latin American countries, including South America, face similar challenges related to crisis management, such as lack of financial and technological resources, rapid and uncontrolled urbanisation in high-risk areas, and climate change, the effects of which additionally burden crisis management systems. In this context, in 2017, the European Commission, together with the United Nations Office for the Coordination of Humanitarian Affairs and INFORM partners (a global index for measuring humanitarian crisis risk, established in 2014), launched a regional adaptation of the initiative for Latin America, Risk Management for Latin America and the Caribbean (LAC-INFORM).

According to LAC-INFORM, the countries of the region have been divided into groups according to their level of risk of disaster and humanitarian crisis, as follows:

- Group A: countries with the highest levels of vulnerability and lack of coping capacity, such as Guatemala, Haiti and Honduras;
- Group B: countries with the highest levels of vulnerability and a medium level of coping capacity, namely Colombia;
- Group C: countries with the highest levels of coping capacity and a medium level of vulnerability, namely Bolivia, Nicaragua, the Dominican Republic and Venezuela;
- Group D: countries with the highest levels of coping capacity and a lower level of vulnerability, namely El Salvador and Jamaica; and, finally,
- Group E: countries with a medium level of vulnerability and a low level of coping capacity, namely Ecuador, Mexico and Peru.[45]

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[43] M.V. Agouborde, *Marejadas en verano: el cambio climático y la excesiva urbanización amenazan las playas de Chile*, 23.1.2025, https://elpais.com/chile/2025-01-23/marejadas-en-verano-el-cambio-climatico-y-la-excesiva-urbanizacion-amenazan-las-playas-de-chile.html (access: 29.1.2025).

[44] F. Igualt, W.A. Breuer, P. Winckler, M. Contreras-López, *Comprendiendo los factores que incrementan la vulnerabilidad ante inundaciones en asentamientos costeros irregulares en Chile: El caso de Laguna Verde*, "Revista de Estudios Latinoamericanos sobre Reducción del Riesgo de Desastres" 2025, vol. 9(1), p. 16.

[45] NFORM, *Index for Risk Management for Latin America and the Caribbean Lac-Inform 2020 Update*, https://drmkc.jrc.ec.europa.eu/inform-index/Portals/0/InfoRM/2020/Subnational/LAC/LAC_INFORM_2020_v007_MainResults_Eng.pdf (access: 29.1.2025), pp. 10–11.

It should be noted, however, that inter-governmental cooperation among South American countries in the area of crisis management is hindered by tense international and social relations.[46]

DISCUSSION AND CONCLUSIONS

As the analyses conducted in this article indicate, each region of the world is characterised by different levels and types of natural disaster threats. Some of these threats are independent of human activity (earthquakes, volcanic eruptions, or rock impacts from space). However, the intensity and frequency of extreme weather phenomena that can cause disasters are anthropogenic in nature. Currently, talking about stopping climate change is a truism, and in the context of crisis management, the only solution is adaptation to changes. It is also necessary to develop and implement procedures aimed at dealing with events that have not yet occurred in a given area or that have been less intense. It should be remembered that countries and societies with a high level of technological development are much more exposed to the negative effects of such disasters.

The case of Ireland shows that the destruction of infrastructure caused by natural disasters generates high financial costs and disrupts the proper functioning of society and the state, whose functioning is based on critical infrastructure. However, this country, like other Western countries, has adequate financial and technological resources to prepare for crisis situations and to limit damage and rebuild. Although this is, of course, a significant burden for society, the costs incurred for crisis management are an investment that pays off in the future by reducing losses caused by natural disasters.

The situation is completely different in the countries of South America. This continent is torn by conflicts between states and societies. As a result, this region is also characterised by a different susceptibility to natural disasters. The differences also include the scale of potential destruction of critical infrastructure, which cannot be destroyed in areas where it does not exist.

The common feature of the regions analysed is that the frequency and intensity of extreme weather events are increasing. This implies an increase in the number of natural disasters, whose economic and social costs will also increase. Due to different natural and tectonic conditions, Ireland and the South American countries differ qualitatively in terms of the occurrence of the causes of natural disasters. However, each of these types can occur anywhere in the world. While it is true

[46] G. Agostinis, D. Nolte, *Resilience to Crisis and Resistance to Change: A Comparative Analysis of the Determinants of Crisis Outcomes in Latin American Regional Organisations*, "International Relations" 2021, vol. 37(1), pp. 118–123.

that the eastern part of South America is prone to volcanic eruptions, earthquakes, and tsunamis, the occurrence of such phenomena cannot be ruled out in Ireland, which has already experienced them many times in history. Indeed, the historical occurrence of tsunamis in Ireland has been described by O.A.P. Mac Conamhna,[47] among others.

The results of the analyses conducted in this article allow us to put forward the thesis that, on a global scale, the number of disasters will increase not only because of climate change, but also because of the growing world population and infrastructure being built in previously uninhabited places. This requires states and international structures to constantly prepare for the new number and quality of threats and to take into account all, even the most unlikely events. It is also necessary to build public awareness of the fact that the security situation in terms of possible natural disasters is changing for the worse.

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ABSTRAKT

W artykule analizie poddano stopień przygotowania społeczeństw, państw i służb ratowniczych na dynamicznie rosnącą liczbę i intensywność katastrof naturalnych występujących w regionach o zróżnicowanym poziomie rozwoju technologicznego. Aktualność problemu wynika z nasilających się skutków zmian klimatycznych, globalnego wzrostu demograficznego oraz szybkiej ekspansji infrastruktury, co prowadzi do zwiększenia częstotliwości i różnorodności zjawisk ekstremalnych. Celem badania była identyfikacja głównych czynników kształtujących ryzyko katastrof, ocena zdolności państw i struktur międzynarodowych do reagowania na nowe zagrożenia oraz analiza możliwości ograniczania społecznych i ekonomicznych konsekwencji tych zjawisk. W artykule zastosowano porównawczą metodę systemową, analizę literatury oraz studia przypadków, co umożliwiło ocenę odporności instytucjonalnej w układzie międzyregionalnym. Wyniki analiz pozwoliły sformułować tezę, że globalna liczba katastrof będzie nadal rosła, a państwa i struktury międzynarodowe muszą systematycznie dostosowywać swoje systemy zarządzania kryzysowego do nowych typów i skali zagrożeń, uwzględniając również zdarzenia o bardzo niskim prawdopodobieństwie, lecz o wysokim potencjale destrukcji. Artykuł stanowi oryginalny wkład w dyskusję nad wyzwaniami zarządzania kryzysowego w warunkach strukturalnych zmian globalnych. Autorzy podkreślają poznawczą i praktyczną wartość wzmacniania świadomości społecznej, udoskonalania procesów planistycznych i zwiększania koordynacji pomiędzy podmiotami krajowymi i międzynarodowymi.

Słowa kluczowe: katastrofy naturalne; zarządzanie kryzysowe; infrastruktura krytyczna; Irlandia; Ameryka Południowa; odporność