ENERGY
TRAINING CENTER

Visegrad Fund

Climate change preparedness of the Polish energy infrastructure

Author: Karol Janas

Project:
"Energy Infrastructure Security During Climate Change-Induced Disasters"

Date: September 2026

IRMiR INSTITUTE OF URBAN AND REGIONAL DEVELOPMENT

Introduction

Poland's energy infrastructure, like that of other countries, is a key component of critical infrastructure and is vulnerable to external disruptions. It comprises facilities and equipment used to extract resources, generate, transport and store energy, and deliver it to consumers. It includes the electricity system as well as gas, fuel and district heating infrastructure.

Assessing the exposure and preparedness of Poland's energy infrastructure to climate-related hazards is neither straightforward nor clear-cut. Although it is possible to identify natural phenomena whose intensity and frequency may change as the climate warms, unequivocal attribution is difficult. A review of studies examining changes in the frequency and intensity of extreme events in Poland indicates an increase in heatwave frequency and atmospheric water demand, which favours drought. For severe thunderstorms, windstorms and precipitation, the findings are less conclusive. Poland's geographical location in temperate latitudes and its transitional climate are also important. The adverse effects of warming are less intense here than in subtropical, tropical, Arctic and high-mountain regions.[1]

Other external factors also shape perceptions of the threats facing the country's energy infrastructure. In the current geopolitical context, significant risks in Poland concern cybersecurity, potential sabotage, interruptions to energy resource supplies and sharp increases in their prices. The energy transition itself is also a major challenge, particularly when its pace exceeds the expansion of the necessary infrastructure, such as transmission networks, energy storage and new generating capacity capable of stabilising the national electricity system.

From this perspective, climate-related threats appear less significant. They should nevertheless not be underestimated: in a crisis, any additional stressor may trigger a chain of adverse events or cascading problems. Regardless of whether particular extreme events can be attributed to climate change, energy infrastructure must be adequately prepared for them. Drought is a hazard whose conditions of occurrence may change with the climate. Its consequences include low river levels, which also threaten the operation of older coal-fired power plants using once-through cooling systems.[2]

1. Links between climate change and phenomena that may affect Poland's energy infrastructure

1.1 Heatwaves show a clear increase in Polish observations

In her study Heat waves in Poland in the period 1951–2015: trends, patterns and driving factors, Joanna Wibig of the University of Łódź analysed data from 24 meteorological stations. She found an increase in the frequency and intensity of heatwaves, statistically significant at approximately 60% of the stations examined. A subsequent study covering 1951–2019 showed that the trend became more pronounced when data from the twenty-first century were included. These findings provide strong evidence of observed change in Poland.[3]

---

[1] Wibig, J., 'Hot Days and Heat Waves in Poland in the Period 1951–2019 and the Circulation Factors Favoring the Most Extreme of Them', Atmosphere, 12/3 (2021), article 340. DOI: https://doi.org/10.3390/atmos12030340. Arażny, A., Kępińska-Kasprzak, M., Łaszyca, E. Z., Chmist-Sikorska, J. and Bartczak, A., 'Reference evapotranspiration during the growing season in Poland (central Europe) in response to ongoing climate changes (1966–2020)', International Journal of Climatology, 43/14 (2023), pp. 6505–6522. DOI: https://doi.org/10.1002/joc.8216.

[2] Walczykiewicz, T. and Żelazny, M., 'Hydrological and Environmental Conditions and Implications of the Operation of a Thermal Power Plant with an Open Cooling System—An Example from Poland', Energies, 15/10 (2022), article 3600. DOI: https://doi.org/10.3390/en15103600.

[3] Wibig, J., 'Heat waves in Poland in the period 1951–2015: trends, patterns and driving factors', Meteorology Hydrology and Water Management, 6/1 (2018), pp. 37–45. DOI: https://doi.org/10.26491/mhwm/78420. J. Wibig, 'Hot Days and Heat Waves in Poland'.

An analysis of annual mean air temperature anomalies within Poland's present-day borders indicates long-term warming. The chart compares the Berkeley Earth, IMGW-PIB and Copernicus series against the 1850–1900 average (Figure 1); the value for 2025 is based on data up to 25 December.

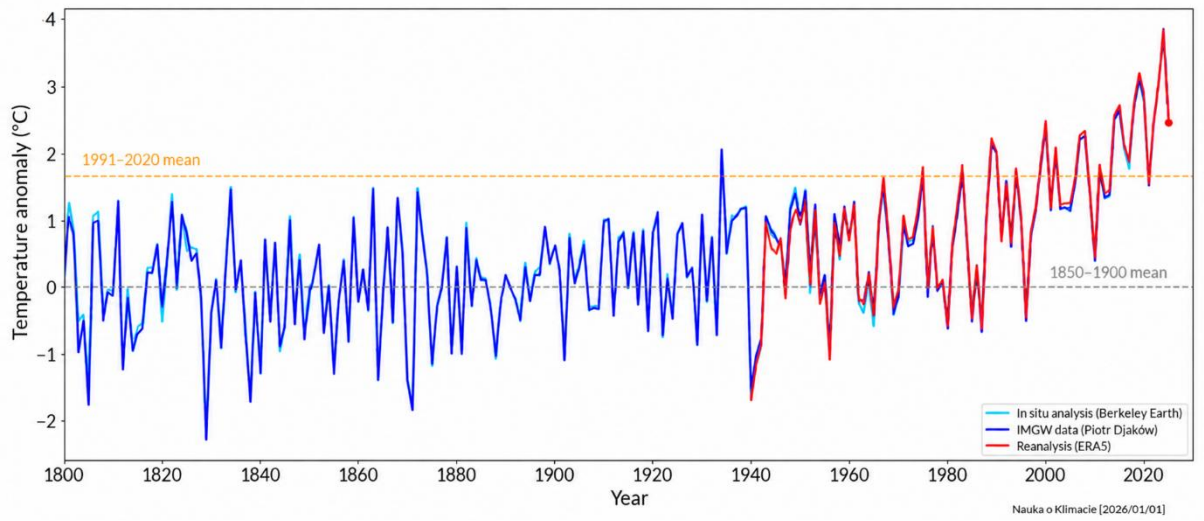


Figure 1. Changes in annual mean air temperature within Poland's present-day borders, 1800–2025, expressed as deviations from the 1850–1900 average. Source: English-language adaptation of the figure published by Nauka o Klimacie (2026); data: Berkeley Earth, IMGW-PIB and Copernicus.[4]

1.2 Long-term trends in extreme precipitation vary by month and location

The study Risk of Natural Hazards Caused by Extreme Precipitation in Poland in 1951–2020 found, among other changes, statistically significant increases in the number of days with precipitation exceeding 100 mm in May and 30, 50 and 70 mm in September. At the same time, decreases were identified for some thresholds during winter months.

These findings therefore do not justify a general statement that heavy rainfall is becoming more frequent everywhere in Poland. The region, season, precipitation threshold and study period must be specified. Trend analysis does not, in itself, establish causal attribution.[5]

An attribution study of the extreme rainfall in September 2024 identified the influence of anthropogenic climate change on its probability and intensity. The World Weather Attribution team, including scientists from Poland, examined the four-day rainfall associated with Storm Boris. The analysis covered a Central European region that included part of Poland, rather than Poland alone.

Combining observations and models, the authors estimated that human-induced climate change:

- approximately doubled the probability of such rainfall;
- increased its intensity by approximately 7%.

[4] Nauka o Klimacie, 'Anomalia temperatury rocznej Polski dla lat 1800–2025' [Annual temperature anomaly in Poland, 1800–2025], 1 January 2026, https://naukaoklimacie.pl/wykres-na-dzis/anomalia-temperatury-rocznej-polski-1800-2025 (accessed 11 October 2026).

[5] Kalbarczyk, R. and Kalbarczyk, E., 'Risk of Natural Hazards Caused by Extreme Precipitation in Poland in 1951–2020', Water, 16/12 (2024), article 1705. DOI: https://doi.org/10.3390/w16121705.

This is a specific example of research attributing an increase in the risk and intensity of an event to climate change. However, the result concerns rainfall in a particular region and over a particular timescale. It does not mean that every flood in Poland has become twice as likely.[6]

1.3 Drought and the strong signal of rising atmospheric water demand

Analysing the period 1966–2020, Araźny and co-authors found a statistically significant increase in growing-season reference evapotranspiration of 16.4 mm per decade. This is an indicator of atmospheric water demand that incorporates temperature, among other variables.

The finding indicates increasing pressure on water resources and conditions conducive to drought. It is not, however, equivalent to evidence that every type of drought—meteorological, agricultural and hydrological—is becoming more frequent in every region of Poland.[7]

1.4 Tornadoes and severe thunderstorms involve greater uncertainty

In Tornado Climatology of Poland, the authors noted that inconsistencies in the data prevented a reliable assessment of the historical trend in tornado numbers. The increase in reports partly reflected improved monitoring, photography and documentation of events. An increase in the number of reports alone therefore does not demonstrate a rise in frequency caused by climate change.[8]

1.5 Icing, freezing rain and rime

European projections suggest a possible decline in the frequency of freezing rain in Central Europe. This result should not be generalised to all forms of icing, particularly rime. The study by Kämäräinen et al. (2018), using seven EURO-CORDEX regional simulations, projects a 20–55% decline in freezing rain frequency in western, central and south-eastern Europe by the end of the century under the high-emissions RCP8.5 scenario, relative to 1971–2000. Nevertheless, such events occur in Poland and may threaten the country's energy infrastructure.[9]

2. Impacts of extreme natural events on energy infrastructure in Poland

2.1 Heatwaves and droughts

Heatwaves and prolonged periods of high temperature threaten Poland's energy infrastructure primarily by impairing cooling conditions and reducing available generating capacity and transmission capacity. In thermal power plants, higher cooling-water temperatures reduce efficiency and may require output to be curtailed. Units using once-through cooling systems that draw water from rivers are particularly vulnerable. When heat coincides with low river flows, constraints on water abstraction and the discharge of heat into rivers compound one another, including those arising from environmental protection requirements.[10]

High temperatures also impair the cooling of grid equipment, increasing the risk of overloads, failures and outages and reducing electricity transmission capacity. Prolonged heat maintains these adverse conditions over successive days. In its risk scenarios, Polskie Sieci

---

[6] World Weather Attribution, 'Climate change and high exposure increased costs and disruption to lives and livelihoods from flooding associated with exceptionally heavy rainfall in Central Europe', 25 September 2024, updated 26 September 2024, https://www.worldweatherattribution.org/climate-change-and-high-exposure-increased-costs-and-disruption-to-lives-and-livelihoods-from-flooding-associated-with-exceptionally-heavy-rainfall-in-central-europe/ (accessed 11 October 2026).

[7] Araźny et al., 'Reference evapotranspiration during the growing season in Poland'.

[8] Taszarek, M. and Brooks, H. E., 'Tornado Climatology of Poland', Monthly Weather Review, 143/3 (2015), pp. 702–717. DOI: https://doi.org/10.1175/MWR-D-14-00185.1.

[9] Kämäräinen, M., Hyvärinen, O., Vajda, A., Nikulin, G., van Meijgaard, E., Teichmann, C., Jacob, D., Gregow, H. and Jylhä, K., 'Estimates of Present-Day and Future Climatologies of Freezing Rain in Europe Based on CORDEX Regional Climate Models', Journal of Geophysical Research: Atmospheres, 123/23 (2018), pp. 13291–13304. DOI: https://doi.org/10.1029/2018JD029131.

[10] T. Walczykiewicz and M. Żelazny, 'Hydrological and Environmental Conditions'.

Elektroenergetyczne (PSE), Poland's electricity transmission system operator, considers simultaneous reductions in power plant availability, transmission capacity and electricity import capability, as well as declining photovoltaic module efficiency as modules heat up.[11]

The greatest threat is systemic: reduced supply may coincide with rising electricity demand for air conditioning and refrigeration, and, during calm weather, low wind generation. August 2015 provides an example, when heat and adverse hydrological conditions, combined with failures and the unavailability of some generating units, led to restrictions on electricity consumption. System resilience therefore depends on upgrading cooling systems and networks, maintaining reserve capacity and enabling flexible reductions in demand.[12]

2.2 Extreme precipitation and floods

Heavy rainfall and floods threaten energy infrastructure in Poland by inundating equipment, undermining structures and hampering repairs. Intense rainfall can cause local flooding even outside river valleys when drainage systems cannot remove water quickly enough. River floods can affect extensive areas and prevent access to infrastructure for longer periods. Protective measures should safeguard substations against inundation and foundations against scour, and ensure effective stormwater drainage.

Substations, switchgear and control equipment located in flood-prone areas or topographical depressions are particularly exposed. Electricity supply interruptions result both from damage and from precautionary disconnections intended to protect people from electric shock. Scour can destabilise poles and cause trees to fall onto power lines. Flooded and damaged roads impede repair crews, while restoring supply requires equipment to be cleaned, dried and inspected. These mechanisms were observed during the floods of September 2024.[13]

The hazards also affect generating facilities and district heating infrastructure: during the 2024 floods, TAURON reported flooding at hydropower plants and in parts of its district heating infrastructure. The scale of the impacts depends on the location and protection of facilities. Priorities should therefore include assessing exposure to inundation, protecting and elevating sensitive equipment, ensuring effective drainage, and providing alternative electricity supply routes and access for technical crews.[14]

2.3 Strong winds and tornadoes

Strong winds and tornadoes threaten Poland's energy infrastructure primarily through mechanical damage to overhead networks: broken conductors, snapped or toppled poles, and equipment damaged by fallen trees and wind-borne objects. Sections passing through wooded areas are particularly vulnerable. For example, during the severe storms of 19–20 June 2024,

---

[11] Polskie Sieci Elektroenergetyczne S.A., 'Zarządzanie ryzykiem' [Risk management], PSE Impact Report 2023, n.d., https://raport.pse.pl/zarzadzanie/zarzadzanie-ryzykiem (accessed 11 October 2026).

[12] Polskie Sieci Elektroenergetyczne S.A., 'Komentarz PSE do publikacji Forum Analiz Energetycznych FAE dotyczących niedoboru mocy w polskim systemie elektroenergetycznym w sierpniu 2015 r.' [PSE commentary on the Energy Analysis Forum publications concerning the capacity shortage in the Polish electricity system in August 2015], 17 September 2015, https://www.pse.pl/-/komentarz-pse-do-publikacji-forum-analiz-energetycznych-fae-dotyczacych-niedoboru-mocy-w-polskim-systemie-elektroenergetycznym-w-sierpniu-2015-r- (accessed 11 October 2026).

[13] TAURON Dystrybucja S.A., 'Zalania i uszkodzenia infrastruktury energetycznej' [Flooding and damage to energy infrastructure], 15 September 2024, https://www.tauron-dystrybucja.pl/o-spolce/aktualnosci/2024/09/15 (accessed 11 October 2026).

[14] TAURON Polska Energia S.A., 'Służby Grupy TAURON pracują nad przywróceniem zasilania na terenach dotkniętych powodzią' [TAURON Group crews work to restore electricity supply in flood-affected areas], 16 September 2024, https://media.tauron.pl/pr/840503/sluzby-grupy-tauron-pracuja-nad-przywroceniem-zasilania-na-terenach-dotknietych-powodzia (accessed 11 October 2026).

TAURON Dystrybucja recorded damage to lines and pole structures; approximately 31,000 customers remained without electricity in the morning.[15]

Windstorms can cause widespread, simultaneous failures, whereas tornadoes concentrate exceptionally strong impacts within a relatively narrow corridor, where numerous infrastructure components may be destroyed. Transmission networks are also at risk: winds on 5–6 October 2017 damaged one 400 kV line and 17 of PSE's 220 kV lines. Damage to a line need not, however, interrupt supply if alternative connections are available.[16]

The consequences include power outages, transmission constraints and reconstruction costs. Fallen trees and hazardous working conditions hinder crew access and prolong repairs.[17]

Reducing risk requires maintaining adequate vegetation clearance around conductors, upgrading structures, selectively replacing overhead lines with underground cables, and ensuring alternative supply routes and effective emergency procedures. Resilience assessments should consider wind strength as well as the condition, surroundings and importance of each network component.

2.4 Icing, rime and freezing rain

Icing caused by freezing rain and rime threatens Poland's energy infrastructure primarily through the accumulation of ice loads on conductors and overhead network structures. Freezing rain forms a compact layer of glaze ice, whereas rime forms when supercooled fog or cloud droplets freeze on surfaces. Both processes can cause substantial increases in the mass of deposits.[18]

Accumulated ice increases loads on conductors, insulators and poles and, in combination with wind, can cause mechanical damage and electricity supply interruptions. Ice-laden trees and branches falling onto lines pose an additional threat. In wind power generation, ice accretion on blades impairs aerodynamic performance, reduces output and may require turbines to be shut down. Both the maximum ice mass and the duration of icing matter.[19]

Vulnerability varies considerably at the local level and depends on temperature, humidity, wind, terrain and equipment exposure. Mountain areas and locations with frequent fog require particular attention. Risk reduction requires structures to be designed for appropriate ice and wind loads, icing to be monitored, vegetation around lines to be managed, and alternative supply routes to be provided. These phenomena should be included in infrastructure resilience assessments, although there is insufficient evidence to conclude that climate change is intensifying them across Poland. Projections for Central Europe suggest a decline in freezing rain frequency, with greater uncertainty concerning extreme events.[20]

---

[15] TAURON Dystrybucja S.A., 'Trwa usuwanie awarii energetycznych' [Work continues to repair power failures], 20 June 2024, https://www.tauron-dystrybucja.pl/o-spolce/aktualnosci/2024/06/20 (accessed 11 October 2026).

[16] Polskie Sieci Elektroenergetyczne S.A., 'Komunikat Polskich Sieci Elektroenergetycznych S.A. z 6 października 2017 z godziny 19:40' [PSE statement of 6 October 2017 at 19:40], 6 October 2017, https://www.pse.pl/-/komunikat-polskich-sieci-elektroenergetycznych-s-a-z-6-pazdziernika-2017-z-godziny-19-40 (accessed 11 October 2026).

[17] TAURON Dystrybucja S.A., 'Trwa usuwanie awarii energetycznych' [Work continues to repair power failures].

[18] Kämäräinen et al., 'Estimates of Present-Day and Future Climatologies of Freezing Rain'. World Meteorological Organization, 'Rime', International Cloud Atlas, n.d., https://cloudatlas.wmo.int/en/rime.html (accessed 11 October 2026).

[19] Rockas, O., Isolähteenmäki, P., Laine, M., Lindfors, A. V., Hämäläinen, K. and Laakso, A., 'Future rime ice conditions for energy infrastructure over Fennoscandia resolved with a high-resolution regional climate model', Natural Hazards and Earth System Sciences, 26 (2026), pp. 1813–1834. DOI: https://doi.org/10.5194/nhess-26-1813-2026.

[20] Hůnová, I., Brabec, M., Malý, M., Valeriánová, A. and Elleder, L., 'Rime ice formation: Insight into time trends over the last two decades based on observations in a Central European country', Journal of Mountain Science, 23/2 (2026), pp. 470–488. DOI: https://doi.org/10.1007/s11629-025-9784-z. Kämäräinen et al., 'Estimates of Present-Day and Future Climatologies of Freezing Rain'.

3. Preparedness of Poland's infrastructure for extreme natural events and their potential intensification due to climate change

Poland's electricity infrastructure benefits from well-developed procedures for responding to extreme weather, but its resilience is uneven. Monitoring, network reconfiguration, coordinated maintenance, and system defence and restoration plans limit the consequences of failures. They do not, however, eliminate the vulnerability of individual facilities or the risk of multiple simultaneous failures.[21]

3.1 Heatwaves and droughts

PSE monitors weather conditions and the levels and temperatures of water used to cool power plants. Some units use recirculating cooling systems; at Kozienice and Połaniec, water impoundment has been used to safeguard abstraction.[22]

Units with once-through cooling nevertheless remain dependent on river flows and temperatures. Heatwaves may simultaneously constrain generation, transmission and imports while increasing demand. Cooling systems need to be upgraded, water availability under future climatic conditions assessed, and reserve capacity and demand flexibility developed.

3.2 Extreme precipitation and floods

Operators carry out precautionary disconnections, mobilise crews and deploy pumps, dehumidifiers and generators. Experience gained during floods supports the organisation of restoration work.[23]

The 2024 floods revealed the vulnerability of substations, hydropower plants and parts of district heating infrastructure, as well as access difficulties. Priorities include reviewing facility locations, protecting equipment against inundation, improving drainage and providing backup power for critical infrastructure.[24]

3.3 Strong winds and tornadoes

Vegetation management around lines, conversion of overhead sections to underground cables and alternative connections limit the consequences of damage.[25]

Nevertheless, severe storms continue to cause extensive damage to conductors and poles, particularly in wooded areas. Selective undergrounding of the most vulnerable sections, structural upgrades and enhanced capability to switch electricity supply routes are needed. For tornadoes, the main priorities are limiting the consequences of local destruction and ensuring rapid restoration.[26]

3.4 Icing, rime and freezing rain

Operational experience in winter conditions and the option of undergrounding networks provide a basis for reducing risk. Overhead networks and wind turbines remain vulnerable to ice

---

[21] Polskie Sieci Elektroenergetyczne S.A., 'Zarządzanie ryzykiem' [Risk management].

[22] Polskie Sieci Elektroenergetyczne S.A., 'Zarządzanie ryzykiem' [Risk management]. T. Walczykiewicz and M. Żelazny, 'Hydrological and Environmental Conditions'.

[23] TAURON Dystrybucja S.A., 'Zalania i uszkodzenia infrastruktury energetycznej' [Flooding and damage to energy infrastructure]. TAURON Dystrybucja S.A., 'Energetycy pracują, by przywrócić zasilanie po powodziach' [Power engineers work to restore electricity supply after the floods], 16 September 2024, https://www.tauron-dystrybucja.pl/o-spolce/aktualnosci/2024/09/16 (accessed 11 October 2026).

[24] TAURON Polska Energia S.A., 'Służby Grupy TAURON pracują nad przywróceniem zasilania' [TAURON Group crews work to restore electricity supply].

[25] TAURON Dystrybucja S.A., 'Plan rozwoju na lata 2023-2028' [Development plan for 2023–2028], 2023, https://www.tauron-dystrybucja.pl/-/media/offer-documents/dystrybucja/inne-dokumenty/plan-rozwoju/plan-rozwoju_2023-2028_dokument.ashx (accessed 11 October 2026).

[26] TAURON Dystrybucja S.A., 'Trwa usuwanie awarii energetycznych' [Work continues to repair power failures].

accretion. Limited data on icing intensity make resilience difficult to assess. Local monitoring of ice loads, verification of structures against combined ice and wind loading, and appropriate turbine protection are needed.[27]

Conclusions

The organisation of system operation and the capacity to respond are strengths of energy infrastructure management in Poland in terms of preparedness for extreme weather. Nevertheless, uneven physical resilience and vulnerability to events affecting many facilities simultaneously still require particular attention and further action. Planned expansion and modernisation of the transmission network offer an opportunity to improve resilience, but announced investments do not yet demonstrate that resilience has been achieved.[28]

Additional action should be informed by local assessments of hazards, technical condition and the importance of each facility for continuity of supply. Adaptation upgrades should be combined with investments required for the energy transition, selecting solutions that both improve reliability and reduce the costs of failures. Uniform intensification of all hazards should not be assumed: for icing, particularly freezing rain, the direction of change remains variable.[29]

[27] Walawender, E., Walawender, J. P. and Ustrnul, Z., 'Geospatial Predictive Modelling for Climate Mapping of Selected Severe Weather Phenomena Over Poland: A Methodological Approach', Pure and Applied Geophysics, 174/2 (2017), pp. 643–659. DOI: https://doi.org/10.1007/s00024-016-1250-y. Rockas et al., 'Future rime ice conditions for energy infrastructure'.

[28] Polskie Sieci Elektroenergetyczne S.A., 'Plan rozwoju sieci przesyłowej na lata 2025–2034 uzgodniony' [Transmission network development plan for 2025–2034 agreed], 2 January 2025, https://www.pse.pl/-/projekt-nowego-planu-rozwoju-sieci-przesylowej-na-lata-2025-2034-uzgodniony (accessed 11 October 2026).

[29] Kämäräinen et al., 'Estimates of Present-Day and Future Climatologies of Freezing Rain'.

References and sources

Araźny, A., Kępińska-Kasprzak, M., Łaszyca, E. Z., Chmist-Sikorska, J. and Bartczak, A., 'Reference evapotranspiration during the growing season in Poland (central Europe) in response to ongoing climate changes (1966–2020)', International Journal of Climatology, 43/14 (2023), pp. 6505–6522. DOI: https://doi.org/10.1002/joc.8216.

Hůnová, I., Brabec, M., Malý, M., Valeriánová, A. and Elleder, L., 'Rime ice formation: Insight into time trends over the last two decades based on observations in a Central European country', Journal of Mountain Science, 23/2 (2026), pp. 470–488. DOI: https://doi.org/10.1007/s11629-025-9784-z.

Kalbarczyk, R. and Kalbarczyk, E., 'Risk of Natural Hazards Caused by Extreme Precipitation in Poland in 1951–2020', Water, 16/12 (2024), article 1705. DOI: https://doi.org/10.3390/w16121705.

Kämäräinen, M., Hyvärinen, O., Vajda, A., Nikulin, G., van Meijgaard, E., Teichmann, C., Jacob, D., Gregow, H. and Jylhä, K., 'Estimates of Present-Day and Future Climatologies of Freezing Rain in Europe Based on CORDEX Regional Climate Models', Journal of Geophysical Research: Atmospheres, 123/23 (2018), pp. 13291–13304. DOI: https://doi.org/10.1029/2018JD029131.

Nauka o Klimacie, 'Anomalia temperatury rocznej Polski dla lat 1800–2025' [Annual temperature anomaly in Poland, 1800–2025], 1 January 2026, https://naukaoklimacie.pl/wykres-na-dzis/anomalia-temperatury-rocznej-polski-1800-2025 (accessed 11 October 2026).

Polskie Sieci Elektroenergetyczne S.A., 'Komentarz PSE do publikacji Forum Analiz Energetycznych FAE dotyczących niedoboru mocy w polskim systemie elektroenergetycznym w sierpniu 2015 r.' [PSE commentary on the Energy Analysis Forum publications concerning the capacity shortage in the Polish electricity system in August 2015], 17 September 2015, https://www.pse.pl/-/komentarz-pse-do-publikacji-forum-analiz-energetycznych-fae-dotyczacych-niedoboru-mocy-w-polskim-systemie-elektroenergetycznym-w-sierpniu-2015-r- (accessed 11 October 2026).

Polskie Sieci Elektroenergetyczne S.A., 'Komunikat Polskich Sieci Elektroenergetycznych S.A. z 6 października 2017 z godziny 19:40' [PSE statement of 6 October 2017 at 19:40], 6 October 2017, https://www.pse.pl/-/komunikat-polskich-sieci-elektroenergetycznych-s-a-z-6-pazdziernika-2017-z-godziny-19-40 (accessed 11 October 2026).

Polskie Sieci Elektroenergetyczne S.A., 'Plan rozwoju sieci przesyłowej na lata 2025–2034 uzgodniony' [Transmission network development plan for 2025–2034 agreed], 2 January 2025, https://www.pse.pl/-/projekt-nowego-planu-rozwoju-sieci-przesylowej-na-lata-2025-2034-uzgodniony (accessed 11 October 2026).

Polskie Sieci Elektroenergetyczne S.A., 'Zarządzanie ryzykiem' [Risk management], PSE Impact Report 2023, n.d., https://raport.pse.pl/zarzadzanie/zarzadzanie-ryzykiem (accessed 11 October 2026).

Rockas, O., Isolähteenmäki, P., Laine, M., Lindfors, A. V., Hämäläinen, K. and Laakso, A., 'Future rime ice conditions for energy infrastructure over Fennoscandia resolved with a high-resolution regional climate model', Natural Hazards and Earth System Sciences, 26 (2026), pp. 1813–1834. DOI: https://doi.org/10.5194/nhess-26-1813-2026.

Taszarek, M. and Brooks, H. E., 'Tornado Climatology of Poland', Monthly Weather Review, 143/3 (2015), pp. 702–717. DOI: https://doi.org/10.1175/MWR-D-14-00185.1.

TAURON Dystrybucja S.A., 'Energetycy pracują, by przywrócić zasilanie po powodziach' [Power engineers work to restore electricity supply after the floods], 16 September 2024, https://www.tauron-dystrybucja.pl/o-spolce/aktualnosci/2024/09/16 (accessed 11 October 2026).

TAURON Dystrybucja S.A., 'Plan rozwoju na lata 2023–2028' [Development plan for 2023–2028], 2023, https://www.tauron-dystrybucja.pl/-/media/offer-documents/dystrybucja/inne-dokumenty/plan-rozwoju/plan-rozwoju_2023-2028_dokument.ashx (accessed 11 October 2026).

TAURON Dystrybucja S.A., 'Trwa usuwanie awarii energetycznych' [Work continues to repair power failures], 20 June 2024, https://www.tauron-dystrybucja.pl/o-spolce/aktualnosci/2024/06/20 (accessed 11 October 2026).

TAURON Dystrybucja S.A., 'Zalania i uszkodzenia infrastruktury energetycznej' [Flooding and damage to energy infrastructure], 15 September 2024, https://www.tauron-dystrybucja.pl/o-spolce/aktualnosci/2024/09/15 (accessed 11 October 2026).

TAURON Polska Energia S.A., 'Służby Grupy TAURON pracują nad przywróceniem zasilania na terenach dotkniętych powodzią' [TAURON Group crews work to restore electricity supply in flood-affected areas], 16 September 2024, https://media.tauron.pl/pr/840503/sluzby-grupy-tauron-pracuja-nad-przywroceniem-zasilania-na-terenach-dotknietych-powodzia (accessed 11 October 2026).

Walawender, E., Walawender, J. P. and Ustrnul, Z., 'Geospatial Predictive Modelling for Climate Mapping of Selected Severe Weather Phenomena Over Poland: A Methodological Approach', Pure and Applied Geophysics, 174/2 (2017), pp. 643–659. DOI: https://doi.org/10.1007/s00024-016-1250-y.

Walczykiewicz, T. and Żelazny, M., 'Hydrological and Environmental Conditions and Implications of the Operation of a Thermal Power Plant with an Open Cooling System—An Example from Poland', Energies, 15/10 (2022), article 3600. DOI: https://doi.org/10.3390/en15103600.

Wibig, J., 'Heat waves in Poland in the period 1951–2015: trends, patterns and driving factors', Meteorology Hydrology and Water Management, 6/1 (2018), pp. 37–45. DOI: https://doi.org/10.26491/mhwm/78420.

Wibig, J., 'Hot Days and Heat Waves in Poland in the Period 1951–2019 and the Circulation Factors Favoring the Most Extreme of Them', Atmosphere, 12/3 (2021), article 340. DOI: https://doi.org/10.3390/atmos12030340.

World Meteorological Organization, 'Rime', International Cloud Atlas, n.d., https://cloudatlas.wmo.int/en/rime.html (accessed 11 October 2026).

World Weather Attribution, 'Climate change and high exposure increased costs and disruption to lives and livelihoods from flooding associated with exceptionally heavy rainfall in Central Europe', 25 September 2024, updated 26 September 2024, https://www.worldweatherattribution.org/climate-change-and-high-exposure-increased-costs-and-disruption-to-lives-and-livelihoods-from-flooding-associated-with-exceptionally-heavy-rainfall-in-central-europe/ (accessed 11 October 2026).