



# Metis

## Study

### Scenarios for the effects of climate change on security policy in Germany

No. 36 | July 2023

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# Summary

**T**his study discusses the security implications and effects of climate change in Germany. On the basis of a combination of scenarios developed by the IPCC (Intergovernmental Panel on Climate Change) for emission-induced climate change and associated socio-economic transformation processes, the study develops three reference scenarios to illustrate the various operational scenarios for subsidiary assistance and host nation support (HNS). The different

development paths are traced to outline some of the future challenges posed by climate-induced operations at home and to derive recommended courses of action for the Bundeswehr.<sup>1</sup>

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<sup>1</sup> The courses of action recommended in this study are based on the recorded development paths and refer to a period of 20+ years. Most of these recommendations will not necessarily be possible to implement in the current legal and security policy environment.

## Effects of climate change on Germany

Climate change has extensive consequences in Germany. In its Climate Impact and Risk Assessment 2021 for Germany, the German Environment Agency compared and combined climate projections based on historic, national and regional models and meteorological data with the IPCC's Representative Concentration Pathways (RCPs) and its Shared Socioeconomic Pathways (SSPs). According to the report, Germany already experiences an average annual temperature that is 1.6 °C higher than it was in 1881 (see Fig. 1).

There already is a trend toward more frequent, severe and longer-lasting extreme weather events such as floods, forest fires, droughts and heat waves, storms and heavy rainfall. The German Environment Agency thus projects that temperatures will continue to increase with extensive social and economic consequences. Should these projections materialise, we could be faced with the following climatic, economic and political implications.

### Climate and extreme weather events

- Several new record temperatures in Germany by 2050; mild winter months and hot summer months with above-average temperatures; more changeable weather in spring and autumn, with highly concentrated precipitation and major temperature fluctuations.

- Regional power cuts caused by high temperatures, when power grids, distribution boxes, relays or generators fail as a result of overuse and overheating; regional extreme precipitation resulting in flooding, washed-out roads and soil erosion.
- More frequent extreme weather events resulting in greater damage.

### Economic implications

- Greater damage leading to higher costs for the repair, protection and maintenance of critical infrastructure in Germany.
- More disruptions of production, supply chain interruptions and more cost-intensive logistics.
- Increasing frequency of climate crises leading to insurance claims in the billions every year.
- Gradual legal restrictions on non-essential economic sectors, causing branches such as the entertainment, consumption and tourism industries to become less viable due to higher prices.
- Organisations that represent the interests of the manufacturing trade trying to obtain special dispensations and exemptions for their interest groups.

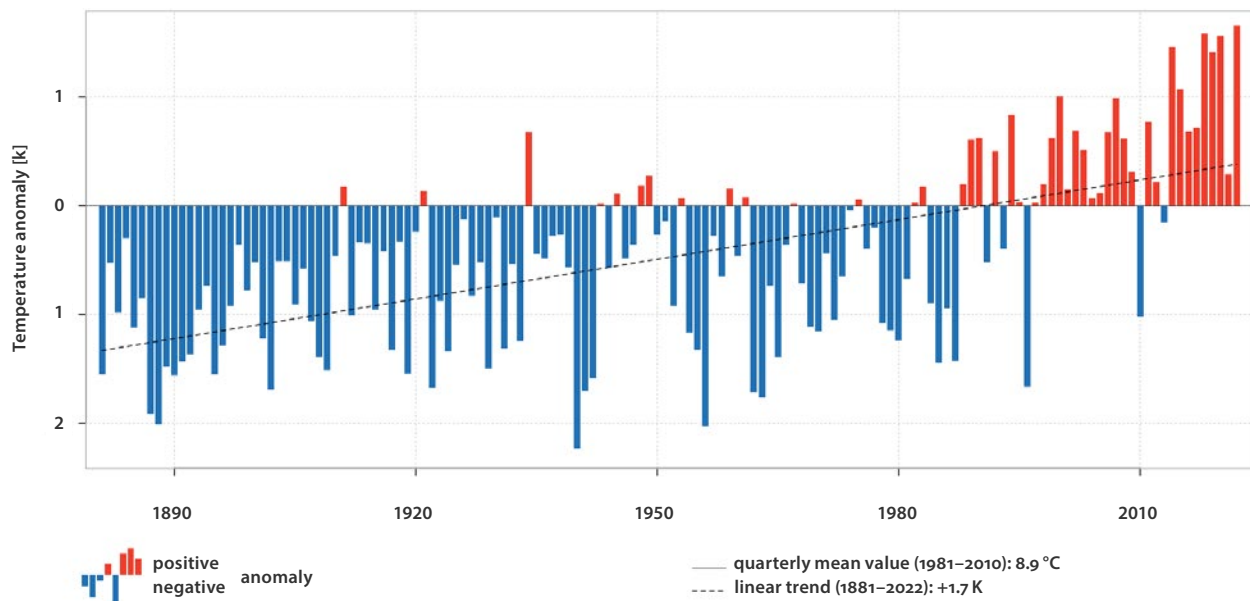


Fig. 1 Average annual temperatures in Germany between 1881 and 2022 as anomalies in the reference period 1981 to 2010 | Source: DWD.de/zeitreihen

### Social implications

- Increased polarisation and division of society as a result of national climate protection policy and regulation; broad consensus among the public in favour of climate protection measures – yet fierce debates on issues of social fairness, sustainability and plausibility of individual projects, fuelled by representatives of particular fossil interests.
- Increasingly heated debate, with sections of the public that feel financially and socially left behind as well as parts of the middle class increasingly perceiving decarbonisation measures as an economic control mechanism of the political elites; classes that are financially better off still able to flourish while majority of the population are subject to climatic and economic restrictions as a result of soaring prices and lack of social redistribution.
- National crisis management and disaster control increasingly important; state elections won by parties and politicians who represent successful crisis management.
- Political future of decision makers on the federal level affected by lack of responsiveness and poor resilience and effectivity; social capital of ministries, agencies and leading politicians increasingly determined by their ability to prevent crises and manage crises efficiently.

In Germany, too, climate change thus also creates risks to human security and to political and economic stability. There are complex interdependencies and feedback loops

between these dimensions, making it difficult to isolate the effects of climate change on one single area of security or society. Environmental changes and climatic influences in fact reinforce existing security challenges that already affect the Global North and which stem from a complex web of social, political and economic factors. Climate change therefore has implications for domestic security, which in turn influence potential operational scenarios within Germany.

### Basic scenarios for emission-induced climate change

In its 2014 and 2022 Assessment Reports, the IPCC outlined several scenarios for the possible development of emissions-induced climate change. These scenarios were presented as Representative Concentration Pathways (RCPs) and describe four different paths for the development of the global average temperature in the 21st century. The RCPs represent plausible scenarios (see Figure 2) for the effects of both emissions and emission reduction and are based on a broad spectrum of scientific literature.

- RCP 2.6 assumes that global annual greenhouse gas emissions will peak sometime between 2020 and 2040 and then decline.
- RCP 4.5 describes emissions peaking around 2050 and then stagnating.
- RCP 6 assumes emissions will peak around 2100 before stagnating.
- RCP 8.5 assumes that emissions will continue to increase unchecked.



In 2022, Shared Socio-economic Pathways (SSPs) were developed to complement the RCP scenarios. The SSPs outline five scenarios (see Fig. 3):

- SSP1–1.9 describes a green sustainability scenario in which the global commons are preserved, economic growth is coupled with environmental protection, and global consumption is less resource- and energy-intensive.
- SSP1–2.6 steers a middle course of continuing the current development. International cooperation continues to develop but has limited effects overall. Population growth remains moderate and stagnates around 2050, while environmental systems experience a certain level of degradation.
- SSP2–4.5 assumes that competitiveness and regional conflicts will overshadow global issues. Investment in technological developments declines while social inequalities increase. On a global scale, issues of environmental protection fade into the background.
- SSP3–7.0 assumes great global inequality. Cooperation between developed societies and less developed states decreases. Environmental policy is increasingly dictated by economic necessities and focuses on issues that benefit the elites.
- SSP5–8.5 continues the current fossil development. Economic growth continues to be based on fossil fuels and is characterised by high energy intensity. The global economy continues to grow, while environmental impacts are managed locally. There is a general belief that social and economic systems can be effectively managed, if necessary by geo-engineering.

### Possible operational scenarios and climate change

Based on the implications of climate change in Germany described above and a combination of the emissions-based and socio-economic development pathways, the following section outlines three different national scenarios for the period until 2050.

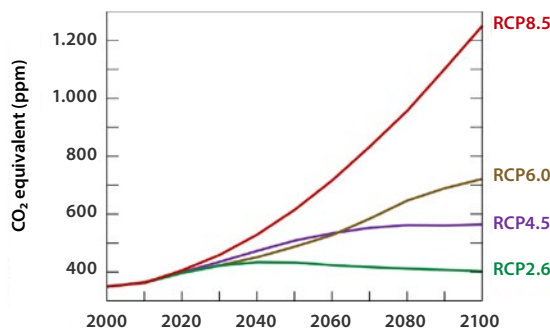


Fig. 2 Scenarios for all forcing agents' atmospheric CO<sub>2</sub> equivalent concentrations | Source: IPCC AR5 2014

### — Scenario 1 Exploitation of climate-induced vulnerabilities for hybrid attacks (RCP 4.5 + SSP1–2.6)

The Hybrid Attack scenario assumes that the CO<sub>2</sub> content in the air will exceed 500 ppm by 2050 and that the global average temperature will have increased by 2.1 °C. Under these conditions, Germany will suffer extreme water shortages as a result of mild winters and periods of drought. Average annual rainfall always remains below 500 mm. The levels of large rivers remain low for months on end, which severely restricts domestic shipping. Agriculture and industry face tighter legal restrictions on water consumption. A certification system is gradually introduced to help to establish low-consumption production. The public is asked to save water, particularly during the summer months. To reduce the risk of forest fires, access to forests is restricted and hiking is prohibited, tourism is curtailed and open fires are banned almost everywhere. In some regions, the water supply is switched off for twelve hours every day from May to September to protect groundwater levels and water reserves. Anybody caught violating the rules, e.g. to wash their private car or to water large areas of their garden, will face a municipal fine. Environmental offences and violations of environmental regulations are prosecuted. Despite such political regulatory and environmental measures, climate change generates ecological vulnerabilities that, in future, can be targeted by hybrid actors.

In June 2029, a conflict escalates between the EU countries and Russia, which culminates in extensive economic sanctions being imposed against Moscow. All trade with Russia is suspended, and draconian measures are used to punish EU companies that import or export goods to or from Russia via detours.

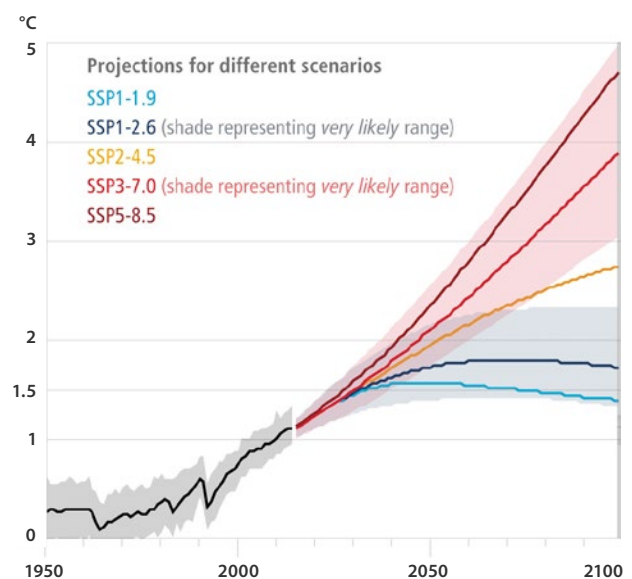


Fig. 3 Socio-economic scenarios for global surface temperature changes relative to 1850–1900 | Source: IPCC AR6 2022)



In addition, the EU announces secondary sanctions against companies with headquarters in countries that continue to be active on the Russian market. The EU imposes a full embargo on Kaliningrad in order to force the Russian government to change its strategy. In the Kremlin, Germany is identified as one of the key drivers of the new sanction regime, and preparations begin for a conventional conflict with the EU. The initial aim is to manufacture domestic crises to politically paralyse Germany as the strongest economy in the EU.

To this end, existing sleeper cells and infiltrated agents are activated. They mobilise small operational cells of willing extreme elements in German society. On top of this, a major disinformation and radicalisation campaign is initiated on social media with the help of AI bots in hopes of encouraging as many copycats as possible. The plan is to slow down the investigation by the security forces. The idea is to attack Germany with hundreds of fires simultaneously set in dozens of forested areas. In this way, Moscow hopes to overwhelm and destabilise national security and crisis management agencies, to engender political apathy among the general public and to push the German government into crisis and thus incapacitate it. Severe forest fires rage all over Germany for weeks, aggravated by strong winds, high temperatures and water shortages. The sky above cities and metropolitan areas is darkened by smoke. Thousands of people are hospitalised with breathing problems. New fires continue to break out even after a week, and once the first arsonists have been caught, it becomes clear that the fires are not a climate-induced phenomenon but a hybrid attack that exploits the dry conditions. Although all available civilian and military forces are deployed and supported by volunteers and the EU civil protection mechanism has been activated and has provided thousands of aid workers from other EU countries, it takes four weeks to bring the fires under control throughout the country.

Initially, the Bundeswehr is primarily tasked with providing subsidiary administrative assistance. Thousands of applications for administrative assistance have to be processed and assessed within a very tight time frame. Personnel and materiel have to be operationally ready and deployed very quickly and supplied for weeks on end. Coordination with civilian agencies and local relief forces must be maintained and ensured without interruption at all levels of decision-making; civilian and military operational picture systems must be interconnected and decision-makers provided with relevant information. When it becomes clear that what is happening is a coordinated hybrid attack, what started as subsidiary assistance transforms into a national and collective defence operation. The Bundeswehr now also has to support state and federal police forces with personnel and materiel for reconnaissance and prevention purposes. Evacuation measures and defence of critical infrastructure to support the police are augmented by calling up reservists, earmarking crisis reaction forces and detaching units for border protection.

## — Scenario 2

### **High Readiness Task Force Poland 2036 (RCP 6.0 + SSP 3–7.0)**

The Host Nation Support (HNS) scenario assumes that the CO<sub>2</sub> content in the air will exceed 550 ppm by 2050 and that the global average temperature will have increased by 2.25 °C. Sea levels rise by 20 to 40 centimetres. Parts of Northern Europe, including Bremen and Hamburg, will be affected. Embankments, locks and barrages prevent the rise in sea levels from threatening densely populated areas. In 2034, the US Army continues to use the so-called ABC Peninsula in Bremerhaven to deploy troops and for replenishment purposes. Since the isolationist US President was voted out in 2034, the US have been more involved in Europe again. From 2035, preparations are underway for NATO's "High Readiness Task Force Poland 2036" (HRTFP 2036) plan. The aim is to redeploy parts of the 1st Brigade of the 10th Mountain Division and other support forces to the Lublin area. Since existing port facilities in Poland are insufficient and some of the materiel is already kept in US depots in Germany, Washington decides to apply for Bremerhaven to be used as a marshalling area for the march from Germany to Poland. The Federal Ministry of Defence (FMoD) receives and approves the request for HNS in 2035. Partial deployment towards Germany already begins in 2035. Vehicles are gathered in the port area: 200 Humvees, around 150 armoured vehicles (Armored Infantry Fighting Vehicle, AIFV and Mine-Resistant Ambush Protected, MRAP), 50 of the latest Abrams tank models and 300 Oshkosh tractor units. Due to the rise in sea levels, unloading from the many transport ships is delayed by several weeks because the ships have to be kept in the locks for longer. Arriving ships are also requested to wait in the open sea to prevent waves from putting more pressure on embankments and barriers.

Initially, the deployment to reinforce the eastern NATO border against Belarus is well received in Germany. Due to the delay, however, the public becomes aware of the kind of equipment to be transported through Germany as part of the relocation process. Some criticise that the US vehicles do not comply with EU emissions standards. The fuel consumption of the Humvee (17 l/100 km) and the Oshkosh (115 l/100 km) attract public attention. Before the relocation process even begins, demonstrators and climate activists besiege the port facility, block access roads and use high-profile protest campaigns to try and shift public opinion against the deployment for HRTFP 2036. When the deployment process begins in January 2036, the convoy is often delayed for hours by demonstrators and road blocks. Demonstrators throw stones, dye bombs and Molotov cocktails at the vehicles, hoist political slogans such as "YANKS, GO HOME!" on motorway bridges and stage several sit-in demonstrations. Instead of taking 24 hours as planned, the convoy has to keep changing course all over Germany until it reaches the German-Polish border.



Initially, this scenario means that the Bundeswehr has to provide HNS to ensure the security of its Alliance partner's forces as well as their freedom of movement throughout the redeployment process. This includes keeping suitable routes open and planning alternative routes in case of disruptions. Alternative routes have to be coordinated with available fuel depots, and forces have to be set aside to secure them. Coordination with the police forces of the federal states that the convoy travels through has to be guaranteed for each modality. In the event that violence erupts against Alliance partner units while they are on the move, the Bundeswehr must be prepared to cooperate with local police forces to maintain their monopoly on the use of force. Close coordination and consultation with the Alliance partner's military police is also essential to contain any potential for escalation. This includes integrating the mission command and control systems of the partner countries into a joint situation picture provided by the Bundeswehr.

#### — Scenario 3

##### **National heatwave – Helios 2048**

(RCP 8.5 + SSP 5–8.5)

The Helios scenario assumes that the concentration of CO<sub>2</sub> in the air will exceed 600 ppm by 2050 and the global average temperature will have increased by 2.5 °C. In June 2048, a high-pressure area – named Helios after the Greek god who personifies the Sun – spreads across large parts of Germany. Because of a weak jet stream, Helios remains almost stationary for five weeks as an area of high air pressure near to the ground. Air masses sink across large areas. The air warms up through adiabatic heating, preventing condensation and cloud formation. As a result, the German Meteorological Service records average daytime temperatures of 37 to 46 °C over several weeks. At night, temperatures range from 28 to 35 °C. Heat domes develop over urban areas and large cities, trapping hot air and keeping temperatures high even at night. While heat-related excess deaths in Germany numbered around 5000 in 2023, that figure increases to about 50,000 deaths per year by 2045. Health risks increase, especially for those who are sensitive to high temperatures, which includes the elderly, people with chronic illnesses, and children. Every day, emergency rooms deal with thousands of patients with breathing problems, circulatory problems and cardiac symptoms. Despite existing climate adaptation plans, local and state authorities are overwhelmed. There is a dire shortage of air-conditioned spaces in retirement and care homes. Throughout the country, barely any public buildings such as schools or school gyms are equipped with air conditioning systems. Local public transport is disrupted by people gathering in (underground) stations for a chance to cool off. There are a number of cases of elderly people suffering heart attacks in hot city centres after shopping in air-conditioned supermarkets. Within a few weeks, 200,000 people fall victim to the 2048 Helios heatwave, many of them elderly.

Initially, the Bundeswehr is primarily tasked with providing subsidiary administrative assistance. The Medical Service installs ad hoc air-conditioned field hospitals all over the country to take some of the pressure off regional and urban hospitals. Some critical patients are transferred to Bundeswehr hospitals. The Bundeswehr is also tasked with transporting patients with ambulances and medical helicopters. It also has to ensure that its own units are provided with water, heat-appropriate clothing and air-conditioned recovery spaces, for example. Newly installed air-conditioned public spaces have to be provided all over the country. Bundeswehr soldiers support the police, the fire service and the Federal Agency for Technical Relief, Germany's federal civil protection agency, in ensuring public welfare and order. Bundeswehr units are deployed to defend facilities and support local authorities with necessary security tasks. Further support services will likely be required, including transportation of important goods such as drinking water, air-conditioning systems and supplies.

##### **Recommendations for action**

Given their complex nature, future climate crises cannot simply be countered with existing security paradigms and established methods of crisis prevention, reduction and management. The conventional state apparatus for managing climate-induced security challenges in Germany needs to be augmented with a more comprehensive and climate-specific approach that expands traditional notions of national security to include the challenges of climate change. An integrative approach is required to manage the climate crisis. Climate change not only leads to more natural disasters but also enables hybrid players to take advantage of emerging vulnerabilities. For such cases, federalism must be expanded to include a national crisis mechanism. This requires an institution to be equipped with extensive authority and discretionary competence that goes beyond the crisis response system currently in place in Germany. The Federal Office of Civil Protection and Disaster Assistance, for example, could be transformed into a Ministry for Civil Protection and serve as a national coordination centre with extensive powers, which, in a state of crisis, could go so far as to encroach on the powers of the federal states. Germany also needs a national civil-military mission command and control system for crisis management operations. The Federal Government should propose a reference system. Such a system must be able to connect individual mayors and local security forces with decision makers at the federal and national levels while providing all stakeholders with an up-to-date shared situation picture to help them make decisions. Systems already in place at municipal and state levels must also be integrated into the network. In this context, the "TerrHub" reference project of the Bundeswehr Homeland Defence Command can serve as a Bundeswehr-specific national coordination and cooperation platform for civil-military cooperation in Germany.



The “TerrHub” project, however, should also be expanded to include a civilian equivalent across municipalities and federal states.

The effects of climate change on the Bundeswehr are already apparent in some areas. Defence-critical infrastructure near the German coast will be immediately affected by a rise in sea levels. Although national and collective defence as well as host nation support will continue to play an essential role, they will eventually be overshadowed by new priorities in the area of subsidiary and administrative assistance in domestic emergency situations. In terms of territorial tasks at home, the Bundeswehr is already helping civilian players to contain and manage natural disasters and large-scale emergencies and provides assistance with ensuing rebuilding efforts. The Bundeswehr is thus already a key player in crisis management and disaster control, often as a direct result of climate change. Crisis management operations as well as collective and national defence operations may escalate in future, which means that the Bundeswehr must be enabled to quickly switch from providing supportive assistance to defence capabilities while maintaining its effectiveness. To be prepared for the climate-induced operational scenarios outlined in this study, the Bundeswehr will have to take steps to ensure the capabilities needed to guarantee operational readiness, to enable our forces to cope with their future domestic task spectrum and to provide the necessary resilience.

#### **Potential measures for subsidiary assistance with an eye toward climate change (Scenarios 1 and 3)**

- The national helicopter fleet should be expanded and a fleet of firefighting aircraft established to extinguish fires from the air.
- Bundeswehr forces should be earmarked for disaster control and for defence against hybrid threats resulting from climate change in Germany.
- Communication between security agencies must be further coordinated to be able to assess whether a climate crisis is of natural origin or an attack.
- Strategic considerations of the Bundeswehr must factor in climate change, for example on the basis of a relevant policy document.
- National and collective defence efforts should be expanded to include national resilience for the protection of critical infrastructure and management of natural disasters. Subsidiary assistance through administrative assistance must be a new focus at the national level.
- The switch from providing subsidiary assistance to national and collective defence must be exercised and prepared.

- Besides lethality, capability and price, aspects of climatic resilience must also be considered in the procurement of equipment and materiel.
- Procurement should be based on dual-use criteria. Materiel must meet military requirements but must also be usable in the event of a disaster. Training and exercises must be expanded to include a climate-specific spectrum of operations so as to increase the survivability of troops on operations.
- Civil-military cooperation and coordination must be intensified at national and international levels and expanded to include aspects of agile operations and cooperation with civil society, non-state and economic actors.
- Germany needs a national mission command and control system to deal with climate crises, natural disasters and hybrid attacks.

#### **General HNS measures with an eye toward climate change (Scenario 2)**

- Strategic communication on the need for HNS operations in Germany must be included in planning processes in order to counter instrumentalisation by political or hybrid interest groups.
- When units of partner nations are deployed as part of HNS, this should be done by rail wherever possible.
- Up-to-date information about the availability and condition of the national road and railway network should be provided on the basis of sensor data, situation picture systems, pre-reconnaissance and CCTV images. Digital mapping of traffic routes is necessary, including to establish the capacity of choke points such as slip roads, bridges and tunnels.
- Multiple suitable alternatives should be prepared and reconnoitred for each section of the route and equipped with fuel depots.
- Military police contingents must be augmented for HNS operations and closely coordinate with the military police of partner nations and with local authorities.
- The mission command and control systems of partner nations applying for HNS operations in Germany must be integrated into a situation picture system provided by the Bundeswehr to serve as a sensor and to improve the decision-making process.

## IMPRINT

### Publisher

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Multi-purpose helicopter NH-90 79+15 flies  
with the filled extinguishing water external  
load container (Bambi Bucket) to fight  
forest fires in Saxon Switzerland in Bad  
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### Original title

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Szenarien zu sicherheitspolitischen  
Auswirkungen des Klimawandels in  
Deutschland Bedrohungen

### Translation

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Federal Office of Languages

**ISSN-2627-0609**

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