Note: Automatically translated using AI

Flood Query by Environmental Action Germany

An Assessment of Exposure and Protective Measures in All Federal States

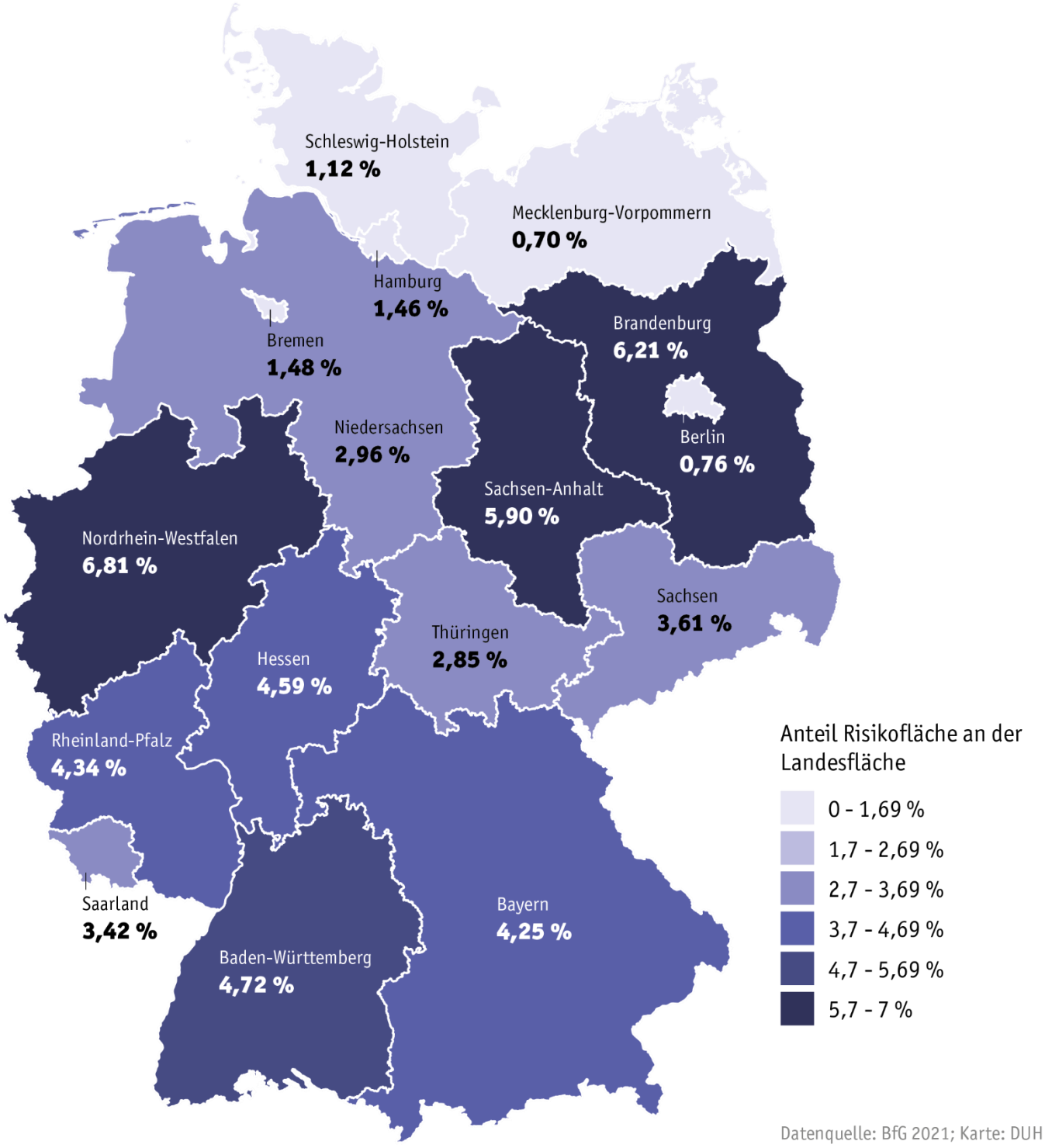
Which federal state is most affected by floods in terms of people and the environment? How many residential addresses would be impacted by a “100-year flood”? Which federal state has the largest flood risk areas? And what progress have the federal states made in flood protection over the past ten years?

In the summer of 2024, Environmental Action Germany (DUH) submitted a comprehensive request under the Environmental Information Act to all 16 federal states regarding flood protection measures from 2014 to 2024. The results provide an overview of what the states have done in the past decade concerning flood prevention and monitoring and where improvements are possible and necessary. Based on the responses, DUH draws five key conclusions to improve flood protection in Germany.

DUH also evaluated data from the German Insurance Association and the Federal Institute of Hydrology to create maps illustrating the flood risk specific to each state. These maps show the proportion of flood-prone areas, the number of flood-affected addresses, and a calculated factor illustrating each state’s vulnerability.

Proportion of Flood Risk Areas

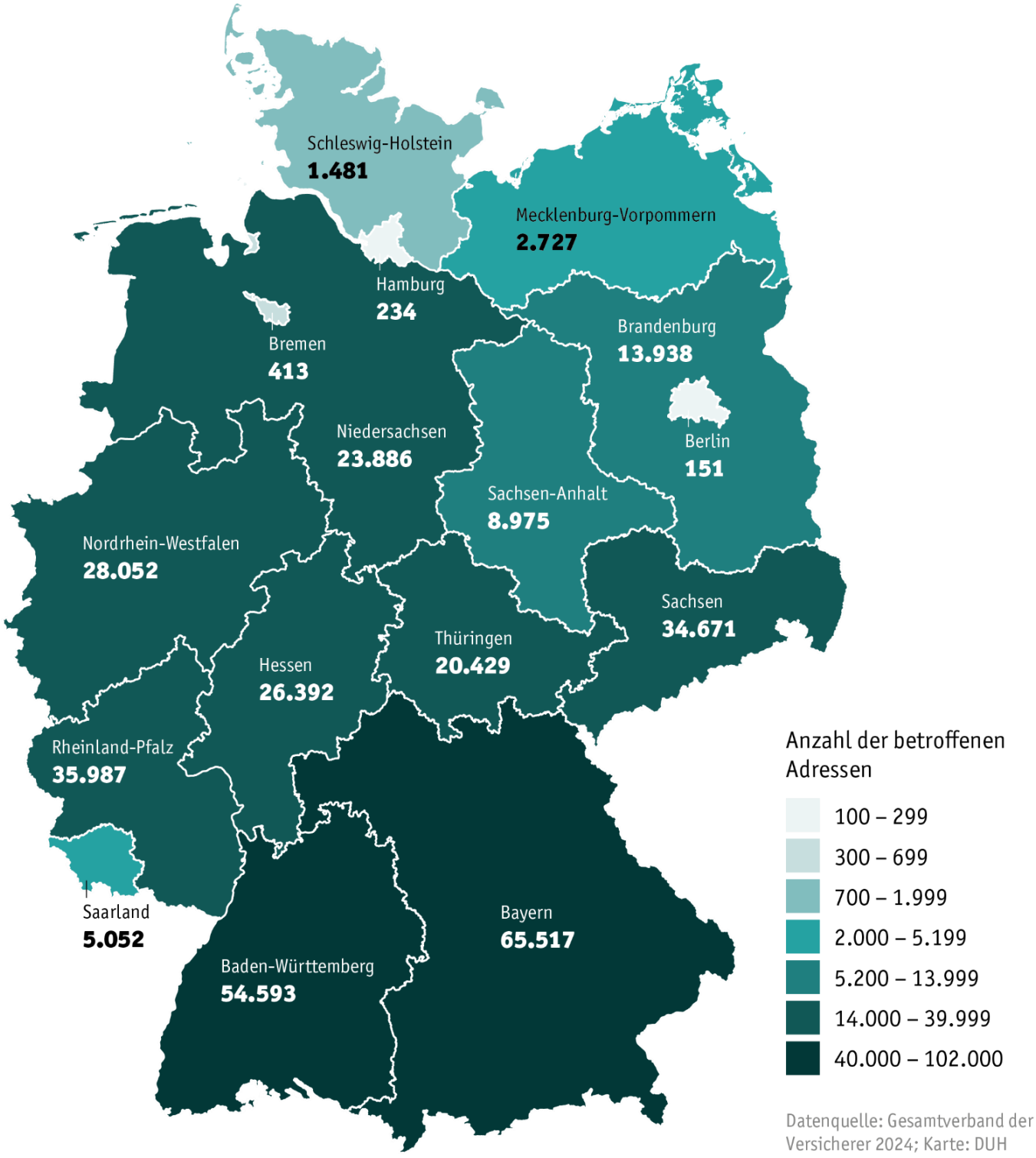
The map illustrates the share of flood risk areas within each state's territory. These are areas where significant damage is expected during a so-called “100-year flood” flood. The assessment considers risks to human health, the environment, cultural heritage, and economic activities. The depiction reflects each state’s potential damage.



Datenquelle: BfG 2021; Karte: DUH

How Many Residential Addresses Are Potentially Affected by Flooding?

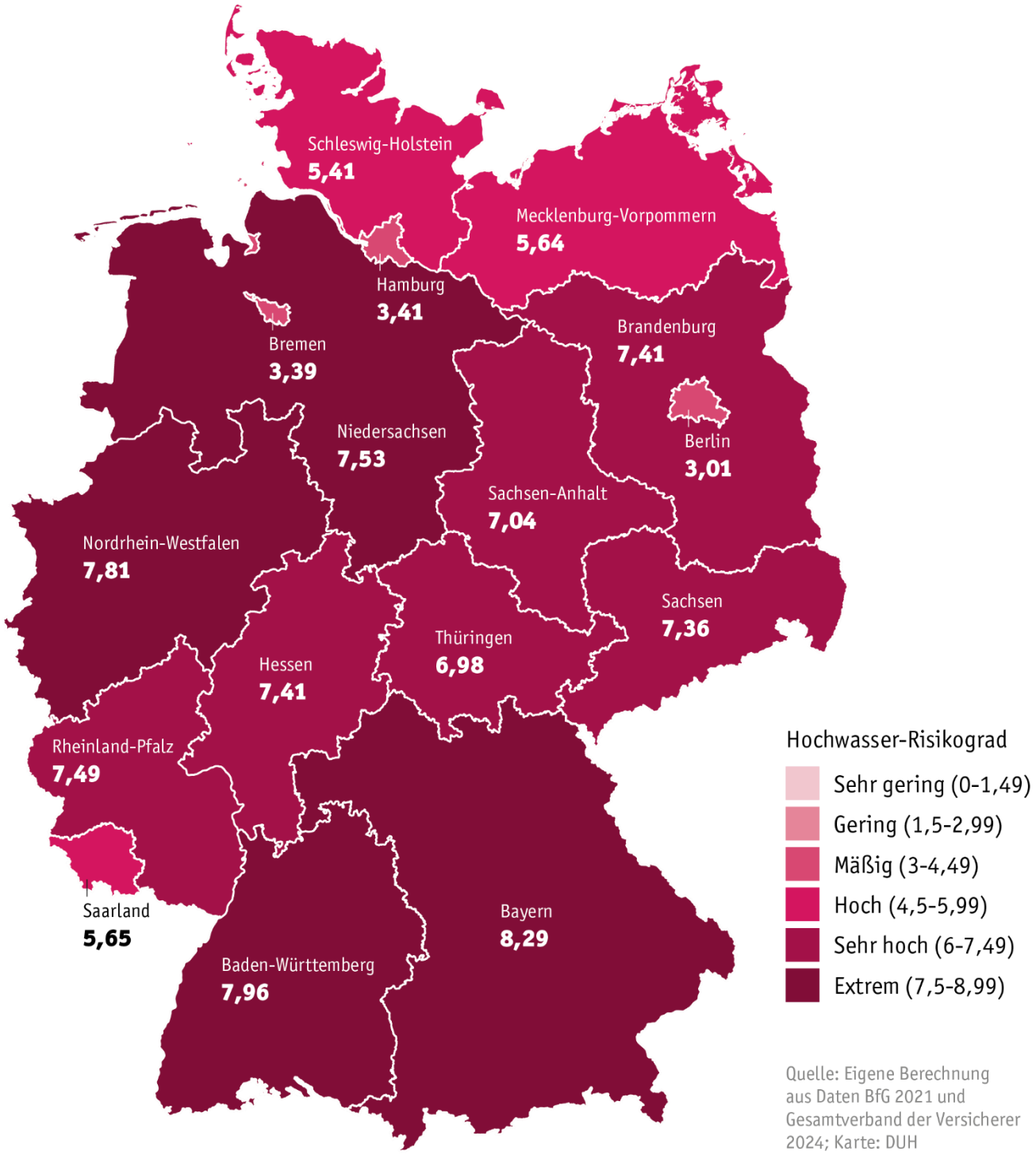
This map indicates how many residential addresses in each federal state would be affected by a “100-year flood” flood. Due to climate change, such extreme water levels are expected to occur more frequently in the future.



Datenquelle: Gesamtverband der Versicherer 2024; Karte: DUH

Flood Risk Level

This map shows the flood risk level for each federal state, calculated by multiplying the area of flood-prone zones by the number of affected residential addresses, based on a 100-year flood event. The risk is particularly high when a state has both a large share of flood-prone land and many homes located in those zones. More information on how the risk levels are defined is provided in the FAQ section at the end of the document.



Quelle: Eigene Berechnung aus Daten BfG 2021 und Gesamtverband der Versicherer 2024; Karte: DUH

Conclusions from the Federal States' Responses

» Federal states must support municipalities in becoming more resilient to extreme events involving flood hazards and water scarcity

Municipalities need to prepare more effectively for extreme weather conditions like heavy rainfall or drought through water-sensitive measures based on the sponge city principle. DUH inquiry reveals that federal states must provide targeted support – both financially and through better coordination and an overview of measures. Currently, this support is largely lacking. Many states lack a comprehensive overview of measures or specific state-level funding.

Bavaria, for example, can only provide information on urban flash flood risk management but not on sponge city or flood protection measures. The city-states **Berlin**, **Bremen**, and **Hamburg** did not disclose funding amounts due to their complexity and the involvement of numerous stakeholders. **Bremen** has begun implementing some sponge city measures. **Baden-Württemberg**, **Lower Saxony**, and **Saxony** could not itemize the costs for water-sensitive projects within urban development programs – they only provided total figures. **Baden-Württemberg** can only provide data on municipal heavy rain concepts. **Lower Saxony** funds projects improving water availability and soil functions, and **Hesse** has its own funding guideline with concrete figures. **Mecklenburg-Vorpommern** funds measures through urban development programs but cannot evaluate them separately. In **Saarland**, funding is partly possible, but water-sensitive measures cannot be distinguished. **North Rhine-Westphalia** offers regional funding programs with earmarked budgets, while **Rhineland-Palatinate** cites two major projects. **Schleswig-Holstein** lacks such measures altogether, and **Thuringia** cannot separately report on water-sensitive measures. **Saxony-Anhalt** introduced a funding guideline in 2024 for this purpose. At the time of the inquiry, it was not possible to provide precise data on the funds spent in **Saxony-Anhalt**.

With climate adaptation in mind, the federal states should have an overview of their own water resilience. A water-resilient landscape is resistant to water stress; it can cope better with both too much and too little water, and even with water pollution. What's more, a water-resilient landscape recovers more quickly afterwards.

» Nature-based flood protection must take precedence over technical flood protection

In relative terms, the states spend far more money on expanding and maintaining technical flood protection measures such as dykes and controlled polders than on nature-based measures. Only a fraction of the funds is invested in nature-based solutions such as reconnecting floodplains. This assessment is based on an overview of the states' responses and the report of the Federal/State Working Group on Water from May 2023. According to this report, the federal states spent €263 million on nature-based flood protection in the period from 2015 to 2021, compared with €452 million on technical flood protection. Although total planned expenditure will increase in the period from 2022 to 2027, only 35 percent of expenditure is earmarked for nature-based flood protection by 2027, with 65 percent going to technical flood protection. In view of the climate and biodiversity crisis, DUH believes that it is urgently necessary to always give priority to nature-based solutions in planning procedures and only favor technical flood protection where there is no alternative. Background information on nature-based and technical flood protection can be found in the FAQs.

» The federal states must promote deconstruction measures in flood-prone areas

Deconstruction measures are extremely important in order to gain new open spaces for reconnecting floodplains while relocating buildings and infrastructure from flood-prone areas to safer locations. However, the federal states were unable to provide much, if any, information on this in our survey. Only **Bavaria** and **Saxony-Anhalt** were able to clearly identify and quantify the funds spent on deconstruction measures in flood-prone

areas. **Thuringia** stated that it had deconstructed buildings in flood-prone areas, but was unable to provide any specific costs. **Bremen, Hamburg, Mecklenburg-Western Pomerania, Saarland, and Schleswig**-Holstein stated that they had not carried out any deconstruction measures or were not aware of any. **Berlin and Hesse** replied that they had not spent any state funds on this at all in the ten years in question. The remaining states (**Baden-Württemberg, Lower Saxony, North Rhine-Westphalia, Rhineland-Palatinate, and Saxony**) were unable to provide any or no explicit information on the costs. **Brandenburg** did not address the sub-question.

» **The federal states must collect more data on their flood protection measures and make it more comparable**

The data available in the states varies greatly and is sometimes unsatisfactory. In addition to an overview of expenditure on various preventive flood protection measures (especially with regard to nature-based solutions), some states also lack basic data on renaturation measures and information on deconstruction in floodplains. There is also a lack of overview of water-sensitive measures, such as the sponge city principle or unsealing, as these are often implemented at the municipal level. There is an urgent need for more comprehensive, differentiated, and comparable data collection in order to have a sound overview in view of the growing challenges posed by the climate crisis and to be able to adapt strategies in a data-driven manner.

» **Exchange between countries on good solutions for nature-based flood protection is essential**

The geographical conditions of the countries differ from one another, which means that the countries must set different priorities. On the one hand, this means that technical solutions may be indispensable in individual locations, for example in the narrow valleys of the low mountain ranges. On the other hand, nature-based measures must always be examined intensively and given priority wherever possible in order to make the best possible use of synergies between nature conservation and flood protection. Finally, nature-based sub-measures must also be included in the implementation of technical flood protection measures. Local conditions must be taken into account when developing integrated concepts that prioritize nature-based solutions and supplement technical solutions where these are indispensable. This means that there is no blueprint that works for all locations. This makes it all the more important for states to exchange information on how tailor-made concepts can be developed for different locations and which nature-based solutions prove effective under which conditions.

Positive Examples from the Federal States:

No federal state has convinced DUH with its overall concept and all its flood protection measures. There is particular room for improvement when it comes to nature-based flood protection. However, individual measures and projects in some states stood out positively:

- **Bavaria** is the only state to has announced a program that includes measures for resettlement for flood protection: the “Gewässer-Aktionsprogramm PRO Gewässer 2030” and its predecessor, the “Hochwasserschutz-Aktionsprogramm 2020plus”. Such programs can have a positive impact on the availability of land for renaturation and prevent damage to buildings by relocating them to safer areas.
- **Bremen** has developed conceptual measures to raise risk awareness and promote self-protection through its BREsilient research project. In addition, the city-state has established a storm surge partnership through a participatory process and has continued a heavy rain partnership as a long-term conceptual measure. DUH particularly welcomes these measures, as citizen participation plays an important role in these processes.

- **Hesse** provides precise figures on infiltration, retention, and evaporation for water-sensitive measures in urban areas. This is due to the funding provided by the state, which is regulated in the "Guideline of the State of Hesse for the Promotion of Municipal Climate Protection and Climate Adaptation Projects and Municipal Information Initiatives." A detailed overview of the measures is important here and stands out positively.
- In **Rhineland-Palatinate**, the Ministry for Climate Protection, Environment, Energy, and Mobility is cooperating with the state forestry department to improve water retention in state forests, especially in areas prone to flooding. For example, ditches are being closed, drainage basins are being created, and drainage from paths is being diverted into the forest. DUH supports interdepartmental cooperation on nature-based solutions and considers this to be particularly well implemented here.

FAQ

1. Technical vs. Ecological/Nature-based Flood Protection?

Technical flood protection measures include dikes, controlled polders, flood retention basins, and flood walls. With the exception of dikes, this type of protection can be controlled directly by humans. For example, polders can be specifically regulated to let water in and out, thereby retaining it for a certain period of time. These measures are usually costly and require frequent maintenance. Nevertheless, there are situations in which they are essential for disaster control. **Ecological flood protection** or **nature-based solutions** refer to measures that are based on natural processes and are generally significantly less expensive. Specifically, these include dike relocation, renaturation of floodplains and rivers, and uncontrolled polders. The space gained allows water to spread out naturally and slowly drain away again. In a dike relocation, a technical solution (dike close to the shore) is converted into a nature-based one: the old dike is dismantled and a new one is built in the hinterland, giving the river and its water more space again. The widening usually allows the dike in the hinterland to be lower because the floodwaters are wider, shallower, and exert less pressure on the dike. Small, decentralized measures such as extending the course of watercourses, removing pipes from streams, and closing drainage systems also have a positive overall effect on water retention. Nature-based flood protection provides valuable habitat for plants and animals through its near-natural areas and processes. This creates synergies between climate, species, and flood protection.

2. What is a „100-Year Flood“?

Floods occur naturally on a regular basis throughout the year. For example, the annual snowmelt in spring leads to increased water levels. Statistical averages are used to calculate the probability of specific water levels and discharge volumes. A 100-year flood is statistically expected to occur once every 100 years, with these values referring to past measurement series. If a certain water level has only occurred once every 100 years in the past, the climate crisis in particular could cause that water level to occur more frequently in the future. Landscape changes over the last century, such as increased soil sealing, river straightening, and the drainage of entire areas of land, also contribute to water being drained away more quickly and flood waves rising higher.

3. What is a Floodplain?

Floodplains are areas along watercourses that are flooded in the event of severe flooding. The federal states must designate floodplains that are subject to special protection under the Water Resources Act: no construction is permitted in these areas. However, exceptions are possible under certain circumstances. The areas are designated based on the water levels that, statistically speaking, can occur in the event of a 100-year flood.

4. Are Buildings Being Constructed in Floodplains?

Yes, since 2000, over 30,000 residential buildings have been constructed in floodplains (GDV 2023). Seven percent of floodplains in Germany are built up with settlements, transport and commercial areas; in addition, two-thirds of formerly flooded areas have been lost due to dyke construction and waterway development (BfN & BMU 2021). In 2023, the German Insurance Association calculated that 1,000 to 2,400

new residential buildings are being built in risk areas every year (GDV 2023). This means that floodplains can also become flood risk areas.

BfN & BMU (2021): Auenzustandsbericht: Auenzustandsbericht. Flussauen in Deutschland. BMU, BFN, Berlin, Bonn.

Gesamtverband der Versicherer (GDV) (2023): https://www.gdv.de/gdv/medien/medieninformationen/neue-gdv-berechnungen-zu-viele-neubauten-in-ueberschwemmungsgebieten--129294 (Zugriff 28.04.2025).

5. How Was the Flood Risk Level Classified?

The flood risk level was calculated for each federal state as follows:

Flood risk level = flood risk area [km2] * number of residential addresses affected by flooding

The results were logarithmized and, based on these values, a suitable scale from 0 to 9 was derived, which was divided into six equal classes:

Flood Risk Level	Classes Flood Risk Level	Possible Interpretation
Very low	0,0 to > 1,5	No to few addresses affected in areas with low flood risk
Low	1,5 to > 3,0	
Moderate	3,0 to > 4,5	
High	4,5 to > 6,0	
Very high	6,0 to > 7,5	
Extreme	7,5 to > 9,0	Large number of addresses affected in flood risk area or moderate number of addresses affected in very high risk area

6. Are the Exact Values for the Maps Also Available?

State	Proportion of Risk Area in Relation to Total Area	Number of Affected Residential Addresses	Flood Risk Level - Value	Flood Risk Level
BB	6,21 %	13.938	7,41	Very high
BE	0,76 %	151	3,01	Moderate
BW	4,72 %	54.593	7,96	Extreme
BY	4,25 %	65.517	8,29	Extreme
HB	1,48 %	413	3,39	Moderate
HE	4,59 %	26.392	7,41	Very high
HH	1,46 %	234	3,41	Moderate
MV	0,70 %	2.727	5,64	High
NI	2,96 %	23.886	7,53	Extreme
NW	6,81 %	28.052	7,81	Extreme
RP	4,34 %	35.987	7,49	Very high
SH	1,12 %	1.481	5,41	High
SL	3,42 %	5.052	5,65	High
SN	3,61 %	34.671	7,36	Very high
ST	5,90 %	8.975	7,04	Very high
TH	2,85 %	20.429	6,98	Very high

7. What Data Sources Were Used for the Maps?

Bundesanstalt für Gewässerkunde (BfG): https://geoportal.bafg.de/inspire/download/NZ/servicefeed.xml (Access 28.04.2025). Map showing the proportion of land area and used as a basis for calculating the state flood risk check.

Bundesamt für Kartographie und Geodäsie: https://www.zensus2022.de/static/DE/gitterzellen/Shapefile_Zensus2022.zip (Access 26.06.2025). Country borders on all maps.

Gesamtverband der Versicherer (GDV) (2024): https://www.gdv.de/gdv/medien/medieninformationen/amtliche-zahlen-zeigen-mehr-als-300-000-adressen-in-deutschland-sind-von-hochwasser-bedroht-168828 (Access 28.04.2025). Map showing the affected addresses and used as a basis for calculating the flood risk country check.

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