



The Multi Hazard Early Warning System in Germany

Deutscher Wetterdienst

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Disaster Management structures in Germany

In Germany, disaster management lies in the responsibility of the 16 Federal States

Federal States ("Länder")

Regional Emergency Situation Centres

Joint Emergency Centre (GMLZ) of the German Federal Government

approx. 210 district and 400 fire brigade control centres

- volunteer fire brigades (about 24.000)
- police, THW (Germany's central disaster relief organisation)
- other emergency and relief organisations (e.g. Red Cross (DRK))



The legal basis for the protection of citizens, laid down by the Federal Government and the Länder:

- specific rules in laws
- Civil Defence Act
- emergency services laws
- various fire and disaster management laws.





A list of national policies and legal documents as well as various agreements that govern DWD's EWS

Name	Type	Date Enacted
Law on the Deutscher Wetterdienst (DWD)	Law	1952
Amendment of the Law on the DWD	Amendment	10 September 1998
Agreement between the Bavarian Ministry of the Interior and DWD	Agreement	April 2005
Administrative agreement signed with each Land and the DWD	Administrative agreement	2001 - 2010
Administrative agreement signed with the Federal Office for Civil Protection and Disaster Assistance (BBK)	Administrative agreement	30 April 2008
Co-operation agreement between the DWD and the German Federal Agency for Technical Relief (THW)	Agreement	4 September 2008





The Deutscher Wetterdienst is responsible to the Federal Ministry of Transport, Building and Urban Affairs (BMVBS)

One main task is to issue and deliver warnings of severe weather events with a view to saving lives and property.

Legal Basis:

→ Law on the DWD of 10 September 1998, last amended by the Law on the establishment of a Federal Supervisory Authority for Air Navigation Services and on the amendment and adaptation of other provisions and regulations of 29 July 2009.





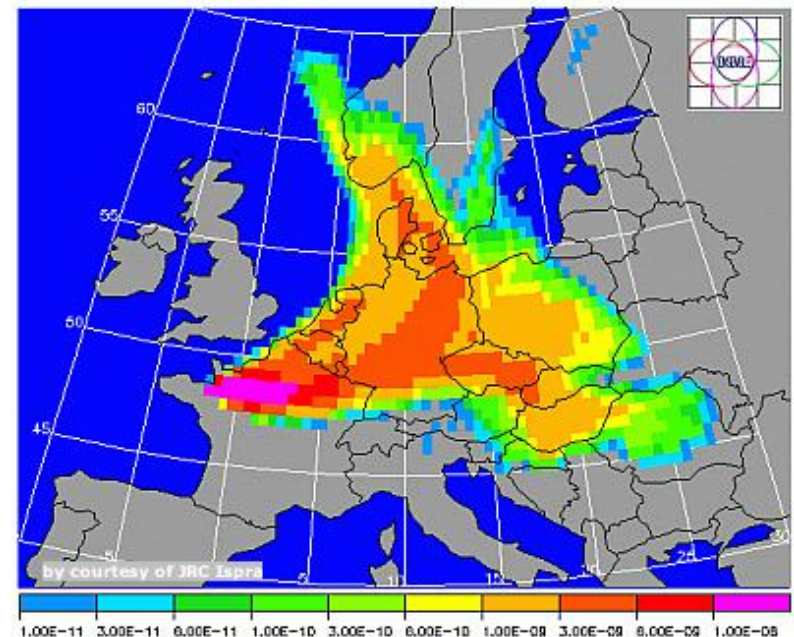
Legal framework I

- ➔ In accordance with Section 4 of the DWD Law, "the Deutscher Wetterdienst supports the Länder in carrying out their responsibilities with regard to disaster control, especially in cases of extreme weather events".
- ➔ In its most recent amendment (10 September 1998), the Law on the Deutscher Wetterdienst calls for "the issuance of official warnings of weather phenomena that could become a danger for public safety and order, especially concerning the impending danger of floods".
- ➔ But: Flood forecasting is the responsibility of the Länder where specific flood response centres are operated.



Legal framework II

- Radioactivity: Pursuant to the Precautionary Radiation Protection Act (Strahlenschutzvorsorgegesetz - StrVG), the DWD is also responsible for monitoring and forecasting (trajectories, Lagrangian particle models and Eulerian models) the radioactivity of air and precipitation.
- The DWD makes its measurements and forecasts available to the Federal Office for Radiation Protection (BfS) and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).
- Public authorities at the federal and regional levels as well as the ministries in the Länder use this information as the basis for their recommendations on further measures to be taken for protection.





Mandate for warning development

The DWD is of the opinion that only official warnings issued by Germany's National Meteorological Service should be binding for disaster mitigation purposes (single-voice principle) in Germany. In this context, the following hazards are Type I hazards:

Violent gusts

Hurricane-force gusts

Extreme hurricane-force gusts

Severe thunderstorm

Intense heavy rainfall

Strong continuous rain

Extremely strong continuous rain

Heavy snowfall

Extremely heavy snowfall

Heavy snowdrifts

Black ice

Heavy thaw

Wind gusts

Storm gusts

Violent storm gusts

Thunderstorm

Heavy rainfall

Continuous rain

Snowfall

Snowdrifts

Slippery roads

Fog

Frost

Severe frost





Mandate for warning development

Likewise the DWD

- issues warnings to safeguard marine shipping, the sea coast and lakes
- warns against extreme heat and UV radiation and
- publishes a forest fire danger index.

Type III warnings, e.g. river flood warnings, are the responsibility of the flood response centres in the Länder rather than the DWD. However, these centres are supplied by the DWD with all essential meteorological data.

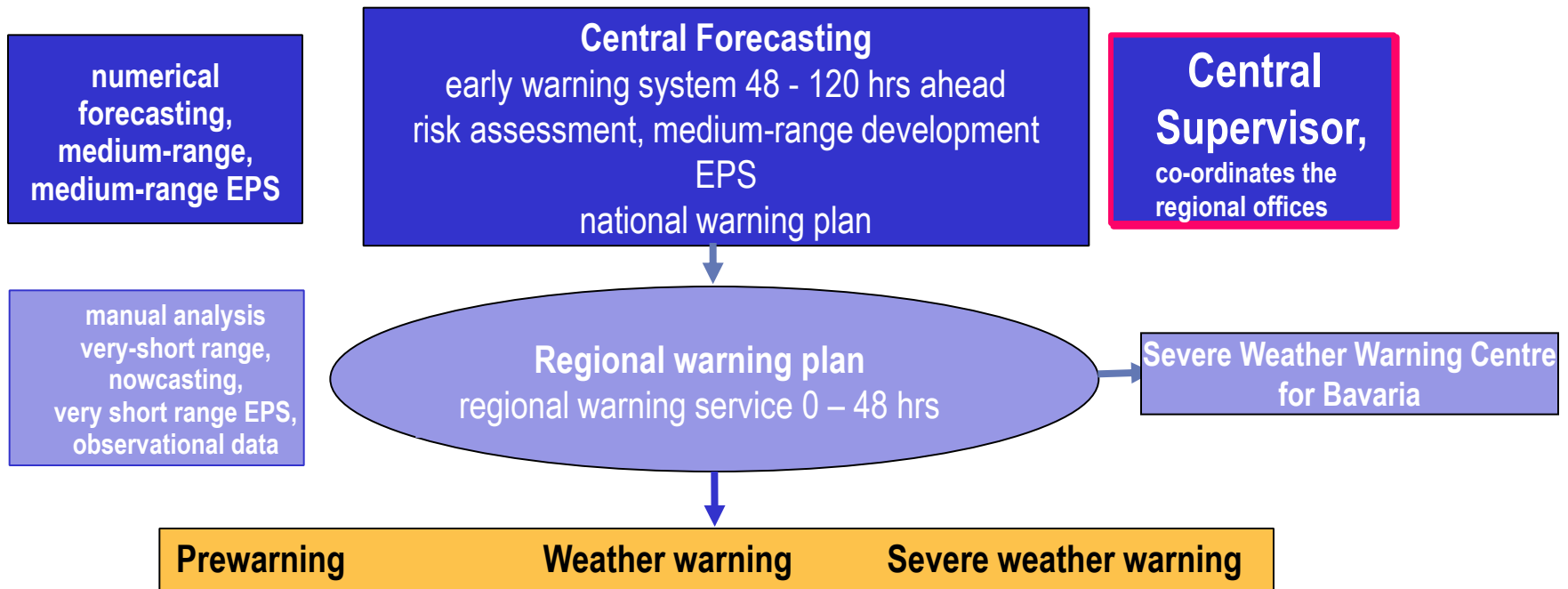
Another example for a type III warning is the warning of radioactivity, which is in the responsibility of BfS and BMU. The DWD is responsible for providing the necessary measurements and forecasts.





DWD Warning Management

Weather monitoring and warning of dangerous weather phenomena is assured 24h/7d and thus is a personnel-intensive task.



- emergency situation centre, fire brigade, police, THW (Germany's official disaster relief organisation)
- traffic warning service
- media/public (radio/television, internet, SMS)





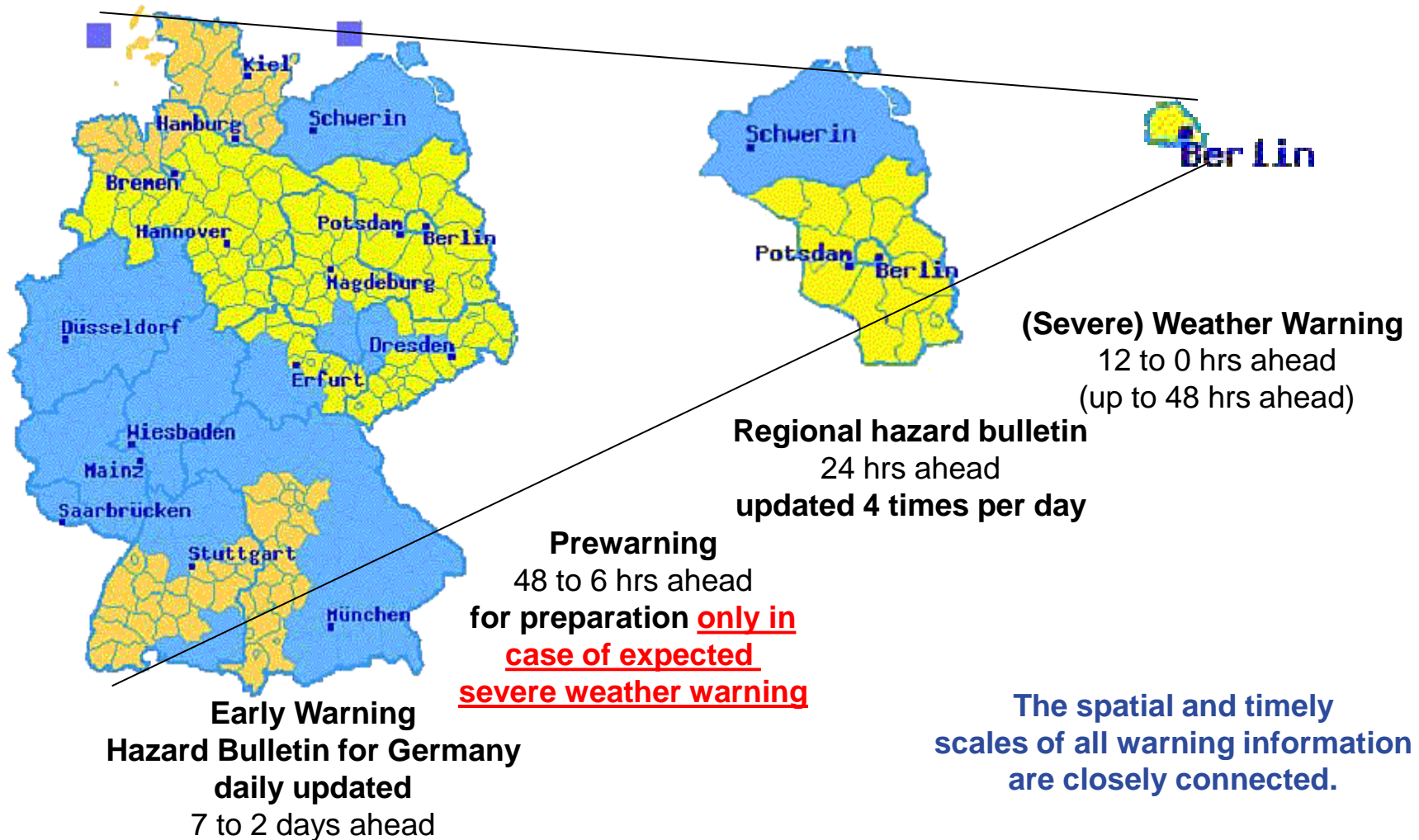
Definitions and lead times of warning information

	0 - 2 h	2 - 12 h	12 - 48 h	48 - 120+h
Definition Forecast	Nowcasting	Very short range	Short range	Medium range
Definition Warning DWD	Warning / Severe Weather Warning		Prewarning	Early Warning
Definition Disaster Prevention	Warning		Early Warning	

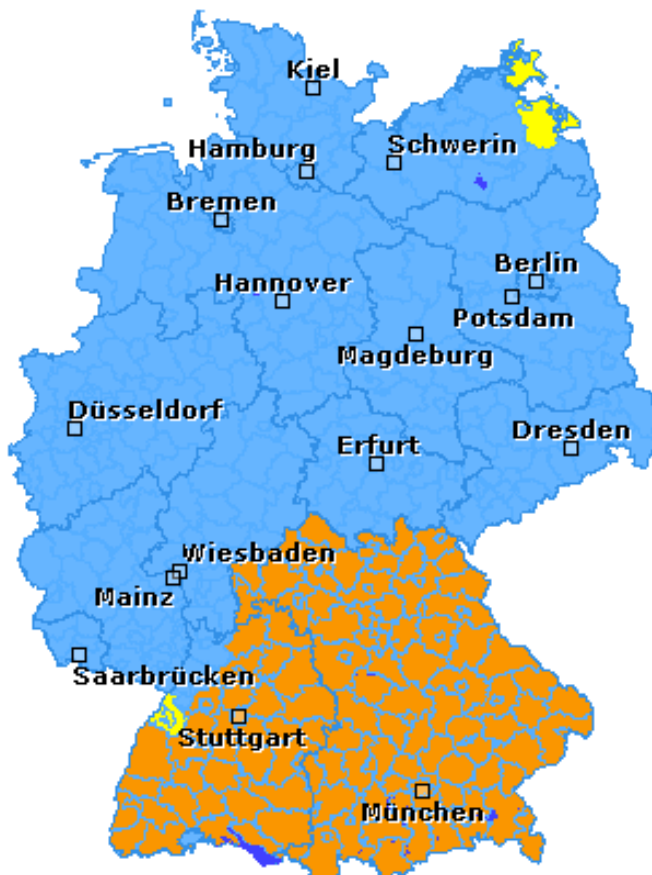




The DWD Early Warning System consists of 3 levels



Weather warnings



DWD issues 27 different types of warnings for about 450 districts or parts of districts in Germany and different height levels.

All warnings of extremely severe weather are issued by the DWD together with a supplementary text describing the effects of the expected extreme conditions.

All warning and additional bulletins are well defined and regularly evaluated in cooperation with disaster management.

The whole warning process is certified ISO 9001.



Wetterwarnung
Warnung vor markantem Wetter
Unwetterwarnung
Extremes Unwetter

- no serious event, but be wakeful
- some operations possible
- serious event, emergency plan is activated
- extreme event

Meteorolog. Erscheinung	Schwellenwert	Bezeichnung			
<h2>Warning criteria and thresholds</h2>					
			Wind	90 bis 104 km/h	Windböen
					Sturmböen
					Schwere Sturmböen
<p>The criteria and thresholds for the issuance of warnings were defined in collaboration with the disaster management authorities in agreement with their experience and their operational necessities.</p> <p>Due to clear information, all warnings include the lead time, the valid time and the time of issuing.</p>		Orkanartige Böen			
			Orkanböen		
			Extreme Orkanböen		
			Nebel		
			Starkregen		
		Heftiger Starkregen			
		Dauerregen			
		Ergiebiger Dauerregen			
Dauerregen	$\geq 70 \text{ l/m}^2$ in 12 Stunden $\geq 80 \text{ l/m}^2$ in 24 Stunden $\geq 90 \text{ l/m}^2$ in 48 Stunden	Extrem ergiebiger Dauerregen			
Schneefall in Lagen bis 800m	bis 5 cm in 6 Stunden bis 10 cm in 12 Stunden	Schneefall			



Other warnings

Heat warnings:

- operational since 2005
- dissemination to some thousand retirement and nursing homes (in co-operation with Federal States)
- number of people affected by heat waves has decreased

UV warnings:

- operational since 2005
- inform the public about increased sunburn-causing UV radiation in summer





Dissemination of DWD warnings I

- fax
- SMS text messages
- e-mail and warning newsletters
- telephone (in 'specific cases')
- ftp server
- Internet (<http://www.dwd.de>):
 - PC, notebooks, etc.
 - mobile and smart phones
 - warning widget for incorporating the DWD warnings in other websites



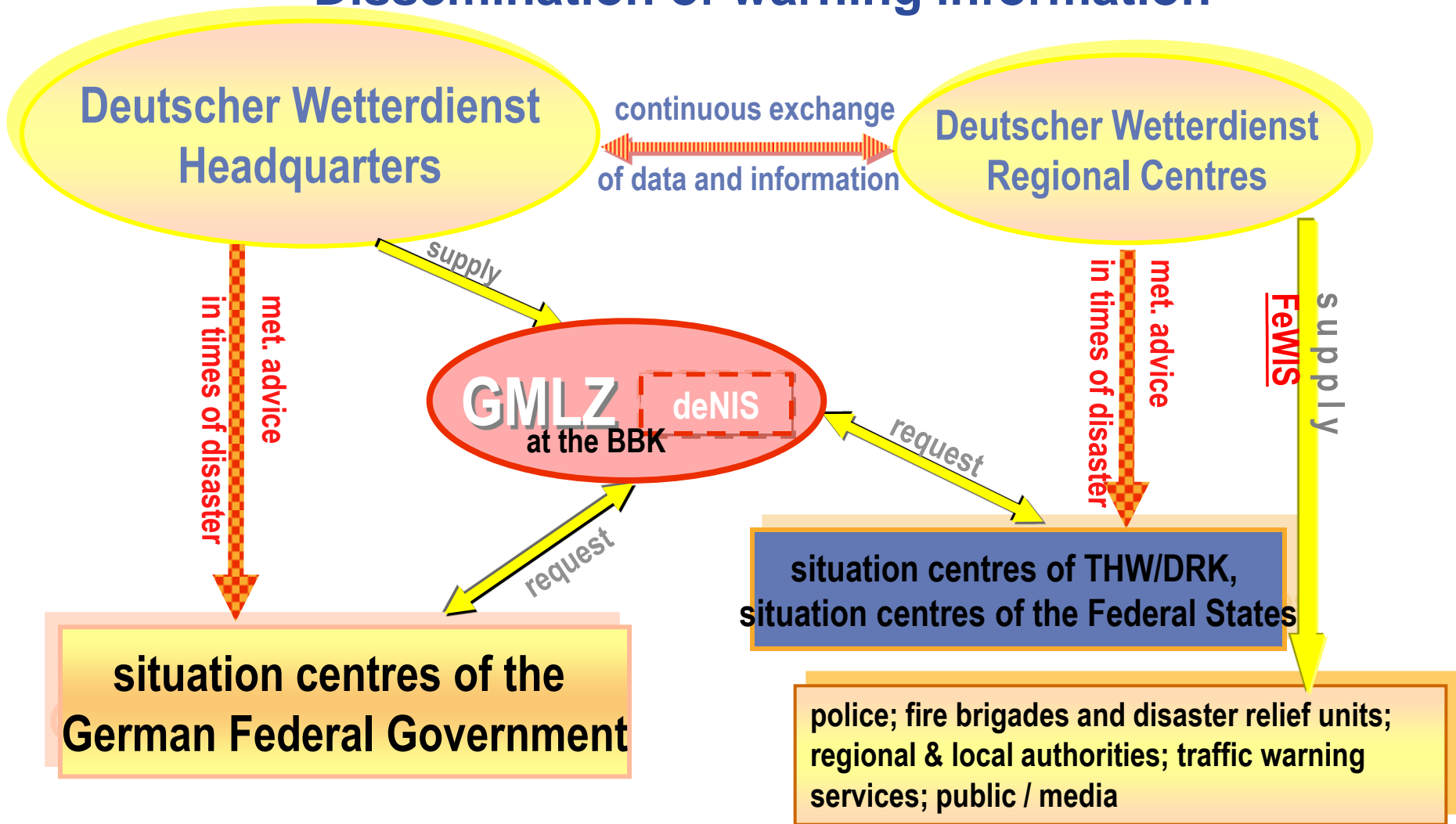
Dissemination of DWD warnings II

- ➔ Radio and television companies usually disseminate the DWD's warnings on a voluntary basis. Only in the event of extremely severe weather situations do they have the obligation to broadcast the warnings.
- ➔ The DWD provides professional disaster management organisations with information systems that are specifically targeted at their needs, such as the FeWIS "Weather Information System for Fire Brigades".
- ➔ DWD data and products are integrated in external information systems operated by the disaster management organisations (e.g. the 'deNIS' Emergency Preparedness Information System of the BBK)





Dissemination of warning information





Working relations:

The DWD co-operates with the following organisations and institutions, for example

- at Länder level with the situation centres at the responsible Länder ministries;
- at regional level with the regional police departments;
- at district level with the control or operation centres at the district administrations and fire brigade units;
- at local level partly with the local authorities;
- and with the operation centres of the THW and the German Red Cross (DRK).

- Co-operation with the Länder:
 - If a disaster occurs, a meteorologist from the DWD can attend the meetings of the disaster relief team at the request of the Länder government concerned.
 - Additionally, a telephone warning service is established at the DWD's Weather Forecasting and Advisory Centre or the Regional Centres to provide the disaster relief teams of the Länder and districts with the necessary information.





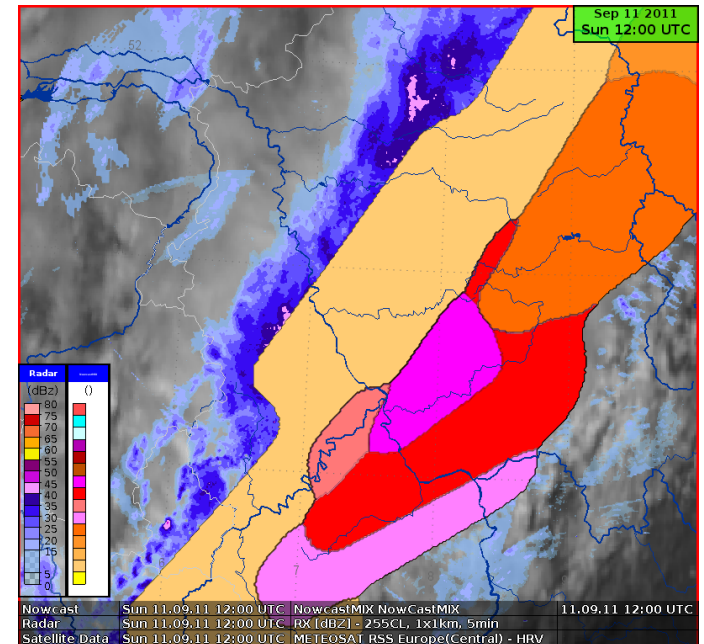
Public awareness and education

- The DWD raises public awareness of its online warning pages through press releases, an annual report and brochures.
- The DWD's website gives an explanation of the criteria for weather warnings.
- The warnings describe the risks and explain the general rules of conduct.



Improvement of DWD Early Warning System I

- ➔ Further development of compilation and presentation processes
 - ➔ machine-assisted analysis of all available data in the field of nowcasting
 - ➔ very high-resolution numerical forecasts (time and space) in the field of very short-range forecasting
 - ➔ change to ensemble forecasting at all temporal and spatial scales
 - ➔ development of systems for the automatic processing of warnings to be revised manually





Improvement of DWD Early Warning System II

- Training programmes are organised each year for DWD staff members responsible for weather forecasting.
- They are trained within the framework of a broadly based meteorological education and training programme, one component of which is the improvement of warning management competences.
- The DWD warning process is certified according to the ISO 9001 quality standards. As part of the QM process, the reliability of the DWD's warnings is monitored by means of a performance figure ('hit rate').
- In addition, there are other quality indices that are continuously evaluated with the aim of improving the warnings (e.g. POD, FAR).



DWD arranges regularly meetings with different disaster management authorities



- central and regional user conferences
- regular co-ordination among the authorities and disaster management and relief organisations with the aim of continuously improving the warning system
- feedback meetings after extreme events (e.g. storm „Kyrill“)
- training workshops at fire brigade control centres
- lessons at the institute for fire brigades in Münster



Disaster preparedness

The DWD participates in LÜKEX exercises (crisis management exercises involving multiple German federal states), which take place approximately once every two years.

LÜKEX is a so-called "strategic staff framework exercise":

The participants are:

- emergency task forces and crisis management teams at Federal Government and Land level
- private operators of critical infrastructures, relief organisations and associations.





Emergency planning: Risk information

The Deutscher Wetterdienst has for many years carried out extreme-value statistical analyses aimed at the practical objectives of hydrology and water management. For example, the results can be taken as a basis for technical flood protection in the sense of disaster preparedness.

On its website, the DWD offers access to a warning system named WESTE-KAT:

- climate data for preventive disaster management purposes or for the evaluation of a past disaster situation
- developed in collaboration with the disaster management organisations
- provided only for disaster management organisations.





Financial considerations

- The federal authorities in Germany that are involved in the German MHEWS, such as DWD, BBK, THW, are financed from the federal budget.
- Authorities at the Länder level are financed from their federal state budget.
- Organisations, such as the German Red Cross (DRK e.V.), are financed from the contributions of their members and donations.





Financial considerations: DWD's Early Warning System

- ➔ The DWD is a federal authority and subject to the Federal Government's budget law. As such, it is obliged to plan its revenues and expenditure annually, in particular for the year after next.
- ➔ The planning information is organised according to so-called titles, so there is no budget that is explicitly planned for warning management.
- ➔ All planning is based on the DWD's overall strategy and the subject-specific strategy for weather forecasting. In this context, the provision of information and services to disaster management is of major importance.





Lessons learned I:

- Together with disaster risk management analyse which warning criteria/thresholds are relevant for operation
- Improve collaboration with disaster management by:
 - arranging workshops on regional and national level
 - defining focal points for disaster management
 - regularly requesting feedback and attuning the requirements brought forward by the users





Lessons learned II:

- A high level national platform (top-down) is important but you need also to meet with basic disaster management offices to see how they work and what they need (bottom-up)!
- When developing a dissemination system, do it in cooperation with disaster management – keep the information as understandable as possible
- A good Early Warning System should follow the 4 rules of service delivery (availability, dependability, usability, credibility)
- NMHSs should meet the needs of the media. They play an important role for public preparedness
- Quality management is an powerful tool to improve your services arranging workshops on regional and national level





The overall message:

**Cooperation, partnership and communication
at all levels between NMHS and disaster management
is the key for a successful development of EWS.**

