Servicio Meteorológico Nacional
Argentina

Setting operational thresholds for Heat Early Warning Systems
Lecture 1 – Warning systems

Carolina Cerrudo

June 09, 2020 – GHHIN Masterclass series

Overview

- Purpose of a warning system
- Components of a warning system
- WMO Guidelines n° 1150
- Types of warning systems

Purpose of a warning system

The design of an early warning system is one of the components that integrate disaster risk management

Tool to help the task of the decision maker

Minimize the effects / impacts

Prevention

Be more prepared to face threats

Must be adjusted to available information, technical and human resources

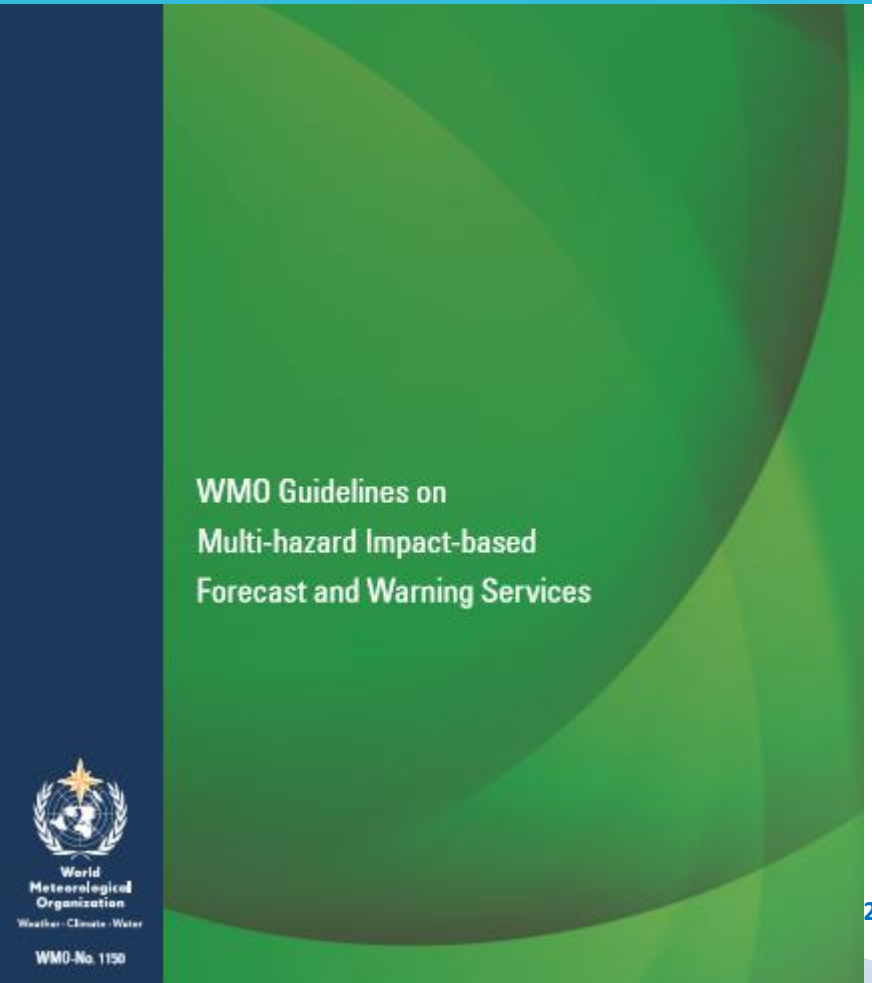
Components of a warning system

Credit: Claudia Campetella

To warn of a possible threat, it is necessary to take knowledge of the characteristics of each place

Interdisciplinary approach

WMO n° 1150



From:
what the weather will <u>be</u>
Towards:
what the weather will <u>do</u>

- Actions to develop an IBF implementation strategy
- Share good practices
- Guidelines for standardizing messages (icons, colour coding)
- Work with users and stakeholders
- Training needs

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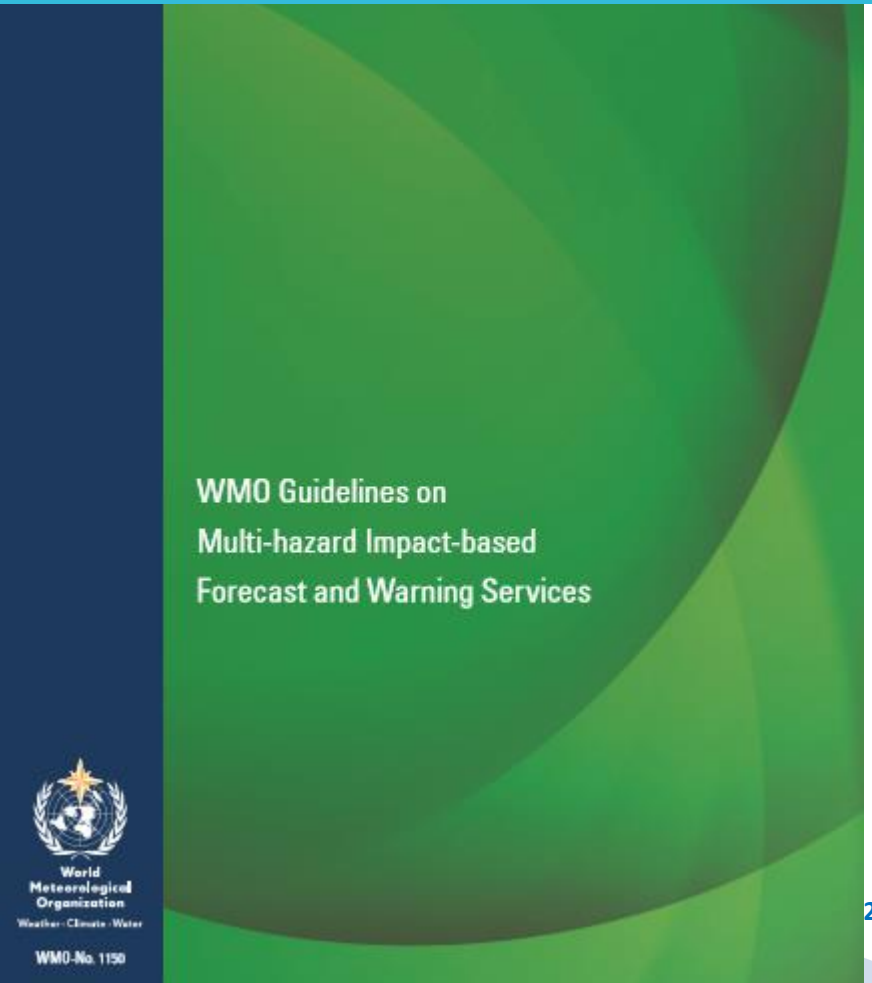


Key points:

1) **Partnerships :** develop relationships, understand needs.

2) **Impact-Based Information and Service Development:** develop the specific framework with partners. Establish relationships between the natural hazard and impacts, vulnerability and exposure from case studies.

3) **Functional Requirements for IBF:** infrastructure required for an IBF (data management, dissemination, data sharing strategies, format)

4) **Human Capacity Development:** training of staff and users on IBF.

5) **Validation:** development of impact-based tools and metrics.

WMO n° 1150

WMO Guidelines on
Multi-hazard Impact-based
Forecast and Warning Services

World Meteorological Organization
Weather · Climate · Water
WMO-No. 1150

REPORT OF THE JOINT MEETING OF THE IMPLEMENTATION AND COORDINATION TEAM / OPAG ON PUBLIC WEATHER SERVICE DELIVERY TOGETHER WITH THE EXPERT TEAM ON IMPACT-BASED FORECAST AND WARNING SERVICES (ET-IMPACT) AND THE EXPERT TEAM ON SERVICES AND PRODUCTS IMPROVEMENT AND INNOVATION (ET-SPII)

Exeter, United Kingdom, 5-6 December 2019

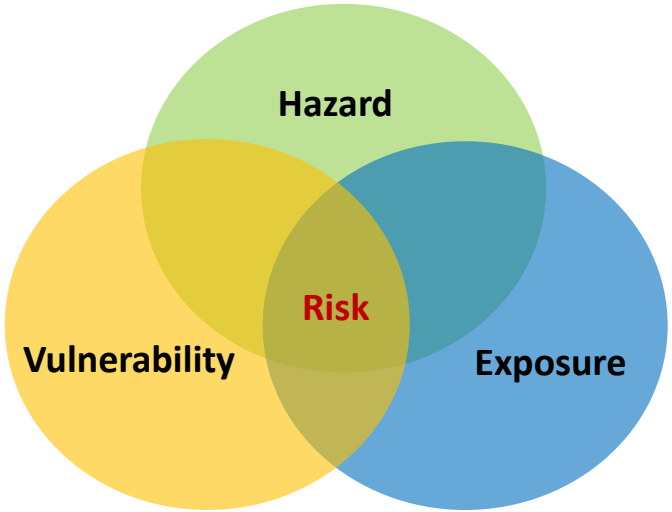
Final Report

2nd edition 2020

Ministerio de Defensa
Presidencia de la Nación

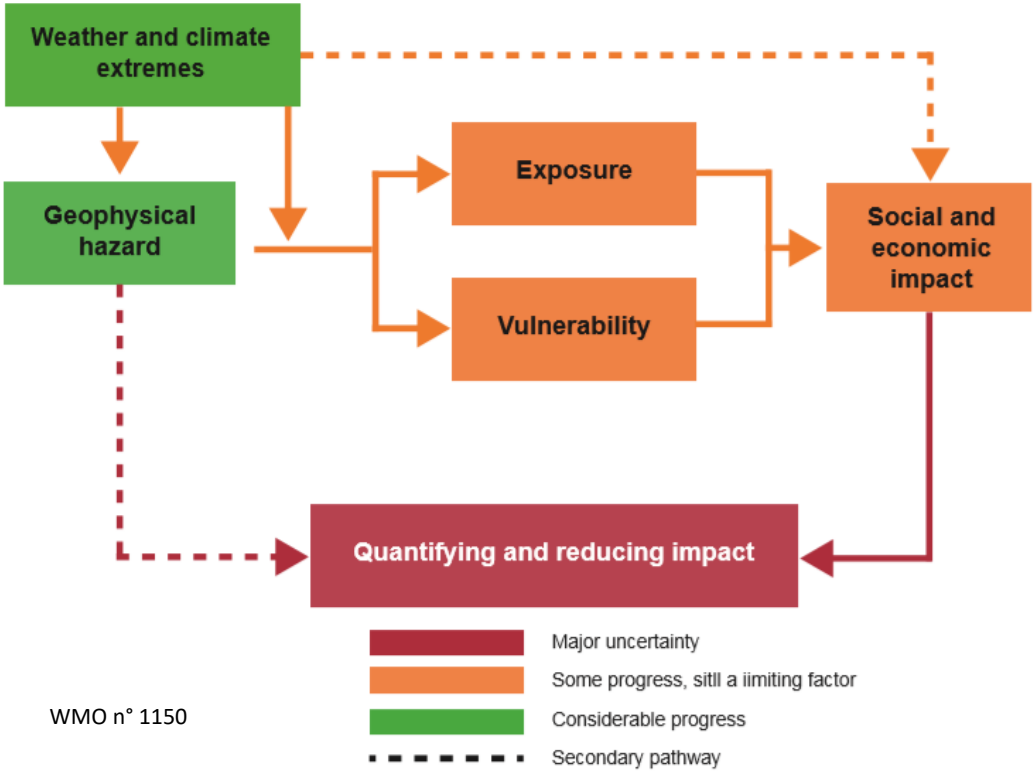
Elements to consider

$$|\text{Risk of impact } (x, t)| \equiv |\text{hazard } (x, t)| \cup |\text{vulnerability } (x, t)| \cup |\text{exposure } (x, t)|$$



The highest risk may not be where the weather is the worst!

Elements to consider



WMO n° 1150

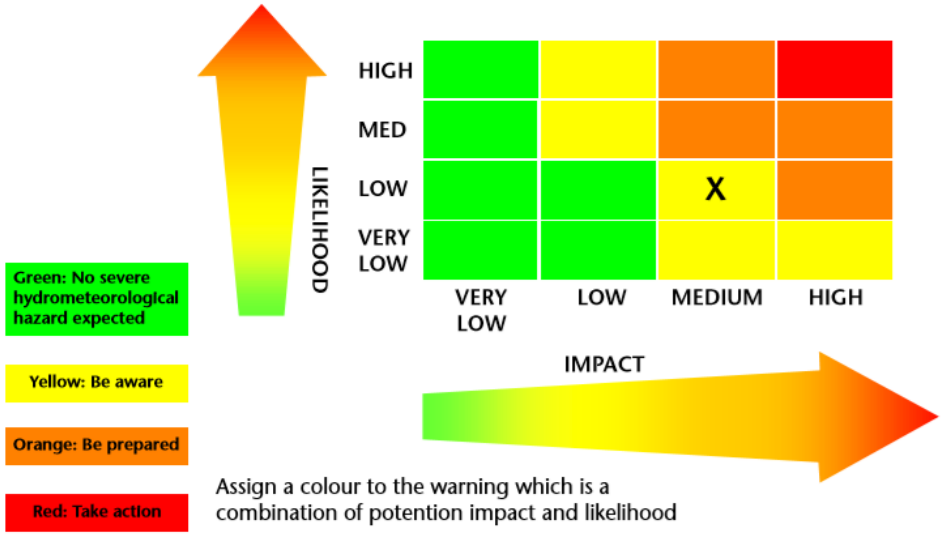
Figure 1. Relationship among the key elements of an impact forecast system

- **It is not just about the hazard and thresholds.**
- **Requires broad partnership development.**
- **Better understand their needs.**

➢ Partnerships

➢ Impact data

Elements to consider

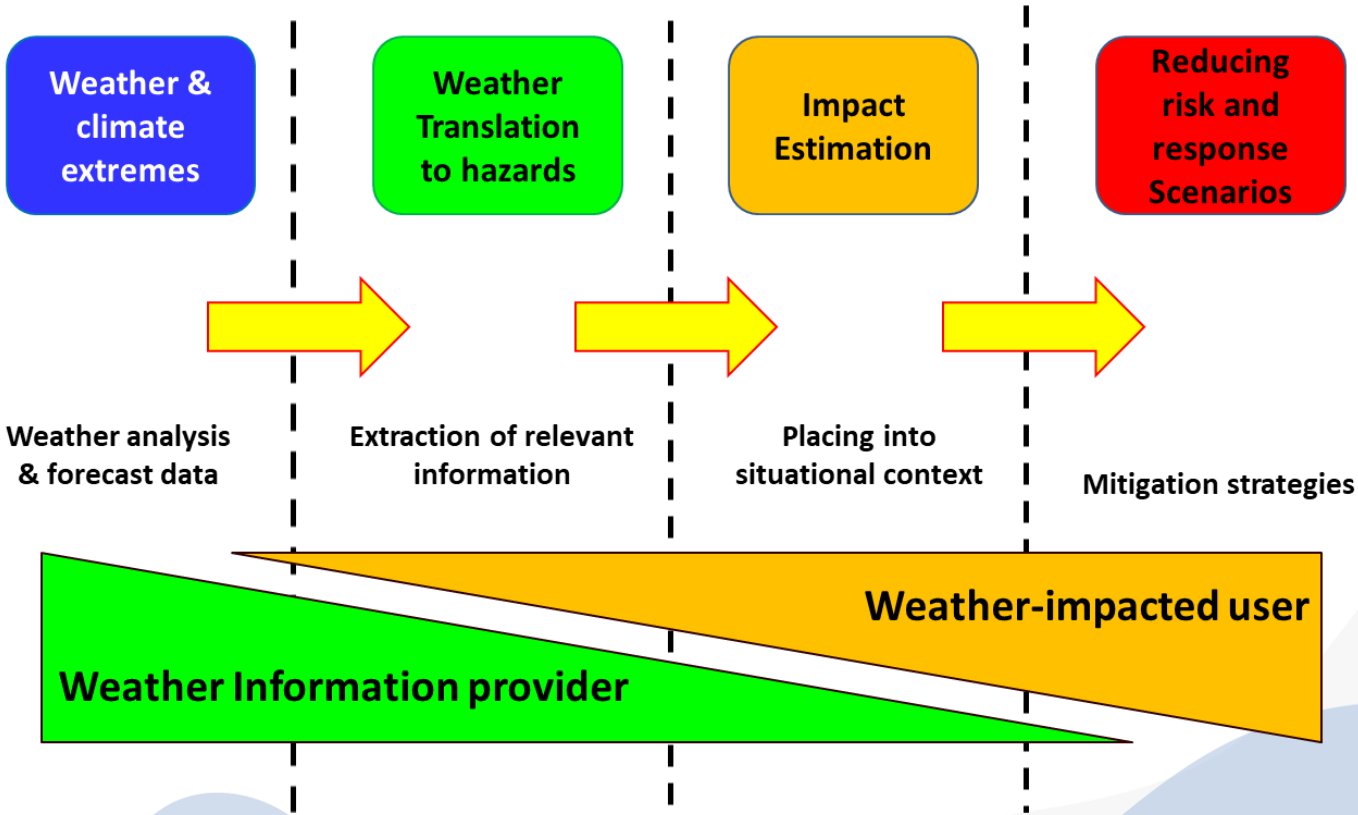


(Source: Met Office, United Kingdom)

Figure 2. Risk matrix

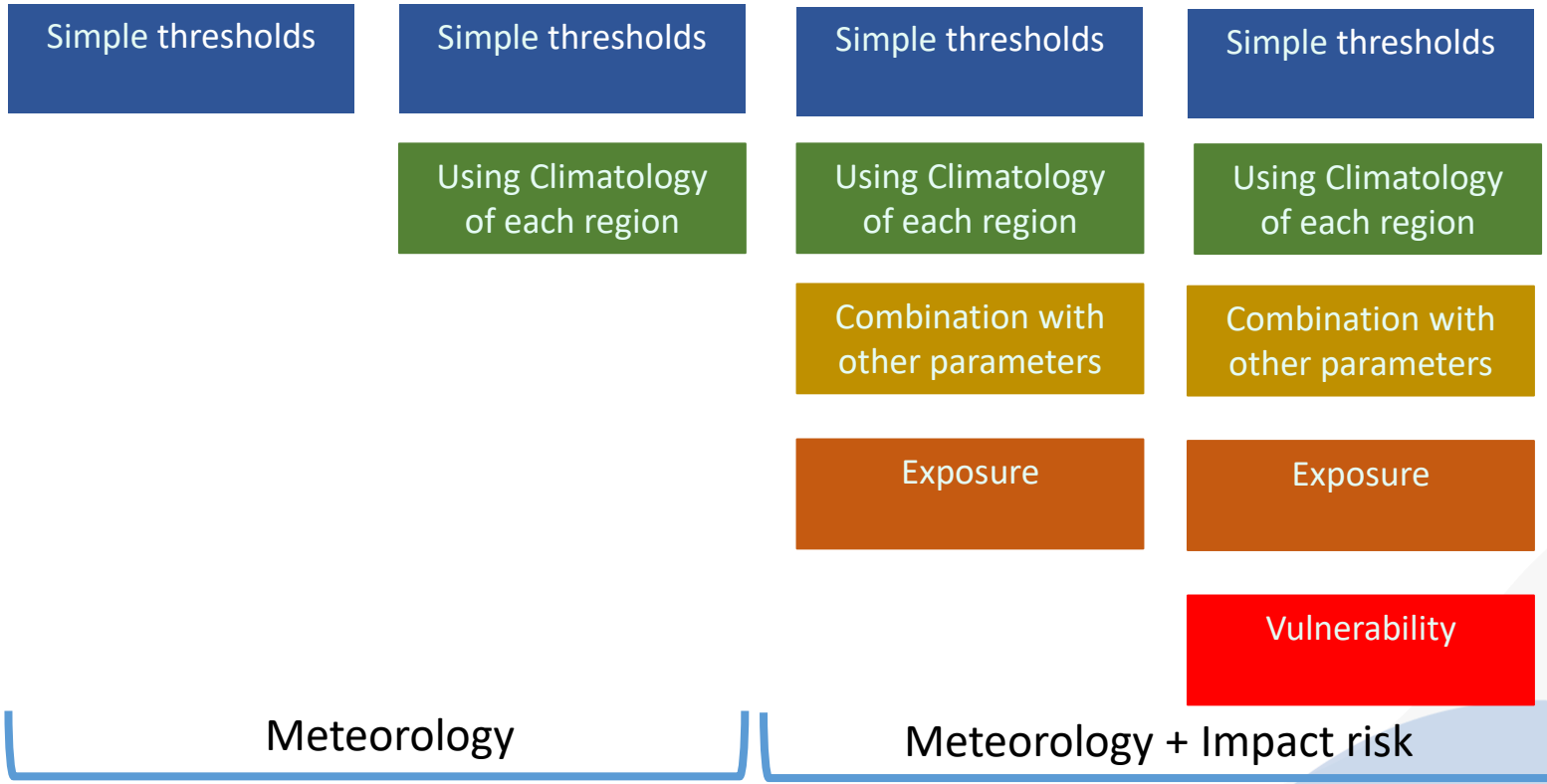
- Provides information on the expected degree of impact and the probability of impact.
- Meteorological thresholds are not decisive, but are part of decision making.

From weather to impact



Credit: Michel Jean

Stages in the evolution of early warning systems



Credit: Michael Staudinger

Types of warning systems

Evolving warning paradigm using a heavy rain event as an example		*Factors incorporated*
General forecast	A cold, windy, wet day tomorrow with spells of very heavy rain expected in the afternoon and evening.	Hazard
Warnings with fixed thresholds	Rainfall accumulations of 30 mm to 40 mm expected tomorrow between 1400 and midnight.	Hazard
Warnings with user-defined thresholds	Heavy rain expected tomorrow afternoon with rainfall intensities of 3 mm/10 mins possible, leading to overflow in the drainage system. *(Note that this type of warning would typically be issued to a municipal authority only.)*	Hazard Vulnerability
Warnings with spatial and/ or temporal variations in thresholds	Spatial differences: Weather warning – rainfall accumulations of 20 mm to 30 mm expected tomorrow in low-lying areas between 1400 and midnight, with accumulations of 50 mm to 60 mm possible at altitudes above 1 500 m. Temporal differences: Weather warning – rainfall accumulations of 15 mm to 20 mm expected tomorrow afternoon during rush hour. *(Note the lower threshold at times when the roads will be very busy.)*	Hazard Vulnerability

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Only weather

Risk impact information

Types of warning systems

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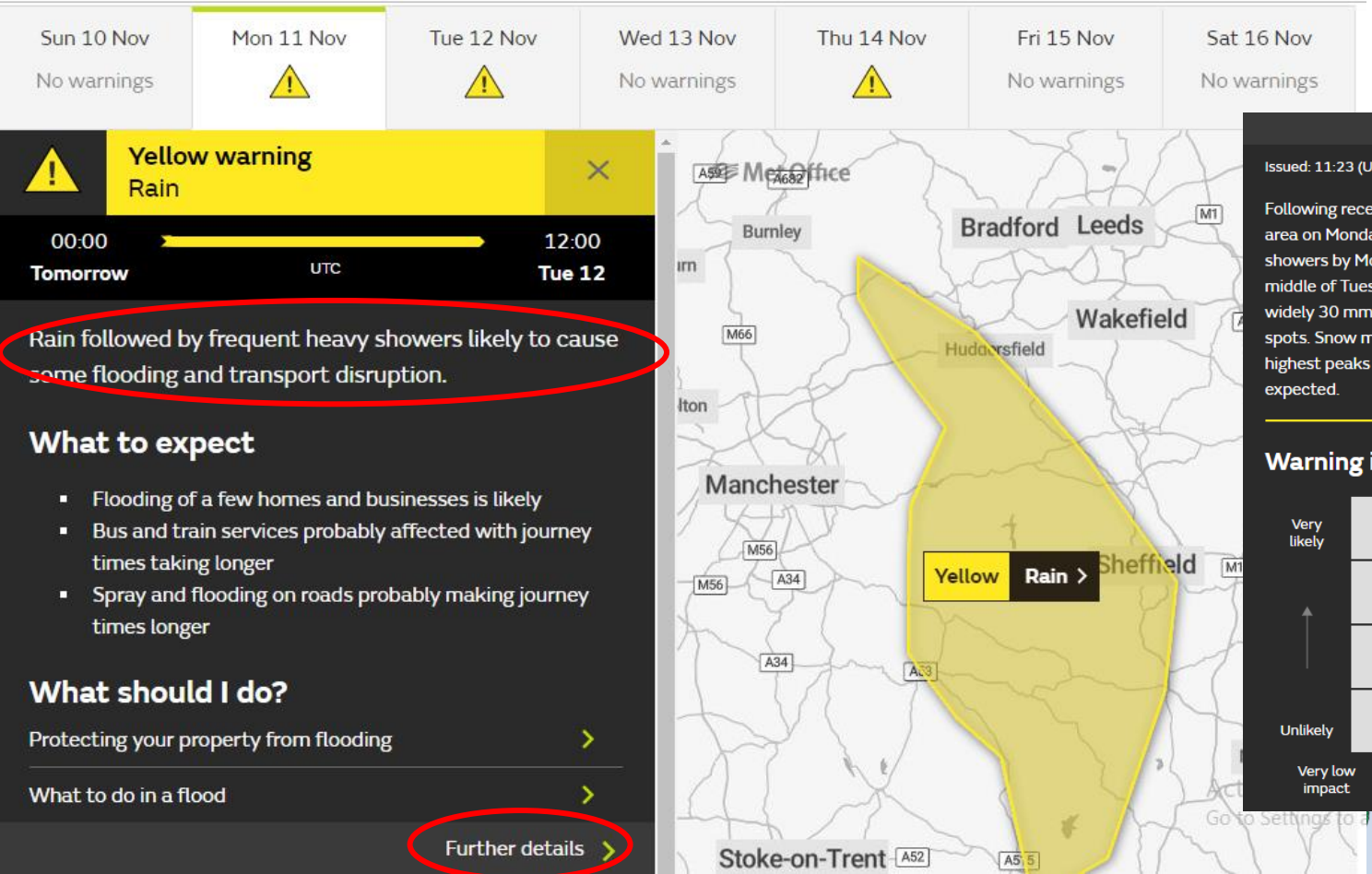
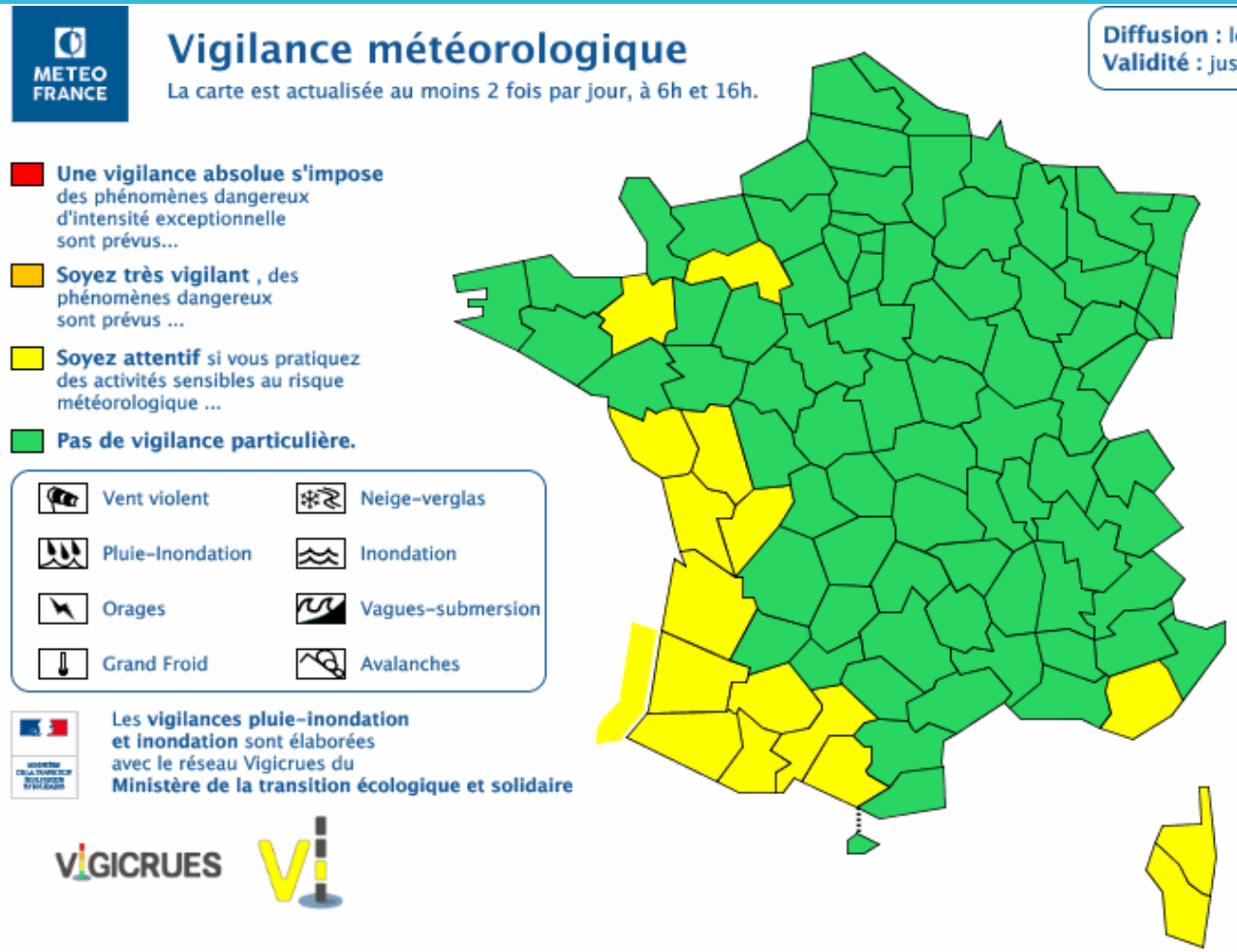
Impact-based warning	Rainfall accumulations of 20 mm to 30 mm expected tomorrow between 1400 and midnight, resulting in possible road closures due to flooding across the south-east. *(Note the subtle but important distinction between the impact-based warning and the threshold warning described above. The distinction is that the threshold-based warnings only specified generalized flooding; the impact-based warning provided specific mention of an impact, in this case road closures.)*	Hazard Vulnerability
Impact warning	Expect journey times on the A111 likely to be lengthened by an hour because of significant traffic disruption in the south-east tomorrow afternoon due to localized flooding which is expected to follow a heavy rain event.	Hazard Vulnerability Exposure

Example - UK Met Office



Example - Meteofrance

- Color code associated with potential impacts, not only to meteorological phenomena.
- Validation: involves stakeholders, takes into account forecasts and reports of impact information.
- Recommendations



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Summary

- Collaboration and permanent dialogue between meteorological services and emergency agencies / users.
- For meteorological information to be suitable for specific dangerous situations, it is necessary to understand the potential impacts of meteorological phenomena, as well as the uncertainties involved.
- Importance of impact, vulnerability and exposure data, and the infrastructure required.
- Warning systems must be adjusted to available information, technical and human resources.
- Interdisciplinary approach, partnerships.

Thank you

Servicio Meteorológico Nacional

Dorrego 4019 (C1425GBE) Buenos Aires . Argentina
Tel: (+54 11) 5167-6712
smn@smn.gob.ar . www.smn.gob.ar

ccerrudo@smn.gov.ar