IPA Floods and Fires

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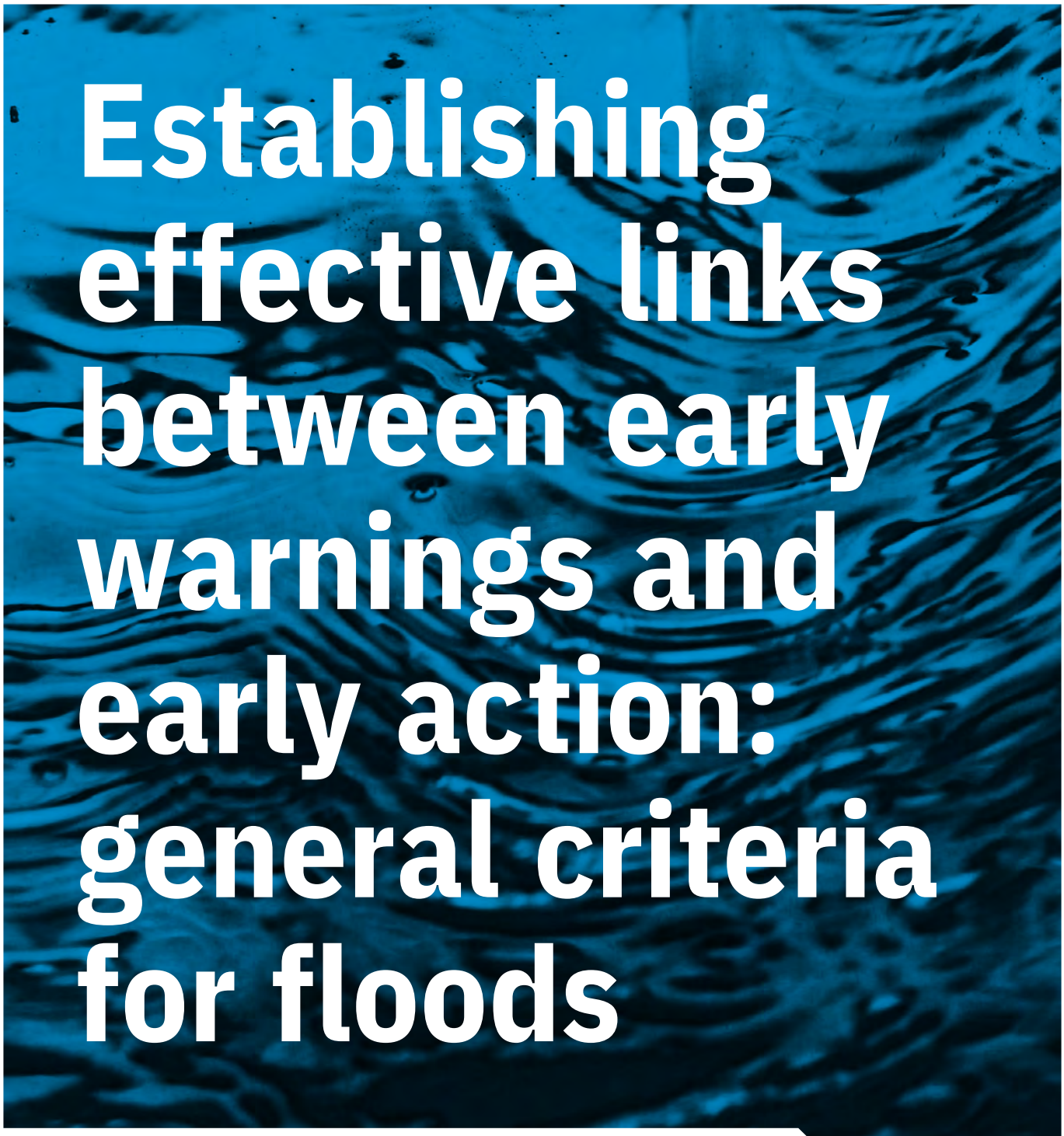

Establishing effective links between early warnings and early action: general criteria for floods

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

cima RESEARCH FOUNDATION

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1: Cima Research Foundation
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Foreword

The relevance of early warning systems has been gaining recognition, over the last years, as an effective and viable measure to save lives and mitigate impacts of water related hazards, especially within the context of climate change. Strengthening the links between early warning and early action is imperative in a modern civil protection system. The earlier the alert, the greater the benefits for society, in terms of safeguarding lives, property, animals, and settlements, along with infrastructure and production sites.

It is a matter of public knowledge that the climate crisis is rapidly increasing, and that mitigation is not the only action to be implemented. Indeed, learning how to live with the growing threat of climate change and developing strategies to adapt to these changes are fundamental. In the medium to long term, all countries will have to prepare for possible extreme weather events and the impacts brought by heavy rainfall and high temperatures.

Prompt activation of the civil protection system at all territorial levels is of paramount importance to prevent or reduce the negative effects generated by these intense weather events, and organized and coordinated actions of local institutions are needed.

Early warning systems may have varying institutional set-ups, operational procedures, technical and scientific activities, and communication mechanisms that are country specific. However, some general criteria can be established to support the design and testing of the effectiveness of the links between early warnings and early actions at any territorial level.

This publication focuses on three main objectives: I) to promote the activation of civil protection systems following an alert rather than responding to an event, thus enabling the anticipation of civil protection actions; II) to activate a gradual and coordinated system in proportion to the severity of alerts, and III) to integrate early warning and early action mechanisms into civil protection plans. The document is set within the broader international context of protecting all people through early warning systems by 2027.

The general criteria outlined in this document are applicable across all pillars of early warning systems and are addressed to agencies responsible for forecasting and monitoring hydrogeological and hydraulic hazards, issuing alerts, protecting populations, as well as those that activate flood risk preparatory measures. Having in mind that building an effective Early Warning-Early Action link is a task requiring a joint effort among key Early Warning actors, reaching all these actors, and bridging them is the key objective of this document.

Fabrizio Curcio
Head of the Italian Civil Protection Department

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Glossary

This glossary provides a general understanding of the document's terminology, with a more comprehensive conceptualization of the terms used for an effective Early Warning – Early Action link developed in the subsequent chapters.

CIVIL PROTECTION FUNCTION

(Adapted from EU Lex Glossary)

Civil protection is the protection of people, the environment and property against all kinds of disasters deriving from natural and man-made hazards. Civil protection function involves the planning and preparation for such events, such as carrying out risk assessments and agreeing on protection and rescue plans and procedures. It also includes the deployment of forces and equipment in response to an emergency.

CIVIL PROTECTION SYSTEM ACTIVATION

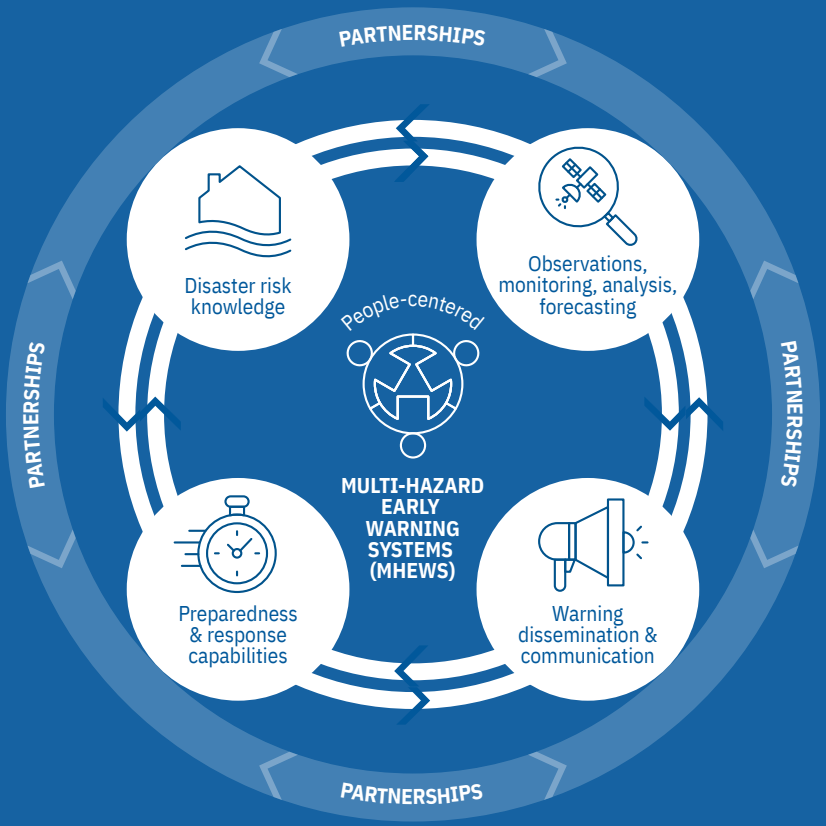
Civil protection system activation is the mobilisation and organisation of all levels of institutions and actors involved in the civil protection function when an early warning is issued. The level of activation can vary according to the severity of early warnings and may be codified in increasing activation phases.

EARLY WARNING (EW)

(Adapted from Glossary of Early Action Terms 2022)

EW is the information provided by the National Hydro-Meteorological Service (NHMS) and/or river basin agencies and/or civil protection authorities prior to a specific hazardous event. These organisations alert stakeholders to possible risks and enable them to take timely action (early action) to reduce expected impacts. EW can be codified at different levels of alert.

Figure 1: Adapted from "Graphical presentation of a Multi-Hazard Early Warning System (MHEWS)."
Source: WMO, 2022



EARLY ACTION (EA) / ANTICIPATORY ACTION
EA and/or anticipatory action are based on an EW and eventually other triggers, such as predefined thresholds of physical or qualitative indicators. EAs come in many forms and sizes and always take place prior to the impact of a forecasted hazard. They are highly time-sensitive, associated to forecasts[1] and aim to prevent or mitigate the hazard's impact so as to protect people, assets and other exposed elements.[2]

EARLY WARNING - EARLY ACTION LINK (EW-EA LINK)
EW-EA link is the link put in place and codified to translate EW information into EAs, both at system and single actor levels. It furnishes stakeholders with valuable information enabling them to forewarn authorities and communities of potential hazards and impacts using predefined thresholds and analytical criteria. The more consolidated and codified the EW information is, the more complex and efficient the strategy will be to link that information to EAs, thereby potentially reducing the impact of an event.

EARLY WARNING SYSTEM (EWS)
(Adapted from Glossary of Early Action Terms 2022)
An EWS is an integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of a hazardous event.

Effective "end-to-end" and "people-centred" EWS may include four interrelated key elements: (1) disaster risk knowledge based on the systematic collection of data and disaster risk assessments; (2) detection, monitoring, analysis and forecasting of hazards and their possible consequences; (3) dissemination and communication, by an official source, of authoritative, timely, accurate and actionable warnings and associated information on the likelihood and impact; and (4) preparedness at all levels to respond to the warnings.

These four interrelated components need to be coordinated within and across sectors and at multiple levels for the system to work effectively. A feedback mechanism must be included for continuous improvement, as an error in one component or a lack of coordination could lead to the failure of the whole system.

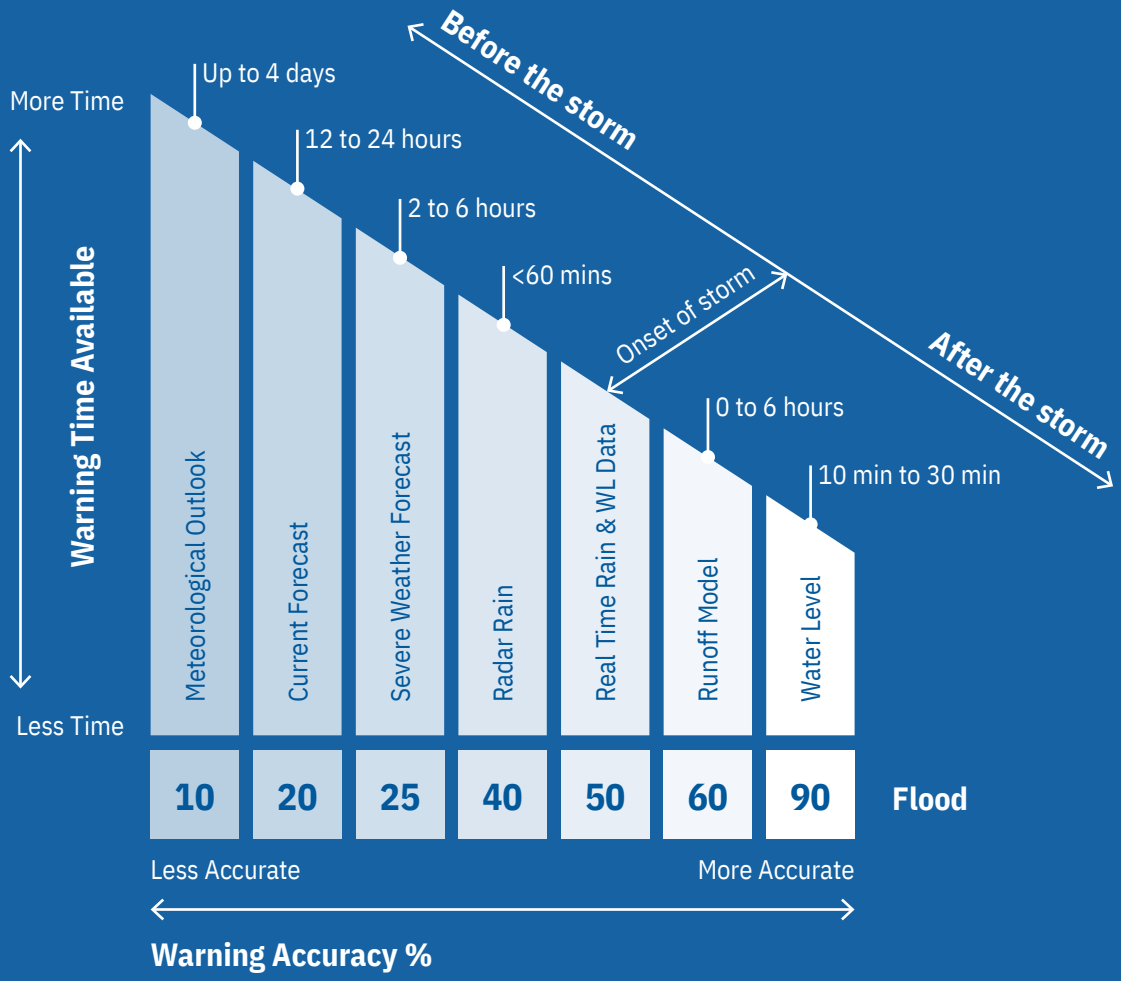
IMPACT-BASED FORECAST AND WARNING
(Adapted from Guidelines on Multi-hazard Impact-based Forecast and Warning Services. WMO-No. 1150)
Impact-based forecast and warning express the expected impacts of an anticipated weather event. The fundamental distinction between a general weather warning and an impact-based warning is that the former is based on a hazard evaluation only, while the latter includes the vulnerability of people, livelihoods and property due to a hydro-meteorological hazard. Furthermore, impact-based forecast and warning differ from impact forecast and warning as the latter includes detailed information on who or what is exposed, thus explicitly considering exposure along with hazard and vulnerability.

LEAD-TIME (Adapted from Integrated flood management tools series flood forecasting and early warning. WMO, 2012)
The basic criterion for assessing lead-time requirements is the minimum period of advance warning necessary for EA to be taken effectively. This will depend on the needs of the target community or area. On large rivers with a major potential impact, the lead-time for evacuating populations at risk may be in the order of days. The concept of lead-time needs to be flexible, with the minimum time depending on the catchment area and the available facilities for forecasting and warning.

The lead-time provided by a flood warning has to be sufficiently long to allow EA to take place. Lead-time involves delivering data from the observation system in time for the forecast mechanisms to issue the appropriate warning.

Usually, a flood can be predicted with high accuracy only in the later stages of its development, once more information - such as observed rainfall - becomes available. Therefore, in order for sufficient warning time to be provided it is often necessary to accept a less precise prediction.
As such, there is a trade-off between prediction accuracy and warning time, as illustrated in Figure 2.

Figure 2: Trade-off between the warning time that can be provided and the level of accuracy (WMO-No. 1072, 2011)



EMERGENCY RESPONSE / PREPAREDNESS AND RESPONSE / PROTECTION AND RESCUE PLANNING

(Adapted from Glossary of Early Action Terms 2022)

Sendai definition: Emergency response, preparedness and response, protection and rescue planning are processes that analyse disaster risks and establish arrangements in advance to enable timely, effective, and appropriate responses.

Emergency response planning results in organised and coordinated courses of action with clearly identified institutional roles and resources, information processes and operational arrangements for specific actors in times of need. Based on scenarios of possible emergency conditions or hazardous events, it allows key civil protection actors to envision, anticipate and solve problems that can arise during disasters. Emergency response planning is an important part of the overall preparedness process that needs to be regularly updated and exercised.

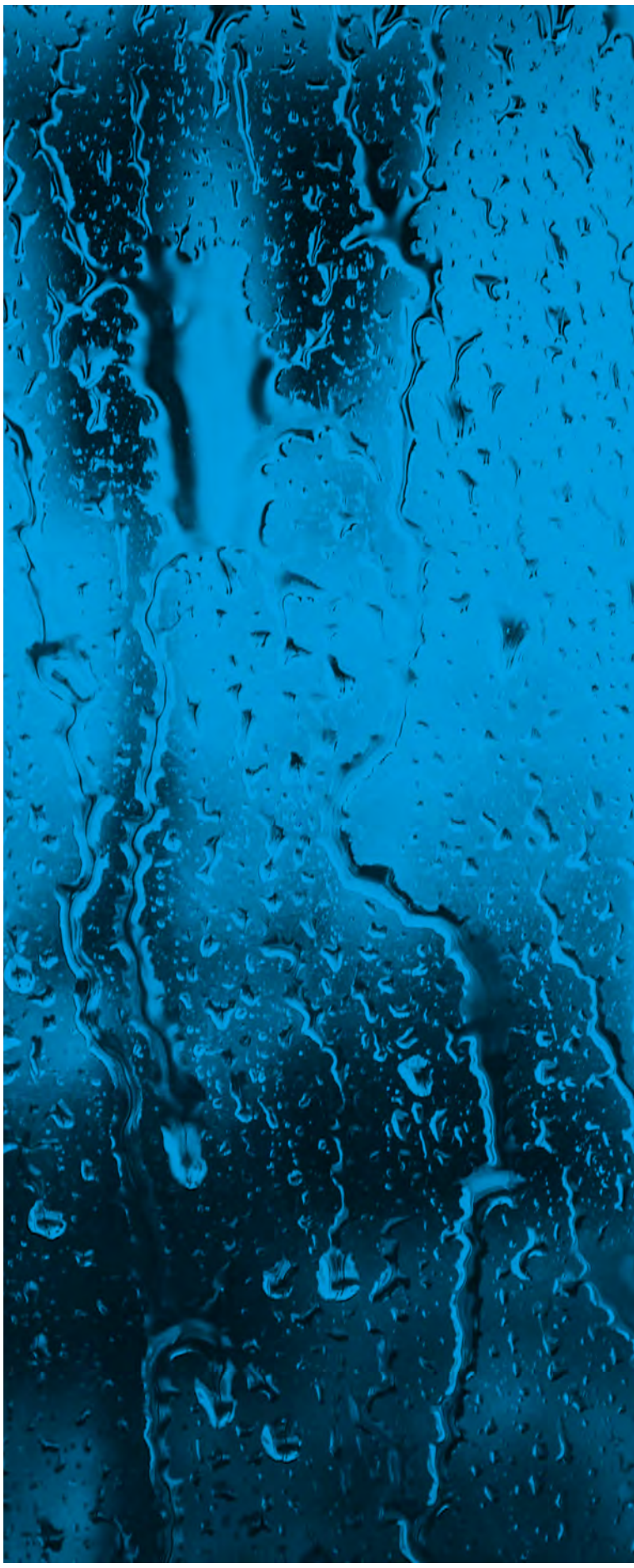
TRIGGER

(Adapted from Glossary of Early Action Terms 2022)

A trigger is a predetermined criterion that, when met, is used to initiate actions. The predetermined value can be for a specific indicator, set of indicators or index that is forecast to occur (such as wind speed in 48 hours time) or has been measured as having occurred (such as the amount of rainfall in a specific time). For example, if a monitored indicator exceeds a predetermined value, it can serve as a trigger to initiate a particular activity, thereby functioning as a measurable quantitative indicator of a specific risk. A trigger can also be an assessment of loss (such as the proportion of damage to property) or a more general judgement of severity (such as a government declaration of emergency).

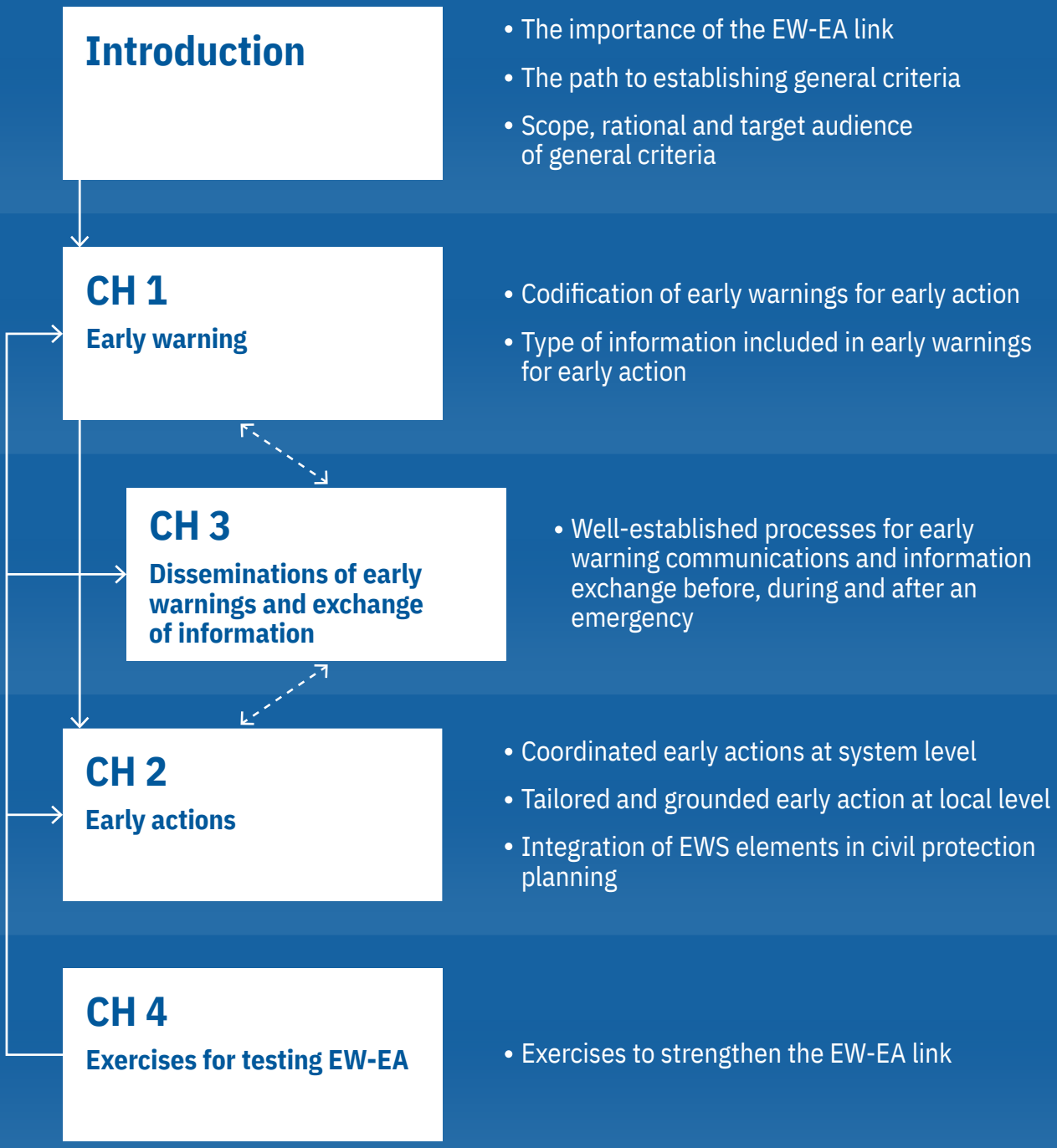
For some users, the term trigger implies that, when the predetermined criterion is met, actions will be initiated automatically.

ACRONYMS	
CAP	Common Alerting Protocol
CPX	Command Post Exercise
DBX	Discussion Based Exercise
DG ECHO	Directorate-General for European Civil Protection and Humanitarian Aid Operations
DPC	Italian Civil Protection Department
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EA	Early Action
EOC	Emergency Operational Centre
EU	European Union
EW	Early Warning
EW4ALL	Early Warnings for all initiative
EW-EA	Early Warning-Early Action
EWS	Early Warning System(s)
FSX	Full Scale Exercise
FX	Field Exercise
GC	General Criteria
IBF	Impact-based Forecast
IBFWS	Impact-based Forecasting and Warning Services
IFRC	International Federation of Red Cross and Red Crescent Societies
IPA FF	Flood Prevention and Forest Fires Risk Management in the Western Balkans and Turkey
ITU	International Telecommunication Union
LSGU	Local Self Government Unit
MHEWS	Multi-hazard Early Warning System
NHMS	National Hydro-Meteorological Service
RCCC	Red Cross Red Crescent Climate Centre
RIMES	Regional Integrated Multi-Hazard Early Warning System
SOP	Standard Operating Procedures
TOT	Training of Trainers
TTX	Table-Top Exercise
UN	United Nations
UNDP	United Nations Development Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNDRR	United Nations Office for Disaster Risk Reduction
WMO	World Meteorological Organization



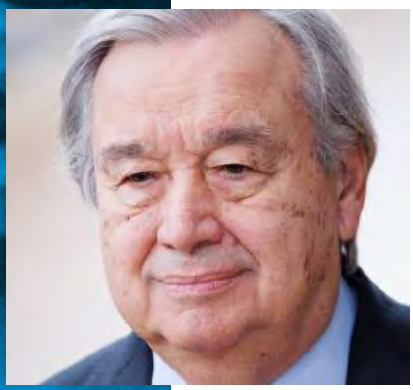
Content structure of the document

The document is divided into five distinct chapters, laying down the key principles and related general criteria to build an effective link between EWs and EAs for floods.



Intro

Today, one third of the world's people, mainly in least developed countries and small island developing states, are still not covered by early warning systems... This is unacceptable, particularly with climate impacts sure to get even worse. Early warnings and action save lives. To that end, today I announce the United Nations will spearhead new action to ensure every person on Earth is protected by early warning systems within five years...



António Guterres
UN Secretary General

on World Meteorological Day 23 March 2022

The importance of the Early Warning - Early Action link

Last year, the United Nations Secretary General launched the "Early warnings for all Initiative"[3] – hereafter EW4ALL – recognising the relevance of an Early Warning System (EWS) as an effective and feasible measure to mitigate the impacts of water related hazards and to save lives, especially within a context of changing climate. This initiative aims to ensure every person on Earth is protected by EWS within the next 5 years, with particular emphasis on translating EWs into anticipatory and mitigating EAs.

Before the EW4ALL, the Sendai Framework for Disaster Risk Reduction, 2015-2023,[4] clearly set EWs as one of the global targets for reducing the impact of disasters; specifically, Target G envisages to "substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030".

In Europe, several policies address EWS from different perspectives. The "EU Floods Directive",[5] which came out in 2007, envisages that flood risk management plans shall address all aspects of flood risks with particular attention to prevention, protection, and preparedness, including flood forecasts and EWS, while taking into account the characteristics of the particular river basin or sub-basin.

Within the Joint Communication to the European Parliament and the Council "A Strategic Approach to Resilience in the EU's external action Annex",[6] ten guiding considerations are outlined for a strategic approach to resilience. Among them "early warning needs to be linked to early action. It is not possible to avoid all risks, so an effective resilience approach requires decision makers to be able to identify and assess pressures in the long, medium and short term, and to take effective early action. This means that a complete assessment has to be linked to appropriate decision-making processes". As stated by REAP,[7] in a context where hazards are increasingly predictable and loss of life and livelihoods are therefore not inevitable, it is imperative that systems adjust and adapt, moving from reactive to proactive, anticipatory approaches. The challenge is to change the systems, at both national and international levels, to take risk-informed early action to scale and to make it the norm for the management of predictable risks.

More recently, the five European Disaster Resilience Goals sponsored by DG ECHO[8] prioritised risk-based and anticipatory actions among the targeted preparedness actions. Specifically, the disaster resilience goals address the inter-links among anticipation, preparedness, alerting, responding, and securing. Collectively the goals contribute to reinforce the EW-EA system as a whole.

Ensuring that EW information is effectively translated into EAs is a pressing challenge that requires the partnership and coordination of multiple actors at different territorial levels. In fact, EWS can only save lives and protect livelihoods if they incorporate clear roles, responsibilities, and coordination mechanisms for EA (WMO EW4ALL).

EU regional programmes and projects in the Western Balkans and Türkiye have greatly contributed to enhance cooperation in the area in terms of disaster risk reduction and civil protection. Today, six countries are participating members of the EU Civil Protection Mechanism. Regional EWS have been modernized with systems that are increasingly capable of transcending borders between countries. While challenges still remain, improvements in availability of risk information, monitoring, and forecasting have been significant in the region over the last decades.

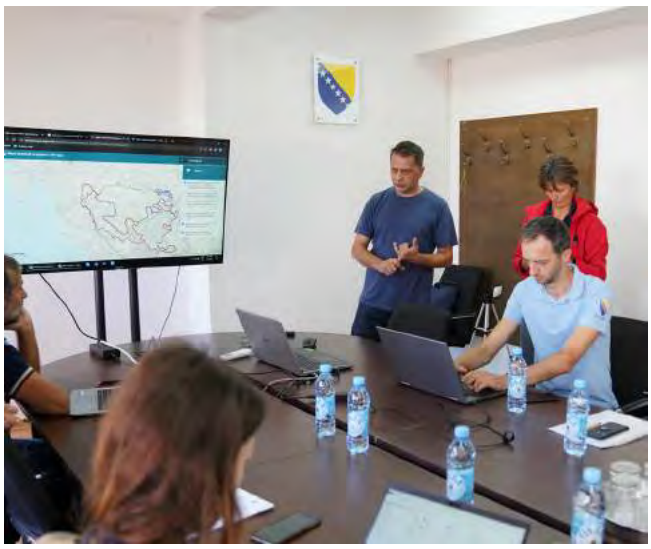
The "Global status of Multi-Hazard Early Warning Systems (MHEWS): Target G report" (UNDRR and WMO, 2022) highlighted that MHEWS should be understood as a complete cycle, rather than as a set of separate elements. Indeed, the MHEWS cycle is recognised as being as strong as its weakest link, in the sense that a single break or delay in information transfer at any stage may derail the whole system. An EWS saves lives when it is able to translate EWs coming from authoritative sources – such as the NHMS and civil protection authorities - into preparedness and EAs. EWs clearly linked to EAs and integrated into emergency response or civil protection planning can save lives and protect livelihoods, thereby reducing the impacts of a flood.

The IPA FF program contributed to improve the effectiveness of EWs and EA systems by reinforcing the links between timely warnings and prompt actions from the national to local level for each partner. The program supported partners in testing the effectiveness of their own EW-EA system by identifying the needs and gaps for improving the system at all levels. The lessons learned along the process provide the foundations for establishing the general criteria for effective links between EWs to EAs with regards to flooding, as described in this document.

The path to establishing general criteria

To strengthen the EW-EA link, the IPA FF program adopted a systems approach, involving key national and sub-national institutions with mandates and roles in planning EAs for floods as a response to EWs.

The approach consisted in four key steps, as described in Figure 3, and form part of the capacity development process. The steps include:



01 Conducting country-level context analyses through questionnaires, self-assessment tools attesting the "maturity levels" of individual EWS, and interactive workshops. This led to a comprehensive stakeholder mapping and guided the formation of multi-territorial and multi-sectorial working groups (from NHMS to river basin and water agencies and civil protection authorities at all levels).

02 Designing and implementing a Command Post Exercise (CPX) to test coordination and communication among all EWS actors, as well as the activation of emergency plans and procedures in response to warnings from national to local levels. This step was instrumental in strengthening interagency familiarity and functional capacities of the system, identifying barriers to effective operations, and raising awareness on strategies for EW-EA linkages.

03 Analysing the lessons learned, recognising gaps and capacities to be strengthened. Specifically, the analysis of the CPX provided the foundations for a set of general criteria that built on the regional experiences, and informed the integration of EWs into emergency response planning and civil protection actions, thereby linking EWs to EAs.

04 Conducting a regional Training of Trainers (TOT) session that focuses on the definition of general criteria for an effective EW-EA link. The TOT has a twofold goal: to enhance the knowledge and awareness of the essential elements of an effective EW-EA link and to equip participants with the ability to train others effectively. Participants in the TOT are regarded as partners in the learning experience by leveraging their knowledge, skills and experiences.

Figure 3: IPA FF Program's (WP 1.3) path towards establishing general criteria

01

Setting the scene and context

- Comprehensive stakeholder mapping
- Constitution of multiterritorial and multisectoral working groups
- Selection of pilot cases

02

Initial review of SOPs & Plans

- Exchange of good practices
- EWS scheme
- Design a CPX
- CPX planning & execution

03

Identify best practices and areas for improvement for SOPs & plans

- CPX debriefing
- CPX results analysis

04

Improvement of SOPs & Plans

- Training of Trainers (ToT) to strengthen the Early Warning-Early Action link

- **CODESIGN**

  Codesign the ToT and discussion on general criteria

- **IMPLEMENTATION**

  Regional exchange of experiences

  Training of trainers at partner level

- **FEEDBACK & DISCUSSION**

  Final regional workshop

GENERAL CRITERIA FOR AN EFFECTIVE EARLY WARNING-EARLY ACTION LINK

This document outlines the general criteria for establishing effective links between EWs and EAs with regards to flooding within the IPA FF program region. It started with the outcomes of the CPX and other analyses, which have been further enriched through a comprehensive examination of EU and international standards.

Several documents (see bibliography) related to civil protection, EWS and disaster risk management were consulted to ensure that the formulated criteria are aligned with the most up-to-date strategies. The “EW4ALL” documents and reports played a significant role in guiding this process, as they establish the global EWS direction for the next five years.

Scope, rational and target audience of general criteria

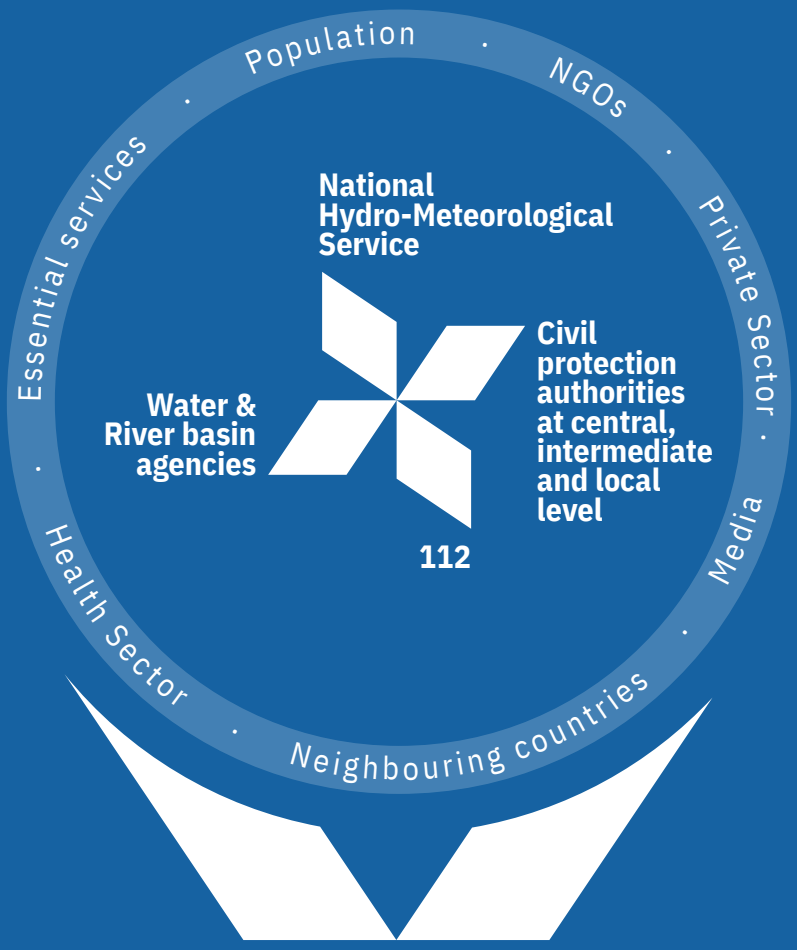
General criteria are a set of principles and requirements that can support the design or test the effectiveness of the link between EWs and EAs at any territorial level. They aim to be a resource and strategic guide for all answerable actors within the system.

The main recipients of this document are institutions that are responsible to forecast and monitor floods, issue EWs, and prepare and coordinate for the protection of people, the environment and assets exposed to possible flood risk. Bearing in mind that establishing an effective EW-EA link requires a combined effort of key EWS actors, general criteria needs to build bridges among actors with specific reference to:

- NHMSs and in some cases water/ river basin agencies responsible for preparing and issuing EWs
- 112 (national emergency number) and operational centres that deal with the dissemination of EWs
- civil protection actors who endorse and implement EAs at any relevant territorial level, including local level

Although general criteria are referred primarily to these actors, their influence can be broader, spanning stakeholders from the private sector to the media to the population at large, who are ultimately at the centre of the EWS (Figure 4).

Figure 4: The EW-EA link requires a combined effort among many actors: the white circle indicates actors directly involved in the IPA FF activities for partnership and collaboration, while those In the blue circle tend to be actors that may be affected by activities



Partnership and collaboration to speak a common language

General criteria address cross cutting issues among EWS components at different territorial levels. They need to be implemented in a context of collaboration and partnership, supported by plans, standard operating procedures (SOPs), and agreements.

General criteria aim to:

1. support the system to develop mechanisms for acting before the flood occurs, by responding to EWs and not to floods (Figure 5)
2. support the system to implement EAs that are proportionate to the level of EWs and coordinated among all actors within the system (Figure 6)
3. integrate EW-EA elements into plans and procedures

Figure 5: Scheme of activation of early actions, adapted from Anticipation Hub (IFRC, German Red Cross, Red Cross Red Crescent Climate Centre)

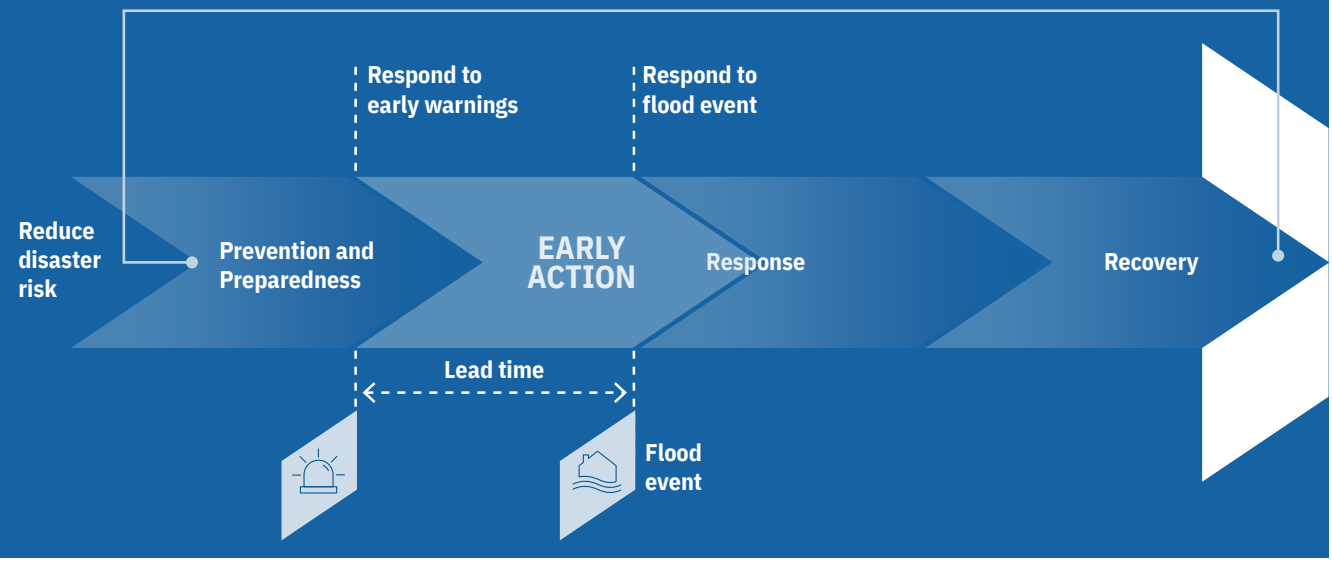
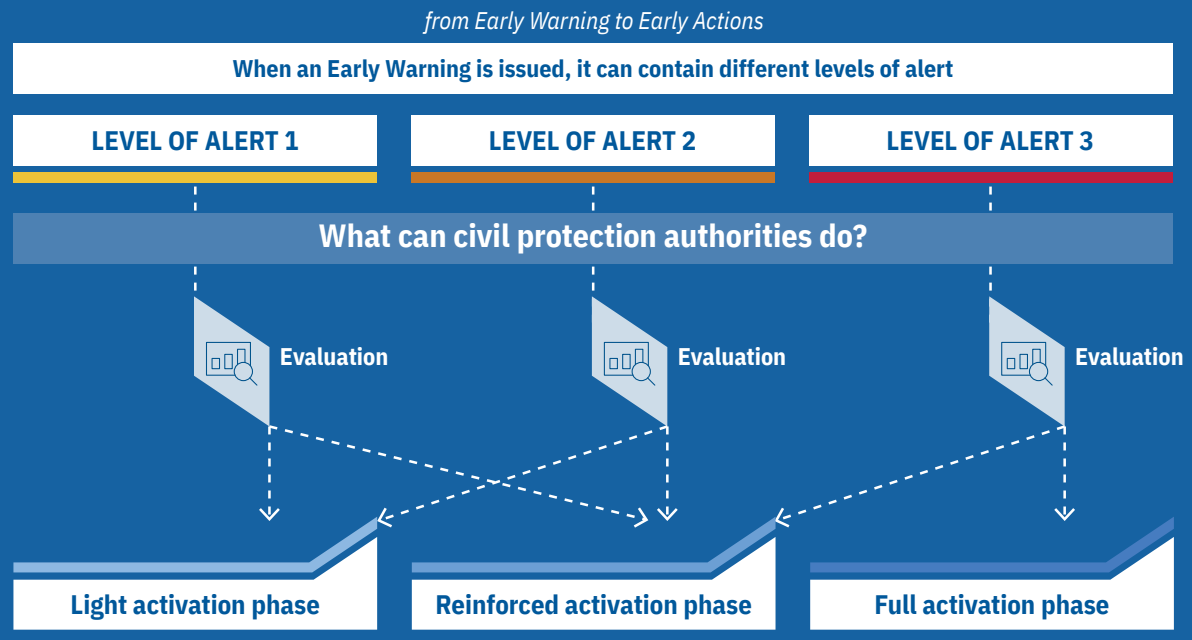


Figure 6: Gradual activation of the civil protection system according to early warning severity



General criteria do not focus on single components of an EWS (disaster risk knowledge, monitoring and warning services, communication and dissemination, emergency response capacity) for which standards and/or guidelines have already been developed by WMO[9] and others, but instead are conceived to reflect the entire system, enabling the activation of a prompt and coordinated civil protection system.

The quality, accuracy, and timeliness of EW information influence the activation of EAs by civil protection authorities and affect their effectiveness and efficiency. For example, if a municipality received information from an alerting authority about heavy rainfall that could cause flooding with no further details on where and when these adverse conditions might take place, the local authorities would have insufficient information to act. This would risk the onset of flooding before any action is taken, and thereby limit the municipality's ability to reduce the impacts of the event.

Moreover, the response to EWs needs to be calibrated with the forecasted information provided by the NHMS, which should contain valuable insights to anticipate possible consequences. This means that the more the EWs are codified between NHMS and civil protection actors, the more efficient the activation of the civil protection system will be. Therefore according to the EW information received, resources can be allocated and operational actors activated in proportion to the expected impacts, while targeting the communities most at risk.

Acting before the onset of an event reduces the risk of having to deal with a disaster, as vulnerable groups can be protected and critical assets safeguarded. Acting locally and in a timely fashion with a progressive triggering of EAs enhances the optimal use of resources and hence the sustainability of such activities.

The link between EW-EA should guarantee a gradual and coordinated activation of the civil protection system, ensuring that EAs are proportional to both the severity and potential impacts as defined by the EWs, and are taken before any expected hazard arises.

General criteria are organized under four categories, each with several associated key principles (Table 1).

Table 1: Overview of the topics, key principles and general criteria presented in the document (general criteria are designated as GC followed by the number of the chapter)

TOPIC	KEY PRINCIPLE	GENERAL CRITERIA (GC)
01. Early warnings	Codification of EWs and procedures among national hydro-meteorological services and civil protection authorities for gradually triggering EAs	**GC1.1.** Encode forecasting and monitoring information and data at different levels of alert **GC1.2.** Translate forecasts and associated levels of alert into expected scenarios (forecasted scenario) on which civil protection authorities must calibrate EAs **GC1.3.** Define the actors, modalities, timing and validity of EWs
	Provision of actionable EW messages that contain all the information required for an effective mobilisation of civil protection authorities (user driven)	**GC1.4.** Prepare readily understandable EW messages that adopt the "5W" messaging format: Who/ to Whom, What, Where, When, Why
02. Early Actions and their integration into Emergency response plans	At systems level, plan for coordinated EAs to define when and what needs to be done in advance of a flood	**GC2.1.** Set triggers and thresholds to define when to act: as a baseline requirement, codified EWs should act as a trigger for instigating EAs, while the gradual activation of the civil protection system should be linked to the forecasted alert levels and its associated potential impacts **GC2.2.** Clarify the activation phases of the civil protection system, and their associated EA codified packages
	At local level, plan for tailored and grounded EAs that reflect local priorities, risk knowledge and available resources	**GC2.3.** Link EAs to activation phases and thereby to EWs **GC2.4.** Include – at the very least - the monitoring and observation of the phenomena's evolution, its impact on the territory, and communication of EWs to the population **GC2.5.** Align local EAs – and EWs – based on local knowledge of risks in the target territory (such as hazard, exposure, vulnerability and coping capacity)
	Inclusion of EWS elements into emergency response plans to effectively anticipate and respond to the impacts of forecasted, imminent or current risks	**GC2.6.** Include elements of the EWs into emergency response plans that identify when to activate them, which actions to take based on the alert levels and how to test the plan **GC2.7.** At local level, include any risk information and/or SOPs to activate EAs within the emergency response plans, and ensure that the population understands them

03. Communication flows for the dissemination of early warnings and exchange of information among operational centres and institutions before, during and after the emergency	Establishment of processes for EW communications and information exchange to ensure coordination before, during and after an emergency	**GC3.1.** Define the roles of operational centres and actors **GC3.2.** Ascertain a shared definition of the type of information to be disseminated **GC3.3.** Define the communication flow so as to avoid gaps and/or overlaps **GC3.4.** Establish a feedback system **GC3.5.** Hold a debriefing immediately after the emergency response phase, appraising the communication flow to eventually adapt procedures and/or correct oversights **GC3.6.** Test the information flow among involved actors through targeted exercises and workshops. Pool expertise to build the network and facilitate communication in case of a real event
04. Exercises	Design and implement exercises for strengthening interagency familiarity and functional capacities of the system	**GC4.1.** Engage a broad range of actors involved in the EWS at different territorial levels **GC4.2.** Define the type of exercise (national or international/ regional) on the basis of the flood scenario and the level of coordination to be tested **GC4.3.** Design the exercises, adopting a participatory approach, to ensure transparency in the decision-making process, taking into account the local context and knowledge of all parties involved **GC4.4.** Ascertain the timing of the civil protection exercises **GC4.5.** Incorporate feedback and lessons learnt from exercises within the EW-EA system

01

Early warning

Key principle: Codification of early warnings and procedures among National Hydro-Meteorological Services and civil protection authorities for gradually triggering early actions

GC1.1. Encode forecasting and monitoring information and data at different levels of alert

GC1.2. Translate forecasts and associated levels of alert in expected scenarios (forecasted scenario) on which civil protection authorities must calibrate EAs

GC1.3. Define the actors, modalities, timing and validity of EWs

Key principle: Provision of actionable early warning messages that contain all the information required for an effective mobilisation of civil protection authorities (user driven)

GC1.4. Prepare readily understandable EW messages that adopt the "5W" messaging format: Who/ to Whom, What, Where, When, Why

Key principle: Codification of early warnings and procedures among National Hydro-Meteorological Services[10] and civil protection authorities for gradually triggering early actions

Civil protection authorities require lead-time to implement EAs in preparation for an expected flood event, starting from the moment an EW is issued. As shown in Figure 2, forecasts improve in accuracy as hazard events draw nearer, but waiting for certainty about where impacts will be felt leaves little time to mobilise anticipatory actions. To strike a balance, EA systems use thresholds or triggers to make decisions about when to act.[11]

To build such a system, it is essential to create and consolidate the partnership between NHMS[12] and civil protection authorities. The skills and knowledge base of these two sectors are different, with consequences on the language, procedures and modalities of exchanging information. To improve cooperation and coordination, it is important to "speak" the same language, thus facilitating the translation of EWs into EAs.[13] The more the EW message is codified and understandable, the more civil protection actors are able to act in a coordinated and gradual way. In some cases, for example, EAs are implemented as soon as a certain level of alert is reached within a national EWS.[14]

To build this clear and codified EW context, it is necessary to:

GC1.1. Encode forecasting and monitoring information and data at different levels of alert:
This entails defining a system of thresholds for each type of flood[15] (river, flash or urban) to reflect the different degrees of severity. Regardless of the method used to define these thresholds, the anticipated levels of alert should be linked to encoded expected scenarios (GC1.2).

Many EA systems employ these thresholds as a predetermined trigger for action, starting from the forecast of the severity and probability of quantitative indicators such as rainfall, wind speed or temperatures. More sophisticated triggers use risk information and are based on a threshold of how likely an impact will be reached[16]. Nevertheless, the current approach is to shift the paradigm from simply providing information on *"what the weather/ climate will be"* to *"what the weather/ climate will do"*,[17] by enriching EW messages with an understanding of the impacts that an event may cause, based on past experiences. To achieve this goal, and according to the sophistication of the EWS and the available information, the system of triggers can be structured through:

- qualitative thresholds
- weather or hydrological thresholds based on an assessment of the hazard level and possible associated impacts (impact-based forecast)
- impact thresholds based on an assessment of possible impacts

In defining thresholds, quantitative or qualitative variables must be carefully chosen and processed to minimize false alarms, and to ensure timely and accurate EWs to civil protection actors. Moreover, they need to be tested and eventually adjusted based on post event analysis and lessons learned from previous events (GC3.5).

GC1.2. Translate forecasts and associated levels of alert into expected scenarios (forecasted scenario) on which civil protection authorities must calibrate early actions. There are two types of scenarios:

- *hazard scenario with potential impacts*, containing a description of the forecasted event (such as expected rainfall, water levels and flood events, wind speed and direction) and the relative consequences on the ground, which can be elaborated based on expert judgment and qualitative considerations
- *impact scenario* outlining details of the exposed elements such as the number of people and infrastructures that are potentially affected by the forecasted hazard. This may ultimately include information on potential direct and indirect damage to enable the activation of extraordinary resources

Which of the scenarios to anticipate should be agreed upon by both the NHMS[18] and civil protection actors so that they have a common understanding of what to expect, and can each contribute with their specific knowledge and expertise.

Typically, this partnership involves defined roles, with NHMS taking the lead in forecasting hazards, while civil protection actors assume the responsibility for assessing the impact of the forecast, drawing from their experience on the ground.

Below is an example of thresholds linked to different levels of alert and their corresponding scenarios.

Table 2: Example of the link between the level of alert and expected scenario based on different thresholds

SYSTEM OF THRESHOLDS[19]	LEVEL OF ALERT	EXPECTED SCENARIO
Threshold 1	LEVEL OF ALERT 1	Widespread phenomena of: • significant increase in water levels of major rivers with flooding of neighbouring areas and floodplains, effects on embankments • bank erosion, solid transport and diversion of the riverbed • partial or total obstruction of the openings of bridges of major waterways Even in the absence of precipitation, discharge in major rivers can cause critical issues
Threshold 2	LEVEL OF ALERT 2	Widespread phenomena of: • overflow of major rivers with extensive flooding, widespread erosion of the banks, solid transport and diversion of the riverbed • overflow, siphoning or rupture of the banks, overtopping of bridges and other crossings, as well as cut-offs • partial or total obstruction of bridge openings of major rivers Even in the absence of precipitation, discharge in major rivers can cause critical issues

GC1.3. Define the actors, modalities, timing and validity of early warnings, specifically:

- institutions responsible for issuing forecasts by defining times and communication activities (Chapter 3)
- institutions that carry out monitoring by defining times and communication activities
- institutions that issue EWs to the entire civil protection system

The NHMS'* work does not cease once an EW has been issued but continues with the monitoring of the situation and updating civil protection authorities on the evolution of the event, which may be used to instigate EAs.

The process outlined above can be summarised with an example:

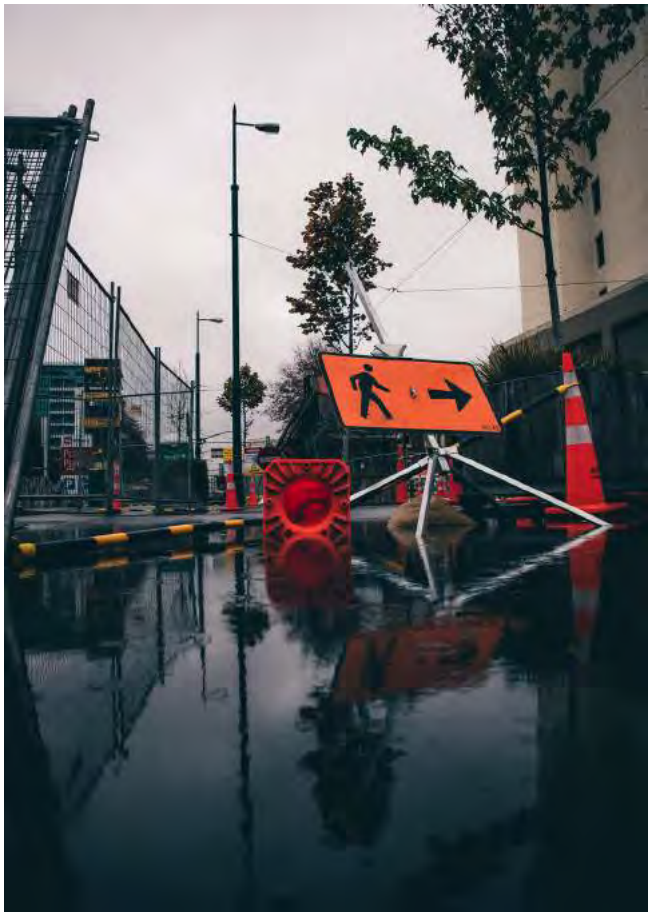
"At 10:00 UTC on 09/02/23, the NHMS forecaster conducts weather and hydrological assessments using the forecast model X and the hydrological model Y. The evaluation shows that threshold 1 has been exceeded in territorial area Z. The NHMS operator verifies that threshold 1 is associated with scenario 1 and consequently alert level 1. Therefore, s/he issues an EW to the civil protection authorities specifying the alert level from 00:00 on 10/02 to 23:59 on 10/02. The civil protection actors at all territorial levels, in turn, decode alert level 1 and act according to pre-agreed plans and procedures."

The example illustrates the importance of defining the time of issuance of the EW, the interval of validity, the codification that enables the translation of the hydro-meteorological situation into an operational EA and the communication with the civil protection authorities (Chapter 2).

Key principle: Provision of actionable[20] early warning messages that contain the information required for an effective mobilisation of civil protection authorities (user driven)

EW messages need to be clear, consistent, and informative to elicit a tangible connection between threat levels and EAs. In fact, information must be produced and articulated according to users' needs so as to be effectively employed (user-driven approach). This can be achieved by codifying the information provided by the NHMS[21] to the civil protection actors according to different alert levels that correspond to specific expected scenarios (GC1.1; GC1.2), as well as by providing the information required to take action in a comprehensive way.

This requires a structured approach and effective partnership between NHMS[22] and civil protection actors as it needs to combine hazard related information with exposure and vulnerability data to identify risk, provide operational recommendations, and support decision-making.[23] To reach these two goals, it is necessary to:



GC1.4. Prepare readily understandable early warning messages that adopt the "5W" messaging format,[24] and thus contain the following information:

- **"who"**, referring to the institutions that produce the EWs (NHMS[25] or NHMS in partnership with civil protection authorities) and **"to whom"**, referring to the civil protection actors that receive the message and others according to SOPs (Chapter 3)
- **"what"**, providing details about the scenario to be expected according to different levels of alert based on the codification agreed between NHMS[26] and civil protection actors (Introduction), and if possible, additional information on the magnitude (water level for flood, precipitation height, etc.) of the forecasted hazard
- **"where"**, specifying the area or part of the region where events could occur so as to target who needs to carry out EAs
- **"when"**, specifying the anticipated timing of the event and therefore the validity of the EW
- **"why"**, referring to the possible impacts of the expected scenario, or specific numbers of certain categories that might be affected (numbers of people, buildings, potentially flooded cropland areas etc.) and operational recommendations for activating the EAs (Chapter 2). Some previously prepared EWs may need to alter the information presented or include additional data. Converting an existing EW based on hazard thresholds into an impact-based warning can be readily done if it requires merely adding data and information from partner organisations.

In addition to producing EW messages that contain relevant information, the alerting authority should routinely utilise the Common Alerting Protocol (CAP) of the International Telecommunication Union (ITU) for the dissemination of warning information.[27] CAP provides a "standard business form", designed for use by any media, to announce alerts and/or communicate information on all types of hazards.

Table 3: Example of an early warning message issued by the Civil Protection of Campania based on the hydro-meteorological information provided by the Regional Hydro-meteorological Service

INFORMATION	MESSAGE CONTENT
WHO	At 13.00 on 24/01/23 the Regional Civil Protection on receiving information from the Hydro-meteorological Service in Campania (Italy), notifies
TO WHOM	civil protection authorities (municipalities, prefectures, provinces, representatives of volunteers, fire fighters, national civil protection department, regional offices of risk management...)
WHAT	that a yellow alert level EW has been issued. Showers and thunderstorms are expected in some parts of the Amalfi Coast, Monti Lattari and Monti di Sarno. The storm will experience a rapid evolution and may be accompanied by lightning, hail and wind gusts.
WHEN	Valid from 00:00 on 25/01/23 to 00.00 on 26/01/23
WHERE	Warning areas include the Amalfi Coast, Monti Lattari and Monti di Sarno
WHY "SCENARIO"	The anticipated hydrogeological scenario includes: • occasional landslides and possibly falling rocks due to fragile conditions as a result of soil saturation • rising water levels in watercourses • flooding of underground and ground floors • flowing water along roadways • run-offs, possibly carrying floating debris Due to the type of phenomena, wind gusts and hailstorms forecasted, the following impacts are expected: • damage to temporary structures • falling branches or trees • damage to roofing (due to hail)
WHY "RECOMMENDED ACTIONS"	Local civil protection authorities are recommended to activate all coordination centres and to implement measures to prevent and mitigate the expected phenomena, in line with municipal civil protection plans and procedures

Reference documents
Chapter 1

- ASEAN, 2022. Framework on Anticipatory Action in Disaster Management
- DPC, 2016. Indicazioni operative per l'omogeneizzazione dei messaggi di allertamento e delle relative fasi operative per rischio meteo-idro
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- WMO, 2015. Guidelines on Multi-hazard Impact-based Forecast and Warning Services. WMO-No. 1150
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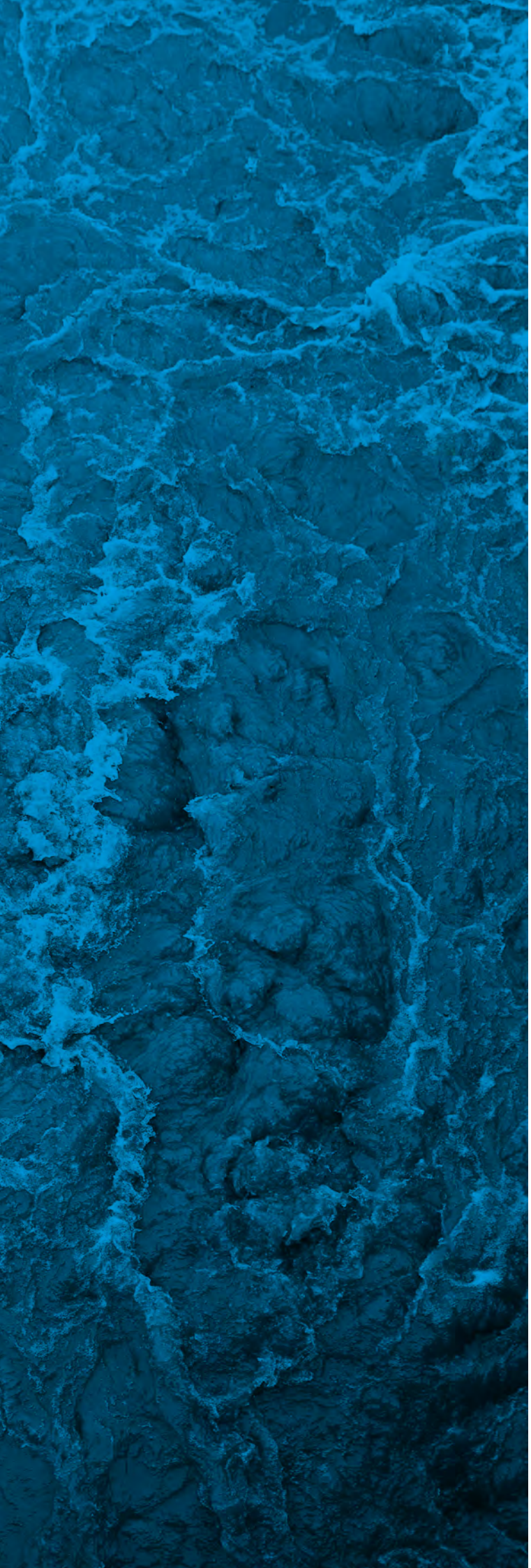
02

Early Actions and the integration of an Early Warning-Early Action link within emergency response plans



Key principle: At systems level, plan for coordinated early actions to define when and what needs to be done in advance of a flood

GC2.1. Set triggers and thresholds to define when to act: as a baseline requirement, codified EWs should act as a trigger for instigating EAs, while the gradual activation of the civil protection system should be linked to the forecasted alert levels and its associated potential impacts

GC2.2. Clarify the activation phases of the civil protection system, and their associated EA codified packages

Key principle: At local level, plan for tailored and grounded early actions that reflect local priorities, risk knowledge and available resources

GC2.3. Link EAs to activation phases and thereby to EWs

GC2.4. Include - at the very least - the monitoring and observation of the phenomena's evolution, its impact on the territory, and communication of EWs to the population

GC2.5. Align local EAs - and EWs - based on local knowledge of risks in the target territory (such as components of hazard, exposure, vulnerability and coping capacity)

Key principle: Inclusion of EWS elements into emergency response plans to effectively anticipate and respond to the impacts of forecasted, imminent or current risks

GC2.6. Include elements of the EWS into emergency response plans that identify when to activate them, which actions to take based on the alert levels and how to test the plan

GC2.7. At local level, include any risk information and/or SOPs to activate EAs within the emergency response plans, and ensure that the population understands them

Key principle: At systems level, plan for coordinated early actions to define when and what needs to be done in advance of a flood

When an EW is issued – whether during the forecasting or monitoring and observational phases - it entails a call for actors on the ground. It summons national and local authorities, businesses, communities, and others to activate their respective emergency response plans to reduce the impact of the hazard,[28] with the aim of protecting people, assets, the environment and other elements that are likely to be affected.

To ensure this happens, tested and shared mechanisms (Chapter 4) to translate EWs into EAs should be defined, so as to establish which EAs (what) should be taken by relevant actors that deal with civil protection at their respective territorial levels (who) and when is the right time to act.

These mechanisms need to ensure sustainability and efficiency in activating the system over time. In this sense, it is essential for all EWS actors to collaborate in defining a general framework of EAs that are coordinated and linked to distinct activation phases (GC2.2), which in turn are connected and proportionate to alert levels. This enables a gradual activation of the system from national to local level. Embedded within the EA systems, therefore, is the usage of triggers or thresholds to define when to act. In all cases, triggers and decision-making protocols should be pre-agreed so that all actors are aware of their own and others roles within the system, and when – for example - a certain level of alert is issued and thus a certain activation phase is triggered. For this reason, broad partnerships[29] between NHMS[30] and civil protection actors are at the core of EA.

More specifically, once civil protection actors receive an EW, bearing in mind the codification on EW messages (GC1.1; GC1.2), they need to decide which of the EA options to enact, at what level (whole system or specific actor) and when. Three general criteria govern these coordinated EAs among actors at all territorial levels:

GC2.1. Set triggers and thresholds to define when to act: as a baseline requirement, codified EWs should act as a trigger for instigating EAs, while the gradual activation of the civil protection system[31] should be linked to the forecasted alert levels and its associated potential impacts

At systems level, a harmonised framework needs to be agreed that links the activation of the civil protection system to – at least – EW levels of alert (GC1.1; GC1.2).[32]

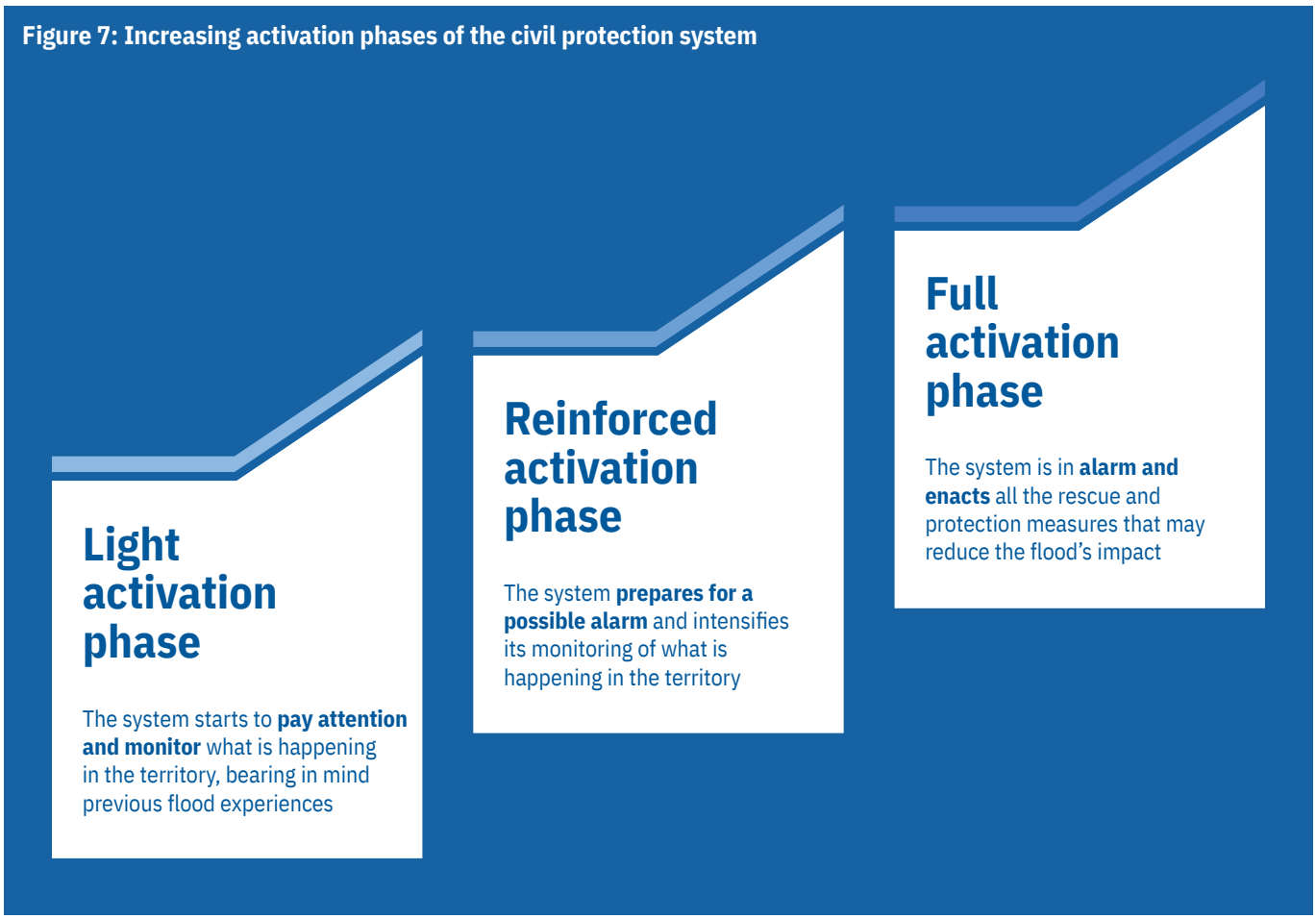
A national level codification that guides the minimum activation of civil protection actors according to each level of alert would be beneficial: the relevant civil protection actor decides to activate itself according to specific elements. Indeed, the linkage between EW and activation phases (GC2.2) derives from an evaluation/planning process. This considers the expected scenario associated with the level of alert as well as the contextual elements related to the potential impacts, the coping capacities[33] (level of risk on the territory, lead-time, available resources, preparedness and response capacities, etc.).

GC2.2. Clarify the activation phases of the civil protection system, and their associated early action codified packages (homogeneity of the system, from national to local level)

EAs entail and, to some extent, ensure an incremental activation of the civil protection system. This gradual mobilisation can be obtained through increasing activation phases. The term “activation” refers to the operational mobilisation of the system and to the management of the forecasted flood event across the various territorial coordination levels, while “phases” denote the stages that are identified and triggered by increasing alert levels (GC1.1; GC1.2) that are linked to different anticipatory actions.

To understand these activation phases, it helps to look at the different terminology used in Europe, such as Attention, Pre-alarm and Alarm in Italy; and Monitor, Prepare and Act for the Emergency Response and Coordination Centre (ERCC). Figure 7 illustrates increasing activation phases denoted as Light, Reinforced and Full activation phase.

Figure 7: Increasing activation phases of the civil protection system



Each activation phase defines a certain degree of activation required by the civil protection structures to implement the measures and actions that have been previously planned. As such, it is necessary to define general classes of EAs, associated to each activation phase and their corresponding EWs, in order to establish a minimum level of emergency preparedness and response within the system. They need to be (i) harmonised and coordinated among all actors at different territorial levels, according to their respective institutional mandates, and (ii) linked to the expected scenario description of the EW. These general classes of EAs are intended as guidelines that each actor of the civil protection system should adapt to their own specific territorial and organisational situation within the scope of their own responsibilities. The aim is to guarantee coordination and proper deployment of operational resources, as well as the on-going monitoring of current and forecasted situations. These classes of actions depend on the legal and institutional framework of each partner.

To clarify this concept, Table 4 illustrates general coordinated EAs that relevant actors can carry out in each activation phase.[34] EAs reported in the table are not comprehensive of all the measures that must be implemented to protect people and assets (GC2.4; GC2.5). Moreover, all EAs implemented during the preceding operational phases continue to be in effect and are further strengthened in the subsequent phases. As such, they are not repeated in the table.

Table 4: Possible general coordinated early actions that relevant actors can carry out in each activation phase (content adapted from the Italian case – DPC, 2016)[35]

ACTORS		ACTIVATION PHASE 1 LIGHT ACTIVATION Expected scenario from an early warning necessitating the monitoring function	ACTIVATION PHASE 2 REINFORCED ACTIVATION Expected scenario from an early warning necessitating the actors' presence to enable a rapid activation of operations	ACTIVATION PHASE 3 FULL ACTIVATION Severe event(s) in progress
NATIONAL ACTORS	**NHMS/ water and river basin agencies**	• Guarantee forecasting, monitoring of meteorological, hydrological and hydraulic events and their related effects on the ground (floods, flash floods, landslides) • Guarantee information exchange with national level civil protection authorities and others according to SOPs	• Reinforce forecasting, monitoring and transmitting eventual messages with updates at a frequency depending on the type of expected event (24h) • Guarantee, and eventually reinforce, information exchange with national level civil protection authorities	• Reinforce forecasting, monitoring and transmitting eventual messages with updates at a frequency depending on the type of expected and on-going event • Maintain information exchange with national level civil protection authorities
	Civil protection authorities	• Guarantee information exchange with the NHMS • Guarantee the collection, verification and dissemination of information on civil protection, ensuring timely alerting of units and structures responsible for managing the emergency • Verify the internal procedures and implement planned countermeasures • Verify the availability of monitoring units, logistic capacity and resources	Reinforce all activities envisaged in the previous activation phase, and in particular: • Maintain information exchange with NHMS and local civil protection actors, disseminating related communications According to the internal procedures: • Support the management of emergency activities, by identifying and preparing available resources to be mobilised in case of the event worsening and/or requests from local areas	Reinforce all activities envisaged in the previous activation phase, and in particular: • Maintain information exchange with NHMS and other subnational or local civil protection actors, with the dissemination of related communications, actively asking for periodic updates at a frequency calculated according to the on-going event • Support the implementation of the planned countermeasures According to the internal procedures: • Support the implementation of the planned countermeasures • Support the implementation of rescue activities and technical evaluations if needed

SUBNATIONAL ACTORS (IF EXISTING) – CIVIL PROTECTION	• Guarantee information exchange among the municipalities/ LSGUs and national level, ensuring feedback to and from all actors • Monitor the territory • Verify the plans and procedures (protection and rescue plans, emergency response plans etc.) and implement the foreseen countermeasures • Verify the availability of personnel, logistic capacity and resources	Reinforce all activities envisaged in the previous activation phase, and in particular: • Activate the Emergency Operation Centre (EOC) • Liaise with municipalities/ LSGUs and national level • Support the implementation of foreseen countermeasures according to internal procedures	Reinforce all activities envisaged in the previous activation phase, and in particular: • Reinforce the EOC • Liaise with municipalities/ LSGUs and national level • Support the implementation of foreseen countermeasures according to internal procedures • Assist the municipalities/ LSGUs
MUNICIPALITIES/ LOCAL SELF-GOVERNMENT UNITS (LSGU) – CIVIL PROTECTION	• Eventually activate the local operational centre and liaise with the other coordinating structures that have been activated • Activate the information flow with higher territorial levels • Monitor the territory • Verify the plans and procedures (and implement the foreseen countermeasures) • Verify the availability of personnel, logistic capacity and resources	Reinforce all activities envisaged in the previous activation phase, and in particular: • Activate the local EOC and liaise with other coordinating structures that have been activated • Activate the local personnel and teams to monitor the critical points (bridges, underpasses etc.) • Activate the procedures and plans by implementing the specific measures to deliver critical relief assistance and protection (assess the need to limit the access to certain activities and schools, consider activation of volunteers and Civil Society Organisations and operational units etc.)	Reinforce all activities envisaged in the previous activation phase, and in particular: • Reinforce the local EOC and liaise with other coordinating structures that have been activated • Activate the procedures and plans by implementing the specific measures to deliver critical relief assistance and protection (assess the need to secure at-risk areas, close activities and schools and evacuate endangered areas; activate volunteers and Civil Society Organisations and operational units etc.)

Key principle: At local level, plan for tailored and grounded early actions that reflect local priorities, risk knowledge, and available resources

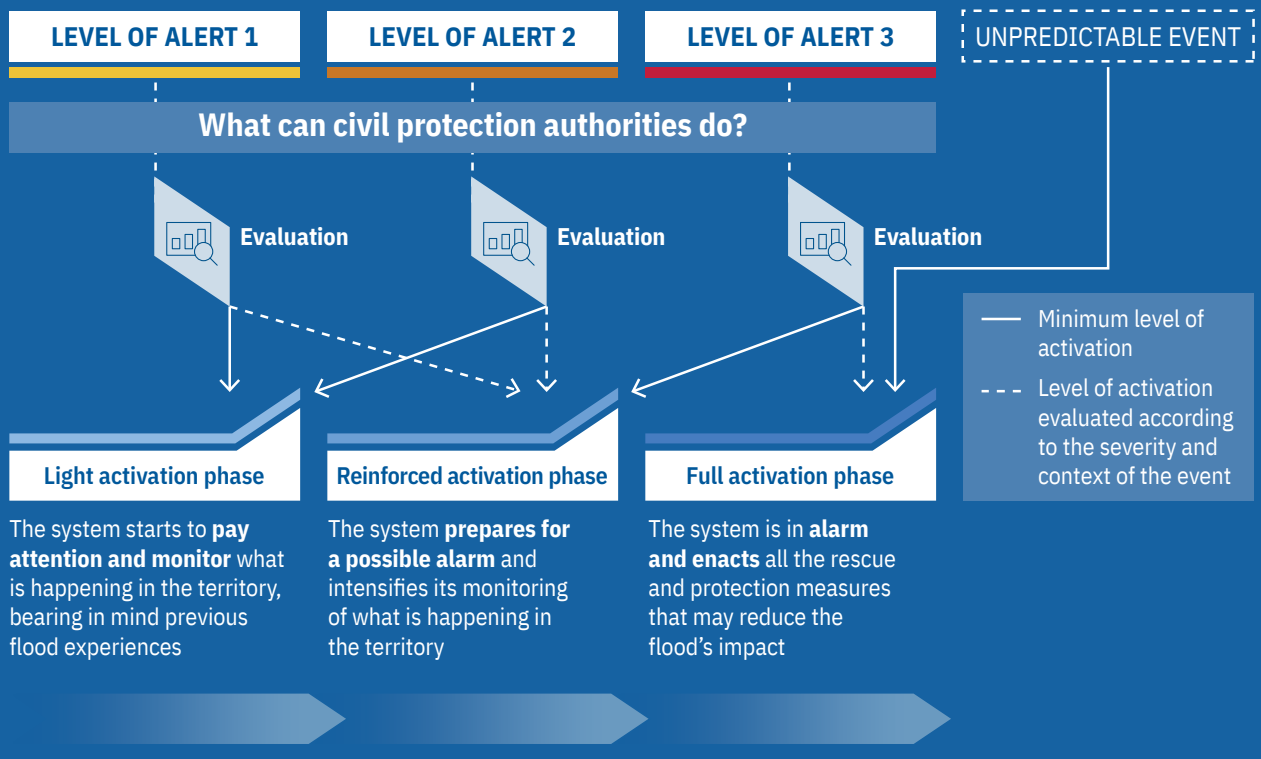
Besides a general framework of activation phases and pre-agreed packages of EAs at system level, each actor must plan for specific EAs to protect people and assets and the environment. This is especially true for local level actors (municipalities or LSGUs) as considering their proximity to the communities at risk, they play a critical role in connecting EWs to EAs for effective and concrete emergency response. With their knowledge of specific risk elements in the territory, local civil protection authorities can plan tailored EAs based on local priorities and available resources to activate preventive measures. They can define EAs that ensure interventions benefit exposed groups, even if the hazard does not materialise.[36]

As general criteria, at local level it is important to:

GC2.3. Link early actions to activation phases and thereby to early warnings and the severity of the alert. As such, EAs need to be conceived at increasing levels of protective measures.[37]

Municipalities or LSGUs may choose to exercise caution according to their own capabilities or current risks, deciding to initiate EAs linked to a higher activation phase than what is suggested by the national authorities.

Figure 8: Example of linkages between different levels of alert of early warning and increasing activation phases and thereby early actions. Continuous lines refer to the minimum level of activation for that level of alert. Note that for unpredictable events the system goes directly to a full activation phase



According to the example given in Figure 8, if an EW indicates a "level of alert 2", the local level should initiate EAs associated with a "Light Activation Phase", which is the minimum activation phase suggested by national authorities. However, if there is insufficient capacity, or if local monitoring reveals a possible deterioration of the situation, the municipality can choose to elevate the state of civil protection readiness to a "Reinforced Activation Phase" by deploying more resources and personnel as well as strengthening EAs.

GC2.4. Include – at the very least - the monitoring and observation of the phenomena's evolution, its impact on the territory, and communication of EWs to the population. Monitoring critical points provides EWs of emerging risks that in turn allow for EA. Furthermore, it is essential to communicate EWs to the population, as well as protective measures.[38]

GC2.5. Align local early actions - and early warnings - based on a local knowledge of risks in the target territory (such as hazard, exposure, vulnerability and coping capacity). In particular, local civil protection actors should take into account:[39]

- **typology of flood, and thus its speed of onset**: Lead-time available for taking EAs is different for riverine, urban and flash floods. For example, for an anticipated riverine flood, civil protection actors have time to organize the evacuation of buildings, while waiting for a more accurate forecast. However, in the case of flash floods, civil protection needs to anticipate the choice of evacuation as soon as the EW is issued
- **hazard, (acknowledging past events and indigenous knowledge)**: The geographical extent of hazards should be taken into account to define safe areas and evacuation zones. At the same time, hot spots should be considered when planning EAs for floods
- **exposure and vulnerability**: EAs should account for the needs of people with different degrees of vulnerability,[40] such as the elderly, children, persons with disabilities.[41] Schools, care structures and hospitals must be prioritised, with risk information on vulnerable groups availed to identify evacuation routes and the location of temporary shelters, as well as defining how best to inform them
- **capacities and resources already in place at local level**: civil protection actors should plan EAs that they are able to put in place, with pre-defined funding to support them
- **community level of preparedness**: including the level of risk awareness. The more the community is prepared, the more they are able to cope with expected floods

Key principle: Inclusion of EWS elements into emergency response plans to effectively anticipate and respond to the impacts of forecasted, imminent or current risks

Having preparedness and response plans, and coordinated and tested SOPs, including at local government level, are vital to respond to EWs issued by the NHMS and the civil protection authorities.[42] If SOPs are clearly written down and readily understood – as well as being compatible among actors at various levels - the procedure can be replicated in the same way and to the same standard as on previous occasions.[43]

GC2.6. Include elements of the EWS into emergency response plans that identify when to activate them, which actions to take based on the alert levels and how to test the plan. Therefore, emergency response plans should include the following:

- SOPs for EW dissemination (how the EWs are received and/or disseminated at all levels, which institutions are in charge, timing, messaging format, communication flow and coordination among operational centres)[44] (Chapters 1 and 3)
- elements of flood monitoring (location of monitoring instruments: rain gauges and hydro-metres, on-site teams, hot spots to focus on, etc.)
- definition of minimum EAs to put in place in case of an EW, as well as SOPs as a clear inventory of who does what, when and how[45] (GC2.2; GC2.4; GC2.5). Civil protection EAs should be planned at all relevant territorial levels taking into account current flood risks and capacities to respond (means, resources, preparedness and response level of people in charge, etc.)
- configuration of the activation of operational coordination centres in a modular and/or progressive manner according to the level of alert and on how the event evolves
- reference to exercises for testing the EWS at all levels (Chapter 4)
- training to reinforce EW-EA capacities especially at local level. For the effective implementation of anticipatory actions, accountability and capacity needs to be fostered at local level, for instance, through the decentralisation of funds, and strengthening of the capacity to monitor and interpret EWs.[46] Constant coaching and training, as well as awareness raising campaigns among both civil protection actors and citizens, should be envisaged to increase the preparedness of the system

GC2.7. At local level, include any risk knowledge and/or SOPs to activate early actions within the emergency response plans and ensure that the population understands them. As such, local emergency response plans should include:[47]

- EW procedures (how EWs are received at local level from higher institutions; how warnings are disseminated among the population, especially vulnerable people; who is in charge; timing; bulletin and messaging format; communication flows among coordination centres) (Chapters 1 and 3)
- elements of flood monitoring at local level (on-site teams, hot spots to focus on according to past floods events and/or risk assessments). It is crucial to monitor at local level since the NHMS cannot cover all rivers and water channels. Monitoring actions, taken at different alert levels, should be included in the local emergency response plans
- risk information[48] to identify the appropriate measures to undertake once a warning is issued (geographical extent of hazards to define safe areas and evacuation zones, risk information on vulnerable groups to identify evacuation routes and location of temporary shelters, etc.) (GC2.5)
- SOPs containing EAs to put in place in case of an EW, by who and when
- configuration of the activation of the local emergency operational centre in a modular and/or progressive manner according to the level of alert and based on how the event evolves (GC3.1)

Furthermore, emergency response plans should be known by the population and preferably planned adopting a participatory approach involving the community. Awareness raising campaigns for citizens should be envisaged to increase the preparedness of the system.

Reference documents
Chapter 2

- ASEAN, 2022. Framework on Anticipatory Action in Disaster Management
- DPC, 2016. Indicazioni operative per l'omogeneizzazione dei messaggi di allertamento e delle relative fasi operative per rischio meteo-idro
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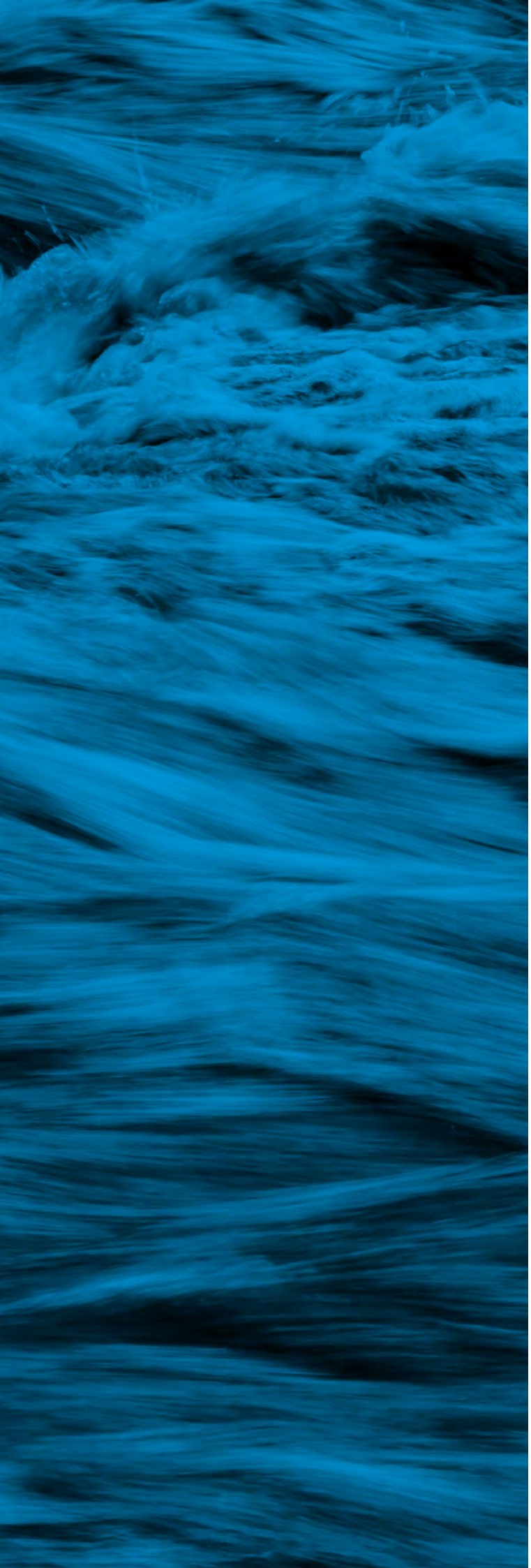
03

Communication flows for the dissemination of early warnings and exchange of information among operational centres and institutions before, during and after the emergency



Key principle: Establishment of processes for early warning communications and information exchange to ensure coordination before, during and after an emergency

GC3.1. Define the roles of operational centres and actors

GC3.2. Ascertain a shared definition of the type of information to be disseminated

GC3.3. Define the communication flow so as to avoid gaps and/or overlaps

GC3.4. Establish a feedback system

GC3.5. Hold a debriefing immediately after the emergency response phase, appraising the communication flow to eventually adapt the procedures and/or correct oversights

GC3.6. Test the information flow among involved actors thorough targeted exercises and workshops. Pool expertise to build the network and facilitate communication in case of a real event

Key principle: Establishment of processes for early warning communications and information exchange to ensure coordination before, during and after an emergency

An EWS includes a set of procedures and activities, based on forecasts of an event and its possible effects, that activate civil protection authorities in advance, by enabling them to implement prevention measures aimed primarily at safeguarding human life (Chapter 2).

Emergencies and crisis events can be by nature chaotic and highly dynamic, creating physical, emotional, and social distress. In this context, communication is critical at all phases of disaster risk management. Information processing becomes particularly challenging during on-going crises when cost-benefit calculations have to be made under pressure. On the other hand, predictable events, such as floods, can be anticipated by EWs so as to prepare responders in advance of a possible emergency. In this case, the issue is to decide how to act and how to allocate resources on the basis of available, yet uncertain, information (Chapters 1 and 2).

In the absence of a well-structured EWS, where a common language between the NHMS* and civil protection actors is missing, information emanating from the territory can be ambiguous and open to interpretation. Moreover, even a well-codified and actionable EW may not trigger effective EAs if the dissemination flow is faulty.

To ensure that the communication flow for addressing an incoming hazard event will connect EWs to EAs the emergency management needs to include six main general criteria, as follows:

GC3.1. Define the roles of operational centres and actors:[49] this entails defining who is responsible for producing and sending the EWs (Chapter 1), and who receives and uses them.

While risk assessment and prevention are often diversified and fragmented among different institutions, EW and response systems are usually more strictly organised and subordinated to the highest national civil protection authorities. One of the organisational-legal issues to address is to define who has the mandate for issuing an EW when a potential critical event has been identified. A legally empowered competent authority should therefore be designated to disseminate the EW messages (GC1.3).

Potential users of forecast and EWs differ, as they are located within organisations involved in disaster risk reduction, crisis management or disaster response, or any organisation, business or individual that takes critical decisions around potentially impactful weather or climate events. In defining the architecture of the EWS, it is necessary to outline the complete and specific information flow at each territorial level, including entities, structures and operational centres.

EWS actors should be aware of the respective responsibilities and division of labour, communication flows, and so on. In practice, the most advanced EWS are organised through warning centres staffed 24/7 with trained professionals, who can estimate the required level of EW and respective recommendations, as well as the target audience.

Furthermore, each actor involved in the EW and EA system and any receiver of the EW messages should ensure the operability of their structures based on their organisational and functional arrangements. This is important even outside normal office hours, as EW messages can be issued at any time. Moreover, in the event of foreseeable incidents such as floods, the organisational set-up of the different levels of coordination can be based on gradual activation by relevant operational coordination centres, and on areas of activity for emergency management, according to specific activation phases and different levels of alert[50] (Chapter 2).

The responsibilities of organisations involved in the response phase must be clarified in advance in order to facilitate an emergency operation.

GC3.2. Ascertain a shared definition of the type of information to be disseminated: EW messages and information for situational awareness must have a shared codification among all actors so that the terms used are attributed the same meaning, and misunderstandings are avoided. Furthermore, all essential information must be included to enable each stakeholder to take initiatives and act (Chapter 1).

Communication and dissemination systems should be tailored to the needs of the individual communities and target groups; communication with the public, and particularly people-at-risk should be two-way to allow verification (GC3.4).

This means that EW processes should be standardised, and agreements and interagency protocols should be in place to ensure the consistency of warning (GC1.3).

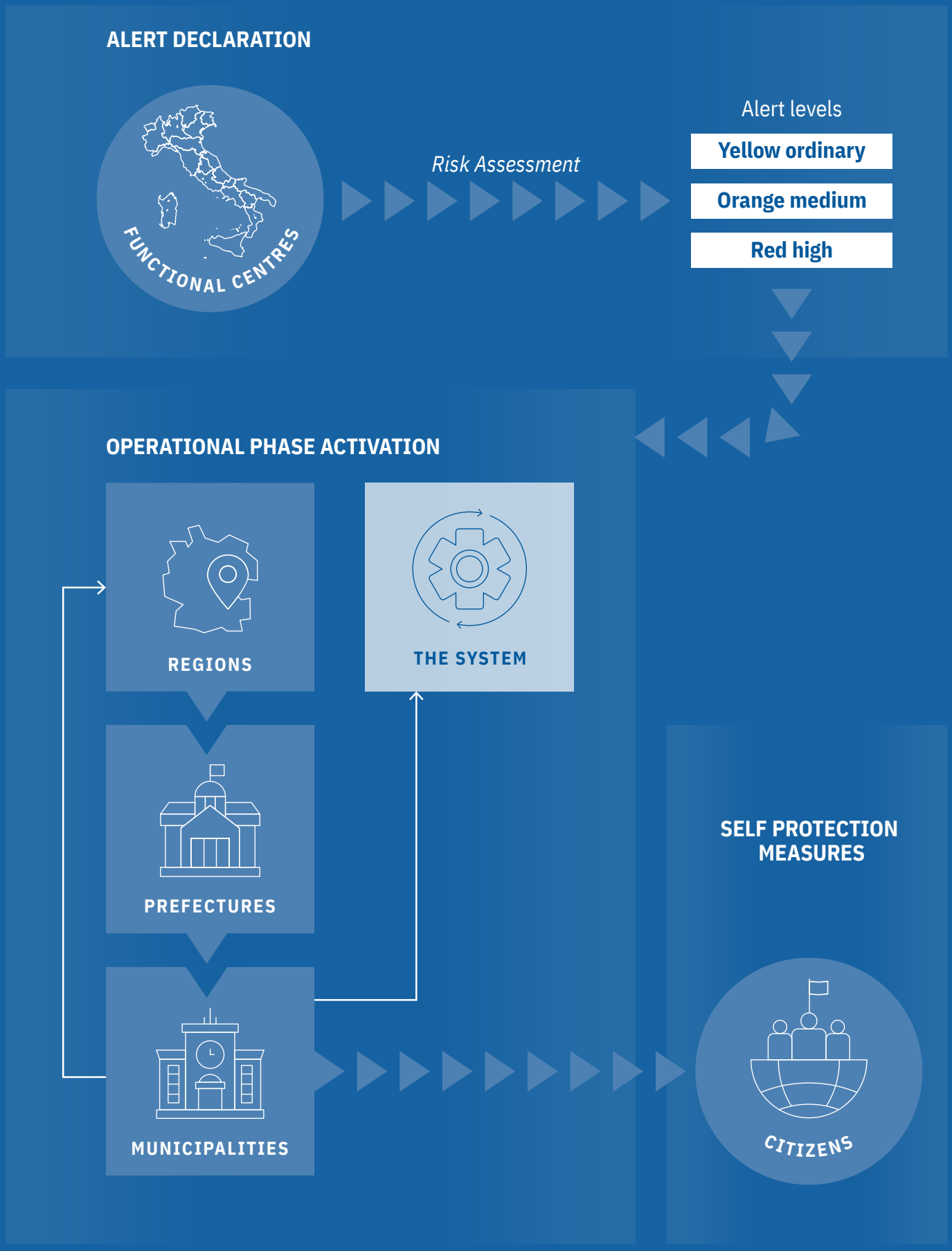
GC3.3. Define the communication flow so as to avoid gaps and/or overlaps. After defining the actors involved in the warning system, it is important to define how the exchange of information and communication among structures takes place. The communication flow comprises the general framework of the information as well as who does what. Therefore, a flow chart needs to be drawn up, indicating procedures that specify how the communication is transmitted and to whom[51] so as to avoid gaps and/or overlaps. More specifically, it is necessary to define the coordination chain.

When local capacities are likely to be inundated, it is recommended to adopt the principle of subsidiarity early on, so that the locally responsible disaster protection authority can take on the overall coordination of the emergency. This means that the political and administrative aspects in emergency operations are managed by a purposefully selected small disaster protection leadership group within the higher administrative authority; whereas the operational side is managed by local leaders of operations who are appointed ahead of time and appropriately trained.

GC3.4. Establish a feedback system. Feedback is the final step of the process that ensures the EW messages and information for situational awareness have been received and interpreted correctly. This two-way process increases the effectiveness of the communication as it enables the sender to know the efficacy of his/her message by soliciting a response from the receiver.

Feedback also refers to the action by which, after sending the EW message, the person who initiated the communication is informed of the steps taken as a result of the message, in order to become part of the emergency response network.

Figure 9: Early warning and activation of the Italian operational response during a non-emergency phase, at different territorial levels



GC3.5. Hold a debriefing immediately after the emergency response phase, appraising the communication flow to eventually adapt procedures and/or correct oversights. Debriefing directly after an event is crucial to reflect on all actions undertaken, whether performed correctly or in need of modification.

The debriefing should include all stakeholders involved in the management of the emergency (both EW and EA phases), and pay special attention to the communication flow among coordination centres. In case of a predictable event, such as a flood, an accurate information flow and understanding of EW messages by all stakeholders are fundamental to avoid losing time and possibly irreparable damage to people and goods. A post-analysis of occurred events assesses the functionality of the system and makes adjustments where necessary.

GC3.6. Test the information flow among involved actors through targeted exercises and workshops. Pool expertise to build the network and facilitate communication in case of a real event.

To strengthen the information flow within the EW and emergency response system, and test shared procedures and planning, exercises should be conducted along the entire system. Like debriefings, exercises represent an opportunity for sharing know-how and expertise by stakeholders involved in emergency management. The EW dissemination and information flow can be tested, by verifying whether all actors were alerted and operational centres activated, by testing means and modalities of communication, and by checking feedback.

Networking and information exchange among experts are effective ways to create relationships and establish trust among actors involved in the EW and emergency response systems.

Conducting exercises and pooling expertise help improve the system during non-emergency periods, refining existing procedures and planning, particularly on dissemination and information exchange (Chapter 4).

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04

Exercises

Key principle: Design and implement exercises for strengthening interagency familiarity and functional capacities of the system

GC4.1. Engage a broad range of actors involved in the EWS at different territorial levels

GC4.2. Define the type of exercise (national or international/ regional) on the basis of the flood scenario and the level of coordination to be tested

GC4.3. Design the exercises, adopting a participatory approach, to ensure transparency in the decision-making process, taking into account the local context and knowledge of all parties involved

GC4.4. Ascertain the timing of the civil protection exercises

GC4.5. Incorporate feedback and lessons learnt from exercises within the EW-EA system

Key principle: Design and implement exercises for strengthening interagency familiarity and functional capacities of the system

Regular exercises are necessary to test and optimise the effectiveness of EW dissemination processes, preparedness and response to EWs.[52] These exercises verify the implementation of civil protection plans at various territorial levels,[53] enabling, when needed, the improvement and development of SOPs, forecast-based EAs, and warning mechanisms. Hence, they enhance the preparedness for anticipation[54] and raise awareness of the contents of the plan among civil protection actors and the population at large.

Based on the IPA FF Program's experience in designing and executing a Command Post Exercise (CPX) in the Western Balkans and Türkiye, an exercise process that tests and strengthens the EW-EA link should take into account the following general criteria:

GC4.1. Engage a broad range of actors involved in the EWS at different territorial levels: including the NHMS, water/ river-based agencies and civil protection authorities (Who). The involvement of local level municipalities and authorities is crucial to effectively test the chain of command from the issuance of EWs to their dissemination among the population, and subsequently the activation of EAs.

GC4.2. Define the type of exercise (national or international/ regional) on the basis of the flood scenario and level of coordination to be tested (What). Regional exercises can be particularly useful in testing communication among different countries in transboundary river basins. Moreover, depending on whether or not the planned activities are actually carried out, the exercises are divided into different categories (Command Post Exercise – CPX, Field Exercise – FX, Full Scale Exercises – FSX, Table-top Exercise – TTX, Discussion Based Exercise – DBX). According to the IPA FF Program's experience, CPX proved to be a cost-effective way to test both the communication flow and decision-making processes of different actors involved in the EW and emergency system. Developing complex scenarios can activate a greater number of actors within the system, test different lines of communication, and stress the system, through cascading and multiple events.[55]

GC4.3. **Design the exercises, adopting a participatory approach, to ensure transparency in the decision-making process, taking into account the local context and knowledge of all parties involved** (How). The exercises need to be developed in collaboration with all participating institutions and actors. They entail different phases, starting with defining specific objectives, scenarios and actors to include (planning phase); executing the exercises; and finally evaluating the results and lessons learned.

GC4.4. **Ascertain the timing of the civil protection exercises** (When). In general, regular exercises prepare the system for the possibility of a flood event. These exercises should be scheduled whenever there is a change in the EWS (variations in alert levels, coordination centres, etc.) and according to the available resources and specific objectives.

GC4.5. **Incorporate feedback and lessons learnt from exercises within the EW-EA system** when developing/improving warning messages and operational forecasting processes; communicating dissemination agreements and protocols among agencies, institutions and the public; and updating emergency response plans[56] (Chapter 3).

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