Warning Value Chain Glossary

A glossary of value chain terminology

in a hydrometeorological hazard warning context

v1.3

This glossary is designed for physical and social scientists involved in enhancing the effectiveness of warning systems, particularly in the context of hydrometeorological hazards. It bridges concepts from multiple disciplines, providing clear definitions of terms used in the framework *Value Chain Approaches to Describe, Improve, Value and Co-Design Early Warning Systems.* By clarifying key terminology, the glossary aims to support a better understanding and collaboration across fields to improve the design, delivery, and impact of warning services.

Accuracy: An attribute of forecast quality; specifically, the magnitude of the error(s) in a single or a set of forecasts. An accurate forecast is one with a small error; it addresses the question "Was the forecast close to what happened?" Accuracy is usually taken as an attribute of deterministic forecasts and is measured in the units of the predictand. When applied to probabilistic forecasts accuracy refers to high probabilities on the verifying outcome (Mason 2013).

Actor: Actors in a value chain encompass a diverse range of individuals, organizations, and entities engaged in creating, using, transforming and transmitting information. Often described as agents, experts, stakeholders, and producers, actors play crucial roles in various parts of a warning value chain, and are characterized by dynamic qualities like objectives, resources and constraints.

Affected: People who are affected, either directly or indirectly, by a hazardous event. Directly affected are those who have suffered injury, illness or other health effects; who were evacuated, displaced, relocated or have suffered direct damage to their livelihoods, economic, physical, social, cultural and environmental assets. Indirectly affected are people who have suffered consequences, other than or in addition to direct effects, over time, due to disruption or changes in economy, critical infrastructure, basic services, commerce or work, or social, health and psychological consequences (UNDRR 2021).

Avoided cost: Actual or imputed costs for preventing environmental deterioration by alternative production and consumption processes, or by the reduction of or abstention from economic activities (OECD, 2008); for example, benefits of reduced air pollution by assessing the cost of installing indoor air purifiers.

Baseline: The standard or reference conditions (for example, the current state) against which changes or impacts can be measured.

Benchmarking: A process in which a business evaluates its own operations (often specific procedures) by detailed comparison with those of another business (especially a competitor), in order to establish best practices and improve performance; the examination and emulation of other organizations' strengths (Oxford English Dictionary).

Benefit: (1) A positive outcome or advantage resulting from the implementation of an early warning system or improvements in it. This may include the reduction of potential risks, the mitigation of adverse impacts, improved preparedness and response capabilities, and ultimately the protection of lives, property, and the environment. (2) Benefits may concern effects that are monetary, such as avoided repair cost, as well as those that are non-monetary, such as well-being effects related to human health or the environment. The latter, non-monetary, type may be monetizable in many cases, e.g. the incidence of injuries can be converted into care costs and costs of temporary or permanent loss of the ability to work.

Benefit–cost analysis: See cost-benefit analysis

Bias: A systematic difference between the forecasts and the outcomes (Mason 2013).

Capability: The demonstrable ability to perform a particular task (WHO, 2015).

Capacity: The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience. Capacity may include infrastructure, institutions, human knowledge and skills, and collective attributes such as social relationships, leadership and management (UNDRR, 2021).

Climate information: Climate data, climate products and/or climate knowledge (WMO, 2014a).

Climate product: A derived synthesis of climate data. A product combines climate data with climate knowledge to add value (WMO, 2014a).

Climate services: The provision of climate information in a way that assists decision making by individuals or organizations. A service requires appropriate engagement along with an effective access mechanism and must respond to user needs (WMO, 2014a).

Co-design: Process of working with clients, stakeholders and collaborators to design the objectives, activities and scope of a project before commencing. It can extend beyond the initial phases in some cases where the design is adaptive to feedback (Fleming et al. 2023).

Co-production: An umbrella term for research engagement (which typically incorporates some or all of co-design, co-development, and co-delivery, often sequentially) that brings diverse knowledges together to create new knowledge, tools or products, activities, processes and/or outcomes (Fleming et al. 2023).

Community: Specific group of people, often living in a defined geographical area, who share a common culture, values and norms, arranged in a social structure according to relationships which the community has developed over a period of time. Members of a community gain their personal and social identity by sharing common beliefs, values and norms which have been developed by the community in the past and may be modified in the future. They exhibit some awareness of their identity as a group and share common needs and a commitment to meeting them (WHO, 1998).

Community knowledge: Locally sourced information that has grown over many years and passed down through generations (Dube and Munsaka, 2018). Also called "traditional" or "indigenous" knowledge.

Compound hazards: (1) Multiple major hazards faced by a community, and (2) the simultaneous, cascading, or cumulative occurrence of hazardous events over time, taking into account the potential interrelated effects (modified from UNDRR/ISC 2020). See also "Multi-hazard".

> Simultaneous: Pure coincidence. Both spatial and temporal overlay of the impacts of two hazards, but not triggering or dependence relationship (Anticipation Hub, 2021).

> Change conditions: A hazard could alter the disposition of a consecutive hazard by altering the environmental conditions (Anticipation Hub, 2021).

> Cascading: When two or more natural hazards, caused by the same "trigger" event, affect human life and/or property. For example, a storm may result in a specific area experiencing both a tornado and flooding. Both of these have been caused by the first event (NEMA, 2021).

> Cumulative: Where two or more unrelated natural hazard events have the potential to affect human life and/or property. For example, an area may be susceptible to flooding, bush fires, and fault rupture (NEMA, 2021).

Confidence interval A range defining upper and lower limits between which the value of a parameter being estimated (e.g., a verification score) is likely to lie. The confidence level defines how likely it is that the interval contains the parameter value (Mason 2013).

Consequences: The outcome of an event or situation expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. In the emergency risk management context, consequences are generally described as the effects on persons, society, the environment and the economy (AIDR, 2019). See also "Impact".

Contingent valuation: A survey method used to ascertain willingness to pay for services or environmental amenities (Carson, 2000).

Costs: (1) The total amount of priced and unpriced resources allocated to accomplish a task or produce an early warning service. It can encompass purchased goods and services, labour effort (working hours), use of goods from inventory, use of equipment, models and buildings (capital stock) and use of public goods and non-monetized resources. (2) The damage toll caused by hazardous weather including foregone welfare, loss of income, loss of earning capacity due to ailments, loss of good health, etc. Some of these elements are monetary, others would need to be monetized if cost-benefit analysis is used. Avoided costs constitute the benefits of early warnings systems (see also "benefit").

Cost-benefit analysis: The quantification of the total social costs and social benefits of a policy or a project, usually in monetized terms. The costs and benefits concerned include not only direct pecuniary costs and benefits, but also public goods, as well as externalities, meaning external effects not traded in markets. These include external costs, for example, pollution, noise and disturbance to wildlife, and external benefits such as reductions in travelling time or traffic accidents. Benefits and costs can also be weighted in order to account for different levels of wealth within and across communities involved (Nurmi and Ahtiainen 2018). Cost-benefit analysis is often used to compare alternative proposals. If the

total social benefits of an activity exceed total social costs, this can justify subsidizing projects that are not privately profitable. If the total social costs exceed total social benefits, this can justify preventing projects even when these would be privately profitable. There are several types of criteria for judging the balance of costs and benefits, such as benefit-cost ratio, net present value, and internal rate of return. Yet, in modern social cost-benefit analysis the evaluation of the outcomes is often not narrowed down to one ratio, but various indicators and effects of uncertainty are considered.

Cost-effectiveness: The achievement of results in the most economical way. Cost-effectiveness is most relevant as a concept of efficiency in cases such as the provision of defence, education, health care, policing or environmental protection, where it is sometimes difficult to measure the monetary value of the results achieved (Black et al., 2012).

Customer (of meteorological or hydrological services): The person or organization which pays for products and services and agrees on the specifications for delivery through a customer–supplier agreement or service-level agreement. The customer may or may not be the user (WMO, 2014b).

Damage: The physical destruction, harm, or impairment inflicted on structures, infrastructure, natural environments, and personal property as a direct result of a natural hazard.

Deterministic forecast: A forecast expressed as a specific value (e.g., total rainfall in mm) or a specific category (e.g., temperature in the below-normal, normal, or above-normal category) without any indication of uncertainty (Mason 2013).

Disaster: A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts. The effect of the disaster can be immediate and localized but is often widespread and could last for a long period of time. The effect may test or exceed the capacity of a community or society to cope using its own resources, and therefore may require assistance from external sources, which could include neighbouring jurisdictions, or those at the national or international levels (UNDRR, 2021).

Disaster impact: The total effect, including negative effects (e.g., economic losses) and positive effects (e.g., economic gains), of a hazardous event or a disaster. The term includes economic, human and environmental impacts, and may include death, injuries, disease and other negative effects on human physical, mental and social well-being (UNDRR/ISC, 2020).

Early warning system (EWS): 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 hazardous events. Effective "end-to-end" and "people-centred" early warning systems 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 the hazards and possible consequences; (3) dissemination and communication, by an official source, of authoritative, timely, accurate and actionable warnings and associated information on likelihood and impact; and (4) preparedness at all levels to respond to the warnings received. These four interrelated components need to be coordinated within and across

sectors and multiple levels for the system to work effectively and to include a feedback mechanism for continuous improvement. Failure in one component or a lack of coordination across them could lead to the failure of the whole system (UNDRR,2021).

Economic efficiency: A general term that expresses the notion that all available resources are allocated optimally. Economic efficiency in this sense is purely descriptive and does not provide a precise definition or test. Pareto efficiency is a formalization of the concept of economic efficiency that provides a method of testing for efficiency (Black et al., 2012).

Economic loss: Total economic impact that consists of direct economic loss and indirect economic loss. *Direct economic loss*: the monetary value of total or partial destruction of physical assets existing in the affected area. Direct economic loss is nearly equivalent to physical damage. *Indirect economic loss*: a decline in economic value added as a consequence of direct economic loss and/or human and environmental impacts. Examples of physical assets that are the basis for calculating direct economic loss include homes, schools, hospitals, commercial and governmental buildings, transport, energy, telecommunications infrastructures and other infrastructure; business assets and industrial plants; and production such as crops, livestock and production infrastructure. They may also encompass environmental assets and cultural heritage (UNDRR, 2021).

Effectiveness: The degree to which something is successful in producing a desired result; success. Examples of improving the effectiveness of the weather enterprise include better data coverage, wider information dissemination, more realistic and scalable models, increased infusion of cutting-edge technology, and greater number of specialized products. (Fair Weather: Effective Partnership in Weather and Climate Services, 2003)

Efficiency: Obtaining the maximum output for given inputs. Efficiency in consumption means allocating goods or services between consumers so that it would not be possible by any reallocation to make some people better off without making anybody else worse off. Efficiency in production means allocating the available resources between industries so that it would not be possible to produce more of some goods or services without producing less of any other (Black et al., 2012).

Emergency: A type of event or imminent threat that produces or has the potential to produce a range of consequences, and which requires coordinated action, usually urgent and often non-routine (UNDRR, 2021).

Evacuation: Moving people and assets temporarily to safer places before, during or after the occurrence of a hazardous event in order to protect them.

Evaluation: The systematic assessment of the effectiveness, efficiency, and impact of each stage and component within the value chain. It involves analyzing the performance of hazard monitoring, risk assessment, communication, and preparedness activities to determine the overall success of the early warning system. Evaluation provides insights into strengths, weaknesses, and areas for improvement, contributing to continuous enhancement and optimization of the warning value chain.

***Ex ante*:** Literally translated from Latin: from before. The term describes activities (for example, actions, decisions, formation of expectations) that are undertaken before the state of nature is revealed. For instance, an *ex-ante* socioeconomic benefit study involves the analysis of potential benefits of a new or improved met/hydro service before it is actually available to user communities (Black et al., 2012).

Ex post: Literally translated from Latin: from after. The value of a variable, or of a decision made, as it appears after the outcome of randomness has been realized, that is, what actually occurred (Black et al., 2012).

Exposure: The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas. Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability and capacity of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest (UNDRR, 2021).

False alarm: A forecast or warning for an event that did not occur.

First mile: The initial stage of community engagement or involvement in the planning, design, and implementation of a warning system where communities take ownership of the process and identify their needs and priorities.

Forecast: A statement of expected meteorological (or hydrological) conditions for a specific period and for a specific area or portion of air space (WMO, 1992).

Hazard: A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation (UNDRR/ISC 2020).

Hydrometeorological hazards: Hazards of atmospheric, hydrological or oceanographic origin. Examples are floods, including flash floods; drought; heatwaves and cold spells; and coastal storm surges. Hydrometeorological conditions may also be a factor in other hazards such as landslides, wildland fires, locust plagues, epidemics and in the transport and dispersal of toxic substances and volcanic eruption material (modified from UNDRR, 2021).

Impact: The occurrence of loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation due to the realisation of a hazard (IPCC 2014).

Indicator: A specific, observable, and measurable accomplishment or change that shows the progress made toward achieving a specific output or outcome.

Information flow: The movement of data, alerts, and communications through each stage of the value chain. It involves the transmission of relevant information from hazard monitoring and assessment to public communication.

Information value chain: A linked set of processes, nodes, actors, and information that combine to produce actual or potential value for end users.

Infrastructure: The essential physical and organizational elements that support the monitoring, communication, and response to hazards and emergencies in an early warning system. This includes technological systems, communication networks, monitoring equipment, and other critical components that enable the effective functioning of the early warning system.

Intangible: Items which are not normally bought or sold (such as memorabilia, lives, health and the environment) and for which, therefore, no agreement on their monetary value exists. (AIDR 2002, Manual 27)

Intervention: An action or policy introduced to achieve a specific outcome.

Last mile: The final link between warning dissemination and community response of a warning system by delivering warnings directly to at-risk communities, ensuring they receive timely information and take appropriate actions to mitigate risks.

Lead-time: The period between issuing a warning and the expected onset of a hazardous event which allows for preparatory actions and enhances readiness before the hazard occurs.

Local/indigenous knowledge: Locally sourced information that has grown over many years and passed down through generations.

Loss: An economic loss is a measure of the impact of the disaster on the economy, equal to the resources (expressed in time, money or intangible loss) lost by the specified area as a result of the disaster. This is distinct from financial losses due to the disaster which are losses borne by individual enterprises as well as the other sectors. Many individual business losses do not amount to economic losses as their losses are offset by other businesses gaining the trade, or are made up over time. (AIDR 2002, Manual 27)

Missing persons: The number of people whose whereabouts since the disaster is unknown, and who are presumed dead (official figure when available) (CRED 2009).

Mitigation: Any measure intended to reduce the severity of, or eliminate the risk from, disasters. Mitigation is usually thought of in terms of prevention and community preparedness (AIDR 2002, Manual 27). The adverse impacts of hazards, in particular natural hazards, often cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques and hazard-resistant construction as well as improved environmental and social policies and public awareness. In climate change policy, "mitigation" is the term used for the reduction of greenhouse gas emissions that are the source of climate change (UNDRR, 2021).

Multi-hazard: Situations with more than one hazard at a time (and they are potentially interacting with each other) (Anticipation Hub, 2021). See also "compound hazard".

Multi-hazard early warning systems: Like "early warning system" above, but address several hazards and/or impacts of similar or different type in contexts where hazardous events may occur alone, simultaneously, cascadingly or cumulatively over time, and taking into account the potential interrelated effects (see also "multi-hazard" and "compound hazard"). A multi-hazard early warning system with the ability to warn of one or more hazards increases the efficiency and consistency of warnings through coordinated and compatible mechanisms and capacities, involving multiple disciplines for updated and accurate hazards identification and monitoring for multiple hazards (UNDRR, 2021).

National Hydrological Service: An organization with national responsibility for river, lake and other hydrological observation, data management, research, modelling and streamflow forecasting and warning responsibilities (WMO, 1992, 2000, 2001, 2012b). The functions of the NHS are similar to those of the National Meteorological Service but focused mainly on the surface phase of the hydrological cycle; NHSs are often located with water supply or river management ministries.

National Meteorological and Hydrological Service: Refers to an NMS or NHS, or an organization which combines the functions of both, NMHS (WMO, 1992, 2000, 2012b).

National Meteorological Service: An organization established and operated primarily at public expense to carry out those national meteorological and related functions which governments accept as a responsibility of the state in support of the safety, security and general welfare of their citizens and in fulfilment of their international obligations under the Convention of the World Meteorological Organization (WMO, 1992, 2000, 2012b; Zillman, 1999). The primary functions of an NMS are usually identified as observation, data archival, research, service provision and international cooperation.

Node: Essential point in an information value chain where information and knowledge are conceived, produced, translated, transformed, disseminated, and utilized. Examples of nodes in an early warning system include weather forecasting, warning creation, and decision-making, serving as foundational elements that define the roles and responsibilities of actors in the value chain.

Non-market valuation: The economic valuation of goods and services not distributed through markets (Black et al., 2012).

Nowcast: A description of current weather and a short-period (one to two hours) forecast (WMO, 1992).

Numerical weather prediction (NWP): The forecasting of the behaviour of atmospheric disturbances by the numerical solution of the governing fundamental equations of hydrodynamics, subject to observed initial conditions. Electronic computers and sophisticated computational models are required (Geer, 1996).

Partnership: A collaborative and mutually beneficial relationship between different actors (entities, organizations, or stakeholders).

Preparedness: The knowledge and capacities developed by governments, response and recovery organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters. Preparedness action is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery (UNDRR, 2021).

Present discounted value: The value today of a future payment, or stream of payments, adjusted using a constant interest or discount rate. It represents the current worth of future receipts by accounting for the time value of money. The PDV of multiple payments is the sum of the discounted values of each payment (Black et al. 2012).

Probabilistic forecasts: A forecast that is expressed as a probability or set of probabilities of one or more events occurring. Probabilistic forecasts explicitly indicate the level of uncertainty in the prediction (Mason 2013).

Probability: Measure of the chance of occurrence expressed as a number between 0 and 1 where 0 is impossibility and 1 is absolute certainty (ISO 22300:2021).

Public awareness: The extent of common knowledge about disaster risks, the factors that lead to disasters and the actions that can be taken individually and collectively to reduce exposure and vulnerability to hazard. Community engagement is critical in order to raise

public awareness, work for social mobilization, health promotion and risk communication (WHO 2015).

Public goods: Goods and services which are non-excludable (meaning no one can be denied access) and non-rival (one person's use doesn't reduce availability for others). As a result, they are typically free and provided by public organizations. Some public goods, like road networks, may face limits on non-excludability or non-rivalry under high demand. Early warning systems and many weather services are usually public goods.

Public warning: Notification and alert messages disseminated as an incident response measure to enable responders and people at risk to take safety measures. Public warning can include information to raise public awareness and understanding or to provide advisory or compulsory instructions (ISO 22300:2021).

Public warning system: Set of protocols, processes and technologies based on the public warning policy to deliver notification and alert messages in a developing emergency situation to people at risk and to first responders (ISO 22300:2021).

Public weather services: Those basic weather and related services provided, usually by the National Meteorological Service, for the benefit of the public (WMO, 1999).

Recovery: The restoring or improving of livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and "build back better", to avoid or reduce future disaster risk (UNDRR, 2021)**.**

Reliability: (1) In early warning systems reliability signifies the consistent and accurate issuance of timely alerts, fostering trust and confidence. A reliable system ensures stakeholders and communities can depend on accurate information for effective preparedness and response. (2) An attribute of the quality of probabilistic forecasts; specifically, the correspondence between the forecast probabilities and the conditional observed relative frequencies of events. Forecasts are reliable if, for all forecast probabilities, the observed relative frequency is equal to the forecast probability (i.e., an event must occur on 40% of the occasions that the forecast probability is 40%) (Mason 2013).

Resilience: The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management (UNDRR, 2021).

Response: Actions taken directly before, during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. Disaster response is predominantly focused on immediate and short-term needs and is sometimes called disaster relief. Effective, efficient and timely response relies on disaster risk-informed preparedness measures, including the development of the response capacities of individuals, communities, organizations, countries and the international community (UNDRR, 2021).

Risk: The chance of something happening that will have an adverse impact on community, business or individual objectives. In emergency risk management, risk is used to describe the likelihood of harmful consequences arising from the interaction of hazards, exposure to the

hazards, and the vulnerability of what is exposed (EMA, 1998). It is usually considered in terms of communities and the environment. (AIDR 2002, Manual 27)

Risk Management: Activities to handle risk such as prevention, mitigation, adaptation or sharing. It often includes trade-offs between costs and benefits of risk reduction and choice of a level of tolerable risk (Aven et al., 2018).

Sensitivity analysis: The study of how the uncertainty in the output of a model or evaluation (such as a cost-benefit analysis) can be apportioned to different sources of uncertainty in the input (Tarantola et al. 2002).

Skill: A comparative measure of forecast quality, in which a set of forecasts has positive skill if it scores better on one or more forecast attributes than another set, known as the reference set. Forecast skill is usually measured against a naïve forecasting strategy, such as random guessing, perpetual forecasts of one category, or climatological probabilities of all categories, but can be calculated using any reference set (Mason 2013).

Social benefit: The total benefit from any activity. This includes benefits accruing directly to the person or firm conducting the activity, as well as external benefits outside the price system accruing to other people or firms (Black et al., 2012).

Social cost: The total cost of any activity. This includes private costs which fall directly on the person or firm conducting the activity, as well as external costs outside the price system which fall on other people or firms (Black et al., 2012).

Socioeconomics: The study and analysis of the interaction between social factors and economic activities, including how societal structures, behaviours, and norms influence economic outcomes and vice versa.

Tangible: Items which are normally bought or sold and which are therefore easy to assess in monetary terms. (AIDR 2002, Manual 27)

Theory of change: A framework that explains how certain actions or efforts are expected to lead to specific results or improvements in a particular situation.

Timeliness: The quality of occurring or being done at the right time, often emphasizing the importance of promptness or efficiency in addressing a situation.

Uncertainty: A consciousness of limited knowledge about present facts or future events. There is a formal distinction between risk and uncertainty: risk applies when probabilities can be assigned to the likely occurrence of future outcomes; uncertainty applies when probabilities cannot be assigned (Black et al., 2012).

User (of meteorological or hydrological services): The individual, organization or intermediary who receives the product and services and bases his or her decisions on them. For the delivery of public weather services, members of the public will ideally have their needs considered by an organization or representative body, although in reality this is often done in an ad-hoc manner (WMO, 2014b).

Valuation: The process of determining the financial worth or economic value of an asset, investment, or entity.

Value: (1) The effectiveness of each stage of the value chain, and overall, in changing the outcomes. Early warnings produce value when they (help) reduce the hazard-related losses to communities and individuals. (2) The total benefits (both monetary and non-monetary)

the user receives from using a service minus the total costs (both monetary and non-monetary) of using the service.

Value added: The amount by which the value of information, services or goods is increased at each stage of its production (Oxford English Dictionary).

Value chain: The process or activities by which value is added to information, services or goods, from production to final use or consumption (see also "information value chain"). The value chain can also provide a framework for characterizing relationships, processes, inputs, contributions, operational contexts of stakeholders when investigating warning performance for hazardous events.

Value cycle: In the hydrometeorological context, the production (observing, modeling, forecasting) of information, the dissemination to users (ways of provision, communication, and tailor-made products), perception and decision-making, and the outcomes and values, incorporating feedback from users at all steps along the cycle to explore "what works" in terms of relevance, quality, and impact (Ruti et al., 2020).

Value of information: The value of the outcome of action taken with the information less its value without the information (West and Courtney, 1993, p. 230).

Verification: A process for determining the accuracy of a weather or climate forecast by comparing the predicted weather with the actual observed weather or climate for the forecast period (Glickman, 2000).

Vulnerability: The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards (UNDRR, 2021). See also "capacity".

Warning: See "public warning".

Warning chain: Specific instances of value chains that are used for warnings.

Weather: State of the atmosphere at a particular time, as defined by the various meteorological elements (WMO, 1992).

Willingness to pay: The maximum amount that an economic agent is willing to pay to acquire a specific good or service. The WTP is private information but may be obtained using revealed-preference methods or stated-preference methods (Black et al., 2012).

Version history

Version	Date	Comment/Change
v1.0	17/7/21	First version released
v1.1	11/8/21	Added terms 'Impact' and 'Disaster Impact'. Modified 'Hydrometeorological hazard'.
v1.2	09/07/24	Added terms 'Affected', 'Capability', 'Community', 'Compound hazard', 'Emergency', 'Evacuation', 'Missing person', 'Multi-hazard', 'Probability', Public awareness', 'Public

		warning', 'Public warning system', 'Warning'. Updated references.
v1.3	03/10/24	Additional terms added from Value Chain Framework. Some verification terms deleted.

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