DRIVER+ TAXONOMY OF CRISIS MANAGEMENT FUNCTIONS 2020

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IT4SecReports 135 „DRIVER+ Taxonomy of Crisis Management Functions 2020" In 2017, a research team in the DRIVER+ project led by the authors of this report developed a "Taxonomy of crisis management functions for classification of solutions." The taxonomy included a comprehensive set of 54 crisis management (CM) functions, with sub-functions and tasks, grouped in ten main functional areas. This taxonomy was implemented in the online platform Portfolio of Solutions (POS) and used to classify project-defined crisis management gaps and solutions uploaded on the POS. With the accumulation of experience, the authors were tasked to review, update and amend the taxonomy of functions taking into account user's feedback, the "Common Global Capability Gaps" identified by IFAFRI and the strategic gaps and challenges elaborated by the EU Disaster Risk Management Knowledge Centre. This report presents the amended taxonomy of functions, along with revised and amended taxonomy of hazards. In combination, the two taxonomies allow effective classification of any content and navigation of the POS platform.

Keywords: crisis management, taxonomy, functions, hazards, tagging, navigation

IT4Sec Reports 135 „Таксономия на функции за кризисно управление 2020" През 2017 г. изследователски екип в проект DRIVER+, ръководен от авторите на този доклад, разработи „Таксономия на функции в кризисното управление за класифициране на решения". Таксономия включва 54 функции, с техните подчинени функции и задачи, групирани в 10 функционални области. Тя бе приложена в онлайн платформата „Портфолио от решения" и използвана за класифициране на дефицити в кризисното управление, определени в проекта, и съответни технологични, организационни и процедурни решения. С натрупването на опит, авторите прегледаха, допълниха и осъвремениха таксономията, като отчетоха мненията на потребителите на платформата, общите стратегически дефицити от способности, определени от IFAFRI и Disaster Risk Management Knowledge Centre на Европейския съюз. Докладът представя допълнените таксономии на функции и опасности, които в комбинация позволяват ефективно класифициране на съдържание и навигация на онлайн платформата.

Ключови думи: управление при кризи, таксономия, функция, бедствие, опасност, класифициране, навигация

With the launch of the DRIVER+ project, a research team led by the authors of this report developed a "Taxonomy of crisis management functions for classification of solutions." The taxonomy included a comprehensive set of more than fifty crisis management (CM) functions, grouped in ten main functional areas (Table 1). Many of these functions require coordinated actions from multiple stakeholders who are sometimes also operating at different administrative levels.

Table 1. Crisis management functions along functional areas.

Functional area: Outcome	Main functions
Mitigation: Comprehensive understanding of risks, reduced vulnerability	Organise for mitigation - Assess risks - Elaborate mitigation policy and strategy - Implement mitigation measures -Maintain relevance of strategy over time
Capability Development: Comprehensive and balanced protection, response, and recovery capabilities; readiness to respond to extreme events	Plan for CM capabilities -Manage CM system of systems development - Manage human resources - Organise for CM - Establish CM doctrine and train organisations and people - Establish a CM lessons learning system
Strategic adaptiveness: Agile CM organisation, able to adapt in a timely manner to changes in the CM environment (hazards, threats, technologies, societal attitudes, etc.); strengthened resilience	Promote CM organisational agility - Conduct civil security foresight - Develop capacity to adapt - Build and measure community resilience
Protection: Reduced likelihood of disruption; shorter period; limited impact of disruption on people and institutions	Conduct systematic monitoring and data collection - Conduct operational planning - Conduct incident and emergency response operations (below the level of "crisis") - Coordinate and provide public protection - Protect critical infrastructures - Coordinate and provide CII protection
Response: Immediate actions to save lives, protect property and meet basic citizens' needs; crisis impact is mitigated; the crisis is de-escalated; conditions for relief and recovery are established	Orient and decide - Respond to the hazard - Limit the impact of the crisis - Support affected people - Build the ground for relief and recovery
Recovery: The affected area and community are restored in political, economic, social, environmental, security, and psychological terms	Adjust the recovery planning - Provide immediate relief support - Engage the population - Manage humanitarian recovery - Recover public lifelines - Manage economic recovery - Manage infrastructure recovery - Manage environmental recovery
Crisis communication and information management (CCIM): Effective, interoperable communications among all CM actors; uninterrupted access to relevant information	Establish CCIM organisation - Conduct and coordinate communications and information planning - Create CCIM networks - Continuously improve CCIM - Exploit CCIM for protection, response, and recovery
Command, Control and Coordination (C3): Purpose, direction, and effective command of CM operations; shared awareness; integrated efforts of first and other responders; properly defined and delivered tasks and resources	Build and maintain the C3 system - Establish the command component - Establish the control component - Establish the coordination component - Exploit the C3 system
Logistics: Comprehensive crisis logistics planning, management, and sustainment capabilities that harnesses the resources of government agencies, key public and private stakeholders, and nongovernmental organisations to meet the needs of responders and affected population	Establish crisis logistics management system - Manage material logistics - Conduct transportation logistics - Provide medical logistics - Manage facilities - Provide logistics services
Security Management: Secure environment for responders, people, equipment, and supplies involved in CM operations	Conduct security orientation and planning - Establish security management organisation - Provide key security capabilities - Exercise on-site security control

This taxonomy was implemented in the online platform designated as Portfolio of Solutions (POS) and used to facilitate the navigation of the platform primarily by tagging project-defined crisis management gaps and solutions uploaded on the POS.

With the accumulation of experience, the authors were tasked to review, update and amend the taxonomy of crisis management functions (presented in Deliverable D934.10, December 2017).

The following objectives were pursued in the review:

1. Analyse and account for the experience in the use of the taxonomy in classifying crisis management gaps and solutions on the Portfolio of Solutions (POS) platform;

2. Provide for classification of new solutions and authoritative lists of crisis management gaps (from sources beyond the DRIVER+ project) and effective association of gaps and solutions;

3. Expand the taxonomy to allow for classification of gaps and solutions related to terrorist acts, CBRNE threats and the increasing reliance of both society and crisis management organisations on information and communications infrastructures. i.e. on cyberspace.

Towards the first objective, the research team collected feedback on the taxonomy and the experience in uploading, classifying and updating the description of crisis management gaps and solutions. One major point raised by users of POS was that the taxonomy of functions is too complex and they found it challenging to identify the most relevant taxonomy terms to classify their content. The team discussed the issue in detail and decided that the original level of complexity of the taxonomy was appropriate, especially in view of the expectation that in the future POS will list hundreds or solutions and a user, searching for a potential solution to their particular needs, needs to get only a short list of most relevant solutions. In addition, in the process of revising the taxonomy, the team provided fuller and more clear description of taxonomy terms to enhance the automated generation (already implemented on the POS) of suggestions and, hence, to facilitate classification of gaps and solutions.

In addressing the second objective, the team reviewed and searched for the best possible ways to classify gaps with focus on and covering all available at the time of the study:

• "Common Global Capability Gaps" identified by the International Forum to Advance First Responder Innovation (IFAFRI); and

• 'strategic gaps' and the challenges, policies and recommendations elaborated by the EU DRMKC's (Disaster Risk Management Knowledge Centre) "Gaps Explorer" in a pilot project on forest fires.

The principle the team followed in amending the taxonomy was to provide for higher resolution in taxonomy areas, where a number of gaps and challenges have been identified, and to merge taxonomy terms in functional areas that are not of particular interest at current. Notably, the amended taxonomy provides higher resolution in functions related to building an adequate environment for reliable common operational picture; the ability to address psychological stress of volunteers; overcoming shortcomings in policy and procedures for communicating with the public during a crisis; performing real-time detection, monitoring and analysis of threats and hazards; establishing coordination in dealing with large numbers of severely burned casualties; exchanging crisis-related information among agencies and organisations in an effective and timely manner; performing large scale evacuation in urban areas; providing appropriate medical assistance to casualties; securing capabilities for real-time data and information fusion to support the incident commander's decision-making; overcoming limitations in the cross-vulnerabilities (people, property, environment) assessment to optimise task prioritisation and decision making; managing spontaneous volunteers in an escalating crisis situation; providing for common understanding of the information exchanged in response operations; locating in real time responders and hazards; and reflecting a number of functional terms specific to gaps in dealing with wildfires.

One of the lessons from the analysis of the experience was that the 2017 taxonomy of functions does not relate well particular hazard-specific gaps and solutions, e.g. a user looking for a solution predicting the evolution of a wildfire was guided to a solution predicting the evolution of floods. The research team explored options in resolving this issue and concluded that the best option is not to expand the functional taxonomy with hazards' specific functions and tasks, but to use it in combination with the hazards' taxonomy (amending the one already implemented on the POS). Yet, two types of changes were introduced in the functional taxonomy:

- introducing new functions and tasks related to cybersecurity of the crisis management system itself (not including gaps and solutions related to crises as result, for example, of a cyberattack on critical infrastructures);
- adding to the description of specific functions and tasks CBRNE and terrorism related activities as examples, in order to facilitate the automatic suggestion of taxonomy terms in the classification of related gaps and solutions.

Further, we reviewed and amended the hazards taxonomy (see Annex 2). In that revision, the team provided for distinguishing single-hazard and multi-hazard risks as implemented in the DRMKC's "Gaps Explorer".

Annex 1 presents the revised and amended taxonomy of functions, listing all taxonomy fields with their description. Annex 2 presents the updated taxonomy of hazards.

Finally, the research team, jointly with PoS developers, uploaded the amended functional and hazards taxonomies on the POS and supported the transitioning of content from the initial to the updated versions.

Acknowledgement

Annex 1. Amended Taxonomy of Crisis Management Functions

This annex presents the taxonomy in a textual format, listing all taxonomy fields and, where relevant, their more detailed description.

Annex 1.1 presents the notation followed in the annex for the four levels of the taxonomy – functional area, function, sub-function, and task.

Annex 2.2 lists all taxonomy fields with their description.

Annex 2.1. Notations in the textual presentation of the taxonomy

Taxonomy Field	Description
Functional Area "**XXX**"	
Function Yyy	Description of Function Yyy
Sub-function Zzz	Description of sub-function Zzz; may include tasks (a), (b), (c), …, when these tasks are not detailed at the lower level.
Task Www	*Description of Task Www*

Annex 2.2. Taxonomy fields and descriptions

Taxonomy Field	Description
Preparatory Functional Area "**MITIGATION**"	
Organise for mitigation	
Define national mitigation framework	Develop a national mitigation framework, incl.: a. Perform national crisis risk assessment and define the scope of mitigation measures and activities b. Identify the key mitigation actors and stakeholders c. Establish stakeholders' roles and responsibilities for hazards' mitigation d. Define the core capabilities necessary to prepare for the specific types of disasters and crises that pose the greatest risk to the security of the people e. Relate the mitigation objectives and approaches to the remaining CM functional areas f. Establish national CM chain of direction and co-ordination – nationally and internationally g. Establish mitigation long-term and operational planning and resource framework at local, regional, national, and international levels
Develop expertise for hazards mapping, vulnerabilities and risk assessment	Provide scientific, modelling and simulations, and technical expertise for hazards mapping, vulnerabilities assessment, and risk assessment to support mitigation policy-making and planning, e.g. in the elaboration and prioritisation of mitigation measures)

Taxonomy Field	Description

Provide for mitigation cooperation and coordination	Provide for cooperation between governments and CM agencies to overcome cultural, institutional and legislative issues between countries in developing a common, all-hazards mitigation approach:
	  a. Encourage the exchange of good practices on resilience to hazards and sustainability, as well as on crisis prevention, preparation, training, response and recovery
	  b. Coordinate the use of international mechanisms such as the EU Civil Protection Mechanism, UN and other mechanisms

Assess the risks	

Conduct all-hazards identification, documentation and analysis	Undertake hazards identification, registration and analysis using an approved, recognised methodology that considers all plausible hazards, both natural and human-made, incl.:
	  a. Document and make publicly available hazard identification and analysis (risk assessments) to stakeholders and community members, and review them regularly
	  b. Support risk assessment with scientific data, the use of GIS, and analysis of historical and projected impacts to identify area specific exposures and vulnerabilities

Assess vulnerabilities to hazards	Assess exposure and vulnerabilities of critical infrastructures, assets and essential services to hazards, cyber and CBRNE threats, incl.:
	  a. Define infrastructure and assets potentially affected by hazards, cyber and CBRNE threats
	  b. Set vulnerability assessment criteria
	  c. Identify critical infrastructure and assets
	  d. Quantify the infrastructure and assets' value
	  e. Assess vulnerabilities of essential services

Estimate the risks	Estimate risks by performing the following tasks:
	  a. Collect evidence and define the risk factors (establish a scale)
	  b. Establish database on population, economic, housing, health, infrastructure, climate, land, water, raw resources, cultural heritage, etc.
	  c. Establish hazards scenarios, including cyber and CBRNE threats
	  d. Assess hazards impact to people, essential functions of the government and local administration, physical and digital infrastructure and assets and evaluate the levels of risks
	  e. Develop and maintain civil security (e.g. vulnerability to hazards and threats) maps at national, regional, and local levels

Estimate cascading effects	Estimate the impact of possible cascading effects, e.g. a flood leading to epidemics or an earthquake causing a dam failure
Estimate cross-domain effects	Estimate possible cross-domain effects under the impact of concrete hazards, e.g. a natural disaster leading to mass disorders
Estimate cross-border impact	Estimate possible cross-border impact of hazards
Elaborate mitigation policy and strategy	

Provide policy guidance	Prepare and issue policy guidance by performing the following tasks:
	  a. Analyse the effect of potential mitigation measures on hazards, cyber and CBRNE threats
	  b. Analyse the effect of potential mitigation measures on the exposure of critical infrastructure and assets to hazards
	  c. Collect, organise and use evidence to assess effects of mitigation measures
	  d. Implement modelling and simulation to assess effects of mitigation measures
	  e. Define mitigation principles and goals

Taxonomy Field	Description

Formulate the mitigation strategy	Formulate the mitigation strategy by performing the following tasks:
	  a. Define mitigation strategy goals
	  b. Provide "goals-to-tasks" analysis
	  c. Define mitigation measures (plans and programmes; at state, regional and local level, international)
	  d. Select and prioritise mitigation measures

Establish planning and coordination	Establish a mechanism for mitigation planning and coordination, including the following tasks:
	  a. Prepare professional staff for mitigation planning and implementation of mitigation measures
	  b. Conduct demonstrations
	  c. Establish and certify educational modules

Conduct a mitigation communication campaign	Initiate, coordinate, and conduct a mitigation communication campaign
Implement mitigation measures	

Explore usability of natural values	Explore usability of natural values, incl.:
	  a. Further develop the multi-functionality of forests, land, rivers, lakes, seashore, and others through supporting the economic, recreational and amenity value chains
	  b. Stimulate the incorporation of new restoration treatments into policy and management protocols
	  c. Develop a shared view of priorities for natural stakes (e.g. map of soil erosion risk)
	  d. Develop new approaches for long-term biomass management
	  e. Regularly update the information on ecosystems vulnerability to various fire recurrences and intensities

Facilitate the implementation of a zero-waist approach to reduce hazards risks	Promote technology and practice of using residual materials that may cause massive hazards, e.g. stimulate residual forestry biomass exploitation by private owners establishing specific markets and procedures to reduce the forest fires threat

Apply long-term vulnerability reduction measures	Apply long-term vulnerability reduction and mitigation measures, incl.:
	  a. Introduce land use planning and design decisions that avoid developments and community infrastructure in areas prone to hazards to reduce their possible impact and avoid risk to life, property and environment
	  b. Ensure the reliability of critical infrastructure (such as physical facilities, supply chains, systems, assets, information technologies and communication networks) that provide essential services to the people (incl. safe drinking water, food, reliable transport, accessible public health services, energy for homes and industry, access to banking, finance and government services, and communications networks to connect the people socially and in business)
	  c. Adopt and enforce hazard-resistant building codes and standards
	  d. Design improvements to the existing infrastructure and essential services
	  e. Perform capital works to reduce the impact of regular hazards such as seasonal flooding, icing, wildfires, tornados and others
	  f. Establish back-up data storage and processing systems
	  g. Take systematic measures to protect the landscape and environment form irreversible degradation
	  h. Employ build-in safety, security and resilience into the design and operation of assets, systems, and networks
	  i. Initiate and maintain neighbourhood hazard response civic (volunteers) associations
	  j. Others

Enhance education, awareness and skills on mitigation measures	Enhance education, awareness and skills in devising and implementing mitigation measures, incl.:
	  a. Conduct community awareness campaigns to increase knowledge of how to prepare for disaster events
	  b. Introduce general education programmes to build knowledge on the appropriate actions to prepare for and respond to a disaster event
	  c. Conduct training and exercise programmes to improve skills and coordination in devising and implementing mitigation measures

Taxonomy Field	Description
Keep the mitigation strategy relevant	
Establish a reporting mechanism	Establish a mechanism for regular reporting on results and performance in the implementation of mitigation policies, programmes, and measures
Assess mitigation strategy's implementation	Regularly review and assess results, effects, and the efficiency in the implementation of the mitigation strategy and related policies and programmes
Amend and update the mitigation strategy	Amend and update the mitigation strategy and respective policies and programmes
Preparatory Functional Area "**CAPABILITY DEVELOPMENT**"	
Plan for CM capabilities	
Establish a CM policy framework	Establish a crisis management policy framework, i.e.: a. Formulate and approve CM policy framework in terms of objectives, tasks, and responsibilities b. Conduct high-level cost-benefit analysis of the CM options, e.g., is it cheaper to reduce a vulnerability or to replace infrastructure and equipment; balance of investments in mitigation, protection, and response, etc. c. Define priorities d. Make the policy framework available to all CM stakeholders
Promote standards for assessment of hazards and interoperability	Promote standards to provide for commonality of hazards' assessment and interoperability, e.g. common standards of fuel characterisation in regions prone to wildfires, data exchange formats, map symbols, etc.
Determine future crises' scenarios and key characteristics	Determine key characteristics of future crises (type, scope, intensity, dynamics, complexity, impact, etc.), elaborate and analyse respective scenarios and select a set of scenarios to be used in the planning process
Define required CM capabilities	Define required crisis management CM capabilities, i.e.: a. Develop a CM concept of operations b. Formulate and coordinate a national generic CM task list c. Conduct mission-to-task analysis d. Define key capability clusters e. Set-up capability goals
Assess current capabilities	Collect and organise the information on current crisis management capabilities and assess their adequacy vis-a-vis the set of scenarios
Identify gaps and redundancies	Compare required and current capabilities; Identify capability gaps and redundant capabilities
Define capability options	Generate and compare various options to meet capability requirements, e.g. upgrade existing or procure new equipment; introduce new training standards; invest in specialised or general-purpose CM units; maintain in-house or outsource the capability, etc.
Test the capability options	Test the capability options against resource constrains and CM priorities
Coordinate and approve capability development plans	Coordinate planning processes and key resource allocation decisions among main contributing agencies; Approve capability development plans
Manage CM system of systems development	
Develop integrated warning and alerting	Develop an integrated warning and alerts system
Build broadcast-, cable- and satellite-based messaging capability	*Build message dissemination capability utilising broadcast, cable, satellite, and wireline services*

Taxonomy Field	Description
Build messaging to mobile devices capability	*Build message dissemination capability to broadcast to mobile devices*
Create radio-based weather information network	*Create and maintain radio-based weather information network*
Organise Internet-based emergency messaging	*Organise a system for Internet-based emergency messaging*

Perform tests to assess warning systems' reliability	*Perform tests to assess the warning systems' reliability, incl.:*
	   a. Technical reliability of the systems' components
	   b. Inherited system reliability
	   c. The reliability of networks of detection and warning systems (fire, weather, air pollution, temperature, earthquake, tsunami, tornado, and others)

Develop the C3 system	Develop the command, control, and coordination system (presented in detail in Common Functional Area "C3")
Develop the communications and information management system	Develop the crisis communications and information management system (presented in detail in Common Functional Area "Crisis communications and Information management")
Develop awareness and decision support systems	Develop CM awareness and decision support systems to facilitate the performance of the tasks enumerated below
Access, integrate and display images and video from the incident scene	*Access, integrate and display images and video from the incident scene (for the on-scene responder and incident command)*
Merge disparate data and non-traditional sources in real time	*Merge disparate data and non-traditional (incl. crowdsourcing and social media) sources in real time (e.g. known hazards, building blueprints, ownership records) to support situational awareness*
Maintain a high-level view of the incident scene	*Obtain and maintain a high-level (bird's-eye) view of the incident scene*
Define in real time the location of responders and their proximity to risks and hazards	*Define the location of responders (including latitude, longitude and altitude/ depth) and their proximity to risks and hazards in real time (indoors and outdoors)*
Identify suitable sites for staging, command posts and ingress/ egress routes	*Identify suitable sites for staging, establishing command posts and suitable ingress/ egress routes*
Detect, monitor and analyse passive and active threats and hazards at incident scenes	*Detect, monitor and analyse passive and active threats and hazards at incident scenes in real time; generate incident-specific maps tied to GIS coordinates for indoor and outdoor locations on the incident scene*
Identify secondary incidents and effects during response and project consequences	*Identify secondary incidents and effects during response operations (e.g. after-effects and devices) and project their consequences*
Identify hazardous agents and contaminants, incl. CBRN	*Rapidly identify hazardous agents and contaminants on the incident scene, incl. CBRN*
Predict the evolution and behaviour of hazards and disasters	*Predict the evolution and behaviour of hazards and disasters*
Develop and evaluate alternative courses of action	*Develop and evaluate alternative courses of action*

Taxonomy Field	Description
Evaluate responders' performance and outcomes	*Evaluate responders' performance and outcomes*
Establish resource management and mutual aid system	Establish resource management and mutual aid system, including: a. Build decision support information capability for collecting, updating, and processing data, and tracking resources b. Define acquisition/ procurement procedures c. Establish a system for provision of mutual aid between different levels of crisis command and management d. Determine flow of requests and responds at national (inter-agency), regional, and local levels
Establish a crisis logistics management system	Establish crisis logistics management system (presented in detail in Common Functional Area "Logistics")
Establish a solid waste collection system	Establish a solid waste collection system (see also Operational Functional Area "Recovery")
Manage equipment and infrastructure acquisition	Manage the CM equipment and infrastructure acquisition, including performance of the following tasks: a. Determine required capabilities b. Establish interoperability requirements/ standards c. Determine the key equipment life cycle d. Establish equipment certification procedures e. Regulate centralised/ decentralised acquisition procedures f. Manage acquisition contracts g. Manage the equipment life-cycle h. Enhance the resilience of supply chains
Manage the system of reserves	Manage the system of emergency and crisis reserves and stockpiles
Manage human resources	
Manage professional responders	Manage career models and professional responders, i.e. a. Conduct general, regional, and local needs analysis b. Establish a framework of competencies and behavioural indicators c. Establish a CM profession with career paths and job requirements d. Select, organise, train, certify and motivate the professional responders e. Assure that CM leaders are knowledgeable, competent, and well supported
Manage volunteers	Manage organised and spontaneous volunteers
Conduct needs analysis	*Conduct needs analysis; assure adequate legislation for the use of volunteers*
Select, organise, train, and motivate the volunteers	*Select, organise, train, and motivate the volunteers; provide for allocation of responsibilities among relevant governmental and non-governmental organisations*
Task volunteers	*Provide preliminary tasking to organised volunteers across scenarios*
Maintain registers of volunteers	*Create and maintain current registers of volunteers, their competencies and tasking*
Establish organisation for spontaneous volunteers	*Establish organisation to identify and register spontaneous volunteers and to assign them to teams and coordinators*
Prepare for crowd tasking	*Prepare for crowd tasking, i.e. tasking spontaneous volunteers*
Organise for crisis management	

Taxonomy Field	Description
Establish an integrated CM organisation	Establish an integrated organisation for crisis management, i.e.: a. Establish a framework of authority at central, regional, and local level b. Achieve consensus on the overall CM process c. Establish legal lines of authority, duties, and responsibilities d. Establish CM HQ, supporting centres, and local command structures
Define minimum activation requirements	Define a set of minimum activation requirements for situations at different levels of crisis command and management
Identify and analyse bottlenecks	Identify key resource constraints and potential bottlenecks in decision-making and provision of resources and analyse their potential impact
Establish CM rules and standard operating procedures	Establish rules and standard operating procedures for crisis management, i.e.: a. Draft, co-ordinate, and approve CM legal acts b. Define critical pre-crisis, response, and recovery procedures for different levels of command and management c. Prepare, approve and communicate to all stakeholders SOPs for each hazard d. Establish hazards' information and data requirements and rules for their collection and sharing
Establish protocols for cross-border emergencies	Prepare and agree in the relevant international format on response protocols for cross-border emergencies
Establish CM doctrine and train organisations and people	
Develop doctrine	Develop, approve and disseminate among all stakeholders a Crisis Management doctrine
Coordinate and conduct research and education	Coordinate and conduct research and education, i.e.: a. Organise hazard and CM studies and develop modelling and simulation capacity to understand data flows, bottlenecks, integration and interoperability issues b. Establish hazards and CM discipline and a research and education network
Train individuals, teams and organisations	Train individuals, teams, organisations, and at national, regional, and local levels of crisis management
Develop and conduct all-hazards training	*Develop and conduct national, regional, and local training to improve all-hazards CM capacity*
Conduct CM exercises	*Conduct exercises/drills of sufficient intensity to challenge the CM system*
Develop hazard-specific simulations and conduct CAX	*Develop hazard-specific simulations and conduct table-top and computer and simulations assisted exercises and drills*
Provide training for interoperability between organisations and command levels	*Provide instructions and national and international training for achieving interoperability between different organisations and CM command levels*
Certify personnel, training and education	Certify crisis management personnel, training centres, and educational institutions
Train resilient communities	Train resilient communities, incl. for provision of MHPSS
Establish a CM lessons learning system	

Taxonomy Field	Description
Develop after-action and lessons learned reporting	Develop after-action and lessons learned reporting system and procedures, i.e.: a. Develop lessons learned and after-action reporting procedures b. Establish lessons-learning database and analysis capacity and develop a collaborative platform to support new tools like situation reports, best practice guidelines, task sheets and checklists, exercise scenarios, etc. c. Adapt post-crisis reviews to feed a lessons-learned information system d. Provide interagency training of personnel on after-action reports analysis and drafting lessons learned e. Establish procedures for implementation of lessons learned
Provide cross-border learning	Provide opportunities for cross-border learning
Provide international CM education and training	*Provide opportunities for international CM education and training*
Establish international evaluation of CM experience and lessons learning	*Establish a mechanism for international evaluation of CM experience and lessons learning*
Preparatory Functional Area "**STRATEGIC ADAPTIVENESS**"	
Promote CM organisational agility	
Establish continuous monitoring	Establish continuous monitoring of the CM environment, i.e. horizon scanning
Promote knowledge centricity	Place knowledge in the centre of responders' organisations and the wider network of stakeholders
Maintain diverse and evolving competencies	Maintain diverse competencies and perspectives and provide for continuous learning
Facilitate networking and cooperation	Facilitate networking and cooperation among agencies, professional societies, and projects
Exchange foresight experience and findings	Exchange experience from foresight studies, their findings, consequent actions and evidence of impact
Establish international exchange on adaptiveness	Establish opportunities for international exchange on organisational adaptiveness
Conduct civil security foresight	
Identify key drivers and trends	Identify key drivers of change and trends in the civil security environment, incl.: a. Analyse historical characteristics of critical hazards and form central databases with harmonised information on single-hazard events b. Update and detail the information on hazards' occurrence and behaviour in sensitive areas (e.g. wildland-urban), e.g. with respect to land use fragmentation and climate change c. Consider climate change in hazards' projections d. Include direct environmental losses (e.g. forests, infrastructures) and indirect losses (e.g. air quality, biodiversity, etc.) into the economic assessment of damages
Identify plausible futures	Identify plausible future hazards, environments, and crisis management futures, incl.: a. Project and use projections of changes in hazards to evaluate impact of climate change on forest fires, floods, extreme weather, and others b. Identify thresholds of change and tipping points in ecosystem regeneration with account of climate trends and past land use management history c. Consider ecosystems functioning in the design of adaptation strategies d. Account for multiple risks in the management of forests, water, and land including biotic and abiotic disturbances (e.g. insects, wind storms, droughts, and others)

Taxonomy Field	Description
Explore the implications of alternative futures	Explore the implications of alternative crisis management futures, e.g. conduct exercises (table top, academia) and simulations in alternative futures' scenarios
Develop capacity to adapt	
Develop options and estimate required resources	Develop possible courses of action across plausible alternative futures and estimate respective required resources
Develop courses of action in alternative futures	*Develop potential courses of action in plausible alternative futures of crisis management*
Develop adaptation policies	*Provide for adaptation of CM policies and management decisions, incl.:* a. *Assess relevance of existing CM policies and management decisions to alternative futures* b. *Identify adaptation and development pathways (with emphasis on hazard-resilient landscapes) per alternative futures*
Estimate resource requirements	*Estimate resource requirements; Identify specific capability needs and critical resources per alternative futures*
Establish coordination with military and other backup	*Establish coordination with the military and other available backup units and personnel, e.g. organisations with CBRN capabilities*
Create and maintain materiel reserves	Create and maintain materiel reserves, e.g. particular vaccines, for scenarios not considered likely in the near future, but are plausible in an alternative future (e.g. in grey and black swan scenarios)
Maintain hazards and CM research capacity and agenda	Maintain hazards and crisis management research and development capacity and agenda, incl.: a. Network, collaborate, communicate and share experiences b. Establish robust research governance and support structures, build-in monitoring, evaluation and lessons learning with account of alternative futures c. Conduct pilot and demonstration projects to facilitate innovation and prepare for uncertainty d. Develop flexible research agendas
Build and measure community resilience	
Strengthen community assets for resilience	Strengthen the community financial, physical, MHPSS, political, human, social, and natural assets for resilience
Provide for bonding and linking communities' assets across borders	Provide for bonding, bridging, and linking communities' assets across the country and throughout the European Union
Improve communities' preparedness, responsiveness, learning, self-organisation, and innovation	Improve communities' preparedness, responsiveness, learning, self-organisation, and innovation, incl.: a. Regularly update guidelines or procedures on how citizens should equip themselves for emergencies involving extreme events b. Stimulate the implementation of advanced restoration treatment c. Organise educational and awareness campaigns d. Develop new awareness raising methods to overcome attitude and behavioural barriers
Strengthen the communities' capacity for collective actions	Strengthen the communities' capacity for collective actions for disaster risk reduction, conflict mitigation, social protection, natural resource management, and management of public goods and services: a. Empower local communities with tools, information and skills to recognise the benefits of integrated hazards risk management b. Conduct awareness-raising campaigns for targeted stakeholder groups Communicate the social, environmental and economic benefits of community action and resilience c. Adopt participatory planning to evaluate the general public's acceptance of a given hazard management policy in different regions d. Develop flexible crisis management plans and policies that account for the differences in local and regional contexts

Taxonomy Field	Description
Establish measures and measurement of resilience	Establish measures of resilience and measurement approaches, i.e.: a. Explore community-based approaches for measuring resilience b. Establish measurement framework for community resilience c. Use modelling to analyse the impacts of community resilience
Operational Functional Area "**PROTECTION**"	
Conduct systematic monitoring and data collection	
Conduct monitoring and anticipation	Conduct continuous monitoring and anticipate emergencies and crises, i.e.: a. Scan continuously hazards and threats and exchange information in relevant regional, national, and global frameworks b. Gather and store required raw data using sensing, detection, and surveillance technologies c. Combine cyber detection and physical surveillance to better protect critical CM networks and assets as well as elements of the critical infrastructure and critical information infrastructure d. Share systematically information, analyses, and emergency reports
Raise awareness and anticipate	Conduct analysis to raise awareness and anticipate emergencies, crises and their impact
Combine status with consequence analysis	*Combine 'current operational status' with consequence analysis to build a real-time geospatial framework in support of effective and timely decision-making*
Provide predictive analysis and situational awareness	*Provide predictive analysis and deliver situational awareness to the decision-makers and first responders by using modelling, damage estimation, risk analysis, resource analysis and inventory, and organisational systems analysis*
Maintain public awareness on hazards and respective services	*Maintain public awareness on hazards, availability of respective services, and the means by which they can be accessed*
Provide professional and public-relevant visualisation	*Provide professional and public-relevant visualisation of incidents and emergency situations and protection operations*
Conduct operational planning	
Establish an operational planning framework	Establish an operational planning framework, i.e.: a. Define planning assumptions to guide the development of operational plans b. Establish operations planning requirements for every level of CM command and management c. Determine jurisdictional priorities, objectives, tasks, and resource acquisitions and allocations needed to protect against and respond to potential hazards and threats d. Make the operational planning framework available to all government agencies, local authorities, non-governmental organisation and private business
Plan across ranges and level of activities	Perform planning across the full range of activities, at every level of CM command and management
Coordinate planning with support providers	Coordinate operational planning with military and other providers of support
Conduct incident/ emergency response (below the level of "crisis")	
Detect pending emergencies and provide early warning	Detect pending emergencies or other threatening situations and provide early warning

Taxonomy Field	Description
Conduct seismic monitoring and alert of geological hazards	*Conduct seismic monitoring activities to provide alerting of geological hazards and define roles and responsibilities on alerting*
Conduct weather monitoring and alert on weather hazards	*Conduct weather monitoring activities to provide alerting of weather-related hazards and define roles and responsibilities on alerting*
Conduct permanent cyberspace monitoring	*Conduct permanent monitoring of cyber networks and assets that connect cyber-physical systems for access control, early warning, sensing, alarming, data storage, analysis and decision support, and physical control to limit the impact of possible attacks*
Provide a composite threat picture of CBRNE	*Detect illicit radioactive and nuclear materials; identify chemical, biological, and explosives' threats and provide a composite threat picture across all modalities – radiation/nuclear, chemical, biological, and explosives*
Conduct biological and epidemiological monitoring and alert on pandemics	*Conduct biological and epidemiological monitoring activities to provide alerting of dangerous pandemics and define roles and responsibilities on alerting*
Warn in case of escalation	*Deliver warning information in case of escalation of incidents*
Coordinate and conduct incident SAR operations	Coordinate and conduct incident search and rescue operations, i.e.: a. Maintain in high readiness search and rescue capacities for urban, sea/water, and mountainous operations b. Conduct search and rescue operations c. Coordinate emergency medical and psychological aid to rescued people
Conduct emergency firefighting	Conduct emergency firefighting, i.e.: a. Maintain in high readiness sufficient firefighting capacities for urban, forest, and mountainous operations b. Conduct firefighting operations c. Coordinate emergency medical and psychological aid to affected people
Conduct emergency *radiation/nuclear, chemical, and biological* protection operations	Conduct emergency *radiation/nuclear, chemical, and biological* protection operations, i.e.: a. Maintain, in coordination with the military, sufficient CBRN protection capacity b. Conduct CBRN operations c. Coordinate emergency medical and psychological aid to affected people d. Share threat information and analysis with international partners
Conduct ammunition and counter-IED operations	Conduct ammunition and counter-IED operations, i.e.: a. Maintain, in coordination with the military, sufficient ammunition and counter-IED capacity b. Conduct ammunition and counter-IED operations c. Coordinate emergency medical and psychological aid to affected people
Conduct limited emergency evacuation operations	Conduct limited emergency evacuation operations, i.e.: a. Maintain and coordinate with the military capacity for evacuation b. Conduct evacuation operations c. Provide temporary shelters and special housing d. Coordinate emergency medical and psychological aid to evacuated people
Coordinate and provide public protection	
Safeguard the public health	Safeguard the public health
Provide epidemiological surveillance and investigation	*Provide human and animal epidemiological surveillance and investigation*

Taxonomy Field	Description
Apply preventive measures	*Apply preventive measures, such as vaccines, immunisation, face masks, fluoridated water supply, iodised salt, etc., and psycho-educative measures*
Perform food and water safety control	*Perform comprehensive and permanent food, water, and agriculture safety control, covering supply chains and warehouses*
Assess safety, integrity and security of buildings	Assess safety, structural integrity, and physical security of buildings
Provide safety during mass public events	Provide safety during mass public events, i.e.: a. Develop and implement case-specific public safety plans and guidelines b. Exploit public safety emergency communications systems
Protect critical infrastructures	
Maintain list of national and international critical infrastructures	Maintain the list of national and international critical infrastructures, sectors and assets up to date, i.e.: a. Maintain the classification of national critical infrastructures, taking account of the effects of disruption or destruction of a particular infrastructure (geographic extent of the damage and seriousness of the consequences) b. Identify and analyse geographic and sectoral interdependencies
Establish Operator security plan	Develop, approve, and implement Operator security plan for each critical infrastructure
Apply case-specific protection measures	Apply case-specific protection measures, i.e.: a. Employ security protection systems to detect or delay an attack or intrusion b. Detect malicious activities that threaten critical infrastructure and related operational activities across the sectors c. Implement intrusion detection and intrusion protection systems on sensitive or mission-critical networks and facilities to identify and prevent unauthorized access and exploitation
Establish CI reporting mechanism	Establish national and international critical infrastructures' risks, threats, and vulnerabilities reporting mechanism
Coordinate and provide CII protection	Coordinate and provide protection of critical information infrastructure (CII)
Protect physical and cyber assets, networks, applications, and systems	Implement countermeasures, technologies, and policies to protect physical and cyber assets, networks, applications, and systems that could be exploited in order to cause harm
Secure networks and CI based on risk assessment	Secure, to the extent possible, public and private networks and critical infrastructure (e.g. communication, financial, power grid, water, and transportation systems), based on results from risk assessment, mitigation, and incident response capabilities
Protect personal data	Apply comprehensive personal data protection measures
Share cyber threat information and analysis	Share cyber threat information and analysis with the domestic and international actors to promote shared situational awareness
Implement standards for security, reliability, integrity, and availability of critical information	Implement risk-informed standards to ensure the security, reliability, integrity, and availability of critical information, records, and communications systems and services, and business continuity
Identify, track, investigate, disrupt, and prosecute malicious actors	Leverage law enforcement and intelligence assets to identify, track, investigate, disrupt, and prosecute malicious actors
Back-up information and key processes	Ensure that essential information is backed up on remote servers and that redundant processes are implemented for key functions, reducing the potential consequences of cyber security incidents
Operational Functional Area "**RESPONSE**"	

Taxonomy Field	Description
Orient and decide	
Determine the nature of the crisis	Collect information, determine and evaluate the nature of the crisis
Survey or/and investigate the affected area	*Conduct inter-agency surveillance or/and investigation of the affected area*
Conduct flights to collect information	*Conduct flight planning and operations to collect information and use data from airborne sensors for the assessment*
Determine and evaluate crisis triggers	*Determine and evaluate the causes, nature and source of the hazard (threat) triggering the crisis*
Conduct damage and needs assessment	Conduct damage and needs assessment, i.e.: a. Collect and integrate human and sensor data from the field and from airborne platforms b. Conduct situational analysis c. Conduct first damage and risk assessment d. Identify the immediate needs of affected populations e. Develop a model- and data-based prediction of crisis evolution and impact across domains
Provide decision support	Provide decision support, i.e.: a. Prepare information for decision-making b. Provide assessment of impact across vulnerabilities (people, property, environment) c. Facilitate the prediction of the hazard and its impact d. Develop and evaluate courses of action e. Prioritise tasks and key resources f. Translate information into actionable formats for crisis management users g. Provide scientific support to decision-making
Manage warnings	Manage warnings to the public, providers of essential services and operators of critical infrastructure, i.e.: a. Prepare warnings b. Authorise warnings c. Deliver warnings
Decide on the introduction of crisis legislation	Decide on the introduction of crisis legislation and other emergency measures, i.e.: a. Introduce crisis legislation at national, regional or local level b. Take other emergency measures c. Deliver information on the situation and measures taken – nationally and internationally
Review and adjust the response plan	Review and adjust the response plan, i.e.: a. Decide on initial engagement of government agencies, local authorities and non-governmental organisations b. Adjust the management procedures according to the situation c. Adjust the chain of command and decide on deploying mobile crisis management command centres d. Assess critical resource needs and ways of their delivery
Respond to the hazard	
Activate crisis management bodies	Activate the crisis command and management bodies and centres
Maintain shared situational awareness	Achieve and maintain shared situational awareness
Collect information from deployed sources	*Collect, manually and automatically, information from deployed operational centres, sensors, and other field equipment*

Taxonomy Field	Description
Integrate data and information from various sources	*Integrate data and information from various sources; Fuse historical data, models' outputs and real-time data feeds in various formats to enhance the decision-makers' situational awareness*
Predict hazards' escalation and impact	*Predict hazards' (wildfire, floods, radiation, chemical and biological agents, and others) propagation through real-time modelling and analysis by considering the variability of wind speed and direction, humidity and fuel moisture forecast and other relevant factors*
Develop and sustain COP	*Develop and sustain a common operational picture (COP), based on information on hazard sources and evolution, identified vulnerabilities and potential risks*
Disseminate COP and assessments	*Disseminate the common operational picture and assessments*
Conduct coordinated operational tasking and resource management	Conduct coordinated operational tasking (re-tasking) and resource management, i.e.: a. Define, prioritise and assign tasks b. Identify sites suitable for command posts, staging areas, and ingress/egress routes c. Monitor and position resources d. Pool and share resources e. Assign resources to tasks f. Exchange information on tasks and resources
Deploy responders	Command and manage deployment of the responders
Determine the area of operations	*Determine the area of crisis operation(s)*
Conduct first on-site hazard and consequence assessment	*Conduct or support first on-site hazard and consequence assessment, i.e. by establishing multi-agency investigation teams to improve the knowledge on the causes of the crisis*
Deploy first responders	*Command and manage deployment of first responders, incl.:* *a. Support the efforts of first-responder teams in the management of multi-causal situations* *b. Provide the first-responders with advanced hazard behaviour prediction through real-time risk analysis by considering the variability of hazard-specific characteristics*
Manage organised volunteers	*Manage the deployment of organised volunteers and their tasking, resourcing, control, re-deployment, etc.*
Manage spontaneous volunteers	*Manage the on-site spontaneous volunteers*
Manage deployment and delivery of first aid	*Manage deployment and delivery of resources for first aid*
Command response operations	*Command, coordinate, and manage response operations*
Secure digital infrastructure and assets	Take immediate measures to safeguard the functionality of digital infrastructure, i.e.: a. Filter or assign lower priority to suspicious network traffic b. Reconfigure critical CM networks c. Shut down specific services or parts of the CM network when a detected cyberattack is affecting the confidentiality or integrity of ongoing CM communication
Manage international support	Manage international support, i.e.: a. Request international support b. Establish a coordination body, transportation routes, storage facilities c. Provide support to the international first responders d. Establish a mechanism for international financial support
Limit the impact of the crisis	

Taxonomy Field	Description
Contain hazardous causes of the crisis	Apply measures to contain hazardous causes of the crisis
Fight and contain fires	*Conduct firefighting and containment*
Control floods	*Conduct flood control operations*
Detect explosives and mitigate potential impact	*Detect explosives and undertake measures to mitigate their potential impact*
Control the range of CBRN agents	*Control the range of chemical, biological agents and radiation/nuclear agents or HAZMATs, incl.:* a. *Gather, assess and disseminate the available information to first responders* b. *Assess the scene (e.g. by first responders using Chemical, Biological and Radiological Detection, Identification and Monitoring Equipment to recognise the signs and indicators of CBRN or HAZMATs* c. *Isolate the scene to mitigate the consequences and establish inner and outer cordon (hot/warm/cold zone)* d. *Establish quarantine area for contaminated victims/casualties, as well as decontamination and triage areas* e. *Conduct CBNR and HAZMATs response operations, including decontamination, evacuation, and others*
Take immediate law enforcement measures	Take immediate law enforcement measures, i.e.: a. Isolate the area affected by the crisis b. Establish emergency traffic control c. Maintain public order within the affected area d. Launch investigations e. Open-up lines of transportation and communication to safe(r) areas
Protect CI from secondary damage	Identify damaged critical infrastructure and key assets and coordinate immediate actions to protect them from secondary damage
Limit the impact of failure of digital infrastructures	Limit the impact of digital infrastructures and assets' partial damage or complete dysfunctionality on the ability to manage the crisis, to provide aid and services within affected areas, the ability of affected people to communicate, and the functionality of critical systems as electric power and gas delivery, air and railroad transportation, public communications, banking, and others
Support affected people	
Conduct SAR operations	Conduct search and rescue operations: Search for missing people, rescue the victims, provide first aid, and move the people to safety
Provide on-site first aid	Provide on-site emergency ambulances, first treatment service and psychological first aid
Provide evacuation and shelter	Provide evacuation and shelter within and outside the affected area
Evacuate and shelter within the affected area	*Conduct evacuation operations and provide shelter (e.g. in tents) within the affected area*
Evacuate and shelter outside the affected area	*Conduct evacuation operations and provide shelter outside the affected area*
Provide temporary housing	*Provide temporary, longer-term housing*
Provide for evacuees	*Provide health care, MHPSS care, nutrition, and sanitation to evacuees and communication to/reunification with their relatives*
Decontaminate persons	Provide decontamination, degassing and disinfection of persons

Taxonomy Field	Description
Provide off-site health and MHPSS services	Provide off-site health care and MHPSS services: a. Deploy field hospitals b. Provide transportation to regular hospitals c. Apply quarantine and isolation measures d. Perform mass prophylaxis and vaccination e. Provide psychological, psychosocial, paediatric and other specific care
Provide essential services to the affected community	Provide essential services such as emergency power to critical facilities; fuel supplies and potable water, mobile communications, and food and pharmaceuticals to the affected community
Provide MHPSS	Provide mental health and psycho-social support (MHPSS) to professional responders, volunteers and the affected population
Establish emergency mobile phone	Establish special emergency mobile telephone access
Provide care for animals	Provide care for animals in the affected area
Build the ground for relief and recovery	
Restore the delivery of basic services	Restore or provide for basic services and needs, e.g. water, food, energy, communications, etc.
Decontaminate assets and infrastructure	Conduct decontamination, inactivation, and detoxification of buildings, equipment, machines and land
Initiate disaster area cleaning	Initiate general cleaning of the affected area
Manage the transition from response to recovery	Manage the transition from response to recovery and implementation of long-term consequence management plans; Implement demobilization and deactivation plans
Operational Functional Area "**RECOVERY**"	
Adjust the recovery planning	
Establish and share detailed COP	Establish detailed common operational picture and share it across the government, i.e.: a. Organise inter-agency fact finding mission b. Integrate collected data and information c. Invite scientific support on concrete issues d. Study possible secondary and collateral hazards e. Provide assessment reports
Provide for evidence-based decision-making	Collect and verify data and develop tools to allow for evidence-based decision-making
Modify recovery plans and policies	Modify the recovery contingency plans, programmes, and policies as necessary
Amend norms and legislation	Formulate and introduce required changes in legal norms or government decisions (adjustments, amendments or introduction of new case-specific norms)
Provide immediate relief support	
Expand the immediate health care	Expand the immediate health care, i.e.: a. Notify affected people on the organisation of health care b. Take epidemic prevention measures c. Provide clinical care for the injured d. Apply infectious diseases' prevention and control measures
Upgrade the temporary sheltering	Upgrade the temporary sheltering, i.e.: a. Estimate the actual needs b. Mobilise mutual aid resources c. Request and manage international support for temporary sheltering

Taxonomy Field	Description
Provide psychosocial support	Provide psychosocial support to individuals and families
Provide psychological support to relatives	*Provide psychological support to victims' relatives*
Provide disaster welfare and family reunification	*Collect, process, and disseminate disaster welfare and family reunification information*
Provide electricity	Provide emergency electricity support
Open critical transportation lines	Open and maintain critical transportation lines and manage their use
Engage the population	
Maintain population's operational awareness	Maintain the population's operational awareness on recovery operations and measures, i.e.: a. Deliver public information on the situation, recovery organisation and plans b. Instruct people how to act in case of secondary hazards and collateral damage c. Advise people on how to behave/ act in the situation d. Provide people with the ability to communicate privately in case of damaged public digital infrastructure and communication channels e. Establish a liaison mechanism and communication channels between communities and institutions
Organise volunteers and communities for recovery	Organise activities of volunteers and communities in recovery operations
Manage organised volunteers during recovery	*Deploy, task, resource and oversee organised volunteers*
Manage spontaneous volunteers during recovery	*Network spontaneous volunteers with professional staff and organised volunteers, provide instructions and resources*
Activate PPPs to mobilise resources	*Activate public-private partnership mechanisms to mobilise, deliver and utilise resources*
Identify communities' priorities and perceived benefits	Initiate a comprehensive on-site assessment to identify communities' priorities and the impact of potential recovery assistance measures
Manage humanitarian recovery	
Restore critical medical and MHPSS services	Restore critical medical and MHPSS services, i.e.: a. Provide comprehensive stress management, mental health and psychosocial support (MHPSS) and substance abuse services and programmes b. Establish (review, update) plans for sustainable medical recovery c. Ensure treatment by relevant health care institutions and procedures d. Identify and mobilise health care resources (budget, personnel, equipment, facilities)
Provide reliable temporary sheltering	Provide safe and reliable temporary sheltering and utilities
Establish temporary school organisation	Establish temporary organisation for schooling of children
Provide food, water, and energy for the population	Provide regular deliveries of food, water, and energy for private use
Support families' reunification	Facilitate and support reunification of families from the affected area
Address the needs of vulnerable populations	Address the needs of vulnerable populations, paying special attention to big families, people with disabilities, and relatives to victims

Taxonomy Field	Description
Manage volunteers providing social services	Assist local authorities in managing volunteers providing social and psychosocial services
Recover public lifelines	
Restore sustainable delivery of electricity	Restore and sustain the delivery of electricity to public and private users
Restore delivery of potable water	Restore and sustain the delivery of potable water to public and private users
Re-establish food supply chains	Restore and sustain supply chains for basic foods
Restore mass transportation	Restore and sustain basic mass transportation services
Restore delivery of fuels	Restore and sustain the delivery of all main types of fuel to public and private users
Restore local public services	Support the restoration of local public services, with schools, health and social care services as highest priority
Restore mass communications and Internet	Restore mass communications and Internet connectivity throughout the affected area
Restore banking and commercial services	Support the restoration of banking and other commercial services
Restore postal services	Re-establish the state postal service; support the restoration of other postal services
Restore the solid waste collection system	Restore and sustain the system for collection of solid waste and waste disposal
Manage economic recovery	
Assess economic reconstruction needs	Coordinate and conduct comprehensive inter-agency and public-private economic reconstruction needs assessment Assess economic consequences at the national, regional, and local level, evaluate and justify government's involvement in economic recovery
Plan long-term economic recovery	Plan long-term economic recovery efforts, i.e.: a. Coordinate government, regional, local, and private efforts b. Coordinate agricultural recovery programmes c. Introduce monetary instruments (e.g. assistance loans) to support the recovery of local industry, agriculture, trade, and tourism
Provide jobs' incentives or unemployment assistance	Provide affected people with incentives to keep their jobs or special unemployment assistance
Manage infrastructure recovery	Manage infrastructure recovery by performing the following functions: a. Coordinate and conduct comprehensive inter-agency and public-private reconstruction and rehabilitation needs assessment b. Develop prioritised policy, plans, and programmes for infrastructure recovery c. Mobilise public, private, and international resources for infrastructure recovery programmes d. Establish special legal norms and financial mechanisms to support individual and business infrastructure reconstruction e. Coordinate the rehabilitation of buildings and transportation infrastructure f. Provide governmental engineering services and other support to local authorities for public works and reconstruction of infrastructure g. Integrate state, local, and private efforts in infrastructure recovery
Manage environmental recovery	

Taxonomy Field	Description
Conduct environmental decontamination	Coordinate and conduct decontamination and other measures to eliminate crisis' effects on the environment
Clean up the affected area	Clean up the affected area from hazardous waste
Develop policy for sustainable rehabilitation	Conduct long-term environmental impact assessments and develop policy and programme for sustainable rehabilitation
Remove damaged structures and debris	Remove damaged structures; manage debris to reduce environmental and human impact
Common Functional Area "**CRISIS COMMUNICATIONS AND INFORMATION MANAGEMENT**"	
Establish CCIM [1] organisation	
Set-up an integrated CCIM network	Set-up an integrated Crisis Communications and Information Management network
Identify stakeholders' CCIM capabilities and procedures	*Identify stakeholders' available crisis communications and information management capabilities and interoperability issues*
Define requirements for CCIM infrastructure	*Define sectoral and geographic requirements for crisis communications and information management infrastructure*
Establish CM operations infrastructure	*Establish crisis management operations infrastructure for decision-making, organising, and controlling operations*
Establish information management infrastructure	*Establish information management infrastructure for collecting, storing, processing, analysing, and disseminating the information needed for decision-making*
Organise CCIM's cybersecurity	*Establish cybersecurity roles and responsibilities of central and local authorities and participating agencies and procedures for information exchange, tasking and coordination*
Establish a concept of CCIM operations	Coordinate and establish a concept of crisis communications and information management operations
Regulate access to CM communications and information	Regulate access to crisis management communications and information, i.e.: a. Define and coordinate overall rules for access to CM communications and information and standards for certification of networks, infrastructure, and personnel b. Develop and coordinate crisis communications and information management documentation and procedures across state agencies, local authorities, private entities, and volunteer organisations c. Establish standards, procedures and channels for granting and revoking employee access to resources or systems d. Establish procedures for authentication of users and dynamic modification of permissions during an emergency e. Periodically review the access protocols for each critical asset or system to ensure that the right individuals have authorised access
Provide secure storing and exchange of content	Provide secure storing and exchange of content, i.e.: a. Establish structured information exchange system for data transformation and routing b. Develop collaborative tools for secure storing and exchange of data c. Develop collaborative tools for enterprise content management
Conduct and coordinate communications and information planning	

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[1]   CCIM – Crisis Communications and Information Management

Taxonomy Field	Description
Activate an inter-agency CCIM team	Organise/activate an inter-agency crisis communications and information management team to set up mechanisms for collecting, analysing, producing, and disseminating crisis information

Develop communications policy, plans and procedures	Develop communications policy, plans and procedures to support government agencies, local authorities, private and volunteer organisations, i.e.:
	  a. Make and maintain an assessment of the communications and information environment
	  b. Define each actor's communications and information management responsibilities and authority in the CM chain of command
	  c. Clarify the target audience
	  d. Develop implementation packages (audience, information, channels, tools, timeframe) and determine responsibilities
	  e. Monitor, obtain institutional and public feedback and adjust as necessary
	  f. Establish the ground for international cooperation in communications and information management
	  g. Establish consultations and coordination among stakeholders in the development of communications policy, plans and procedures to facilitate the exchange of crisis relevant information before and during a crisis

Develop cybersecurity policy, plans and procedures	Develop cybersecurity policy, plans and procedures to secure the functioning of CM networks based on an all-hazards approach, i.e.:
	  a. Define the cybersecurity's place in the crisis management system
	  b. Perform all-hazard inter-agency cyber risk assessment
	  c. Identify expertise and capabilities at the sub-government levels of CM, private actors, including operators of digital infrastructure, and volunteers
	  d. Place the cyber security decision-making within the overall CM multijurisdictional decision-making process
	  e. Determine which organisations to involve and the roles they will play in protection, response and recovery operations

Establish relationships between CM authorities and media	Establish (renew) relationships between crisis management authorities (teams) and media, i.e.:
	  a. Coordinate the format of deliverable information
	  b. Coordinate the work of media staff within the affected area (rules of engagement and support from the CM agencies)

Manage the frequency spectrum in a crisis	Establish norms and mechanism of national frequency spectrum management for crisis situations
Manage visibility in media	Manage the production, use and dissemination of visual materials via Internet, social networks, TV, and newspapers for the crisis management operations, agencies and volunteer organisations
Maintain a record of planning and decisions	Maintain a record of the planning process and decisions to facilitate the evaluation of crisis operations
Create CCIM networks	
Build CCIM components and functionalities	Define, build, and maintain the crisis communications and information management system's components and functionalities
Manage data	*Manage access to data, data processing and distribution*
Establish all-hazards database	*Establish all-hazards CM database and regulate the access to it*

Integrate decision support	*Integrate CM decision support systems and tools, incl.:*
	  a. Incorporate into the decision support system(s) the outputs – status and forecasts – of the spread of hazards and their impact
	  b. Integrate into the decision support system(s) the assessment of cross-domain vulnerabilities and their impact
	  c. Combine data from various sources and models' output to provide decision support to crisis managers and commanders

Provide for crowd sourcing	*Create opportunities for application of relevant modes of crowd sourcing; disseminate the information on such opportunities*

Taxonomy Field	Description
Establish crisis communications capabilities	Establish and maintain crisis communications capabilities, incl.: a. Define the communications and information requirements for central authorities, first responders, regional and local authorities, volunteer organisations and private entities b. Secure interoperable communications with responders, authorities and stakeholders in any environmental conditions through standards and coordination of acquisition c. Provide capability to obtain critical information remotely about the extent, perimeter, or interior of the incident d. Establish coordination with corporate communications systems and assets
Establish emergency call services	Establish emergency call services; disseminate information and guidance on the use of such services
Establish information management capabilities	Establish and maintain crisis information management capabilities
Identify information needs of stakeholders	*Identify and analyse the information needs of crisis management stakeholders*
Integrate data collection tools	*Design and integrate tools for data collection, incl.:* *a. Provide near real-time feed of actual data to allow for assessment of threats and reliable forecasts by the crisis managers and commanders during response operations* *b. Integrate data collection tools in a common data and information management architecture to assure interoperability*
Determine reporting flows	*Describe and approve reporting flows and provide guidance to CM actors*
Ascertain the quality of data	*Check and ascertain the relevance and the quality of data*
Define information management procedures	*Define and coordinate information management procedures among stakeholders to facilitate the exchange of crisis related information*
Set-up data storage and retrieval	*Set-up data storage and retrieval procedures and assets*
Set-up data analysis	*Determine data analysis procedures and provide respective capacity*
Set-up dissemination and information sharing	*Define dissemination principles and routes for sharing information among CM actors and stakeholders*
Provide CCIM technology support	Provide technologies to support crisis communications and information management, including solutions for interoperability
Continuously improve CCIM	
Establish equipment and training standards	Establish and enforce the implementation of equipment and training standards
Implement training programmes for CCIM	Develop and implement training programmes for crisis (protection, response, and relief) communications and information management, i.e.: a. Develop and conduct exercises to test the knowledge and skills of individuals and organisational and capabilities for using crisis communications and information b. Conduct exercises to test the interoperability, reliability and cybersecurity of the communications equipment and software c. Conduct crisis response exercises to assess readiness d. Conduct multinational, national, regional, and local exercises
Exploit CCIM for protection, response, and recovery	
Secure warning and alerting	Secure warning and alerting to all command levels, CM agencies, and the public

Taxonomy Field	Description
Ensure the functioning of critical communications	*Ensure that all critical communications networks are functioning*
Communicate hazard information within the CM system	*Communicate hazard (threat) information within the CM system*
Communicate hazard information to the public	*Communicate hazard (threat) information to the public*
Communicate directly with media and citizens	*Involve crisis managers in direct communication with media and citizens*
Provide communications and information support to C3	Provide operational communications and information support to C3 by certain organisations (e.g. professional responders) to other stakeholders (e.g. local authorities, private actors, volunteers) to facilitate e.g. interoperability
Communicate operational information across chain of command	*Communicate operational information across the crisis management chain of command*
Provide communications with and between task groups	*Provide secure communications with and between search and rescue and first responders task groups*
Provide communications with volunteers	*Provide reliable communications and information exchange with volunteer formations and spontaneous volunteers*
Deploy field communications	*Deploy mobile crisis communications system(s) within the affected area*
Facilitate data processing/ lift	*Facilitate data processing, including operational data lift*
Conduct information analysis and evaluation	*Conduct permanent information analysis and evaluation*
Provide communications support to local authorities and the private sector	*Coordinate and provide open communications support to local authorities and the private sector to assist awareness, protection, response and relief operations*
Support C3 decision making	Support decision making in the processes of command, control, and coordination, e.g. by implementing analysis, assessment and predictive models and tools
Provide information to media and the public	Prepare and provide relevant and adequate information to media and the public
Provide information on the crisis impact	*Provide or facilitate producing resources (photographs, maps, graphics, videos, press releases, etc.) that document the impact of the emergency and of disaster response actions*
Advise the leadership on working with media	*Advise the CM leadership on working with the media (monitoring their work, coordination)*
Monitor media coverage	Organise and conduct monitoring of media coverage on the impact of the emergency, progress in disaster response made by the CM agencies, recommendations to the population, etc.
Detect and debunk deception and rumours in social media	Detect and debunk deception and rumours in the social media regarding the crisis situation
Common Functional Area "**COMMAND, CONTROL, AND COORDINATION (C3)**"	
Build and maintain the C3 system	

Taxonomy Field	Description
Design, test, and validate the C3 system	Design, test, and validate the C3 system by components and in its entirety, i.e.: a. Establish C3 system for each participating agency b. Determine the levels of command and establish C3 system for each command level, e.g. operational, local, regional, and national (central) c. Provide doctrinal and technical interoperability and integrate agencies' and authorities' levels of command and management
Prepare C3 personnel	Select, train and certify C3 personnel
Establish C3 information systems	Establish C3 information systems and information system management
Establish C3 procedures	Establish C3 procedures at all levels of command and management
Provide equipment, software, codes	Provide required equipment, software, codes, etc.
Provide fixed and mobile command facilities	Provide fixed and mobile (field, deployable) command infrastructure, equipment, software, personnel, training, etc.
Maintain integrity of the C3 system	Maintain the integrity of the system for command, control, and coordination
Establish the command component	
Define the CM chain of command	Define the CM chain of command, i.e.: a. Establish C3 at central, regional, and local levels b. Define authority and responsibilities at each level c. Define a framework and rules of delegating authority d. Define procedures and provide guidelines for incident, emergency, and crisis command and management e. Provide command integrity while transitioning from incident toward emergency and crisis management
Establish decision-making environment and resources	Establish CM relevant decision-making environment and dedicate resources
Establish the control component	
Design a control system	Design a control system along the chain of command, i.e.: a. Define the control tasks for decision-making, operations and resource planning, and implementation feedback b. Determine rules of control within each level and across all levels of command c. Establish planning and decision-preparing procedures for crisis environment d. Formulate execution information (decisions, directives, orders, commands) and provide templates for each level of command e. Provide integrity while transitioning from incident toward emergency and crisis management
Establish control capability at each command level	Establish control capability at each level of command including information, communications, and organisation (personnel)
Determine the principles of information exchange	Determine the principles of exchange of CM information among agencies and levels of authority
Provide scientific and technical advice	Provide in-house scientific and technical advice and ready access to external expertise
Establish rules for reporting	Establish rules for reporting on results and performance
Establish the coordination component	

Taxonomy Field	Description

Establish internal coordination	Establish mechanisms for internal coordination:
	  a. Between various ministries, agencies or policy sectors (horizontal)
	  b. Between parent ministry and subordinate agencies/bodies in the same sector (vertical)

Establish coordination with societal, private and international organisations	Establish mechanisms for coordination with civil society organisations, the private sector, and international organisations
Establish professional coordination	Establish professional coordination based on templates and permanent CM organisation/staff
Establish transborder coordination	Establish coordination in response to a (potential) transborder crisis
Establish coordination in transition from response to recovery	Establish recovery coordination task group to manage the transition from response to recovery
Establish coordination with media	Establish coordination teams and common rules for media relations and communicating with the public
Exploit the C3 system	
Monitor the affected area	Establish comprehensive monitoring of the affected area, people, critical infrastructure and assets, and vital functions, including use of data from various sources to monitor the affected area comprehensively, enhance the situational awareness, and facilitate decision support

Provide situational awareness, share COP	Provide situational awareness across the chain of command, collecting operational information, continuously assessing risks and threats, and building and sharing a Common Operational Picture (COP), incl.:
	  a. Exchange crisis-related information among organisations to contribute to situational awareness
	  b. Integrate data from various sources and models to improve the COP and situational awareness
	  c. Provide fusion of historical, real-time data and outputs of validated models, coming in various formats, to improve the managers' situational awareness

Provide orientation of decision-makers	Provide orientation of the decision-makers, proposing courses of action, priorities, resource allocation and other immediate measures
Take and disseminate decisions	Take, communicate, and disseminate decisions, directives, commands and instructions
Task responders	Provide tasking to all responders
C3 SAR and first responders' operations	Command, control, and coordinate Search and Rescue and first responders' operations
C3 volunteers' operations	Command, control, and coordinate volunteers' actions and operations
Manage and support international responders	Manage and support the international responders' actions and operations
Provide continuous deliberate planning	Provide continuous deliberate planning according to set priorities
C3 delivery of critical support assets	Command, control, and coordinate delivery of critical support assets (transport, UAVs/drones, specialised aircrafts, satellite imagery, international information, etc.)
Establish ad-hoc task groups	Establish ad-hoc groups with tasking to manage specific problems
Maintain scientific and technology advisory capacity	Maintain permanent capacity to provide scientific and technology advice to decision-makers and planners

Taxonomy Field	Description
Manage resources to cope with priority tasks	Manage materiel and other resources to support the performance of priority tasks
Provide warning and alerts for secondary hazards	Continue to provide public and institutional warning and alerting for secondary hazards, collateral threats and related developments
Deliver public information and advice	Deliver public information, guidance, instructions and advice
Common Functional Area "**LOGISTICS**"	
Establish crisis logistics management system	
Identify the components of crisis logistics support	Identify the components of the crisis logistics support structure, i.e.: a. Define roles and responsibilities of logistics managers and organisations b. Provide a concept of operations for logistics support c. Establish principles and procedures for logistics support between agencies and local authorities
Establish supply chains	Establish a system of crisis supply chains management
Provide end-to-end visibility of resources	Establish and manage an infrastructure and database to provide end-to-end visibility of crisis response resources
Develop logistics policy, plans, and programmes	Identify required resources and develop crisis logistics policy, plans, and programmes
Establish logistics C3	Establish a system for command, control, and coordination of logistics
Provide norms for procurement in crises	Provide norms, procedures and responsibilities for procurement and contracting during crises
Manage materiel logistics	
Determine materiel requirements	Determine materiel requirements for operational functions and command levels
Perform *production logistics* within "Preparedness"	Perform *production logistics* within the "Preparedness" function, providing specification, design and production of required materiel
Perform *consumer logistics*	Perform *consumer logistics*, providing storage, repair, maintenance of CM materiel and its disposal
Perform *supply logistics*	Perform *supply logistics*, determining stock levels, provisioning, distribution and replenishment of materiel between responders and CM command levels
Perform *maintenance and repair logistics*	Perform *maintenance and repair logistics* during 'Protection,' 'Response' and 'Recovery'
Create common operational framework for prioritisation	Create common operational framework to prioritise the use of key assets, needed by various task forces
Conduct transportation logistics	
Plan, organise, and resource transportation logistics	Plan, organise, and resource transportation logistics for protection, crisis response and recovery
Provide transportation of responders and supplies	Provide transportation of responders and supplies to and within the affected area: a. Provide strategic transportation b. Meet responders' requests for transportation c. Provide transportation of materials, medicine and medical materials, food and water for first aid to affected people

Taxonomy Field	Description
Provide transportation equipment and procedures for its use	Provide transportation equipment and establish procedures for moving materiel from storage facilities and vendors to people in the affected area, evacuation camps and other crisis response facilities
Provide transportation support to other stakeholders	Provide transportation support to other agencies, task groups, spontaneous volunteers, etc.
Transport debris and waste	Provide transportation of debris and waste
Provide medical logistics	
Plan medical logistics	Plan, coordinate, contract, and resource medical logistics for crisis response and recovery, i.e.: 　a. Estimate medicines' and other medical materials requirements for incidents, emergency, and crisis situations and establish reserves according to the hazards risk mapping 　b. Maintain database of the national, regional and local medical organisations, medical personnel, and medical materials 　c. Develop and maintain policy, plans, and programmes for securing CM medical logistics capacity 　d. Establish public-private partnerships for medical logistics
Provide medical supplies	Coordinate and provide medical supplies to meet operational requests
Direct additional national and international medical support	Accept and direct additional national and international medical support for the victims
Manage facilities	
Select storage and distribution facilities	Conduct location, selection, and acquisition of storage and distribution facilities
Operate facilities and manage related services	Establish and operate facilities and manage related services to shelter and support crisis responders
Manage evacuation camps and related services	Establish and operate facilities, temporary deployable accommodation camps and other evacuation facilities, and manage related services, within and outside the affected area
Manage acquired property	Manage property acquired to support crisis response and relief operations
Operate waste and debris management facilities	Identify, establish and operate facilities for management of waste and debris, enabling reuse, and recovery where possible, and disposal when required
Provide logistics services	Provide operational re-supply, map distribution, labour resources, postal and courier services, canteen, laundry and bathing facilities, burials, etc., for responders, volunteers, the people in temporary shelters, hospitals, and housings within and outside the affected area
Common Functional Area "**SECURITY MANAGEMENT**"	
Conduct security orientation and planning	

Taxonomy Field	Description
Develop security component in CM plans and systems	Develop security component in the national, regional, and local crisis management plans and systems, i.e.: a. Within the crisis management scenarios, identify security threats, issues and responses b. Identify and cluster inter-agency security capabilities requirements c. Establish a model of using security capabilities for crisis management functions d. Develop a security operations plan for the crisis management system e. Introduce security chapters in the crisis management planning at all command and management levels f. Establish and maintain security preparedness assessment and reporting mechanism
Establish programmes for acquisition of security capabilities	Establish central, agency-specific, regional, and local programmes for acquisition of security capabilities
Establish preliminary coordination	Establish pre-crisis security management coordination
Develop preparedness security guidance	Develop and promulgate preparedness security guidance
Provide performance guidelines	Provide performance directives, guidelines, and instructions
Introduce security specific norms	Introduce security specific norms as part of the crisis management legislation
Establish security management organisation	
Establish security coordination and control organisations	Establish security coordination and control organisations according to the CM chain of command, as well as in private and non-governmental entities planned to engage in CM operations
Establish a crisis security clearance system	Establish a crisis security clearance system, i.e.: a. Establish a national authentication and security identification certification system for emergency responders and official personnel and other non-governmental personnel requiring access to affected areas b. Establish a national database of cleared crisis management staff and volunteers
Introduce chief security officer	Introduce chief security officer (manager) in each crisis command and management entity
Establish secure information exchange	Establish a system to exchange security information
Provide expertise and coordination for security planning	Provide expertise and coordination for security planning efforts and for conducting technical assessments (e.g. vulnerability assessments, risk analyses, surveillance sensor architecture, etc.)
Provide key security capabilities	
Staff with qualified personnel	Staff with qualified personnel, i.e.: a. Establish key competencies' requirements for security staff b. Select, motivate, certify, and maintain professional security staff at national and local levels, as well as for private and non-governmental entities
Develop and conduct security management training	Develop and conduct training to improve all-hazard security management capability, i.e.: a. Develop standardised training courses on security management b. Provide training courses for the security officers c. Tailor security management courses and provide training for volunteers d. Deliver guidelines on crisis security to the population, business entities, and institutions

Taxonomy Field	Description
Supply security control equipment	Supply security control equipment, i.e. provide specialised security assets such as traffic barriers; chemical, biological, radiological, nuclear, and high-yield explosives detection devices; canine units; law enforcement personal protective gear; etc.
Exercise on-site security control	
Test critical infrastructure security plans	Develop and implement exercise programmes to test critical infrastructure security plans
Ensure safe and secure CM environment	Ensure a safe and secure environment through law enforcement and related security and protection operations for people and communities located within affected areas and for all responders engaged in CM operations, i.e.: a. Perform early on-site assessment actions b. Establish security control system in the affected area c. Develop (review) a site security plan d. Develop and implement case-specific physical security measures, countermeasures, and procedures e. Conduct security operations within, on the borders, and outside the affected area where evacuees are temporarily placed f. Share security related information with state and local officials, the private sector and the public, as appropriate
Perform access, traffic, and crowd control	Perform access, traffic, and crowd control within and on the borders of the affected area, in temporary evacuation facilities and camps, i.e.: a. Provide security forces to support state and local efforts to control access to the incident site and critical facilities b. Provide security forces and establish protective measures around the affected site, critical infrastructure, and critical facilities c. Secure protection of emergency responders and other workers operating in a high-threat environment, and provide operational security of emergency response operations wherever they may occur d. Establish public traffic control e. Deploy capacities for crowd control
Coordinate security measures with other operations	Coordinate security measures with other search and rescue, response and recovery operations
Ensure responders' safety and security	Ensure the safety and security of all on-the-scene responders by developing a structured and standardised system of protocols and procedures for all responders, including: a. Establish site management and control to provide physical security of the response operations and the follow-up recovery measures b. Identify the scope and nature of the problem, including the eventual presence of CBRN and other hazardous materials c. Evaluate the immediate risk to the responders and establish limits of access and movement ('hot zones' or an inner safety perimeter) d. Provide all crisis response personnel with the type of personal protective clothing and equipment appropriate for the mandated tasks e. Provide immediate healthcare support to the responders in case of need f. Safeguard the emotional and mental wellbeing of emergency/crisis responders, including stress management

Annex 2. Revised Taxonomy of Hazards 2020

This annex presents the revised taxonomy of hazards, related to the crisis management phases and functions, in a textual format

Annex 2.1. presents the notation followed in the annex for the levels of the taxonomy – hazards origin, hazards group, type of event, specific hazard.

Annex 2.2. lists all taxonomy fields.

The actual classification of a crisis management gap, solution or other related content is at the level of specific hazard.

Annex 2.1. Notations in the textual presentation of the taxonomy

Taxonomy Field
HAZARDS ORIGIN
Hazards group
Type of event
Specific hazard X
Specific hazard Y
….

Annex 2.2. Hazards' Taxonomy fields

Taxonomy of Hazards
NATURAL
Meteorological (Atmospheric)
Severe weather
Storms, tornadoes, cyclones
Extreme heat waves
Extreme cold waves
Heavy snow and/or Icing
Avalanches
Heavy rainfall
Geological (Seismic)
Earthquakes

Taxonomy of Hazards
Tsunami (high tides)
Landslides
Volcanic
Volcanic lava flows
Volcanic ash clouds
Hydrologic
Floods (fluvial floods, flash floods, triggered by heavy rainfall, floods through infrastructure failure, coastal flooding)
Drought
Wildfires (naturally inspired)
Forest fires
Ground fires (bush and grass)
Underground fires
Pandemics/epidemics
Disease outbreaks
Infestations
Livestock epidemics/epizootics
Livestock epidemics
HUMAN INDUCED HAZARDS
Non-malicious human induced hazards
Fires
Large urban fires
Large industrial fires
Maritime transportation fires
Explosions

Taxonomy of Hazards
Industrial explosions
Ground and maritime transportation explosions
Mine explosions
Spills
Industrial air pollution
Radiological pollution
Chemical spill
Biological spill
Maritime and coastal pollution
Collapse (loss) of critical infrastructure
Collapse of critical elements of the power grid (interruptions in or loss of electrical service for extended periods of time, sufficient to require crisis management response to meet health and safety needs)
Dam failure causing down-stream flooding
Collapse of critical transportation structures (bridges, tunnels)
Telecommunications failures (failures of data transfer, communications, or processing brought about either by physical destruction of computers or communications equipment or a performance failure of software)
Contamination
Drugs and health products contaminant
Water, food, air contaminant
Environment contaminant
Massive public disorder at public spaces
Massive public disorder at public spaces due to design and/or management failures, e.g. stampede
Malicious activities
Cyber attacks
Spread of disinformation, rumours, and abusive content (e.g. incitement to violence)
Malicious code (virus, worm, trojan, spyware, dialer, rootkit, etc.)

Taxonomy of Hazards
Information gathering (scanning, sniffing, phishing, social engineering)
Intrusion attempts and intrusion
Availability (DoS, DDoS, sabotage, outage)
Information content security (unauthorised access to information, unauthorised modification of information)
Terrorist attacks
Use of conventional tools (explosives, shooting, knife, truck)
Use of chemical, biological or radiological tools
Complex coordinated terrorist attacks (domestic and international), incl. attacks against critical infrastructure
Widespread criminal offenses
Widespread criminal offenses during and after natural or man-made disasters or terrorist attacks
Widespread criminal offenses during public events
EMERGING HAZARDS (with long-term impact)
Climate change
Continuous dangerous emissions
Sea-level rise
Ozone depletion
Biodiversity degradation
Introduction of invasive species for industrial or other human-related purposes
Overexploitation of species or plants (beyond their reproductive capacity)
Industrial pollution (in deadly doses to species and plants)
Land degradation
Deforestation
Desertification (significant loss of productive soils)
Space hazards

Taxonomy of Hazards
Space debris
Near-Earth objects
Space weather phenomena
CASCADING HAZARDS
Natural hazards triggering other natural hazards
Human activities triggering natural hazards
Human activities exacerbating natural hazard triggering
Networks of hazard interactions (cascades)
Concurrence of two (or more) hazardous events
Hybrid hazards

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