driver+

Driving Innovation in Crisis Management for European Resilience

D934.10 - TAXONOMY OF CM FUNCTIONS FOR CLASSIFICATION OF SOLUTIONS

SP93 - SOLUTIONS

DECEMBER 2017

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Revision Table

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The DRIVER+ project

Current and future challenges due to increasingly severe consequences of natural disasters and terrorist threats require the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with Crisis Management. DRIVER+ (Driving Innovation in Crisis Management for European Resilience) is a FP7 Crisis Management demonstration project aiming at improving the way capability development and innovation management is tackled. DRIVER+ has three main objectives:

1. Develop a pan-European Test-bed for Crisis Management capability development:
    - Develop a common guidance methodology and tool (supporting Trials and the gathering of lessons learned.
    - Develop an infrastructure to create relevant environments, for enabling the trialling of new solutions and to explore and share Crisis Management capabilities.
    - Run Trials in order to assess the value of solutions addressing specific needs using guidance and infrastructure.
    - Ensure the sustainability of the pan-European Test-bed.
2. Develop a well-balanced comprehensive Portfolio of Crisis Management Solutions:
    - Facilitate the usage of the Portfolio of Solutions.
    - Ensure the sustainability of the Portfolio of Tools.
3. Facilitate a shared understanding of Crisis Management across Europe:
    - Establish a common background.
    - Cooperate with external partners in joint Trials.
    - Disseminate project results.

In order to achieve these objectives, five sub-projects (SPs) have been established. **SP91** ***Project Management*** is devoted to consortium level project management, and it is also in charge of the alignment of DRIVER+ with external initiatives on crisis management for the benefit of DRIVER+ and its stakeholders. In DRIVER+, all activities related to Societal Impact Assessment (from the former SP8 and SP9) are part of SP91 as well. **SP92** ***Test-bed*** will deliver a guidance methodology and guidance tool supporting the design, conduct and analysis of Trials and will develop a reference implementation of the Test-bed. It will also create the scenario simulation capability to support execution of the Trials. **SP93** ***Solutions*** will deliver the Portfolio of Solutions which is a database driven web site that documents all the available DRIVER+ solutions, as well as solutions from external organisations. Adapting solutions to fit the needs addressed in Trials will be done in SP93. **SP94** ***Trials*** will organize four series of Trials as well as the final demo. **SP95** ***Impact, Engagement and Sustainability***, is in charge of communication and dissemination, and also addresses issues related to improving sustainability, market aspects of solutions, and standardization.

The DRIVER+ Trials and the Final Demonstration will benefit from the DRIVER+ Test-bed, providing the technological infrastructure, the necessary supporting methodology and adequate support tools to prepare, conduct and evaluate the Trials. All results from the Trials will be stored and made available in the Portfolio of Solutions, being a central platform to present innovative solutions from consortium partners and third parties and to share experiences and best practices with respect to their application. In order to enhance the current European cooperation framework within the Crisis Management domain and to facilitate a shared understanding of Crisis Management across Europe, DRIVER+ will carry out a wide range of activities, whose most important will be to build and structure a dedicated Community of Practice in Crisis Management, thereby connecting and fostering the exchange on lessons learnt and best practices between Crisis Management practitioners as well as technological solution providers.

Executive summary

The taxonomy of crisis management functions is developed in pursuit of two main objectives: to offer a classification instrument for crisis management solutions and to meet the needs of crisis management practitioners for a proper, easy-to-use, and sustainable approach that will facilitate navigation of the DRIVER+ on line platform in the search for required solutions and other relevant information.

The design of taxonomy followed an eight-step methodological approach: formulation of requirements; identification of key concepts; formulation of a conceptual model; development of a draft; review by the users; refinement; application; and analysis of the experience.

The scope of the taxonomy is capturing natural and man-made hazards; their impact on society, economy and the environment; mitigation, preparation, protection, response, recovery, and resilience measures and activities of all stakeholders and at all levels of crisis management.

Key taxonomy concepts are defined through review of policy and operational documents and research sources. The hazard-vulnerability-risk concept is applied, along with the concept of community to represent the social aspect of crisis management. Further elaborated are two groups of concepts – consequences-based and management-based, and three interpretations of crisis management – narrow, comprehensive, and as a function.

The taxonomy's conceptual model is a multi-dimensional hierarchical classification of crisis management functions within the civil protection mission and in the internal security context. The functions are related to purpose (e.g., 'protection,' 'response', etc.) and processes (e.g., 'planning,' 'organising,' 'training,' etc.). The model further incorporates a widely accepted view on crisis management, distinguishing five logical steps: signal detection, preparation/prevention, containment-damage limitation, relief and recovery, and lessons learning.

The taxonomy of crisis management functions presented here builds on three main categories of functions: Preparatory, Operational, and Common. *Preparatory* are the functional areas *Mitigation*, *Capabilities development*, and *Strategic adaptiveness*, part of which is community resilience. *Operational* are the functional areas *Protection*, *Response*, and *Recovery*, the latter divided in turn in immediate relief, and long-term recovery and reconstruction. *Common* are the functional areas supporting the first two categories by providing *Crisis communications and information management; Command, control, and coordination; Logistics;* and *Security management*. In a tree-like structure, each of the ten functional areas consists of functions (56 in total), sub-functions (264), and tasks (87).

The taxonomy is compatible with major fields of practice, e.g. the Sendai Framework and the EU civil protection mechanism, in terms of concepts, language and main categories. Hence, the expectation is that practitioners will easily navigate the online platform using the taxonomy. Its use by solution providers may be more challenging. Therefore, the report includes recommendations on using the taxonomy by practitioners in classifying needs and gaps, describing Trial stories and organising Trials, and soliciting solutions. Solution providers are then expected to explain which gaps their solution intends to remedy, and will select one or a set of the respective taxonomic functions to tag the proposed solution.

The taxonomy will serve a community of users wider than the DRIVER+ consortium, and beyond the life of the project. It is not limited by the scope of preliminary identified gaps, planned Trials, or envisioned solutions.

The taxonomy is a living document. Drafts were subject to intensive internal debates and scrutiny by consortium partners. Nevertheless, the expectation is that, with the accumulation of experience, there will be well founded suggestions for its amendment – to refine the description of a function, to add a function, or to increase the visibility of a task. In longer term, new legislation, policy documents or conceptual developments, as well as emerging threats, vulnerabilities and perceptions will generate further requirements for amendment of the taxonomy. Therefore, the report outlines a transparent process to keep the taxonomy adequate to the crisis management environment and relevant to the needs of stakeholders. The process is based on community assessment and clearly defined decision roles of competent editors and an Editorial Board.

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List of Acronyms

Acronym	Definition
BCMS	Business Continuity Management System
C3	Command, Control, and Coordination
CAX	Computer Assisted Exercise
CBRN	Chemical, Biological, Radiological, Nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear, Environmental (protection)
CCIM	Crisis Communications and Information Management
CI	Critical Information
CII	Critical Information Infrastructure
CM	Crisis Management
COP	Common Operational Picture
CoPCM	Community of Practice in Crisis Management
DHS	Department of Homeland Security (U.S.A.)
EU	The European Union
FEMA	Federal Emergency Management Administration (U.S.A.)
HAZMAT	Hazardous Materials
HQ	Headquarters
IED	Improvised Explosive Device
LL	Lessons Learned
MHPSS	Mental Health and Psycho-Social Support
OODA	Observe, Orient, Decide, Act
PDCA	Plan-Do-Check-Act (cycle)
PoS	Portfolio of Solutions
PPP	Public-Private Partnership
SAR	Search And Rescue
SOP	Standard Operating Procedure
SP	Subproject
UNISDR	United Nations Office for Disaster Risk Reduction
UTL	Universal Task List
VUCA	Volatility, Uncertainty, Complexity, and Ambiguity
WHO	World Health Organization
WP	Work Package

1. Introduction

DRIVER+ starts with the understanding that the European crisis management capabilities already constitute a mature system-of-systems able to support to a high degree the Union Civil Protection Mechanism in the pursuit of the following objectives:

- "To achieve a high level of protection against disasters by preventing or reducing their potential effects, by fostering a culture of prevention and by improving cooperation between the civil protection and other relevant services.
- To enhance preparedness at Member State and Union level to respond to disasters.
- To facilitate rapid and efficient response in the event of disasters or imminent disasters.
- To increase public awareness and preparedness for disasters" (1).

In this context, DRIVER+ has three main objectives: 1) Develop a pan-European Test-bed for crisis management capability development; 2) Develop a well-balanced comprehensive Portfolio of crisis management Solutions, and 3) Facilitate a shared understanding of crisis management across Europe (2).

The objectives of Work Package 934 (WP934), under which the taxonomy falls, is to assure that the necessary crisis management solutions are adapted for their use in the DRIVER+ context, e.g. that practitioners can easily identify one or more solutions that meet their needs. Attempts were made in the first phase of DRIVER to categorise experiments and tools along crisis management functions. One of the objectives of DRIVER+ is to create and implement a taxonomy of crisis management functions to facilitate both the classification of solutions in the PoS (Portfolio of Solutions) database and identification of solutions by practitioners looking to address a particular need. To support these objectives, and in the pursuit of the long-term, sustainable use of the taxonomy, some broader applications were considered in its design:

- Providing a platform for sharing crisis management related knowledge in terms of experience, solutions on practical problems, development of instruments as doctrines, procedures, equipment, etc.
- Facilitating professional communications and information sharing among various crisis management stakeholders, between and within specialised organisations, trainers, research communities, industry, software producers, and other actors, as well as throughout the European community and citizens for strengthening disaster response volunteerism and resilience.
- Affording integration of various datasets.
- Decision support in every functional area of crisis management, as well as for most specific tasks.
- Offering semantic frameworks for crisis management organisation of professional and volunteer formations, as well as for national crisis command and management architectures.
- Exploring the hazards related professional vocabulary.
- Helping focused gap analyses throughout the spectrum of crisis management.
- Representing case-specific semantics for development of solutions and tools.
- Providing a tool for the study of issues in disaster sociology and crisis management.

The DRIVER+ taxonomy of crisis management functions uses five classes of hazards and six properties of the Community concept to define 10 functional areas, 56 functions, 264 sub-functions, and 87 tasks. The decomposition is limited to the taxonomy's fourth level to make it manageable by the DRIVER+ Portfolio of Solutions (PoS). However, it could be further elaborated both horizontally and in-depth, down to tasks, activities and transactions.

Section 2 of the report describes the methodological approach to the design of the taxonomy and includes references to relevant organisational and academic literature. Section 3 outlines the taxonomy, with visual representation of functional areas. Section 4 provides guidance to users of the taxonomy, taking the view of both crisis management practitioners and solution providers, while section 5 presents the current view of the taxonomy's governance process. Annex 1 lists the ten crisis management terms most relevant to this deliverable, and Annex 2 lists all taxonomy fields with a description of each field.

2. Methodological approach

The taxonomy is built on the System theory, as a mechanism for structuring the knowledge about the crisis management domain (see Figure 2.1). The process of taxonomy development consists of information collection, systematic analysis, and classification of system attributes (3).

The established method of work includes several tasks in the development of the taxonomy and maintaining it in its entire lifecycle. The method is adapted from a number of sources (3), (4), (5), (6), (7), (8).

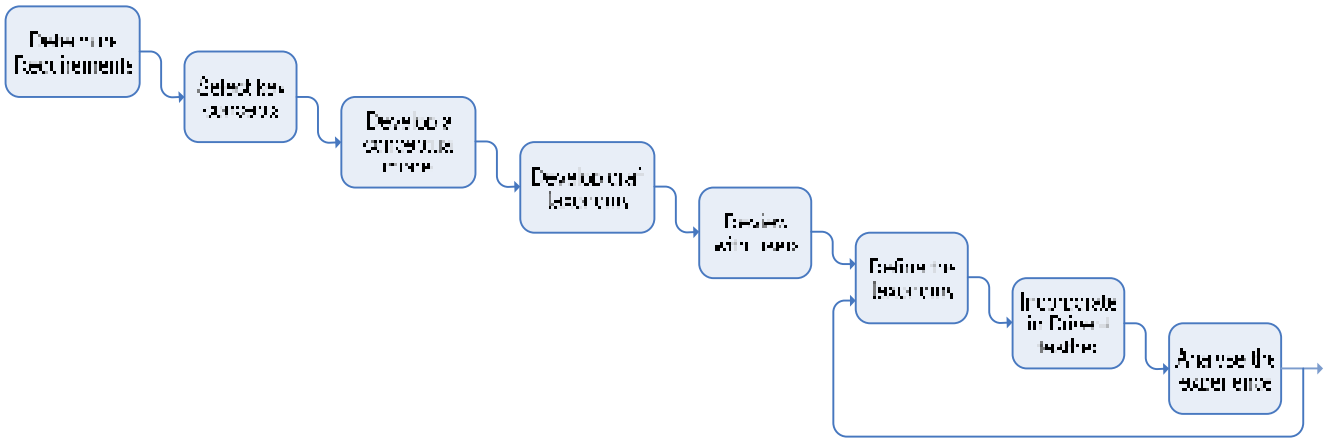

Figure 2.1: DRIVER+ Taxonomy of crisis management functions – development approach

This section explains the requirements and key underlying concepts and presents the conceptual model. The taxonomy itself is presented in the next section, with detail description of all taxonomy fields in Annex 2.

2.1 Requirements

According to the Description of Work, the taxonomy structures crisis management functions within the DRIVER+ scope, i.e. it accounts for natural and man-made hazards, including consequences of terrorist attacks (but not the anti-terrorism itself). Crisis management for civil protection is a complex endeavour, performed by multiple organisations, in a complex social environment, and with significant political meaning. Protecting lives and property, critical infrastructure, and the environment are functions of highest importance and value. In the spirit of ISO 15489-1 (9), higher the risk-level and accountability and/or public scrutiny is, greater is the need for accuracy, precision, and control in preparing and organising crisis management operations and measures. To fulfil such requirements using the traditional classification of organisational structures and subjects is difficult, if at all possible.

On one side, the organisations engaged in contemporary European management of crises are so different and specifically organised, function under different legislation, apply different operational procedures, and use equipment which is rarely interoperable. An organisation-based classification would probably lead to more confusion than consolidation. On the other hand, classification under subject content fits more the classification of items; rather, crisis management is most of all about processes.

The functional taxonomy overcomes these concerns. Functions are determined by necessities while for the implementation of one and the same function different organisations might be established. For example, during the Cold War, the Bulgarian Civil Defence was a militarised structure within the Ministry of Defence implementing military operational procedures; later, it became a civil service under the Ministry of Interior, with own legal act; nevertheless, its functions in support of the population have hardly changed.

Functions provide information about the actors, character, direction, resources, and scope of processes. Their classification derives from the context of the process under consideration, e.g., the function 'planning' has a different context in functional areas Mitigation and Response. Accounting for context is very important

for the overall security sector and policy management. National systems and policies for 'national security,' 'national defence,' 'national crisis management,' etc., are interconnected and functionally bounded. Regarding the taxonomy, this requires maximum terminological interoperability, along with the other forms, such as doctrinal, technical, procedural, legal, etc. For example, the militaries use three levels of military art: 'strategy, operational art, and tactics' depending on the level of engagement. If the levels are changed to 'strategy, tactics, and operations' (10) then many processes and tools like 'intelligence' and 'planning,' 'transportation' and 'communications' would have different content.

The functional taxonomy must contribute to DRIVER+ goals, providing an opportunity to identify functional areas, key functions, sub-functions and tasks that derive from the crisis management framework. The taxonomy should capture high-priority functions, which are critical for the crisis management mission. The depth of their decomposition should not make the taxonomy hard to use, while key processes need to be clear to both practitioners and solution providers.

The DRIVER+ taxonomy of crisis management functions is the way to make available (as well as future) tools accessible, usable, and re-usable. Therefore, the taxonomy should be both suppliers and user-oriented. It should allow solution providers to place their products 'bottom-up' and across the taxonomy of functions, and users of the solutions (e.g., crisis management practitioners) – to find the tools and solutions entering into the taxonomy 'top-down.' Taxonomy's orientation should cope with the requirements of two types of stakeholders: tools/solutions suppliers are mostly engineers, software developers, business entrepreneurs, researchers, etc.; tools/solutions users might be policy makers, public administrators, executive officers, fire-fighters, medical doctors, etc. Crisis management vocabularies used by the two groups are different, and the taxonomy must provide an advantage to the crisis management practitioners, as they might use the DRIVER+ platform even in critical moments.

2.2 Key concepts

The scope of the taxonomy is defined by the DRIVER+ crisis management format. It covers natural and man-made hazards and related disasters, and communities, critical infrastructure and assets, as well as the environment. The 'space' between hazards and communities is the crisis management functional domain – a functional area to which crisis management authorities, organisations, communities, and individuals have to allocate their activities to mitigate hazards and enhance public resilience, to build relevant capabilities and provide civil protection, and to establish control in cases of disasters and crises.

The key concepts shall encompass the crisis management domain.[1] 'Concept' is preferred instead of 'definition' (as a statement of the meaning), as it explains relationships, e.g. between information and awareness; awareness and planning; planning and decisions; decisions and organisations; organisations and activities; activities and outcomes; etc. The relationships serve as arguments for defining the taxonomy's scope and for building its hierarchy (the 'taxonomy tree'). Specific relationships emerge as 'disaster' is not simply a 'big incident,' and 'catastrophe' is not just a bigger disaster (11).

The conceptual approach in the crisis management domain involves turning abstract concepts into a framework within which tools and solutions are and will be applied to collect and process information, take decisions, apply measures and perform operations. This framework is used to solve the fundamental problem of crisis management – to protect communities and their environment from hazards.

This general framework is used to build the DRIVER+ taxonomy's conceptual model:

> *Communities of people with their properties (public and private, cultural, infrastructure and assets, resources); state and private livelihoods; the work of commercial, administrative and non-for-profit organisations; governmental, commercial, and voluntary services; and environment (natural and built) may be considered a system. The system is influenced by the socio-political*

[1] The authors of reviewed literature and documents prefer to focus on empirical studies and definitions instead on distinguishing between concepts. However, at the scale of 'crisis' with wide physical and socio-political consequences, we consider concepts more relevant as a platform for taxonomy development.

context. It may generate or is exposed to hazards and threats. The socio-political instruments must be built and used to minimise risks from identified hazards and threats. If the control of risk fails and communities enter into a crisis, then measures to respond effectively, provide relief and recovery should be available and undertaken. All this can be achieved by understanding models' causation for public protection, which will result in hazards mitigation, reduction of vulnerabilities, strengthening response and recovery capabilities and readiness and, generally, in building community resilience.

Within this conceptual framework, the following key concepts are briefly explained.

2.2.1 Hazard, vulnerability, and risk

For the crisis management in civil protection context, 'hazard,' 'vulnerability,' and 'risk' are interrelated concepts. This triad determines strategy and policy, priorities, allocation of resources, and organisations needed for effective preparation, protection, response, and recovery against and from hazards and threats, i.e. for crisis management. However, neither are 'hazard' and 'risk' synonyms, nor can they be estimated without assessing the 'vulnerability' of every object against a concrete hazard.

'Hazard' is defined by ISO 22300 (12) as 'source of potential harm.' Within the above-mentioned conceptual framework, it has the potential to cause harm to the people, their activities, property, and environment: hazard is a "dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage." ((13), p.17).

Most of the official and research qualifications of hazards are based on their origin: natural; man-made, civil or technological; environmental; biological; and other variations (14). A European Commission review of the member-states national risk assessments identified 25 natural and man-made hazards, among which the following 12 are addressed most often:

- "Natural hazards: Floods; Severe weather; Wild/Forest fires; Earthquakes; Pandemics/epidemics; and Livestock epidemics.
- Man-made hazards: Industrial accidents; Nuclear/radiological accidents; Transport accidents; Loss of critical infrastructure; Cyber attacks; and Terrorist attacks" (15).

Recent research evolves in three directions: expanding the scope of classification through further specialisation of hazards as, e.g. medical, transport, energy, etc.; limiting the classification list to natural and man-made hazards, despite that natural events are hazards only if they affect communities of people and their environment (16); looking for a different classification approach to reflect the complex origin of contemporary hazards (17), (18).

For the purpose of DRIVER+ taxonomy, the classical approach is reasonable and valuable, as it facilitates the consideration of causes-consequences relationships; helps to determine concrete case-specific mitigation and response measures to specific hazards; provides better hazard awareness to wider stakeholders; and, last but not least, serves better to the purpose of classifying crisis management tools and solutions in a manner convenient for practitioners. The conceptual model reflects the following five classes of hazards:

- Natural hazard is "unexpected and/or uncontrollable natural event of unusual magnitude that might threaten people" (19).
- Technological hazard is "a hazard originating from technological or industrial conditions, including accidents, dangerous procedures, infrastructure failure or specific human activities, that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage" (13).
- Biological hazard is "process or phenomenon of organic origin or conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage" (13).

- Environmental hazard is "any single or combination of toxic chemical, biological, or physical agents in the environment, resulting from human activities or natural processes, that may impact the health of exposed subjects, including pollutants such as heavy metals, pesticides, biological contaminants, toxic waste, industrial and home chemicals" (20).
- Socio-natural hazard is "the phenomenon of increased occurrence of certain geophysical and hydro-meteorological hazard events, such as landslides, flooding, land subsidence and drought, that arise from the interaction of natural hazards with overexploited or degraded land and environmental resources" (13).

'Vulnerability' is a "physical feature or operational attribute that renders an entity open to exploitation or susceptible to a given hazard" (21), "the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard" (13). It might result from ineffective governance, poor management, a poor design, confusing realisation, or badly performed operation of a community, organisation, asset, infrastructure, system, or network that can be disrupted by any hazard. Within the above-established framework, "it is the interaction of the hazard of place (risk and mitigation) with the social profile of communities" (22).

In his review, Weichselgartner (23) identifies three perspectives on the community vulnerability to hazards. In the first perspective, vulnerabilities result from exposing community's attributes to hazards; i.e., the hazards, with their characteristics, are the driver of vulnerability. The second perspective is on the community's capacity (organisation, resources, culture, etc.) to prepare and resist to hazards' repercussions. In the third perspective, the vulnerability of concrete community or asset derives from its geographical location that presupposes exposure to the powerful hazard(s). This triple perspective provides orientation about the conduct of risk assessment and risk management as components of the preparatory, operational, and recovery functions in crisis management.

'Risk' is a concept that, in the designed taxonomy framework, serves as a hub between hazard (threat) and vulnerability (community, assets, environment) assessment, from one side, and the comprehensive crisis management approach, from another. As "risk is a combination of the consequences of an event (hazard) and the associated likelihood/probability of its occurrence" (24), the level of risk is a ratio between the likelihood (probability) of occurrence of a concrete hazard and the adverse impact (consequences) it may have to a concrete object – people, functions, assets, infrastructure, networks, resources, environment, etc. (25). The *Risk Assessment and Mapping Guidelines for Disaster Management* of the European Commission elaborate further:

- "The terms 'probability' or 'likelihood' are understood as the probability or likelihood of the risk occurring or taking place in the future.
- "'Consequence' or 'impact' are understood as negative effects of the disaster or risk expressed in terms of human impacts, economic/infrastructure impacts and environmental impacts" (26).

According to ISO 31010, "risk assessment is the overall process of risk identification, risk analysis, and risk evaluation" (24). Consequences may include "dead and missing; injury (mental and physical); disease (mental and physical); secondary hazards (fire, disease etc.); contamination; displacement; breakdown in security; damage to infrastructure; breakdown in essential services; loss of property; loss of income…" (27). Consequently, the logic of risk management (as a component of crisis management) is to reduce the likelihood of occurrence of concrete hazard (where possible) and to limit its consequences through eliminating vulnerabilities and strengthening the community' capabilities to resists, to respond, and to recover.

For the DRIVER+ taxonomy's conceptual model, two important conclusions derive from the 'hazard-vulnerability-risk' factor. First, the information, analysis, and evaluation of hazards, vulnerabilities, and risks are the key factors of crisis management decision-making and should be secured to the highest extent in all normal, emergency, and critical conditions. Second, measures to put under maximum possible control the hazards, vulnerabilities, and risks are, or should be, undertaken throughout all preparatory and operational functional areas with the overall aim to strengthen the community resilience.

2.2.2 Community

The concept of 'community' is central to both DRIVER+ and the taxonomy of crisis management functions. DRIVER+ places society at the heart of crisis management to design integrated solutions that build long-term societal resilience and help crisis managers to work for, in, and with communities affected directly by a crisis. Through the comprehensive crisis management, the role of the community resilience, trust and social cohesion is complemented by the role of the professional emergency management organisations through interaction between these two components (2). From the taxonomy point of view, the concept of 'community' provides the necessary details on what concretely the crisis management functions (and respectively – tools and solutions) should focus on to maintain the people-centred prioritisation across preparatory and operational efforts.

According to the U.S. Department of Homeland Security (DHS) *National Response Framework,*

> Communities are groups that share goals, values, and institutions. They are not always bound by geographic boundaries or political divisions. Instead, they may be faith-based organizations, neighbourhood partnerships, advocacy groups, academia, social and community groups, and associations. Communities bring people together in different ways for different reasons, but each provides opportunities for sharing information and promoting collective action (28).

In this explanation, distinguishing the community from the geographical area on which some people live is very important for the crisis management planners and leaders to prevent thinking that if there are people living in a particular area then there is a community. There is no all-embracing 'community.' Rather, communities are defined by culture, interests, specific features (affection, interests, competition, status), as well as by location that might be chosen as result of the former determinants (29).

For the DRIVER+ taxonomy model, the following key attributes of the concept of the Community are taken into consideration:

- The people over concrete geographical area as demographics; respect to the safety regulations; willingness to participate in governmental mitigation and resilience building programmes; attitude towards voluntarism and mutual help; historical experience; emergency related skills; etc.
- Peoples' property as possession of infrastructure, land, forests, small dams, etc.; mobile, communications, and other assets usable for crisis management; public and cultural infrastructure within the area; etc.
- Existing voluntary, formal, or non-for-profit organisations that might be somehow used for crisis management.
- Services provided by different jurisdictions, as well as commercial and voluntary services.
- The dominant sources of livelihood and their relationships with plausible hazards.
- The living environment, both built and natural.[2]

Reviewed sources share the view that there is no exemplary implementation of the culture of crisis response volunteerism and resilience in terms of better awareness, preparedness, and self-reliance in emergencies and crisis. The role of the crisis management planners and authorities is to build environment for and to support the establishment of such culture. For that aim, specific tools and solutions should be developed and adapted to concrete types of communities.

2.2.3 Consequence-based concepts: incident, disaster, catastrophe, and crisis

The conceptual model underlying the DRIVER+ taxonomy should provide opportunities for classification of tools and solutions when hazards threaten or affect communities and their properties. Presumably, this limitation should put aside the 'incident' as it is a non-community situation. However, as history clearly illustrates, many community-wide and even international crises have begun as incidents, like those with

[2] Adapted from several sources by the World Health Organization.

chemical and nuclear facilities (e.g., the chemical industrial catastrophes in Seveso in 1975 and Bhopal, India in 1984, the Chernobyl nuclear power station catastrophe in 1986) that made people realise that European-wide policy on environmental protection is needed. Terminological clarity is important for the taxonomy, as the conceptual model is comprehensive—in scope and in terms of levels of command and management—and needs a well-established scale for classification. Shaluf *et al*. (30) illustrate the problem using the case of the chemical plant in Bhopal: the company owner reported an 'incident'; the government of India qualified it as 'accident'; the affected people called it 'disaster'; and the social activists titled it as 'tragedy,' 'massacre,' and 'industrial genocide,' while Shrivastava (31) qualified the case as a 'crisis.'

'Disaster' differs from 'incident' with its broader impacts on the communities. In the EU definition, "'disaster' means any situation which has or may have a severe impact on people, the environment, or property, including cultural heritage" (1). As the designation of 'severe' may be based on expectations, direct observations or perceptions, the European Commission provides guidelines: the national risk identification would need to consider at least all significant hazards "would occur on average once or more every 100 years (i.e. annual probability of 1% or more) and for which the consequences represent significant potential impacts, i.e. number of affected people greater than 50, economic and environmental costs above €100 million, and political/social impact considered significant or very serious" (32).

As a concept, 'disaster' is framing the relationships between the levels of command and management. When the capacities of the lower levels are not sufficient to cope with the consequences, engagement of the upper levels might be necessary. The decision on the actual engagement is based on objective criteria (scope and damage), leadership's perceptions, or the intention to secure that the disaster would not escalate into a crisis due to mass perceptions of the 'coming' threat or its consequences. Another, more conceptual explanation is provided by UNISDR: disaster is, "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (13).

'Catastrophe' differs from disaster on all critical components – the scale of damage, scope of effects, level of impact, and required organisation and capabilities for preparation, response, and recovery. Compared to 'incident' and 'disaster,' it is less discussed and conceptually developed in studies and documents. However, as by presumption any catastrophe may lead to a crisis, it provides an essential guide to the DRIVER+ taxonomy. From this point of view, catastrophe's conceptual characteristics might be summarised as follows:

- "A catastrophe is defined by the magnitude of the event on an area, the capacity and ability to respond, and the time to recover" (*National Homeland Security Consortium Meeting*, December 2005, quoted in (33)).
- "There is a fundamental difference in the preparation, complexity, quality of effort, and scope of catastrophic disaster as opposed to a major natural disaster" (34).
- "Most or all of the community built structure is heavily impacted" (35).
- "In a catastrophe, most if not all places of work, recreation, worship and education such as schools totally shut down and the lifeline infrastructures is so badly disrupted that there will be stoppages or extensive shortages of electricity, water, mail or phone services as well as other means of communication and transportation" (35).
- "Most, if not all, of the normal, everyday community functions are sharply and simultaneously interrupted" (11).
- "Local officials are unable to undertake their usual work role, and this often extends into the recovery period" (35).
- "…the response and recovery capabilities needed during a catastrophic event differ significantly from those required to respond to and recover from a 'normal disaster'" (36).
- "A catastrophe, however, overwhelms state and local governments and requires a federal response that anticipates needs instead of waiting for requests from below" (37).
- "Help from nearby communities cannot be provided" (35).

- "In catastrophes, compared to disasters, the mass media differ in certain important aspects. There is much more and longer coverage by national mass media. This is partly because local coverage is reduced if not totally down or out" (35).
- "In catastrophes, there is a need for a more agile, adaptable and creative emergency management" (38).

'Crisis' in the DRIVER+ taxonomy of functions refers to communities, jurisdictions, and organisations "…being significantly damaged by an event or being unable to respond at maximum coherence or effectiveness when the stakes for doing so are at their highest because of lack of resources, planning, leadership, or capacity" (39). Farazmand ((40), as quoted in (33)) elaborates further:

> Crises involve events and processes that carry severe threat, uncertainty, an unknown outcome, and urgency… Most crises have trigger points so critical as to leave historical marks on nations, groups, and individual lives. Crises are historical points of reference, distinguishing between the past and the present… Crises consist of a 'short chain of events that destroy or drastically weaken' a condition of equilibrium and the effectiveness of a system or regime within a period of days, weeks, or hours rather than years… Surprises characterize the dynamics of crisis situations… Some crises are processes of events leading to a level of criticality or degree of intensity generally out of control.

Despite that reviewed sources do not connect catastrophe to crisis directly, there is an obvious link, mostly due to the anticipated almost total inability of local authorities and people to manage the situation; the interruption of most of the vital functions and services; and the psychosocial impact on the people that a totally damaged living environment has.

2.2.4 Management-based concepts: incident, disaster, and crisis management

The management-based concepts provide a framework for an effective and timely response to emergencies including to those that might be unusual or unexpected. Having the response function as a management pillar, various activities such as systematic planning, capability building, risk assessment and management, mitigation, prevention and protection, as well as relief and recovery might be organised. As the DRIVER+ taxonomy is to help better classify and search for tools and solutions, a relevant approach is to look at the problematic 'management' as a process [3] that involves a number of functions as planning, organising, staffing, capabilities development, training, directing, and consolidating communities' efforts to prepare, protect, being able to respond to and recover from the effects of natural and man-made hazards on life, property, and environment.

From the management point of view, incident, disaster, and crisis have a common feature – they all are a kind of emergencies as they contain an actual threat to the communities and their properties. In this context, 'emergency' is a "sudden, urgent, usually unexpected occurrence or event requiring immediate action" (41). Emergency situations—and the decisions and operations to manage them—are different from the routine public protection work; nevertheless, as they are anticipated, various contingency planning, organisational, and preparation measures could be undertaken to provide relevant, effective, and timely assistance.

Presumably, incident, disaster, and crisis management should be seen as levels of an integrated approach in which every consecutive level includes and expands on the previous. There are many common components that might be applied across the triple scale – alerting system, preparatory functions, equipment, resources, etc. However, as the size of the event matters, there is a reason for some nations and organisations to differentiate the management at '3+' levels.

Incident management: The concept of incident varies depending on the way countries built the response systems. In the U.S., the National Incident Management System is "…for managing incidents that range from the serious but purely local to large-scale terrorist attacks or catastrophic natural disasters," where a 'catastrophic incident' is defined as "any natural or manmade incident, including terrorism that results in

[3] The term 'management' is also referred to as a body of knowledge, a practice, and discipline; an art and science; a technique of leadership and decision-making; a system of authority; etc.

extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, or government functions" (28). ISO 22399 provides more universally applicable notion: if not managed properly, the incident "…might be, or could lead to, an operational interruption, disruption, loss, emergency or crisis" (41).

Disaster or emergency management: Presumably, the concept of disaster management should be applicable to the disaster-level events. Catherine Romano contends that disaster management includes "1) preparedness planning to assess hazard vulnerability; 2) mitigation activities to reduce hazards in the structure of the facility, its equipment, its operations, and its personnel; 3) response planning to provide for key support operations, such as first aid, search and rescue, building evacuation, emergency communications, and general personnel training; and 4) recovery, in which an organization prioritizes its operations for efficient business continuation and determines how to protect and restore these components" (42).

The UN uses the concept of 'emergency management' as a universal approach, not-attached to the level of intensity of an event, "…to engage and guide the efforts of government, non-government, voluntary and private agencies in comprehensive and coordinated ways to respond to the entire spectrum of emergency needs" (13). Salient in this definition is the integration of many different organisations, each with its own Standard Operating Procedures (SOPs), towards a common goal in a complex situation.

Crisis management: As already stated, every crisis is an emergency and, from this point of view, the respective management concepts should not differ. The emergency planning component of management is about preparing for *anticipated* situations in terms of origin, localisation, and intensity. The managers are more or less aware of the possible developments and the emergency character of a situation is determined most often by the surprise of appearance or unexpectedly quick escalation.

However, the crisis situation (as well as the catastrophe) is different. Crisis starts with the *unusual* and *unexpected*. They may result from *surprise* or *uncertainty* of a newly escalated situation, despite that completely new types of crisis are rare. A crisis might be born also by a complex situation (simultaneous appearance of different hazards, aggravated by social reactions, etc.), significant collateral damage and secondary effects of what seems to be a 'known' emergency situation (39). From this point of view, the crisis management should prepare the community and organisations for both the expected and the unusual. As Charles Hermann has underlined during the early years of the discipline, "…the term crisis has long been used to describe an event or problem that "1) threatens high-priority values of the organization, 2) presents a restricted amount of time in which a response can be made, and 3) is unexpected or unanticipated by the organization" ((43), as quoted in (39)).

Building crisis management capacity, organisation, skills, resources, and culture is about preparing to cope with extraordinary and unexpected situations to save lives and property. From this perspective, the taxonomy reflects three notions of the 'crisis management:

- *'Narrow' crisis management*: In a narrow context, the crisis is seen through the prism of decision-maker(s) as "…a situation that threatens high priority goals of the decision-making unit, restricts the amount of time available for response before the decision is transformed and surprises the members of the decision-making unit by its occurrence" (44).

  The 'narrow' crisis management is a response rather than a planning, organising, mitigating, preparing, etc. Response is provided in a situation, which is either unexpected or planning has not been made due to variety of reasons, or the crisis management organisation has been made dysfunctional by the event. As the crisis deeply affects the way of life and functioning of the community, the 'narrow' crisis management might be seen also as change management (39).

- *Comprehensive crisis management*: To meet the DRIVER+ taxonomy's specific requirements, the 'traditional' view of emergency management 'phases,' introduced by the National Governors' Association' guide in 1979 (45), are expanded to integrate hazards awareness and community vulnerabilities into a better understanding of complex contemporary risks; improvements of the governance frameworks and mechanisms; coverage on the entire spectrum between hazards identification, mitigation, preparation, protection, response, and recovery, rehabilitation and reconstruction till building reliable and sustainable community resilience. The management of every func-

tional area is based on the Henry Fayol's classical formula "to manage is to forecast and to plan, to organise, to command, to coordinate and to control," expanded with: building common goals across the various crisis management stakeholders; motivating the people for volunteerism and mutual aid; coordinating across large number of very different organisations engaged in crisis management; sense-making; building meaning through comprehensive communications; and others. Briefly, comprehensive management is about all hazards, all public security stakeholders, all systems, all resources, and all actors across all jurisdictions.

- *Crisis management function*: The crisis management function aims at achieving effects, e.g. coordination, a direction of effort, shared awareness, etc., in a crisis management system-of-systems. The 'function' focuses on what is to be achieved, not how or by whom. Several systems, tools, building blocks, etc. may individually or in concert deliver a given function and, conversely, they may support several different functions (46).

In the DRIVER+ taxonomy,[4] 'crisis management' is not a total and distinct approach. It does not supersede 'emergency management.' As the taxonomy encompasses central, regional, and local levels, 'emergency management' is applied to situations in which the affected communities have the capacity to cope. 'Disaster management' is about situations in which the affected communities might need and require support from upper-level jurisdictions. The comprehensive and narrow approach are used to combine the preparation (mitigation, capability building, and strategic adaptiveness) with the response (response, relief, and recovery) aspects of the crisis management to be able to cope with both expected emergencies and surprising developments in terms of size, scope, destructiveness, etc. As some authors have summarised, crisis management may either build on emergency management plans and protocols with auxiliary resources or it may augment the more rigid, but efficient, decision-making and problem-solving protocols with selectively used practices that help responders adapt to specific disruptions to the emergency response infrastructure itself (47), (48).

In summary, for the DRIVER+ taxonomy, the operative concept in 'crisis management' is 'management,' not 'crisis,' as the tools and solution providers have to classify their products in a way that allows crisis practitioners to easily identify a solution for their needs.

2.3 Conceptual model

The DRIVER+ taxonomy model is a conceptual systematic representation of a crisis management system existence (49). Accordingly, the key functional areas, functions, and tasks performed by different authorities, organisations, and individuals within the comprehensive crisis management framework are established on the principles of the system theory in their hierarchical relationships. The model is built with a twofold objective: 1) to reveal the comprehensive approach to the modern crisis management (in the DRIVER+ format); 2) to meet the needs for proper, easy-to-use, and sustainable classification both of practitioners and solution providers. From this point of view, the model serves the building of DRIVER+ Portfolio of Solutions and provides opportunities that these solutions are found, tested, evaluated, used and enriched by national and European crisis managers, planners, and researchers.

The DRIVER+ taxonomy is a multi-dimensional hierarchical classification of crisis management functions within the civil protection mission and in the internal security ('homeland' in the U.S. parlance) context. This framework derives from both the historical evolution of the civil protection form the traditional 'civil defence' (50) and the current European Union understanding of civil protection as co-ordinated, effective, and efficient response to natural hazards and man-made threats. The objective set by the European Union Internal Security Strategy to increase Europe's resilience to crises and disasters (51), which is reflected in relevant policy documents and legal acts of member states, determines the particularly wide scope of the DRIVER+ taxonomy.

[4] Unlike in the U.S., where "Crisis management is predominantly a law enforcement function and includes measures to identify, acquire, and plan the use of resources needed to anticipate, prevent, and/or resolve a threat or act of terrorism" (33).

2.3.1 Basic assumptions

According to the European Parliament and the Council,

> In view of the significant increase in the numbers and severity of natural and man-made disasters in recent years and in a situation where future disasters will be more extreme and more complex with far-reaching and longer-term consequences as a result, in particular, of climate change and the potential interaction between several natural and technological hazards, an integrated approach to disaster management is increasingly important (1).

Characteristics such as complexity, cross-sectoral impact of hazards, combination of hazards and man-made intended threats, and highly dynamic escalation call for enhancing crisis management practice in terms of effectiveness, efficiency, and strategic adaptiveness. Responding to these realities and perspectives, the DRIVER+ taxonomy of crisis management functions is based on the following assumptions:

- The scope and impact of natural and man-made hazards and threats to European communities evolve and challenge the European collective crisis management mechanism and national capabilities (2).
- The importance of the civil protection function as a component of the European and national internal security is growing.
- There is a growing need, as well as willingness for joint operations for crisis management and disaster resilience (52).
- Crisis management at the European and national level needs better evidence-based investment decision making for building a well-balanced comprehensive Portfolio of Solutions in terms of tools, operational concepts and approaches (2).

2.3.2 Approach

To cope with the challenge of complexity and comprehensiveness, the DRIVER+ taxonomy of crisis management functions goes beyond the most popular 'phased' model of crisis or emergency management that includes mitigation, protection, response and recovery (53). This is done to avoid the impression that the phases are somehow independent and discrete, that the end of the previous means begging of the next, etc., and that the taxonomy of every phase is a facet of the overall taxonomy. The review of various research works underlines that the so-called 'crisis management phases' should not be seen as linear. According to Boin et al., "Linear thinking ('big events must have big causes') has given way to a more subtle perspective that emphasizes the unintended consequences of increased complexity. Crises, then, are the result of multiple causes, which interact over time to produce a threat with devastating potential" (54). An early eminent report emphasises the cyclical relationships among these four phases of disaster activities, illustrating how the recovery efforts ("like using loans to relocate residents out of floodplain") may have a mitigation effect against future disasters (53). David Neal's comprehensive study proposes, among others, approaches to re-examine the disaster (management) phases with the understanding that they are mutually inclusive, multi-dimensional, and should be seen not only through the organisational prism of the crisis managers, but also by responders and affected people (55).

Reflecting such methodological considerations, this conceptual model encompasses through taxonomy:

- Citizens, private subjects, and public authorities.
- Strategy, policy, and operations.
- Missions, functions, and tasks.
- Organisations, processes, and activities.
- Human, material, and real estate resources.
- Command, control, coordination, management; etc.

The taxonomy provides opportunities to see how different crisis management entities (leaders, organisations, people, resources, information, etc.) are involved in policy and efforts to reduce the risks of hazards,

to build effective and sustainable capabilities, to strengthen the strategic adaptiveness of the system, to provide day-to-day protection, to be able to respond when the crisis goes beyond incident and even disaster, and to provide relieve and recovery making the life of the affected people even safer and better than before. Potentially, it covers a large timeframe in which societies are expected to pass through different stages of maturity and ability to cope with natural and man-made hazards, building the quality and culture of resilience.

In terms of usage, the taxonomy meets the requirements of both crisis management practitioners and solutions providers. For that purpose, the classification is designed following the top-down approach from crisis management decision-makers towards the organisations, responders, and citizens. On the other hand, solution providers may see the crisis management functions decomposed to tasks, operations, and activities and to allocate envisioned and developed products to one or more of them, where it fits best.

2.3.3 Context

The DRIVER+ taxonomy conceptual model reflects the socio-political contexts within which crisis management takes place. This is the *internal security* [5] that sets up the crisis management of hazards. Putting aside other conceptual issues, the taxonomy of crisis management functions reflects the overall internal security taxonomy. The aim is to avoid, broadly said, an interoperability gap that might arise in critical situations in which different leaders, organisations, and people act with a different understanding of facts, signals, and commands, and follow different procedures and communication languages. From this point of view, the conceptual model is context-aware crisis management functional taxonomy, as illustrated in Figure 2.2.

2.3.1 Multi-dimensionality

The taxonomy model's multi-dimensionality reflects the applied comprehensive understanding of crisis management, its command and management architecture and the engagement of people, societal, and private actors, and the set of standardised processes and procedures for setting up policy and strategy, planning and organising, capacity building and exploiting.

'Function' is the core of this taxonomy model. Taken at the upper level of understanding, a 'function' is an established by design characteristic or ability to realise processes of certain sorts for gaining particular outcomes or meeting concrete objectives (56). It is "the action for which a person or thing is specially designed, fitted, used or intended to accomplish or execute" (57). From the public governance point of view, crisis management 'function' is a high-level purpose, responsibility, task, activity and transaction assigned to a particular authority, organisation, as well as to the citizens, by legislation, mandate or policy (58).

In the DRIVER+ conceptual model, functions are related to purpose (e.g., 'protection') and processes (e.g., 'planning,' 'organising,' 'training,' etc.), explaining what and why should be done and in which way. The approach follows one of the most accepted models, developed by prominent authors on crisis management in five logical steps: 1) signal detection, 2) preparation/prevention, 3) containment – damage limitation, 4) recovery, and 5) learning (59).

Applying such logic, the mission (crisis management) is realised through different functional areas organised as 'preparatory,' 'operational,' and 'common.' This approach has been used in the FP7 project ACRIMAS to define capability requirements for aftermath crisis management and identify clusters of managers' practical needs (60). The ResiStand Consortium has used the model also for an EU-sponsored study on increasing disaster resilience by standardisation of technologies and services (52). *Preparatory* are those functions aiming to reduce the loss of life and property by reducing the potential impact of natural and man-made hazards, to shape protection, response, and recovery capabilities, and to build strategic (long-term) crisis management adaptiveness. *Operational* are functions aimed at day-to-day protection of people

[5] The United States and other countries use the term 'homeland security.'

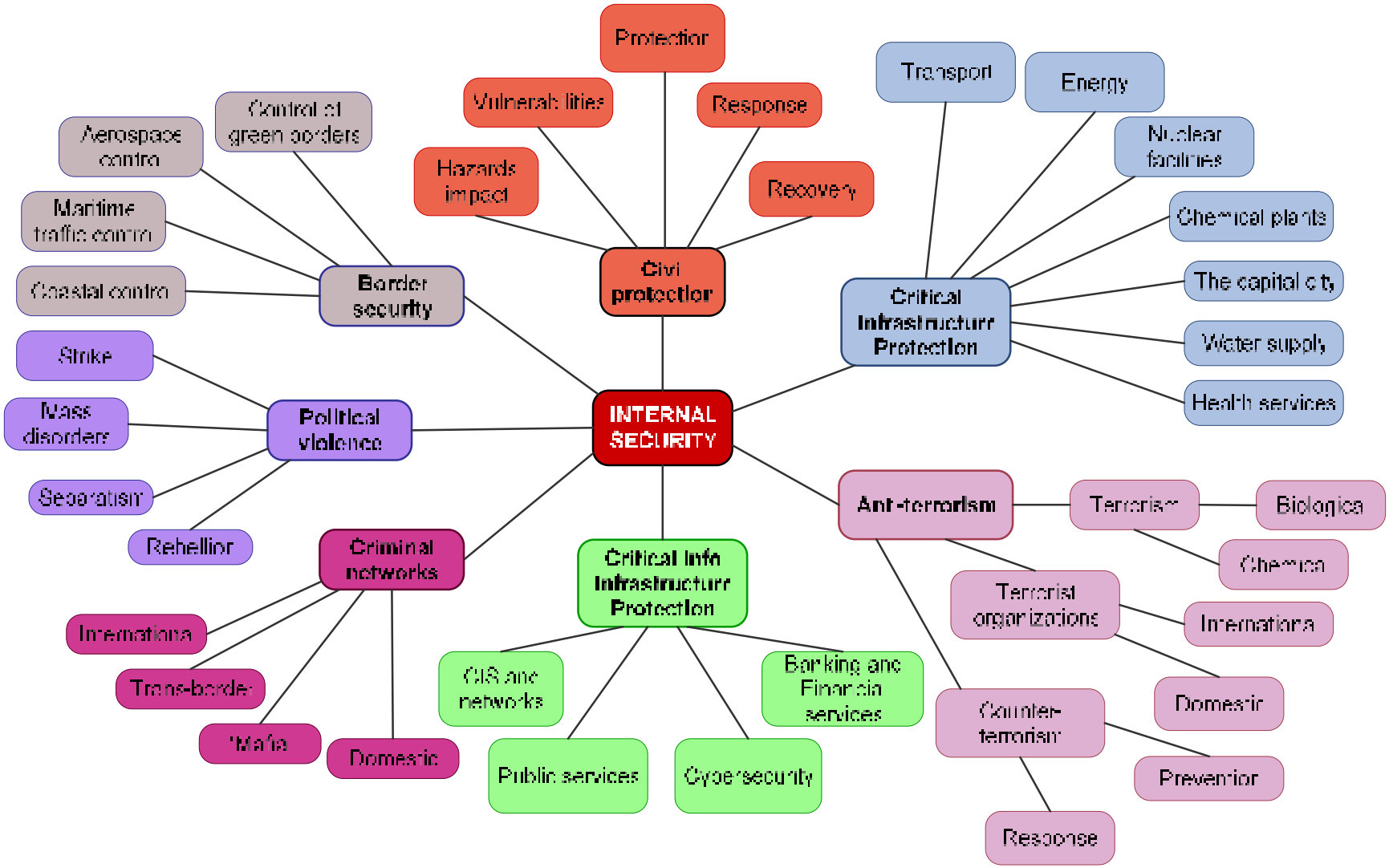

Figure 2.2: Illustration of the DRIVER+ taxonomy context

and infrastructure, relevant response to crises, relief and recovery from the consequences of a crisis. The *common* functions provide critical support for decision-making and operations throughout the crisis management spectrum. Figure 2.3 illustrates this categorisation of crisis management functions.

Further, the taxonomy model's 'key functions' are established on Henri Fayol's (61) core management elements (planning, organising, command, coordination, and control), expanded and adapted to the preparatory, operational, and common functional areas specifics. To make the taxonomy easier to use by crisis management practitioners, some of the key functions are 'horizontally' expanded, e.g., in the 'Capability development' functional area, 'Organise for crisis management' is expanded with 'Establish CM doctrine and train organisations and people'; in the 'Response' functional area, the implementation function is explained by 'Respond to the hazard,' 'Limit the impact of the crisis,' and 'Support affected people.'

The third and fourth taxonomy levels (sub-functions and tasks) are defined through decomposition of functions in accordance with a modified and adapted 'OODA loop' – Observe, Orient, Decide, Act – of John Boyd (62), (63). The model is selected as proven in practice for dealing with volatility, uncertainty, complexity, and ambiguity (VUCA) of crisis situations, as in the DRIVER+ case (Figure 2.4). The four elements of the 'loop' have different interpretations throughout the preparatory, operational, and common functional areas. They reflect the reality that during the preparatory period the loop is 'slow' and to some extend the management gradually transits into a long-term policy (e.g., for strengthening resilience), while during the 'response,' the 'OODA loop' is expected to be more rapid and leadership-driven.

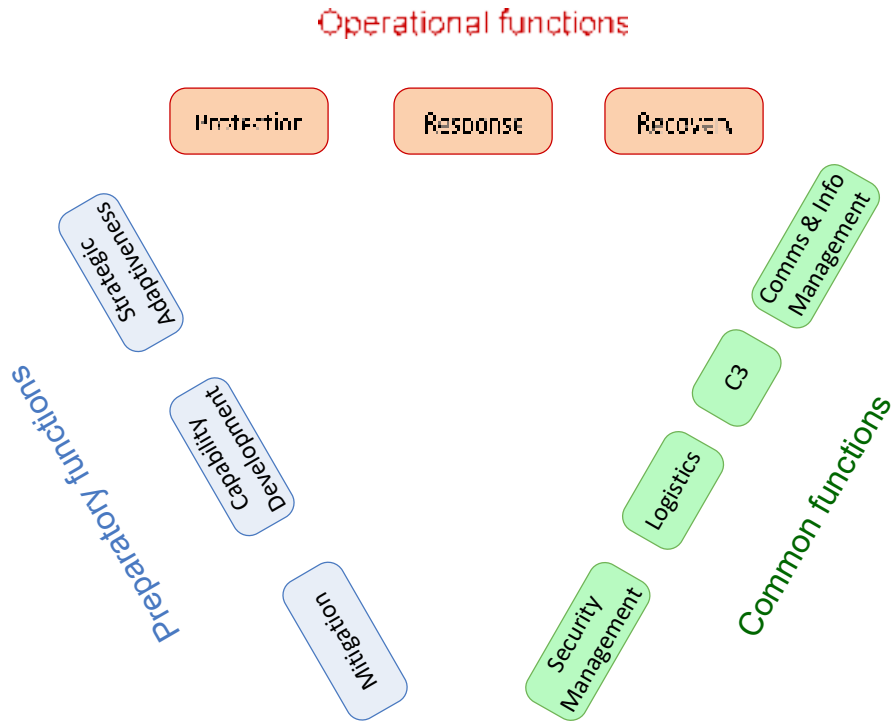

Figure 2.3: Functional areas of the crisis management taxonomy

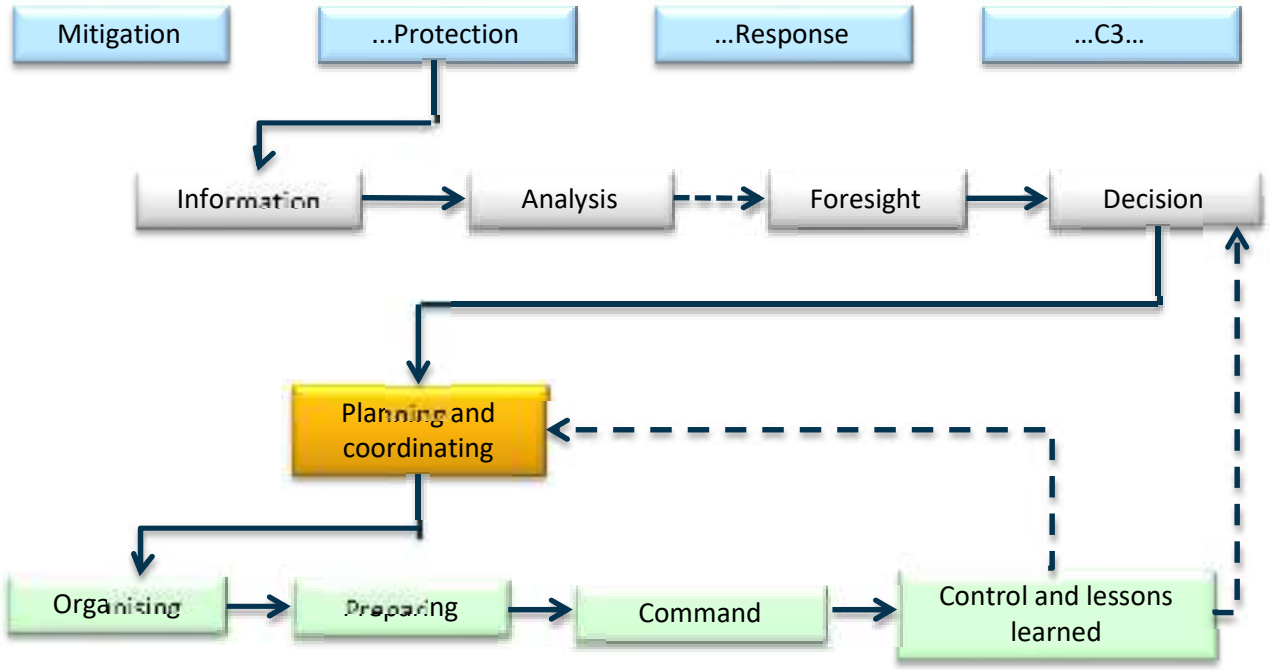

Figure 2.4: Illustration of the crisis management functions decomposition

In their wholeness, the crisis management functions 'connect' the hazards and emergencies with the communities' security. That means the way we think about hazards/emergencies, from one side, and the communities exposed to these threats, from the other, determine where the search for solutions and tools should be directed. To cope with this challenge, the taxonomy is built on nine complex elements that determine the scope and quality of the crisis management system, illustrated in Figure 2.5: legal norms and procedures; policy and strategy; authorities, organisations, and citizens; information, awareness, and knowledge; plans, programmes, and resources; doctrine, training, and skills; equipment, infrastructure, and networks; guidelines, commands, and management; operations, services, and measures.[6]

The model's physical application dimensions include four principle levels of decision-making, organising, planning, training, and acting that need to be defined for each particular country-specific[7] case:

- National (also central, federal or state) level.
- Regional (also a province, governorate or wider specific geographical area).
- Local (also community or an administrative entity at the level below province/governorate).
- Cross-border (also European or international).

In addition, the crisis might be localised or cover a wide-area. The localised crisis has a clearly identifiable scene. A wide-area crisis can be generated by connected acts at multiple wide-area sites, as the September 11, 2001 terrorist attacks in the U.S. or when wide areas are affected to some degree, e.g. by widespread flooding, a pandemic, sustained power outages or severe weather (adapted from (64)).

[6] In comparison, the ACRIMAS project considers the crisis management at the meta-level as a super-entity that consists of four basic elements: organisation, procedures, personnel, and equipment (102).

[7] E.g., the Romanian Emergency Management System is organized on four levels: national/governmental, ministerial, county, and local (100).

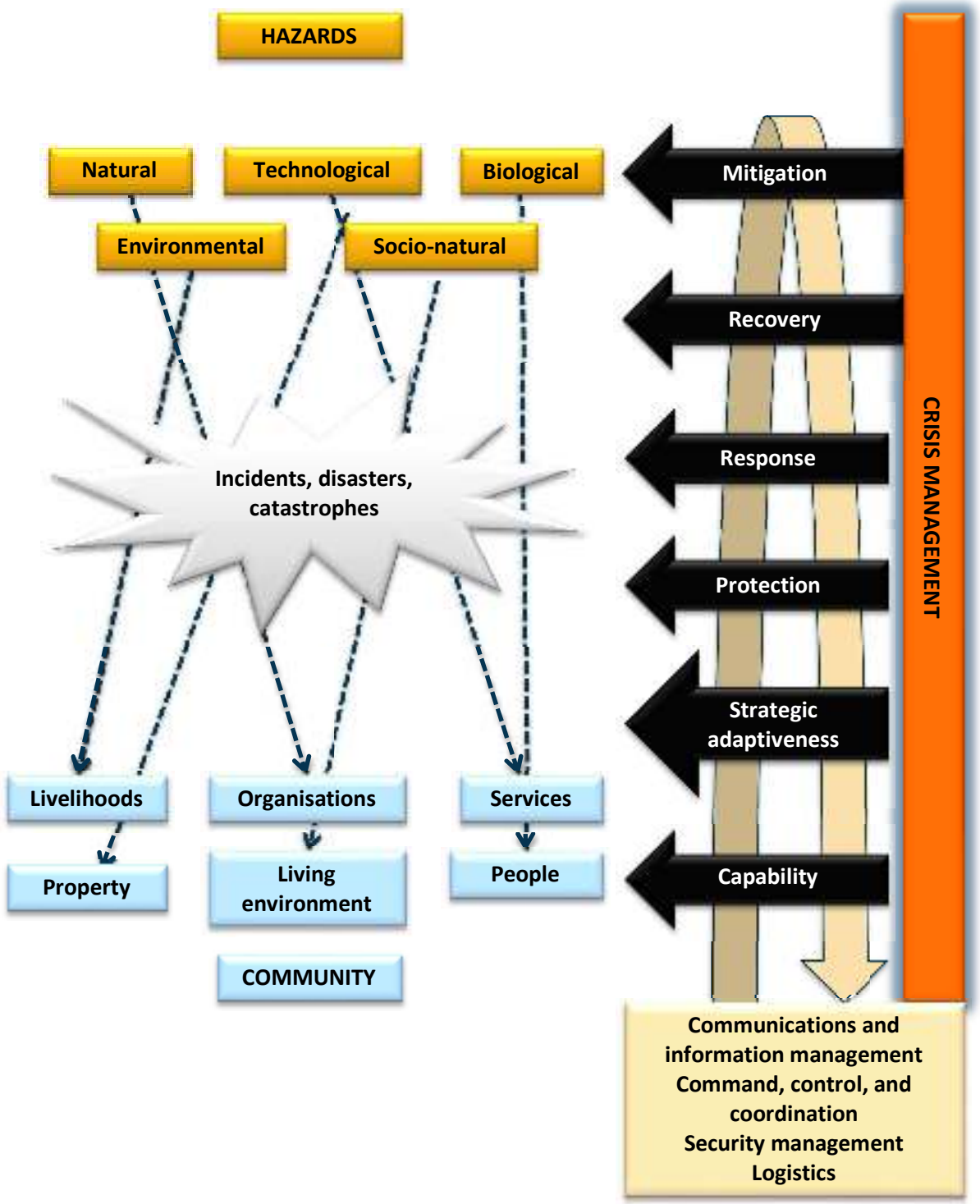

Figure 2.5: DRIVER+ crisis management functions

The third dimension includes those decision-making, command, and management processes through which the functions are realised. They are common as they serve to all preparatory and response functions. However, they are not 'less important' or of a secondary priority. Just the opposite, in almost all aspects of the crisis management continuum they have backbone roles. Figure 2.6 illustrates the model's multi-dimensionality.

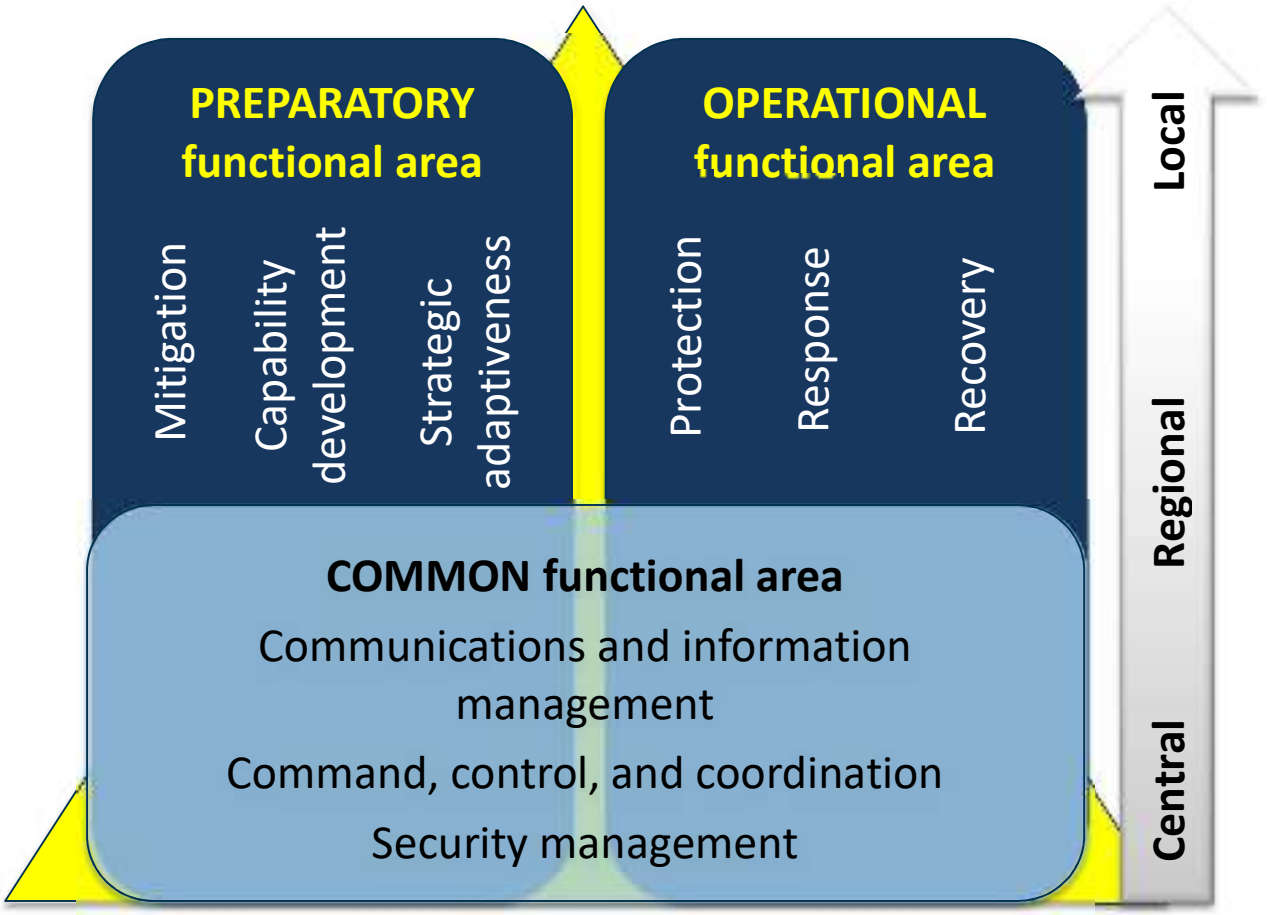

Figure 2.6: Illustration of taxonomy dimensions

2.3.2 Language

In terms of the language, the DRIVER+ taxonomy is developed using the professional language of crisis management practitioners. Words (e.g., responder, volunteer) and standardised phrases (e.g., common operational picture) are taken from normative documents, guides, glossaries of terms, plans, etc. Thus, the model is made easy-to-use for the practitioners, while the solutions/tools providers are expected to invest the necessary effort be able to understand and use this language.

2.3.3 Commonality

Not only language but also the selected structuring of the functional areas of the DRIVER+ taxonomy corresponds to widely used classification schemes. Figure 2.7 presents the correspondence with the UN Sendai Framework for Action (65), the classification used by the UN Office for the Coordination of Humanitarian Affairs, or OCHA (66), the EU Civil Protection mechanism (1), the Universal Task List (UTL), used by the U.S. Department of Homeland Security (67), the organisation of critical infrastructure protection in EU Directive 114 (68), the framework for providing cybersecurity of critical infrastructures, developed by NIST – the U.S. National Institute of Standards and Technology (69), and two relevant research projects – ResiStand (70) and S-HELP (71). As illustrated in the last column in Figure 2.7, two of these classification schemes—of UN OCHA and the UTL of the Department of Homeland Security—cover issues beyond the scope of the DRIVER+ project. Most importantly, there is either direct correspondence between first level categories or easily established relations with and between lower level taxonomy fields.

2.3.4 Adaptability

The functional character of the model provides good opportunities to further taxonomy's precision, to develop and adapt it with the accumulation of knowledge and changing circumstances. Any consequently developed solution or tool could be applied to an existing or newly established function, sub-function, task and activity. That would not change the taxonomy construct; rather, it will improve its consistency and usefulness.

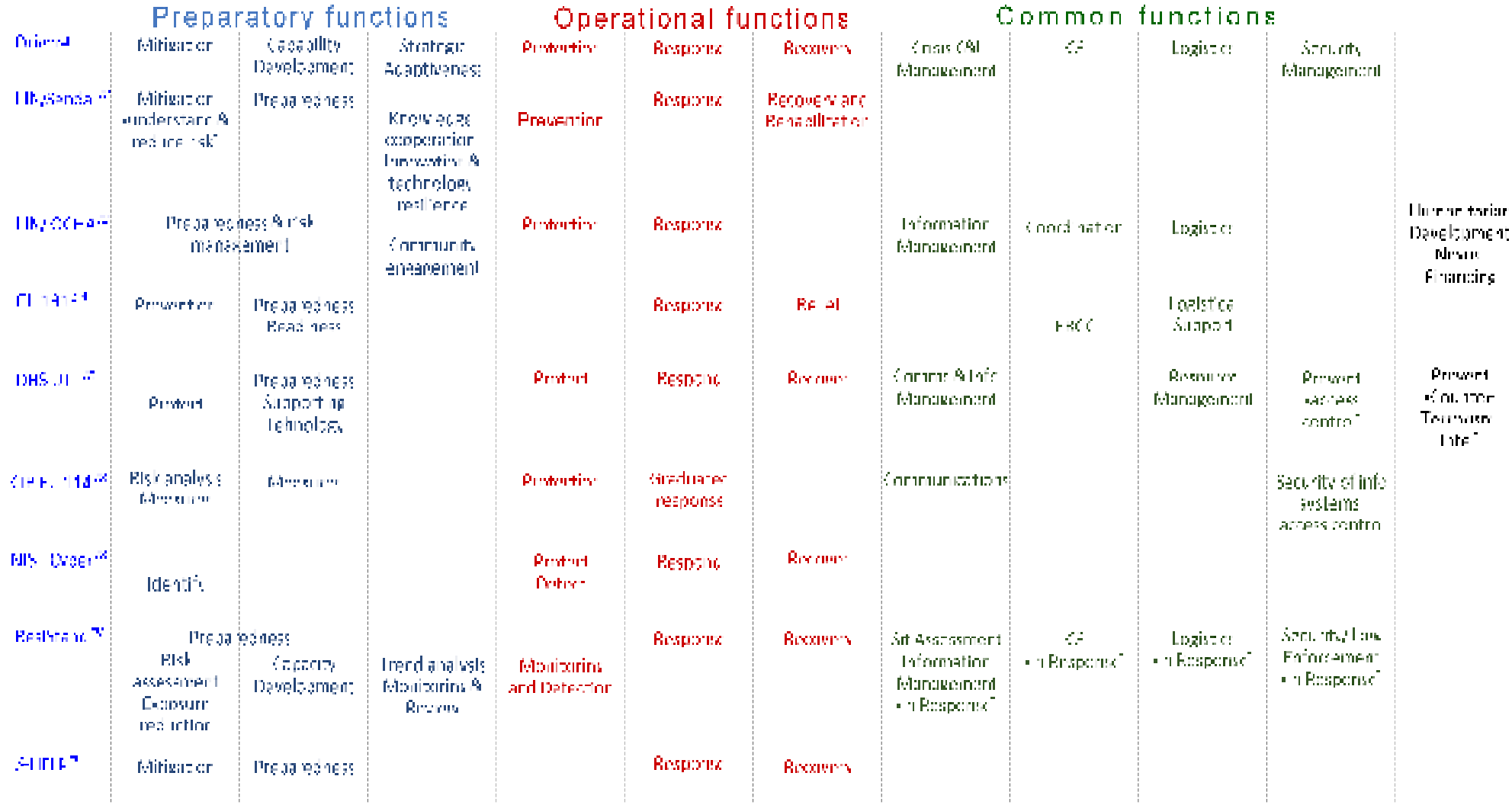

Figure 2.7: Comparison of the taxonomy's functional areas with other classification schemes

3. Taxonomy of Crisis Management Functions

The DRIVER+ taxonomy of crisis management functions for classification of tools and solutions is developed in three broad functional areas – Preparatory, Operational, and Common (see Figure 2.3). Every functional area includes clusters of key functions, sub-functions, and tasks. The Preparatory functions include *Mitigation*, *Capability development*, and *Strategic adaptation*, with Community Resilience being part of the latter. Operational key functions are *Protection* (the day-to-day civil protection operations and measures), *Response*, and *Recovery*, which is sub-divided in immediate relief and long-term recovery and reconstruction. The Common functions are those that support most of the other functions providing *Crisis Communications and information Management* (CCIM), *Command, Control, and Coordination* (C3), *Logistics*, and *Security management*.

This section explains the rationale behind choices in the design of the taxonomy, and provides visual representation for each functional area. Annex 2 provides detailed description of functions, sub-functions, and tasks included in the taxonomy.

3.1 Preparatory functional areas

The preparatory functional areas reflect the guidelines formulated by the *Sendai Framework of Disaster Risk Reduction 2015 – 2030* (65) outlining four priorities for action:

- Understanding disaster risk (in all its dimensions).
- Strengthening disaster risk governance to manage disaster risk.
- Investing in disaster risk reduction for resilience.
- Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction (65).

The functions defined here as *preparatory* reflect also the EU Parliament and the Council Decision 1313 for establishing the Union Civil Protection Mechanism. The Mechanism is established as a "…general policy framework for Union actions on disaster risk prevention, aimed at achieving a higher level of protection and resilience against disasters by preventing or reducing their effects and by fostering a culture of prevention, including due consideration of the likely impacts of climate" (1). The quoted EU document focuses primarily on response capabilities and readiness for action, defining 'preparedness' as:

> a state of readiness and capability of human and material means, structures, communities and organisations enabling them to ensure an effective rapid response to a disaster, obtained as a result of action taken in advance.

ISO 22300 reflects a similar position, defining 'incident preparedness' as "activities taken in order to prepare incident response" (12). UNISDR's understanding is more comprehensive also along the notion of 'readiness' (13). Blanchard has identified 34 definitions of 'preparedness' by overviewing just U.S. official documents and supporting sources (33).

'Readiness' to act is the essence of 'preparation,' but it is only one of the comprehensive crisis management aspects. The DRIVER+ taxonomy elaborates on the approach of the International Federation of Red Cross and Red Crescent Societies that was found to be closer to the comprehensive nature of crisis management. The preparatory functional areas are defined with the broader aim to mitigate the sources of threats; to reduce exposure and vulnerabilities; to predict and where possible to prevent disasters and crises; to provide response capabilities that are effective and maintained at relevant level of readiness, capabilities to cope with the immediate disaster consequences and to provide recovery and reconstruction; and to contribute to building comprehensive and sustainable resilience capacity throughout the society, communities, and businesses.

The functional areas are generally organised following the ISO 22301 "'Plan-Do-Check-Act' (PDCA) cycle to planning, establishing, implementing, operating, monitoring, reviewing, exercising, maintaining and continually improving the effectiveness of an organization's BCMS[8]" (72).

The first two functional areas—Mitigation and Capability development—cover functions aimed at understanding risks, reducing exposure and vulnerabilities, and developing crisis management policies and a broad set of capabilities. The third one—Strategic adaptiveness—reflects on concepts of agility, anticipation (foresight) and adaptiveness of the crisis management arrangements to significant changes in the environment, e.g. in hazards/threats, technologies, societal expectations, etc., and building and measuring community resilience.

3.1.1 Mitigation

Mitigation is the functional area on which the concepts of 'hazards' and 'vulnerability' meet and, if not managed properly, may trigger a 'crisis.' From this point of view, the U.S. Federal Emergency Management Agency (FEMA) defines mitigation as "the effort to reduce loss of life and property by lessening the impact of disasters" (73). ISO 22300 describes mitigation as "measures taken to prevent, limit and reduce impact of the negative consequences of incidents, emergencies and disasters" (74). This is achievable through conducting hazards-specific identification, tracking and assessment, as well as mapping and permanent monitoring of their conditions and possible escalation. Consecutively, a vulnerability assessment methodology is applied to estimate the possible impact of concrete hazards on concrete communities, peoples' lifelines, local and critical infrastructure, etc.

The assessment stage culminates with risk assessment and evaluation. A detailed risk assessment is based on the impact's intensity and likelihood of occurrence of different hazards. Risk evaluation (following ISO 31000) "involves comparing the level of risk found during the analysis process with risk criteria established when the context was considered" and supports making decisions that "take account of the wider context of the risk and include consideration of the tolerance of the risks borne by parties other than the organization that benefits from the risk." (75)

It is important to note that the mitigation functional area is established with the understanding that complete prevention of losses is ultimately unattainable and a mitigation effect on the plausible hazards could be achieved only in a long-term perspective. The taxonomy directs the search of solutions towards concrete vulnerable assets threatened by concrete hazards, and this is used to identify tasks and actions (and other measures) to reduce damages (23).

On that basis, long-term goals and strategy are set, objectives and programmes are developed, resources and organisational and legal measures are initiated, and decisions and actions are undertaken at national, regional, and community level, aimed at mitigating risks from hazards in a manner relevant to potentially affected people, properties, local infrastructure, critical infrastructure, and key state functions. Concretely, ISO 22301 recommends "…measures that: reduce the likelihood of disruption; shorten the period of disruption; and limit the impact of disruption on the organization's key products and services" (72). UNISDR recommends that "mitigation measures encompass engineering techniques and hazard-resistant construction as well as improved environmental policies and public awareness" (13). Special focus is placed on shared information, education, and training of all potentially affected communities and organisations (75), (52).

The proposed cluster of functions is expected to produce a mitigation effect on communities and the state in a long-term perspective. FEMA has emphasised mitigation as the most effective and cost-efficient strategy for dealing with hazards. Its implementation requires comprehensive and sustainable strategy approach, monitoring, evaluation and measuring for keeping the strategy up to date. In some aspects, the mitigation action taken in advance might achieve prevention effects completely avoiding potential adverse impacts (13).

Figure 3.1 presents the preparatory functional area "Mitigation." Implementing the mitigation functions also provides information for comprehensive Capability development and planning of the Strategic adaptiveness

[8] Business Continuity Management System.

of the crisis management system. Hazards mitigation is an element of building resilience throughout communities, nations and the EU.

3.1.2 Capability development

Capability development functions address the overall crisis management system and potentially affected population. Every organisation and everyone who might be a responder of a certain kind or victim in a crisis take measures for better organisation, information, preparation, and action. People, equipment, and resources are integrated in an effective mechanism through crisis management doctrine, organisation, planning, training, command, control, and coordination. As UNISDR explains, "Preparedness action is carried out within the context of disaster risk management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response through to sustained recovery." (13)

Capability development is a method created to be relevant on domains with high level of volatility, uncertainty, complexity, and ambiguity (VUCA). Hazard crisis management is one of those, which possesses all these features. Tagarev defines the term 'capability' as "…the capacity, provided by a set of resources and abilities, to achieve a measurable result in performing a task under specified conditions and to specific performance standards" (76). Paul K. Davis, a renowned author on the issue, argues that the method is about "planning, under uncertainty, to provide capabilities suitable for a wide range of modern-day challenges and circumstances while working within an economic framework that necessitates choice" (77). ISO introduces the term as an element of the disaster management preparatory function: "Knowledge and capacities developed to effectively anticipate, respond to, and recover from the impact of likely imminent or current hazard events or conditions" (78).

To establish a proper ground for the method, the taxonomy elaborates the functions-sub-functions-tasks relationships to involve functional analysis of operational requirements. On this ground the major building blocks are established using proven defence practices. First, high level guidance is provided though the capability development policy framework. It reflects the comprehensive character of the goal to build abilities to act effectively in planned and unexpected crisis situations using different organisations; national, regional and local authorities; public and private entities; communities and individuals; professional responders and volunteers; as well as a variety of resources. Second, taxonomy requires development of a crisis management doctrine as an operational platform on which different agencies, responders, and affected people will act and look for assistance. Third, the taxonomy applies the system of systems approach to group different functions as sources of capability clusters (or capability partitions). The systems encompass the core imperatives of crisis management, such as doctrine, organisation, human resources, equipment in operational systems, infrastructure, education and training, learning lessons, etc. The capability method recognises the interdependence between these imperatives. Fourth, it uses scenarios to identify the most effective combination of capabilities and, respectively, the optimum development investments across different agencies and authorities (79).

Capabilities have value only if a high level of functional and technical interoperability is built-in in the process of design and acquisition. Interoperability is seen as the critical source of gaps throughout the crisis management system.

Capability development is a recurring function. A set of indicators are established for identification, analysis, and evaluation of the key preparedness features as comprehensive awareness, systems and organisations capacities, readiness for response and relief operations, etc. (23). Capabilities are tested in exercises and actions; information on capabilities' performance in different circumstances is shared across EU, while related organisational and technological issues are explored by innovation efforts such as DRIVER+. Capability development for crisis management supposes systematic support by formal institutional, research, technological, legal, and budgetary capacities (13).

Figure 3.2 presents the preparatory functional area "Capability Development."

3.1.3 Strategic adaptiveness

The concept of 'Strategic adaptiveness' in the hazards-oriented crisis management domain reflects shared understanding between scientists and practitioners about the limits of linear, deterministic approaches and predictive models in the field of civil protection (80), (81). Responding to similar observations, Carl Walters appeals that "Instead of seeking precise predictions of future conditions, adaptive management recognizes the uncertainties associated with forecasting future outcomes, and calls for consideration of a range of possible future outcomes" (82). Hazards, both natural and man-made, that drive the crisis management function, are complex and dynamic, and change and surprise are their essential features (83). The Civil protection itself is an adaptive system and function. Its performance might be improved by adjusting organisation(s), legal framework, resources, systems, doctrine and operations as a reflection to the environmental monitoring, analysis, experimentations, lessons learned, foresight, etc., performed across the civil protection domain.

The functional area 'Strategic adaptiveness' is included in the DRIVER+ taxonomy with the aim to help the civil protection decision-makers, stakeholders, managers, and people "…to recognize the limits of knowledge and the need to act on imperfect information" (84). It is a cluster of management functions selected to reflect the evolutionary character of three key components: the ecosystem, the societal system, and the technology systems used to help communities to cope with negative natural and man-made situations. The changes are identified through monitoring, analysis, and foresight, and conclusions are turned into decisions to invest in a capacity to adapt in a timely manner. Adaptation may follow the slow trends ('passive') or, relying on contextual scenarios (or 'alternative futures'), may suggest advanced developments ahead of the coming changes ('active'). For example:

- Strategic adaptiveness to the ecosystem evolution may define three basic tasks: adaptation to gradual changes that may lead to escalation of known hazards; adaptation of measures to reducing the risk hazards that may rise to extreme levels; adaptation to the geospatial change of hazards towards regions, which previously have not been threatened (85).
- Strategic adaptation to changes in the societal system is much broader and entails complex structural domains as demographics, psychosocial developments, urbanisation, volunteerism, governance, and many others.
- The strategic adaptation tasks may include reorganisation of the crisis management system towards more decentralisation or centralisation; expansion of volunteers and public-private formats or strengthening the professional corps of responders; building an extended capacity to provide mental health and psychosocial support; introduction of different methods of emergency sheltering; etc. Strategic adaptation to technology evolution used in crisis management may include 'passive' use of from-the-shelf assets; adaptation of commercial or military assets to the responders' special needs; design of advanced tools that might be software, hardware, or 'Industry 4.0' digital-physical products; etc.

In the face of uncertainty, successful are organisations with a shared purpose, allowing free flow of information and knowledge, able to integrate and mobilise resources, centred on knowledge, maintaining diverse and evolving competencies, facilitating networking and cooperation. They are able to drastically shorten the learning cycle, adapt, self-organize, make decisions and take actions (86). Having such qualities is important for each individual organisation contributing to crisis management, as well—and even more importantly—for the network of public, private, and societal organisations.

The level at which the strategic adaptiveness function affects positively the decision-making and implementation process across all preparatory, operational, and common functions determines its significance.

Between all discussed functions, the strategic adaptiveness seems to be the most prone to science, advanced developments, and strategic thinking. The taxonomy frames some of the most important tasks that can facilitate development of innovative tools and solutions in terms of scientific and learning exercises (e.g., development of alternative hazards and crisis operations models; scenarios; simulations; computer-assisted role games; etc.); advanced information management solutions especially for real-time assessment and forecasts; command control, and coordination models in a catastrophic situation; alternative organisational

arrangements and processes; maintaining a stock of specific assets, e.g. vaccines, that seem relevant for unlikely scenarios (e.g. 'black swans'), etc.

In a broader and longer perspective, the strategic adaptive management should help to build a resilience capacity across the natural and man-made ecosystems, communities, essential services, organisations, and nations. Introducing the *Union Civil Protection Mechanism*, the European Commission declared,

> The Union Mechanism should include a general policy framework for Union actions on disaster risk prevention, aimed at achieving a higher level of protection and resilience against disasters by preventing or reducing their effects and by fostering a culture of prevention, including due consideration of the likely impacts of climate change and the need for appropriate adaptation action (1).

Resilience is included in the Strategic adaptiveness functional area with the understanding that it contributes to the capacity of the community and its governing organisations to adapt to and cope successfully and quickly with shocking events caused by natural and man-made hazards (in the DRIVER+ context). In crisis *management* context, a critical resilience capacity is the ability at all levels of command and management to orient in a highly complex, dynamic, and harmful situation; to take relevant and timely decisions and to communicate them; to manage their implementation and conduct operations, and to re-establish quickly the broken vital functions for communities and nations.

Figure 3.3 presents the preparatory functional area "Strategic Adaptiveness."

3.2 Operational functional areas

The operational functions are organised in three areas: *Protection*, *Response*, and *Recovery*. The purpose of the Operational functional areas is to establish an organisation and procedures for regular protection and incident management, response to major emergencies and crises that disrupt the normal community, business, and national functioning and to provide immediate relief, complex recovery of affected people, assets, and environment, and continuity of operations.

Decision-making and operations are the essence of crisis management. They are time-sensitive, with little allowance for delay or *ad hoc* improvisations, might be specific or comprehensive, performed while the hazard continues, applied on different terrains, time of the day, weather, etc. Nevertheless, according the World Health Organization, "80 % of what we do in emergencies is generic, 15 % is hazard-specific, and 5 % is unique to the event" (87). The taxonomy is designed to help allocate solutions and tools in a manner that will diminish the uniqueness of the crisis management operations strengthening their generic character, and keeping in the same time their hazard-specific effectiveness.

The EU places the emphasis of the civil protection operations on "…primarily people, but also the environment and property, including cultural heritage, against all kinds of natural and man-made disasters, including environmental disasters, marine pollution and acute health emergencies, occurring inside or outside the Union" (1).

The classification of operations and other measures, undertaken during Protection, Response, and Recovery, is not deterministic – protection operations may turn quickly into response in case of surprising escalation of an incident; relief and recovery operations may start while response is still undergoing; protection, response and early recovery (relief) operations may be conducted simultaneously; etc. According to DHS, "these overlapping areas are identified through comprehensive planning with the whole community to ensure that they are properly addressed during the response to an incident. Ensuring that operational plans properly account for the integration of mission areas is essential." (88)

3.2.1 Protection

The protection functional area encompasses functions, tasks, and activities performed on a day-to-day basis to provide comprehensive civil protection against various hazards and threats that do not reach the level of 'crisis.' This is a routine function and is performed mostly by professional response organisations and assets.

Its key features from DRIVER+ point of view are twofold. From one side, the protection functional area overlaps with capability development and mitigation. That means, during the process of building capabilities and reducing hazards, threats and vulnerabilities, operations to protect people, local and critical infrastructure and assets, social and industrial supply chains, etc. are performed at a level below crisis management. Protection functions are especially important if Mitigation is problematic or poorly functioning (89).

The protection function is well defined by the U.S. Department of Homeland Security's *National Protection Framework*:

> The National Protection Framework focuses on Protection core capabilities that are applicable during both steady-state conditions and the escalated decision making and enhanced Protection operations before or during an incident and in response to elevated threat. Steady-state conditions call for routine, normal, day-to-day operations. Enhanced conditions call for augmented operations that take place during temporary periods of elevated threat, heightened alert, or during periods of incident response in support of planned special events in which additional or enhanced protection activities are needed (88).

On the other hand, the protection function is bonded with the response and recovery operations performed in reactions to incidents and those disasters that do not escalate into wider socio-security crisis. For DRIVER+ providers of solutions and tools it is important that in each moment an incident or disaster may escalate into a crisis and, respectively, the response and recovery functions would be engaged.

The DRIVER+ taxonomy classifies three key functions focussed on public protection (including health, buildings and community infrastructure safety, and mass events security), critical infrastructure protection, and critical information infrastructure protection (see Figure 3.4).

3.2.2 Response

In DRIVER+ taxonomy, the response functional area derives from three crisis features: the consequences from the hazard for the society are or could be significant; the threat is imminent and could escalate quickly; the local authorities do not have sufficient capacity to cope with the threat. This approach combines disaster, emergency, and crisis categories in one highly intensive but relatively short period of crisis management in which immediate measures and operations are undertaken, "to save lives and to limit adverse effects" ((52), p. 14). As Christensen *et al*. accentuate, "it is important to contain a crisis or disaster in order to minimize damage and prevent essential systems from collapsing. This may be dependent on prevention and preparation." (89)

Operations are the essence of the response function. They are defined in two basic directions: to limit the scope of the damage and to support the affected people. The taxonomy elaborates operational tasks across the full cycle of orientation, decision-making, mobilisation of responders and resources, command of operations, and preparation for immediate relief and comprehensive recovery. It further includes two specific elements unique for the response functional area: a special legal regime over a concrete affected area or even the state might be introduced for a limited period; law enforcement measures to isolate and protect the affected area and population from eventual marauding and other criminal violations.

The taxonomy pays special attention to the command and management decision-making. The expected shortage of information, highly dynamic and hard to predict developments, complexity and various psychosocial impacts on the population, and the stress on the decision-makers are reflected. The tasks are defined to secure that alerting and special measures are taken adequately, operations are conducted to help the people first, and resources are delivered in a timely manner. Crisis leadership during response is framed by five critical tasks: orientation, decision-making, public communication, a quick exit from the crisis towards relief and recovery, and learning from the experience (adapted from (54)).

Tasks are formulated for notification of disasters within the European Union, a request of support through the Emergency Response Coordination Centre and the Union Civil Protection Mechanism, and for directing assistance interventions (1).

Figure 3.5 presents holistically the operational functional area "Response."

3.2.3 Recovery

The Recovery functional area involves functions, tasks, and activities to return as soon as possible the livelihoods and living conditions of the affected people and the functioning of organisations, businesses, infrastructure, and assets to normality (13), (12), ((52), p. 15).

The taxonomy reflects this objective in two perspectives – immediate relief in terms of vital assistance to most affected people and long-term recovery not only to re-establish the pre-crisis health, livelihoods, and material conditions but also to improve them and develop further critical services and assets. As the U.S. DHS recommends, "Coordination with the pre- and post-disaster recovery plans will ensure a resilient recovery process that takes protection into account. Protection and Mitigation focus on a sustainable economy and community resilience and not just the swift restoration of infrastructure, buildings, and services" ((88), p. 30). The long-term approach to recovery, along with enhancing the strategic adaptiveness, contributes to building community, economy, and state resilience capacity.

Adapted from FEMA's 'capstone doctrine,' the functions and tasks are defined to provide assistance to the affected people, to restore critical public services, to help make the damaged infrastructure operational, to restore the economy, and to mitigate the negative effects on the environment ((90), pp. 32-37).

Figure 3.6 presents holistically the operational functional area "Recovery."

3.3 Common functional areas

Four of the functional areas are defined as 'common,' i.e. they include functions and tasks that are performed to a different degree across the crisis management spectrum of functions: the most intensive use of common functions is during the protection, response, and recovery operations; capabilities for common functions are established during the preparatory work; every common function reinforces the other functions from the cluster. A similar approach is applied by the ResiStand project (52), where 'supporting functions' are identified. The US DHS' Universal Task List defines as 'common tasks' preparedness, resource management, communications and information management, and supporting technology ((67), pp. 7-20).

3.3.1 Crisis Communications and Information Management

The structuring of the Crisis Communications and Information Management (CCIM) functional area is developed within two main assumptions: an integrated communications system is established to provide opportunities for agencies and levels of command and management to communicate; information flows are managed according to a coordinated architecture and procedures ((67), pp.15-16).

Communications capabilities are organised in networks with a crisis communications system at the core. Information flows are regulated bottom-up as data and information flow for situational awareness; and top-down as warning and alerting, Common Operational Picture, and commands and advice; as well as between governmental agencies and volunteer organisations that provide responders, resources or services. Interoperable communications are seen as critical resource and capability for crisis management (28).

The communications capabilities include also the social networks used for dissemination of warning messages, advice and instructions. Tasks for integration of the national crisis communications system with the Common Emergency Communication and Information System, managed by the European Commission (1), are also envisioned.

Information is managed to support a complex goal: to provide the decision-makers with substantial and timely information, to store the information in reliable, secure, and convenient manner, and to ensure that mission-critical information and situational awareness is effectively distributed between interagency partners and through the crisis management hierarchy ((90), pp. 29-30). Crisis information is provided also to people with disabilities and individuals with limited proficiency in the national language (28).

The taxonomy binds the Crisis communications and information management functions and tasks with the Command, control, and coordination functional area and with all operations across the crisis management

spectrum, including inter-agency flows and exchange with international partners. Despite that their primary goal is to support the response operations, communications and information flows pass across Protection, Response, and Recovery functional areas in a continuous process with varying intensity.

Figure 3.7 presents the common functional area "Crisis Communications and Information Management."

3.3.2 Command, Control, and Coordination (C3)

The Command, control and coordination (C3) area of the taxonomy is designed with the aim to reflect requirements and processes of effective and timely decision-making and implementation coordination and control at every level of jurisdiction (central, regional, and local) and across the professional and voluntary organisations that provide responders, resources, and services. The command and control components' tasks are formulated with the understanding that, in a case of single agency engagement, full C3 is applied, while in inter-agency operations, leaders are "…convened to co-ordinate the involved agencies' activities and, where appropriate, define strategy and objectives for the multi-agency response as a whole" ((64), Art. 4.2). The structure of the command and control functions and tasks is adapted from ISO 22320 recommendations ((74), Art. 4).

Coordination is a particular challenge during both preparatory and operational functions. During preparation, it is mostly about strategy and policy formulation, establishment of chains of command and management, allocation of resources, and capability development. As Tom Christensen *et al*. emphasise, "Coordination efforts are particularly important if preparing for multi-level and cross-sectoral crises, and shared planning and training exercises are often crucial too. Both pose instrumental challenges related to potential disagreements between actors, knowledge constraints and coordination problems" (89).

Command, control, and coordination functions might be organised as a single chain of command, e.g., the U.S. National Incident Management System, which includes Incident Command System is defined as "…a flexible, scalable framework for coordinating multi-organisations response" (91). Another format is usually based on highest political engagement (of a prime minister or vice prime minister or equivalent), supported by a Council, with one or two ministries having a leading role, and a single agency as coordinator (e.g., Romania, Bulgaria, Slovenia, etc.).

Figure 3.8 presents the common functional area "Command, Control, and Coordination."

3.3.3 Logistics

Logistics is a common functional area where comprehensive crisis logistics planning and management are organised and conducted and crisis resources are prepared, stored and provided when necessary. Logistics is designed primarily to meet the needs of the responders and affected population. According to the U.S. FEMA,

> Logistics integrates whole community logistics incident planning and support for timely and efficient delivery of supplies, equipment, services, and facilities. It also facilitates comprehensive logistics planning, technical assistance, training, education, exercise, incident response, and sustainment that leverage the capability and resources of Federal logistics partners, public and private stakeholders, and nongovernmental organizations (NGOs) in support of both responders and disaster survivors ((92), p. 1).

The taxonomy defines functions and tasks for material, transportation, healthcare, and facilities logistics, as well as the provision of core logistic services for the affected people.

Figure 3.9 presents the common functional area "Logistics."

3.3.4 Security Management

The primary outcome of Security management is a secure environment for responders, people, equipment, and supplies involved in crisis management operations. Functions and tasks are defined in terms of planning, organising, and capability building for security and safety management. However, the core activities include

a provision of public safety and critical infrastructure protection on a day-to-day basis, on-scene security operations in case of an incident, disaster, and crisis, and law enforcement operations and measures to protect affected people, property, and values (28).

Figure 3.10 presents the common functional area “Security Management.”

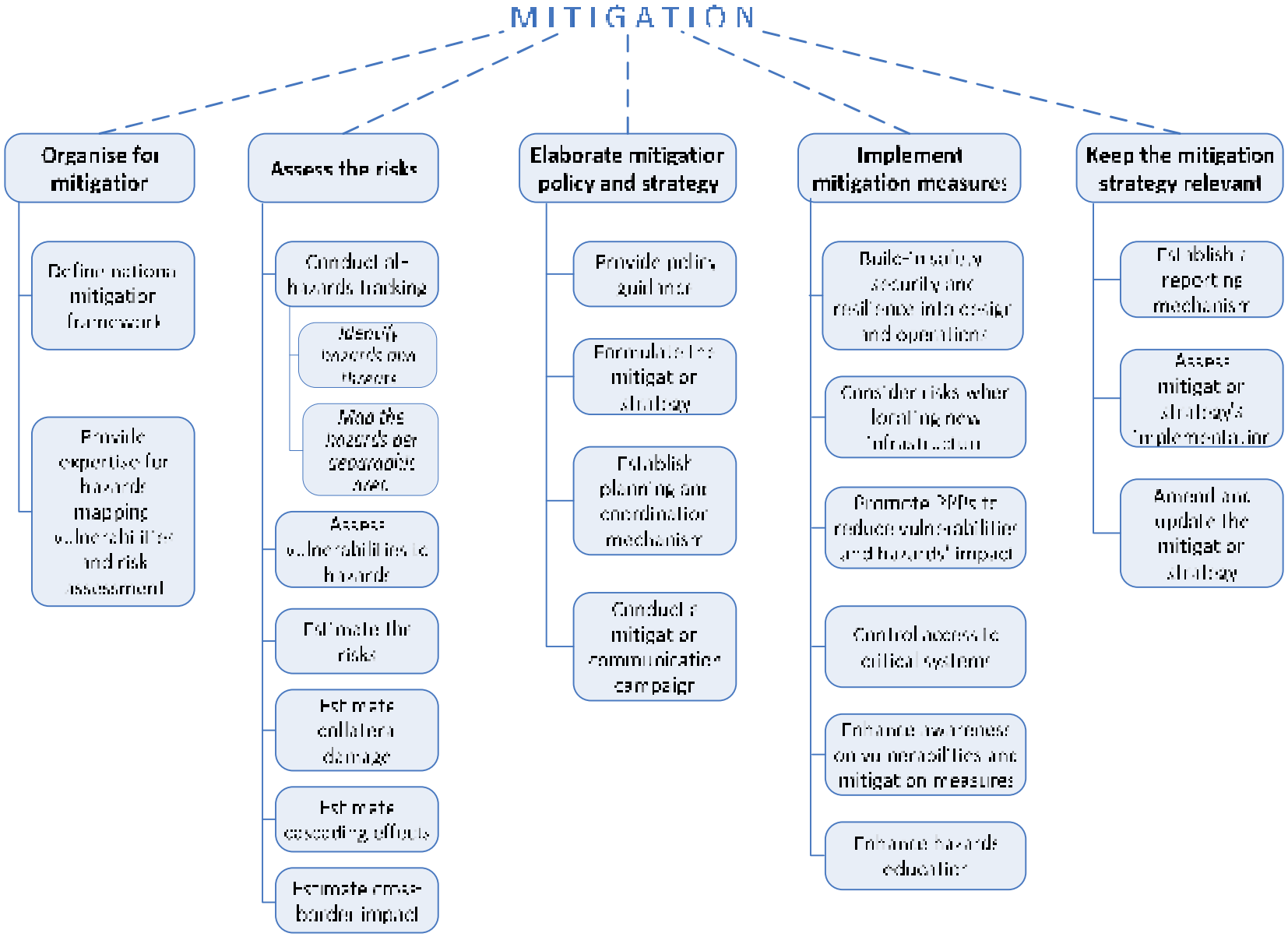

Figure 3.1: Structure of preparatory functional area "Mitigation"

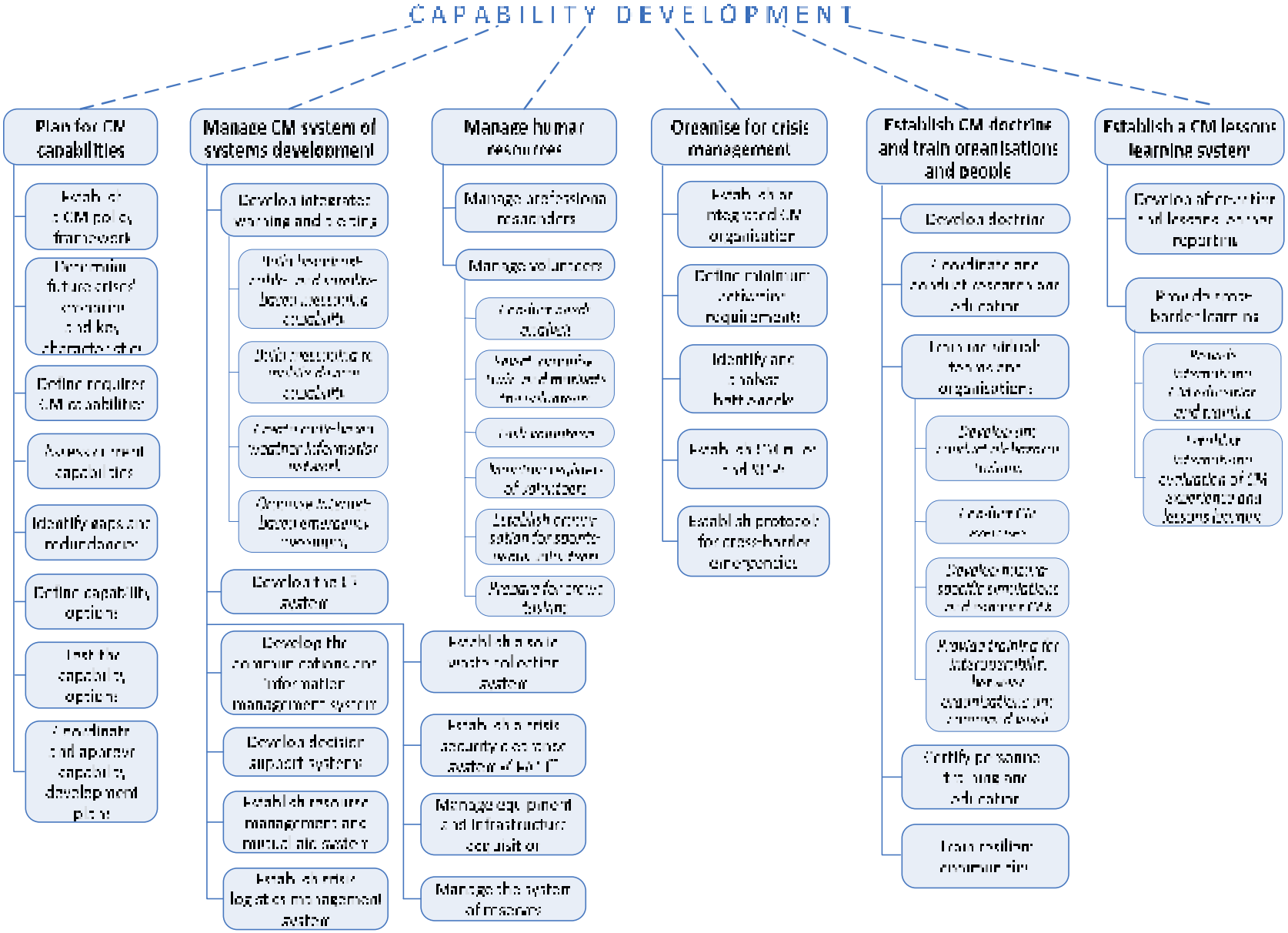

Figure 3.2: Structure of preparatory functional area "Capability Development"

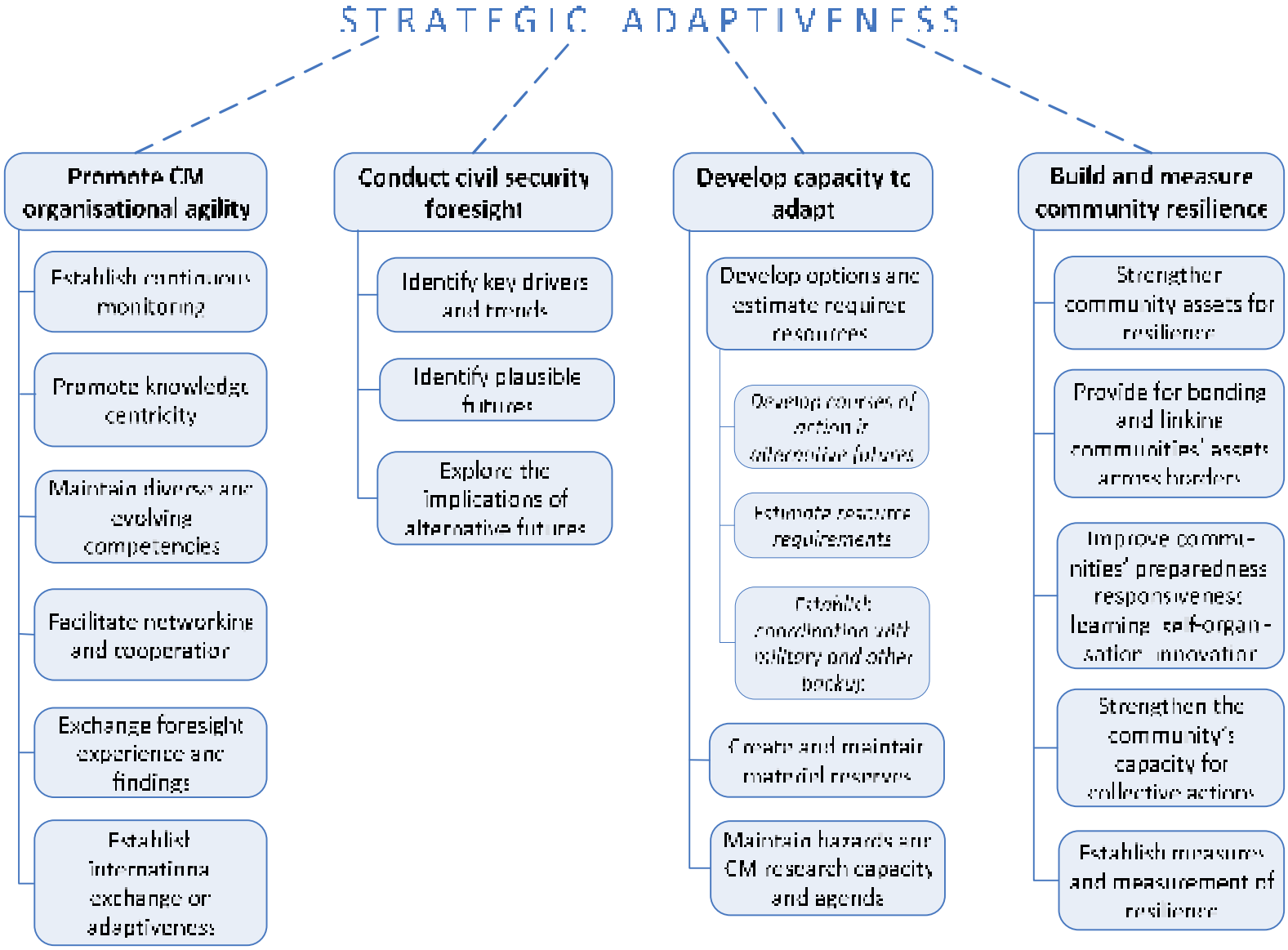

Figure 3.3: Structure of preparatory functional area "Strategic Adaptiveness"

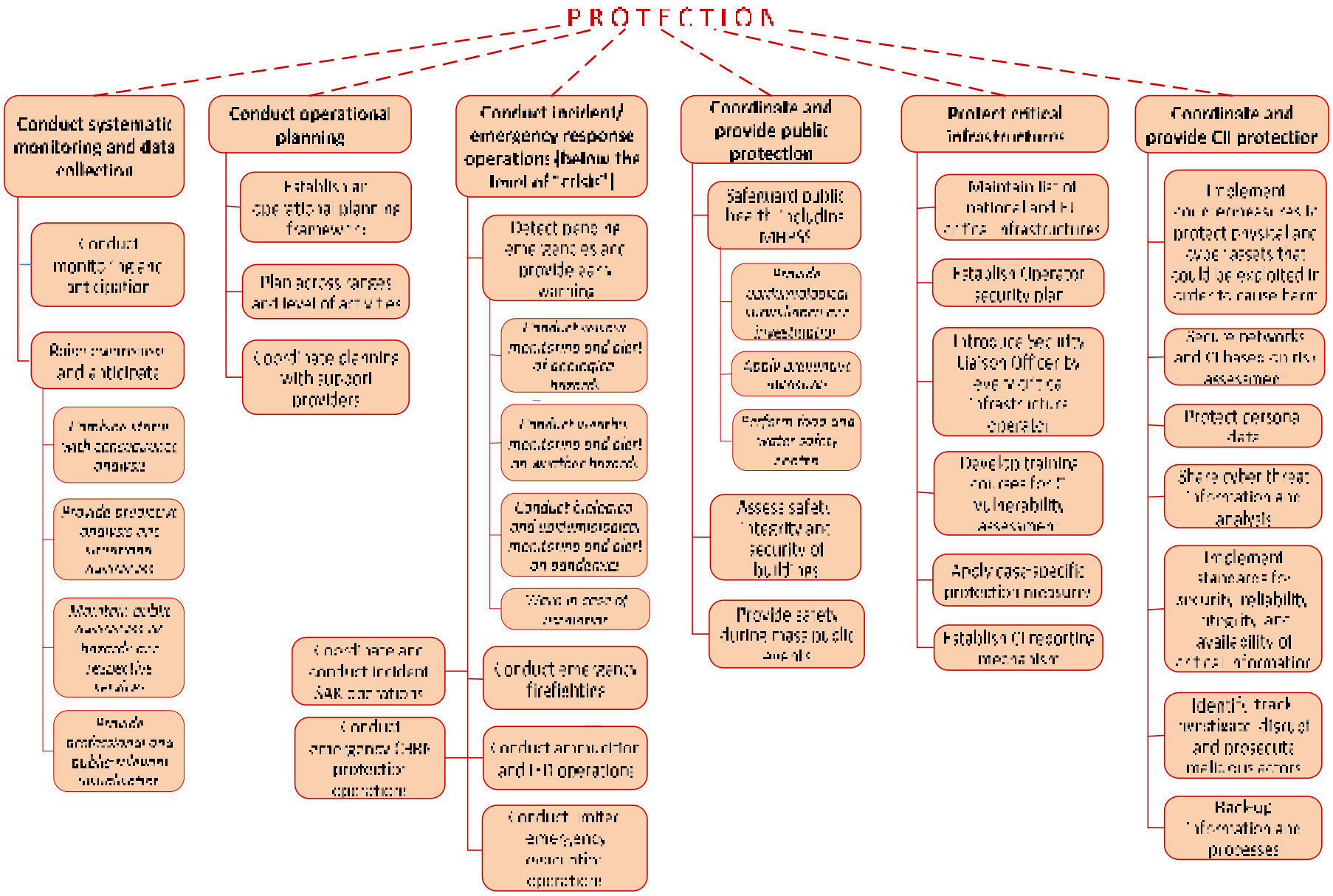

Figure 3.4: Structure of operational functional area "Protection"

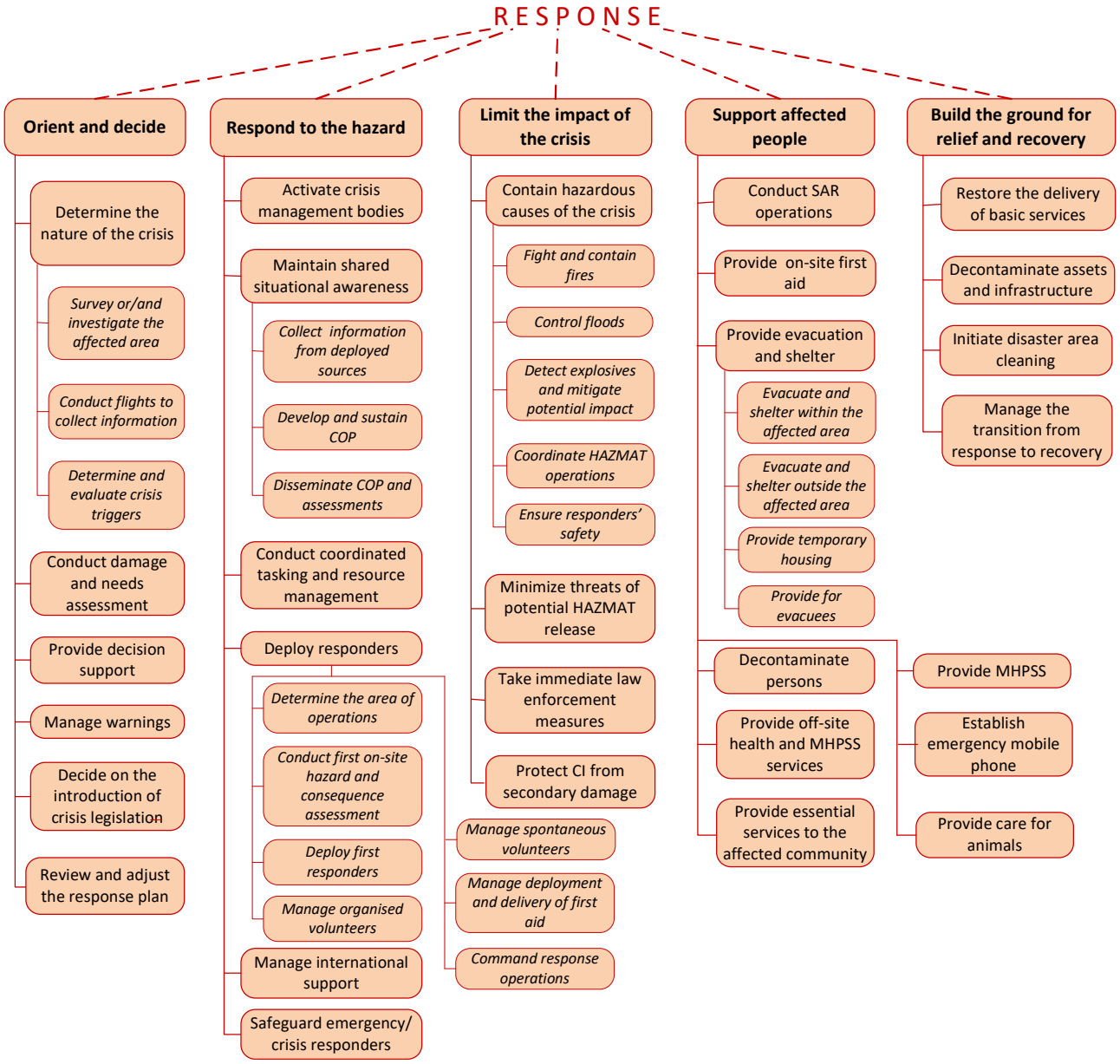

Figure 3.5: Structure of operational functional area "Response"

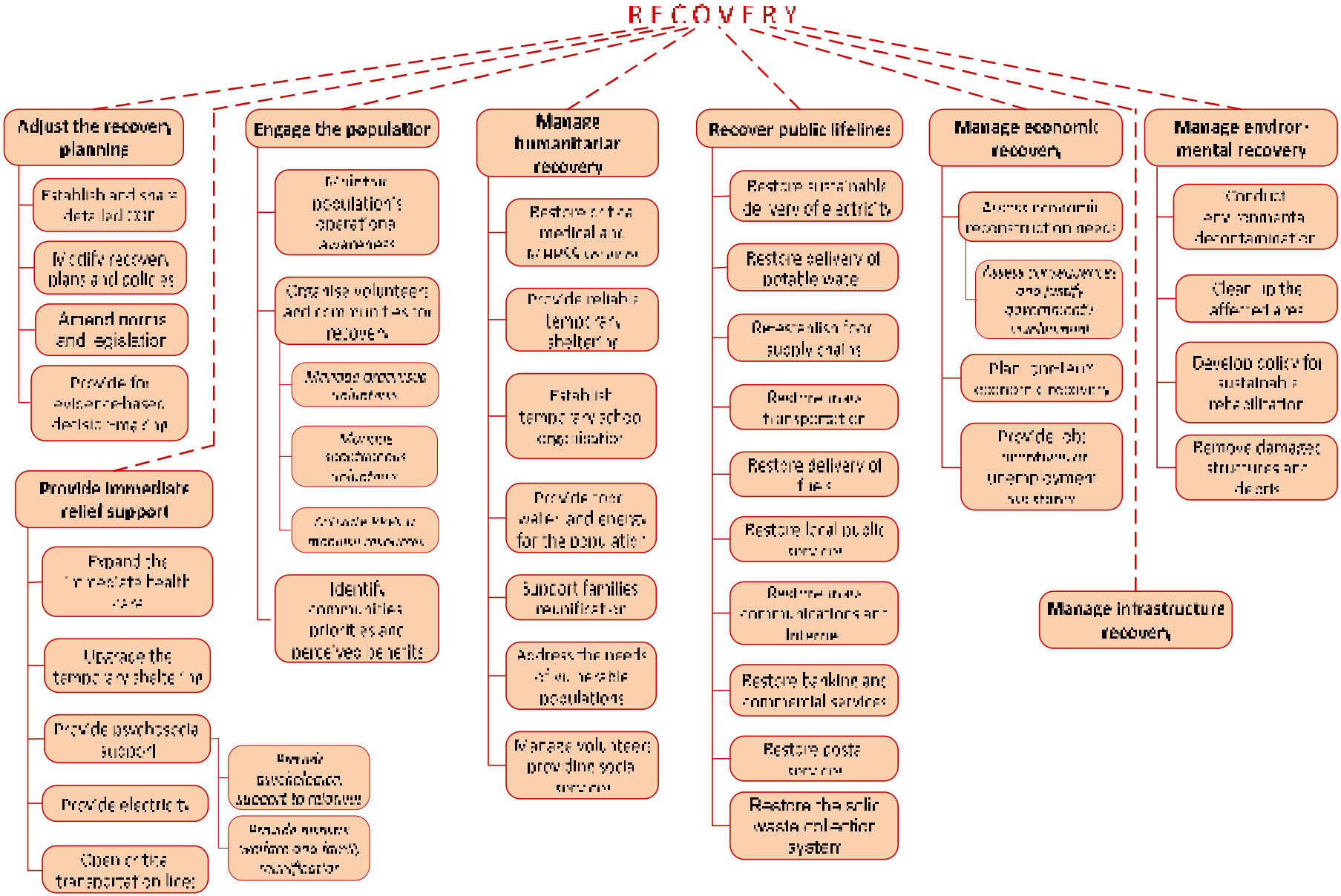

Figure 3.6: Structure of operational functional area "Recovery"

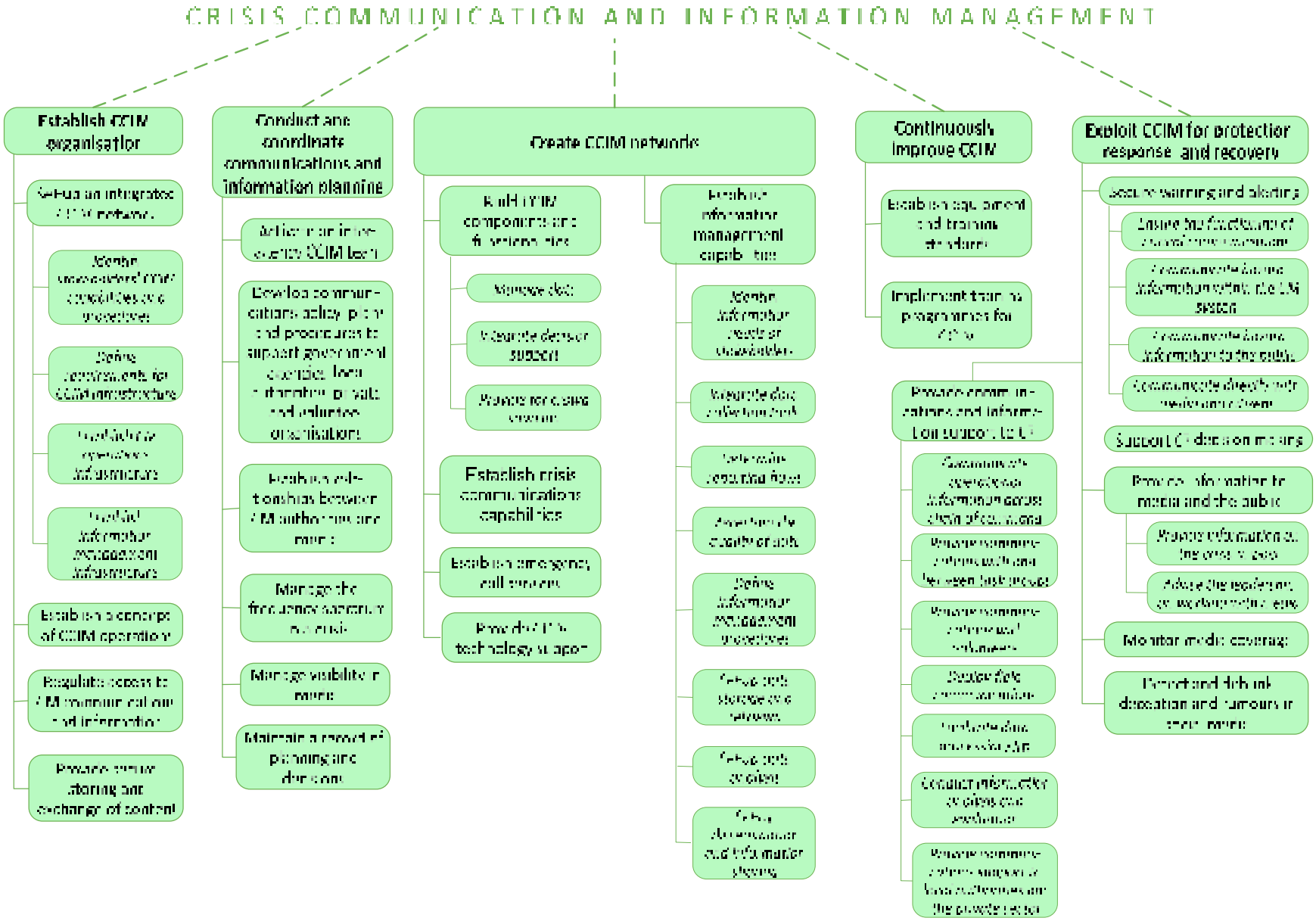

Figure 3.7: Structure of common functional area "Crisis Communications and Information Management"

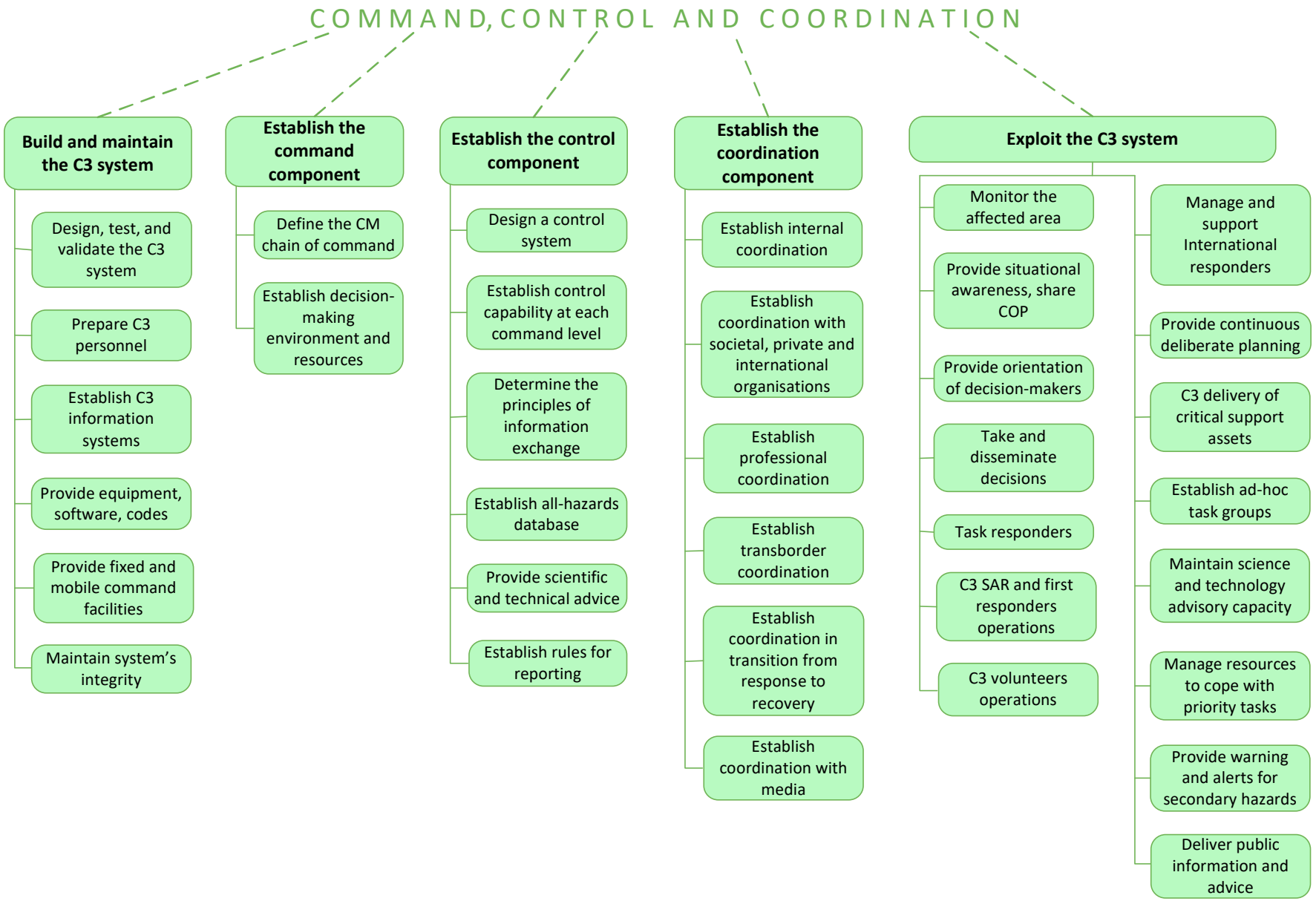

Figure 3.8: Structure of common functional area "Command, Control, and Coordination"

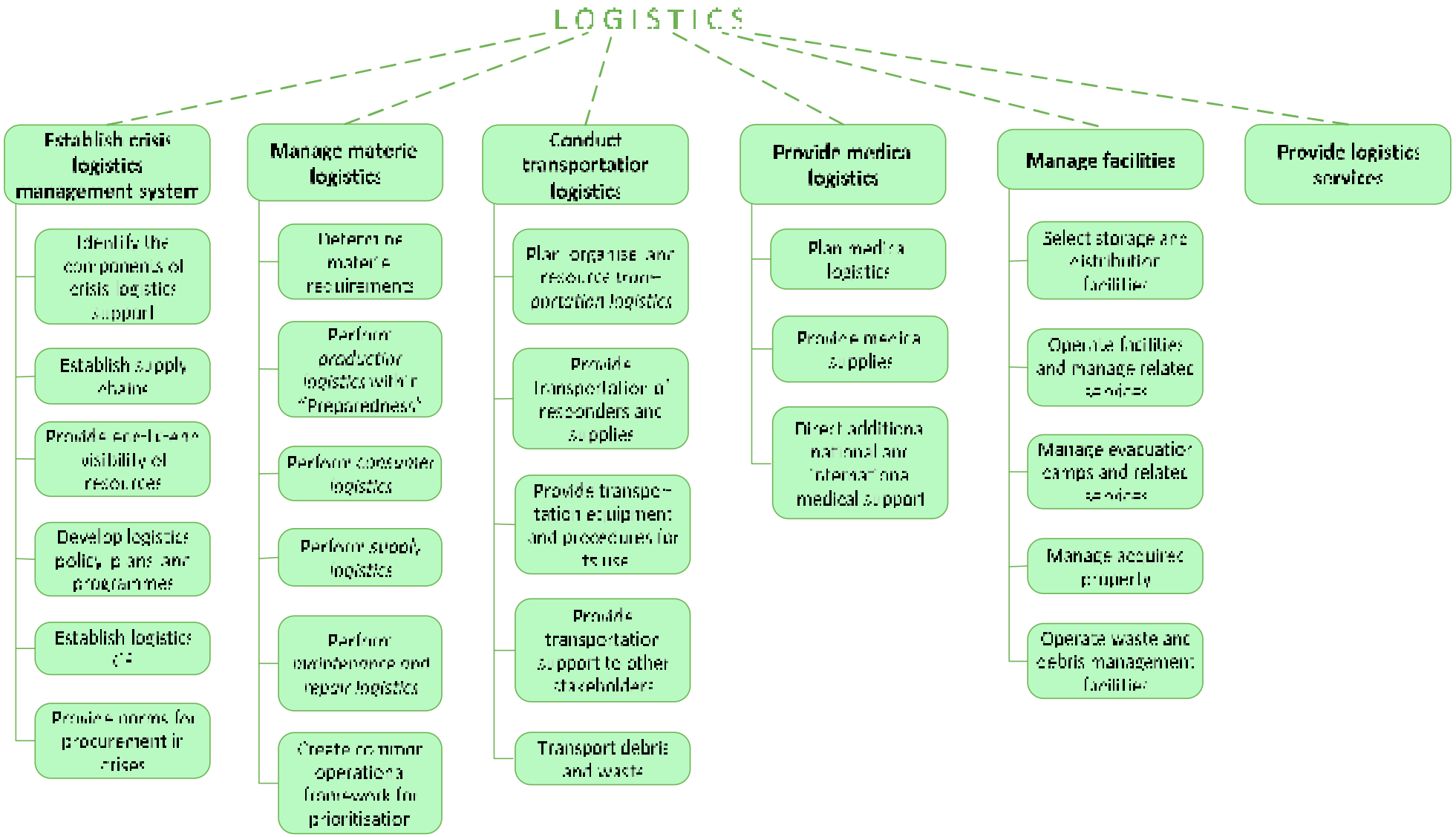

Figure 3.9: Structure of common functional area "Logistics"

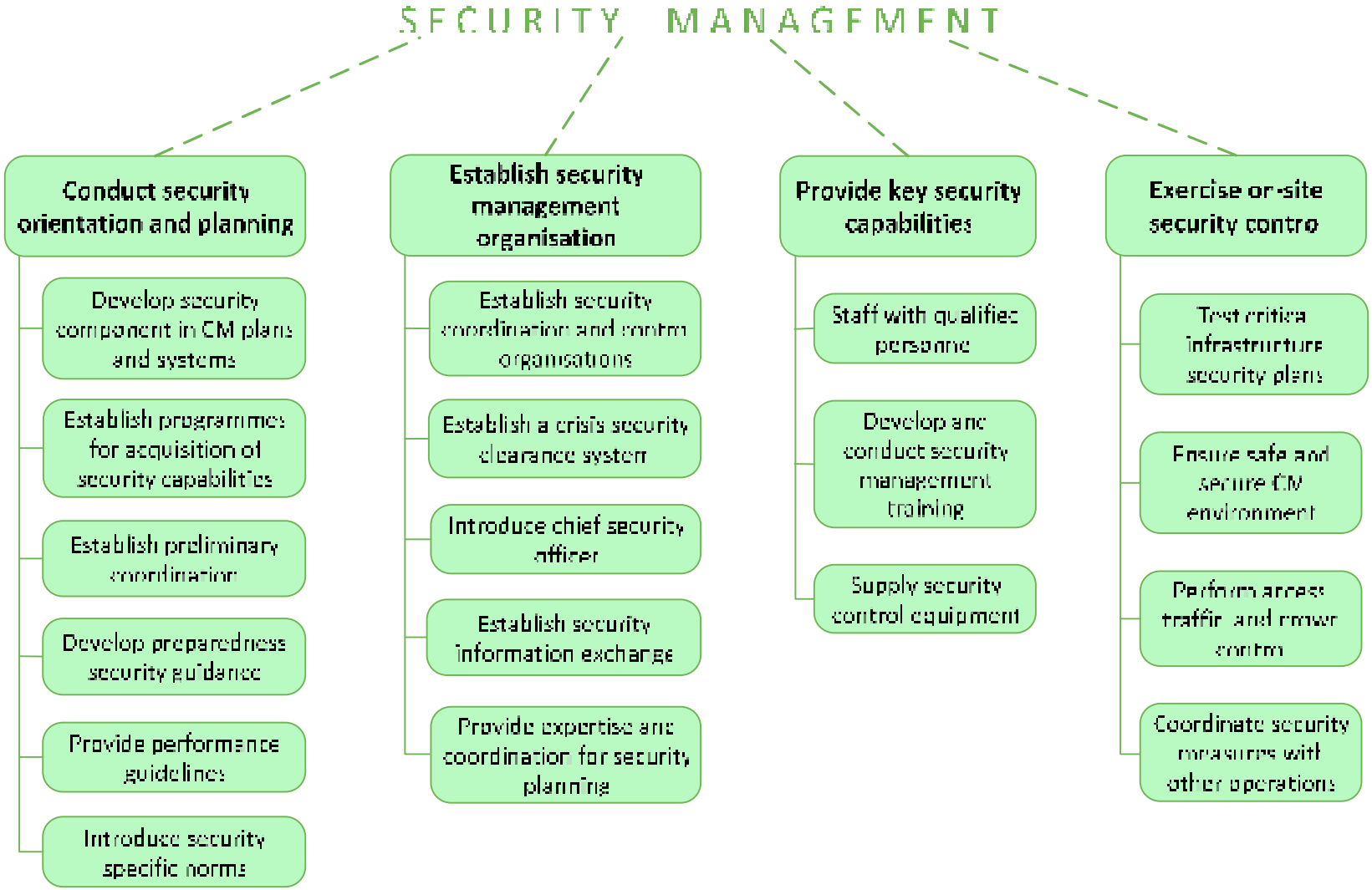

Figure 3.10: Structure of common functional area "Security Management"

4. Recommendations on the use of the taxonomy

The taxonomy will be implemented in the DRIVER+ online platform to support classification, navigation and search for practitioners' needs, available solutions and other relevant information. Thus, it will facilitate the communication among crisis management practitioners, developers, and solution providers.

By design (structure and language), the taxonomy is clear to crisis (emergency, disaster) management practitioners. The expectation is that practitioners will easily navigate the online platform using the taxonomy and thus will find information of interest.

Each solution will be classified in one or a set of taxonomy fields. However, the use of the taxonomy by solution providers may be more challenging, e.g. they may find it more difficult to classify their solution using functional categories.

Admitting that this is a learning process, the following arrangements are being put in place within SP93, in communication with SP92 and SP94, to streamline the use of the taxonomy within the DRIVER+ project (see also the presentation in Figure 4.1):

- The taxonomy will be used in gaps analysis (WP922, T922.1) to organise the deliberations of practitioners and Trial owners and provide updated gaps assessment (or a list of current and foreseen crisis management gaps, Figure 4.1). Thus, gaps will be classified in functional categories.
- In creating Trial stories, Trial owners (SP94) will use the list of gaps and will select the most relevant functions (the ones that have been identified as linked to the gaps) to be evaluated during the respective Trial. Hence, the gaps, and respective functions, to be addressed by a Trial will be explained in respective Trial stories.
- The call for applications, issued by Trial owners, will refer to the sub-set of gaps to be addressed.
- Applying for evaluation in a Trial, solution providers will explain which gaps their solution is expected to remedy, and will select one or a set of the respective taxonomic functions to tag the proposed solution.

The experience will demonstrate whether the use of the taxonomy to classify and find solutions is indeed challenging, and what can be done to make it more beneficial to the community of crisis management stakeholders.

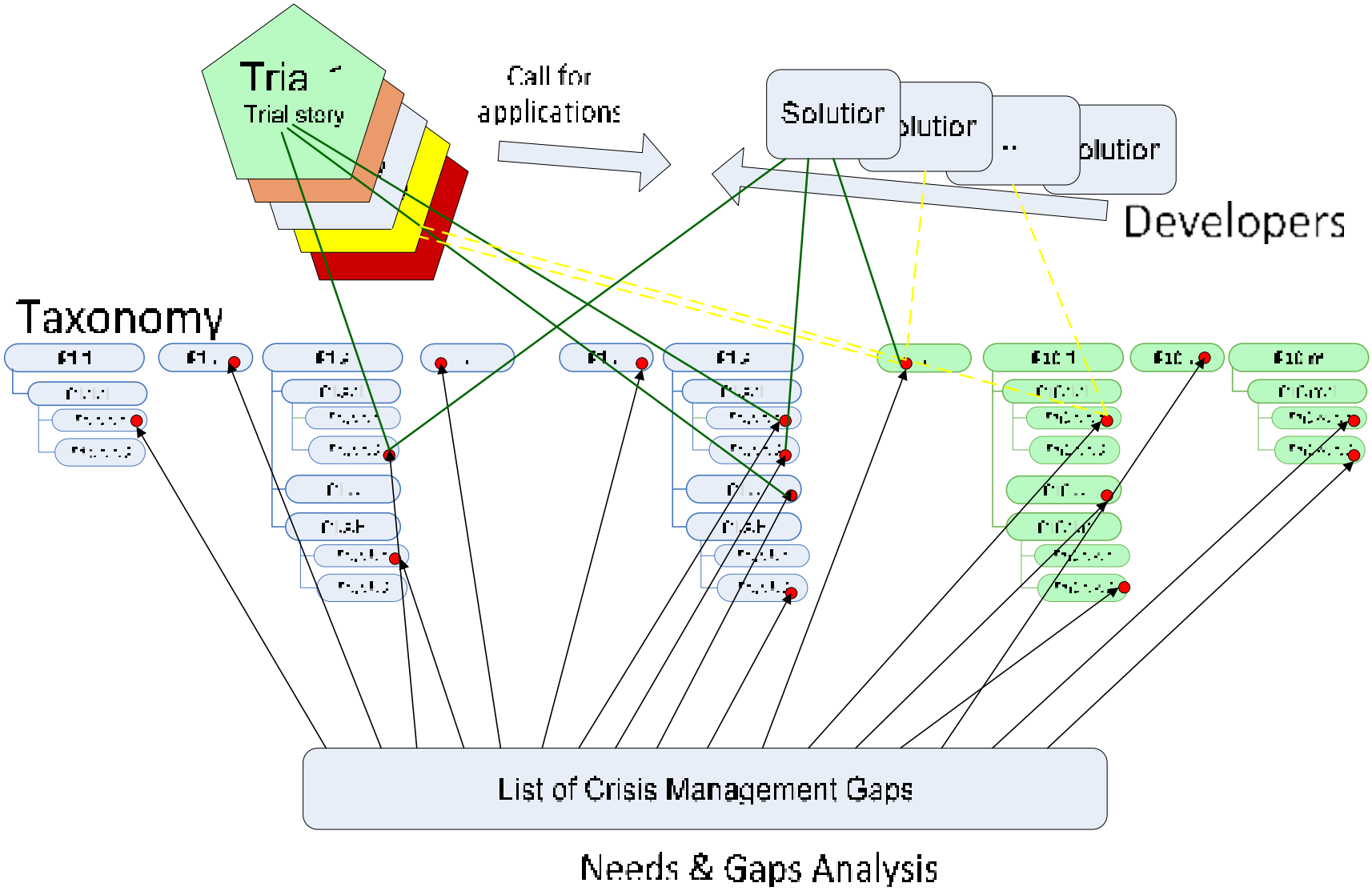

Figure 4.1: Possible use of the taxonomy for classification of gaps and solutions

5. Taxonomy Governance

The design of the Taxonomy of crisis management functions built on interim results from the 'old DRIVER,' in particular attempts to match functions to planned experiments. The efforts highlighted the following functions (in alphabetical order):

- Awareness
- Community resilience
- Coordination
- Crisis communication
- Evaluation & Lessons Learned systems
- Information management
- Logistics
- Psycho-social support
- Training, Education
- Volunteer management

The series of Trials in DRIVER+ are organised to address multiple CM gaps, and in particular (a) Situation Assessment and Logistics, (b) High Level Coordination, (c) Cross-Border Tasking and Resource Management, and (d) Volunteer Management ((2), Part B, p. 12].

However, the design of the taxonomy, presented in this report, was based on the assumption, that it will serve a community of users wider than the DRIVER+ consortium and for a period of time, extending beyond the life of the project. Therefore, we pursued a comprehensive examination of crisis management functions, not limited by the scope of preliminary identified gaps, planned Trials, or envisioned solutions.

The taxonomy was subject of intensive internal debates in the CSDM (lead beneficiary) team and two cycles of scrutiny by consortium partners.[9] Researchers, crisis management practitioners and solution providers critically assessed draft versions of the taxonomy and provided numerous recommendations for improvement of the draft versions.

Nevertheless, the expectation is that with the use of the taxonomy within DRIVER+, the accumulation of experience and in-depth knowledge, there will be well founded suggestions for amendment of the taxonomy – to refine the description of a function, to add a function, or to increase the visibility of a task. The first practical test will be the use of the taxonomy to organise discussions during the workshop on updated gaps assessment (WP922) in mid-January 2018. The use of the taxonomy in DRIVER+ online platform may also generate users' suggestions for amendments of the taxonomy.

In longer term, new legislation, policy documents or conceptual developments, as well as emerging threats, vulnerabilities and perceptions may generate even stronger requirements for amendment of the taxonomy.

Therefore, there needs to be a process in place to keep the taxonomy adequate to the crisis management environment and relevant to the needs of stakeholders. For that purpose, the DRIVER+ project will establish:

- a transparent process to regularly update and amend the taxonomy.
- roles and responsibilities in the process, with account of required competencies.
- a model to sustain the taxonomy during and beyond the project.

The following *organisation* will be created:

- Announce throughout the stakeholders' community that the taxonomy is a living document that will be regularly updated, e.g. in the document, the PoS database (WP933), the platforms for external cooperation (WP912).
- Designate an Editorial Board, with Editors competent in and responsible for one or more of the functional areas of the taxonomy.

[9] In addition to the discussions during the kick-off meeting in Rotterdam and online discussions with the project and sub-project leadership.

- Establish a Point of Contact for communicating with the Editorial Board and users, who have recommended changes in the taxonomy.
- Provide a template for recommending changes in the taxonomy.
- Maintain the versioning of the taxonomy.

The process will include the following steps (respective recommendations were made within WP932, T932.1 "Functional design of the PoS database"):

- A User suggests one or more changes in the taxonomy; the suggestion is sent to the "Point of Contact" on the Taxonomy.
- The "Point of Contact" informs the competent Editor on the suggested change(s).
- If necessary, the Editor seeks clarification from the User.
- The Editor makes a recommendation to the Editorial Board whether to accept or reject the suggested changes in the Taxonomy.
- The User is informed on the decision of the Editorial Board by the "Point of Contact".
- If approved by the Editorial Board, the change is implemented in the PoS platform (along with other approved changes; on a quarterly or bi-annual basis).
- Information on the new version of the taxonomy is disseminated throughout the stakeholder community.

The realisation of this process beyond the DRIVER+ will be discussed in the sustainability deliverables (WP954), where models for maintaining the taxonomy will be recommended.

6. Conclusion

The developed DRIVER+ taxonomy of crisis management functions is a comprehensive and very substantial element for classification of existing tools and solutions, as well as for their search and use through the DRIVER+ Portfolio of Solutions (PoS). The taxonomy reflects the contemporary crisis management complexity and the comprehensive approach to crisis management. The significant number of functions, sub-functions, and tasks offers an opportunity to solution providers to classify their products in an optimum manner, while at the same time facilitating the use of the DRIVER+ PoS by crisis management professionals looking for relevant solutions and other information of interest.

The taxonomy is a unique achievement of DRIVER+, since similar accomplishments have not been identified in official documents or the peer-reviewed literature. The application of the taxonomy to the DRIVER+ PoS, the organisation of Trials and evaluation of solutions is forthcoming. The experience will provide valuable feedback and ideas for further improvement of the taxonomy of crisis management functions also providing a view of its broad applicability beyond DRIVER+.

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Annexes

Annex 1 – Main terms and definitions

In order to have a common understanding within the DRIVER+ project and beyond and to ensure the use of a common language in all project deliverables and communications, a terminology is developed by making reference to main sources, such as ISO standards and UNISDR. This terminology is presented online as part of the Portfolio of Solutions and it will be continuously reviewed and updated[10]. The terminology is applied throughout the documents produced by DRIVER+. Each deliverable includes an annex as provided hereunder, which holds an extract from the comprehensive terminology containing the relevant DRIVER+ terms for this respective document.

Term	Definition	Comment
Capability	The means to accomplish one or more tasks under specific conditions	
Crisis management function		Definition is still "under construction" and can be found online in the near future.
Lesson Learned	[lessons learning: process of distributing the problem information to the whole project and organization as well as other related projects and organizations, warning if similar failure modes or mechanism issues exist and taking preventive actions]	
Mitigation	Measures taken to prevent, limit and reduce impact of the negative consequences (2.1.9) of incidents, emergencies and disasters; [limitation of any negative consequence (3.46) of a particular incident (3.111) - DRAFT 2017]	
Organisation	Person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives. [Note 1 to entry: The concept of organization includes, but is not limited to, sole trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private.] [Note 2 to entry: For organizations with more than one operating unit, a single operating unit can be defined as an organization.]	
Preparedness	The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current disasters.	

[10] Until the Portfolio of Solutions is operational, the terminology is presented in the DRIVER+ Project Handbook and access can be requested by third parties by contacting coordination@projectdriver.eu

Term	Definition	Comment
Prevention	Measures that enable an organization (3.158) to avoid, preclude or limit the impact (3.107) of an undesirable event (3.268) or potential disruption (3.70)	
Recovery	Decisions and actions aimed at restoring or improving livelihoods, health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principles of sustainable development, including build back better to avoid or reduce future disaster risk.	
Response	Actions taken during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.	
Societal resilience	Social entities and their abilities to tolerate, absorb, cope with and adjust to environmental and social threats of various kinds.	

Annex 2 – Taxonomy fields and descriptions

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

Annex 2.1 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 (included sub-functions are not detailed on the lower level).
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	Define scope, actors and roles, incl.: a. Define planning scope and key mitigation areas. b. Identify the key mitigation actors and stakeholders. c. Establish stakeholders' roles and responsibilities for hazards' mitigation.
Provide expertise for hazards mapping, vulnerabilities and risk assessment	Provide scientific and technical expertise for hazards mapping, vulnerabilities assessment, and risk assessment.
Assess the risks	
Conduct all-hazards tracking	Coordinate and conduct all-hazards tracking.
Identify hazards and threats	*Identify all potential hazards and threats to be tracked.*
Map the hazards per geographic area	*Map the hazards for each geographic area, distinct in the planning process.*

Taxonomy Field	Description
Assess vulnerabilities to hazards	Assess vulnerabilities to hazards and threats, i.e.: a. Define infrastructure and assets affected by hazards and threats. b. Set vulnerability assessment criteria. c. Identify critical infrastructure and assets. d. Quantify the infrastructure and assets' value.
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. d. Assess hazards-to-infrastructure impact and assets' risks. e. Build civil security (e.g. vulnerability to hazards) maps at national, regional, and local levels.
Estimate collateral damage	Estimate collateral damages under hazards' impact.
Estimate cascading effects	Estimate the impact of possible cascading effects.
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 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 simulations to assess effects of mitigation measures e. Define mitigation principles and goals.
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 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.

Taxonomy Field	Description
Conduct a mitigation communication campaign	Initiate, coordinate, and conduct a mitigation communication campaign.
Implement mitigation measures	
Build-in safety, security and resilience into design and operations	Build-in safety, security and resilience into the design and operation of assets, systems, and networks. For example, establish a mechanism to develop and enforce mitigation norms and standards.
Consider risks when locating new infrastructure	Consider risks when locating new infrastructure in order to avoid floodplains, seismic zones, and other risk-prone locations. For example, adopt and enforce development regulations in risk areas (limit density, buildings and constructions heights, etc.)
Promote PPPs to reduce vulnerabilities and hazards' impact	Establish rules and promote the practice of public-private partnerships to reduce vulnerabilities and hazards' impact, i.e. strengthen state, regional, and local mitigation capacity
Control access to critical systems	Apply a broad range of physical, technological, and cyber measures to control access to critical locations and systems, e.g. apply international standards and best practices
Enhance awareness on vulnerabilities and mitigation measures	Conduct training and exercise programmes to enhance awareness and understanding of common vulnerabilities and possible mitigation measures
Enhance hazards education	Enhance hazards, emergency, and crisis management education
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.

Taxonomy Field	Description
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 of 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.*
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.*
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 decision support systems	Develop CM decision support systems (see also Common Functional Area “Crisis communications and Information management”).

Taxonomy Field	Description
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 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.*

Taxonomy Field	Description
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, e.g. tasking spontaneous volunteers.*
Organise for crisis management	
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 hazards and crisis management research. b. Develop hazard and CM studies modelling and simulation capacity. c. 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.*

Taxonomy Field	Description
Develop hazard-specific simulations and conduct CAX	*Develop hazard-specific simulations and conduct computer and simulations assisted exercises and drills.*
Provide training for interoperability between organisations and command levels	*Provide instructions and 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	
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. c. Provide interagency training of personnel on after-action reports analysis and drafting lessons learned. d. 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 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.

Taxonomy Field	Description
Conduct civil security foresight	
Identify key drivers and trends	Identify key drivers of change and trends in the civil security environment.
Identify plausible futures	Identify plausible future hazards, environments, and crisis management futures.
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.*
Estimate resource requirements	*Estimate resource requirements; Identify specific capability needs and critical resources.*
Establish coordination with military and other backup	*Establish coordination with the military and other available backup units and personnel, e.g. organisations with CBRNE 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. black swan scenarios).
Establish hazards and CM research capacity and agenda	Establish and maintain hazards and crisis management research and development capacity and agenda.
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' social dimensions in terms of preparedness, responsiveness, learning, self-organisation, and innovation.
Strengthen the community 's capacity for collective actions	Strengthen the community 's capacity for collective actions for disaster risk reduction, conflict mitigation, social protection, natural resource management, and management of public goods and services.

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. 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.

Taxonomy Field	Description
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.
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 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 CBRN protection operations	Conduct emergency CBRN protection operations, i.e.: a. Maintain, in coordination with the military, sufficient CBRN protection capacity. b. Conduct CBRN protection operations. c. Coordinate emergency medical and psychological aid to affected people.
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.

Taxonomy Field	Description
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 public health	Safeguard public health, including MHPSS.
Provide epidemiological surveillance and investigation	*Provide human and animal epidemiological surveillance and investigation.*
Apply preventive measures	*Apply preventive measures, such as vaccines, contraceptive devices, immunisation, 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 EU critical infrastructures	Maintain the list of national and EU critical infrastructures, sectors and assets up to date (68), 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.
Develop training courses for CI vulnerability assessment	Develop standardised training courses for infrastructure inspection and vulnerability assessment.

Taxonomy Field	Description
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 EU critical infrastructures' risks, threats, and vulnerabilities reporting mechanism.
Coordinate and provide CII protection	
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 (28).
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 vulnerability 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.
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 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**"	
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 make an airborne sensors-based assessment.*

Taxonomy Field	Description
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 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.
Provide decision support	Provide decision support, i.e.: a. Prepare information for decision-making. b. Provide scientific support to decision-making. c. Translate information into actionable formats for crisis management users.
Manage warnings	Manage warnings to the public 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 levels. 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 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.*
Develop and sustain COP	*Develop and sustain a common operational picture (COP).*
Disseminate COP and assessments	*Disseminate the common operational picture and assessments.*

Taxonomy Field	Description
Conduct coordinated tasking and resource management	Conduct coordinated tasking and resource management, i.e.: a. Define, prioritise and assign tasks. b. Monitor and position resources. c. Pool and share resources. d. Assign resources to tasks. e. Exchange information on tasks and resources.
Deploy responders	Command and manage deployment of the responders.
Determine the area 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.*
Deploy first responders	*Command and manage deployment of first responders.*
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.*
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.
Safeguard emergency/ crisis responders	Safeguard the emotional and mental wellbeing of emergency/ crisis responders, incl. stress management.
Limit the impact of the crisis	
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.*
Coordinate HAZMAT operations	*Conduct and coordinate response operations to detect hazardous materials.*
Ensure responders' safety	*Ensure the safety of all on-the-scene responders.*

Taxonomy Field	Description
Minimize threats of potential HAZMAT release	Coordinate, integrate, and manage efforts to prevent or minimize threat of potential releases of hazardous materials.
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 co-ordinate immediate actions to protect them from secondary damage.
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.
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 MHPSS to professional responders, volunteers and the affected population.
Establish emergency mobile phone	Establish special emergency mobile telephone access.

Taxonomy Field	Description
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 (93) 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. Use technically collected data. c. Invite scientific support on concrete issues. d. Study possible secondary and collateral hazards. e. Provide an assessment report.
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 new case-specific norms).
Provide for evidence-based decision-making	Collect and verify data and develop tools to allow for evidence-based decision-making.
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 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. Advice people on how to behave/ act in the situation. d. Establish 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	*Deploy, task, resource and oversee organised volunteers.*
Manage spontaneous volunteers	*Network spontaneous volunteers with professional staff and organised volunteers, provide instructions and resources.*
Activate PPPs to mobilise resources	*Activate public-private partnership mechanism 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, 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.

Taxonomy Field	Description
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.
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 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 consequences and justify government's involvement	*Assess economic consequences at the national, regional, and local level, evaluate and justify government's involvement in economic recovery.*

Taxonomy Field	Description
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	
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 [11] 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 established procedures.*

[11] CCIM – Crisis Communications and Information Management.

Taxonomy Field	Description
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.*
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. Coordinate across the state agencies, local authorities, private entities, and volunteer organisations to develop crisis communications and information management documentation and procedures.
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	
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.

Taxonomy Field	Description
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.*
Integrate decision support	*Integrate CM decision support systems and tools.*
Provide for crowd sourcing	*Create opportunities for application of relevant modes of crowd sourcing; disseminate the information on such opportunities.*
Establish crisis communications capabilities	Establish and maintain crisis communications capabilities, i.e.: a. Define the communications and information requirements for central authorities, first responders, regional and local authorities, volunteer organisations and private entities. b. Establish coordination with corporate communications systems and assets. c. Secure interoperability through standards and coordination of acquisition.
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.*
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.*

Taxonomy Field	Description
Define information management procedures	*Define and coordinate information management procedures.*
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.
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 exercises to test the knowledge, skills, and abilities of individuals and organisations for using crisis communications and information. b. Conduct exercises to test the interoperability and reliability 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.
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 command, control, and coordination.
Communicate operational information across chain of command	*Communicate operational information across the crisis management chain of command.*

Taxonomy Field	Description
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 to the processes of command, control, and coordination.
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	
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.

Taxonomy Field	Description
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 system's integrity	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 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.
Establish all-hazards database	Establish all-hazards CM database and regulate the access to it.
Provide scientific and technical advice	Provide in-house scientific and technical advice and ready access to external expertise.

Taxonomy Field	Description
Establish rules for reporting	Establish rules for reporting on results and performance.
Establish the coordination component	
Establish internal coordination	Establish mechanisms for internal coordination: • Between various ministries, agencies or policy sectors (horizontal). • 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, focusing on the people, critical infrastructure and assets, and vital functions.
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.
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 all responders with timely and clear tasks.
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 operations.
Manage and support International responders	Manage and support the International responders operations.
Provide continuous deliberate planning	Provide continuous deliberate planning according to set priorities.

Taxonomy Field	Description
C3 delivery of critical support assets	Command, control, and coordinate delivery of critical support assets (transport, UAVs and drones, specialised aircrafts, satellite imagery, international information, etc.).
Establish ad-hoc task groups	Establish ad-hoc groups with tasking to manage specific problems.
Maintain science and technology advisory capacity	Maintain permanent capacity to provide scientific and technology advice to decision-makers and planners.
Manage resources to cope with priority tasks	Manage materiel and other resources to cope with priority tasks.
Provide warning and alerts for secondary hazards	Continue to provide public and institutional warning and alerting for secondary hazards, collateral threats and new 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 a 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 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.

Taxonomy Field	Description
Perform *consumer logistics*	Perform *consumer logistics*, providing storage, repair, maintenance, and disposal to CM materials.
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' request for transportation. c. Provide transportation of materials, medicine and medical materials, food and water for first aid to affected people.
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.

Taxonomy Field	Description
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	
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.

Taxonomy Field	Description
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 security clearance certified crisis management staff and volunteers.
Introduce chief security officer	Introduce chief security officer (manager) in each crisis command and management entity.
Establish security information exchange	Establish security information exchange system.
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.
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.

Taxonomy Field	Description
Exercise on-site security control	
Test critical infrastructure security plans	Develop and conduct 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.