Evaluation Study of Definitions, Gaps and Costs of Response Capacities for the Union Civil Protection Mechanism

D7: Final Report

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Introduction

This report is the final report of the Evaluation Study of Definitions, Gaps and Costs of Response Capacities for the Union Civil Protection Mechanism (UCPM). The overall aim of the study has been to support the European Commission to further develop disaster response capacities under the UCPM. More specifically, the study aims to inform the creation of a dedicated EU-level response in specific areas to complement national capacities when these are overwhelmed, which results from the provisional agreement on the new legislation enhancing the UCPM.[1]

The report presents the results of four Tasks:

- **Task 1: Review and (re-)define the existing response capacities** defined in Annex II of the Commission Implementing Decision No 2014/762/EU, in terms of definitions and quality requirements, past response experiences and national and European risk assessments.[2]
- **Task 2: Cost analysis**; collection of data for the capacities in the 2014 Implementing Decision.
- **Task 3: Risk-based capacity gap analysis**; to understand the extent to which the current pool of resources is able to meet the needs and functions in line with the capacity goals.
- **Task 4: Revision of capacity goals**; development and application of a methodological framework to assess suitability of the existing capacity goals, leading to a proposal for a revision of the goals.

The findings presented in this report are based on two main sources of evidence:

- **Research** conducted for the study: a review of the literature; interviews of European Commission staff, national contact points; module experts and international organisations; and an on-line survey of stakeholders.
- **Expert assessment** by our team of specialists covering all the main areas of expertise within the UCPM.

Context for the study

The European Emergency Response Capacity (EERC) was established as part of the UCPM by Decision No 1313/2013/EU, and subsequently renamed as the European Civil Protection Pool (ECPP) by Decision (EU) 2019/420.[3] The minimum response capacity for the ECPP to be effective, in terms of both types and numbers of response capacities, is referred to as the "capacity goals", which are set out in Decision No 1313/2013/EU. In its early stages, the focus was on building up the quantity of "capacities" in the form of modules, which were registered by Members States into the ECPP (formerly known as the "voluntary pool"). With the provisional agreement on the new legislation enhancing the UCPM, including through creating a rescEU reserve in December 2018, there have been moves towards creating a dedicated EU-level response capacity in specific areas to complement national

[1] European Commission (2017), rescEU: A stronger collective European response to disaster

[2] Commission Implementing Decision of 16 October 2014 laying down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism and repealing Commission Decisions 2004/277/EC, Euratom and 2007/606/EC, Euratom

[3] Decision (EU) 2019/420 of the European Parliament and of the Council of 13 March 2019 amending Decision No 1313/2013/EU on a Union Civil Protection Mechanism

capacities when these are overwhelmed.[4] The legislation proposes financing for adaptation, repair, transport and operation costs for national capacities dedicated to the ECPP.[5]

The approach for defining module definitions, setting capacity goals and identifying capacity gaps within the UCPM is laid out in the 2014 Implementing Decision. Requirements for capacity goals are described in Article 14, with the goals themselves specified in Annex III. The goals are subject to review every second year and should be revised in accordance with risks identified in national risk assessments (and other relevant information sources). The Commission is expected to monitor progress towards the capacity goals and inform Member States of any capacity gaps. The process for identifying capacity gaps is laid out in Article 19, which specifies that the Commission should assess the difference between the capacities registered in the civil protection pool and the capacity goals as defined in Annex III. The Commission can also invite Member States to provide information on any existing capacities not currently registered in the civil protection pool.

In setting capacity goals, the Commission is guided by risks, as identified in national risk assessments (NRAs), which are based on the Commission's Risk Assessment Guidelines. The Commission also invites Member States to assess their risk management capability every three years using the Commission's Risk Management Capability Assessment (RMCA) Guidelines. However, the Commission's EU-level overview has been limited by a lack of full access to the detailed scenario assumptions underpinning the NRAs and (planned) preventive and mitigating actions. The aggregated scenarios give a useful overall impression of the challenges facing each country but do not provide the detail that is necessary to know which capabilities and capacities are needed to address the effects of each scenario. Moreover, there is considerable diversity in the scope and contents of the national risk assessments and in descriptions of aggregated scenarios (where these are provided).

Methodological framework for assessing capacity goals

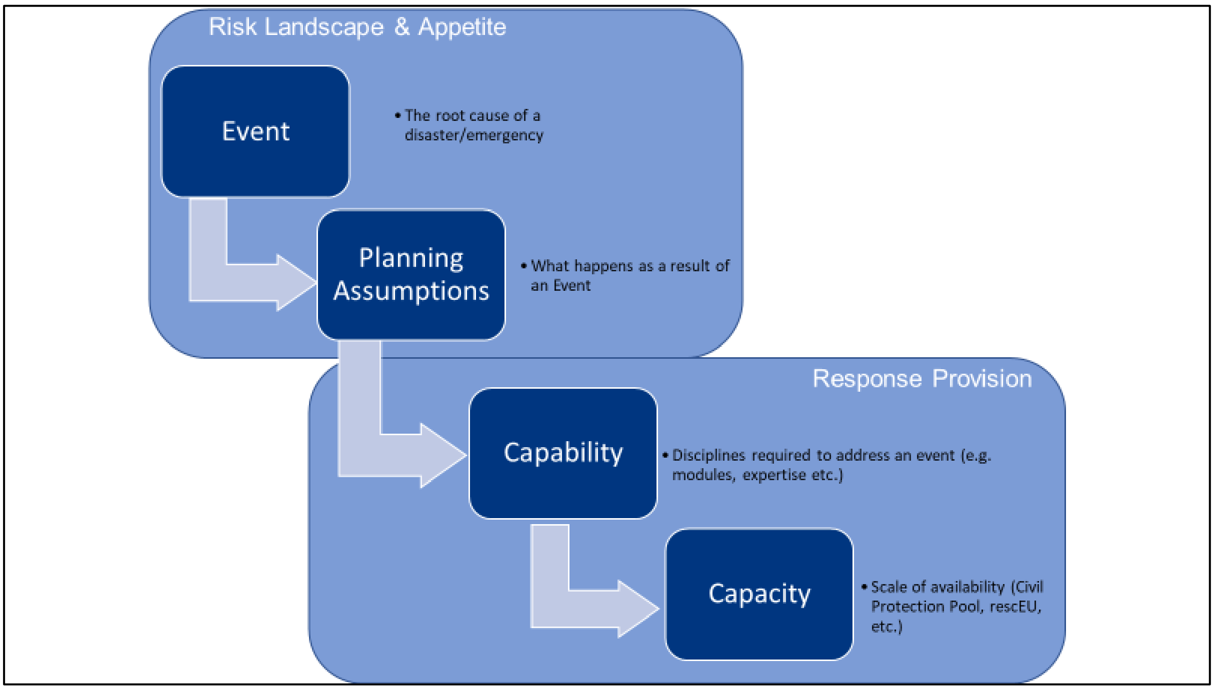
In order to assess the suitability of the existing capacity goals, a methodological framework has been developed. This approach is presented schematically in the figure on the next page. In this concept, a "worst credible event" is described. The details of such an event then inform a set of **planning assumptions** that are used to determine the **necessary capabilities** (the types of skills and resources needed) and **capacities** (how much of those capabilities are needed).

Based on desk research, expert assessment and discussions with the European Commission, a list of the nine "worst credible events" thought to represent the majority of incidents requiring an activation of the UCPM within the territory of the Participating States of the UCPM has been created. A description of each type of event is offered, including its primary characteristics and how it is perceived as a risk.

Worst credible events		
• Flooding • Extreme weather • Forest fire	• Earthquake • International medical emergency • Chemical incident	• Radiological event • Marine pollution • Critical infrastructure disruption

[4] European Commission (2017), rescEU: A stronger collective European response to disaster
[5] rescEU Factsheet, available at: http://europa.eu/rapid/press-release_MEMO-17-4732_en.htm (accessed 30/01/2019).

Schematic overview of assessment framework



Source: Resilience Advisers Network and Centre for Strategy and Evaluation Services

A planning assumption is defined as an event with the most severe consequences, considering all plausible drafted scenarios in risk assessments, historical events and expert knowledge, that can be prepared for in an effective and efficient way. The planning assumption is only relevant if it prompts an activation of the UCPM. A planning assumption describes a hypothetical situation and encompasses a large number of possible similar events. In that way, it can serve as a compilation of worst credible scenarios. This allows the multiple characteristics of an event to be emphasised and the diversity of required capabilities identified.

The word “capability” in this report refers to the skills and resources combined to deal with a pre-defined set of circumstances. It is the answer to the question “what is needed?”. An example of a capability is “Urban Search and Rescue” (USAR). USAR refers generically to the ability to deliver people with the necessary skills and equipment to respond effectively to an incident. Two modules directly contribute to this capability: “Heavy Urban Search and Rescue” (HUSAR) and “Medium Urban Search and Rescue” (MUSAR). Other non-module resources can be delivered as part of the USAR capability, such as structural engineering expertise and seismic monitoring.

The term “capacity” is used for units that can deliver a capability and is the answer to the question “how much is needed?”. A combination of modules and other resources can create a capacity. For example, if a capability called “USAR” is created through the deployment of HUSAR and MUSAR modules, then a group of these modules would be termed a “capacity”. The word “capacities” can be used to describe the entire combined inventory of modules, other response capabilities and experts of the UCPM. In this report, the term “Capacity Goals” refers to the total number of modules and capabilities required to create sufficient capacity to address the needs flowing from DG ECHO’s planning assumptions for civil protection.

A “module” means a self-sufficient and autonomous predefined task- and needs-driven arrangement of capabilities, or a mobile operational team, representing a combination of human and material means that can be described in terms of its capacity for intervention or the task(s) it is able to undertake. A module or group of modules combined to have an effect are described as a capability e.g. a MUSAR module when deployed or combined becomes part of a USAR capability. The number of modules provided for a particular event is described as a capacity and the total number of modules provided to support planned-for events across the entire UCPM is described as a capacity goal.

Conclusions from Task 1: Redefinition of modules

Task 1 involved analysing the appropriateness of the current definitions of response capacities specified in Annex II of Decision No 2014/762/EU, both in terms of definitions and quality requirements, and in terms of past response experiences and the most recent national and European risk assessments. The research found that most module definitions remain fit for purpose. However, most modules will benefit from updates to their definitions and this report details specific areas considered for inclusion in such an update.

The report has shown that a number of new modules may merit definition:

- Water transportation (WT): would enable distribution of clean water using the nearest available supply meeting European or local standards.
- Personal protective equipment and operational support in Chemical, Biological, Radiological and Nuclear environments (CBRN-PROT): would have the same technical capability as the current CBRNUSAR module but would be more versatile and support activity across modules in support of response to events.
- Decontamination of responders and equipment (CBRN-DEC): would decontaminate people and assets deployed as part of the UCPM and may also be usable for public decontamination.
- Medical aerial evacuation of infectious patients or patients requiring a high level of care (MEVAC-INF): this would evacuate patients requiring more than basic medical care, i.e. those requiring intensive care or infectious patients.
- Base Camp (BC): would provide support for deployed capacities, including, office, logistics and subsistence support, accommodation, power supply, water, sanitation and hygiene.

A number of modules are considered to have limited relevance, at least in respect of deployments within the Member States:

- Flood containment (FC): has rarely been deployed within the UCPM, in part because flood containment is generally conducted using local solutions and capacities. Where international assistance was needed, this was in the form of material (e.g. sandbags), rather than modules. Moreover, the modules are not suitable for deployment by air.
- Water purification (WP): the current definition does not guarantee water of a sufficiently high quality for EU standards. Within Europe, it can be cheaper and more effective to transport water from the nearest available source, rather than to purify it.
- USAR in CBRN conditions (CBRNUSAR): would be replaced by the CBRN-PROT module (described above).
- Emergency Temporary Camp (ETC): does not meet the need (in terms of quality) for shelter within Europe. The need is for a support module, so it would be replaced by the Base Camp module.
- Advanced medical post (AMP): replaced by EMT1.
- AMP-S (Advanced medical post with surgery (AMP-S): replaced by EMT2.
- Field hospital (FHOS): replaced by EMT3.

Other issues raised with respect to definitions were as follows:

- The concept of deploying modules will increasingly be complemented or even replaced by other approaches, such as the use of Experts or deployment of parts of modules.
- Benefits of standardisation of module definitions, in line with international standards, e.g. those of the International Search and Rescue Advisory Group (INSARAG) of the United Nations and the World Health Organisation (WHO).
- The use of cross-border or interoperability guidelines could help to maintain flexibility while ensuring required standards of interaction.
- Definitions need to be drafted in such a way as to embrace emerging technology without requiring that unproven technologies be used.
- Self-sufficiency is a cross-cutting definition which should be modified to reflect the needs and requirements for different modules. Clearer guidelines on self-sufficiency would be welcomed by most Member States.
- There is a need to ensure that personnel deployed as part of modules are adequately protected and at least to the same levels as host nation responders.

Conclusions from Task 2: Cost analysis

The research has gathered cost estimates for each of the modules listed in Annex II of the 2014 Implementing Decision. The main elements of costs are:

- Development costs: including staff training costs and the purchase of relevant equipment, vehicles and consumables. For the majority of modules analysed, these costs can be understood as the cost of upgrading an existing national response module for domestic use to meet the standards required for international deployment.
- Maintenance costs: include storage and maintenance of equipment, replacement of consumables as required, ongoing training of staff and the costs of medium to long-term equipment depreciation.
- Deployment costs: the total amount required for a module to be deployed internationally. This covers staff costs, transport costs for both staff and equipment, self-sufficiency costs (e.g. WASH, shelter and food provision) and replacement or repair costs for any equipment or consumables used.

A number of findings emerge regarding the costing methodologies used by modules. Many modules do not exist as units with discrete costs. This means that costs related to the module's development, maintenance and deployment under the UCPM may be inseparable from their wider role at national, regional or local level. Most development costs are incurred in preparing for domestic deployments or international developments on a bilateral basis rather than for UCPM registration. In as far as we have been able to separate additional costs development and maintenance costs to those incurred under a "business as usual" scenario, these are often relatively minor (or non-existent).

Conclusions from Task 3: Risk-based capacity gap analysis

Comparing the current available capacity registered in CECIS with the formulated capacity goals gives an overview of the current adequacy of the UCPM capacity. An analysis of the existing registered capacity against the current capacity goals shows the following over and under-supply.

Numerical capacity gaps against the existing capacity goals were identified in the following modules: Emergency Temporary Camp, Field Hospital.

Numerical capacity gaps against the existing capacity goals were identified with regard to the following other response capacities: Additional shelter capacity, Additional shelter kits, Water pumps up to 800 l/m, Teams for maritime incident response, Medical Evacuation Jets Air Ambulance and Helicopters, Evacuation support, Teams for mountain search and rescue, Teams for water search and rescue, Teams with specialized search and rescue equipment, e.g. search robots, Teams with unmanned aerial vehicles, Communication teams or platforms to quickly re-establish communications in remote areas, Power generators of 5-150 kW, and Power generators above 150 kW.

Numerical overcapacity against the existing capacity goals was identified in the following modules: High Capacity Pumping, Flood Containment, Flood Rescue Using Boats, Ground Forest Firefighting, Ground Forest Firefighting using vehicles, Advanced Medical Post, Advanced Medical Post with Surgery, Medium Urban Search and Rescue, Heavy Urban Search and Rescue, CBRN Detection and Sampling, Technical Assistance and Support Teams.

Numerical overcapacity against the existing capacity goals was identified with regard to the following other response capacity: Mobile Laboratories for environmental emergencies.

What this means, in practice, is spelled out in a little more detail below:

- There is sufficient provision of most of the modules, namely HCP, FRB, GFFF, GFFF-V and CBRNDET MUSAR, HUSAR, MEVAC and TAST taking into account all modules registered in the civil protection pool.
- Currently, the UPCM features gaps against the goals for in-kind assistance items as they are almost not registered in CECIS.
- There would be a need to create or adapt capacities in line with the new module definitions, namely WT, BC, CBRN-PROT, CBRN-DEC and MEVAC-INF.
- The fulfilment of the goals on medical modules would depend on the extent to which existing-registered capacities (AMP, AMP-S, FHOS) can be redefined according to the EMT standards. It also depends on the development of a new EMT3 module, which does not yet exist in the EU.

Conclusions from Task 4: Revision of capacity goals

A set of revised quantitative capacity goals have been developed based on the developed events and planning assumptions. The capacity goals are based on:

- the capacity needed for a worst credible event; and
- the possibility of non-availability due to simultaneous events and the transportability of the modules throughout Europe.

Findings from this exercise suggested that increased capacity is needed with regard to the following existing modules: High Capacity Pumping, Flood Rescue Using Boats, EMT Types 1 and 3, Base Camp, Ground Forest Firefighting with Vehicles, CBRN Detection and Sampling. Increased capacity is also needed with regard to proposed modules (if adopted): Water Transportation, Personal protective equipment and operational support in CBRN environments, CBRN Decontamination, and Medical aerial evacuation of infectious patients or patients requiring a high level of care.

increased capacity is needed with regard to the following other response capacities: Teams for mountain search and rescue, Communication teams or platforms to quickly re-establish communications in remote areas, Water pumps up to 800 l/m, Marine pollution capacities and sandbags.

Contrary to this, capacity for the following modules is deemed as sufficient or exceeding the revised capacity goal: EMT Type 2, Ground Forest Firefighting, Medium and Heavy Urban Search and Rescue, Teams for cave search and rescue, Teams with unmanned aerial vehicles, Structural engineering teams, and Firefighting: advisory/assessment teams.

The following modules are judged as no longer being required as they have now been incorporated into the definition or redefinition of other modules: Teams for water search and rescue, Mobile laboratories for environmental emergencies, Emergency medical teams for specialised care, Mobile biosafety laboratories.

The revised goals suggest the number of capacities that would be required to address the different events individually. However, should events of one or more types occur simultaneously, then more capacities would be required to address the effects of those events. These goals are based on an expert assessment of capabilities and capacities required to address the effects of the nine events, as described in the relevant planning assumptions. However, should the policy choices made by DG ECHO lead to a revision of the choice of events, then the expert assessment would need to be redone and may result in a revision to the goals.

The study also identified the need to set goals for new response capacities:

- Access to medical countermeasures: refers to the ability to medically protect responders required to enter a bio-affected area. The goals proposed are based on: first, the number of person/doses that can be administered on deployment to enable UCPM capacity to be protected for response to an incident; and, second, the number of person/doses that would require administration some time in advance to ensure availability of sufficient capacity. These numbers vary according to the availability, type and period to achieve clinical efficacy for each MCM, so there is a need for further research to demonstrate the detailed requirement for the most commonly planned for events.
- CBRN PPE Stockpiles: events have shown a potential inadequacy in the volume and availability of sufficient PPE and decontamination material to sustain UCPM operations over an extended period of time. Two components have been considered in setting these goals, firstly the number of additional units likely to be required as a result of each of the studied events and secondly the amount of additional decontaminant which might prolong operations with existing stocks.

List of abbreviations

Modules (existing)

AMP	Advanced medical post
AMP-S	Advanced medical post with surgery
CBRNDET	Chemical, biological, radiological and nuclear detection and sampling
CBRNUSAR	Urban search and rescue in chemical, biological, radiological and nuclear conditions
EMT	Emergency Medical Team
ETC	Emergency Temporary Camp
FC	Flood containment
FFFH	Aerial forest fire fighting using helicopters
FFFP	Aerial forest fire fighting using planes
FHOS	Field hospital
FRB	Flood rescue using boats
GFFF	Ground forest fire fighting
GFFF-V	Ground forest fire fighting using vehicles
HCP	High capacity pumping
HUSAR	Heavy urban search and rescue
MEVAC	Medical aerial evacuation of disaster victims
MUSAR	Medium urban search and rescue
TAST	Technical assistance and support team
WP	Water purification

Modules (proposed)

BC	Base Camp
CBRN-PROT	Personal protective equipment and operational support in chemical, biological, radiological and nuclear environments
CBRN-DEC	Chemical, biological, radiological and nuclear decontamination
MEVAC-INF	Medical aerial evacuation of infectious patients or patients requiring a high level of care
WT	Water transportation

Other

CECIS	Common Emergency Communication and Information System
EASA	European Union Aviation Safety Agency
EERC	European Emergency Response Capacity
ECPP	European Civil Protection Pool
EU	European Union
FAA	Federal Aviation Administration
HILP/Hi-Lo	High-impact, low-probability risk
ICT	Information and communications technology
INSARAG	International Search and Rescue Advisory Group
JRC	Joint Research Centre
MCM	Medical Counter Measure
NATO	North Atlantic Treaty Organisation
NRA	National Risk Assessment
OECD	Organisation for Economic Co-operation and Development
RMCA	Risk Management Capability Assessment
RPAS	Remotely Piloted Aircraft System
SMS	Safety Management System
ToR	Terms of Reference
UAV	Unmanned Aerial Vehicle
UCPM	Union Civil Protection Mechanism
WHO	World Health Organisation

1 Introduction

1.1 Purpose and scope of the report

This report is the final report of the Evaluation Study of Definitions, Gaps and Costs of Response Capacities for the Union Civil Protection Mechanism (UCPM). The overall aim of the study has been to support the European Commission to further develop disaster response capacities under the UCPM.

As required by the Terms of Reference (ToR) for the study, the report presents the results of four Tasks:

- **Task 1: Review and (re-)define the existing response capacities**; this involved collecting and analysing the available evidence regarding the appropriateness of the currently available response capacities defined in Annex II of the Commission Implementing Decision No 2014/762/EU, both in terms of definitions and quality requirements, and in terms of past response experiences and the most recent national and European risk assessments.[6]
- **Task 2: Cost analysis**; this involved the collection of detailed data in order to provide a cost breakdown for the capacities listed in the 2014 Implementing Decision.
- **Task 3: Risk-based capacity gap analysis**; this involved an evidence-based analysis, to understand the extent to which the current pool of resources is able to meet the needs and functions in line with the capacity goals. It builds on the Commission's 2017 report on progress made and gaps remaining in the European Emergency Response Capacity (EERC)[7] and the framework of the current capacity goals, encompassing actual experiences as observed in the course of activation of individual modules and in addressing demands for support by the Member States and the European Commission.
- **Task 4: Revision of capacity goals**; this involved the development and application of a methodological framework to assess the suitability of the existing capacity goals, leading to a proposal for a revision of those goals.

The results of the four tasks are brought together within this report.

Section 2 provides the **context for the study** including an introduction to the UCPM and an explanation of how risk assessment and risk management has developed within the European context. It highlights an information gap in the EU's current approach to risk assessment.

Section 3 presents the **methodological framework for assessing capacity goals**. The framework is then applied in the sections that follow.

Section 4 highlights the need to **redefine existing modules** and their general requirements, as well as the possible need to **define new modules**.

Section 5 provides a **summary analysis of the available risk assessments** for Europe. It draws on national risk assessments, the Commission's overview report, international risk assessments by other international bodies, other literature and interviews.

[6] Commission Implementing Decision of 16 October 2014 laying down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism and repealing Commission Decisions 2004/277/EC, Euratom and 2007/606/EC, Euratom

[7] Report from the Commission to the European Parliament and the Council on progress made and gaps remaining in the European Emergency Response Capacity, COM(2017) 78 final.

Section 6 provides a description of the **risk landscape** facing the EU, expressed in terms of different types of events that would require a response from the UCPM. The characteristics of these events have informed a number of planning assumptions that are then presented after summary descriptions of the events. The planning assumptions determine the details of the response that would be required from the UCPM in order to address the effects of each type of event. More detailed descriptions of the events and their related planning assumptions are provided in Annex.

Section 7 **applies the methodological framework** presented in Section 3. It assesses the capabilities that will be required to address the events described in Section 6, given the planning assumptions described in Section 6.3. It also considers any other desirable capabilities that are not mentioned in the planning assumptions.

Section 8 then considers the **capacities required to provide the necessary capabilities**. Based on that, it then assesses the suitability of the existing capacity goals and proposes a revision of those goals.

Section 9 presents the **analysis of capacity gaps**, first against the current goals and second against the revised goals.

Finally, Section 10 presents the **overall conclusions** of the report regarding both the process of setting capacity goals and the revision of the goals themselves.

1.2 Research undertaken

The findings presented in this report are based on two main lines of research.

First, the report draws on the **research conducted for the overall study**. This includes a comprehensive review of the literature made available by the European Commission, national contact points and module experts as well as publicly available literature from other sources, such as international organisations. It also includes an interview programme covering DG ECHO staff, national contact points, module experts and international organisations, as well as an on-line survey of relevant stakeholders.

Second, the report draws on the **expert assessment of our team of specialists** covering all the main areas of expertise within the UCPM. The experts have drawn on published sources, historical evidence and their own experience to describe the events and determine in a logical way the planning assumptions that would flow from those events.

The research and the expert assessments have together informed the assessment of capabilities required, assessment of the suitability of the existing capacity goals, analysis of capacity gaps and the review and revision of module definitions.

2 Context for the study

As noted in Section 1, the purpose of the study has been to **assess the current definitions of response capacities, provide cost estimates, analyse gaps in response capacities and update the capacity goals.** As will be shown in Section 3, this has been done using a three-step process based around the use of planning assumptions. This first step involves the definition of a "worst credible event" (based on all relevant information available), which is then used to develop a set of "planning assumptions" which, in turn, are used to determine the capabilities (skills and resources) and capacities (how much of the capabilities are required) needed to respond effectively. Once the required capacities have been calculated, these can then be used both to define appropriate capacity goals and identify current capacity gaps in the civil protection pool.

Before describing this process in detail, it is useful to briefly summarise three elements of the wider context: first, the **development of the European Emergency Response Capacity and the rescEU proposal**, which will be informed by this study; second, the **EU's approach to defining modules, setting capacity goals and measuring gaps**; and third, the evolution of the **EU's approach to risk assessment**. It will be shown that information gaps in the current approach to risk assessment require the development of a new methodological framework to assess capabilities and capacities in light of risks. For the purposes of this study, capabilities are defined as "the types of skills and resources needed" and capacities as "how much of those capabilities are needed."

2.1 Development of the EU's capacity to respond

The European Emergency Response Capacity (EERC) was established as part of the UCPM by Decision No 1313/2013/EU, and subsequently renamed as the European Civil Protection Pool by Decision (EU) 2019/420.[8] Decision No 1313/2013/EU enshrined a number of capacity goals in European legislation, as described in Section 9. The creation of the EERC aimed to **enable EU disaster response to move from a rather reactive and ad hoc approach towards a more co-ordinated mechanism**, which could be relied on to provide a **well-organised, high-quality and efficient European response** in times of emergency. The minimum response capacity required for the EERC to be effective, in terms of both types and numbers of response capacities, is referred to as the "capacity goals".

In its early stages, the focus was on building up the quantity of "capacities" in the form of modules, which were registered by Members States into the EERC.[9] From 2013 to 2017, 16 Member States committed a total of 77 resources to the voluntary pool (now known as the "civil protection pool").[10] According to the 2017 interim evaluation of the UCPM, the capacities in the pool were of "overall good quality" and the number of modules was "above initial targets".[11] The interim evaluation also found that as the focus in the initial years following the establishment of the UCPM was on **building up the European response capacity and showing that the UCPM was an effective coordination mechanism**, less attention was given to how well the EERC overall matched the needs that were emerging. As the mechanism has matured, there is an emerging consensus that a shift towards a more **evidence-based response** is required, which aims to **match the capacities available with the needs identified**, through national risk assessments, feedback from exercises and deployments, and an identification of emerging risks.

[8] Decision (EU) 2019/420 of the European Parliament and of the Council of 13 March 2019 amending Decision No 1313/2013/EU on a Union Civil Protection Mechanism

[9] ICF (2017), Interim evaluation of the Union Civil Protection Mechanism, 2014-2016

[10] European Commission (2017), Report from the Commission to the European Parliament and the Council on progress made and gaps remaining in the European Emergency Response Capacity, COM(2017) 78 final

[11] ICF (2017), Interim evaluation of the Union Civil Protection Mechanism, 2014-2016

In a 2017 report on progress made and gaps remaining in the EERC, the European Commission identified a number of areas where the existing response capacity was judged as either insufficient or non-existent. The report identified **gaps in the areas of forest fire fighting planes and shelter**. It also called for further research into the need for and availability of: resources to respond to **chemical, biological, radiological and nuclear disasters (CBRN); big field hospitals and medical evacuation capacities** as part of the European Medical Corps; **remotely piloted aircraft systems**; and **communication teams**.[12] Furthermore, the report found that the existing capacity goals (as laid out in the 2014 legislation) may need to be revised.

With the provisional agreement on the new legislation enhancing the UCPM, including through creating a **rescEU** reserve in December 2018, there have been moves towards creating a dedicated EU-level response in specific areas to complement national capacities when these are overwhelmed.[13] Furthermore, the proposed legislation aimed to boost national capacities dedicated to the EERC (which henceforth is to be known as the European Civil Protection Pool) by providing increased financing for adaptation, repair, transport and operation costs.[14]

In this context, the interim evaluation of the UCPM identified a need for capacity gap analysis. Such an analysis was needed to help revise the suitability of current capacity goals on the basis of risks identified in national risks assessments or other appropriate national or international sources of information.

2.2 EU approach to defining modules, setting capacity goals and measuring gaps

The approach for defining module definitions, setting capacity goals and identifying capacity gaps within the UCPM is laid out in the 2014 Implementing Decision, specifically in Articles 13, 14, 18 and 19.

According to Article 13, modules and technical assistance and support teams are required to comply with the general requirements listed in Annex II of the Implementing Decision. It is expected, however, that these requirements be reviewed from time to time in order to ensure they remain fit for purpose. One example of such a review was the decision in 2018 to replace the medical modules (Advanced Medical Post, Advanced Medical Post with surgery, Field Hospital) with three Emergency Medical Team modules as defined by the standards of the World Health Organisation (WHO). Article 13 also requires that modules for technical assistance and support teams be interoperable and able to operate with international disaster response capabilities supporting the affected country. Requirements to participate in training and exercises are also specified for team leaders, deputy team leaders and liaison officers both for Technical Assistance and Support Teams (TAST) and for modules.

Requirements for capacity goals are described in Article 14, with the goals themselves specified in Annex III. The goals are subject to review every second year and should be revised in accordance with risks identified in the national risk assessments (and other relevant information sources), as provided by the Member States.

According to Article 18, the Commission is expected to continuously monitor progress towards the capacity goals and inform Member States of any capacity gaps. The process for identifying capacity gaps is laid out in some detail in Article 19, which specifies that **the Commission should assess the difference between the capacities registered in the civil protection pool and the capacity goals as defined in Annex III**. In order to gain a complete picture of the capacities available within the EU, the

[12] European Commission (2017), Report from the Commission to the European Parliament and the Council on progress made and gaps remaining in the European Emergency Response Capacity, COM(2017) 78 final
[13] European Commission (2017), rescEU: A stronger collective European response to disaster
[14] rescEU Factsheet, available at: http://europa.eu/rapid/press-release_MEMO-17-4732_en.htm (accessed 30/01/2019).

Commission can also invite Member States to provide information on any existing capacities not currently registered in the civil protection pool – as described in Article 20(3).

The process of setting capacity goals and analysing capacity gaps therefor relies heavily on national risk assessments provided by the Member States. Some of the difficulties raised by this approach are described in Section 2.3 below.

2.3 EU approach to risk management

2.3.1 Risk assessment process

As mentioned in Section 2.2, the process of setting capacity goals and analysing capacity gaps as laid out in the 2014 Implementing Decision relies heavily on national risk assessments provided by the Member States. It is therefore important to understand how this process works and what implications this may have for any analysis of the response capacity required and currently available at EU level.

The EU has been developing a comprehensive risk-based approach to disaster management since 2009, when the Commission adopted a Communication on a Community approach on the prevention of natural and man-made disasters. The Council Conclusions on a Community framework on disaster prevention within the EU, adopted on 30 November 2009, directed the European Commission to develop **Risk Assessment and Mapping Guidelines for Disaster Management** to increase Europe's resilience to crises and disasters.[15] The Commission published these Guidelines in 2010.[16] The same Council Conclusions also invited the Member States to provide **national risk assessments** (NRAs) to the Commission, based on the Risk Assessment Guidelines before the end of 2012.

Following Decision No 1313/2013/EU, the Commission further developed its approach to risk assessment and risk management with the requirement for Member States to submit to the Commission summaries of their national risk assessments as well as assessments of their risk management capability every three years. To facilitate the latter, the Commission published **Risk Management Capability Assessment (RMCA) Guidelines** in 2015.[17] These build on the Risk Assessment Guidelines by providing Member States with a non-binding comprehensive and flexible methodology that assists them in the self-assessment of their risk management capability through a questionnaire and self-scoring system.[18] This is in line with the objectives of the RMCA to build up awareness on the strength and weaknesses of the Member States' disaster management systems, contribute to development of improved disaster management policies and to facilitate cooperation between Member States. The RMCAs provide, therefore, only a limited contribution to both the financial evaluation of module capacities, and the rationales to establish those capacities.

In producing their NRAs, the Member States are guided by the EU Risk Assessment and Mapping Guidelines although no specific format is required for the NRAs.[19] According to the Guidelines, "national risk assessments and mapping deliver the essential input for informed capacity building and the enhancement of both disaster prevention and preparedness activities". Since the NRAs are a starting point for decision-making regarding a wide range of possible mitigating and preventive actions, there is **no direct link between a described disaster risk scenario and the capacities required.** The latter can in most cases only be established after preventive or mitigating actions are taken or

[15] Council of the European Union (2009), Council Conclusions on a Community framework on disaster prevention within the EU; 2979th Justice and Home Affairs Council meeting, Brussels, 30 November 2009

[16] SEC(2010) 1626 final, Commission Staff Working Paper: Risk Assessment and Mapping Guidelines for Disaster Management

[17] Commission Notice Risk Management Capability Assessment Guidelines (2015/C 261/03)

[18] The three elements of disaster risk management assessed are: 1) risk assessment, 2) risk management planning, and 3) implementation of prevention and preparedness measures.

[19] New Guidelines are being prepared following the legislative review.

planned. Although the Guidelines ask Member States to adopt a **longer-term perspective to adequately capture the potential impacts of climate change** on certain types of disasters such as floods and droughts, the Guidelines are not mandatory. As such, many Member States do not (yet) fully integrate climate change impacts into their NRAs although progress can be observed over time.

Using the results of the NRAs, the Commission has released a Staff Working Document that provides a cross-sectoral overview of natural and man-made disaster risks the Union may face.[20] However, as noted by the Staff Working Document, the overview does not constitute, in itself, a European assessment of disaster risks. Instead, "it builds on nationally-assessed disaster risks to reflect the complex landscape of disaster risks across Europe, the supra-national dimension of disaster risks and the relevance of their management to many policy areas at national, regional and European levels". It has allowed for an **identification of areas of common concern, such as an increasing risk of climate-change related disasters and an increasing perception of risk related to CBRN incidents**, such as biological and chemical attacks.

Using the NRAs to create a European risk assessment is hindered by **certain methodological barriers** in understanding the comparative scale, likelihood, and severity of risks. At the most basic level, there is a clear difference amongst NRAs in terms of methodology; some clearly describe the risk scenarios and use multi-hazard approaches, whilst others only present the risk on an aggregated level or have a single hazard approach. When indicators of impact and likelihood are used, they may also not have the same standards across countries. The disruptive nature of a disaster can be assessed as low in one country and high in another, due to different demographics or economic dependencies.

Comparison is also made difficult by differences of opinion on which risks should be classified under civil protection and which are better classified under national security. As a result, the NRAs received by the Commission do not necessarily cover all possible risks for reasons of national security. Whilst there is naturally a grey area between the two, this is not expressed uniformly across NRAs.

Furthermore, there is a **lack of focus on innovative approaches**, such as resilience, as described in a Joint Research Centre (JRC) report from 2017.[21] By adding the concepts of resilience to bolster prevention and preparedness, the JRC report suggests a broader social adaptation rather than a focus upon the intervention narrative that underpins classic civil protection theory.

Finally, there is **insufficient coverage of the cross-border nature of risks** and ways in which they can be prevented or prepared against: whilst some reports have a strong element of previous cross-border cooperation, others acknowledge that they have not explored this area. Reports also mention that the influence of cross-border risks can be small. Border regions are often less densely populated and have less critical economic activities, except for flood-prone border river basins. Interviews with national contact points have highlighted increasing concerns around high impact cross border risks, such as pandemics, nuclear incidents (this is especially a concern for countries with nuclear power stations very close to their borders), terrorist attacks and cyber-attacks. However, as these risks often fall under the remit of national security, it may be the case that civil protection bodies are not fully involved in assessing such risks and/or in preparing or responding to such events, as and when they occur.

For the purposes of this study, it was necessary to create a methodology taking into consideration the current deficit of a single agreed process for risk assessment and linking it to evaluation of current and new resource requirements. The methodology described under section 3 endeavours to achieve this.

[20] SWD(2017) 176 final Commission Staff Working Document: Overview of natural and man-made disaster risks the European Union may face

[21] http://publications.jrc.ec.europa.eu/repository/bitstream/JRC106265/jrc106265_100417_resilience_scienceforpolicyreport.pdf

2.3.2 Information gap in risk assessments

The EU-level overview has been limited by a lack of full access to the detailed scenario assumptions underpinning the NRAs and the (planned) preventive and mitigating actions. The summaries only provide the aggregated risks, which provide no additional information beyond the existence of a scenario. Instead, they provide only a rather shallow view, as the final set of national risks presented represent only one of the outcomes of risk assessment, with the sole purpose of setting priorities. Analysis of those scenarios combined with an understanding of any preventative measures taken and capacities used to respond to disasters could meet the unspoken need to **establish a baseline**, in order to understand both **under which scenarios the UCPM should be activated and what level of response should be expected from the mechanism** (within the territory of the EU in the first instance, but also in response to emergencies outside of the EU). This would allow for a better analysis of the effectiveness of EU emergency response and the identification of European priorities.

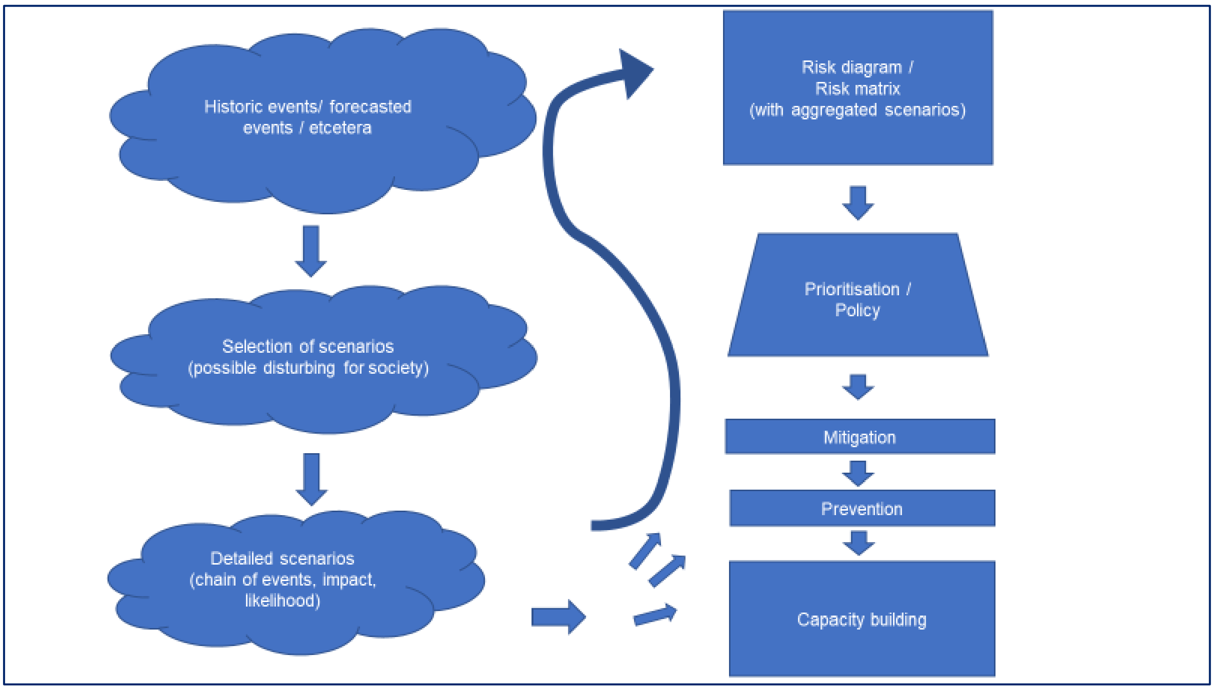
The limited access to detailed scenarios is problematic since they should inform capacity building. The aggregated scenarios give a useful overall impression of the challenges facing each country but do not provide the details that are necessary to know which capabilities and capacities are needed to address the effects of each scenario. Moreover, there is considerable diversity in the scope and contents of the national risk assessments and in descriptions of aggregated scenarios (where these are provided).

The following figures provide a visual illustration of the information gap in the current approach to risk assessments.

Figure 1 outlines a **comprehensive approach** whereby data on historic events or evidence-based forecasts of future events informs the identification of broad scenarios that would bring about adverse effects for society. From those broad scenarios, a process of logical thinking (albeit informed by historical evidence) leads to the specification of detailed scenarios and the likelihood of specific effects that would require a civil protection response. Based on these detailed scenarios, it is then possible to construct a risk diagram/matrix that plots impacts against their likelihood. This informs the prioritisation of risks and the design of policies or strategies. Those policies can then identify the actions that would be required to mitigate risks or prevent adverse effects, which in turn inform decisions about capacity building.

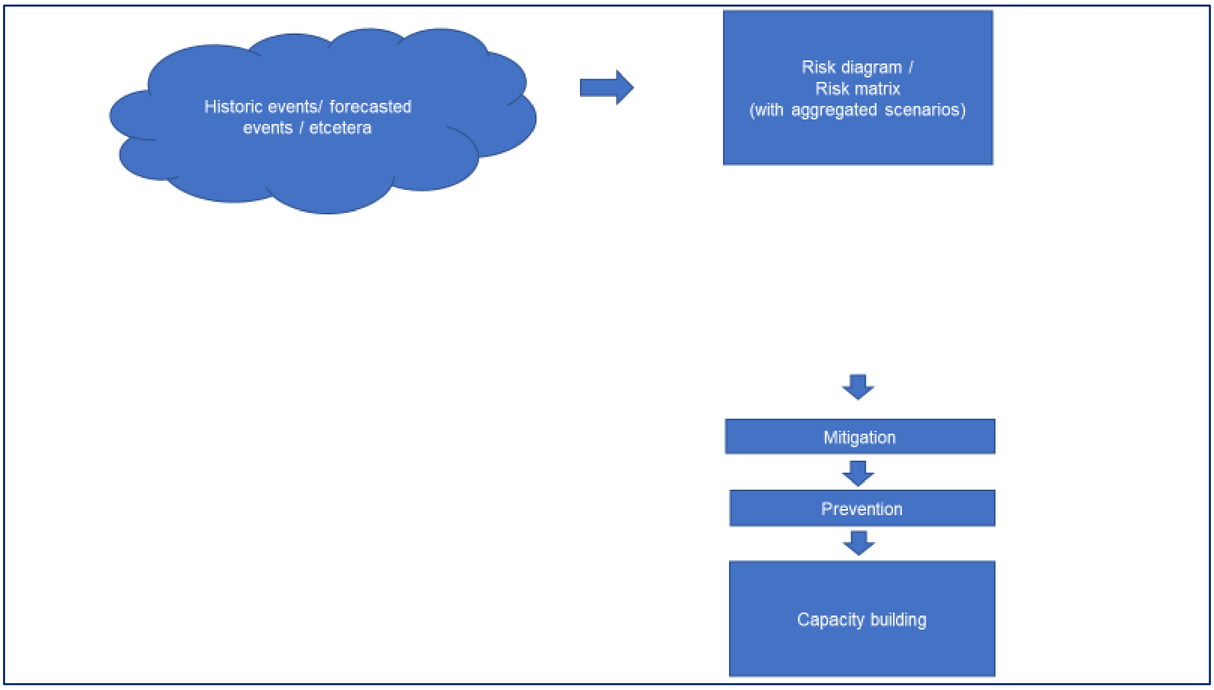
In contrast, Figure 2 characterises the **current approach** and highlights the potential weaknesses arising from an information gap. Within the current approach, data on historic events or evidence-based forecasts of future events leads neither to a detailed specification of the scenarios that would result nor to the effects of those scenarios. Instead, a risk diagram/matrix is developed solely on the basis of the historic events or evidence-based forecasts of future events. Policy is thus not developed on the basis of an understanding of the specific effects that would occur. Capacity is built to mitigate broad risks or prevent broad effects rather than to respond to detailed scenarios. Ultimately, the risk is a lack of capacity or a mismatch of capacities available to the UCPM.

Figure 1 Comprehensive approach to risk assessment



Source: Resilience Advisors Network and the Centre for Strategy and Evaluation Services

Figure 2 Information gap in the current approach to risk assessment



Source: Resilience Advisors Network and the Centre for Strategy and Evaluation Services

3 Methodological framework for assessing capacity goals

The ToR for this study requires the development of a methodological framework aimed at assessing the suitability of the existing capacity goals. This section starts by describing the current policy approach to assessing risks and risk management capability. It highlights a gap in this approach and thus the need for a new framework for assessing capabilities and capacities in light of risks. Finally, the proposed framework is presented, together with a description of key terms used. The framework is then applied in Sections 6, 7 and 8.

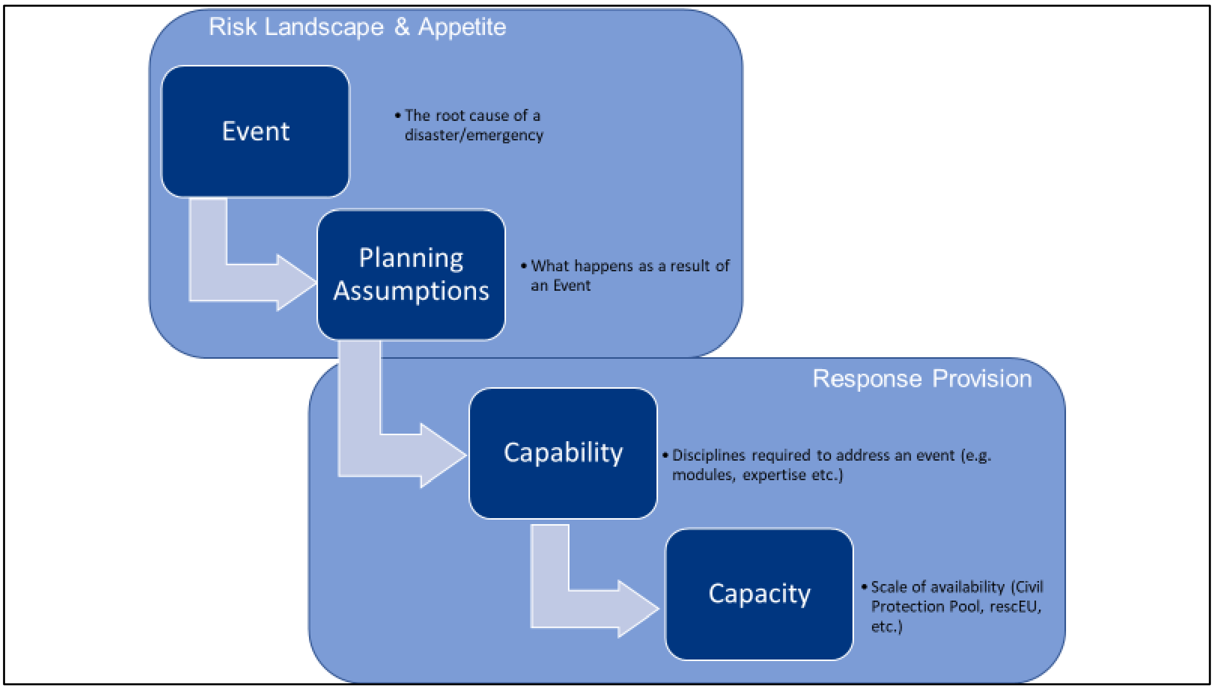
3.1 Overview

Currently, there is an information gap between knowledge on risks and the necessary capabilities and capacities at the European level since there is no direct way to derive this information either from the NRAs or from the RMCAs submitted to the Commission. This is compounded by the available EU Guidelines on the two processes, as these do not ask for this type of information from the Member States.

The proposed assessment framework is intended to address the information gap by introducing a **three-step process**, at the heart of which is the concept of the planning assumption. This concept is widely used in the chemical industry and also in the risk assessment methodology of the UK. The concept of a planning assumption can be fitted into an overall methodology, which helps to structure the available information on historic and foreseen disastrous events. By following three logical steps, it will be possible to assess the capacities needed to respond to any defined event.

This approach is presented schematically in Figure 3. In this concept, a "worst credible event" is described based on all information available, including expert assessment. The details of such an event then inform a set of **planning assumptions** that are used to determine the **necessary capabilities** (the types of skills and resources needed) and **capacities** (how much of those capabilities are needed).

Figure 3 Schematic overview of assessment framework



Source: Resilience Advisers Network and Centre for Strategy and Evaluation Services

3.2 Event descriptions

In the risk landscape, a description of each type of event is offered. The description includes information on how the event is perceived as a risk and what the characteristics are of the event. Characteristics would include, for example, **direct impacts, cascading events, cross-border effects, or wider effects** of climate change. Also, the **policy dimension** and **descriptions of relevant historic events** are given. The events are written to fit in the context of European solidarity between States that participate in the UCPM. This implies that only the characteristic of an event is described for which international assistance can be relevant. The severity of the event by itself does not automatically lead it to be included in the framework. For example, events such as an airplane crash or a flash flood in a village might have a high human, economic and environmental cost but would not be included if it is reasonable to conclude that the relevant country has the capacity to address any effects.

The events included in this report are thought to represent the overwhelming majority of incidents that would require an activation of the UCPM within the territory of the EU (or the Member States). A previous scenario study published by the Commission in 2009 identified seven basic disaster types.[22] These were discussed with project managers at DG ECHO and further refined to create the nine event types used for this part of the study, as follows:

- Flooding
- Extreme weather
- Forest fire
- Earthquake
- International medical emergency
- Chemical incident
- Radiological event
- Marine pollution
- Critical infrastructure disruption

A summary of each event is given in Section 6.2, whilst the full event descriptions are presented in Annex 1.

3.3 Planning assumptions

A planning assumption can be defined as an **event with the most severe consequences**, considering all drafted scenarios in risk assessments, historical events and expert knowledge that is considered **plausible or reasonably believable** and can be **prepared for in an effective and efficient way**. In addition, the planning assumption is only relevant if it is large enough in scale to prompt the activation of the UCPM.

Although it has the characteristics of a scenario, it is not exactly the same. In a scenario, all the parameters describing an event should form a logical and consistent whole. A planning assumption may not be consistent in certain parameters, as it focuses only on the consequences relevant for the planning assumptions. It describes a hypothetical situation; for instance, a planning assumption can describe an event in a city that does not exist in Europe, but which has the characteristics of several cities. **A planning assumption encompasses a large number of possible similar events and in that**

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[22] European Commission DG Environment (2009), Strengthening the EU capacity to respond to disasters: Identification of the gaps in the capacity of the Community Civil Protection Mechanism to provide assistance in major disasters and options to fill the gaps – A scenario-based approach.

way can serve as a compilation of the worst credible scenarios. In this way, the multiple characteristics of an event can be emphasised and the diversity of required capabilities identified. In this report, the focus is on events requiring international assistance, so the myriad of different other elements of an event will not be described as this is not relevant for the development of a planning assumption.

Moreover, a planning assumption differs from the articulation of a "worst case scenario". A planning assumption describes a "worst credible event". An event which could happen and, based on expert assessment, is "credible" to happen. A worst-case scenario describes the most severe consequences that might arise without considering the likelihood/credibility of such a scenario. Although such a scenario would trigger a civil protection response, it is not realistic to plan capacity (of the EU and the Member States) based on a worst-case scenario. Investments in planning always need to take into account a certain likelihood of a scenario to remain cost effective. Of course, those capacities can also be used if a worst case scenario happens.

At the same time, the worst credible events considered by the planning assumption could include "high impact/low probability" events. The logic of considering such events is that planning a response at the EU level instead could be considered worthwhile (in light of the severity of the effects) and more efficient than planning at Member State level (since one response capability might be sufficient for the whole EU). Moreover, a high impact/low probability event for one country can be a medium probability event for another country.

Ultimately, there will be policy choices to be made regarding the selection of events that form the basis of the planning assumptions.

The planning assumptions are described using 11 parameters. An overview of the parameters and their definitions are given in Table 1.

Table 1 Parameters of planning assumptions

Type	Parameter	Description
General	**1 Affected countries**	The number of countries that are affected by the initial event. This includes countries that are affected and can cope with their own capacities but are not capable of delivering mutual assistance.
	2 Country size(s) (total population) and general characteristics	The typology of the affected countries, mainly described by population size, but also by other geographic characteristics, such as length of coastline, terrain or degree of remoteness.
	3 Affected area	Description of the size of the affected area in a relevant unit, like square kilometres or number of structures.
	4 Affected population	Number of people affected by the event. This can be subdivided into directly and indirectly affected people.
Direct	**5 Number of fatalities**	The number of fatalities together with the development in time.
	6 Number of injured	The number of people needing medical treatment. This can include information on the time within treatment of the injured that is needed for saving the lives of the injured.

Type	Parameter	Description
	7 Number of people to be rescued	This can be specified by type of rescue needed. It can be presented together with a timeline taking into account 'spontaneous' rescue.
	8 Number of people to be sheltered	This number can consist of the total of people who lost their homes and the number of people that cannot be directly sheltered by absorption in the country or neighbouring countries.
	9 Affected infrastructure	
	9a Telecommunication	Number of people without access to communication, including timeline for recovery.
	9b Drinking water	Number of people without access to clean water, including timeline for recovery.
	9c Power	Number of people without power, including timeline for recovery.
	9d Transport routes	Kilometres or percentage, including timeline for recovery.
	9e Health	The number of health facilities that are no longer operational.
Response and recovery	**10 Recovery parameters**	Some events have consequences that need special attention in order to start the (early) recovery phase.
	11 In country capacity	Expected available capacity given the typology of the country.

3.4 Capabilities

In order for the assessment framework to serve its purpose, it will be necessary to provide a clear understanding of the terminology used. The standard nomenclature of the UCPM is not always helpful in this regard, as it uses the term "capacity" to describe both the module itself and the number of them. For this reason, it is necessary to differentiate between these two meanings of the term "capacity" in order to avoid confusion. Providing such differentiation will also add logic to the definition of modules, the aspirational number of modules provided (capacity goals) and the actual number of them available to the UCPM.

The word "capability" in this report therefore refers to a set of skills and resources combined to deal with a pre-defined set of circumstances. It is the answer to the question "what is needed?".

An example of a capability is "Urban Search and Rescue" (USAR) or "Pumping". USAR refers generically to the ability to deliver resources (people with the necessary urban search and rescue skills) and equipment required to respond effectively to an incident. Two modules are defined in the Implementing Decision 2014/762/EU that directly contribute to this capability, namely "Heavy Urban Search and Rescue" (HUSAR and "Medium Urban Search and Rescue" (MUSAR). Other non-module resources can be delivered as part of the USAR capability, such as structural engineering expertise and seismic monitoring.

Where more than one type of module contributes to a capability, the two words remain distinct and have different meanings.

3.5 Capacities and capacity goals

The term “capacity” (or “capacities”) is used in this report for units that can deliver the results for a capability and is the answer to the question “how much is needed?”. A combination of modules and other resources can create a capacity. For example, if a capability called “USAR” is created through the deployment of HUSAR and MUSAR modules, then a group of these modules would be termed a “capacity”. The entire provision of HUSAR across the UCPM would rightly be termed “the HUSAR capacity”.

The word “capacities” can be used to describe the entire combined inventory of modules, other response capabilities and experts of the UCPM.

In the context of this report, the term “Capacity Goals” refers to the total number of modules and capabilities required to create sufficient capacity to address the needs flowing from DG ECHO’s planning assumptions for civil protection.

3.6 Modules

According to Decision No 1313/2013/EU, “module” means a self-sufficient and autonomous predefined task- and needs-driven arrangement of Member States’ capabilities or a mobile operational team of the Member States, representing a combination of human and material means that can be described in terms of its capacity for intervention or by the task(s) it is able to undertake.[23]

The general requirements of each type of module are defined in the Commission Implementing Decision 2014/762/EU or its subsequent amendment Commission Implementing Decision (EU) 2018/142 of 15 January 2018, which lay down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism.

A module or group of modules combined to have an effect are described as a capability e.g. a MUSAR module when deployed or combined becomes part of a USAR capability.

The number of modules provided for a particular event is described as a capacity and the total number of modules provided to support planned-for events across the entire UCPM is described as a capacity goal.

[23] Decision No 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism

4 Redefinition of modules

As required by the Terms of Reference (ToR), Task 1 has involved collecting and analysing the available evidence regarding the appropriateness of the currently available response capacities considered in Annex II of the Commission Implementing Decision No 2014/762/EU, both in terms of definitions and quality requirements, and in terms of past response experiences and the most recent national and European risk assessments.[24]

Based on this research, this section presents the evidence gathered and highlights possible redefinitions that could be applied to existing modules and their general requirements. These suggestions can inform a discussion amongst the European Commission, Member States and others. Section 4.1 lists the modules that are currently defined by the 2014 and 2018 Implementing Decisions. Section 4.2 then presents a general overview of relevant issues for each sub-set of modules. This is followed in sections 4.3 to 4.11 by a more in-depth discussion of each of the modules individually.

4.1 Current response capacities

The table below presents the modules listed in Annex II of the 2014 Implementing Decision, as amended by the 2018 Commission Implementing Decision.[25] The 2018 Implementing Decision added four medical modules – EMT 1 type fixed, EMT type 1 mobile, EMT type 2, EMT type 3 - in line with the classification and standards of the World Health Organisation (WHO).

The codes from the Decision are those used in this report, as a shorthand way of referring to each module. Two modules are outside the scope of the study: Aerial forest fire fighting module using planes (FFFP) and Aerial forest fire fighting module using helicopters (FFFH).

Table 2 Modules currently defined in the 2014 or 2018 Implementing Decisions

Code	Module
AMP	Advanced medical post
AMP-S	Advanced medical post with surgery
CBRNDET	CBRN detection and sampling
CBRNUSAR	USAR in CBRN conditions
EMT1 fixed	Emergency medical team type 1: Outpatient Emergency Care – fixed
EMT1 mobile	Emergency medical team type 1: Outpatient Emergency Care - mobile
EMT2	Emergency medical team type 2: Inpatient Surgical Emergency Care
EMT3	Emergency medical team type 3: Inpatient Referral Care
ETC	Emergency Temporary Camp
FC	Flood containment
FFFH	Aerial forest firefighting module using helicopters

[24] Commission Implementing Decision of 16 October 2014 laying down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism and repealing Commission Decisions 2004/277/EC, Euratom and 2007/606/EC, Euratom

[25] Commission Implementing Decision (EU) 2018/142 of 15 January 2018 amending Implementing Decision 2014/762/EU laying down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism.

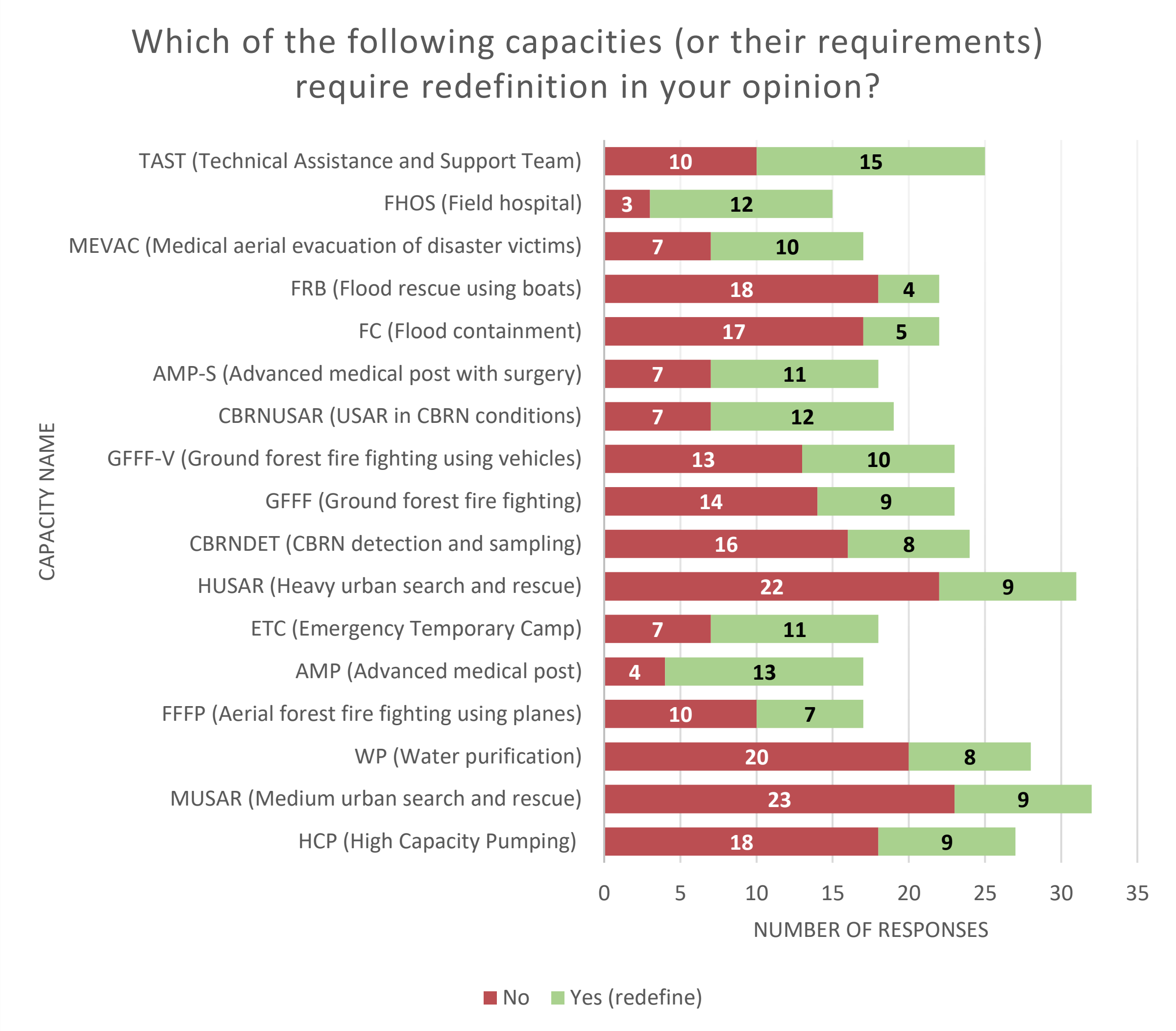
Code	Module
FFFP	Aerial forest fire fighting module using planes
FHOS	Field hospital
FRB	Flood rescue with boats
GFFF	Ground forest fire fighting
GFFF-V	Ground forest fire fighting using vehicles
HCP	High Capacity Pumping
HUSAR	Heavy urban search and rescue
MEVAC	Medical aerial evacuation of disaster victims
MUSAR	Medium urban search and rescue
TAST	Technical Assistance and Support Team
WP	Water purification

4.2 Overall findings

4.2.1 Survey evidence

Evidence from the literature, interviews and the survey suggests the need for some minor revisions of the module definitions, as shown in the figure below. A clear majority was against any redefinition of HUSAR and MUSAR, perhaps reflecting satisfaction with the current alignment with INSARAG standards. There was also a strong majority against redefining the two flood modules (FC, FRB) and a clear majority against redefining the two water-related modules (HCP, WP). In contrast, there were majorities in favour of redefining the medical modules (AMP, AMP-S, FHOS), as well as TAST. Whilst these results provide a useful indicator, it should be noted that respondents may have been expressing a view on modules in which they are not experts. For that reason, the survey results were tested against evidence emerging from the interviews of modules and of experts.

Figure 4: Survey evidence on modules requiring redefinition



4.2.2 The module concept

Some interviewees suggested that, as the number of scenarios to which the UCPM is expected to respond evolves, the concept of **deploying modules will remain important but will increasingly be complemented or even replaced by other approaches**. In some scenarios, the deployment of "traditional" modules may be too onerous, or inflexible, to respond to the evolving risk landscape. For example, one national contact point highlighted the added value in keeping the system flexible, as national contexts vary and teams can be created in different ways. Another reported that most EU Member States have their own capacities, so are more likely to only need experts who can be deployed quickly. A shift to a more responsive and flexible needs-based approach, which relies more on the initial deployment of experts and the use of more strategic stockpiles, is suggested as an alternative. Stakeholders point to recent activations as evidence of this shift, with increasing requests for expertise or specific assets (such as personal protective equipment or medical countermeasures) and a limited number of requests for the different modules. Indeed, one national contact point highlighted the need for specialised capacities for particular incidents or advisory missions. Particularly during the very early stages of an emergency, there is an increasing need for swift deployment of technical expertise to make the appropriate assessments and support the relevant country in their analysis.

4.2.3 Redefinitions in line with international standards

Where interviewees and survey respondents offered a view, they were unanimous in supporting the definition of EU modules according to existing international standards where these exist.

Interviews with DG ECHO officials underline a trend towards **increasing standardisation of module definitions**, particularly with regard to USAR and medical modules which are now expected to align with international standards set by the International Search and Rescue Advisory Group (INSARAG) of the United Nations and the World Health Organisation (WHO) respectively. The 2014 and 2018 Implementing Decisions alignment of the USAR and EMT modules in line with the INSARAG and WHO standards respectively was seen as beneficial by all module experts who expressed a view. Similarly, the national contact points generally supported the trend towards using international standards for USAR and medical capacities. At the same time, some national contact points raised concerns that if such an approach is applied more widely, it may prevent them from being able to register modules which might be perfectly adequate to respond to the majority of activations.

European Commission officials also reported that the use of international standards – where these exist - may help overcome certain issues related to cross-border deployment and **interoperability** of different modules, another common concern cited by DG ECHO staff. If all modules are certified (or classified) according to a particular standard, they can be expected to be able to work together in a large-scale disaster response scenario. It was also suggested by some DG ECHO representatives that the use of such standards may help to standardise the interpretation of particular terminology, which may be defined or understood differently by different Member States. At the same time, international standards do not exist for some of the most commonly-deployed modules, such as HCP, WP or GFFF-V. In that context, the lack of detail within Annex II of the Implementing Decision may encourage countries to register their modules to the pool, but can create difficulties with regard to deployment, both with regard to the amount of equipment and human resources available within the module and to the ability of different modules to work together.[26] It has been suggested by some of those interviewed at DG ECHO that the use of cross-border or **interoperability guidelines** could help to maintain flexibility while ensuring required standards of interaction. Another possibility would be for the Emergency Response Coordination Centre (ERCC) to introduce an 'interoperability' component to the certification process to ensure that deployed modules are interoperable.

4.2.4 Technology

The Report from the Maltese Presidency on the main achievements at EU level in the field of civil protection suggested that national authorities should ensure that new technologies created in research institutes are conveyed to the emergency response community in order to maximise their effectiveness.[27]

In that context, there is some evidence from different sources of the need for some capacity definitions to incorporate new technologies. For example, many respondents to the survey reported that they were aware of innovations or technological developments that affect the definition of the different capacities. Indeed, respondents were aware of innovations and technological developments in all the modules and particularly in the medical modules (AMP, AMP-S, FHOS) and the USAR modules. In contrast, fewer respondents were aware of innovations and technological developments in the flood-related modules (FC, FRB) and in ETC.

[26] This is primarily a technical issue, related to the different types of equipment used.

[27] Council of the European Union (2017), Report from the Maltese Presidency on the main achievements at EU level in the field of civil protection

The technology mentioned by the highest number of survey respondents (9) was unmanned aerial vehicles (UAVs), commonly known as drones but more accurately (and internationally) described as RPAS - Remotely Piloted Aircraft Systems. RPAS already support a range of modules, including USAR, CBRN and GFFF. This supports the Commission's report on progress and gaps in the EERC, which points to the role of technological innovations for civil protection, such as drones, and moots the idea of "teams with unmanned aerial vehicles" for modules such as forest fire fighting.[28] There is little appetite for a new module involving this technology as applications are so different. A standard to ensure interoperability across module types is supported. Possibilities for inclusion of RPAS and recommendations for how they might be incorporated into existing module operations are discussed in detail in Annex 3.

Other innovations and technological developments mentioned by survey respondents included:

- robots, robotic process automation and artificial intelligence, including assessment by terrestrial or aerial RPAS;
- new technologies in detection and sampling of CBRN agents;
- new technologies for searching for and detecting disaster victims;
- improvements in medical capabilities (e.g. video/audio connection to headquarters via internet to provide consultation and expertise);
- energy-saving or green technologies;
- water barriers built into water tanks;
- equipment for creating clean water from saltwater;
- molecular genetic analysis;
- different types of tents;
- Types, technologies and capacities of pumps;
- Different types of tents.

While these innovations were referred to as part of the online survey, they have not been explored in significant detail in this report. This is largely because such developments are too specific and technological innovation too fast-paced, that it would not be reasonable to update modules to include them. Rather, definitions should remain flexible enough to incorporate current and future technological developments. As discussed above, the primary innovation raised through the stakeholder survey – RPAs – has been discussed in some detail in the Annex.

4.2.5 Self-sufficiency

Article 12 of the 2014 Implementing Decision defines the elements of self-sufficiency that certain modules must comply with. Of the 17 modules defined in Annex II, 14 must comply with all the requirements of Article 12. The other 3 (FFFH, FFFP, MEVAC) are only required to comply with elements (f) and (g).

Self-sufficiency is a necessary part of modules under the UCPM. In most cases, the certification of modules found that that they were self-sufficient when looking at table-top and real-life training exercises. However, case studies from evaluations demonstrate that this is not always the case when modules are deployed. The Lessons Learned Meeting in January 2017 found evidence of failures in terms of financial self-sufficiency during emergency relief operations in Ecuador.[29] Moreover, despite

[28] COM(2017) 78 final, Report from the Commission to the European Parliament and the Council on progress made and gaps remaining in the European Emergency Response Capacity.
[29] Outcomes of the Technical and Operational Level Lessons Learned Meeting on 24 January 2017

being well reviewed in their certification reports, some HCP modules, one WP module, and one TAST module found that their shelter capacity – in particular, the robustness of their tents in extreme weather – was lacking.

European Commission staff and a number of national contact points raised concerns with regard to the self-sufficiency of different modules, although the severity of the problem depends upon the context in which a module is being deployed. In theory, **a module should not exert additional pressure on the host nation, meaning that they should be responsible for their own food and fuel**. Depending on the context, however, it may be appropriate to buy these items locally or this may put further strain on local infrastructure and they may be expected to bring these items with them. Countries report difficulties with regard to specific activations, where certain modules where perceived as not being sufficiently equipped with food and fuel or not being self-sufficient in communications. For example, the certification report for one HCP module noted that there were insufficient methods for back-up communications beyond mobile phones.

Four suggestions were offered by DG ECHO staff and/or national contact points regarding self-sufficiency:

- Developing **support modules for horizontal needs** (base camp, transport, logistics, field kitchen, fuel), which would enable deployed experts to concentrate on their core activities.
- Development of a **working definition of self-sufficiency**, which would help address the fact that the concept of self-sufficiency may be understood differently in different Member States. Some consultees suggested that it could be more nuanced within the legislation, as it is currently a requirement for all modules but may be more relevant for some than for others (i.e. those which involve only the provision of equipment).
- **Clearer guidelines on self-sufficiency**, which would be welcomed by most Member States.
- Inclusion of **information in the fact sheets** on the self-sufficiency of different capacities, to enable host countries to know what level of self-sufficiency the different modules are able to sustain.

A further question to consider is whether "other response capacities" should be required to be self-sufficient. For example, it was mentioned that the providers of water pumps might not be self-sufficient but require host nation support to function and establish a pumping system. Additional team members might be able to reduce this dependency.[30]

4.2.6 Interoperability

A number of national contact points have raised concerns which reflect the questions raised by DG ECHO staff with regard to the **interoperability** of the modules of the same type from different countries. Better definition of **operating procedures** within large-scale emergencies (with multiple modules being supplied by different countries) may also help to overcome the technical and cultural issues reported by some Member States. The use of cross-border or **interoperability guidelines** could help to maintain flexibility while ensuring required standards of interaction.

As noted above, the use of **international standards** may help overcome certain issues related to cross-border deployment and interoperability of different modules. If all modules are certified (or classified) according to a particular standard, they can be expected to be able to work together in a large-scale disaster response scenario.

Countries report technical difficulties between similar modules from different countries (such as, for example, different couplings for water hoses and pumps) which can negatively affect the modules' capacity to interact with each other. For example, the certification report for one HCP module noted

[30] This could also be solved at national level through the task force concept.

a lack of standardisation related to hygiene control procedures (such as waste management) between this module and the WP and FC modules.

4.2.7 Medical protection for responders

Definitions have highlighted gaps in the area of certain cross-cutting and pan-module issues. One issue raised through interviews and expert evaluation is the **health protection of responders** from primary and secondary consequences of deployment as any module may be requested for deployment into a raised bio-risk environment.

Much work is currently being undertaken by the Commission to co-ordinate national access to medical countermeasures in the form of creation of stockpiles of vaccinations and antidotes. This access needs to be mirrored within the definitions of the UCPM to ensure that **personnel deployed as part of modules are adequately protected** at least to the same levels as those provided in the host nation. This has been discussed as possibly being a national responsibility but this ceases to be the case when operating as part of the UCPM.

4.3 Flooding

4.3.1 Issues

In general, the modules related to flooding seem fit for purpose, although two **concerns have been raised with regard to the flood containment (FC) module** and the extent to which it is suitable within the context of international emergency response. The first issue relates to the equipment's weight, which necessitates deployment by land, thus limiting the distance over which an FC module may be deployed, and potentially limiting the efficiency of deployment (it may take a long time to arrive at the site of a disaster). A second issue relates to the need for such a module. Within Europe, many countries have their own flood containment capacity as part of their flood management plans required under the EU floods directive and thus do not request international deployment of flood containment as defined within the UCPM. Requests tend to be for sandbags as in-kind assistance to supplement their own capacity. We have therefore included suggestions within Sections 7 and 8 for the incorporation of sandbags into the European civil protection pool.

One further issue raised by module experts is the **multiple contexts in which the flood modules work**, which may have implications for the definitions. The HCP module, for example, has a dual function – fire-fighting and flood mitigation - and the module description could be further developed to better reflect requirements under the two functions. It was reported that modern pumps can relieve flooding without the requirement to deliver water under pressure over a distance (which is needed for fire-fighting) and increased efficiency of pumps (delivery of more water with smaller pumps, less fuel, etc.). Given that international deployments to date have mainly related to flooding, it may be that any requirements for fire-fighting might be better served by the definition of a separate new module. However, as described in section 4.3.2, it may be preferable to retain the dual function of the HCP module (i.e. providing water for firefighting and relieving flooding). The current definition of the FRB module is in general seen as adequate, and no redefinition is required, however some further detailing of the requirements could be useful.

4.3.2 High Capacity Pumping (HCP)

Despite the dual function of the HCP module, most stakeholders consulted would like to retain the flexibility within the module definition. Most countries use their existing national capacities and hence a variety of equipment and responses exist, with modules able to change composition (team and equipment) in order to cover the most relevant distance/depth required and ensure the most effective response to the situation. However, it was also queried whether the inclusion of a single type of pump to cover all aspects of the module in terms of volume and distance could be beneficial.

Different categorisations of the module (high/medium) could be developed to further detail deployment capacities, allowing the host country to choose the most effective response to the specific situation i.e. medium capacity (as reflected in the current module) for fire-fighting and high capacity (exceeding these requirements and in line with the already as other response capacity registered larger pumps) for flooding.

It was also proposed that the module definition should include further detail. The reduced capacity "to pump 40 metres height difference" is not specific it would be better to formulate it as a clear output such as a capacity of $500m^3$/hour with a height differences of 40m is appropriate. Equally, a specific pressure should be stated to ensure the module is fit for purpose for fire-fighting: the final point on the module capacities should be revised to "deliver water at a pressure of 3 bar over a distance of 1000 metres".

Other suggestions that were put forward during the consultation regarding redefinition of the modules are listed below:

- All-terrain vehicles are a necessity as the module is deployed in flooded areas where roads are unusable or hard to follow. At the same time, such vehicles are not suitable for travelling long distances and hence the possibility to loan them in the host nation should be considered.
- Realistically, transport by land is the only option if there is full deployment of the module due to the weight of the equipment and national air force capacities (most would need assistance). Hence geographical proximity could be an important factor in deployment. Air deployment could be incorporated in the module as an add-on.
- The module training is overly complicated and expensive – it is not necessary to send people and pumps for the training: the challenging aspect is the operational problem-solving and therefore training (sharing knowledge, capacities and being able to cooperate strategically) can be undertaken without the long distance transportation of heavy equipment.
- The requirement of pumps to be able to work with water containing 40mm large particles is seen as an unrealistic capacity.

4.3.3 Flood Containment (FC)

Despite numerous flood-related disasters within Europe, FC modules have rarely, if ever, been deployed within the UCPM, although sandbags have been deployed on several occasions as a form of in-kind assistance. In interviews of national contact points, the need for the FC module was never specifically mentioned. National contact points reported that flood containment was generally conducted using locally-available solutions and capacities. Indeed, many EU Member States have their own flood containment equipment as part of the flood management plans required under the Floods Directive. Where international assistance was needed, this was in the form of material (e.g. sandbags), rather than modules. Moreover, the modules are not suitable for deployment by air, which severely limits their utility. Overall, this implies that the current FC module may not be the right answer to the need for flood containment during a disaster.

Alternative options to contain floods, could be defined as other response capacities or as an in kind assistance, most notably sandbags. The requirement for a sandbag-filling machine was seen as superfluous by a majority of those consulted, as host nations usually have equipment. Flood containment could, sensibly, therefore be another response capacity or in kind assistance rather than an individual module.

If FC does remain as module the following comments made should be taken into account:

- Whilst theoretically there is no distance limitation for deployment, new barriers need to be assembled at a very early stage in the flooding, preferably before the flooding occurs, to be useful. This restricts the deployment of this module both in terms of timing and radius of deployment, especially as land deployment is the most feasible due to the weight of the equipment.

- The prescribed length and height of the barrier is not adequate in all scenarios and topographies (e.g. 0.8m is too low in the case of flash flooding, 1000m long is too short in many situations).
- Activity under the module relates to assembling barriers to prevent flooding, not “reinforce(ing) existing structures/levees” and wording to this end should be deleted.
- There is significant variation in deployment under this module, it is highly situation dependent: a structure is built as quickly as possible and then the team wait for the water to recede, assess the situation and adjust, therefore a specific mention to minimum a 10 day deployment is not relevant in relation to the whole team as following the initial “build”, shifts of only 2 people at a time are needed.

4.3.4 Flood Recue with Boats (FRB)

In general, the FRB module is seen as relevant and fit for purpose. However, a number of suggestions have been raised regarding potential redefinitions. These are listed below:

- There is a mixed view regarding the inclusion of divers. Modules do not often have rescue divers available as they tend to sit within the local Fire Brigade. Deployment is faster and collaboration more effective and efficient with a pre-existing team. However, the lack of a diver can hinder/prevent rescue and personal equipment limits ability of other team members to dive. One module takes diving equipment but purely to ease logistic issues (e.g. open /close/remove obstacles). It was suggested this could be an add-on or extra, used when required, but not part of the core definition.
- The ability to work together with an aerial team in both search and rescue may include the ability to winch people to rescue. This is not explicitly stated, yet personnel must be trained to do this. It does not always form part of regular training, and hence generally the training requirements should be better specified in the module. This skill could be formulated as an add-on to the module.
- RPAs can be useful when moving the module to get a quick overview of the situation on the ground. However, the broad geographical coverage of a flood means their use can potentially be limited under this module.
- Additional clarity would be welcomed over the role of medical staff in terms of meeting first needs. It is assumed that boats are used to transport people to medics who must be able to stabilise and treat them, rather than including a medic on each boat, but this could be made clearer.
- A trained boat mechanic should be included in the personnel to ensure any damage to the boats can be instantly repaired.
- Greater flexibility could be allowed for in the composition of teams to fit differing situations.
- 10 days may be too short a deployment if it includes 4 days travel time to and from the host country. Longer than 10 days in situ is not needed for rescue purposes.
- Air deployment is a goal but can depend on aspects such as national air force capacity /fleet. Current deployment by land means that the geographically closest module will always be the first to arrive and hence the most relevant in a crisis. Air deployment could be included as an add-on to the module.

4.4 Drinking water

4.4.1 Issues

Drinking water problems within the European Union are usually dealt with at national level or bilaterally. The quality of water required within EU Member States is very high and, as such, the current WP module – which refers to WHO standards - is not fit for purpose for use within the EU. It may, nonetheless, remain relevant to deployments outside the EU, where reference to WHO standards is in line with host nation standards.

4.4.2 Water Purification

As mentioned above, the current definition for water purification does not guarantee water of a sufficiently high quality for EU standards. It has therefore been suggested that the definition could be widened from water purification solely to cover wider water quality and delivery, as the aim of disaster response is to re-establish and enable distribution of a clean water supply rather than water purification per se.

In response to this and to align with current in-country practices, a new module for water transportation has been proposed. This is described in more detail in Section 7.2.1.

A number of suggestions have been raised through the interview and survey consultation with regard to the WP module definition. These are listed below for consideration:

- A reference to the capacity and equipment to distribute water produced in the field is missing from the current WP module.
- The minimum production of drinking water of 225,000 litres per day does not realistically reflect all situations.
- The reference to WHO standards is insufficient; local, HACCP and ISO standards need to be taken into account. A suggested modification is "to the level of WHO and host nation standards" although it should be noted that not all current registered modules reach the standards required in EU countries.
- The module is highly situation dependent and must be flexible to allow for different modalities. 12 weeks is a very significant deployment length, and shorter deployments or rotations would be expected. Some modules specify this explicitly, that the deployment of material is 12 weeks but handover from the original team (deployed for a minimum of 10 days) is expected.
- The module should include an additional main component: experts in well rehabilitation, water sanitation and restoration of other original sources of water. A swifter restoration of original water sources and reestablishment of infrastructure would reduce the length of deployment required.
- Air deployment could be incorporated in the WP module as an add-on.
- A reference to the capacity and equipment to distribute water produced in the field is missing from the module definition; currently mobile taps are utilised by every module to distribute in the field.

4.5 Medical

4.5.1 Issues

Interviews with DG ECHO officials, national contact points and module experts show support for **increasing standardisation of module definitions**, namely the move away from AMP, AMP-S and FHOS towards EMT1, 2 and 3 as defined by the World Health Organisation (WHO). A large number of survey respondents recommended (through their responses to open questions) that the AMP, AMP-S and

FHOS modules should be redefined as EMT modules in line with the terminology and requirements of the WHO.

Although the requirements outlined in the WHO guidance are more burdensome than the definitions laid out in the 2014 legislation and allow for less flexibility at national level. This is a cause of concern for some of those interviewed, who felt that the increased requirements of the EMT2 and EMT3 in particular might not be necessary and could potentially block adequate medical support teams from being deployed. It was generally agreed by all stakeholders that these trade-offs are worthwhile in order to achieve **greater international interoperability** and a clearer understanding on the part of host nations with regard to what is being provided by each module.

The ongoing transition of many of the medical modules currently registered in CECIS and the civil protection pool into EMT1, EMT2 and EMT3 type modules means that there has been limited deployment of the EMT modules. However, 4 EMTs were deployed as part of the international response to the Typhoon in Mozambique in (April/May) 2019. This has allowed for some initial learning to be drawn and interviewees who were involved in these deployments have highlighted some particular concerns. These relate mainly to the **management and coordination of the different medical teams**, for example with regard to providing enough **space and transportation options** being available for the EMT 2 and 3 types.

It is particularly important for EMTs to be able to interact with each other, and with national healthcare providers in order to ensure that patients are referred in a timely manner and receive a satisfactory level of ongoing treatment. Specific gaps identified with regard to this more systemic view of healthcare include transport (both on arrival and between different healthcare modules), **specialised cells** to treat particular types of patients (e.g. **burns victims, rehabilitation units, non-trauma emergencies and patients with infectious diseases**) and to ensure **ongoing public health needs**, such as chronic illnesses, psycho-social support, pre-natal and neo-natal support and paediatrics are also appropriately met.

Several survey respondents also mentioned that changes are needed in the requirements for EMT deployments, particularly in light of the changing environment of disasters. Indeed, the Commission has proposed that a rescEU module would offer key capabilities, specifically in the field of EMT (including MEVAC) during HILP events including CBRN disasters.[31] Interviews with module experts highlighted that EMTs are often requested for **deployment in fragile states or conflict/post-conflict scenarios**. It was suggested that additional consideration could be given to the implications this may have in terms of staff training and the types of treatments that might be expected (e.g. gunshot wounds). Some EMTs specify that they only deploy to non-conflict scenarios.[32] EMTs are also expected to stay in place for much longer than was previously the case, as has been seen in the recent deployments to Mozambique. This causes some problems with regard to staffing, with some module experts and international organisations suggesting that it may be appropriate to train local healthcare workers in order to leave them in charge of the EMT or that different EMTs could be flexible in terms of sending personnel from one Member State to staff an EMT which has been established by another Member State. For other interviewees, such options are not possible. The Ebola crisis was also reported by one national contact point to have raised challenges in terms of how to respond and shown that the EMT needs to be developed a lot more, perhaps with different strands within.

A final issue raised following the deployment in Mozambique is the requirement to leave an EMT in-country. For some Member States, this requirement was not problematic but for larger EMT 2s, it was viewed as particularly onerous.

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[31] For example, see: DG SANTE (2018) Flash report from the Plenary Meeting of the Health Security Committee (HSC) 14 December 2018, Senningen/Luxembourg.

[32] Those are deployments outside the EU which is not the focus of this study

4.5.2 AMP and EMT1 (mobile and fixed)

The Advanced Medical Post (AMP) represents the smallest and most basic of the three medical modules. This allows for rapid deployment in order to perform triage, referrals and basic medical care during daytime hours. Under the 2018 Implementing Decision, the EMT1 mobile and fixed modules were introduced.[33] The EMT1 mobile is equipped with vehicles in order to travel to more remote locations and provide first aid, triage and basic treatment for very minor injuries (at least 50 patients per day). The EMT1 fixed provides outpatient care for at least 100 patients per day. The type of care provided by the EMT1 fixed is similar to the EMT1 mobile, however its more permanent structure means that twice as many patients are expected to be seen in a day.

There is support for redefinition of this module and the ongoing effort to upgrade the definition to EMT1 in alignment with WHO standards. Of the survey respondents offering a view, more than three-quarters see the need to revise the definition. This issue is addressed by the Amendment of 2018, which seeks to upgrade this module to Emergency Medical Team Type 1: Outpatient Emergency Care (EMT1) in line with the classification and minimum standards for foreign medical teams of the WHO.[34]

Specific suggestions that were put forward during the consultation regarding redefinition of the modules are listed below:

- One particular issue raised with regard to the AMP were the deployment times. The 12 hour availability requirement was seen as onerous by some module experts. Some experts mentioned that while AMPs can provide basic services after one hour, this sometimes caused tension with patients who arrived expecting services which were not yet available.
- Regarding EMT1 fixed, interviewees raised concerns with regard to the deployment time. Whilst all interviewees were able to meet the minimum requirement of 14 days, for some it was difficult to accept a longer deployment time due to the need for a change of staff after 2 weeks.
- Concerns were also raised with regard to transportation for the EMT1 fixed. As this module only provides basic healthcare, it can be expected to make a significant number of referrals. It is not seen as practical to require EMT1s to be equipped with their own transport (this would cause them to become much heavier and harder to transport), meaning that it is very important for transportation to be provided either by the host nation or through a supporting module.
- Regarding EMT1 mobile, as with the EMT1 fixed, interviewees raised concerns with regard to the deployment period. Whilst all interviewees were able to meet the minimum requirement of 14 days, for some it was difficult to accept a longer deployment time due to the need for a change of staff after 2 weeks.

4.5.3 AMP-S and EMT2

The AMP-S and EMT2 provide all of the services provided by an AMP/EMT1 as well as basic surgery and inpatient care. Provision is available 24 hours a day. The EMT2 provides a larger spectrum of services than the AMP-S and, in some cases, almost reaches the standard of a field hospital or EMT3.

There is support for redefinition of the AMP-S module and the ongoing effort to upgrade the definition to EMT2 in alignment with WHO standards. Of the survey respondents offering a view, more than half see the need to revise the definition. This issue is addressed by the 2018 Implementing Decision, which seeks to upgrade this module to Emergency Medical Team Type 2: Inpatient Surgical Emergency Care (EMT2) in line with the classification and minimum standards for foreign medical teams of the WHO.

[33] Commission Implementing Decision (EU) 2018/142 of 15 January 2018 amending Implementing Decision 2014/762/EU laying down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism.

[34] https://www.who.int/hac/global_health_cluster/fmt_guidelines_september2013.pdf?ua=1

Other suggestions that were put forward during the consultation regarding redefinition of the modules are listed below:

- The primary issue raised with regard to the AMP-s relate to a lack of standardisation between different modules (for example, one module expert reported that cushions had been used as hospital beds in the AMP-S). The introduction of EMT2s is designed to overcome this problem.
- The EMT2 model is very large and this has created some problems with regard to deployments. For example, in Mozambique it was difficult to find appropriate locations for the EMT2s which were deployed there.
- The requirements imposed by the EMT2 are seen as quite stringent and it is feared that this may be too much for some countries, who have a medical post with surgery but may not be able to support a full EMT2. That said, there is still majority support for the decision to align the EU with the WHO standard.
- The requirement to leave the EMT equipment behind is difficult, as the cost of recreating an EMT2 from scratch is high.
- A significant gap identified by module experts relates to transportation on-site – there are no specifications regarding this and it has led to some difficulties with the referral system.
- Other logistical issues, such as translation, have also proved problematic during deployment.
- It may be useful to consider deploying parts of the EMT2 in a modular way – at the moment, module experts are unclear if this is possible but such a needs based approach could overcome some issues related to space. For example, it has been suggested that the capacity to put a surgical cell into an existing facility would be useful.
- There is a gap with regard to facilitating the coordination provided by the host government.
- Module experts also suggest that the use of specialist cells (dependent upon the nature of the deployment) may help to complement the EMT2.
- It was suggested that greater consideration be given to which modules need to be deployed together, in order to ensure that the response is effective. One module expert calculated that an EMT2 requires approximately 14,000 litres a day and produces 14,000 litres of wastewater daily. This would mean that a Water Purification module would be a useful complement to an EMT2. It would be expected, however, that the module's own requirement for self-sufficiency would render this unnecessary.

4.5.4 FHOS and EMT3

There is support for the redefinition of the FHOS module and the ongoing effort to upgrade the definition to EMT3 in alignment with WHO standards. Of the survey respondents offering a view, four-fifths see the need to revise the definition. Four survey respondents recommended (through their responses to open questions) that the AMP, AMP-S and FHOS modules should be redefined as EMT modules in line with the terminology and requirements of the WHO.

This issue is addressed by the 2018 Implementing Decision, which seeks to upgrade this module to Emergency Medical Team Type 2: Inpatient Referral Care (EMT3) in line with the classification and minimum standards for foreign medical teams of the WHO.[35]

Given the deployment times involved, the burden of deploying a full EMT3 is perceived as too large for one Member State. Therefore, there has been research into the possibility of a modular field hospital with responsibilities shared between a number of different countries. The idea of a modular

[35] https://www.who.int/hac/global_health_cluster/fmt_guidelines_september2013.pdf?ua=1

approach divides opinion, however, with some experts strongly supporting this approach and others sceptical that it could work efficiently and effectively in a real deployment scenario.

There are two schools of thought regarding development and storage of the module:

- Responsibility for different elements of the module are divided between different Member States, who exercise together regularly in order to ensure that the full EMT3 can be assembled as and when required.
- A full EMT3 is maintained under the responsibility of one Member State or the European Commission and is stored in one location in order to facilitate easier deployment.

Other suggestions that were put forward during the consultation regarding redefinition of the module are listed below:

- Circumstances under which a full EMT3 would be deployed are rare. However, the risks associated with such situations are perceived to merit the availability of an EMT3. In order to maximise the module's utility, it is therefore suggested that it may be worth exploring which elements of the module could be deployed individually.
- In case of deployment, it is suggested that a needs-based approach be taken, using different configurations of the modules available.
- There were concerns regarding interoperability of a modular field hospital, however in Modex deployments any cultural differences were swiftly overcome.
- Transportation of the module remains a challenge.
- As with the EMT2, concerns were raised with regard to complementary modules (e.g. water purification, TAST etc.). It would be expected, however, that the module's own requirement for self-sufficiency would render this unnecessary.

A number of countries have specialised cells available or are in the process of developing them. It may be useful to carry out a mapping exercise to define what specialised cells would be required and understand any gaps in current availability.

4.6 Shelter

4.6.1 Issues

The Emergency Temporary Camp (ETC) as currently defined appears to sit slightly uncomfortably between two different types of shelter module: mass shelter, e. g. for provision in the event of a humanitarian crisis (e.g. the aftermath of a significant earthquake); and a much smaller shelter module, which could work in support of other modules as a type of basecamp.

A recent attempt to better define a European shelter capacity can be seen in the European Union Mass Shelter Capability (MaSC) Projects, which ran from 2015 to 2016 and 2017 to 2018 respectively. These projects aimed to prepare guidance for planners on the preparation, activation and operational delivery of an Emergency Mass Shelter Capability for use in an EU context. The first project worked on developing standards for a modular, scalable mass shelter capacity, while the second project worked to enhance preparedness of Member States through the identification of detailed deployment requirements. Feedback from project participants suggests that attempts to develop such a module ended in failure, due to the lack of a clear need for a mass shelter capability within Europe and the lack of support for such a module at a European level. It was reported that the overwhelming feeling with regard to a shelter module is that within Europe this is viewed as a national concern, and at the international level there are a number of well-established organisations who are well-equipped and experienced in providing mass shelter.

Some experts and national stakeholders showed interest in a shelter module to help with the ongoing refugee crisis in Europe, either for temporary shelter provision or to act as a reception centre at state boundaries. The capacity gap analysis (see Section 6.1) also identified a need for shelter in a number of the planning assumptions. However, some Member States stated that such shelter would be needed in the form of containers or empty buildings, rather than tents as currently specified. However, it is generally agreed that all Member States have the capacity to shelter affected populations with basic accommodation in schools, hotels etc. Therefore, the need for a tent-based camp is minimal. Any shelter module defined for use within the European Union would therefore need to consider the minimum requirements that would be acceptable for use within EU Member States. The only shelter module that currently exists within the UCPM acts more as a support module/base of operations for other modules deployed through the mechanism.

4.6.2 Emergency Temporary Camp (ETC)

Interviews with Member States have suggested that this module, as currently defined, would not need to meet the need (in terms of quality) for shelter within Europe. Of the survey respondents offering a view, nearly two-thirds see the need to revise the definition. Thus, this module is not perceived to be fit for purpose, as it is believed to be better suited as a support module than a shelter module per se. It has been suggested by a number of experts that it be redefined as such and that it be re-specified as a Base Camp module.

It has also been suggested that expertise (e.g. shelter provision under CBRN conditions) may be more useful than a specified shelter module, especially in the EU context.

4.7 Forest fire fighting

4.7.1 Issues

The UCPM was activated a number of times during the 2016 Forest Fire season. Activations included a scoping mission to Indonesia; full scale deployment to Cyprus and Israel (civil protection pool module, CECIS modules, and the Buffer capacity); pre-deployment to France/Corsica (Buffer capacity; detachment to Portugal (Buffer- capacity); a pre-alert for Slovenia and two Requests for Assistance (with no deployment) from Albania and Montenegro.[36]

The importance of **early notification and clear communication** as situations evolve was underlined, and the need to develop scenarios in order to better prepare for such scenarios in future (including mapping the deployment of ground forces). Furthermore, a significant gap was a lack of aircraft.[37]

A separate “lessons learned” session was held to analyse the response to the 2017 forest fire season. As the forest fire season appears to be one of the biggest annual stress tests of the UCPM, it is an important document in terms of identifying pressure points and weaknesses in the context of multiple activations. The UCPM was activated 17 times during the 2017 forest fire season, including multiple activations by some individual countries. Assistance was provided in ten cases. Important issues impacting on the UCPM’s response included extreme weather conditions (strong winds, drought) which lasted throughout the summer, as well as multiple simultaneous activations and reduced availability of the buffer capacity due to national deployment which impacted the ERCC's and Member States’ ability to respond to all requests for assistance. Key findings emerging from the 2017 forest fire season include a need for better prevention, detection and communication systems, and a request for a more regional approach to improving buffer capacities.

[36] European Commission (2017), Outcomes of the Technical and Operational Level Lessons Learned Meeting on 24 January 2017

[37] Aerial forest firefighting is outside of the scope of this study so this gap is not investigated further in this report.

4.7.2 GFFF and GFFF-V

The stakeholders that were consulted were satisfied with the general requirements of this module as defined in Annex II of the 2014 Implementing Decision. Indeed, of the survey respondents offering a view, only about one-third see the need to revise the definition and none highlighted the need for a major revision.

Other suggestions that were put forward during the consultation regarding redefinition of the module are listed below:

- inclusion of drone technologies, infra-red cameras and satellite images; this was suggested by the UCPM mid-term evaluation and supported by some of the survey feedback for this study.
- inclusion of other professionals, such as foresters and meteorologists;
- capacity to use the EFFIS or other support systems.

  The suggestions given are in fact covered by the forest fires advisory teams which are registered as other response capacity.

In the case of GFFF and GFFF-V, interoperability between units may also be an issue. For example, one instance was cited of inter-operability issues between capacities deployed during the 2018 forest fires.

4.8 USAR

4.8.1 Issues

In general, changing the current definition is not necessarily perceived as a need for USAR because current requirements are general enough to enable deployments. Indeed, of the survey respondents offering a view, nearly three-quarters did not see the need to revise the definitions of MUSAR and HUSAR. It was noted that there is added value in keeping definitions flexible because national contexts vary and teams can be created in different ways. If definitions were more detailed, it would be harder to create teams to fit requirements.

Some issues were nonetheless noted in terms of how the definitions fit their purpose. In fact, some experts noted discrepancies between what is defined in the 2014 legislation and the current situation in the EU as regards USAR deployments.

In the last few years, it seems USAR teams have increased in size (i.e. personnel). Experts have thus highlighted the need to deploy a rapid response light USAR team (LUSAR) in small independent cells, to start the initial set-up process and/or initial searches to allow for the heavy components to arrive later. LUSAR is regarded as a useful idea, especially at bilateral level. Some countries are already developing LUSAR capacities.

Further to this, those consulted note an over-capacity of USAR teams within the UCPM. The “market” is saturated at EU level: experts have commented that there is no need for so many teams within the EU, especially since for many countries, an in country USAR deployment is only relevant for a HILP situation (i.e. earthquake risks are in Southern Europe).

Some Member States have never deployed their USAR teams outside their country and/or outside the EU. This suggests it is unrealistic for some USAR team to be deployed outside the EU because of the cost and difficulty to deploy large teams – this is particularly the case for HUSAR.

4.8.2 Medium/Heavy Urban Search and Rescue (MUSAR/HUSAR)

There are some issues with the definitions in so far as they are increasingly being considered as a minimum. The number of personnel included in USAR teams can be much higher than those prescribed leading to inaccurate registration of the module. As examples, HUSAR teams can now be above 100 people and MUSAR teams above 70 people. It is recognised that some countries have de-scaled their USAR teams to have a smaller footprint (=LUSAR). The number of people in any team varies from one country to another, as the INSARAG guidelines provide standard criteria only for the capability of teams, not for the actual number of staff.

HUSAR is a very specific high-quality requirement derived from the global risk landscape. It is not well adapted to the EU reality. USAR deployments in the EU are generally to HILO risks (e.g. terrorist attack, building collapse etc), especially in Northern European countries. Moreover, some experts noted that deploying HUSAR outside of their country or outside the EU was highly unlikely, due to the cost and difficulty of deployment. Many EU countries are not geographically located in the vicinity of earthquake-prone regions.

HUSAR teams are prescribed to be deployable in less than 48 hours, however this can depend on the location and the travel time required. Experts noted that establishing air transportation for HUSAR deployments can be a substantial issue as it is expensive to keep flights on standby. One proposal was for the UCPM to guarantee the provision of flights when the mechanism is activated. Alternatively, classified teams could have procedures in place for arranging travel (e.g. call-off contracts with airlines).

4.9 CBRN

4.9.1 Issues

The European Commission's 2017 report on progress made and gaps remaining in the European Emergency Response Capacity highlighted the need to further explore what, if any, additional CBRN capacities might be required. In interviews with national contact points, the need for increased capacity to respond to CBRN events has been consistently raised. This is particularly the case in countries with nuclear power stations close to their borders. National contact points explain that as chemical biological, radiological and nuclear incidents are perceived as low probability at the national level, often have a cross-border element, and require costly response capacities, it may be better to maintain these capacities within a European mechanism such as the UCPM.

The risk of terrorism is acknowledged to have increased the need for specialised and highly trained CBRN response capacities. Recent emergencies have shown that there is a need for the protection of first responders to be addressed more systematically and for the concept of "self-protection" to be translated not only into public awareness programs but also into response mechanisms and capacity building across the agendas of key actors. There is a broader need for the training programme to be adapted in relation to emerging risks and relevant lessons learned from domestic deployments

CBRN (both intentional and accidental incidents) is a complex field with multiple actors and interdependencies. DG ECHO's CBRN response is coordinated with DG HOME and DG SANTE based on a Memorandum of Understanding. DG ECHO also co-operates with DG ENV and the JRC in relation to industrial accidents and in the context of the Seveso Directive.[38] It is further linked with CIMIC frameworks and NATO, and often coincides with national security concerns (which come under the remit of the Ministry of the Interior or Defence at national level). The plethora of actors and the relative unpredictability of many CBRN scenarios needs to be further explored in order to understand which competencies and potential support tools are within the remit of the UCPM. Furthermore, CBRN scenarios can be very difficult to predict, making the development of any kind of early warning systems particularly complex, not least since the task of assessing the risk of malicious acts occurring falls outside the remit of DG ECHO. It should also be highlighted that the full extent of capacity gaps

[38] Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC.

cannot be fully assessed due to the confidential nature of information about risks and about the capacities to respond, which may fall within the domain of the security services rather than civil protection agencies.

CBRN is generally a top priority for Member States. CBRN is a HILO risk but many countries rely on EU networks to address CBRN scenarios, particularly smaller states. This is due in part to the fact that maintaining the skill base of CBRN modules is costly (i.e. human resources) and the main issue reported by the experts consulted is a lack of access to sufficient expertise.

4.9.2 CBRNUSAR

There are many issues with the definition of CBRNUSAR resulting in challenges as to whether it actually exists as a capability. For example, one survey respondent stated that conditions are unrealistic and should be redefined. Based on the capacity gap analysis this module is seen as having limited relevance (see section 8) and it is proposed to replace it with a more generic module: Personal protective equipment and operational support in CBRN environments (CBRN-PROT/CBRNDET). This would be a module with the same kind of technical capability that currently exists within the CBRNUSAR module but would be more versatile and designed to support activity across modules in support of response to events. The definition of the new modules would need to ensure that the module can encompass the current CBRNUSAR role.

All modules may be required to be deployed within a CBRN environment, particularly when considering environments of heightened bio-risk. The definition should reflect this by defining the provision of CBRN protection for all modules.

Suggestions were put forward during the consultation regarding redefinition of the module and included:

- A broader definition to support deployment of all modules.
- Including facilities for decontamination of local people
- Inclusion of specific provision for experts as part of module deployments.

Some of the above has been included within the Capacity Gaps sections of this report to examine emerging needs but the key point here is that CBRNUSAR needs broadening to be able to support all modules as a pan-module capability.

4.9.3 CBRNDET

Interviews with European Commission staff and national authorities have highlighted a need to strengthen the capacity for sampling, forensics and detection, although further clarity is required as to what extent such a capability might fall within the remit of the UCPM. Indeed, one-third of respondents to the survey suggested the need for a revision.

A number of national authorities also mentioned technological advances which have impacts on the definitions of detection and sampling modules. In light of this, modules may need to be updated to reflect **changing techniques for detection,** such as the transition from mobile laboratories to field instruments and a changing concept of intervention.

The requirement for mobile laboratories may need to be reconsidered in the context of technological innovations such as the development of field instruments. This may still form part of other scientific capabilities (e.g. CBRN). However, the need for such a response capacity cannot be pre-planned and may be better served through an effective Expert strategy.

CBRNDET may not be a short-term deployment as contamination can endure for extended periods of time (12+ months for chemical and longer for Radiological). The definitions should describe durations of equipment deployment and expert support in a longer context.

Further suggestions that were put forward during the consultation regarding redefinition of the module are listed below:

- Expansion to include detection and sampling needed for immediate response actions, and detection and sampling for in depth analysis for long term treatment of casualties, recovery and full decontamination of areas could also be useful. However, a more appropriate approach might be to define a new module for CBRN forensics and mobile laboratories, as described above.
- Issue with deployment timescales: if an international deployment is required, victims are likely to already be contaminated and/or face high casualty rates. There is a need to narrow down the definition so it is more specialised whilst recognising that needs may also be protracted.
- More specialised teams that are able to address specific threats are needed in Europe: given the evolution of needs, CBRNDET needs are becoming more complex and thus require larger teams, with more specialised team members. Whilst countries themselves can create CBRN-response teams, it is important for the UCPM to define flexible, open criteria encouraging a range of special skills and capabilities.

4.9.4 CBRN-DECON

Annex 4 offers a definition for a proposed new module: CBRN Decontamination (CBRN-DECON)

In some Member States, such a capability is described as "Mass Decontamination". This is a term generally applied to decontamination of large numbers of affected public. It is suggested that setting such an expectation should be avoided and this definition concentrates on the act of decontaminating people and assets deployed as part of the UCPM. Whilst this capacity could be used for public decontamination (as suggested by one respondent to the survey), it is suggested that this is a matter for operational deployment rather than definition.

Although deployment timing is a critical issue, thinking around the amount of time such a capability might be required has shifted considerably of late where deployment of people into a contaminated zone can go on for many months following the initial incident. Immediate decontamination will of course be undertaken by the affected member state. This capability addresses a longer-term exposure and ongoing incident. For materials/vehicles/buildings the time factor is less relevant because assets can be effectively isolated by the module for later decontamination.

Decontamination techniques are different depending on the type of the agent (dry, wet, extended, etc.), so it is necessary to have a broad capability within this module.

Similarly, detection needs be broad in nature in order to determine the presence of the contamination before and after the operation.

An important component of the module will be its relationship with medical expertise. It is not advisable to try to combine such advice into the module but it will be necessary to use reach-back to obtain support for the medical/decontamination triage of people.

Decontamination of 340 persons per hour is achievable with a single well-equipped vehicle but requires highly trained operatives. It may be preferred to reduce this aspiration for practical and certification purposes.

4.10 Medical evacuation

4.10.1 Issues

The current capacity for medical evacuation within the UCPM is limited to the evacuation of an estimated 50 injured people on stretchers. In many instances, this number would be exceeded.

A requirement for medical evacuation has been raised consistently in interviews with national authorities, often in the context of a high impact, low probability risk which may be considered too expensive to invest in at national level. The development of an EU-level MEVAC capacity may therefore be appropriate.

Specific attention is needed with regard to the evacuation and subsequent treatment of highly infectious patients.

Lessons learned after the Ebola outbreak have shown:

- Limited international capacity for transport and treatment, covering the entire "patient journey".
- Variation in quality of service.
- Lack of national/international command and control.
- To recruit Health Care Workers for deployment in outbreak areas there must be an established plan and a system for both in-country and International medical evacuation.

4.10.2 MEVAC

Redefinition or clarification of the MEVAC capacity is broadly supported by those interviewed both from DG ECHO and at national level (including the three MEVAC modules that were interviewed) and by the one independent expert interviewed.

There may be merit in widening the definition of "disaster victims" to explicitly include international professionals deployed in the context of an international incident. The 2016 report of the European Court of Auditors suggests the need for international workers (for example, within EMT modules) to be given a guarantee of medical evacuation in case of infection during a deployment. This issue arose during the outbreak of the Ebola virus disease in west Africa (March 2014-January 2016), where the current definition in Annex II only refers to the "medical aerial evacuation of disaster victims" and does not anticipate a service specifically adapted to evacuate (potentially) infected medical staff or humanitarian aid workers. The report notes that the lack of such a guarantee deterred some individuals from accepting deployment to the region.[39]

There is also a need to define a new module relating to the evacuation of patients requiring more than basic medical care, i.e. those requiring intensive care or infectious patients. This would involve the provision of additional equipment not included in the current definition and appropriate medical professionals.

4.11 Technical assistance and support teams (TAST)

Interview and survey feedback from Member States suggests that these are perceived as outdated, with a need for more clarification around TAST capacities.

One expert interviewed during the research noted the very wide differences in TAST teams deployed, which reflect the nature of the event and the needs on the ground. For example, a light deployment might feature only two people who provide ICT and administrative support to modules or other experts deployed within the UPCM. In contrast, a fully-staffed team of 12 people would be necessary for events like earthquakes where a tent-based camp is necessary and the local infrastructure cannot be used. The expert noted that the capacities of TAST are defined but there are many differences concerning the equipment. Some TAST have only basic equipment for communication which means,

[39] European Court of Auditors (2016), Union Civil Protection Mechanism: the coordination of responses to disasters outside the EU has been broadly effective, Special Report 33.

that satellite communication can be limited. Some TAST have a special focus on this topic and can provide communications systems with a high bandwidth and high speed.

Several Member States suggested a possible role for TAST in the provision of logistic support for self-sufficiency, however this view is not supported by the majority of them.

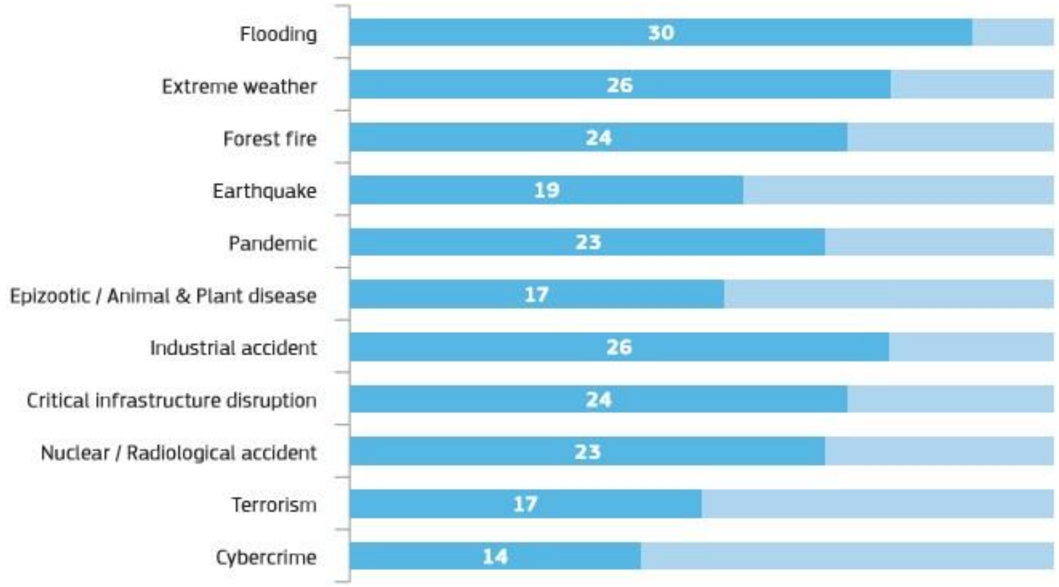
5 Analysis of available risk assessments

This section of the report summarises our analysis of the available risk assessments for Europe related to disaster events. It draws on national risk assessments, the Commission's overview report, international risk assessments by other international bodies, other literature and interviews.

5.1 Risks identified at national level

Despite their different methodologies (as highlighted in Section 2.3.1 above), the national risk assessments show some commonality in terms of the main identified risks. Figure 5 below shows the risks most commonly identified in the national risk assessments from 2015.

Figure 5 Risks identified in the national risk assessments



Source: European Commission COM (2017) 176 final

The **most commonly identified risks relate to natural disasters and extreme weather events**, such as flooding, droughts, high winds, earthquakes and heat-related issues (drought and forest fires). Indeed, as highlighted in the European Overview, flooding is the main common risk faced by European emergency management authorities. Of these, fluvial flooding is the most mentioned risk, accounting for two-thirds of reported historical floods.[40] The European overview also highlights the potential cross-border dimension in the case of river basins located in more than one country (e.g. Danube). **Epidemics** also feature prominently in several of the more complete NRAs, with new, lethal types of influenza considered a concern. The ongoing Ebola epidemic has compounded concerns regarding the risks of epidemic or pandemic, with fears that it may spread to Europe, as cited in some interviews.

It is important to note that these risks have different levels of probability and significance to Member States depending upon their geographical situation. For example, the risk of flooding might relate to only a small part of the population or territory of a Member State, while in another the majority of the country may be at risk from flooding. Furthermore, interview feedback suggests that the **NRAs tend to focus more on what has happened historically than on issues which could be significant in the future**. While there is a logic to using past events to support forecasting, it does risk missing

[40] European Overview Assessment of Member States' reports on Preliminary Flood Risk Assessment and Identification of Areas of Potentially Significant Flood Risk, Final Report, European Union, 2016, p.36.

dangers linked for example to the changing climate or to increasingly interlinked digital infrastructures. In some NRAs, this weakness is recognised and addressed by adding trend analysis and horizon scanning. Also, it has to be noted that most NRAs are considered to be snapshots of the risks with a limited validity in time, with a maximum scope of five years.

Some common emerging risks are, however, noted across the NRAs. **Climate change** is mentioned as a risk driver in eight of the 2017 NRAs studied and in 21 of those for 2018. Countries note that **the impacts of climate change tend to aggravate pre-existing risks in both impact and likelihood, such as flooding and extreme weather**, rather than posing entirely as a new challenge. An even more prevalent emerging risk is that of a **cyber-attack against critical infrastructure**, mentioned in 11 out of 21 NRAs. A cyber-attack can both be seen as a trigger event or an aggravating factor for existing disaster scenarios, such as **power failures and industrial accidents, even with knock-on impacts as far as fires and flooding**. These are sometimes classed as national security, rather than civil protection concerns.

In some of the NRAs, there is consideration of whether the main need is to update existing policies or whether there is a need to develop entirely new policies. This is a matter for each Member State but it results in a disparity of approaches making it harder to draw comparisons across the whole policy landscape. In these considerations, most NRAs do not describe the Member States' policies on how to deal with the risks, particularly those with high impact and low probability. Investments for low likelihood events may be hard to justify. At this stage, there is a question as to whether states will adopt a more uniform approach at national level in the medium-term future. The **level and type of mitigating and preventative actions and the level of what is seen as an acceptable risk determine the capabilities and capacities in response**. Few NRAs go as far as to provide statements of the acceptability of risks or to describe the preventive and mitigating actions.

High-impact, low-probability risks (HILP/Hi-Lo) have been described as "events or occurrences that cannot easily be anticipated, arise randomly and unexpectedly, and have immediate effects".[41] There is, however, no agreed definition of HILP events at the European level and within the NRAs the definitions vary.[42] Additionally, because there is no agreed methodology, differing impact scales and a lack of comparability of risk ratings may result. Low probability is judged according to different standards in different states.

Based on the presentations given at the EU Workshop on High-impact/ Low Probability and the NRAs, some principles to categorise an event as "high impact/low probability" can be derived:

- **Scale** of the event (mass casualties, mass fatalities, mass displacement, psychological effects, etc.) overwhelming the national capacities to respond (including solidarity through the civil protection pool);
- **Duration** of the event (long lasting consequences going above the national capacity to handle);
- Degree of **unpredictability** of the event;
- Degree of **complexity** of the event (or disrupting severely national Government functioning or resulting in a social, environmental, economic, public health critical infrastructure breakdown);
- **Geographical** spectrum: can be both national and multi-national, i.e. have "beyond border" impact – simultaneous or cascading effects or from a 3rd country but affecting several MS, e.g. Chernobyl;
- Specific **indications**; IPCR activation or solidarity clause invocation could be an indication for HILP

[41] www.domesticpreparedness.com/preparedness/preparing-for-high-impact-low-probability-hilp-events
[42] The term High Impact – Low Probability was introduced into UCPM legal basis during the recent legislative review and will be defined in the implementing act.

events;

- **Specificity** of capacities needed: highly specialised, scarce at EU level and very expensive.[43]

5.2 Risks identified at international level

International risk assessments represent a meta-analysis of the NRAs mentioned above, as well as additional studies of EU and global risks. The international risk assessments analysed as part of this study are listed below:

- National Risk Assessments: A Cross Country Perspective (OECD, 2018);
- Words into Action Guidelines: National Disaster Risk Assessment (United Nations International Strategy for Disaster Reduction - UNISDR, 2016);
- Climate change, impacts and vulnerability in Europe 2016: An indicator-based report (European Environment Agency, 2017);
- Climate change and water - Warmer oceans, flooding and droughts (European Environment Agency, 2018);
- Extreme Weather Events in Europe: preparing for climate change adaptation (Norwegian Meteorological Institute, 2018);
- Best practices and methodological guidelines for conducting gas risk assessments (European Commission, 2012).

Taken together, these highlight key international risks which both directly and indirectly affect Member States.

5.2.1 Main emerging international risks

The international risk assessments highlight, in particular, the risks emerging from climate change. For example, the European Environment Agency's Climate Change Risk Report 2016 notes that climate change impacts are wide-ranging and include changes to land and sea temperatures, variations in precipitation, the spread of pests to areas previously inhospitable to them, and rising sea levels. As such, impacts of climate change can be understood as worsening existing conditions, as noted also in the UNISDR Risk Assessment 2017.

Based on the international assessments listed above, emerging disaster scenarios for the EU with regard to climate change can be broadly divided into two categories: direct and indirect. **Direct risks can be defined as those which directly harm infrastructure or lives. Indirect risks, by contrast, represent knock-on effects** of climate change elsewhere in the world indirectly affecting the situation in the Member States. One example of the latter is migration driven by deteriorating livelihoods in parts of Africa or risks to security of food supply. Assessing the likelihood of risks in both categories is difficult.

5.2.2 Implications for the EU's response capacity

Direct and indirect risks associated with climate change represent a challenge for the UCPM in terms of an **increased number of emergencies, and an increasing severity of these events**. This can be expected to lead to more activations of the UCPM and requests for increased levels of assistance, as national capacities are tested by increasingly severe weather events and the effects thereof. As noted above, **climate change tends to aggravate existing types of risks rather than creating entirely new**

[43] Romanian Presidency workshop on Preparing for low probability high impact disasters - way ahead, Bucharest 30 January – 1 February 2019. See: https://www.romania2019.eu/event/workshop-on-preparing-for-low-probability-high-impact-disasters-way-ahead/

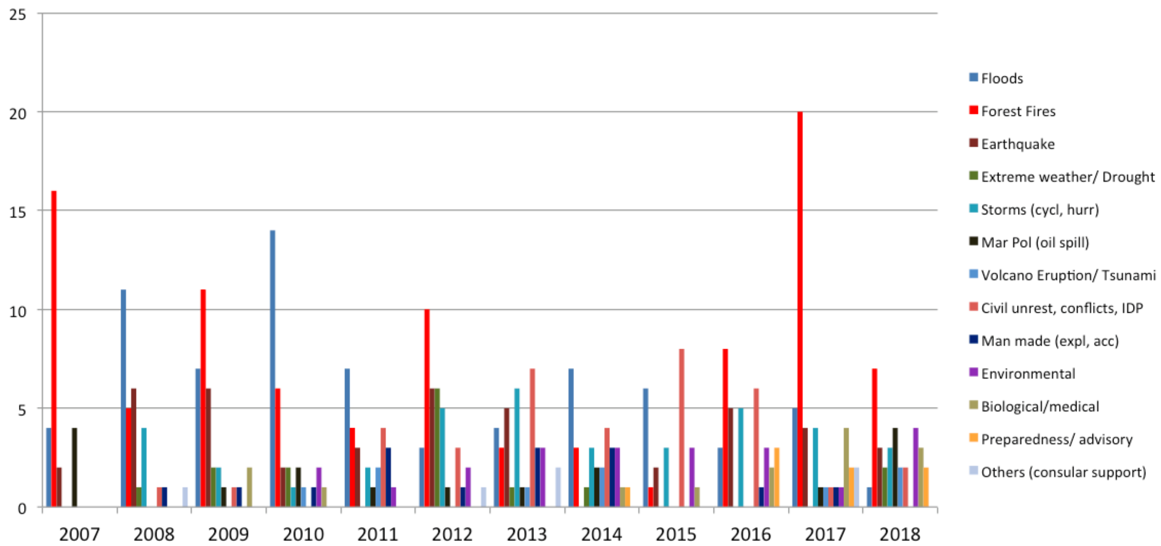
ones. Every NRA includes climate change as an underlying cause but this manifests itself in this study through an increased incidence of specific events (e.g. flooding). On that basis, it would not seem that climate change by itself creates the need to define new types of capacities. Instead, it is likely to increase the need for existing types of capacity. In particular, medical modules and those dealing with natural emergencies (such as forest fires, floods, and extreme weather) will need to expand and adapt to new conditions as preventive measures lose their effectiveness. The implications for capacity gaps and goals within the UCPM arising from the increased risks due to climate change is explored in more depth in the Event descriptions (Section 5.2).

5.3 Risks highlighted by UCPM activations

A further data point for identifying gaps in the existing response capacity is an analysis of **UCPM activations to date**, and the effectiveness of the European response in supporting the party that activated the mechanism. This is one of the key testing grounds for the response capacities, as in deployments the suitability and interoperability of the different modules can be tested as well as the sufficiency of the overall capacity available within the civil protection pool.

Figure 6 provides an overview of the types of events which have led to an activation of the UCPM from 2007 to 2018. This shows that the most common reasons for activations have been **forest fires and flooding**. The implications of these hazards for the capacity goals of the UCPM will be explored in more depth in Sections 5, 6 and 7.

Figure 6 Evolution of hazards that lead to an activation of the UCPM



Source: European Commission (2019)

Major activations linked to high impact, low probability events in this period were:

- Deep Horizon oil spill (USA, 2010)
- Eruption of the Eyjafjallajökull volcano (IS, 2010)
- Ajka alumina plant accident - alkali sludge spill (HU, 2010)
- Fukushima Daiichi Nuclear Accident (JP, 2011)
- Cold wave (SI, 2014)
- Ebola medical evacuation (2014/2015)

- EU citizen evacuation Mumbai YE, US (2015)
- Immunoglobulin Crisis (RO, 2018)

Having reviewed the current approach taken to risk assessment within Member States in this Section, the next section will propose a new methodology using descriptions of “worst possible event” scenarios to inform planning assumptions, which in turn can be used to create the basis for an evidence-based needs assessment of the emergency response capabilities needed at EU level.

6 Risk landscape and planning assumptions

6.1 Outline

In this section, we look at the two elements that make up the Risk Landscape element of our model:

- event descriptions; and
- planning assumptions.

These will be used to develop estimates regarding what can be judged as a reasonable level of response provision in Section 7.

6.2 Event descriptions

This section present summaries of the nine event descriptions. These provide an overview of common events which have been identified as a risk within the different national risk assessments submitted to the UCPM. Each event description describes the nature and impact of such an event, as well as providing a summary of the current regulatory framework at EU level. The events chosen for this exercise represent situations in which it is expected that the UCPM would need to be activated. The full text of the event descriptions is provided in Annex.

6.2.1 Flooding

Flooding is perhaps the primary risk faced by Member States in the UCPM, in terms of both frequency and severity. In national risk assessments provided to DG ECHO by Member States, nearly all rank flooding as a major risk. The most common source of historical flood events is fluvial (66%), followed by pluvial (20%) and seawater (16%).[44]

The economic impact of flooding in the EU is significant, with the EU Solidarity Fund having mobilised over EUR 1.9 million in response to flood events since 2002.[45] The disruption caused by flooding is expected to be further exacerbated by climate change, with the socio-economic impact of river floods in Europe projected to increase by an average of 220% by the end of the century.[46] Climate change is also expected to increase the probability and impact of pluvial floods, particularly flash floods, whilst rising sea levels will increase the risk of coastal floods. In addition to man-made climate change, other interventions such as the location of assets within floodplains, a reduction in water-retaining surfaces and interventions to watercourses or their surroundings all contribute to an increase in the likelihood and adverse impact of flood events.

At policy level, flooding is addressed by Directive 2007/60/EC on the assessment and management of flood risks ('the Flood Directive'). This requires EU Member States to identify river basins and coastal areas at significant risk of flooding and to prepare flood hazard maps, flood risk maps and flood risk management plans for these areas to reduce the occurrence and impact of flooding.

6.2.2 Extreme weather

Extreme weather is understood to include heatwaves, cold waves, droughts, heavy snowfall, storms and cyclones. There are some differences in the types of extreme weather events most likely to affect different countries in Europe. Storms resulting from warm subtropical air meeting polar air in the

[44] National Risk Assessments, as reviewed by CSES/RAN
[45] European Commission (2017), Evaluation of the European Union Solidarity Fund 2002-2017
[46] Joint Research Centre (2018), Technical Report Task 7 – River Floods, available at: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC110308/task_7_floods_final_report_dec2018.pdf

Atlantic are a significant risk to western and central Europe (less frequently, these may progress to southern and south-eastern Europe). Drought and heatwaves are a particular risk for countries located in the Mediterranean, however national risk assessments underline a much broader geographic scope for drought risk (including across central Europe).

According to the European Environment Agency, extreme weather and climate related events caused 90,325 fatalities across its 33 member countries between 1980 and 2017.[47] During the same period, weather and climate-related extremes also caused economic losses of approximately EUR 453 billion (in 2017 Euro value), which accounted for 81% of total losses caused by natural hazards.[48] Climate change is a significant exacerbating factor in extreme weather events. Recent data shows that floods and other hydrological events have quadrupled in frequency since 1980, while climatological events (including extreme temperatures, droughts and forest fires) have more than doubled in frequency over the same period. Global temperatures for June 2019 were 2 degrees Celsius above average across Europe, making it the hottest month in Europe since weather records began. It is expected that climate change will lead to increased frequency and intensity of extreme weather events going forward.

EU policy related to addressing the risks and effects of extreme weather falls under the EU Strategy on adaptation to climate change.[49] A recent evaluation concluded that more action is needed to build the resilience of Europe and especially vulnerable regions.[50] The Water Framework Directive is also a significant piece of legislation in addressing the impacts of droughts.[51]

6.2.3 Forest fire

Forest fires are a recurrent phenomenon in the EU. Latest figures from the EU's Joint Research Centre show that forest fires and other wildfires in the EU in 2017 burned more than 1.2million hectares of natural lands (of which 25% was located within the Natura 2000 network), killed 127 people (including firefighters and civilians) and caused losses of €10bn.[52] According to this source, the countries with the highest risk from forest fires are located in the Mediterranean (Portugal, Spain, France, Italy and Greece account for 85% of the total burnt area in Europe).

As climate change is predicted to exacerbate both the frequency and severity of forest fires, a key issue of concern at EU level is the likelihood of forest fires occurring in multiple countries simultaneously. Indeed, the trend towards dryer and hotter seasons linked to man-made climate change means forest fires are an increasing risk in Northern Europe. Forest fire is identified as a risk in 24 of the national risk assessments provided to DG ECHO by Member States. This risks overstretching the European response capacity in this area.

The EU Forest Strategy represents the European framework on forest management.[53] One of the priorities of this strategy is the protection of forests from different threats. Prevention of fires is also identified as a priority area where Member States need to make progress. Significant financial

[47] The European Environment Agency's member countries are the 28 EU Member States, Iceland, Liechtenstein, Norway, Switzerland and Turkey.

[48] European Environment Agency (2019), Economic losses from climate-related extremes in Europe.

[49] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: An EU Strategy on adaptation to climate change; COM(2013) 216 final.

[50] Report From The Commission to the European Parliament and the Council on the implementation of the EU Strategy on adaptation to climate change; COM/2018/738 final.

[51] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

[52] Joint Research Centre (2018), Forest Fires in Europe, Middle East and North Africa 2017.

[53] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A new EU Forest Strategy: for forests and the forest-based sector; COM(2013) 659 final.

resources have also been allocated for the prevention of forest fires and the restoration of affected areas. Investments by the European Agricultural Fund for Rural Development (EAFRD) during 2014-2020 include EUR 1.7 billion for prevention of damage to forests and EUR 780 million for restoration of damages from forest fires and natural disasters.[54] Funds are also available in 2014-2020 from the European Regional Development Fund (ERDF) and the Cohesion Fund.

6.2.4 Earthquake

Earthquakes are sudden movements of the earth caused by an abrupt release of energy that has accumulated over time due to the friction caused by the movement of tectonic plates. This means that earthquakes tend to be concentrated in areas that lie on or close to tectonic plate boundaries. Earthquakes are a particular concern in south-eastern Europe, due to the location of a major fault line where the Eurasian and African tectonic plates meet. In 2017, 19 Member States cited earthquakes as a risk in the national risk assessments delivered to DG ECHO. One national contact point suggested that there was a need for more action at EU level to address the risks posed by earthquakes (and none contradicted this suggestion).

Research has shown that there was no statistically significant increase in the frequency of large magnitude earthquakes from 1900 to 2011.[55] However, increasing urbanisation and a concurrent increase in population density – particularly in cities located close to fault lines – may have increased the impact of such events in terms of fatalities and structural damage. This problem is further exacerbated by poor quality housing and infrastructure, with 75% of earthquake-related deaths attributed to collapsing buildings. As well as the direct destruction wrought on local infrastructure, earthquakes can trigger significant secondary disasters, such as fires, landslides, tsunamis and floods. Since 2002, the EU Solidarity Fund has mobilised over EUR 1.2 billion in financial assistance related to earthquakes affecting EU countries.

The European Committee for Standardization (CEN, French: Comité Européen de Normalisation) has set harmonised technical rules for the design of structures for earthquake resistance, namely Eurocode 8. The purpose of these rules is to ensure that, in the event of earthquakes, human lives are protected, damage is limited and structures important for civil protection remain operational.[56] A report published by the JRC found that all EU Member States and Norway published as National Standards 100% of the Eurocodes Parts, except Germany and Luxembourg, which did not publish one part, and Spain, which published or ratified 83% of the Eurocodes Parts.[57] EU policy also refers to the UN's Sendai Framework for Disaster Risk Reduction. Two main preventive measures can help to limit the impacts of earthquakes with regard to new construction: micro-zoning, taking into account fault lines and soil composition, when making decisions on the location of building areas; and application of relevant building codes and zonation in land use planning in order to reduce the severity of human, structural and economic impacts of earthquakes.

6.2.5 International medical emergency

In general, the risk of an international medical emergency can be expected to be intertwined with other scenarios, such as earthquakes or forest fires, which can cause many casualties and overwhelm local healthcare provision. A further issue which may trigger the need for a coordinated EU-level medical response is the possibility of a mass casualty incident such as a terrorist attack – this could

[54] DG AGRI (2018), The Role of CAP in Forest Fire Prevention
[55] Shearer, P., and Stark, P., (2012), Global risk of big earthquakes has not recently increased; Proceedings of the National Academy of Sciences. January 17, 2012 109 (3) 647-648.
[56] https://eurocodes.jrc.ec.europa.eu/
[57] Athanasopoulou, Adamantia & Dimova, Silvia & Fuchs, Manfred & Sousa, M. & Pinto, Artur & Nikolova, Borislava & Iannaccone, Sonia. (2018). State of Eurocode 8 Implementation in the European Union.

relate to trauma (such as gunshot wounds) or the potential deployment of chemical or biological weapons.

The most significant stand-alone medical risk relates to epidemics or pandemics. 23 Member States cite epidemic or pandemic as a moderate to severe risk in their national risk assessments. Recently the World Health Organisation (WHO) declared the current Ebola epidemic in DR Congo as a public health emergency of international concern. The most likely projected pandemic scenario relates to a model strain of influenza-A, to which there is limited or no immunity in the human population. Although pandemics reoccur on average every 30-40 years, it is very difficult to predict with any certainty the likelihood or severity of such an outbreak. Recent outbreaks, including the West Africa Ebola outbreak in 2014 and the H1N1 pandemic in Canada in 2009, have highlighted weaknesses with regard to Europe's ability to produce and distribute vaccines. Growing antimicrobial resistance and the re-emergence of historic infectious diseases, such as smallpox, are also causes for concern. World Bank models suggest that a "Spanish flu-like" outbreak today would kill more than 33 million people in 250 days, costing more than EUR 3.4 trillion, or 4.8% of global GDP.[58]

In any of the circumstances described above, a wide variety of medical responses may be required alone or in combination. These include evacuation, diagnosis, decontamination, trauma response and strategic stockpiling of commonly required medicines, antidotes and antibiotics. Within the EU, the Member States are responsible for public health, whilst an EU agency, the European Centre for Disease Prevention and Control (ECDC), works to improve the efficiency and effectiveness of public health through coordination of registration of drugs, medical devices and funding into research into infectious diseases, pandemic response and the preparedness of Member States in the event of biological terror attacks.

6.2.6 Chemical incident

Chemical incidents can be broadly divided into two categories: industrial accidents and malicious release of toxic material. While small-scale industrial incidents are not uncommon in Europe, major industrial incidents are rare. However, the possibility of such an incident is listed in 26 of the national risk assessments provided to DG ECHO by Member States. There is, besides this, a significant risk of toxic materials being released with malicious intent by terrorists or state actors. One example of such an event was the Novichok attack, which took place in Salisbury (UK) in 2018, resulting in six contaminated individuals (one fatality) and a year-long decontamination process. In 1995, a Sarin attack on the subway in Tokyo (Japan) resulted in 12 deaths, 50 injuries and temporary loss of vision for almost 1,000 others. Severe industrial incidents tend to have higher death tolls and wider impacts than chemical attacks. The Seveso Disaster in 1976, for example, caused long-term health implications for numerous victims and had significant impacts on local wildlife.

The main impacts of chemical incidents caused by an industrial accident could be broadly similar to those caused by malicious release of toxic material. They can include fatalities and injuries, damage to property, disruption of local services, long-term environmental contamination, and substantial economic losses. Climate change also has indirect effects on the likelihood and severity of industrial accidents, as increased flood, fire and extreme weather risks can weaken or damage key infrastructure, causing an increased likelihood of explosions, industrial fires and the release of dangerous substances.

Major accident hazards related to dangerous substances are governed at EU level through the Seveso III Directive.[59] This covers prevention, preparedness and response to industrial accidents involving

[58] World Bank (2017), Pandemic Emergency Financing Facility (PEF): Proposed Financing From IDA.

[59] Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances,

hazardous substances. Member States are obliged to ensure that operators have a policy in place to prevent major accidents. Operators handling dangerous substances are obliged to notify the relevant national competent authorities of their activities, submit safety reports, establish a safety management system and set up an internal emergency plan. National competent authorities are also required to draw up emergency plans for the surrounding areas and carry out regular inspections.

6.2.7 Radiological event

A nuclear event is a specific type of radiological event. It can be defined as uncontrolled nuclear fission, for example due to a breakdown in the control mechanisms in a nuclear reactor. This can lead to a release of radioactive elements and the contamination of the surrounding area. The European Union currently houses 130 nuclear reactors, grouped on 55 sites in 14 Member States.[60] In addition, the Russian Federation has a number of nuclear installations operating close to the boundaries of the EU. Risks associated with nuclear power plants include explosions or leaks at the sites themselves, as well as leaks not originating from the plants such as the transportation of radiological material, issues with installations handling reactor fuel, nuclear-powered engines, storage materials and industrial use of radioactive material. Nuclear accidents are named as a risk in 23 of the national risk assessments provided to DG ECHO by Member States. Nuclear accidents can be considered as high impact/low probability (HILP) events. Given the number of nuclear reactors in Europe, an incident in one of the reactors would be a credible, albeit low probability, event.

Although the likelihood of a major nuclear incident occurring is low, the predicted human, environmental and economic impacts would be severe. This may include land/water contamination, health implications for human and animal populations related to exposure to radiation, and economic losses related to impacts on agriculture, tourism and industry. There is also a risk of nuclear events related to terrorism. While nuclear power plants tend to be heavily protected, the consequences of radiological material falling into the hands of hostile actors and being released in public areas or turned into a 'dirty bomb' could have far-reaching negative impacts which could require international assistance.

The 1957 Euratom Treaty covers the use of nuclear fission in energy development within the European Union. Following the Fukushima accident in Japan, a risk and safety assessment (a so-called "stress-test") of all nuclear power plants in the EU was carried out by the European Commission. Findings from this review were positive overall, but further upgrades were recommended in order to ensure consistent standards across all EU Member States. In 2014, Directive 2014/87/Euratom updated European safety rules for nuclear installations with the requirement that Member States install an emergency management system for nuclear incidents to ensure cooperation between relevant services.

6.2.8 Marine pollution

The total coastline of Member States covers tens of thousands of kilometres and represents some of the busiest waters in terms of global shipping. Additionally, the seas are used for a number of activities including oil platforms and wind parks, while ports and recreation areas along the shoreline provide important economic and social contributions. The biggest risk in term of marine pollution relates to oil spills, which have a significant impact on both terrestrial and marine environments and require complex, lengthy and often dangerous clean-up operations.

The impacts of oil spills include significant damage to local flora and fauna, prolonged contamination of the seabed, negative health impacts for local populations and clean-up workers, and significant economic impacts in terms of lost revenue and potential infrastructure damage. Whilst technology should be reducing the risk of oil spills, a number of factors are leading to a potentially increased

[60] http://www.euronuclear.org/info/encyclopedia/n/nuclear-power-plant-europe.htm

likelihood such as: ageing and abandoned production infrastructure, increased automation of operations, and reduced investment in oil production and transport as other energy sources become prioritised. The International Association of Oil and Gas Producers (IPIECA) defines oil spills according to a three tier system, the most severe incident being a Tier 3 spill: "Tier 3: Global resources necessary for spills that require a substantial external response due to incident scale, complexity and / or consequence potential".[61] The cost of the shore-line clean-up for the latest three Tier 3 oil spills in European waters have been estimated at €178.8m (Erika, 19,8000 tonnes, 1999), €284.4m (Prestige, 63,300 tonnes, 2002) and €16.1m (Alfa I, 330 tonnes, 2012).[62] Climate change plays an exacerbating role with regard to marine pollution, through rising sea levels. Rising sea levels, increased sea temperatures, ocean acidification and precipitation changes are expected to reduce 'ecosystem resilience' to environmental challenges as marine ecosystems become increasingly sensitive to disruption.

The European Marine Strategy Framework Directive, adopted in June 2008, aims to increase the effectiveness of protections for the marine environment across the European Union. The Directive aims to achieve Good Environmental Status (GES) for European marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. In order to ensure this is achieved, each Member State is required to develop a Marine Strategy for its marine waters. These are to be updated regularly and reviewed every 6 years.

6.2.9 Critical infrastructure disruption

Critical infrastructure refers to physical and information technology facilities, networks, services and assets that, if disrupted or destroyed, would have a serious impact on the health, safety, security or economic well-being of citizens or the effective functioning of governments in Member States. Critical infrastructure extends across many sectors of the economy, including banking and finance, transport and distribution, energy, utilities, health, food supply and communications, as well as key government services.[63] The ability of such services to withstand and recover from shocks is essential for the provision of many societal functions and for ensuring an effective and efficient response to emergencies. Many critical infrastructure services are interconnected, meaning that disruption to one service can have knock-on effects on others. For example, a disruption to electricity provision can disrupt telecommunication networks or medical facilities, which cannot function without a power supply. The risk of critical infrastructure disruption is named in 24 of the country risk assessments provided to DG ECHO by Member States. As well as risks due to accidents or natural phenomena (such as falling trees), critical infrastructure networks are also vulnerable to targeted attacks by hostile actors.

Electricity provision is a good example to help understand the impact of critical infrastructure disruption, as it is required for a number of other services to function. In general, the European electricity network is very safe and reliable, with the average EU customer experiencing only 136 minutes without power per year. [64] Most power outages are limited to local impacts, however major power outages (caused by a failure in the main power grid or problems in power plants) have the potential to cause large-scale, cross-border blackouts leaving millions of people without power. In these situations, usual standby options (such as rerouting power supplies or using generators as

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[61] IPIECA (2015), Tiered preparedness and response: Good practice guidelines for using the tiered preparedness and response framework.

[62] European Maritime Safety Agency (2017), Study on the Cost Effectiveness and Efficiency Of EMSA's Oil Pollution Response Services

[63] Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection.

[64] DG ENER (2018), Study on the quality of electricity market data of transmission system operators, electricity supply disruptions, and their impact on the European electricity markets, p.82.

standby capacity) are not sufficient and can lead to other services coming to a standstill. Consequences range from people being trapped in lifts, to transport problems due to traffic lights not functioning or civil unrest due to city-wide power cuts. With rising temperatures related to climate change, a disruption to the power grid during a heatwave could have critical effects in terms of increasing the number of casualties. Especially vulnerable people will have a higher death rate as soon as air conditioning will not work during heat waves.[65]

European policy with regard to critical infrastructure is governed by the Directive to enhance the protection of European Critical Infrastructure (2008/114). Currently, this applies only to the energy and transport sectors. The Directive requires Member States to adopt legislation aimed at protecting critical infrastructure and to work to identify potential European critical infrastructures. The Directive is also one pillar of the European Programme for Critical Infrastructure Protection (EPCIP). An evaluation of the Directive was launched in 2018, including a public consultation that closed in February 2019, with the results expected in 2019.[66] In 2013, the European Commission published a working document (SWD(2013) 318) with a new approach for critical infrastructure giving more attention to their interdependencies.

6.3 Planning assumptions

This section describes the planning assumptions for each of the events described in Section 6.2. The planning assumptions build on the event descriptions by developing the "worst credible scenario" for each event showing how the different stages might evolve. This scenario development allows for assumptions to be made regarding the nature and scale of the response required, and the type of capacities which may be needed to ensure an effective response. Each planning assumption operates according to eleven parameters. The full text of the planning assumptions is offered in annex to this report.

6.3.1 Flooding

An area of low pressure is formed and causes heavy rainfall in a major river basin in Europe. Due to atmospheric blocking, the amount of rainfall is extreme in this river basin, resulting in flooding in an area of approximately 200 by 600 kilometres along a major river and its tributaries. The flooding area is spread over five European countries. Two of those countries are severely affected, while the other countries are less affected.

The flooding starts in the upper part of the catchments leading to landslides and flash flooding. In one or two days, the water moves downstream leading to large scale flooding in the valleys along the rivers. The water level in the river recedes after approximately two weeks.

In the affected area, several bridges collapse due to the force of the water and large areas of farmland are flooded as well as several cities and villages. The water levels in most flooded areas are between 10 cm and two metres, flooding only the first floor of houses. In some lower areas, this can be up to five metres.

6.3.2 Extreme weather

The planning assumption is based on a heatwave, as these are on top of the list in terms of deadliest disasters in Europe since 2000 and the other most important extreme weather events are covered in other planning assumptions:

[65] Keatinge W. R. (2003). Death in heat waves. BMJ (Clinical research ed.), 327(7414), 512–513.
[66] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2018-1378074_en

- In a critical infrastructure event, the effects of black ice and storms are taken into account;
- In a flooding event, the effects of heavy rainfall are taken into account;
- A heatwave can also lead to large scale forest fire, this is taken into account in a separate scenario.

A heatwave with extreme temperatures takes place in Europe affecting 10 countries in the south of Europe. In these countries, temperatures reach close to record levels previously registered. The heatwave lasts three weeks before temperatures start to drop. The countries in the planning assumption are based on earlier heatwaves (for example, the heatwave in 2003). Due to the length of the heatwave and the fact that high temperatures persist at night, the impact is considered to be severe.

6.3.3 Forest fire

A long heatwave hits several European countries at the same time. Already there have been multiple outbreaks of forest fires. Every country in the zone of the heatwave is facing them and all capacities are in a state of alert or already deployed.

One of the fires (or several close to each other) starts to become overwhelming for the local and national capacities because of a blazing storm of dry air. The wind speed combined with forests that are not historically prone to fire but are now because of the arid weather conditions (high fuel) cause a severe forest fire that spreads quickly to more urbanised areas.

The direction of movement and speed of the fire challenges the predictions and several villages are cut off, before evacuation can be effected. The disturbed spontaneous evacuation leads to fatalities and victims with severe burns.

The planning assumption specifies the number of casualties, which is about twice the worst event in modern times in the Western world.

6.3.4 Earthquake

The Earthquake planning assumptions outlined have been defined using the following approach:

1. Historical comparison with past European earthquakes, to understand what has previously happened, and how this could inform what may happen in the future.
2. A high-level Seismic Risk Assessment of European cities, considering hazard, vulnerability and exposure. This is to define the likely frequency and severity of casualties and damage due to future earthquakes, informed by historical events but also considering possible scenarios outside of recent historical experience.

As a basis for the planning assumption, an earthquake in one of the smaller EU Member States is used. This is because the large earthquake-prone countries have the capability to build more capacities and reduce in that way the likelihood that the UCPM is activated. By the same line of reasoning, an urbanised area is chosen. Urbanised areas are more vulnerable on a large scale and the impact is more likely to overwhelm the country’s own capacities.

6.3.5 International medical emergency

The International medical emergency event concerns the otherwise unaddressed effects of a pandemic or epidemic. Pandemic escalation is a major disaster risk of concern to most national authorities across the EU.

As influenza is the most commonly assessed form of pandemic risk within the EU, the figures of the SARS outbreak with lethal percentages etc. have been used as the basis for the medical planning assumption.

6.3.6 Chemical incident

This plan assumes a release of a cocktail of up to 40,000 different toxic chemicals involved in fire due to an industrial accident (although a chemical attack could produce similar effects and thus require the same kind of response). The scenario is made worse by unfavourable weather conditions assisting plume travel across large populations and multiple countries. A contaminated gas cloud disperses to the surrounding area affecting people, livestock, farmland and water bodies. The gas cloud will lead to effects in one other country, while pollution of the water will lead to the pollution of water in another neighbouring country. The assumption considers the direct medical effect on people as well as indirect effects such as pollution of drinking water supplies.

The need for local evacuation of those closest to the incident is assumed along with short and medium-term decontamination of people and infrastructure.

6.3.7 Radiological event

A chain of events in a nuclear power plant causes a discharge of radioactive material. The starting event leads to a failure of the cooling of the fuel rods. The fuel rods overheat so they become damaged and partially melt. This leads to pressure build-up in the reactor core. Within two hours of the cooling failures, a small fraction of the reactor core will be released in both the reactor vessel and the cooling system. The fraction consists of radioactive iodine isotopes and radioactive noble gases. The released iodine (I-131) poses the greatest threat. Due to damage to the cooling system, the radioactive substances within the safety containment (reactor vessel) of the nuclear power plant are released. In a few hours the pressure builds in this containment and leads, 24 hours after the cooling failed, to a discharge of a large quantity of radioactive material that lasts 4 hours.

The discharge consists of a wide range of different radioactive elements, such as iodine, caesium, and rare gases. The radioactive material spreads in the south-western direction within a few hours in the direction of the EU border. The reactor is about 60km from the eastern EU border. Ultimately, the radioactive material will disperse over a distance of many hundreds of kilometres in Europe.

This is based on an STC-CON1 scenario. STC-CON1 is a term for a scenario in which the last barrier fails 24-hours after the start of the chains of events at an A-object. At that time, the highest quantity of radioactive materials is released. The release contains, inter alia, 1% of the iodine isotopes (I-131) from the core inventory. The duration of this emission is 4 hours. The weather is either the local annual average or the weather type D5 (average day with little sun and a lot of wind up to 5 m/s). The scenario is divided into three parts:

3. The early release phase (2 hours after cooling failure) where mostly noble gases and a small amount of iodine (highest risk) are discharged;
4. The 'real' discharge (24 hours after cooling failure with a duration of 4 hours), the discharge of a cloud with a lot of different nuclides;
5. Phase after discharge: there is a contaminated area.

6.3.8 Marine pollution

The planning assumption consists of an event in which oil pollution reaches the shoreline. The focus is on the shoreline response as civil protection is mainly involved in oil pollution when it reaches the shoreline. However, coordination with at sea response is an important challenge in this situation. The European Maritime Safety Agency (EMSA) will conduct this year a stress test for the marine oil pollution capacity in Europe, which will focus on the off-shore capacities.

An oil crude tanker LR2 class of 120,000 DWT collides with a cruise ship carrying 500 passengers close to the shoreline (within 10 miles) of an EU Member State. The collision leads to a large leak and fire on the crude tanker resulting in severe pollution. The passenger ship can reach a nearby harbour on its own and the oil tanker is fully evacuated. The crude oil has a high sulphur percentage, which leads to large scale complaints about the smell and respiratory irritation.

6.3.9 Critical infrastructure disruption

An emergency stop in one of the power plants leads to a cascading effect in the network causing a large blackout in which more than 20 million people are affected across several countries. The network operator is able to restore most of the network within a few hours. However, a part of the network covering an area in which approximately 1 million people are living cannot be restored quickly, as the cascading effect has led to physical damage in the network. A fire has destroyed a critical transformer station and, due to the ongoing repair works, rerouting is not possible. After 24 hours, it becomes clear that restoring the power for approximately 1 million people in an area of 10,000 km^2 will take at least 2 weeks. The affected country asks for international assistance to mitigate the impact of the power outage.

7 Capabilities

Each planning assumption indicates the need for certain capabilities to support resolution. In this section, we demonstrate which capabilities would be required to respond to each event according to the planning assumptions. As noted in the methodological framework (Section 3), the concept of a "capability" describes the disciplines required to address an event. The concept provides the logical link from the planning assumptions to the actual modules registered in the Civil Protection Pool. The word "capability" in this report therefore refers to a set of skills and resources combined to deal with a pre-defined set of circumstances.

In Section 7.1, we present a matrix showing the capabilities needed for each event. This has the benefit of showing how modules are relevant to events (to the extent that modules can form part of a capability). It also highlights possible gaps, where certain types of expertise or equipment are not currently defined in the UCPM.

Finally, in Section 7.2, we consider how the current modules (as defined in the 2014 Implementing Decision) contribute to the provision of capabilities that would be required to address the planning assumptions of each event.

7.1 Matrix of planning assumptions – capabilities

Table 3 presents a matrix showing the capabilities required for each of the events summarised in Section 6.2 and described in full in Annex. The matrix shows that for each event a combination of capabilities needs to be deployed, including modules but also expert advice (off site or on site), information management support, logistical support.

The matrix shows that most of the currently-defined modules remain relevant to the events and thus to the main risks facing the Member States. However, some capabilities for which modules are available do not feature, raising the possibility that they are outdated or have limited relevance. This possibility is discussed in Section 8, which presents the revised capacity goals.

The matrix also highlights a possible need to redefine new modules, not currently included in the 2014 Implementing Decision. Examples would include the aerial evacuation of infected victims or CBRN decontamination of the public. Again, the need to define new modules (based on the logic of the planning assumptions) is considered alongside the evidence of needs emerging from Tasks 1 (review of definitions) and 3 (capacity gaps analysis) in Sections 8 and 9.

The table presents the results of each event descriptor and planning assumption (appendices) and broadly describes the likely capabilities required for each of them. An empty cell does not necessarily imply that the capability is not needed, only that no assistance is needed from the UCPM (e.g. the Member State can provide the necessary capability. Using Water Pumping as an example, the planning assumptions for each event anticipates needing additional (UCPM) support of this nature for flooding, forest firefighting and nuclear/radiological incidents. The power of this methodology becomes apparent when reading the table vertically where it outlines the capabilities likely to be required for each event. From this, the need for specific modules and the capacities (numbers of them) will later be derived.

Table 3 Matrix of UCPM capabilities required for events

	01 Flooding	02 extreme weather – heat wave	03 forest fire	04 earthquake	05 international medical	06 chemical release	07 nuclear	08 marine pollution	09 critical infrastructure – power outage
Disaster/post-disaster									
Water pumping	High capacity water pumping from pockets for early recovery		Water transport and delivery for fire fighting				Supplementary cooling supply		
Flood Containment	Capacity to contain water in the riverbeds								
Fire-fighting capacity			Ground forest fighters Forest fire vehicles to access area if possible						
Search and rescue	Search and rescue of people by boat/ trucks/ helicopters			Search and rescue in collapsed structures (access voids)		Search and rescue in contaminated environment			
Detection and sampling			Smoke sampling		Detection and sampling – Biological agents	Detection and sampling – chemical substances	(remote) Detection and sampling – radioactive radiation / contamination	Detection and sampling – CBRN (oil and hazardous and noxious	

	01 Flooding	02 extreme weather – heat wave	03 forest fire	04 earthquake	05 international medical	06 chemical release	07 nuclear	08 marine pollution	09 critical infrastructure – power outage
								substances (HNS))	
Drinking water		Possible mass need for drinking water		Mass need for drinking water		Mass need for drinking water	Mass need for drinking water		Mass need for drinking water
Power Supply	Supply needed if flooding damaged infrastructure		Supply needed if forest fire damaged infrastructure	Supply needed					Supply needed
Medical assistance				Treatment injured (mostly trauma) Medical countermeasures for all responders	Treatment injured (infectious diseases) Medical countermeasures for all responders	Treatment injured (mostly respiratory, skin, other) Medical countermeasures for all responders	Specific treatment for contaminated patients/patients with radiation sickness. These might not be available in sufficient number in all countries nationally.		
Evacuation	Mass evacuation		Redistribution of injured --------- Rapid evacuation	Mass evacuation	Specialised evacuation of infected victims	Rapid evacuation	Rapid/ mass evacuation	Passenger evacuation	

	01 Flooding	02 extreme weather – heat wave	03 forest fire	04 earthquake	05 international medical	06 chemical release	07 nuclear	08 marine pollution	09 critical infrastructure – power outage
Sheltering	Long term sheltering, return possible		Short term sheltering, return mostly possible	Long term sheltering, return not possible		short term sheltering, return possible	Long term sheltering, return not possible		
Decontamination					Decontamination	Decontamination	Decontamination	Decontamination	
Replacing infrastructure	Replacement of medical facilities			Replacement of medical facilities					Replacement of medical facilities Local Power generation for critical structures Wide area replacement
Expert Advice (Off site)	Geo-spatial monitoring	Meteorological	Meteorological Geo-spatial monitoring						
Expert Advice (On site)	Water management		Forest fire tactics	Construction assessment	Medical and Viral expertise	Environmental assessment CBRN-expertise	CBRN-expertise	Environmental assessment	
	Post disaster needs assessment								
Information management	IM International assistance								
Logistical support	Logistical support International assistance								
Threat/ preparation									

	01 Flooding	02 extreme weather – heat wave	03 forest fire	04 earthquake	05 international medical	06 chemical release	07 nuclear	08 marine pollution	09 critical infrastructure – power outage
Expert Advice	Monodisciplinary hazard/risk assessment								
	Interdisciplinary hazard/risk assessment								
	EU-legislation enforced advice								

7.2 Discussion on Modules as capabilities

In this section, we consider how the current modules (as defined in the 2014 Implementing Decision) contribute to the provision of capabilities that would be required to address the planning assumptions of each event.

As noted above, two modules are outside the scope of the study: Aerial forest fire fighting module using planes (FFFP) and Aerial forest fire fighting module using helicopters (FFFH).

7.2.1 High Capacity Pumping

Water pumping is the capability to pump large amounts of water over a distance.

In the planning assumptions, water pumping is identified as a capability needed for flood response forest fire response and nuclear response.

Within the UCPM, a high capacity pumping (HCP) module is defined as having the objective to pump water for flooding and forest fires with a capacity to pump at least 1,000m^3 water per hour over a distance of at least 1,000 meters. Currently, 16 modules are part of the civil protection pool and 14 more are registered in CECIS.

The HCP module is as a capacity fit for both flood response and forest fire response.

Besides this, other response capacities registered are able to pump far higher amounts of water, e.g. up to 5,000m^2 per hour.

These other capacities do not have the ability to deliver water over distance which makes them unfit for delivering water for forest fires response and providing water supply for cooling of nuclear facilities. Given the capacity per unit, they could nonetheless be very useful during large scale flooding.

7.2.2 Water Purification

Water purification is the capability to meet mass needs for drinking water.

In the planning assumptions, drinking water is identified as a capability needed for earthquake response, chemical release response, nuclear response and critical infrastructure/power outage response.

Within the UCPM, a water purification (WP) module is defined as providing drinkable water from surface water sources by purifying 225,000 litres per day, performing water quality controls and having storage capacity equivalent to the production of half a day.

Currently, 5 modules are part of the civil protection pool and five more are registered in CECIS.

As a capacity, the WP module is fit for earthquake response, chemical release response, nuclear response and critical infrastructure/power outage response.

7.2.3 Search and Rescue

Search and Rescue is the capability to search for, locate and rescue victims of a disaster and to provide lifesaving first aid.

In the planning assumptions, search and rescue is identified as a capability needed for forest fire response, earthquake response, response to chemical incidents and critical infrastructure disruption.

Within the UCPM, a medium urban search and rescue (MUSAR) module is defined as search with search dogs and/or technical search equipment; rescue, including lifting; cutting concrete; technical rope; basic shoring; hazmat detection and isolation and advanced life support. A heavy urban search and rescue (HUSAR) module is defined as search with search dogs and technical search equipment;

rescue, including heavy lifting; cutting reinforced concrete and structural steel; technical rope; advanced shoring; hazmat detection and isolation and advanced life support.

Currently:

- 8 HUSAR modules are part of the civil protection pool.
- 6 HUSAR modules are registered in CECIS.
- 9 MUSAR modules are part of the civil protection pool.
- 2 MUSAR modules in cold conditions are part of the civil protection pool
- 22 MUSAR modules are registered in CECIS.
- 1 Search and Rescue in CBRN conditions are part of the civil protection pool.
- 2 Cave SAR other response capacities are part of the civil protection pool
- 1 Mountain SAR other response capacity is part of the civil protection pool
- 1 Water Search and Rescue other response capacity is part of the civil protection pool

The HUSAR and MUSAR modules are as a capacity fit for the response requirements as identified in the planning assumptions.

7.2.4 Medical assistance

Medical assistance is the capability to provide initial and/or follow-up trauma and medical care.

In the planning assumptions, medical assistance is identified as a capability needed for flooding, extreme weather, forest fires, earthquake and international medical emergency response. In some circumstances, it may also be required for critical infrastructure breakdown, but this would depend on the scale and impact of the emergency on local medical infrastructure.

Within the UCPM, the definitions of emergency medical response teams (EMT1, 2 and 3) are aligned with WHO certification standards.

Currently:

- 3 EMT1 Fixed module are part of the civil protection pool
- 4 EMT 2 modules are part of the civil protection pool
- 5 Advanced Medical Post modules are registered in CECIS.
- 3 Advanced Medical Post with Surgery modules are registered in CECIS.
- 2 Field Hospital modules are registered in CECIS.

The EMT1, 2 and 3 modules are fit for most disaster relief situations.

7.2.5 Medical aerial evacuation of disaster victims

Medical evacuation is the capability to transport disaster victims to health facilities for medical treatment.

In the planning assumptions, medical aerial evacuation is identified as a capability needed for forest fire response and international medical response.

Within the UCPM, a ‘medical aerial evacuation of disaster victims’ module is defined as the capacity to transport 50 patients per 24 hours and to fly during day-time and night-time.

Currently, 2 MEVAC modules are part of the civil protection pool and 2 more are registered in CECIS.

Besides this, a special MEVAC "other response" capacity has been available for patients with infectious diseases.

7.2.6 Emergency shelter provision

Emergency shelter provision is the capability to provide emergency temporary shelter, including staff to assemble the camp, mainly in the initial stages of a disaster in coordination with existing structures, local authorities and international organisations until handover to local authorities or humanitarian organisations, where the capacity remains necessary for longer periods.

In the planning assumptions, shelter is identified as a capability needed for response to flooding, extreme weather, forest fire, earthquake, chemical incident, nuclear incident, marine pollution and critical infrastructure failure. In most instances, it is expected that such shelter could be provided using existing infrastructure (e.g. schools, town halls) or by the construction of longer-term shelter facilities, rather than an emergency temporary camp. In some situations, there will nonetheless still be a need for shelter provision which cannot directly solved by the affected country.

Within the UCPM, an emergency temporary camp (ETC) module is defined as the provision of a tent camp equipped for 250 persons (50 tents).

Currently, 1 ETC module is part of the civil protection pool, although one Additional Shelter Capacity is registered in CECIS.

7.2.7 Chemical, biological, radiological and nuclear detection and sampling

CBRN is a problematic phrase referring to the cause of an incident rather than its resulting effects. Normally applied to terrorism causes, the modules resulting will also be considered for accidental emergencies (more commonly referred to as Hazardous Materials) for example involving chemical release, nuclear or biological environments.

CBRN detection and sampling is the capability to identify chemical and detect radiological hazards through a combination of handheld, mobile and laboratory based equipment.

In the planning assumptions, detection and sampling is identified as a capability needed for international medical response, chemical release response, nuclear response and marine pollution response.

Within the UCPM, a chemical, biological, radiological and nuclear detection and sampling (CBRNDET) module is defined as the ability to detect alpha, beta and gamma radiation and to identify common isotopes; to identify, and if possible, perform semi-quantitative analyses on common toxic industrial chemicals and recognised warfare agents; to gather, handle and prepare biological, chemical and radiological samples for further analyses elsewhere; to apply an appropriate scientific model to hazard prediction and to confirm the model by continuous monitoring; to provide support for immediate risk reduction, including hazard containment and hazard neutralisation; and to provide technical support to other teams or modules.

Currently, 5 modules are part of the civil protection pool and 12 more are registered in CECIS.

This module has applications beyond traditional CBRN incidents with regards to toxicity and air quality monitoring. For this reason, it appears as a beneficial component of responses to other events including flood response and forest fires where resulting contaminants can be wide-ranging and unidentified.

7.2.8 Ground forest firefighting

Ground forest firefighting is the capability to contribute to the extinction of large forest and vegetal fires using on the ground means.

In the planning assumptions, ground forest firefighting is identified as a capability needed for forest fire response.

Within the UCPM, a Ground Forest Firefighting module (GFFF/GFFF-V) module is defined as the ability to operate in areas with restricted access continuously for 7 days, with the ability to set long lines of hoses with pumps, minimum 2 km, and/or make defence lines continuously.

Currently,

- 6 Ground Forest Fire Fighting modules are part of the civil protection pool
- 4 GFFF modules are registered in CECIS.
- 5 Ground Forest Fire Fighting using Vehicles modules are part of the civil protection pool
- 19 GFFF-V modules are registered in CECIS.
- 2 Fire-fighting advisory other response capacities are part of the civil protection pool

The GFFF and GFFF-V modules are fit for purpose as forest fire response capacities.

7.2.9 Flood containment

Flood containment is the capability to reinforce existing structures and build new barriers to prevent further flooding of rivers, basins and waterways with rising water levels.

In the planning assumptions, flood containment is identified as a required emergency response capability, not in terms of preventing flooding, but rather protecting specific objects and areas of interest (for example highly populated areas of areas with critical infrastructure).

Within the UCPM, a flood containment module is defined as the ability to dam up water to a minimum height of 0.8 metres and to build a 1,000m barrier. Furthermore, the module is required to have the ability to reinforce existing levees and to operate at a minimum of 3 locations at the same time within an area accessible by trucks.

Currently, 4 Flood Containment (FC) modules are part of the civil protection pool and 3 more are registered in CECIS.

7.2.10 Flood rescue using boats

Flood rescue is the capability to carry out water-based search and rescue and assist people trapped in a flooding situation by using boats; and to provide lifesaving aid and deliver first necessities as required.

In the planning assumptions, flood rescue using boats is identified as a capability needed for flooding response and marine pollution response.

Within the UCPM, a Flood Rescue Using Boats (FRB) module is defined as the ability to search for and rescue people out of a flooded area including medical care on first responder level; to work together with aerial search (helicopters and planes); to deliver first necessities of life in a flooded area, including transportation of doctors, medicines, etc. and food and water. The module must have at least 5 boats and the ability to transport 50 people in total excluding the staff of the module. Boats should be designed for use in cold climate conditions and be able to drive upstream against a flow of at least 10 knots.

Currently, 4 FRB modules are part of the civil protection pool and 5 more are registered in CECIS. 1 Water SAR other response capacity is also registered in CECIS

The Flood rescue using boats module is as a capacity fit for flood response. However, the module would not be suitable as a response to marine pollution as the boats are fit for use only on inland flooding and not at sea.

7.2.11 Technical and expert assistance

Technical and expert assistance is the capability to provide or arrange for ICT support, logistics and subsistence support, transport support (on site) and the set-up and running of an office. It may also cover the provision of expertise, as outlined in Section 9.3.

In the planning assumptions, technical and expert assistance is not discussed, however it is recognised that this would be required in almost any emergency response scenario.

Within the UCPM, a technical and support team (TAST) module is defined as being capable of assisting an assessment, coordination and/or preparedness team, an on-site operations coordination centre, or of being combined into a civil protection module as referred to in Article 12(2)(c).

Currently, 4 modules are part of the civil protection pool and 8 more are registered in CECIS.

The TAST module is as a capacity fit for support provision to a broader emergency response effort. More work may be required to define further expert roles, including with regard to technical assistance and logistical/coordination support.

8 Capacity goals

Having defined which capabilities are required to address each event and Planning Assumption and having examined the modules required to create such a capability, it is a relatively simple step to start to analyse how many of each module will be required. This quantitative analysis can then be mapped to create an aspirational number of modules required for each event and thereby how many might be needed to assure constant availability.

This section offers a recommendation for a possible revision of the capacity goals. The proposed revision consists of an expert assessment of required capacity based on the analysis of changing and emerging risks and the planning assumptions presented in the event documents. The expert assessment also builds on the results of Task 1 (Review and redefinition of existing response capacities) and Task 3 (Risk-based assessment and capacity gap analysis), which are captured in the relevant deliverables: D3: Data Analysis Report (survey, interviews and desk research) and D5 Capacity Gaps Analysis.

The capacity goals are based on the planning assumptions which describe the characteristics of different types of “worst credible events” that could occur within the Member States or within neighbouring countries where this would affect those States. In this section, we describe the rationale for the capacity goals for each module.

After defining the amount of modules needed for an event an analysis is made of the amount of modules need to be available to assure the amount of needed modules. This is determined by:

- The type of event: some events only occur in one location at the same time (e.g. earthquakes), whereas other types of events can occur simultaneously in a large area experiencing the same weather conditions (e.g. forest fires). As a result, the total number of modules needed is greater than the number needed for the event. Moreover, there will be a need for the available modules, to be distributed across Europe, so that some modules will always be available outside “affected”” area.
- The transportability of a module: some modules can only be transported by road. As a result, the total number of modules needed is greater than the number needed for the event. Again, there is a need for modules to be distributed across Europe.

It is important to note that the revised goals relate to the capacity required to respond to events within the Member States or events in neighbouring countries that would affect those States. They do not relate to the capacity required to respond to global events, as such events that are not covered by the relevant planning assumptions.

8.1 Revision of module capacity goals

Table 4 presents a proposal for the possible revision of the capacity goals. The second column presents the current available capacity in the civil protection pool and registered in CECIS. The third column presents the current capacity goals, as listed in the 2014 Implementing Decision. The fourth column then offers the suggested number of goals that would be needed to respond to the events listed in the planning assumptions document. (Capacity goals are not offered for the two aerial forest fire fighting modules, as these are outside the scope of the study, as specified in the ToR). Finally, the fifth column presents the suggested goals if the UCPM is to be able to guarantee the availability of capacities. The rationale for this approach is that multiple events might arise at the same time. For example, forest fires can often arise simultaneously in several Member States under certain weather conditions. Moreover, some modules have a limited deployment range due to needed speed and transportability (for example, HCP modules are mostly only road transportable). This implies that the overall needed capacity needs to be spread over the whole of Europe and not concentrated in parts of Europe.

Table 4 Revised capacity goals: existing modules

Existing modules	Current capacity (registered in pool	Extra registered in CECIS	Current capacity goals	Needed for event	Overall needed to guarantee availability
HCP (High capacity pumping)	16	14	6	10	20[1]
FRB (Flood rescue using boats)	4	5	2	2	6[1]
HUSAR (Heavy urban search and rescue)	8	6	2	3	4[2]
MUSAR (Medium urban search and rescue)	9 (+2 for cold conditions)	22	6 (1 for cold conditions)	3	4[2]
GFFF (Ground forest fire fighting)	6	4	2	2	4[2]
GFFF-V (Ground forest fire fighting using vehicles)	5	19	2	5	15[1]
CBRNDET (CBRN detection and sampling)	5	12	2	2	6[3]
MEVAC (Medical aerial evacuation of disaster victims)	2	2	1	1	+ 2[2]
EMT type 1 fixed	1 (AMP)	5 (AMP)	5	5	8[2]
EMT type 2 (Emergency medical team type 2:	1 (AMP)	3 (AMP-S)	3	2	3[2]

Existing modules	Current capacity (registered in pool	Extra registered in CECIS	Current capacity goals	Needed for event	Overall needed to guarantee availability
Inpatient Surgical Emergency Care)					
EMT type 3 (Emergency medical team type 3: Inpatient Referral Care) 1	0	2 (FH)	1	1	1
TAST	4	8	2	2	3[2]
FFFP (Aerial forest fire fighting module using planes)	5 (rescEU)	[not included in the current study]			
FFFH (Aerial forest firefighting module using helicopters)	2 (rescEU)	[not included in the current study]			

Table references

1: Geographical distribution within Europe needed. Affected countries (multiple) use their own capacities that are no longer available to the UCPM.
2: Redundancy to compensate modules that are not (directly) operational due to multiple issues.
3: Because of needed specialisation of the modules it is advised to have more but specialised modules available

Table 5 proposes capacity goals for new modules not listed in the 2014 or 2018 Implementing Decisions together with the rationale for defining these modules. Further description is provided in Section 4.

Table 5 Capacity goals: new modules

New modules	Needed for event	Overall needed to guarantee availability	Rationale
WT (Water transportation)	1	1	- Replaces WP

New modules	Needed for event	Overall needed to guarantee availability	Rationale
CBRN-PROT (PPE and operational support in CBRN environments)	2	3	- Replaces CBRNUSAR
CBRN-DEC (Decontamination)	2	3	- Replaces decontamination teams - Existing as other response capacity
MEVAC-INF (Medical aerial evacuation of infectious patients or patients requiring a high level of care)	1	2	- Specialised form of MEVAC - Existing as other response capacity
BC (Base Camp)	1	2	- Replaces ETC

Building on the review and redefinition of existing response capacities in Task 1, Table 6 highlights a number of existing capacities that are considered outdated in light of historical experience, evidence from the consultations and the expert assessment. This includes the three medical modules (AMP, AMP-S, FHOS) that have been rendered obsolete by the inclusion of the three EMT modules in the 2018 Implementing Decision. Further description of the rationale is provided in Section 4.

Table 6 Modules considered as having limited relevance for EU deployments

Existing modules	Current capacity (registered in pool	Extra registered in CECIS	Current capacity goals	Rationale
FC (Flood containment)	4	2	2	- Not used within the EU - Not relevant to the planning assumptions
WP (Water purification)	5	5	2	- Not used within the EU - Not relevant to the planning assumptions - Replaced by WT module
CBRNUSAR (USAR in CBRN conditions)	1	7	1	- Replaced by new CBRN-PROT module
ETC (Emergency Temporary Camp)	1	1	2	- Not used within the EU - Replaced by new Base Camp module
AMP (Advanced medical post)	1	5	2	- Replaced by EMT1
AMP-S (Advanced medical post with surgery)	1	3	1	- Replaced by EMT2

Existing modules	Current capacity (registered in pool	Extra registered in CECIS	Current capacity goals	Rationale
FHOS (Field hospital)	0	2	1	- Replaced by EMT3

The rationale for revising the goals is as follows.

High capacity pumping (HCP): HCP capacity is mostly needed to address the effect outlined in the flooding planning assumption. It is estimated that 10 HCP modules will be sufficient to respond to the flooding event, as described. This number would also be sufficient to address the needs arising from other events, for example, delivery of water to a forest fire fighting response or delivery of supplementary cooling supply of water in a nuclear event. However, due to the limited deployment range and the non-availability of modules in the same river basin due to national use, a total capacity of at least 20 modules well distributed over Europe is needed to assure availability throughout Europe.

Flood rescue using boats (FRB): this capacity is only needed for a flooding event. Based on the details of the planning assumptions, only two FRB modules are needed to respond to the event as described. However, to assure rapid deployment of the capacity required to meet the needs of the planning assumptions, a total capacity of 6 modules distributed widely across the different river basins of Europe is needed (since modules in the same river basin might be unavailable for international deployment, as they are addressing the effects of the same flood in their own country).

Flood containment (FC): this module is now considered as having limited relevance. As noted in the Capacity Gaps Analysis (D5), despite the numerous flood-related disasters within Europe this capability has never been deployed, which suggests that the current module is not the right answer to the need for flood containment during disaster. The solution for improving dikes and dams is most likely to be done through sandbags rather than the deployment of FC modules. The choice could be made to have a stockpile of sandbags as part of the other response capacities. It is estimated that a stockpile of 2 million sandbags should be made available for an event.[67] To ensure availability for each major river basin, the capacity would need to be spread over different regions of Europe.

Heavy urban search and rescue (HUSAR)/Medium urban search and rescue (MUSAR): the deployment of 6 international USAR teams as search and rescue capacity is considered sufficient to meet the planning assumptions for the earthquake event. This could consist of three HUSAR and three MUSAR modules (INSARAG-classified). Heavy teams deliver more specialised capacity, but the compact size of a medium team can have advantages too. In practice, Member States tend to have the flexibility to provide either a HUSAR or MUSAR response, not least since the same professionals can work in either capacity.

Ground forest fire fighting (GFFF)/Ground forest fire fighting using vehicles (GFFF-V): According to the planning assumption, up to 5 modules will be needed to respond to the effects of a forest fire. In most situations, this will be a deployment within Europe involving a module with vehicles and fire appliances supporting a defensive fire-fighting strategy (e.g. using stopping lines in a vehicle-accessible location). Given the limited deployment range of GFFF-V, the need for road travel with the vehicles and the likelihood of competing demands within the same region during an event, a total capacity of 15 modules evenly distributed across Europe is needed to guarantee the availability of 5 modules for an event. In addition, it is also necessary to have two GFFF modules without vehicles to provide the necessary capacity to deploy in situations where there is limited accessibility to vehicles.

[67] This is the amount used during the flooding in 2013 in Hungary (https://europa.eu/rapid/press-release_IP-10-622_en.htm)

The GFFF module has a large deployment range, which implies that with a total of 4 modules spread over Europe will be sufficient to guarantee the availability of 2 modules for any single event.

Water Purification (WP): the current module for drinking water delivery through water purification is now considered to have limited relevance within the territory of the Member States. Evidence from historical experience, stakeholder consultations and expert assessment suggests that within the territory of the EU, it will be more effective and efficient to transport water (bottled or by water tankers) from the nearest available source of clean water than to purify water at the site of an event. Also, the quality criteria for drinking water makes the current water purification module not fit for use inside the EU. There may be a rationale for continuing to register WP modules within the UCPM for the purposes of global deployment, i.e. where an alternative source of clean drinking water is not available nearby. However, this would not require the specification of a capacity goal.

Water Transportation (WT): would be a new module requiring definition. Evidence from historical experience, stakeholder consultations and expert assessment suggests that most Member States have the capacity to meet the need to transport water within their own territory. A goal of just one capacity is therefore recommended.

Chemical, biological, radiological and nuclear detection and sampling (CBRNDET): Capacity is needed for detection and sampling in the event of a forest fire, intentional medical emergency, chemical releases, nuclear incident and or marine pollution. A maximum of 2 modules is required to respond to any one event. However, given that this module could be needed for different types of events, it is recommended that capacity is available to meet multiple events occurring simultaneously. In addition, it is quite possible that a need will arise for high-level specialised teams that would add value to national teams. For that reason, it is recommended to have specialised detection and sampling teams in one or two of the above-mentioned fields. To have added value, a laboratory capacity will benefit this module. At the moment "separate mobile biological laboratory" is registered as an "other response capacity", although this could be integrated in this module. A total of 6 CBRNDET are needed for each type of event (chemical, biological, nuclear) with two specialised modules.

Search and rescue in CBRN conditions (CBRNUSAR): The capability of search and rescue using protective clothing in a contaminated environment is needed to respond to a chemical release but USAR experts challenge the usefulness of the model in its current form as it is too small and limited in application. Many events can have a contaminated environment, whereas not all attract a USAR response. The effect of this is that most modules cannot operate in a CBRN environment. To address this, it is suggested that the CBRN protection of USAR teams be enhanced whilst replacing the CBRNUSAR module with a more generic CBRN protection capability.

Personal protective equipment and operational support in CBRN environments (CBRN-PROT): This module is not defined in the Implementing Decision. As noted in Section 4, it would be a module with the same kind of technical capability that currently exists within the CBRNUSAR module but would be more versatile and designed to support activity across modules in support of response to events. Based on the planning assumptions, an expert assessment suggests that two modules will be required to respond to an event and 3 to guarantee availability.

Chemical, biological, radiological and nuclear detection decontamination (CBRN-DEC): The capability for decontamination of responders and equipment would be needed to respond to different types of events. Based on the planning assumptions, an expert assessment suggests that two modules will be sufficient for an event and 3 to guarantee availability.

Medical aerial evacuation of disaster victims (MEVAC): the current capacity goal is considered sufficient to address the needs of any specific event, i.e. 1 capacity. However, to avoid the risk that a specific capacity is not (directly) operational (e.g. due to non-availability of a plane, exercises, etc.), it is recommended that a minimum of 2 modules are available at European level. The current definition does specify the need to provide specific care to disaster victims. This remains valid, provided that a new module is also defined, i.e. MEVAC-INF.

Medical aerial evacuation of infectious patients MEVAC-INF: the planning assumptions (drawing on the experience of historical events) highlights the need to transport infectious patients or other patients requiring very specific care as a result of an event. It is therefore recommended that at least one such capacity is available at European level. In practice, this could be offered by the same provider of the basic MEVAC module, provided that the necessary equipment, resources and professional skills are available.

Emergency Medical Team (EMT): For EMT1 and EMT2, the need to treat injured patients in emergencies is the determining factor for the required amount of capacity. A goal of 5 x EMT1 and 2 x EMT2 teams would be sufficient to satisfy the planning assumptions regarding treatment of patients. For the replacement of non-functional medical infrastructure, EMT1 and EMT2 may prove sufficient for some events. However, EMT3 would prove necessary if, due to a disaster, one or more hospitals are no longer functioning and transferring patients to other hospitals is not an option.

Emergency Temporary Camp (ETC): as noted in the Capacity Gaps Analysis Report, a high proportion of the stakeholders consulted identified the need to redefine this module or replace it with an alternative module. The current module was considered to be inadequate, amongst other reasons, because of the need to provide different forms of shelter or to shelter a different number of people or to provide non-food items (NFI) / Core Relief Items (CRIs). Consequently, the ETC module as currently defined would be unlikely to address the planning assumptions around the housing of evacuated or displaced people. In some situations, there will nonetheless still be a need for shelter provision which cannot be directly solved by the affected country. It is therefore recommended to introduce “Additional Shelter Capacity”, as described below.

Additional Shelter Capacity: it is advised that plans be developed to ensure the international availability of shelter provision for 50,000 persons at European level (i.e. according to the planning assumptions for earthquakes). A consultation with Member States regarding their view on the current international sheltering solutions and a review of the ETC module is needed to understand what type of sheltering solution could be adequate for this capacity. This capacity should have a quality level comparable with existing solutions in Member States.

Base camp (BC): given the weaknesses in the current ETC module, there is a possible need to define a new base camp module. This only needs to be available for one disaster at a time (an earthquake for example).

Technical assistance and support team (TAST): based on historical experience within Europe, there has never been a deployment of more than two UCPM teams needing the support of a TAST at the same time. This implies that 2 TAST teams are sufficient to meet the needs of the planning assumptions, for example, two UCPM-teams in different countries in the same river basin. To assure availability, a third TAST would be sufficient as the modules are easily transportable by air.

8.2 Revision of goals for experts and other capacities

The revised goals for other response capacities are presented in Table 7.

Table 7 Revised goals for other response capacities

Other response capacity	Current capacity (registered in pool	Extra registered in CECIS	Current capacity goals	Needed for event	Overall needed to guarantee availability
Teams for mountain search and rescue	1	0	2	1	2
Teams for water search and rescue	1	0	2	Included in the FRB module, no need for separate teams	
Teams for cave search and rescue	2	1	2	1	2
Teams with specialised search and rescue equipment, e.g. search robots	0	0	2	Not covered in this study	
Teams with unmanned aerial vehicles	1	1	2	No separate module, but inclusion in other modules	
Teams for maritime incident response	1	0	2	Not covered in this study	
Structural engineering teams	2	0	2	1	2
Evacuation support: including teams for information management and logistics	0	0	2	Further study needed to identify needed capability for evacuation	
Firefighting: advisory/assessment teams	2	0	2	1	2
Mobile laboratories for environmental emergencies	1	0	2	Included in CBRNDET	
Communication teams or platforms to quickly re-establish communications in remote areas	1	0	2	1	2
Additional shelter capacity	0	1	100	shelter capacity for 50.000 people	Depending on how it will be organised
Additional shelter kits	0	0	6		
Water pumps up to 800 l/m	0	0	100	100	100

Other response capacity	Current capacity (registered in pool	Extra registered in CECIS	Current capacity goals	Needed for event	Overall needed to guarantee availability
Power generators of 5-150 kW	0	0	100	1000 1-5 KvA generators	To be organised through the market
Power generators above 150 kW	0	0	10	125 MW capacity	To be organised by power companies
Marine pollution capacities	1	0	As necessary	1 (shoreline response)	2
Emergency medical teams for specialised care	0	0	8	Suggested to solve this with specialisation of EMTs	
Mobile biosafety laboratories	2	0	4	Included in CBRNDET	
Sandbags	-	-	-	2 Million	4 Million

The rationale for these goals is as follows.

Cave and mountain Search and Rescue: The events did not cover the need for international cave and or mountain search and rescue. But given the highly specialised nature of the tasks, it seems reasonable to have a capacity for 2 teams of each (to guarantee the availability of 1 each) at European level.

Water pumps: Pumps for up to 800 litres/minute are part of the current capacity goals. They can be used for the pumping water after flooding in small pockets, in basements etc. It is proposed to ensure that the availability of a certain number of such pumps can be guaranteed. In most situations, local emergency services and contractors in the affected area and its surroundings can be expected to have access to pumps of this type. Based on existing provision, this implies that a capacity of 100 seems reasonable. In the case of a more significant flood, the need may be much larger.

Power generators: Two types of power generator are included in the capacity goals: small power generators (up to 150 KVA) and large power generators (> 150KVA). Based on the planning assumption for critical infrastructure failure there is a need for 1000 small generators and a capacity of 125 MW in large generators to be provided internationally. Given the responsibility of power companies to restore power in the event of an outage, there are arrangements in place for large generators and/or power companies in other countries can be expected to have large capacity generators available. The UCPM should make use of these capacities and possibly only organise the logistical aspects of it.

The small generators are intended for temporary supply to critical functions in society. Providers of critical functions will in most situations have existing arrangements in place with supplies, mostly rental companies. In a large scale event, the regional/national market will be overwhelmed to fulfil the requests but on the European market a sufficient number of generators should be available. Similarly, the UCPM could also make use of this capacity and should possibly only organise the logistical aspects of it.

Expertise: fire fighter advisory teams and structural engineering teams now feature in the revised the capacity goals. Based on the expertise needed, one of each type of team should be available for any given event, which implies two of each type of team would be required at the European level (bearing in mind the likelihood of such events occurring in multiple countries simultaneously). For other types of expertise, further analysis is proposed to identify the specific type of expertise needed.

Additional other response capacities: The current capacity goals on the further mentioned other response capacities in the implementing decision of 2018 require further study to identify the needed amount. Based on the planning assumptions it seems reasonable to have capacity goals for most of the items, however the number requires a further analysis of the scenarios.

8.3 Goals for new response capacities

The revised goals for other response capacities are presented in Table 8 and Table 9.

Table 8 Access to Stockpiles

Other response capacity	Needed for Flooding Event	Needed for Forest Fire event	Needed for Earthquake	Needed for Medical Emergency	Needed for Chemical	Needed for Nuclear
Access to Medical Counter Measures:						
Doses	350-450	300-400	600-700	450-550	250-300	250-300
CBRN PPE Stockpile:						
Fully encapsulating chemical protective suit.	700-900	600-800	1200-1400	900-1100	500-600	500-600
Decontamination Materials (e.g. Fullers Earth or RSDL)	1000-					

CBRN PPE Stockpiles: Recent events have shown a potential inadequacy in the volume and availability of sufficient PPE and decontamination material to sustain ongoing UCPM operations over an extended period of time. The benchmark for this has been taken as the recent Novichok contamination in UK where operations were protracted over a full year and the National stockpile of PPE was all-but exhausted. This is a reasonable planning assumption for the UCPM as the amount of contaminant was so small.

Two components have been considered in setting these goals, firstly the number of additional units likely to be required as a result of each of the studied events and secondly the amount of additional decontaminant which might prolong operations with existing stocks.

As for the MCM calculations above, the number of responders to each event have been calculated accurately but assumptions have had to be made regarding the level and quantity of additional PPE that might be required based upon each operative requiring 2 sets of PPE (2 operational wears) and three packs of decontamination capability (2 operational and one emergency).

Table 9 presents the revised goals for access to medical countermeasures. Table 8 outlines the number of individuals requiring protection per event. Table 9 describes the number of personnel requiring protection per module based upon the capacity goals.

Table 9 Access to Medical Counter Measures

Existing modules	Needed for event	Overall needed to guarantee availability	Personnel per module	Factor to maintain module Availability	Total Responders	Personnel needed for event	Overall Personnel Needed
	A	B	C	D	E=C*D	F=A*E	G=B*E
HCP (High capacity pumping)	10	20	20	3	60	600	1200
FRB (Flood rescue using boats)	2	6	40	3	120	240	720
HUSAR (Heavy urban search and rescue)	3	4	70	3	210	630	840
MUSAR (Medium urban search and rescue)	3	4	40	3	120	360	480
GFFF (Ground forest fire fighting)	2	4	50	3	150	300	600
GFFF-V (Ground forest fire fighting using vehicles)	5	15	40	3	120	600	1800
CBRNDET (CBRN detection and sampling)	2	6	20	3	60	120	360
MEVAC (Medical aerial evacuation of disaster victims)	1	2	20	4	80	80	160

Existing modules	Needed for event	Overall needed to guarantee availability	Personnel per module	Factor to maintain module Availability	Total Responders	Personnel needed for event	Overall Personnel Needed
	A	B	C	D	E=C*D	F=A*E	G=B*E
EMT 1 Emergency medical team type 1	5	8	40	3	120	600	960
EMT 2 Emergency medical team type 2	2	3	50	3	150	300	450
EMT 3 Emergency medical team type 3	1	1	100	3.5	350	350	350
TAST	2	3	15	3.5	52.5	105	157.5
UCPM	[not included in the current study]	[not included in the current study]	10	5	50	NA	NA

Medical Counter-Measures (MCMs): This refers to the ability to medically protect responders required to enter a biologically contaminated area as described in the planning assumption describing *International Medical Emergency - Pandemic*. Scenarios might range from those that have already been experienced to those with a more HiLo profile such as a malicious biological attack. Recommendations as to which MCMs should be considered are outside of the scope of this evaluation but interviewees, National Risk Assessments (NRAs) and national contact points report having considered the MCMs necessary for an emergency involving Ebola virus disease (EVD), influenza, severe acute respiratory syndrome (SARS), anthrax and smallpox.

In general, it is not considered necessary to pre-vaccinate responders in advance of emergencies in most scenarios hence describing the need for immediate access to a protected stockpile for this purpose. There is considerable risk that many MCMs will not be available for procurement once an emergency has been declared due to the scale of competing demand and limited supply. Production times prevent additional manufacture at short notice.

The goals proposed are based upon two components: first, the number of person/doses that can be administered on deployment to enable UCPM capacity to be protected for response to an incident and, second, the number of person/doses that would require administration some time in advance to ensure availability of sufficient capacity.

These numbers vary according to the availability, type and period to achieve clinical efficacy for each MCM so there is need for further study to demonstrate the detailed requirement for the most commonly planned for events.

However, the UCPM should ensure the availability of medical countermeasures for all emergency responders it sends to an affected zone through the Mechanism. There should however also be a sufficient availability of medical countermeasures to cover the needs for protection of the domestic emergency responders, both from governments and NGO's. It is recognised that currently, not all countries have access to adequate stocks for full coverage of their own emergency responders. Whilst this is beyond the scope of the UCPM, it poses a risk to the mechanism whereby responders through it cannot be supported adequately by a host nation.

Table 8 follows a simple methodology to calculate the total number of responders requiring an unspecified MCM for each event type. For each event, it is calculated by taking the capacity goal for each module and multiplying it by the number of responders required to populate the required number of modules. Which medication or vaccination is not stipulated as the number refers to the people requiring protection, not what they are to be protected from. However, the number of doses required will be specific to each MCM, as some medications require multiple doses to achieve effectiveness.

9 Capacity gap analysis

This section presents the quantitative analysis of the capacity gaps within the UCPM. The analysis is in two parts:

- Section 9.1 presents a quantitative analysis of gaps against the current goals;
- Section 9.2 presents a quantitative analysis of gaps against the proposed revised goals. The revised goals are based on the planning assumptions for the events described in section 6. In this way, the capacity analysis is based on an assessment of the events facing Europe that might trigger an activation of the UCPM.
- Section 9.3 offers reflections on capabilities that are not mentioned in the planning assumptions but that could still merit inclusion in the UCPM.

This section builds on section 4, which addresses fundamental questions around whether the capacities match the identified needs within and outside of the EU.

9.1 Gaps in relation to current goals

The table below provides an overview of the current capacity goals and the extent to which these are available, both through the modules currently registered in CESIS and/or the Voluntary Pool. The modules have been grouped thematically, in order to limit duplication and ensure gaps can be identified more easily.

Table 10 Capacity gaps in relation to the current goals

Module	Capacity goals	Currently registered (Pool)	Currently registered (CECIS)	Capacity gap (+over-supply)
ETC (Emergency Temporary Camp)	2	1	1	-1
Additional Shelter Capacity: units for 250 persons (50 tents); incl. self-sufficiency unit for the handling staff	6	0	1	-6
Additional Capacity Shelter-kit: units for 2 500 persons (500 tarpaulins); with toolkit possibly to be procured locally	100	0	0	-100
HCP (High capacity pumping)	6	16	14	+10
FC (Flood containment)	2	4	2	+2
FRB (Flood rescue using boats)	2	4	5	+2
Water pumps with minimum capacity to pump 800 l/min	100	0	0	-100
WP (Water purification)	2	5	5	+3

Module	Capacity goals	Currently registered (Pool)	Currently registered (CECIS)	Capacity gap (+over-supply)
Teams for maritime incident response	2	1	0	-1
Marine pollution capacities	As necessary	1	0	n/a
FFFP (Aerial forest fire fighting module using planes)	2	Not included in current study		
GFFF (Ground forest fire fighting)	2	6	4	+4
GFFF-V (Ground forest fire fighting using vehicles)	2	5	19	+3
FFFH (Aerial forest firefighting module using helicopters)	2	Not included in current study		
Fire-fighting: advisory/assessment team	2	2	0	0
AMP (Advanced medical post)	2	1	5	-1
AMP-S (Advanced medical post with surgery)	1	1	3	0
FHOS (Field hospital)	2	0	2	-2
MEVAC (Medical aerial evacuation of disaster victims)	1	2	2	+1
Medical Evacuation Jets Air Ambulance and Medical Evacuation Helicopter separately for inside Europe or worldwide	2	0	2	-2
Evacuation support: including teams for information management and logistics	2	0	0	-2
MUSAR (Medium urban search and rescue)	6 (1 for cold conditions)	9 (2 for cold conditions)	22 (1 for cold conditions)	+3
HUSAR (Heavy urban search and rescue)	2	8	6	+6
Teams for mountain search and rescue	2	1	0	-1
Teams for water search and rescue	2	1	0	-1

Module	Capacity goals	Currently registered (Pool)	Currently registered (CECIS)	Capacity gap (+over-supply)
Teams for cave search and rescue	2	2	1	0
Teams with specialized search and rescue equipment, e.g. search robots	2	0	0	-2
CBRNDET (CBRN detection and sampling)	2	5	12	+3
CBRNUSAR (USAR in CBRN conditions)	1	1	7	0
TAST (Technical Assistance and Support Team)	2	4	8	+2
Teams with unmanned aerial vehicles	2	1	1	-1
Structural engineering teams, to carry out damage and safety assessments, appraisal of buildings to be demolished/repaired, assessment of infrastructure, short-term shoring	2	2	0	0
Mobile laboratories for environmental emergencies	2	1	0	-1
Communication teams or platforms to quickly re-establish communications in remote areas	2	1	0	-1
Power generators of 5-150 kW	100	0	0	-100
Power generators above 150 kW	10	0	0	-10
Other response capacities necessary to address identified risks	As necessary	-	-	-

Source: European Commission (extract August 2019)

In pure numbers terms, there is an **over-provision** of capacities in the areas of **high capacity pumping (HCP), medium urban search and rescue (MUSAR)** and **heavy urban search and rescue (HUSAR)** based on the current capacity goals. In these areas, it will be particularly important to analyse the number of deployments and the needs identified in national risk assessments to see if such a level of response capacity is required. There is also a clear **under-provision** (in pure numbers terms) with regard to **shelter modules** and **water pumps and power generators**.

In the area of power generators, despite a gap in terms of the numbers listed here, the 2017 report claims that Member States have their own additional resources available.

The Commission's 2017 report also identified the need for further research into potential capacity gaps into the resources required in **chemical, biological, radiological and nuclear (CBRN) disasters; big field hospitals and medical evacuation capacities as part of the European Medical Corps;**

remotely piloted aircraft systems; and communication teams. With regard to CBRN, there is no capacity registered in the civil protection pool for CBRNUSAR, although the report states that Member States do have this capacity (and seven modules are listed outside of the pool).

The need for a better-defined emergency medical response to address the health consequences of a diverse range of disasters (for example, the failure of critical infrastructure such as hospitals and the increased potential for spread of infectious diseases following a disaster) as well as the potential for disease outbreaks (such as Ebola) is also underlined. Specifically, this includes the need for **big field hospitals (EMT3) and medical evacuation capabilities (MEVAC).**

The Commission report identified in 2017 a number of additional response capacities that would be necessary to address the identified risks. A scoping exercise confirmed that all of these capacities are currently available. The additional response capacities identified in the 2017 capacity gaps report can be broadly divided into three categories:

- additional resources which supplement existing modules (extreme HCP, mobile bio-safe laboratories);
- capacities which replace existing capacities (EMT 1, 2 and 3); and
- new capacities which were not previously part of the civil protection pool (ICT helpdesk, standing engineering capacity, isolation hospital for infectious diseases).

The decision to upgrade the medical response modules currently registered in the civil protection pool (AMP, AMP-S and FH-OS) to World Health Organisation (WHO)-certified EMTs reflects a broader shift within the mechanism to increased standardisation of the response capacities. This can also be seen, for example, with the use of International Search and Rescue Advisory Group (INSARAG) standards for USAR capacities.

9.2 Gaps in relation to revised goals

Table 11 below compares the current capacities available and the revised goals proposed in section 8.

Table 11 Capacity gaps in relation to the revised goals

Module	Currently registered (Pool)	Currently registered (CECIS)	Revised goal (Overall needed to guarantee availability)	Capacity gap (+over-supply)
Flooding				
HCP (High capacity pumping)	16	14	20	-4
FRB (Flood rescue using boats)	4	5	6	-2
Drinking water				
WT (Water transportation)	0	0	1	-1
Medical				
EMT type 1 fixed	1 (AMP)	5 (AMP)	8	-7

Module	Currently registered (Pool)	Currently registered (CECIS)	Revised goal (Overall needed to guarantee availability)	Capacity gap (+over-supply)
Emergency medical team type 1)				
EMT type 2 (Emergency medical team type 2: Inpatient Surgical Emergency Care)	1 (AMP)	3 (AMP-S)	3	-2
EMT type 3 (Emergency medical team type 3: Inpatient Referral Care) 1	0	2 (FH)	1	-1
Shelter				
Base Camp	0	0	2	-2
Forest fire fighting				
GFFF (Ground forest fire fighting)	6	4	4	+2
GFFF-V (Ground forest fire fighting using vehicles)	5	19	15	-10
FFFP (Aerial forest fire fighting module using planes)	5 (rescEU)	Not included in the current study		
FFFH (Aerial forest firefighting module using helicopters)	2 (rescEU)	Not included in the current study		
Search and rescue				
HUSAR (Heavy urban search and rescue)	8	6	4	+4
MUSAR (Medium urban search and rescue)	9 (2 for cold conditions)	22 (1 for cold conditions)	4	+5
CBRN				

Module	Currently registered (Pool)	Currently registered (CECIS)	Revised goal (Overall needed to guarantee availability)	Capacity gap (+over-supply)
CBRNDET (CBRN detection and sampling)	5	12	6	-1
CBRN-PROT (PPE and operational support in CBRN environments)	0	0	3	-3
CBRN-DEC (Decontamination)	0	0	3	-3
Medical evacuation				
MEVAC (Medical aerial evacuation of disaster victims)	2	2	2	0
MEVAC-INF (Medical aerial evacuation of infectious patients or patients requiring a high level of care)	0	0	2	-2
TAST				
TAST	4	8	3	+1

The table highlights a number of gaps in different areas:

- **Flooding**: there are gaps in the HCP and FRB modules in relation to the capacities registered in the pool, although there are sufficient modules, if those registered in CECIS are taken into account;
- **Drinking Water**: as WT is a new module, there are currently no capacities registered. Discussions with stakeholders suggests that several Member States would already have the necessary resources to register WT capacities.
- **Medical**: the fulfilment of the revised goals would depend on the extent to which existing-registered capacities (AMP, AMP-S, FHOS) can be redefined according to the EMT standards. However, the Member States are unlikely to develop an EMT3 module. If the proposed goal of one capacity is to be achieved, it would therefore be necessary for an EMT3 module to be developed by a group of countries/at EU level.
- **Shelter**: since the proposed Base Camp module does not exist, there would be an immediate capacity gap if this module definition is accepted. Given the similarity between this module and the current ETC module, and the existing base camp capacity in the Member States which is not registered, it should be possible to create such capacities within a reasonable timeframe.

- **Forest Fire Fighting**: there would be considerable gaps for the GFFF and GFFF-V modules only based on the Civil protection pool capacities . However, the goals would be met if capacities within CECIS are taken into account.
- **Search and rescue**: the revised goals would be met by the capacities already registered in the pool.
- **CBRN**: there would be a need to register new capacities for the proposed new modules: CBRN-PROT and CBRN-DEC. There would be a gap in CBRNDET capacities against the proposed new goal, although a very high number are registered in CECIS. Adaptation is needed.
- **Medical evacuation**: there are sufficient capacities to meet the revised goal for MEVAC. Some or all of the currently-registered capacities already have experience in evacuating infectious patients and might therefore be able to register under the proposed new module.
- **TAST**: there are sufficient capacities within the pool to meet the revised goal.

9.3 Considerations on capabilities not mentioned in planning assumptions

The planning assumptions focus on capabilities for which civil protection modules are currently available. These consist primarily of response modules deployed in direct response to an incident or to provide direct support to affected citizens.

The literature review and the interviews carried out for this study have identified a number of gaps in the existing capabilities which are currently available to be deployed through the UCPM as part of any European response effort.

These gaps can be broadly clustered according to the following categories: coordination, advice, information management and logistical support gaps. In addition to these five categories, a new type of cross-cutting capacity will also be considered: unmanned aerial vehicles (UAVs), commonly known as “drones”.

9.3.1 Coordination capabilities (UCP coordination teams)

The general principle governing disaster management in general, which is also applicable within the UCPM, is that the host nation (that is, the nation receiving assistance) takes the lead in responding to any event, with the international community providing support to the affected nation only on request.

As part of their own preparedness activities, most Member States have the capacity to coordinate disaster assistance being provided by the international community while being affected by an event of the scale described in the planning assumptions. There have also been efforts within the UCPM to improve host nation support, which has led to increased awareness and better preparedness of Member States for receiving international assistance.

There remains a possibility however that some of the smaller Member States could, due to their size, be overwhelmed during an emergency of the scale of those outlined in the planning assumptions. A UCPM coordination team is therefore proposed to support the affected nation with coordination during an emergency, particularly one on a scale that implies the need for international assistance. Based on the planning assumptions, a need for two UCPM teams to help coordinate response efforts in emergencies affecting two or more countries simultaneously is foreseeable as more than one country is overwhelmed in several of the planning assumptions. The need for co-ordination teams was highlighted in the “lessons-learned” documents and supported by some national contact points interviewed in the context of hybrid, multi-stakeholder response situations where clear communication is needed to ensure flexibility and speed in cooperation across multiple agendas.

9.3.2 Advisory capabilities in specific areas

In interviews with national contact points and module experts, the need for qualified expertise in specific areas to support the affected Member States was mentioned multiple times. Three reasons were given to explain the need for expertise:

First, **lack of specific expertise at national level**, i.e. a qualitative gap in expertise. This was particularly the case in relation to events that are not the dominant events for which the country is prepared, or events which have a low probability but need a high level of expertise. One example of this is in the field of CBRN agents.

Second, **limited number of experts available at national level**, i.e. a quantitative gap in expertise. This was identified as a potential problem with regard to large scale events, such as earthquakes, flooding etc. Experts in damage and recovery assistance were perceived as particularly relevant to this category. For example, a large number of structural engineers to assess the damage on construction (roads, houses, bridges etc.) would be needed after earthquakes, flooding etc., while the number of engineers with specific damage assessment skills and training is limited.

Third, **provision of a second opinion**. Countries affected by a large scale event tend to be fully focussed on activities related directly to the response effort, with no time or capacity to reflect on their own response strategy. Given the changing nature of the risk landscape, countries may also face events of which they have limited experience (for example, a large forest fire in one of the northern EU Member States). In such situations, it is very valuable to have access to assistance in the form of expert advice on the response strategy.

The advisory expertise outlined above exists within the UCPM and can be delivered in several forms:

- **Technical experts**: for specialist advice on a specific topic within an event, sending individual experts through the UCPM as advisors can be an effective response. The UCPM delivers such experts, but currently has no repository of available experts/expertise.
- **UCP advisory expert teams**: if more experts are needed, because of either the amount or complexity of the advisory work, the UCPM can deploy UCP teams with an advisory task. This would be: an ad-hoc team composed of relevant experts nominated by the Member States. The use of UCP advisory teams for this purpose diminishes the burden on the affected state and ensures “a one stop shop” in terms of expertise.
- **Pre-organised advisory teams**: two types of expert advisory teams are currently registered: structural engineers and forest fire advisory teams. The ‘structural engineers’ capacity is composed of a pool of structural engineers that can be made available for damage assessment and engineering advice. The forest fire advisory team is a multi-disciplinary team able to give tactical and operational advice on forest fire response. Based on the planning assumptions, similar pre-organised advisory teams could be formed for events like flooding, CBRN, and restoration of drinking water. One advantage of a pre-organised team is that experts get the possibility to train and work together, enabling the required expertise to be deployed in a short time-frame. In-depth analysis of the events is needed to assess which type of event may require a pre-planned team.
- **Reach-back/remote expertise**: As a recurring theme of interviews, module team leaders and experts ask for organised access to reach-back expertise. For example, CBRN responders would like the possibility to be able to talk with specific experts on specific topics to ask their opinion or knowledge on substance etc. Other experts would like to have support in data processing and analysis, and access to experts with past experiences in similar cases as part of the formulation of advice. Nowadays, technical experts in UCP teams and modules often use contacts in their home organisations to informally arrange this reach-back expertise.
- **UCP Team as assessment team**: within Member States, the need for a UCP Team for a generic primary assessment is not needed for the more common events described in this report. However,

for specific situations (for example a collapsing mine), a secondary assessment could be requested by Member States. Such an assessment is in reality a form of advisory mission.

9.3.3 Information management

The management of information within a disaster is getting more and more complex. Advances in information technology have led to a significant increase in the amount of available information. However, the interoperability of systems for information sharing and exchange is very limited between teams from different Member States as different countries have developed their own individual systems. The ERCC uses CECIS for information sharing with the Member States, but information sharing with the UCP team and deployed modules is mainly done by telephone, email and videoconferences. In this field of work, further improvement is therefore needed.

Two suggestions for how this could be achieved are:

- **Common operational technology (information exchange support system)**: A system in which information is digitally shared between ERCC, UCP teams and the different modules.
- **Reach-back support**: Experts currently depend on their own IT and use templates delivered by email from the ERCC. A well-developed digital office functionality, including the possibility to make use of mapping and an information management specialist to process incoming information, could significantly increase their value while on deployment. Basic reach-back support for IT is currently delivered through the deployment of a TAST module. However, this is limited to secretarial and technical support.

9.3.4 Logistical support

For deployment of modules, logistical experts and teams are needed. The logistical principles currently followed are:

- modules are self-sufficient;
- the host nation provides the support required to facilitate deployed modules;
- UCP teams and experts are supported by TAST modules.

The self-sufficiency of modules has a number of limitations. Upon arrival by air, modules need transport capacity to deliver them to the affected area. If a smaller country is affected by an event on the scale described in the planning assumptions, the possibilities to deliver transport will be limited. It could be a good solution to assure that support for transport capacity be made available remotely (for example through commercial contractual provision).

In an event with wide scale collapsed buildings and/or evacuations, it will not always be possible to place the coordination hub close enough to the affected area to use existing facilities. For the UCP team itself, a TAST module can deliver working and living space in tents, but for the coordination hub of a large event this will not be enough. The capacity to build a (tent based) base camp should be considered. The current ETC module could be changed in a module to deliver base camp support facilities.

9.3.5 Remotely Piloted Aircraft Systems

Remotely Piloted Aircraft Systems (RPAS), also known as “Unmanned Aerial Vehicles” (UAVs) or “drones”, are often referred to as a new type of capacity being needed. The possibilities of drones for obtaining an overview of the operational situation and as an asset in search and rescue activities is often mentioned. RPAS technology is evolving rapidly and its uses within emergency response are still being developed.

A very broad range of vehicle types already exists on the market. Current technological developments include miniaturising, self-deployability, swarms, and delivery of goods.

There is a consensus amongst national and module experts, that RPAS do not merit designation as a new type of module. Instead, it will be preferable to incorporate them into existing modules with a single set of interoperability and regulatory guidance. For example, a USAR module could use specific small RPAS for reconnaissance in small buildings, while an FRB module may use large units for localisation of people in a flooded area and a CBRN detection team will use another type for detection and sampling. Alternatively, RPAS could be developed as a cross-cutting capacity that would be deployed either alongside or independently of other modules, depending on the needs of the situation.

Increased use of RPAS will create some challenges that will benefit from over-arching guidance including:

- Large amounts of data/information which will require processing and storage.
- Use of shared airspace with helicopters and other aircraft. Furthermore, if multiple RPAS are being deployed, their movements will need to be coordinated. This requires advance consideration of how to coordinate the air space.
- The usage of RPAS is regulated in most countries, but licensing is not currently internationally aligned.
- Security threats through the use of RPAS warrants consideration. Although beyond the scope of this initial work, because of the amount of discussion generated by the subject, a short paper is included addressing the key issues in Annex 3.

9.3.6 Other areas

The research identified specific examples of possible new modules, experts or other response capacities that might merit definition within the UCPM but which do not directly flow from the planning assumption and do not fit neatly into the categories described in sections 4.3 to 4.11. At this stage, the validity of these suggestions is not proven, so the suggestions are presented here for consideration but without offering conclusions or recommendations.

The need for a **maritime evacuation module** could be explored. One high impact, low probability scenario identified by DG ECHO staff and by national contact points in interviews was the possibility of a ferry incident (for example, a collision between a ferry and a tanker) which could lead to mass casualties requiring evacuation. A further high impact, low probability issue is that of accidents involving ageing platforms for oil extraction, such as those in the North Sea and the associated risk of oil spills and contamination. Marine pollution is linked to increased marine traffic around the European coastline. There appears to be a gap in the national risk assessments related to marine incidents. This is because marine pollution does not always fall within the remit of the civil protection authorities, who carry out the risk assessments. The European Maritime Safety Agency (EMSA) is currently carrying out a stress test regarding the European preparedness for the response at sea.

Cyber-security is referred to in several reports and was mentioned by some stakeholders interviewed, including two national contact points. As with terrorism and war, there is a strong overlap with the field of national security here. Indeed, in some risk assessments and reports, all three are listed as part of hybrid strategies which threaten infrastructure and lives. It is worth noting that whilst cyber-security is discussed multiple times, the exact requirements of such a module are not clearly discussed. One national contact point suggested that it might be sufficient to define expert profiles for responding to cyber incidents and consequence management, rather than defining a new module.

Protection of cultural heritage: the literature highlights the possible need to define a module, type of expert or other response capacity to protect cultural heritage in case of disasters. Such a need is likely to increase, given the risks arising from climate change. This issue has been the subject of "PROMEDHE", a pilot project supported by DG ECHO, which had the aim of strengthening the capacity for disaster management preparation through the development of the civil protection sector, the development of operational manuals for emergency management at the institutional level and the development of information systems for the management of emergency information.[68] PROMEDHE was also linked to the European Year of Cultural Heritage 2018, which featured four principles, including "Protection".[69]

Public information teams for hybrid and security scenarios provide one example of where such expertise could be useful, as such events are moving targets by nature which require flexibility in defining response and resilience.

9.3.7 In-kind assistance

In addition to modules and experts, in-kind assistance is frequently delivered by the UCPM and part of the civil protection pool. For example, numerous items were provided in 2016 in response to the European refugee crisis, including protective equipment, blankets, clothing-disposable raincoats, roll mats, sleeping bags, beds, bed clothes, solar lanterns, heaters, latrines, residential containers, power generators and sanitary containers.[70]

Previous research has identified some needs and gaps regarding the use of in-kind assistance:

- Consistent use of liaison officers to monitor the reception of in-kind assistance;[71]
- Better provision of up-to-date information (e.g. daily) about the type of in-kind assistance required (for example, as evidenced by the 2016 refugee crisis).[72]

A specific topic regarding in kind assistance is stockpiling of goods as part of the European civil protection pool. To have a prepared and predictable response and assure availability stockpiling of critical goods is needed. Issues raised and to be discussed regarding stockpiling include:

- joint procurement and storage (hosting capacities) at country or (sub-European level);
- planning and delivery of strategic stockpiles; and
- consideration to material investments to certain network components, which are not immediately available from markets and require a long manufacturing process.

[68] http://www.fireriskheritage.net/none/promedhe-eu-project-protecting-cultural-heritage-across-borders/
[69] https://europa.eu/cultural-heritage/news/protecting-cultural-heritage-across-borders_sv
[70] ICF (2017), Interim evaluation of the Union Civil Protection Mechanism, 2014-2016
[71] ICF (2017), Interim evaluation of the Union Civil Protection Mechanism, 2014-2016, p.161
[72] ICF (2017), Interim evaluation of the Union Civil Protection Mechanism, 2014-2016, p.159

10 Cost data

10.1 Introduction

This section provides an overview of the range of cost estimates provided for each module, followed by a brief description of the types of costs involved in development, maintenance and deployment of modules. Up to three modules for each capacity were interviewed about their approach to costing and data were requested in order to establish an overview of the main types of costs incurred in the development, maintenance and deployment of each of the modules listed in Annex II of the 2014 Implementing Decision and Annex I of the 2018 Implementing Decision for medical modules.[73] This includes, for example, the nature of contractual arrangements, extent and nature of training typically undertaken, number of professionals deployed, etc.

Having reviewed the cost data available for all of the cost modules, a number of findings emerge. Firstly, as mentioned above, many modules do not exist as discrete costed units. This means that costs related to the module's development, maintenance and deployment under the UCPM may be inseparable from their wider role at national level. Most development costs are incurred for domestic purposes rather than for UCPM registration. In as far as we have been able to separate additional development and maintenance costs to those incurred under a "business as usual" scenario, these are usually relatively minor (or even non-existent).

10.2 Development Costs

In the overwhelming majority of cases, the modules incurred few additional costs in securing UCPM registration. Instead, modules primarily incur costs in developing capacity for domestic deployment or for international deployments on a bilateral basis (i.e. not only through the UCPM). Having developed such capacity, modules are then able to demonstrate that they meet the requirements set out in Annex II of the Implementing Decision without incurring extensive additional costs. Where additional costs are incurred, these tended to relate to items such as vaccinations, additional training or English language tuition specifically required to make the modules ready for international deployment. None of the modules identified costs of staff time associated with securing UCPM registration and ensuring readiness for international deployment, except time associated with staff training. Instead, the costs of such time tend to be absorbed into the day-to-day running costs of the relevant body.

The exception to this general rule would be modules that are only or primarily developed for international deployment. None of the existing modules were identified as such, although any EMT3 would be likely to fall into this category.

The main types of costs associated with developing modules that are ready for deployment (whether domestic or international) are as follows:

- **Training of staff**; several modules were able to identify the number of professionals requiring to be trained and the number of training days involved. Typically, modules train more professionals than would be required for any deployment. For example, one CBRNDET module reported having trained 57 professionals, whereas only about 32 had featured in a previous international deployment. One GFFF module reported having trained more than 1,250 professionals, although in practice the majority of those would only ever be deployed domestically. One HCP module reported that each staff member received 2 days training specifically related to international

[73] The Terms of Reference excluded the two aerial forest fire fighting modules from the scope of the study.

deployment.

- **Vaccinations**: several modules reported incurring costs related to vaccination of staff, including EMT, ETC, FRB, HCP and USAR. Understandably, those modules routinely vaccinate all personnel that are available for deployment, which obviously exceeds the number that feature in any single deployment. For example, one FRB module maintained a roster of 70 vaccinated staff and another a roster of 315, whereas an international deployment might only feature 30 people. One GFFF module reported that vaccinations are required only to ensure readiness for deployment outside Europe.
- **Equipment**: no instances were identified of equipment having been purchased solely for international deployment. Instead, it appears that equipment purchased for domestic deployments is generally sufficient for international deployments within Europe, depending on the needs of the event.
- **Consumables**: as with equipment, consumables purchased for domestic deployments are generally sufficient for international deployments within Europe. These can include specialist consumables, such as CBRN decontamination consumables, health kits (e.g. malaria, diarrhoea), medicinal drugs, etc. Some costly consumables tend to be purchased only at the time of a deployment, for example, food or fuel.
- **Vehicles**: again, no instances were identified of equipment having been purchased solely for international deployment. Instead, any vehicles purchased for domestic deployment tend to also be suitable for international deployment. Moreover, some vehicles can meet the needs of more than one type of module, for example, USAR as well as CBRNDET. Some modules were able to provide the costs of procuring such vehicles.
- **Contracts and agreements with third parties**: this includes agreements with healthcare providers to make medical staff and equipment available or contracts with airlines to make aircraft and personal available.
- **Self-sufficiency equipment and materials**: such as mobile shelters, tents, containers, etc. Some modules did not require such equipment and materials for domestic deployment but instead required them primarily for international deployments.

Examples of cost incurred solely to ensure readiness for international deployment include:

- **Certification** by the WHO (EMT modules) or INSARAG (USAR).
- **International driving licences**, where deployments outside the EU are foreseen, although in practice such licences might only secured at the point at which such a deployment is confirmed.

10.3 Maintenance Costs

Maintenance costs cover all elements required to keep a module ready for international deployment. As with deployment costs, the overwhelming majority of modules incurred few additional costs in ensuring continued readiness for deployment through the UCPM, as opposed to domestic deployment or international deployment in general (i.e. not only through the UCPM). Again, where additional costs were incurred, these tended to relate to items such as vaccinations, additional training or English language tuition required to ensure continued readiness for international deployment. None of the modules identified costs of staff time associated with ensuring continued readiness for international deployment, except time associated with staff training. Instead, the costs of such time tends to be absorbed into the day-to-day running costs of the relevant body.

The main types of annual costs associated with maintaining modules that are ready for deployment (whether domestic or international) are as follows:

- **Staff training**: in some cases, modules reported considerable investments in staff training in order to maintain specialist skills. For example, one country reported providing 50-55 days training per annum to each professional available for deployment within its GFFF, USAR and CBRNDET modules. One GFFF module reported providing 20 days' training each year for all staff, whilst an ETC module reported providing 15 days for each person. Requirements for ongoing training within FRB modules were reported to be much lower, only 2-3 days per person per year. One EMT module reported lump sum costs of €185,000 in staff training each year, whilst an USAR module gave a figure of €29,000. One module provided English language tuition to 30 staff members each year, specifically to ensure readiness for international deployment.
- **Vaccinations**: annual costs of vaccination are typically lower than the initial deployment costs. In many cases, repeat vaccinations are not required each year and, in any case, tend to be cheaper than the initial vaccination. However, modules will usually have to allow for the costs of vaccinating new staff that replace staff members that are no longer available for deployment, e.g. due to natural staff turnover. One FRB module estimated the ongoing costs of vaccinations to be €137 per person, per annum.
- **Depreciation of equipment, consumables and vehicles**: modules were mostly unable to provide detailed figures for such costs. Some were able to provide estimates for the expected lifetime of equipment and consumables, which thus facilitates the estimation of annual costs of depreciation and replacement. For example, different pieces of CBRNDET and CBRNUSAR equipment were estimated to have a lifetime of 5, 10 and 15 years, whilst different consumables were estimated to last 2, 3 or 10 years. Medical consumables were estimated to have a lifetime of only 1 or 2 years, as did plastic foil within the HCP module. Containers and generators had a much longer life, estimated at up to 20 years, whilst tents required to be replaced every 5 years. Vehicles were generally replaced every 10 or 15 years, whilst boats within FRB modules would last 10 years.
- **Maintenance and storage of equipment, consumables and vehicles**: again, modules were mostly unable to provide details figures for such costs. One EMT1 module estimated that maintenance and storage costs amounted to €57,000 per annum. Within MEVAC modules, the costs of maintaining and storing equipment and consumables were covered by the contracts with airlines and healthcare providers.
- **Contracts and agreements with third parties**: these include agreements with healthcare providers to make medical staff and equipment available or contracts with airlines to make aircraft and personal available. In practice, the ongoing annual costs can be similar to the set-up/first year costs, albeit with allowance for inflation.
- **Licences**: require to be renewed on an annual basis, including boat licences (within FRB modules) and international driving licences (where deployment outside the EU is foreseen).
- **Exercises**: substantial costs are usually incurred when modules participate in exercises, whether organised in the context of the UCPM or not. These can vary considerably both within and between modules, depending on the nature, scale and location of the exercise. One module reported the costs of an exercise as €100,00, whilst a different module quoted €250,000. Depending on the module, full-scale exercises might be undertaken every year or every 2 years.

10.4 Deployment Costs

Deployment costs can be understood as the total amount required for a module to be deployed internationally for a given amount of time. There is inevitably considerable variation in total costs, depending on the length, location and scope of a deployment. However, the research has been able to identify the types of costs usually incurred, as well as benchmarks for certain unit costs and for total costs.

The main types of costs are as follows:

- **Staff time**: approaches to the costs of staff vary. Some modules pay staff no more than their usual salary during a deployment, whilst others provide a salary enhancement. For one module, this amounted to €50 per day, which was equivalent to 42-73% of staff salaries. If subsistence is not directly provided by the module, then a per diem is typically paid. One module reported paying a per diem of €32 per day (in addition to food rations), whilst another paid €68 (without food rations). The policy of one module was to not pay per diems to deployed professionals in order to avoid conflict of interest. Instead, all food, water and accommodation is provided since teams are self-sufficient. Different approaches were also taken to the remuneration of volunteers. In some cases, the national government compensated the volunteers' employers, whilst in another case, volunteers were paid a per diem but received no salary. One FRB module required entirely on volunteers and did not include professionals. In some countries, deployment costs also include physical and mental health checks and debriefs prior to and on return from a deployment.
- **Equipment costs**: typically, the necessary equipment is acquired by modules in advance of any deployment and does not require to be specially purchased. In some cases (particularly EMT modules), some or all equipment may be donated to the host nation to meet its ongoing needs and thus requires to be replaced following a deployment. Equipment that is returned will require maintenance and repair, although costs vary widely. Some modules provided estimates of the degree to which equipment requires replacement following a deployment. One country estimated a replacement rate of around 10% for personal protective equipment within its CBRNUSAR, CBRNDET and GFFF modules, although this could rise to 25-30% for intense fires. One HCP module also estimated a 10% replacement rate for its modules, whilst a WP module provided an estimate of 15%. One HCP module estimated typical costs of replacing equipment to be about €5,000.
- **Consumables and other costs**: consumables can include medical or CBRN consumables. Many modules incur fuel costs for equipment or generators and for local travel. In some deployments, the host nation may provide such fuel free of charge. Equipment fuel costs are generally highest for EMT or HCP modules, given their use of power generators, pumps, etc.
- **Logistics, ICT and communication costs**: in some deployments, modules may incur relatively low costs where host nations or TAST modules provide logistical, ICT and communications support. In other cases, modules must make their own arrangements. Communication costs can be considerable where modules are required to rely on satellite phones (estimated at around €1,000 per day), e.g. if local communication infrastructure is not fully functional. In other cases, modules can rely on their own mobile phones or purchase local SIM cards, which serves to keep costs low.
- **Self-sufficiency costs**: these depend in part on whether the module provides its own accommodation, e.g. using tents, or makes use of local hotels. Approaches to providing subsistence vary. In some cases, food rations may be provided. For example, one module provided a 24-hour ration pack at an estimated cost just below €27 per day per person. In other cases, modules pay a per diem covering food costs.
- **Road transport**: such costs are naturally determined by the distance to be travelled, the number of vehicles and staff deployed and any need for accommodation en route. Modules typically used their existing vehicles, which incurs a certain cost in terms of wear and tear, although modules tended to absorb much of those costs within their usual running costs. Some modules will rent vehicles for international deployments, so that their own vehicles remain available for domestic use. As an example, renting a truck was estimated at €700 per day and minibus at €150 per day by one module. Costs of fuel were estimated at around €1.2 to €1.4 per litre. The number of km per litre is another important determinant and depend on the vehicles used. Accommodation en route most often consists of hotels.
- **Air transport**: for those modules that are transportable by air, costs vary according to the weight

and volume of equipment and the number of passengers. The costs of transport include packaging (including medical and dangerous goods), loading at departure airport, unloading at arrival airport, outward and return flights, in-flight catering and (where relevant) provision for dogs (e.g. USAR). Estimates for different modules are provided in section 10.5.4 below.

10.5 Summary of costs

An overview of the range of development, maintenance and deployment cost estimates for each module is set out in Table 12, Table 13 and Table 14 respectively. The figures presented here provide a good indication of the total costs that might be incurred by a typical module. At the same time, the figures should not be used to make detailed comparisons between modules. The data has been gathered from a range of countries according to the costing methodology used by each country. This results in considerable variation in what costs are included and how they are calculated.

10.5.1 Development costs

Development costs for the modules typically include staff training costs, vaccinations, the purchase of relevant equipment, consumables, vehicles, and materials, establishment of contracts or agreements with third party providers.

Table 12: Estimated development costs per module

Module	Lowest cost estimate	Highest cost estimate	Number of modules providing data
CBRNDET	€ 1,818,370	€ 1,818,370	1
CBRNUSAR	€ 3,616,860	€ 3,616,860	1
EMT1	€ 381,355	€ 381,355	1
EMT2*	€ 726,300	€ 929,895	2
EMT3#	€ 15,500,000	€ 15,500,000	n/a
ETC	€ 8,568,375	€ 8,568,375	1
FC*	€ 116,356	€ 116,356	1
FRB	€ 983,200	€ 983,200	1
GFFF	€ 1,530,420	€ 1,530,420	1
GFFF-V	€ 1,530,420	€ 1,530,420	1
HCP*	€ 1,539,652	€ 2,300,495	2
MEVAC	€ 668,620	€ 668,620	1
USAR	€ 602,787	€ 602,787	1
WP	€ 733,848	€ 733,848	1

** Does not include staff salary costs (not provided by modules).*
 # EMT3 module does not currently exist in Europe. Costs are an estimate based on the European Modular Field Hospital project (EUMFH).

10.5.2 Maintenance costs

Maintenance costs for the modules typically include staff training costs, renewals of vaccinations, maintenance, depreciation and storage of relevant equipment, consumables, vehicles and materials and renewal of contracts or agreements with third party providers.

Table 13: Estimated maintenance costs per module

Module	Lowest cost estimate	Highest cost estimate	Number of modules providing data
CBRNDET	€ 408,667	€ 408,667	1
CBRNUSAR	€ 775,948	€ 775,948	1
EMT1	€ 328,721	€ 328,721	1
EMT2*	€ 461,151	€ 461,151	1
EMT3#	€ 7,500,000	€ 7,500,000	n/a
ETC	€ 783,062	€ 783,062	1
FC	n/a	n/a	0
FRB	€ 554,550	€ 554,550	1
GFFF	€ 117,880	€ 117,880	1
GFFF-V	€ 117,880	€ 117,880	1
HCP	n/a	n/a	0
MEVAC	€ 549,405	€ 549,405	1
USAR	€ 140,689	€ 140,689	1
WP	€ 100,000	€ 100,000	1

** Does not include staff salary costs (not provided by modules).*
 # EMT3 module does not currently exist in Europe. Costs are an estimate based on the EUMFH.

10.5.3 Deployment costs

Deployment costs for the modules typically include staff costs, depreciation or repair of equipment, consumables, vehicles and materials, purchase of consumables, self-sufficiency costs (e.g. accommodation, food), ICT, logistics and communications, and transport by road.

Table 14: Estimated deployment costs per module (transport by road)

Module	Lowest cost estimate	Highest cost estimate	Number of modules providing data
CBRNDET	€ 96,909	€ 96,909	1
CBRNUSAR	€ 133,982	€ 133,982	1
EMT1	€ 349,141	€ 352,739	2
EMT2	* € 1,403,833	€ 2,216,687	2
EMT3#	€ 8,308,160	€ 8,308,160	n/a
ETC	€ 465,100	€ 465,100	1

Module	Lowest cost estimate	Highest cost estimate	Number of modules providing data
FC	€ 77,720	€ 77,720	1
FRB	€ 121,301	€ 121,301	1
GFFF	€ 56,060	€ 56,060	1
GFFF-V	€ 56,060	€ 621,945	2
HCP	€ 62,441	€ 162,880	4
MEVAC	€ 100,000	€ 100,000	1
USAR	€ 540,620	€ 540,620	1
WP	€ 284,725	€ 284,725	1

** Does not include staff salary costs (not provided by modules).*
 # EMT3 module does not currently exist in Europe. Costs are an estimate based on the EUMFH.

10.5.4 Air transport costs

As noted above, a quote for the costs of transporting modules by air was received from a transport broker (covering personnel, equipment and materials). The quote covered packaging, loading at departure airport, unloading at arrival airport, outward and return flights, in-flight catering and (where relevant) provision for dogs (e.g. USAR). The table below provides the cost estimates.

Table 15: Estimated costs for air transport of modules

	Brussels to Istanbul	Brussels to Jakarta
AMP, AMP-S, MUSAR, CBRNDET, GFFF, TAST	€123,000	€395,000
HUSAR, CBRN-USAR, FC, FRB	€203,000	€395,000
FHOS	€182,000	€395,000
ETC*	€400,000	€1,550,000

* ETC quote relates to a departure from Bratislava instead of Brussels.

11 Conclusions

The purpose of this report has been to present the overall results of the study to support the European Commission to further develop disaster response capacities under the UCPM.

As required by the Terms of Reference (ToR) for the study, the report presents the results of four Tasks with simple conclusions as follows:

11.1 Main conclusions regarding the redefinition of existing response capacities

Having collected and analysed the available evidence regarding the appropriateness of the currently available response capacities defined in Annex II of the Commission Implementing Decision No 2014/762/EU, both in terms of definitions and quality requirements, and in terms of past response experiences and the most recent national and European risk assessments, the following conclusions are drawn:

Most module definitions remain fit for purpose.

All **modules will benefit from updating of their definitions** and this report details specific areas considered for inclusion in such an update.

The report has shown that **a number of new modules may merit definition**:

- Water transportation (WT)
- Personal protective equipment and operational support in CBRN environments (CBRN-PROT)
- Decontamination of responders and equipment (CBRN-DEC)
- Medical aerial evacuation of infectious patients or patients requiring a high level of care (MEVAC-INF)
- Base Camp (BC).

A number of modules are considered as having limited relevance, at least in respect of deployments within the Member States. For these modules, it is not therefore worthwhile to define capacity goals. However, it might yet be worthwhile to retain some of these modules for the purposes of international deployment (outside EU). There are as follows:

- Flood containment (FC)
- Water purification (WP)
- USAR in CBRN conditions (CBRNUSAR)
- Emergency Temporary Camp (ETC)
- Advanced medical post (AMP), replaced by EMT1
- AMP-S (Advanced medical post with surgery (AMP-S), replaced by EMT2
- Field hospital (FHOS), replaced by EMT3.

Some interviewees suggested that, as the number of scenarios to which the UCPM is expected to respond evolves, the concept of **deploying modules will remain important but will increasingly be complemented or even replaced by other approaches** such as the increasing use of Experts and/or the deployment of parts of modules.

Interviews with DG ECHO officials underline a trend towards **increasing standardisation of module definitions**, particularly with regard to medical and USAR modules which are now expected to align with international standards set by the International Search and Rescue Advisory Group (INSARAG) of the United Nations and the World Health Organisation (WHO) respectively.

It has been suggested by some of those interviewed at DG ECHO that the use of cross-border or **interoperability guidelines** could help to maintain flexibility while ensuring required standards of interaction.

Definitions need to be drafted in such a way as to embrace emerging technology without requiring that unproven technologies be used.

Self-sufficiency is a cross-cutting definition which should be modified to reflect the needs and requirements for different modules. **Clearer guidelines on self-sufficiency** would be welcomed by most Member States.

In terms of medical protection for UCPM participants, there is a need to **ensure that personnel deployed as part of modules are adequately protected** at least to the same levels as those provided in the host nation responders

11.2 Main conclusions regarding the analysis of costs

The analysis of costs has involved the collection of cost data for the capacities listed in the 2014 Implementing Decision. This has shown that **modules are costed in very different ways by different Member States** and - for the most part – modules are built in such a way that makes a full and detailed costing difficult. Having reviewed the cost data available for all of the modules, a number of findings emerge. Firstly, as mentioned above, many modules do not exist as discrete costed units. This means that costs related to the module's development, maintenance and deployment under the UCPM may be inseparable from their wider role at national level. Most development costs are incurred in preparing for domestic purposes or for bilateral deployments rather than for UCPM registration. In as far as it is possible to separate additional development and maintenance costs to those incurred under a "business as usual" scenario, these are usually relatively minor (or even non-existent).

The main costs incurred by modules are as follows:

- **Development costs**: initial training of staff (salary and course costs) to prepare them specifically for international deployment; vaccination of staff; purchase of equipment, materials, consumables and vehicles; contracts or agreements with third party providers (e.g. health professionals and equipment, or aircraft and crew); licences (e.g. boats); and international certification (WHO, INSARAG).
- **Maintenance costs**: ongoing training of staff (salary and course costs) to maintain readiness for international deployment; refresher vaccinations; maintenance, depreciation and storage of relevant equipment, consumables, vehicles and materials and renewal of contracts or agreements with third party providers; exercises (typically annual or bi-annual).
- **Deployment costs**: typically include staff costs, depreciation or repair of equipment, consumables, vehicles and materials, purchase of consumables, self-sufficiency costs (e.g. accommodation, food), ICT, logistics and communications, and transport by road or air.

11.3 Main conclusions regarding the process of identifying capacity gaps and setting capacity goals

Building on the Commission's 2017 report on progress made and gaps remaining in the EERC[74] and the framework of the current capacity goals, in order to describe capacities, gaps and to propose the revision of capacity goals in the context of risk, it is first necessary to agree a process by which this can be demonstrated.

There is an important gap in the current approach to the assessment of risk at the European level. This approach is based on the analysis of NRAs submitted by Member States. As the submissions received are very heterogeneous, this process does not establish any direct link between a described disaster risk scenario and the capacities required.

A risk-based approach to the development of capacity goals needs a summary of those risks as perceived not just by DG ECHO but by every component part of the UCPM – in other words, representatives of each Member and Participating State along with a detailed review of the risks they describe for their own country. This project evaluated all National Risk Assessments and interviewed the vast majority of national contact points. This produced an improved understanding of the risk landscape and captured the types of risk that the UCPM may be deployed for.

There is a need for a better understanding of the scenarios under which the UCPM could be activated and what level of response should be expected from the mechanism. Whilst the EU-level Overview of Risks has allowed for an identification of areas of common concern, policy is not developed on the basis of an understanding of the specific impacts that would occur. Instead, capacity is built to mitigate broad risks or prevent broad effects rather than to respond to detailed scenarios. Ultimately, there is a risk is of a lack of capacity or a mismatch of capacities available to the UCPM.

For the purposes of this study, it was necessary to populate the risk landscape with agreed 'credible worst events'. This work was based upon previous studies further informed by the risk perception of Member States and Participating States.

In the implementation of such an approach, **it is suggested that nine worst credible events are developed and used to inform the UCPM capacity goals**, which would be of nine types, namely: flooding, extreme weather, forest fire, earthquake, international medical emergency, chemical release, nuclear, marine pollution and critical infrastructure.

Given the weaknesses in the current approach, **it is recommended that a new methodological framework is introduced for the purposes of assessing capacity in light of risk**. Such an approach would identify and prepare a series of "worst credible events" that can inform a set of planning assumptions. Those planning assumptions can then determine the response that is required from the UCPM.

With an agreed and described list of events, it is then possible to establish planning assumptions based upon scale and coverage. In simple terms: how big, affecting how many and over what area. These planning assumptions then inform the type of capabilities likely to be required to support affected countries.

Linked to this, **there is a need to distinguish between the concepts of "capabilities" and "capacities".** Capabilities are the skills and resources required to respond to a particular event, whilst capacities are how much of those capabilities are needed.

With the type of capabilities required agreed, for each planning assumption, it is then possible to describe the scale and resource likely to be required from the UCPM to support national responses.

[74] Report from the Commission to the European Parliament and the Council on progress made and gaps remaining in the European Emergency Response Capacity, COM(2017) 78 final.

This can then be compared with those currently available resulting in a clearly demonstrated over-provision or 'gap'.

It is understood that this is the first time such an approach has been described so it is the **conclusion of this study that the process should be further understood, developed and embedded into future reviews** so as to provide an ongoing evidenced and quantitative methodology for future modification and development of the UCPM.

In developing the framework, **there is also a need to highlight the policy choices that need to be made**. Whilst the probability and effects of specific scenarios can be determined on the basis of an expert analysis of the evidence, the degree of preparedness requires a balance to be struck between different (potentially competing) objectives. Most obviously, the objective of achieving a high level of preparedness has to be seen in the context of a finite level of resources available to support such preparedness.

11.4 Main conclusions regarding capacity gaps

Comparing the current available capacity registered in CECIS with the formulated capacity goals gives an overview of the current adequacy of the UCPM capacity:

- **There is sufficient provision of most of the modules**, namely HCP, FRB, GFFF, GFFF-V, CBRNDET MUSAR, HUSAR, MEVAC and TAST taking into account all modules registered in CECIS.
- There would be a need to **create or adapt capacities in line with the new module definitions**, namely WT, BC, CBRN-PROT, CBRN-DEC and MEVAC-INF.
- The fulfilment of the goals on medical modules would depend on the extent to which **existing-registered capacities (AMP, AMP-S, FHOS) can be redefined according to the EMT standards** It also depends on the development of a new EMT3 module, which does not yet exist in the EU.

11.5 Main conclusions regarding the revision of capacity goals

In the study, based on the developed events and planning assumptions new capacity goals have been set for the modules and other response capacities.

The capacity goals are based on:

- the capacity needed for a worst credible event
- The possibility of non-availability due to simultaneous events and the transportability of the modules throughout Europe.

A set of revised quantitative capacity goals is proposed in the tables in Section 7.1

The capacity goals cover existing modules and other response capacities as well as proposed new modules:

In revising the capacity goals, **there is an important choice to make regarding the extent to which the availability of capabilities will be guaranteed**. In Section 7.1, we have presented the number of capacities that would be required to address the different events individually. However, should events of one or more types occur simultaneously, then more capacities would be required to address the effects of those events. In the case of forest fires, for example, it would seem prudent to prepare for more than one event occurring at the same time (since extreme weather conditions may cause fires in several places at the same time). Similarly, an international medical emergency can be expected to be intertwined with other scenarios, such as earthquakes or forest fires. In contrast, the extent to which the goals should allow for the simultaneous occurrence of, say, an earthquake and a chemical release might be thought less likely.

These capacity goals are based on an expert assessment of capabilities and capacities required to address the effects of the nine events, as described in the relevant planning assumptions. However, this expert assessment does not replace the need for policy choices to be made by DG ECHO (as described above). Should the policy choices lead to a revision of the choice of events, then the expert assessment would need to be redone and may result in a revision to the goals.

Annex 1: Proposed module revisions and redefinitions

This annex provides an overview of the redefinitions proposed by experts in section 4, as they might be applied to the definitions outlined in Annex II of the 2014 Implementing Decision.

It is worth noting that the redefinitions and new definitions proposed here are a first iteration of any revisions to the modules in Annex II and should not be read as definitive. A more detailed piece of operational work and consultation, going beyond the scope of this study, would be required to verify the detailed redefinitions and new definitions as proposed in this annex.

The table below provides a brief overview of the findings from Chapter 9 related to which modules were viewed as requiring revision or a new definition. Proposed definitions then follow, based on the feedback received from module experts in the interview and survey consultations.

Table 16: Overview of proposed module deletions, revisions and redefinitions

Module Name	Status
High Capacity Pumping (HCP)	Suggested revisions included in revised version.
Flood Containment (FC)	Limited relevance within Europe. No revision required.
Flood Rescue with Boats (FRB)	Module fit for purpose as currently defined. No revision required.
Water Purification (WP)	Replaced by Water Transportation (WT)
Water Transportation (WT)	New definition included
Emergency Medical Team Type 1 (EMT1)	Aligned with international standards. No revision required.
Emergency Medical Team Type 2 (EMT2)	Aligned with international standards. No revision required.
Emergency Medical Team Type 3 (EMT3)	Aligned with international standards. No revision required.
Emergency Temporary Camp (ETC)	Limited relevance within Europe. No revision required. Replaced by Base Camp (BC)
Base Camp (BC)	New definition included
Ground Forest Firefighting (GFFF)	Module fit for purpose as currently defined. No revision required.
Ground Forest Firefighting with Vehicles (GFFF-V)	Module fit for purpose as currently defined. No revision required.
Medium Urban Search and Rescue (MUSAR)	Aligned with international standards. No revision required.
Heavy Urban Search and Rescue (HUSAR)	Aligned with international standards. No revision required.
Urban Search and Rescue in CBRN conditions (CBRNUSAR)	Limited relevance within Europe. No revision required.

Module Name	Status
CBRN Detection and Sampling (CBRN)	Suggested revisions included in revised version.
Protection in CBRN Conditions (CBRN-PROT)	New definition included
CBRN Decontamination (CBRN-DECON)	New definition included
Medical Aerial Evacuation (MEVAC)	Revised definition included
Medical Aerial Evacuation of infectious patients or patients requiring a high level of care (MEVAC-INF)	New definition included

Proposed module redefinitions

Proposed redefinitions for existing modules are presented below. Obsolete text is shown as deleted. New text is highlighted.

High capacity Pumping (HCP)

Module	General Requirements
Tasks	Provide pumping: — in flooded areas — to assist firefighting by delivering water
Capacities	Provide pumping with mobile medium and high capacity pumps with: — an overall capacity of at least 1,000m^3/hour, and ~~— a reduced capacity to pump 40m height difference~~ — a reduced capacity of 500m^3/hour with a height differences of 40m . Ability to: — operate in areas and terrain that are not easily accessible, ~~— pump muddy water, containing no more than 5 percent solid elements having particles size up to 40 mm,~~ — pump muddy water, containing no more than 5 percent solid elements having particles size up to 20 mm, — pump water up to 40°C for longer operations, — deliver water at a pressure of 3 bar over a distance of 1,000 metres.
Main Components	— Medium and high capacity pumps. — Hoses and couplings compatible with different standards, including the Storz standard. — Sufficient personnel to fulfil the task, if necessary, on a continuous basis. — Optional: All terrain vehicles (may be rented in host country)

Module	General Requirements
Self Sufficiency	Article 12 applies
Deployment	— Availability for departure maximum 12 hours after acceptance of the offer. — Ability to be deployed for a period of up to 21 days

CBRN Detection and Sampling (CBRN)

Module	General Requirements
Tasks	• Carry out/confirm the initial assessment, including: — the description of the dangers or the risks, — the determination of the contaminated area, — the assessment or confirmation of the protective measures already taken. • Perform qualified sampling. • Mark the contaminated area. • Prediction of the situation, monitoring, dynamic assessment of the risks, including recommendations for warning and other measures. • Provide support for immediate risk reduction.
Capacities	• Identification of chemical and detection of radiological hazards through a combination of handheld, mobile and laboratory-based equipment: — ability to detect alpha, beta and gamma radiation and to identify common isotopes, — ability to identify, and if possible, perform semi-quantitative analyses on common toxic industrial chemicals and recognised warfare agents. — Ability to gather, handle and prepare biological, chemical and radiological samples for further analyses elsewhere. • Ability to apply an appropriate scientific model to hazard prediction and to confirm the model by continuous monitoring. • Provide support for immediate risk reduction: — hazard containment, — hazard neutralisation, — provide technical support to other teams or modules.
Main Components	— Mobile chemical and radiological field laboratory, handheld or mobile detection equipment. — Field sampling equipment. — Dispersion modelling systems. — Mobile meteorological station. — Marking material. — Reference documentation and access to designated sources of scientific expertise. — Secure and safe containment for the samples and waste. — Decontamination facilities for the personnel. — Appropriate personnel and protective equipment to sustain an operation in a contaminated and/or oxygen deficient environment, including gas tight suits where appropriate.

Module	General Requirements
	— Supply of technical equipment for hazard containment and neutralisation. — Optional: It is advised to have a specialisation in the module for or biological, or chemical or nuclear incidents
Self Sufficiency	Article 12 applies.
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer.

Medical Aerial Evacuation (MEVAC)

Module	General Requirements
Tasks	— Transport disaster victims and internationally deployed professionals to health facilities for medical treatment.
Capacities	— Capacity to transport 50 patients per 24 hours. — Ability to fly day and night.
Main Components	— Helicopters/planes with stretchers.
Self Sufficiency	— Elements (f) and (g) of Article 12(1) apply.
Deployment	— Availability for departure maximum 12 hours after the acceptance of the offer.

Proposed new module definitions

Water Transportation (WT)

Module	General Requirements
Tasks	— Transport and distribute drinkable water according to the applicable standards and at least to the level of host nation, HACCP, ISO and WHO standards — Perform water quality control at the outtake point of the transportation equipment
Capacities	— Transport 150 000 litres of water per day over a distance of up to 500 km — Storage capacity equivalent to 75 000 litres of potable or bottled water
Main Components	— Transportation vehicles — Distribution equipment (if not bottled water) — Couplings compatible with different standards, including the Storz standard — Sufficient personnel to fulfil the task, if necessary, on a continuous basis — Optional: well rehabilitation expertise
Self Sufficiency	Article 12 applies

Module	General Requirements
Deployment	— Availability for departure maximum 12 hours after acceptance of the offer. — Ability to be deployed for a period of up to 12 weeks.

CBRN Protection (CBRN PROT)

This module is an enhancement of the previous search and rescue module in CBRN conditions (CBRNUSAR) designed to support broader operations within the UCPM.

Module	General Requirements
Tasks	To enable operation of UCPM modules in a contaminated or CBRN environment
Capacities	Personal Protective Equipment in accordance with the requirements of; — Medium and Heavy Urban Search and Rescue modules (H/MUSAR) — Pumping Capabilities (HCP) — Decontamination (CBRN-DECON) Minimum support for: — Three people working simultaneously in the hot zone — Continuous intervention over a period of 24 hours
Main Components	— Marking material — Secure and safe containment for the waste — Decontamination facilities for module personnel — Supply of technical equipment for hazard containment and neutralisation
Self Sufficiency	Article 12 applies
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer

CBRN Decontamination (CBRN-DECON)

Module	General Requirements
Tasks	To provide a limited decontamination capability for people and equipment following chemical exposure and, in specific instances, nuclear/radiological exposure. To create a safe environment (cordon) in which to undertake decontamination that includes detection (identification), sampling, and monitoring of contaminants within the protected zone as well as monitoring the efficacy of decontamination.
Capacities	To provide decontamination for: — Up to 340 ambulant persons per hour for up to eight hours — Up to 20 Non ambulant person per hour (clinical need) — Fatalities

Module	General Requirements
Main Components	— Public decontamination structure and ancillary equipment including disrobe and re-robe apparel, lighting, water heating, suitable surfactant wipes and other ancillary items for decontamination and containment of waste and materials used for decontamination — Detection, Identification and Monitoring capability as support within the decontamination zone — Appropriate personal and protective equipment to sustain operations to the scale described above. — Provision of water for decontamination, where appropriate, when unavailable locally (e.g. via a fire pump). — Provision for social sensitivities such as separate facilities for men and women and acknowledgement of religious constraints.
Self Sufficiency	Article 12 applies
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer.

Base Camp (BC)

Module	General Requirements
Tasks	Provide a base camp with support for deployed capacities, including: — Support for set-up and running of office — Logistics and subsistence support — Accommodation — Power supply — Water, sanitation, hygiene
Capacities	Capable of accommodating a staff of 100 people who fulfil a coordinating/staff role in the response to a disaster Both Office and tent camp accommodation for 100 people Meeting facilities for cluster coordination meetings with 50 participants
Main Components	Support components, enabling all on-site operations and co-ordination centre functions to be fulfilled, taking into account acknowledged international and EU guidelines: — support for set-up and running of office, — ICT support equipment, — logistics and subsistence support equipment, — Communications — ICT support — transport support on site. The support components shall be able to be divided in different units to ensure flexibility when adapting to the needs of a specific intervention. Taking into account acknowledged international and EU guidelines: — Tents with heating (for winter conditions) and camp beds with sleeping-bag and/or blanket

Module	General Requirements
	— Power generators and lighting equipment — Sanitation and hygiene facilities — Distribution of drinkable water according to the applicable standards and at least to the level of host nation, HACCP, ISO and WHO standards
Self Sufficiency	Article 12 applies
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer Ability to be operational for at least 4 weeks

Medical aerial evacuation of infectious patients or patients requiring high level of care (MEVAC-INF)

Module	General Requirements
Tasks	Transport contagious, burns and intensive care patients and internationally deployed professionals to health facilities for medical treatment
Capacities	Capacity to transport: — 3 critical level (intensive care unit) patients, — 6 intermediate level patients — 10 sitting passengers and/or companions Ability to fly day and night
Main Components	Helicopters/planes Isolation systems, as required Stretcher capacities: — 3 Intensive care stretcher units — 6 Intermediate level stretchers — 10 Military standard stretchers Staff: — Doctors (at least covering anaesthesia or intensive care medicine, critical care transport) — Nurses (at least covering anaesthesia or intensive care medicine, critical care transport) — Medical Technicians — Pilots — Flight Technicians — Cabin crew
Self Sufficiency	Elements (f) and (g) of Article 12(1) apply
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer

Annex 2: Definitions of “Other Response Capacities”

1. Introduction

The TOR requested definitions for “Other Response Capacities” - a task that has proved difficult to achieve. The evaluation team considered why this might be so and arrived at the conclusion that the question is conceptually flawed.

The design of the existing mechanism creates what could best be described as four types of capacity:

1. Firstly, the best understood and only one that lends itself to definitions is that of “**Modules**”. These are easy to define and indeed are what the project has largely been about.
2. “**Teams**” - Civil Protection Teams used for assessment, technical advice, support and coordination of emergency response. These are outside of the scope of the evaluation but are referenced in various places. Their constitution defies definition as they are created in response to the needs and skill requirements of the specific mission.
3. “**Experts**” - increasingly deployed and extensively referenced throughout the report, again defying definition by virtue of their dynamic and responsive constitution.
4. And finally “**in-kind assistance**” or goods which may range from tents to food supplies. Inventories are created in response to demand so, again, defy easy definition.

With this thinking (which is merely a reflection and organisation of the current mechanism) it can be seen why the random listing of what the mechanism describes as “Other Response Capacities” becomes so hard - many of the components listed cannot and should not be defined as they need to be dynamically created in response to a request for assistance. They exist well as a concept and provide scope to assist thinking but do not lend themselves to definition unless they can be described and treated as a module.

A few of course do have components that can at times act as modules - a cave search and rescue team being a good example and others that can form a component of another module (e.g. shoring). Where this is the case, we have drafted what a definition may look like based on existing provisions of member states and registration on CECIS.

Where components do not perform as a module such as an assessment team (is this a new team or group of experts?), we have noted the reason why there is no definition offered in the summary table.

As a final reflection on this topic, we would offer that definition of TAST teams has always proved and continues to prove problematic for the very reason described above. TAST is listed as a ‘module’ despite the fact that it clearly is not a module.

We would propose that DG ECHO revisit the classifications as described at some time and perhaps move to restructure thinking about the purpose of definitions to best support the creation, registration and certification of modules perhaps setting broader “requirements” for capabilities to meet rather than strict definitions and consideration mechanisms by which technical experts might be accessed on a dynamic basis for example; a system in whereby high level knowledge might be rapidly accessed from European institutes, organisations and industry.

2. Summary of Other Response Capacity Definitions

Other Response Capacity	New definition?	Comments
Teams for mountain search and rescue	Y	Performs as a module so outlined below.
Teams for water search and rescue	N	No definition as they are considered to have limited relevance. There is a water search and rescue module defined.
Teams for cave search and rescue	Y	Performs as a module, so outlined below.
Teams with specialized search and rescue equipment, e.g. search robots	N	An additional component of H/MUSAR or other search-based modules
Teams with unmanned aerial vehicles	N	New criteria for use of UAVs not specific to modules.
Teams for maritime incident response	N	Definition can be made (see below)
Structural engineering teams, to carry out damage and safety assessments,	Y	Strictly a team of experts. Outlined below reflecting existing provision but not recommended for continuation (see note above).
Appraisal of buildings to be demolished/repaired, assessment of infrastructure,	N	To be combined with Structural Engineering teams.
Short-term shoring	Y	Strictly a component of H/MUSAR. Outlined below reflecting existing provision but not recommended for continuation (see note above).
Evacuation support: including teams for information management and logistics	N	This is an IT and logistics function enlarging on the role of the CP Team and/or TAST.
Fire-fighting: advisory/assessment teams	N	This is an ad-hoc team of “experts”.
CBRN decontamination teams	N	New Module.
Mobile laboratories for environmental emergencies	N	Part of new module on CBRNDET.
Communication teams or platforms to quickly re-establish communications in remote areas	N	Currently a component of TAST but please see note above regarding TAST.
Medical Evacuation Jets Air Ambulance and Medical Evacuation Helicopter separately for inside Europe or worldwide	N	Will be defined as part of the MEVAC modules, no separate definition in teams.
Additional Shelter Capacity: units for 250 persons (50 tents); incl. self-sufficiency unit for the handling staff	N	No definition - see the remarks on the shelter in Europe in the report.
Additional Capacity Shelter-kit: units for 2 500 persons (500 tarpaulins); with toolkit possibly to be procured locally	N	No definition - see the remarks on the shelter in Europe in the report.
Water pumps with minimum capacity to pump 800 l/min	N	No definition needed as this is in-kind assistance variable to the request.

Other Response Capacity	New definition?	Comments
Power generators of 5-150 kW	**N**	No definition needed as this is in-kind assistance variable to the request.
Power generators above 150 kW	**N**	No definition needed as this is in-kind assistance variable to the request.
Marine pollution capacities, as necessary	**N**	Any definition would require to be proposed within the marine pollution community.
Maritime Firefighting (MIRG)	**Y**	Performs as a module so outlined below.

3. New Definitions

3.1 Cave Search and Rescue

Module	General Requirements
Tasks	To undertake search and rescue operations in underground and enclosed spaces
Capacities	Search in confined space with technical search equipment down to 1.000 m depth (caves) Rescue people out of a confined space with technical single rope rescue technique for horizontal and vertical transport down to 1.000m depth (caves), Provide medical care on advanced life support level Install of communication system (wireless and long line wired) Conduct technical blasting in case of narrow passages Mountaineer for accessing cave entrance Conduct cave diving operations in siphons and other water environments Ability to support any other module who request advance rope technical support Ability to work 24 hours for 7 days
Main Components	3 Management personnel 3 Management support 16 Cave search and rescue 2 Medical personnel 3 Logistics 3 other specialists Helicopter to be provided
Self Sufficiency	Elements (f) and (g) of Article 12(1) apply
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer

3.2 Mountain Search and Rescue

Module	General Requirements
Tasks	To undertake search and rescue operations in wide and/or mountainous areas
Capacities	Able to conduct area searches in mountainous environment (all types of areas within Europe), able to rescue during all time of day, able to perform 1 technical rescue at a time. Ability to conduct technical search and rescue operations in high and medium mountain areas in all weather conditions. Able to perform vertical rescue in very restricted areas.
Main Components	General mountain rescue equipment including: Winches Staff - Chief operations - Operations staff - Support staff - Medical staff - Safety officer Helicopter to be provided by the host country
Self Sufficiency	Elements (f) and (g) of Article 12(1) apply
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer

3.3 Structural Engineering Teams

Module	General Requirements
Tasks	Structural engineering teams, to carry out damage and safety assessments,
Capacities	Perform rapid structural assessment (triage) of criticalities related to life safety for a large number of buildings situated on vast areas after a significant earthquake Assist USAR teams in safety assessment of collapsed structures Information management and georeferencing of assessment data Assist and train local technicians for building protection Capacity to assess 100 moderately damaged single-story buildings within one day
Main Components	Staff - Team leader - Engineers in in structural evaluation and props design - Logistics staff
Self Sufficiency	Elements (f) and (g) of Article 12(1) apply
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer

3.4 Short-term Shoring

Module	General Requirements
Tasks	Short term shoring
Capacities	- Effective shoring up damaged strategic infrastructure for continuity of operation - Effectively protecting cultural heritage buildings - Design and build safety props upon request of USAR teams
Main Components	Staff - Team leader - Engineers in in structural evaluation and props design - Props and shoring specialists - Logistics
Self Sufficiency	Elements (f) and (g) of Article 12(1) apply
Deployment	Availability for departure maximum 12 hours after the acceptance of the offer

3.5 Marine Firefighting

Maritime Incident Response Group (MIRG)

Module	General Requirements
Tasks	Provision of firefighting on vessels and other off-shore installations
Capacities	Capacity to fight fires on ships after having winched of on the ship by helicopters Ability to operate day and night
Main Components	Helicopters Staff: Firefighting crew of minimum 10 persons, Adequate PPE
Self Sufficiency	Equipment and to be able to stay on board of a vessel for 48hrs continuously.
Deployment	Availability for departure maximum 1 hours after the acceptance of the offer

Annex 3: Remotely Piloted Aircraft Systems

Introduction

National Authorities are increasingly developing Remotely Piloted Aircraft Systems (RPAS), also known as “Unmanned Aerial Vehicles” (UAVs) or “drones”, in support of domestic civil protection modules and capacities. As these become embedded within operations, they are now being offered in support of UCPM modules and deployments. RPAS are not like any other UCPM defined capacity as they operate within a highly regulated environment and as such attract a degree of risk for the deploying and operating agency.

Aviation is a niche business with unique challenges and as such it requires specific experience and expertise in order to successfully manage it in a safe and appropriate manner. This is particularly important when the operator is deploying aircraft in a manner that would be considered ‘high risk’ such as in support of the UCPM capabilities. It has been established that the use of RPAS (drones) should be governed to the same stringent standards as those for crewed aircraft to ensure the highest levels of safety and interoperability.

Many UCPM modules have indicated that they already have (or are developing) an RPAS capability appropriate to their module. However, the UCPM is currently silent on the protocols such as certification, training, deployment, flight operations, and integration. It is considered that this situation is not sustainable with a deficit of experience and associated misunderstanding of the legislation potentially leading to unacceptable risks being created within the UCPM by allowing the use of RPAS in emergency response context.

Complex aviation operations present considerable operational and reputational risks for any organisation as a lack of experience is potentially filled with well-intentioned (albeit often incorrect) information from enthusiastic hobbyists rather than from seasoned aviation professionals. For this reason, it is imperative that any proposal to include RPAS capabilities within the mechanism be led by aviation professionals. This will both reduce operational/organisational risk and avoid managerial and governance challenges emerging during deployments.

The evaluation has found no relevant expertise in place to manage RPAS effectively leading to a conclusion that it is imperative that any future model adopted for RPAS use has appropriate management led by those experienced in commercial aviation management capable of providing expert opinion on the commercial and operational aspects of aviation. As national authorities develop their own regulation for RPAS use, it will become increasingly important for the UCPM to establish a core of experts able to manage an operational centric, performance and risk-based approach to RPAS deployment. This core team could ensure expert advice to safely manage the risk profiles of an unmanned aviation capability.

Current Regulatory Position (EU)

Many national aviation authorities within the EU are relatively unprepared for the RPAS revolution and the expanding use of this technology in many commercial, hobbyist, and emergency response spheres. The lack of clear legislation and frameworks has resulted in many operators of RPAS using them as toys rather than treating them as aircraft as the law dictates. This has led to some operators unwittingly exposing themselves and other airspace users to unacceptable levels of risk. This situation is untenable and has led to an urgent need for appropriate regulation and legislation to be enacted.

Many Member States already have, or are now, developing their own regulatory frameworks for RPAS and their safe integration into the existing airspace. Many have also recognised the specialist nature of the risks presented by spontaneous use in emergency situations and have created a separate risk-based framework for approved operators; thus, allowing this work to continue in a flexible but appropriate manner. Whilst UCPM participating modules may conform to national aviation authority standards, these legally only allow operation in national airspace, with conflicting areas in legislation, operational security and privacy guidance, and product standards.

The European Aviation Safety Agency has recognised the lack of overarching regulatory framework and is in the process of enacting Regulation EU1139/2018 (EASA basic regulation) encompassing EU competence standards for all RPAS operations. This will only apply currently to civil operated RPAS but there is an opt-in for state and military aircraft. These rules will be operation centric; performance and risk based and will provide legal certainty for the operator. The rules will set the benchmark in terms of training, safety management and governance currently in two specific risk categories:

- **Open – Low risk**. This is primarily hobbyist (non-commercial) operations within Visual Line of Sight (VLOS) below 120m (400ft) in open areas away from persons not involved in the operations of the RPAS. Whilst there are sub-categories within the Open Category, this is a summary of the general ruleset.
- **Specific – Increased risk**. Operations fall within this category as soon as the Concept of Operation exceeds the limitations defined within the Open Category. Examples could be Beyond Visual Line of Sight (BVLOS), higher than 120m, over an urban area, and the RPAS has a Maximum Take-Off Weight (MTOW) exceeding 25kg or does not have a CE mark.

This framework which is likely to be enacted by many Member States in 2020 and fully adopted by 2022 will provide a framework standard that can be adopted for the purposes of the UCPM framework of modules under a central operator mandate and common operations framework within the specific category. This will immediately allow cross-border operations without further approvals being required within Member States and international recognition as the EASA ruleset is aligned with FAA (US) and Nav Canada regulatory frameworks for RPAS.

Whilst the EASA ruleset is complex in nature and will require extensive expert knowledge in aviation risk management and mitigation to attain operational approvals within the Specific Category; these rules are to set the foundation for the safe integration of RPAS alongside other aviation assets and protection of the public. Whilst state and military operators have an opt-in option as part of these regulations, not doing so has the potential to restrict cross-border operations and interoperability as no common standard is adopted in terms of risk, training, or equipment. EASA is also working on the Certified Category which will encompass much higher risk operations that will require the highest levels of training and certification in terms of the operator, pilots, and the RPAS. The type of RPAS operations that will be covered by this category may include autonomous RPAS that carry passengers, or those dropping loads, etc. The levels of governance and oversight in these operations will mimic those in airline service providers.

The Future Framework for RPAS within the UCPM

Whilst many modules may provide drones as part of their national capability, it is incumbent on DG ECHO to deliver a single conduit through which the UCPM can ensure that these modules are taking measures to mitigate the risk of RPAS deployment. It is recommended that this is done through a small cell of experts embedded within DG ECHO as an Aviation Standards and Evaluation Unit (StanEval Air). This cell will provide the expertise and governance to ensure leaders are informed and comfortable with the deployment of this disruptive technology. It will do this through:

1. The provision of a governance cell led by an Accountable Manager whom will be legally accountable for the RPAS use whilst deployed as part of the UCPM framework.
2. The provision of standardised operations manuals that are applicable for core business with additions for specialist roles.
3. The establishment of a secure online management portal that manages pilots training and currency, whilst ensuring that every flight is both auditable and safe.
4. The establishment of a just culture, closed loop, safety management system with incident reporting and investigation.
5. Working with global partners to ensure operational inter-operability and provision of appropriate procurement advice for systems and potential for a single procurement framework to assist in cost management and commonality of RPAS platform.

How the StanEval Air Cell will achieve these aims and recommendations are detailed below;

Governance Cell

Simplicity is the key to effective governance and this proposal sees the introduction of a single permission to operate being established for the UCPM. This single operator philosophy will have a single Accountable Manager who will be solely responsible to the regulator (EASA) for the UCPM RPAS governance structure. They will lead a small cell of aviation experts who will lead on setting and auditing operational capabilities within the national modules.

This single cell will provide expert advice, oversight, and safety management of the UCPM RPAS operation, whilst allowing individual modules to deploy their UAVs as they wish tactically. The cell will also provide national modules with periodic safety audits for quality assurance and management of their pilots, and risk, through an online secure portal.

The formation of this cell and its structure will afford DG ECHO the opportunity to professionalise its current RPAS operations across the board to a standard that allows cross-border operations and global inter-operability. Adoption of the EASA RPAS mandates will combine all operations into a single gold standard level organisation that is commensurate with the regulation of other specialist areas within the framework.

The scope of the roles for the StanEval Air cell are such that it is envisaged that the Accountable Manager and other roles could be a consultancy role for an aviation professional with suitable provenance in UAV management. It is envisaged that in the first 5-years this would be a significant commitment as the foundation for the future framework of RPAS operations is established. Thereafter it is envisaged that this would be a part-time role.

There are opportunities to save costs as a single operator approval from EASA could be used by all modules, as well as a single insurance policy. In the case of insurance, it would also set the correct levels of liability as many are reducing costs by having liability levels that are unrealistic for aviation risks. This unit also negates the need for this structure to be replicated in each module and the associated costs of this. This is an opportunity to combine oversight and management at the highest levels in a cost sharing partnership.

The Provision of Standardised Operations Manuals

It is important that the UCPM provide a framework that supports operational delivery of RPAS support as a tactical tool. The provision of a single operations manual provides all modules with clarity on the accepted scope of practice and the risk that is acceptable to DG ECHO as the responsible operator. It is also important to recognise within that scope of practice that the requirements of an USAR user will not be the same as a CBRN or medical user. As such, the manuals must be structured in a way that takes account of these vagaries as well as different platform types without adding complexity for the pilot. The manuals will be structured using the EASA format so that they are also future-proofed should it be decided to go beyond the 25kg mass limit or to become subject to future EASA Certified Category regulations. The manuals would be held within the online portal so that the appropriate manuals are accessible by any authorised user. The main contents of the Operations Manual would be as follows:

- **Part A - General**: This is the manual that sets out all the governance structures that are common to any operation, such as the law, human factors, safety management system, hierarchy and reporting structures etc.
- **Part B - POM**: This is the manufacturers pilot operating manual for the type of UAS being used by that unit. Part B may come in various sections e.g. Part B (POM Inspire 2), Part B (POM Aerion SkyRanger) etc. This allows varying platforms to be included for each user.
- **Part C - Authorised RPAS operations**: This manual would be spilt into three separate volumes to allow for the vagaries in operational types of RPAS deployments. This would allow those pilots who were appropriately trained to operate to a level that is commensurate with their training and authorised scope of practice.
- **Part D – Training exposition and training materials**: covering the level and type of skills required and the content and format of training, whilst also providing materials on which to base training courses.
- **Part E - Maintenance**: This manual would be platform specific and match the Part B for the platforms being used. It is important that the manufacturers guidance on battery and systems use is followed as this is a requirement of insurance and EASA approvals.

The StanEval Air Team would work with existing users to ensure that current capability is not compromised within the new manual structures. Notwithstanding this, practices that present a level of risk that is not commensurate with the operational role will require risk analysis and review before being included within the accepted professional practice. This would be done using the Specific Operation Risk Assessment (SORA) format developed by EASA for RPAS operators.

These manuals will clearly define the requirements, conduct and responsibilities of every person involved in the operation of a RPAS in any role authorised as part of the UCPM framework. This gives clarity and legal surety to the pilots and those supervising them operationally.

The Establishment of a Secure Online RPAS Management Portal

The UCPM RPAS capability can be managed by a small core team by using technology as an enabler. The portal would facilitate the management of the pilots and their currency requirements whilst also allowing the pilots to capture and store the risk assessments and associated paperwork for each launch. This should be available on any mobile device and can be accessed offline at deployed locations to ensure the correct data is captured, ensuring that every flight is a safe flight and that paperwork is kept for 24-months to allow EASA and StanEval Air to audit. This would also allow DG ECHO to capture a significant amount of data about the use of RPAS and their effectiveness across the different specialisations. The system will not store imagery or any information that is protectively marked.

The portal will also be used to submit reports as part of the Safety Management System and facilitate the closed loop safety system that was highlighted earlier.

The Establishment of a Collective Safety Management System (SMS)

Having robust governance is the foundation on which we build our safety management system for the UCPM framework, however it is important to first establish a just culture which accepts that mistakes are inevitable. When we accept that mistakes will be made, we then encourage open reporting of these mistakes to ensure that the collective learning and mitigation, if required, is shared with every operator. This closed loop reporting system allows every partner to benefit from the broader reporting system and DG ECHO to demonstrate to EASA that is has a healthy reporting culture and can investigate causal factors and take appropriate remedial action.

Whilst every responsible operator of RPAS must have a SMS, there are anecdotal reports of incidents having gone unreported due to fear of punitive action or adverse implications for operations. This increases the actual risk of the entire operation. Having the SMS sit outside the national modules and reporting chain will encourage open reporting and a just culture.

The StanEval Air SMS will be managed by a development and safety lead and will be one of the main functions of this role within the cell. This post will also carry out any safety investigations and will report on these in line with the safety management system. This is pivotal part of our own quality assurance as a large operator with many operational units as it means the operators (modules) are not responsible for their own governance and oversight in terms of safety compliance and reporting.

Working with Partners

Whilst this document focusses on the establishment of a single cell within DG ECHO that can act as the conduit through which the UCPM framework can establish and monitor professional standards in relation to RPAS use. It is also envisaged that this cell would establish a benchmark that other global partners may wish to emulate in terms of governance and oversight. Engaging with these partners and promoting the standards that are established will afford the UCPM network the ability to attain global approval for RPAS use or swift derogation from national aviation authorities.

We are already aware that a number of emergency response RPAS users are working with manufacturers to develop aircraft that better fit their niche operational requirements. This is largely being done in isolation and would benefit from coordination through the StanEval Air cell when established. This would allow the UCPM framework to work at the highest levels of industry to develop these niche products for all within the network, whilst ensuring compliance with regulatory constraints such as CE marking on commercial RPAS. This would add significant value to the modules in terms of collective procurement and development.

Summary

RPAS assets are going to become an integral part of all areas of emergency response over the next few years and the complexity of these operations in these specialist arenas are going to make it extremely challenging for DG ECHO to govern appropriately. This proposed solution affords the organisation the ability to have a single governance structure that is led by an aviation professional that meets the existing and emerging needs. This solution is available immediately and can be instigated within a matter of months. There is no solution that is as far reaching or robust as this one and that manages the operational and reputational risk in a way that sets a professional, rather than pseudo hobbyist tone.

It is known that the aspiration of national modules is to operate extremely complex unmanned systems soon, and the complexity of these will require aviation professional leadership and expertise as these are considered aircraft by EASA.

Lastly, it is sadly inevitable in this high risk environment, that a RPAS will fail whilst being operated as part of the UCPM network and perhaps cause damage or injury to a member of the public. When this happens DG ECHO needs to be confident that they have embraced the highest levels of safety and governance possible and that this incident could not have been foreseen. This solution will give the organisation that level of assurance and afford them the ability to demonstrate this across the national modules; which is some margin from where they are currently.