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Smart practices in cold climates

EU Nordic Modules project article on rescue operations in cold climates

Abstract

Civil protection operations in cold conditions are subject to severe challenges not often seen elsewhere. This article presents the result of a smart practice analysis on operational approaches and relevant competences used by CMC in Finland, MSB in Sweden and DEMA in Denmark and Greenland. The article is based on expert assessments from the participating countries, and on a literature analysis. The article shows that civil protection responses in cold conditions are possible, but that a range of special preparatory and operative considerations needs to be taken into account, and that procedures are generally more cumbersome.

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Introduction

The Nordic countries, as neighbors with relatively good knowledge of each other's civil protection systems, are mutually dependent when large scale disasters happens in one or more Nordic countries. Additionally the Nordic countries faces similar risks, have similar climate and have similar operational capacities. This makes it opportune to cooperate in order to support each other better if disasters strike. The European Union's Nordic Modules (EU-NOM) project aims at strengthening the ability for the Nordic countries to support each other in case of disasters, by taking steps towards creating joint Nordic modules that, in the future, can be part of the European Emergency Response Capacity, known as the EU Voluntary Pool. The cooperation aims at facilitating faster mobilization of support and a higher degree of interoperability between the countries. In addition, further development of the Nordic modules will strengthen the EU capacity to operate in cold conditions in general.

The intended audience of this article is civil protection and response authorities taking part in the European Union's Civil Protection Mechanism. The article contains recommendations related to both the technical aspects of working in cold conditions as well as recommendations towards policy framing cooperation when responding to cold condition disasters. Furthermore the article approaches competences, related to civil protection work in cold climates, from different angles. By this the article seeks to inspire further development, and is as such not meant to function as a textbook or readily implementable set of recommendations.

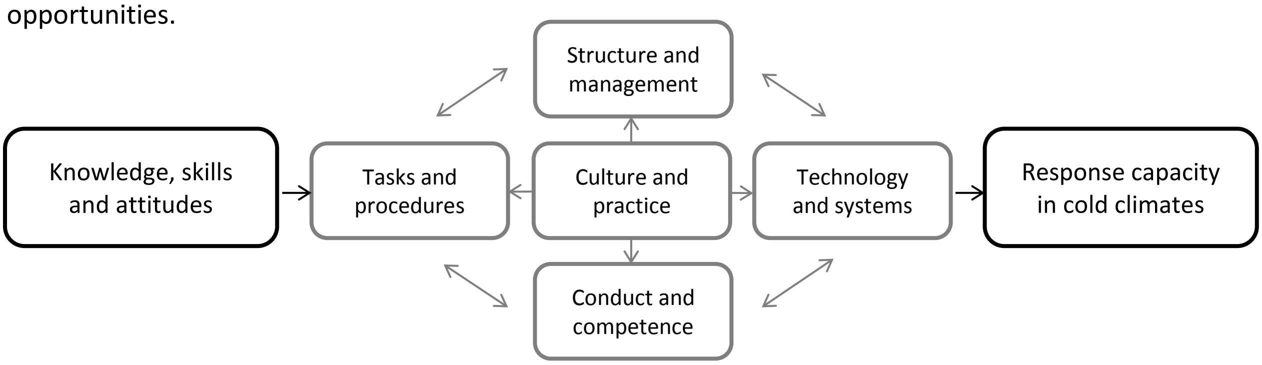
In relations to the EU-NOM project, cold conditions are characterized by temperatures ranging from 2°C to about -20°C. Colder climates, such as can be found in the arctic regions of the consortium countries, are beyond the scope of this project. Emergency response to disasters with much milder temperatures can however often be challenged by freezing and melting of water, formation of ice and moisture, strong winds with high chill factors, difficult and changing terrain, low air pressure due to high elevation and long logistic supply lines. Solidly freezing temperatures can actually often prove to be an advantage for operations, as issues with moisture and dampness are significantly lessened. Based on these variables' impact on rescue operations in cold conditions the EU-NOM project in general, and in this article in particular, are taking all of the above observations into account, but with a focus on ambient temperatures above -20°C. Furthermore the project has focused primarily on the geographical areas within the consortium countries, and secondarily on areas within the European Union's Civil Protection Mechanism and eastern neighboring countries.

Methodology and theoretical perspectives

The commissions implementing decision of 16.10.2014 laying down rules for the implementation of decision number 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 chapter 4, defines four main components in the civil protection mechanism; modules, technical assistance and support teams, other response capacities, and experts. Based on a contextual scenario analysis, the EU-NOM project has identified the following modules, technical assistance and support team capacities and other response capacities to be most relevant in relations to operations in cold conditions.

- The Urban Search and Rescue (USAR) heavy and medium modules, which aim to search for and rescue victims located under debris, and provide lifesaving first aid as required until handover for further treatment is possible.
- The chemical, biological, radiological and nuclear detection and sampling (CBRN) module, which aims to carry out initial CBRN assessment, perform qualified sampling, mark contaminated areas, predict situational development and provide support for immediate risk reduction.
- The High Capacity Pumping (HCP) module, which aims to remove water from flooded areas and assist firefighting by delivering water.
- The medical aerial evacuation capacity (MEDEVAC) of disaster victims, which aims to transport disaster victims to health facilities for medical treatment.
- The technical assistance and support teams (TAST), which aim to support set-up and run office, Information and Communication Technology (ICT) support, logistics, subsistence and transport support on site for international coordination personnel.

Based on the documentation related to the implementation of decision number 1313/2013/EU, on the above mentioned capacities, this article approaches the smart practice analysis based on a data display known as the diamond[1]. The data display assists in structuring and illustrating the dynamic links which characterizes the analyzed response capacities and competences. The arrows depict predominant impact opportunities.



In order to structure the data and counteract duplication, the analysis is divided into two sections. The first part relates to the overarching subjects, common to most modules and response capacities. The second part contains specific analysis related directly at individual modules or response capacities.

From a practical and implementing point of view there are off cause significant overlaps as nothing

[1] Read more about this method on exhibition of qualitative data in: (Dahler-Larsen, 2002)

coincides solely within a singular subject. But as this article does not intend to present complete educations or operative guidelines in cold conditions, but inspire further development, this methodology will be more applicable towards this specific goal.

The Finish Crisis Management Centre in Finland, the Swedish Civil Contingencies Agency and the Danish Emergency Management Agency are all governmental institutions that manage authority and obligations in relations to assistance within their national boundaries. These obligations are not weather specific, and each year several operations are carried out in cold weather, both in urban and rural settings. To that extend the agencies carry out their responsibilities in cold as well as warmer weather, and the underlying demands are the same. Agencies need to be able to perform civil protection operations under all conditions in a safe and efficient manner. Even within the very similar Nordic countries, significantly different scenarios exist. In order to provide for the most usable source of inspiration the article focuses on generic competences and operative actions relevant to most civil protection capacities operating in cold climates.

Smart practices

Best practice theories are based on the idea that instead of formulation an abstract ideal state that we want to reach, we should develop what has been or is being implemented and is proven to work somewhere else. According to this approach, one should, above all, study carefully and disseminate "what works" instead of formulating hitherto unimplemented objectives and ways of attaining them. Three main theoretical approaches to this goal exist; (i) best practice, (ii) good practice and (iii) smart practices. For all approaches, the following three main questions are pivotal:

- Something functions well, but why?
- Towards which objective does it work well?
- Does the practice extrapolate?

Best and good practice methodology (i and ii)[2] is based on the notion that an established group of experts, assessing a set of proposals to identify the best, based on their individual experiences does not qualify as rigorous objective research. Issues of completeness, conditioning and rigidity of criteria definitions are essential. In order to truly identify a best practice, we must include all comparable examples, analyze how some practice might not be relevant in other contexts, and specifically identify the criteria used to compare levels of appropriateness. The best practice approach is mostly based on quantitative analysis methods and inspired by positivistic traditions.

Smart practice (iii)[3] methodology is to a larger degree concerned with the practicality of transference. Specifically it understands completeness as impractical from a development point of view, and prioritizes flexibility above detail-rich prescriptability. Furthermore the smart practice approach focuses on adaption and inspiration instead of linear extrapolation. Those implementing the smart practice exemplar in the target site should be free to adapt it to the new circumstances which may differ significantly. It is also important not to understand implementation as adoption or even enforcement of foreign practices. Smart practices are often highly complex and multidimensional. Therefore they cannot be reviewed in a few sentences or paragraphs. Instead, they consist of a set of diverse general ideas that are not ordered hierarchically. The smart practice tradition is mostly based on qualitative methods and is inspired by retroductive traditions. The goal is to establish the existence of a hypothesized structure or mechanism that

[2] For further on best practice theory the following article is a good starting point: (Bretschneider, March-Aurele, & Wu., 2005)
[3] For further on smart practice theory Bardach have authored the following relevant literature: (Bardach, Getting agencies to work together: the practice and theory of managerial craftsmanship, 1994) (Bardach, 2000) (Bardach, 2004)

is responsible for producing an observed regularity. The logic of discovery is key in maintaining the mechanism behind an observed phenomenon.

In relations to the EU-NOM project, the smart practice approach is being utilized. There are however a few limitations to this approach. Particularly smart practice approaches has relatively low level of external validity. In order to extrapolate from one site to another, a curtain level of generalization has to be undertaken. The complexity of the contextual reality can however cloud the logic of functions, both in the understanding of the quality of a practice, and in the implementation of one. Specifically identifying the mechanisms behind a practice can be very difficult. In order to understand how something works, it is pertinent to also understand why and under which conditions it works. This can be very challenging, especially in dynamic and complex settings. Furthermore any smart practice identified might not be the most appropriate for other contexts. For instance when trying to transfer a practice from a highly experienced organization to a lesser experienced organization, the differences might demand intermediate development steps, or the adaption of less smart approaches, at least for a time. In order to reach the most versatile and usable product the EU-NOM project focuses on inspiration above dictation, mechanisms in the analysis, tactic knowledge on the site of implementers and possible use of the civil protection mechanisms Exchange of Experts program for implementation.

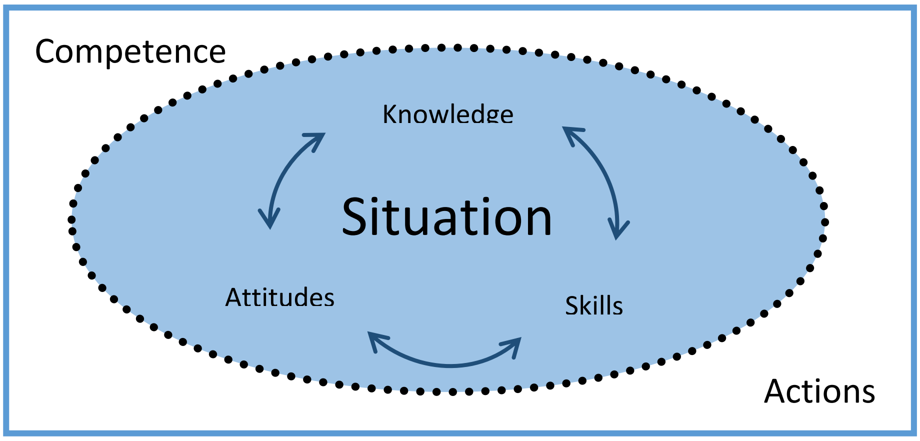
Standard Operations Procedures

Based on analysis of the existing standard operating procedures, for the above mentioned modules and response capacities in the consortium countries, the EU-NOM project approaches the subject with two key acknowledgements in mind. First the guideline for Standard Operating Procedure (SOP) for civil protection modules published by the commission functions as the starting point for all relevant SOP document bits produced by the project. The guideline insures a uniform and interoperable format where key frames are documented in a clear format, especially for use at policy level. Secondly, and in order to ensure operative functionality the INSARAG mission cycle (INSARAG, 2015) format functions as a framework to divide the contents of the SOPs into chapters related to different phases of operations. Combining these two approaches, with appropriate appendixes, actions cards and references helps to maintain actionable plans and procedures as well as collected documentation platforms.

Cold conditions competences

Civil protection agencies in the consortium countries, and likely in all civil protection organizations, has strong and positive traditions for working structured, targeted and thoroughly with education, development and training. Any input, such as the present, thus has to add value and play into existing structured frameworks in order to be implemented in different agencies' methodologies. Furthermore it has to be adaptable, but with a starting point in the known traditions and a focus on current development trends.

Traditional understanding of teaching and learning is challenges by contemporary research. This applies in particular to approaches that basically rely on a relatively simple transfer of knowledge from one person to another. This is particularly true in regard to the formal teaching situation, where the teacher as an expert is tasked to convey knowledge to the more or less passive (and ignorant) participants. This type of teaching has been illustrated through the so-called gas station methodology, where new knowledge is poured into the participants' empty heads. The focus in this method is to give the participant new skills and the underlying assumption seems to be that conveyed knowledge is actually learned - and that it is immediately applicable in practice. With the move from primarily industrial societies to the contemporary complex knowledge based societies today, the needs has shifted from routines, recognizability and predictable contexts, to a high degree of complexity and lack of technocratic predictability. Social development has thus contributed to a marked shift in learning paradigms. Teaching of skills is still relevant, especially in an international civil protection context, but when simple skills are to be implemented in a complex society they cannot stand alone. Instead the *professionally competent* is in addition to the holder of professional expertise, also able to relate one-self, values and the contexts, to which they belong. The professionally competent is continuously able to create new meaning on the basis of many different - and often contradictory – inputs of everyday life. Thus, contemporary education under the auspices of the EU-NOM project is in place to at once convey high-level professional knowledge while training the participant ability to relate to his or her, own work and life situation, and to relate this to the outside world. In addition to ensuring that the participant has access to professional knowledge, the teaching is thus also required to help the participant in translating, carrying onwards, adapting and developing for use in many different scenarios and situations. An important prerequisite for being able to relate is to acknowledge that one's interpretation of the outside world is based on the perspective of the observation. From this point of view, it becomes clear that others can understand the outside world differently and that reality is open to interpretation. For the teacher, facilitator, developer and trainer of the EU-NOM contents, a key challenge will be to initiate and facilitate such shifts in the participant's dominant perspectives. Good teaching will therefore consist in creating reflection - as well as in an acknowledging way to problematize the participant's perhaps stubborn ways to do things. Through this reflection, not only is a new professional identity created, but also an important prerequisite to actually go out in reality and act differently based on the new knowledge. The EU-NOM project understands learning as a socially constructed process that creates new meanings by facilitating semi-permanent psychological change. This learning provides the participant with the ability to relate meaningful to specific situations. In the context of the EU-NOM project, this is known as a competence. Previously competence was seen as a change in either knowledge, attitudes or skills – thus changes in separated entities. EU-NOM, based on contemporary research, sees the learning of competences as only creating value if the competence can be used in practice. This entails that the ability to do something differently, because you gained a new competence, is a product of the learning of the competence happens in ways that relate closely to reality. Put into a diagram this approach can be depicted to show the competence perception as an actionable situation within which knowledge, attitudes and skills are inseparable.



Smart practices

Overarching subjects

Structures according to the diamond methodology, the overarching issues related to USAR, TAST, CBRN, HCP and MEDEVAC is outlined below.

Structure and management

Operations in cold conditions will in general take a larger toll on personnel and equipment. Seemingly simple tasks can become cumbersome and slow, and otherwise robust machinery can become instable. In order to ensure efficient operations under these circumstances, management at different levels should take steps towards strengthening the organization's robustness. From a strategic point of view, a larger amount of personnel than in normal conditions should be mobilized. This will provide the tactical and technical level with the man-power needed to tackle the additional cold-related issues. At the operational level this additional resource should be used to cycle operational crew more often, to leave more time for the tasks surrounding actual rescue operations and to provide additional robustness at support functions. From a safety point of view the additional resources should also be used to ensure that all cold-exposed personnel can work in a body-system. This helps to identify cold-related issues earlier, which provides more and better options for alleviation. In addition more ridged accountability systems should be put in place, to ensure whereabouts and response-checks at set intervals.

Tasks and procedures

From a technical point of view additional personnel resources should be utilized to unsure that the *hurry up slowly* methodology is prioritized. Perspiration from hard labor can lead to serious issues later, as moisture conducts heat away from the body at accelerated rates. A slower work pace can alleviate some perspiration, if however hard labor is unavoidable, undressing as you heat up, and redressing as you cool down can assist in maintaining a functional and non-perspiring body temperature.

Casualty protection in the cold

Casualties and/or rescue personnel in cold conditions are specifically challenged by hypothermia and frostbite. In cold conditions, the surface blood circulation is reduced, in the extremities of the body in particular, in order to prevent heat loss. This has the added effect that the cooling down of these areas is accelerated. As skin temperature drops below -2°C the outer layers of tissues will freeze. Symptoms of frostbites can vary from blisters to irreversible tissue damage requiring amputations depending on the temperature and other factors. Hypothermia occurs when the core temperature decreases below +34°C. The symptoms vary greatly depending on the temperature. Symptoms of hypothermia usually start with shivering, but in time patient becomes confused and may behave strangely - even attempting to take of his or hers clothes. In severe cases the patient may become unconscious and eventually die. Since hypothermia can have very serious consequences and the symptoms can vary a lot, the rescuers must be well aware of the condition and know how to treat it properly.

The main aim of casualty protection in cold conditions is to prevent patients' body heat from decreasing into dangerous levels. Preferably structures (such as buildings or winterized tents) with protection from the elements should be used. If this is not possible, the rescuers should be able to provide the casualties with other cover, such as sleeping bags or specialized hypothermia equipment. One should also take into consideration, that the casualties may need protection in relatively warm temperatures (10°C and below) if not properly clothed and/or injured.

As cold conditions can cause additional injuries and treating them in the cold is especially challenging, evacuation should be considered as early as possible. The method of evacuation should be chosen so, that treatment and protection from the cold is possible during the whole evacuation phase. Further information about treating patients in cold conditions can be found for example in: (CMC; MSB, 2012)

Technology and systems

Basic principle for equipment usage and maintenance in the cold is to avoid and prevent the equipment from freezing. If the equipment freezes it is usually rendered useless. Freezing can be avoided mainly by reducing condensation and removing snow and frost from the equipment. Furthermore additional maintenance tasks regarding water transport and usage becomes pertinent. If water is allowed to freeze inside equipment it can render it unusable and very difficult to repair. In some cases keeping water flowing can be an option, in others emptying the equipment either via gravity or via forced air mechanism is necessary. Additionally equipment exposed to water, in any form, should be evaluated for effects, including need for anti-freeze liquid.

Condensation, also called sweating, is water appearing on especially metal surfaces due to change of temperature from cold to warm. Condensed water commonly appears on equipment when it has been moved indoors from the cold outdoors or when the equipment has warmed during use. As condensation occurs on all metal surfaces, equipment can also freeze from the inside. Condensation can be avoided easily by storing equipment outdoors, if possible, or in storages with lower temperatures thus reducing the temperature change. If the equipment is brought indoors for maintenance, the maintenance should be started only after approximately one hour, when the condensation water has dried up.

Vehicles

Driving in cold conditions presents special challenges to the mechanics of vehicles, as well as the drivers themselves. Drivers must be able to drive safely in slippery or snowy conditions, often with little or no external lights. Furthermore drivers should be equipped and competent to cold starting the vehicle. Incorrect actions may result in the failure to start or cause damage to the engine or other equipment of the vehicle. Procedures to be carried out in order to ensure the working order of the vehicle include:

- Maintenance of cold starting equipment;
- Maintenance and condition inspection of the batteries;
- Protecting components and connectors of the electric system from moisture;
- Changing the oils of the engine and the transmission gear to a fluidity that is suitable for cold conditions;
- Removing water from systems and refueling with a fuel suitable for cold conditions;
- Removing water from pneumatic brake systems on a daily basis.

When protecting a motor vehicle from the cold, the thermal energy stored in the engine and transmission gear components should be utilized by restricting the engine air inlets and outlets with cardboard sheets or covers.

When the temperature is below -10°C, the engine must be preheated before starting and fuel should be changed for winter-fuel rated at -40°C, engine oil -25°C, and frost resistance of the engine coolant to -45°C.

One cold start at a temperature of -20°C, without preheating the engine, wears down the engine as much as driving 300 to 400 km. An engine block heater, a cold start pump, or an external heater powered by the vehicle's fuel, can be used to assist in cold-starting vehicles. (CMC; MSB, 2012)

Fuel

Diesel fuel must meet EN 590 specifications or similar. The standard also has specifications for temperate climatic zones and arctic climatic zones. The arctic climatic zones range from class 0 to class 4.

Arctic Climatic Zones						
Characteristics	**Class 0**	**Class 1**	**Class 2**	**Class 3**	**Class 4**	**Unit**
CFPP (Cold filter plugging point)	**-20**	**-26**	**-32**	**-38**	**-44**	**°C**

Take in consideration not to use "old summer fuel" by a mistake. Fuel tanks on generators should be emptied before deployment and must be refueled with the right classification of arctic fuel, most likely from the local area's supply. Vehicles can most efficiently be refueled on the road towards the Site of Operation.

Heaters

Using headers for equipment, accommodation or personnel can be viable options. But when placing the heaters, special care should be taken in regards to the safety distance in regards to objects and people. Heaters and their heating tubes can warm up the ground or other conductive materials leading to melting of snow, heating up of unwanted areas or objects, or even heat damage to fabrics or skin. Fuel containers near heaters should be set on a level surface where there is no risk of melting, to prevent the fuel containers from falling over and causing environmental damage or fire hazard.

ICT

Communication equipment must be protected against the cold, as it reduces the capability of power supplies to transmit which can freeze the accumulators. Emergency power supplies could for instance be stored under the clothing. Any unnecessary moving of electronic equipment, from warm to cold conditions in particular, should be avoided in order to prevent the humidity accumulated in the equipment from freezing.

In cold conditions, most ICT problems are caused by humidity and variations in temperature. Most circuit boards and other components in devices do not tolerate humidity or great variations of temperature, especially when the internal temperature of the device changes rapidly. Breathing or blowing in the connectors of communication equipment can introduce additional humidity which may freeze the connectors. Connectors can be protected by, for instance, tape while microphones of radios and phones can be protected with a plastic film. (CMC; MSB, 2012)

Clothing & PPE

The basic idea when choosing clothing for cold conditions is layering. Using several thinner layers of clothing instead of fewer thick ones gives better protection from the cold since the air between the layers gives better insulation than the garment itself. Layering has other advances too: it is easier to remove or add layers of clothing to adjust according to temperature or workload.

The first or "base layer" of clothing (right next to the skin) should be light and its main purpose is to transfer moisture away from the skin. Moisture enables frostbites and can disable insulating effect of some fabrics. Moisture also increases the rate in which the body cools down, so keeping dry helps to prevent hypothermia. Good materials for the base layer are technical fabric or wool.

Next layers are mainly for insulating purposes. They should be able to transfer humidity further and prevent body heat from escaping. Good material for middle layer(s) would be for example wool or fleece.

The outer layer, the "shell" is mainly in place to give protection from the elements, such as wind and water. Outer layer clothing should able to allow the humidity to escape, if necessary. Therefore, jackets and pants with good venting abilities and with a protective film in the fabric (Gore-Tex®, Cordura® and similar) are recommended.

Same layering principles should be applied also to other parts of clothing in cold conditions. Use of insoles and multiple socks (preferably wool) in boots and taking into consideration that winter boots should be about 2-3 sizes larger than normal footwear. A good rule of thumb is that you should be able to wiggle your toes, even with several socks and insoles in place. Also make sure that the shoes are easy to put on, and to remove innersoles, since it makes daily drying and other maintenance more manageable. On your hands, it is also recommended to use thin base layer gloves and mittens over them, as well as protecting your wrists. The head should be covered also, taking especially good care of prominent parts of head such as ears and nose, since they are more exposed to frostbites. Keeping additional gloves, socks, insoles and headwear with you at all times, provides the ability to change for dry garments when necessary. Cold conditions usually also means low-light conditions. Special emphasize should be given to good lighting gear, for example headlights. And as low temperatures reduce battery life of electronic equipment, extra batteries should be kept warm by storing them inside your clothing.

Accommodation

When working under cold conditions continued efficiency is related to the ability to warm up when accommodated. Tents or other types of heated facilities, for accommodation and workspace are a vital part of cold weather operations. The four essential requirements for survival in a cold weather environment are warmth, food, water, and shelter. Shelter is of particular importance in remote areas because, without it, it is extremely difficult to provide yourself with the remaining three requirements, especially during inclement weather. Tents can be erected quickly with proper training and adequate practice. However, you may become separated from your equipment due to weather or tents may be destroyed or lost. In such circumstances, available materials must be utilized to construct shelters. Unless your team masters the techniques of expedient shelter construction, they may be unable to survive in the cold weather environment. (Unites States Army Alaska, 2000)

Special requirements for camping in cold conditions

Setting up and maintaining a tent based camp in cold conditions is a significant task. In most Nordic scenarios large winter camps are however unlikely as existing buildings and functional infrastructure is predominant. The International Humanitarian Partnership (IHP) and CMC have however published relevant guidelines for camp construction and management. (International Humanitarian Partnership, 2014) (CMC; MSB, 2012)

Existing buildings

Existing buildings are preferred as the main facility for accommodation, command, office and maintenance when deployed in cold conditions. Even if existing buildings are used, for example hotels or public buildings, it is important to make sure that the building stays warm and you can supply it with either electricity or fuel heaters in case of power outage.

Nutrition in cold conditions

Working in cold conditions takes a special toll on the human body. Therefore, operating in cold conditions requires specific attention to nutrition. Basic information about correct dietary and hydration choices are well documented, see for instance: (CMC; MSB, 2012).

Conduct and competences

Learning practical competences

Civil protection organizations are structured differently. Some rely on a high basic level of competences; some rely on extended specializations and most somewhere in between. Most civil protection organizations can be understood along the lines of strategic, operational and technical management. How these managerial layers connect is however unique to each organization.

Focusing on how cold condition operations differ from civil protection operations under warmer conditions, some characteristics becomes evident; operating technical equipment with heavy gloves on can slow procedures, much equipment will need additional maintenance to function in severely cold conditions and the physical and mental strain on personnel is increased. Many situations, which might not under normal conditions be dangerous, are in cold conditions inherently unsafe. Simply getting lost in a blizzard can be lethal, and small technical mistakes caused by exhaustion, due to the added physical strain, can prove catastrophic. With these considerations in mind, civil protection operation method often change by adding personnel resources to alleviate the challenges by increasing rotations and spending more resources on tasks surrounding actual rescue operations. Furthermore, victims who might not under normal circumstances be in direct danger can under cold conditions be in immediately life threatening situations by for instance simply being stuck on a roof during a flooding.

Based on practices in the consortium countries and on a general understanding of training and organizational approaches in civil protection organizations in general, this chapter presents key ideas on what and how to work with cold climate competences.

Based on practices in the consortium countries the EU-NOM project has formulated the following general competence goals. For ease of approach the goals are subdivided according to their main relations to the display model.

Tasks and procedures

A. *All personnel deployed to cold conditions should be able to take appropriate safety related aversive action based on indicators for harmful effects of cold conditions.*

B. *Technical personnel should be able to contextually identify and implement relevant cold conditions procedures.*
C. *Based on the analysis of the specific operative needs, the strategic personnel should be able to activate relevant plans, allocate relevant additional resources, and define strategic goals coherent with the operative limitations imposed by the cold conditions.*

Culture and practice

D. *Understanding and respecting cold environments, based on personnel experience, all deployed personnel should take part in cultural norms to work smart in cold conditions by conserving resources and sharing a positive mental attitude.*
E. *All personnel deployed to cold conditions should be able to preemptively take care of their own well-being, including appropriate behavior in cold conditions, nutrition, hydration and rest.*

Technology and systems

F. *All deployed personnel to cold conditions should be able to efficiently utilize cold protection related equipment and clothes.*
G. *All personnel deployed to the field should be able to recognize key functions, strengths, weaknesses and capacities of equipment used in cold conditions.*

Conduct and competences

H. *Beyond taking care of personnel well-being, and surviving cold conditions, all deployed personnel should be able to perform their normal duties under these challenging conditions.*
I. *All deployed personnel should recognize and take action on early indicators of negative effects of cold conditions' on personnel's well being and operational capacity.*
J. *All personnel deployed to the field should be able to read the weather and take appropriate actions accordingly.*
K. *Field-level commanders should be able to choose the most appropriate means of transportation.*
L. *All personnel deployed to the field should be able to utilize snowshoes and skies.*

Structure and management

M. *The field level commanders should take the most appropriate preventive steps towards ensuring safe and efficient technical operations.*
N. *Based on an analysis of the expected potentially life-threatening consequences from cold conditions on victims and personnel, tactical staff should prioritize operations accordingly.*
O. *Based on a qualified contextual analysis of current and likely developing conditions, indicators related to the climatic situation, the scale, the location and the type of incident, the strategic personnel should be able to declare cold conditions.*
P. *Based on the recognition of cold conditions operations, the strategic personnel should be able to collect and analyze information on specific vital operative needs.*

In cold conditions there is a special focus on deployed personnel surviving the environmental challenges, both as individuals and as a group. This is perhaps most clearly expressed in the added need to show a vigilant behavior in regards to the wellbeing of colleagues, victims and the development of the weather.

Before training, a competence-based evaluation according to participants' roles and functions should take place. For example, the natural competence of people working in cold conditions varies a lot and depends on living places (south / north), profession, previous training etc. By developing a competence-based approach competences to cope with cold conditions can be evaluated, developed and re-trained specifically. In order to reach the competence goals, the following content themes have been identified. Following the table displaying the themes main connections to the competence goals, each theme is explored in relations to the main subjects of interest.

Content themes / competence goals	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Defining cold conditions	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Harmful effects of cold conditions				X					X					X		
Cold conditions procedures		X	X												X	X
Safe and smart operations in cold conditions	X		X				X			X	X		X	X	X	X
Coping in cold conditions	X	X		X	X			X	X							
Basic survival in cold conditions					X					X				X		
Weather															X	
Clothing						X						X				
Equipment						X	X									
Transport											X	X				
Medical									X							
Navigation													X			
Communication													X			

Culture and practice

Working in cold conditions, like working in very hot conditions is in generally more difficult than working in more normal conditions. Additionally the often lack of light, and other connected psychological factors can present as stress factors for rescue personnel and victims. In order to carry out successful operations in cold conditions it is necessary to keep a keen focus on a conductive culture. Especially positive reinforcement of special cold-related procedures and a heightened attention to individual's wellbeing is important.

Module specific subjects

The chapter above presented overarching issues. This chapter presents a few issues which are specific only to individual modules and capacities.

Medical evacuation

Teams deploying to cold conditions need to consider the need for plans covering medical evacuation as well as plans for keeping casualties alive until they can be transported to the nearest medical facility. In arctic regions weather can change with short notice, meaning that both ground transportation and air transportation is impossible for shorter or longer periods of time. Therefore special attention is needed to plan for treatment of casualties, keeping the patient stable and warm, to prepare the casualty for transport and in some cases be able to transport the casualty to the nearest medical facility or pickup point.

USAR

USAR operations combine many different aspects of general rescue operations. The following directly targets the needs of USAR teams in cold conditions: (CMC; MSB, 2012).

HCP

To maintain full capacity in cold conditions, following technical steps must be taken into consideration:

- Glycol for frost protection of pumps and hoses.
- Electrical or gas heat guns to assist in operating equipment.
- Adapter/clamps for different coupling-systems i.e. Storz, BS standard.
- Fuel for arctic conditions classification according to EN 590.
- Minesweeper/metal finder to identify the location of hydrants and sewages.
- Tools for making access thru thick ice such as jack-hammers, ice-drilling machines and chainsaws.

CBRN

During the decontamination process and planning the first phases of the CBRN response, it is necessary to take the weather conditions into account. Response tactics and techniques are the same in many situations, but in order to get the results wanted, the intervention leader must bear in mind the possible difficulties due the cold weather. If water is used in the operation, it is necessary to keep the water running and prevent it from freezing, possibly through a water heater. Certain amount of area heaters is needed to keep decontamination areas warm. It is necessary also to plan beforehand how to keep possible patients warm during the chain of work, from removing contaminated gamins to post decontamination. When decontaminating cold people with bleeding wounds, the diminished coagulation ability of their blood might need immediate re-bandaging during decontamination procedures to prevent dangerous blood loss.

Before deployment it is recommended to investigate the utility of the different equipment in cold conditions. It is furthermore necessary to remember that certain chemicals behave differently in different temperatures and they can change form from liquids to gas and even solid.

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List of abbreviations

EU-NOM	The European Union´s Nordic Modules
CBRN	Chemical, biological, radiological and nuclear
CMC	Crisis Management Centre of Finland
DECON	Decontamination
DEMA	Danish Emergency Management Agency
HCP	High Capacity Pumping
ICT	Information and Communication Technology
INSARAG	International Search and Rescue Advisory Group
MEDEVAC	Medical Aerial Evacuation Capacity
MSB	Swedish Civil Contingencies Agency
PPE	Personal Protection Equipment
SOP	Standard Operating Procedure
TAST	Technical Assistance and Support Team
USAR	Urban Search and Rescue