FLOOD RESPONSE - CAPACITY BUILDING - TECHNICAL REFERENCE NOTE

Title: URBAN SEARCH AND RESCUE FLOOD RESPONSE
Last revised: 2025

1 Executive summary

This technical reference note is the delivery point of the collaboration between INSARAG member representatives to explore Flood Rescue capabilities as part of the Flexible Response Working Group established in 2020.

This document outlines the background to the formation of the group in recognition of the risk posed globally by climate emergencies. It provides a definition of Flooding as well as highlights some of the hazards within a Search and Rescue context. One of the key challenges in its development was the recognition that many countries adhere to domestic standards for flood rescue due to the multi-faceted response and unique hazards and risk management thereof required.

As part of the delivery of this work, included in this note is a summary of several of the flood rescue standards adhered to by INSARAG members that have already undertaken international Flood Response for consideration of those who may be interested in exploring this capability in the future, or wish to align their own response with a team utilising similar standards.

Participation in water rescue capabilities is purely voluntary for any of the classified teams.

2 Background

The Flexible Response Working Group (FRWG)[1] was established in 2020 following the recommendation of the INSARAG Steering Group (ISG) to discuss and explore the potential for the development of adaptable and flexible response operations. This is in reference to a global context of constantly changing response environment in which there has been an increase in extreme weather-related disasters requiring other specialized capacities in urban search and rescue activities. In 2024, water-related disasters caused more than 8,700 fatalities, displaced 40 million people, and resulted in economic losses exceeding US$550 billion globally[2].

Following on from these recommendations the INSARAG Steering Group 2023 endorsed the establishment of a Search and Rescue in Flood Response Working Group[3] and directed the INSARAG Secretary to facilitate its organization. This team has been tasked with the development of a Technical Reference Note on Search and Rescue in Flood Response encompassing the definition, existing capabilities, and basic standards. As well as developing a virtual directory of existing flood response capabilities of the INSARAG member states (on a voluntary basis) for OCHA and the INSARAG Secretariat to share when countries were affected by extreme flooding and require international assistance.

This document is intended to give guidance to INSARAG member states that nominate to support flood response utilising INSARAG teams or coordination frameworks responding to water events. It is not intended to be a comprehensive management, search, rescue, or

[1] https://insarag.org/global-structures/working-groups/flexible-response-working-group/#:~:text=The%20FRWG%20is%20composed%20of,on%20this%20topic%20in%202020.
[2] https://www.globalwater.online/globalwater/report/index.html#gallery
[3] https://insarag.org/search-and-rescue-in-flood-response-wg/

logistic text. A range of 'Policy Frameworks and Standards' are summarized in section 5 to guide decision making on adopting systems of assurance.

It is necessary for all readers of this Reference Note to review INSARAG Guideline Vol II: Preparedness and Response: Manual A. Manual A defines the process of identifying and supporting the development of new capability through the creation of systems and processes, recruitment of suitable staff, the procurement of equipment, training of personnel. To support and sustain the capability its integration into the existing legal framework for emergency management is critical.

3 Definition

A flood is when the water level exceeds natural embankments or artificial flood defences. Flooding can occur through a variety of circumstances which are influenced by location geography, topography and climate.

Causes of flooding include:

- **Rainfall -** Rivers are watercourses formed over thousands of years. They carry excess water from the land to the lowest point possible, often the sea. There are two main contributors to river flooding: catchment (natural drainage area) moisture, and rainfall. The land is a lot like a sponge – its capacity to absorb water depends how dry it is to begin with.

  For a river to flow, more rain needs to fall than can be absorbed by the soil. When the soil can hold no more water it's 'saturated', so water will flow freely across the ground and join streams, creeks and eventually, mighty rivers. Rivers have a maximum capacity to carry water. If this capacity is exceeded, the river will eventually rise higher than its banks and flow out into areas next to the river.

- **Snowmelt** – whenever snow melts, the resulting water finds its way into waterways. Rapidly warming conditions can cause snow to melt quickly, releasing large amounts of water that enter downstream rivers, which may cause flooding.

- **Dam releases** – dams can hold vast amounts of water, but all dams have a capacity. Meteorological services work closely with dam operators in times of flood to ensure the latest information is available for agencies to manage their assets in a way that minimises impacts on communities downstream.

- **Storm surge** – a storm surge is a rise above the normal seawater level along a shore resulting from strong onshore winds and/or reduced atmospheric pressure. Storm surges often accompany a tropical cyclone – or an intense low-pressure system in non-tropical areas. While coastal flooding is likely during a storm surge. It can sometimes combine with a river flood to produce even more significant flooding.

- **Exceptionally high or King tides** – These tides are a natural and predictable part of the tidal cycle. The time of year they occur varies by location and between years and can have very noticeable effects where the ocean meets the land at beaches, estuaries, harbours, and other coastal locations.

4 Hazard types

Working around flooded waters is an extremely high-risk activity and all operators must work within their skill sets. There are many hazards in and around flood waters that have potential to cause harm to health and safety of people and damage to property. This section will highlight common near water hazards, in-water hazards, and water force hazards.

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Near Water Hazards

- ***Slip, trips, and fall*** - Riverbanks can be unstable, wet and slippery. Riverbanks can have thick and impenetrable vegetation, tangled with timber and brush from the flood. Some vegetation can sting or cause reactions. A search and rescue operator may trip, slip, or fall into the moving water and drown.
- ***Dangerous animals*** - Flood water, debris, and vegetation near flood water can contain dangerous animals (e.g. snakes, spiders and other vermin) seeking higher ground. Search and rescue operators may be stung or bitten causing injury.
- ***Lighting -*** Poor light makes it more difficult to identify flood water hazards. A search and rescue operator may trip, slip, or fall into moving water and drown.
- ***Communication*** - Noise during a flood can make it difficult to communicate among team members and with the person being rescued. You, your team, or the person being rescued may not hear instructions or may misunderstand them.
- ***Human Factors*** - In any work activity, the human factor can be decisive for the positive or negative conclusion of an event. The term "human factor" summarizes a whole series of behaviours ranging from the wrong perception of danger present to the overestimation of one's own skills and knowledge.

In Water Hazards

- ***Untrained People*** - Untrained people who enter flowing water or attempt a water rescue may drown.
- ***Contamination*** - Flood water is contaminated – it can contain water-borne diseases, sewage, toxic chemicals, or other toxic substances from damage to homes and infrastructure. A search and rescue operator may become infected by diseases from contact with flood water.
- ***Underwater hazards*** - There can be unseen hazards in or below the surface – eg fences, trees, floating debris. Objects in and under the water – eg concrete structures, rocks – can affect how the water flows. A search and rescue operator in the water may slip, become injured or entrapped and drown.
- ***Animals*** - Large animals in or near flood water can be distressed and act unpredictably. A search and rescue operator may be crushed, kicked or trampled, or dragged into the water and drowned.
- ***Electricity*** - The distance between power lines and the flood water surface can be reduced. Flood water in contact with the solar power system can be live. A search and rescue operator may receive an electric shock.
- ***Hypothermia*** - Hypothermia may result from immersion in cold flood water.
- ***Hydrocution*** - The situation where blood vessels dilated by the heat contract suddenly, when cold water is applied to the skin, leading to cardiac arrest.
- ***Lighting*** - Poor light makes it more difficult to identify flood water hazards. A search and rescue operator may slip, trip or fall into moving water and drown.

Water Force Hazards

- ***Water force/power*** - It is difficult to determine the depth, current, and flow of flood water. There is enormous force in fast flowing water. A search and rescue operator may misjudge the power of moving water and be swept off their feet or dragged into the water and drown.

- ***Vehicle stabilisation*** - A vehicle can be swept off a road or causeway by the power of the moving water. A search and rescue operator in, on, or near the vehicle may be swept off their feet or dragged into the water and drown.
- ***Recirculation*** - Water flowing over weirs and culverts creates a recirculating current. A search and rescue operator in the water may be unable to remove themselves from the backwash and drown.
- ***Drainage entry point*** - Water flows with great force into drains and pipes during floods. The force can drag a search and rescue operator into the drainage system, and they may drown.

5 Water rescue capability

Water search and rescue teams provide land-based water rescue operators, on-water rescue technicians, in-water rescue technicians, and other rescue specialists when requested. **This technical reference note will only be addressing land based, on-water, and in-water rescue.**

All responding personnel should be trained to a minimum land-based water rescue level with associated water rescue equipment. The following table indicates accreditation levels and the rescue techniques relevant to each accreditation level.

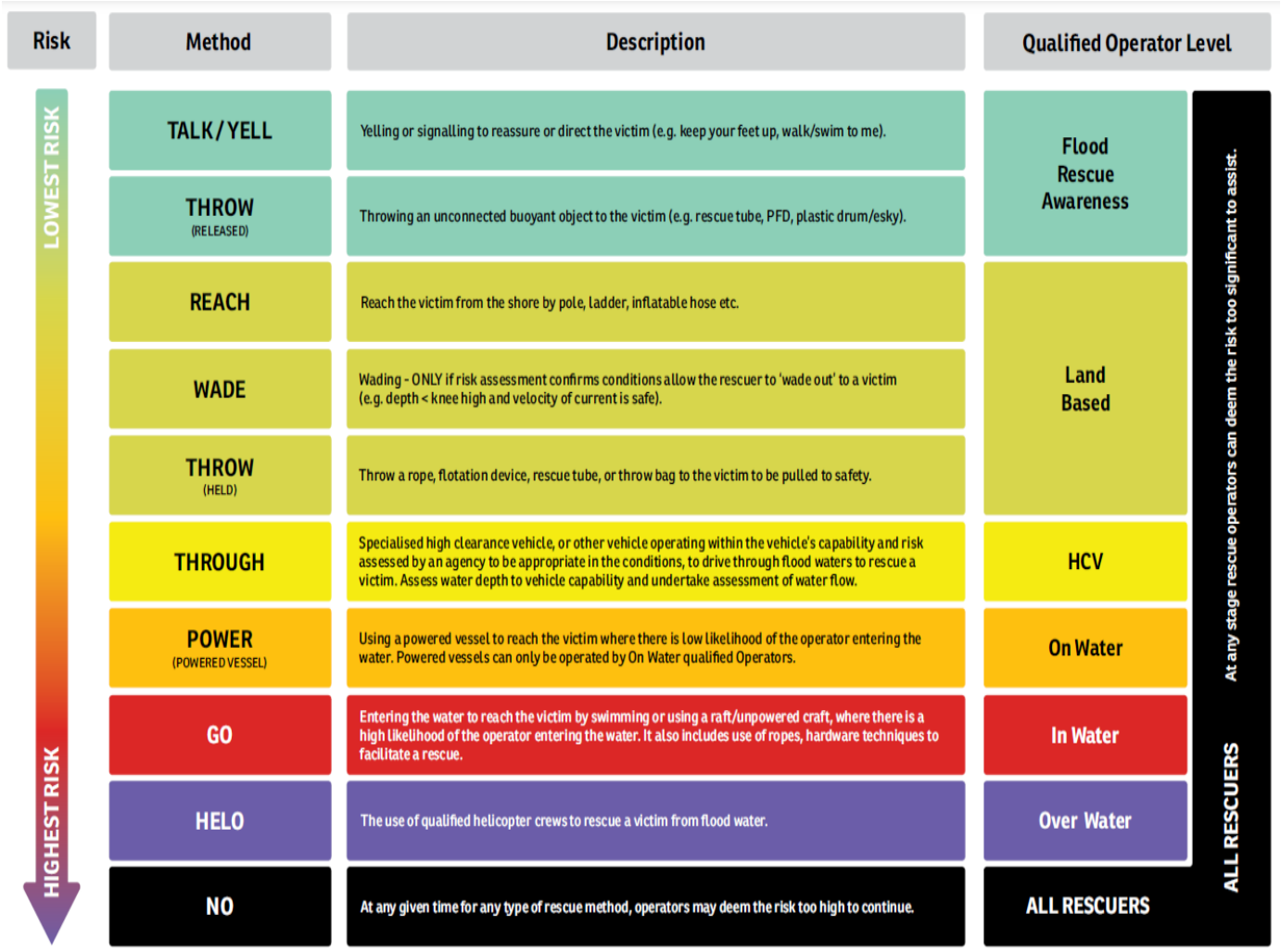

Figure 1 General Flood Rescue Framework

All responders

Water Rescue Awareness is a necessity for all responders who are deployed to a flood incident. These water rescue responders use the Talk and NO rescue techniques to assist the person requiring rescue, stop others from injury, inform subsequent responders, and keep bystanders away from danger. They use equipment available and convey required information for supporting resources required.

Land-based water rescue

These search and rescue operators use Talk, Reach, Throw (held) and Wade and NO rescue techniques. If the Talk rescue technique has not resulted in the person being rescued, a land-based rescue may be required. Additional water rescue equipment will be required to perform these rescues.

On-water rescue

These search and rescue operators use powered rescue to action a rescue. These operators should maintain the in-water capability as they may enter the water at any time and need awareness of each of the rescue techniques.

In-water rescue

If the Reach or Throw rescue techniques have not resulted in the person being rescued, a water-based rescue may be required. Talk, Reach and Throw, Wade, Go and NO rescue techniques are used. In addition to the land-based water rescue equipment, the unit and individual operators should be supplied with necessary water rescue equipment.

6 Policy Framework and Standards

As an INSARAG member state, participants are encouraged to maintain the same principles and methodology outlined within the INSARAG manuals. These trusted methods of coordination add efficiency and safety to any operation.

Standards for flood rescue operations are crucial for ensuring the effectiveness and safety of rescue efforts during flood emergencies. Their importance includes:

- ***Safety Protocols*:** Standards help ensure that rescue personnel follow established safety measures, reducing the risk of injuries or fatalities during operations.
- ***Effective Communication:*** Clear protocols facilitate better communication among rescue teams, local authorities, and affected communities, ensuring information is shared promptly and accurately.
- ***Coordination and Collaboration*:** Standards promote coordinated efforts between various organizations from different countries (government, military, NGOs, volunteers), ensuring that resources are used efficiently and effectively.
- ***Training and Preparedness*:** Standards often indicate minimum training requirements for rescue personnel, helping to prepare them for diverse scenarios and making rescue efforts more efficient.
- ***Resource Management*:** Established guidelines assist in the optimal allocation of resources, including personnel, equipment, and supplies, maximizing the impact of search and rescue operations.
- ***Community Awareness*:** Standards often include community preparedness and awareness campaigns, helping residents know how to respond during floods and enhancing overall safety.
- ***Post-Incident Review*:** Standards facilitate post-rescue evaluations, allowing

organizations to analyse effectiveness, identify areas for improvement, and update procedures based on lessons learned.

- ***Legal and Ethical Considerations*:** These help ensure that rescue operations adhere to legal and ethical standards, protecting the rights of affected individuals and ensuring accountability, according to the UN anti-harassment resolutions.

By implementing and adhering to these standards, organizations can enhance their operational readiness and response capabilities during flood emergencies, ultimately saving lives and minimizing impacts on affected communities in the different countries.

Standardizing operational procedures on an international level is not an easy task. Understanding that safety and security of effective joint operations is the desired outcome guides the application of countries and regions acceptance of variable principles and standards.

Some examples of existing standards within our INSARAG regions include:

Americas - The National Fire Protection Association (NFPA) 1006 Standard for Technical Rescuer Professional Qualifications[4]. This standard outlines the minimum training and performance requirements for individuals engaged in technical rescue operations. The NFPA 1006 details competency requirements, skills and knowledge, risk assessment, incident management, equipment usage, scenario training and safety standards. Overall, NFPA 1006 is designed to enhance the preparedness and capability of rescue personnel involved in flood-related emergencies, ensuring they have the necessary training and tools to conduct effective and safe rescue operations.

Australia - Australia maintains a national qualification framework that delivers assurance of common capability through endorsed ‘units of competency’. Recognised flood rescue units include, and these are in addition to general land rescue:

- Perform land based swiftwater and floodwater rescue and recovery
- Undertake inland flood boat operations
- Undertake swiftwater and floodwater rescue and recovery
- Undertake inland floodboat operations.

Agencies develop and maintain skills aligned to these units of competency. This standard has enabled national resource sharing and communication of competence for bilateral agreements with countries that maintain an alternate standard. The minimum training competencies are personalised by rescue agencies, but the ‘unit of competence’ maintains a common qualification standard. Assurance is either maintained independently within their own assurance processes or through a peer assessment program and detailed within individual State policies[5].

Europe - The European Union Civil Protection Mechanism (UCPM) facilitates and coordinates a European Civil Protection Pool (ECPP)[6] of deployable resources within the European Union (EU). The quality of the assistance is ensured through the establishment of a quality assurance and peer reviewed certification process. The EU certification process is composed of three certification steps (a consultative visit, a table- top exercise and a field exercise), and aims to ensure that the offered capability is predictable and meets the minimum quality requirements of the disaster.

An EU flood rescue team will deploy with equipment able to perform water search and rescue and assist people trapped in a flooding situation using boats. It provides lifesaving aid

[4] https://www.nfpa.org/codes-and-standards/nfpa-1006-standard-development/1006
[5] https://www.nsw.gov.au/sites/default/files/noindex/2024-10/State-Rescue-Policy-%20Edition-5_Final.pdf
[6] https://civil-protection-knowledge-network.europa.eu/media/ecpp-capacities-brochure

and delivers life-saving essentials as required. The teams will have the ability to search for people in urban and rural areas, rescue people out of a flooded area, including medical care on first responder level, work together with aerial search (helicopters and planes), and deliver first life-saving essentials in a flooded area.

United Kingdom (UK) - UK based organisations have a Flood Rescue capability aligned to the National Flood Rescue Concept of Operations[7], set by the Department for Environment, Food and Rural Affairs. It is aligned to the UK's Civil Contingencies legislation and developed a Common Operating Model among response agencies. Response agencies may operate together infrequently outside Flood Rescue Scenarios include the Fire and Rescue Service, and other Response Agencies such as Lowland Search and Rescue teams, the Coast Guard, and the Military.

The UK Flood Rescue Standards set out the Response Structures and detail the different types of capability and training required to achieve the standards. This allows the UK government to compile a National Asset List of Response Capabilities and coordinate an effective and proportionate response anywhere in the country.

The training is broken into Modules of content, which upon completion will define a team's Rescue Capability on the Asset list. Modules include:

- Water and Flood Awareness
- Water and Flood First Responder
- Water and Flood Rescue Technician
- Water and Flood Rescue Boat Operator
- Water and Flood Incident Management
- Flood Rescue Strategic Advisor.

The Rescue standards also specify Personal Protective Equipment requirements and has embedded industry standards to ensure that the safety of the Rescue Worker is considered consistently amongst teams on the Asset Register.

7 Team structure – water rescue deployment

Teams can provide a water rescue capability at individual water rescue incidents, or at larger-scale flood events. A team should remain self-sufficient teams, with a command structure, transport, and equipment. Often water rescue teams are deployed as part of a task force that addresses several risks. For a team to be self-sufficient they should maintain the standard components of management, logistics, and medical resources sufficient to support the search and rescue technicians.

[7] https://assets.publishing.service.gov.uk/media/5faa9ca5e90e0730666d4162/frco-november-2019a.pdf

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Water search and rescue task force deployment team structure (aligned to suggested staffing INSARAG Guidelines Vol II Manual A)		
Component	Task	Role
Management	Command	Team Leader (TL)
	Coordination	Deputy TL
	Planning	Planning Officer
	Liaison/Follow up	Liaison Officer (LO)
	Media/Reporting	Deputy LO
	Assessment/Analysis	Engineer
	Safety and Security	Safety Officer
	Coordination	Coordination Officer
Water Search & Rescue	Operations	Operations Officer
	Water Rescue Team Leaders	Rescue TL
	Water Rescue Technicians	Water S&R team
Medical	Medical Team Management: Coordination/administration of medical team. Integration with local infrastructure.	Doctor / Paramedics
Logistics	Base of Operations	Logisticians
	Water Supply	
	Ration / Food Supply	
	Transport capacity & fuel	
	Communications	

8 Equipment

Teams should be issued with equipment commensurate to their level of training and maintain caches of equipment prepared for deployment. Teams will comply with National capability audits and set equipment standards.

Minimum Equipment				
	Equipment	Water Rescue Capability		
		Land Based	In Water	On Water
PPE	Waterproof radio	✓	✓	✓
	Knife		✓	✓
	Pliers		✓	✓
	Helmet	✓	✓	✓
	Goggles		✓	✓
	Personal Floatation Device (PFD)	✓	✓	✓
	Flashlight		✓	✓
	Water suit to suit conditions		✓	✓
	Water shoes to suit conditions		✓	✓
	Water gloves to suit conditions		✓	✓
	Whistle		✓	✓
	Cow tail		✓	✓
Team Equipment	Throw bags	✓	✓	✓
	Cordage		✓	✓
	Connectors and rope accessories		✓	✓
	Personal location device		✓	✓
	Rescue tube		✓	✓
	Victim PFD	✓	✓	✓
	Boats motorised and other		✓	✓
	Medical resources	✓	✓	✓
	Stretcher	✓	✓	✓

9 Conclusion

The Technical Reference Note currency is monitored and reviewed by the Flood Response Working Group and enhanced through observations submitted to INSARAG.