



# IALA GUIDELINE

## G1120 DISASTER RECOVERY

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# DOCUMENT REVISION

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Revisions to this document are to be noted in the table prior to the issue of a revised document.

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## 1. INTRODUCTION

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Given that Marine Aids to Navigation (AtoN) systems may suffer destruction, disruption or damage, IALA recognizes the need for competent authorities to have fully executable plans to cope with disasters in their different forms. These plans will vary depending on the type of disaster, the inventory of resources available to the authority at the time and the possible cooperation amongst multiple disciplines. This Guideline should serve as a starting point for a competent authority to develop an effective disaster recovery plan to restore safe marine navigation.

## 2. SCOPE

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The purpose of this Guideline is to:

- Promote awareness amongst IALA members of the benefits of building a disaster recovery plan.
- Recommend basic fields of responsibility and actions that can be taken by disaster stricken members in order to restore service capability.
- Assist the competent authorities in anticipating and overcome the difficulties encountered during the aftermath of a disaster.

## 3. FIELDS OF RESPONSIBILITY

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The following are the competent authority's responsibilities when a disaster occurs:

- Determine the area impacted and ensure the immediate assessment of damage and broadcast its effect on the level of safety of navigation.
- Provide AtoN systems to re-establish or increase the availability of safe marine routes.
- Ensure that all relevant information about affected AtoN is communicated to the mariner for updating navigational documentation as soon as possible (for example charts).

## 4. FIRST RESPONSE AFTER A DISASTER

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The re-establishment or alteration of AtoN must be preceded by a navigation assessment (e.g., some channel marking may need to be changed). It is imperative that the authority identifies immediately the required competency in personnel and build action teams for the needed disciplines in the given areas, such as AtoN maintenance, VTS, meteorology, surveyors, traffic control, etc.

Amongst other things, it is necessary to determine the mission objectives, collect meteorological and oceanographic information, and assess the available equipment and staff.

- First stage considerations:
  - Self-capability - if necessary, consider option of third party assistance.
  - Accessibility
  - Positioning and surveying methods: accuracy, reliability, data management
  - Oceanographic and Weather conditions: visibility, currents, swell
  - Vessel - seaworthiness, manoeuvrability, capability and availability



- Area to survey - best, recommended and minimum option.
- Second stage - after defining the areas of action, assess the scale of the operation by estimating:
  - Preparation time
  - Logistics
  - Product/service appropriateness
- Established routes must be surveyed periodically, for instance, to account for large wrecks that may move on the seabed.

Additionally, at the surface, it is necessary to monitor floating debris that might damage AtoN or present a hazard to safe navigation.

Furthermore, in response to a large-scale disaster, relief operations can benefit from the use of aerial/satellite imagery to identify the extent of any damage.

## 5. DISASTER RECOVERY PLAN

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Authorities will be in a better position to contribute to disaster recovery if they have developed contingency planning for such events. Whilst it is difficult to anticipate specific factors for every scenario, it is possible to develop a set of appropriate generic responses.

Rapid response is essential, as the most useful responses are those which are implemented as soon as possible after the disaster event.

The disaster recovery plan should include the development of joint plans with relevant national and local agencies, and identification of potential areas of co-operation. The plan should be exercised at regular intervals to ensure that personnel are aware of their roles and to make improvements to the disaster recovery plan.

The disaster recovery plan should include an assessment, based on a set of representative scenarios, of risks associated with damage to marine related infrastructures (navigational routes/channels, AtoN, port facilities). This plan should include a prioritized list of AtoN based on their category and relevance within the designed scenario (e.g., DGNS stations, as they may provide relevant information to measure land mass movements and support survey works by providing greater accuracy/integrity).

Considerations:

- The ability to issue a general initial navigational warning by any emergency means.
- Immediate identification of the new hazards to navigation.
- Deployment of emergency marking options as appropriate (virtual AtoN, emergency wreck marking buoy, etc.).
- The possibility of cross-contribution and resource sharing with other authorities.
- The availability and accessibility of critical stores and spare parts (including fuel), and from which place or port to deploy.
- Buoyage stocks and availability for deployment at short term.
- The shore-based staff that may reinforce ship-based staff to assist with planning and communications roles and other tasks related with disaster relief operations.
- Identify and record sources for marine surveying.
- The available capabilities to collect and disseminate survey data addressing the following elements:



- Existing geo-referenced information (chart data, AtoN, images, etc.) and in which formats
- Portable GNSS receivers
- Angle and distance measuring instruments
- Depth measuring instruments and sensors (echo sounders, multi-beam, etc.)
- Tide observation instruments (tide pole or gauges)
- Data collection and post-processing software
- GIS capabilities to support the survey planning, data collection and provision of information to update charts and nautical publications (paper or digital format)
- Shore-based planning should include the:
  - The available technical staff
  - The capabilities to deploy staff and equipment
  - The plant, equipment and personnel to facilitate the deployment of temporary AtoN (including virtual AtoN)
  - Sufficient temporary buoy and mooring capacity
  - The capability to restore radio AtoN services, including DGNSS and AIS base stations
  - The capability to deploy portable power sources (e.g., electricity generators, etc.)
  - The awareness that response activities may cause interference with other emergency operations and vice-versa

The competent authority should be aware of redundant systems that can be of help in case of destruction of AtoN structures. For example, solar-powered AtoN may provide an adequate solution in either the short or long term. These are relatively easy to deploy and are likely to be more reliable and safe than temporary main power supplies.

## 6. RESPONSE OF COMPETENT AUTHORITIES

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Competent authorities should use all available resources, including physical and electronic means, to restore safe navigation.

The following should be considered:

- Deployment of maintenance vessels or other appropriate vessels to act as temporary AtoN.
- Deployment of temporary AtoN even with lower performance.
- Provision of additional AtoN, as the situation requires.
- The possibility of assistance in terms of equipment and competency from neighbouring states or authorities.

### 6.1. INITIAL RAPID RESPONSE

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In the first instance, visual AtoN may represent the quickest and most effective solution to provide guidance to shipping. Three key factors should be considered for their adoption:

- Physical AtoN may be provided almost anywhere at short notice. Additionally, in their simplest form, they do not require an energy source (unlighted marks), but even lighted marks may be established in a relatively short time.



- In certain cases, it may be some time before the environmental conditions stabilize. However, it is a relatively straightforward process to adjust the position and configuration of physical AtoN in accordance with changing requirements, including the changing navigable channel profile.
- In situations where nautical charts or ENC are no longer reliable, physical AtoN may become the sole means of navigational guidance. Physical AtoN tend to support traditional navigational techniques and provide an absolute position. Once a clear passage is identified, the implementation of one or more leading lines, possibly in conjunction with floating marks, may be sufficient to support the execution of the passage plan.

## 7. ELECTRONIC BASED SOLUTIONS

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### 7.1. ADVANTAGES

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A mixed solution of positioning and communication systems enhances the resilience of the overall system.

The use of digital information facilitates the updates of databases. For instance, as hydrographic surveys are completed or new AtoN are established, it is relatively easy to provide and/or perform updates in the information systems (e.g., updates to the ENC in the ECDIS or AIS information into the radar).

### 7.2. CONSIDERATIONS

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- 1 Failure to update ENC information and/or radio navigation systems severely limits the capability to conduct safe navigation.
- 2 Disruption of communication channels and networks may affect the operation of a large number of marine services. Restoration of the full capability may depend on numerous factors, some of which may fall outside the field of responsibility of the respective authority.
- 3 It is important to recognize that different vessels have different capabilities of receiving electronic information:

- a GNSS and terrestrial based radio navigation systems

The availability of GNSS and/or terrestrial radio navigation systems to provide reliable and appropriate PNT information will be important to assist in conducting local surveys, and in navigating relief vessels through restricted waterways into affected ports.

Where the authority has a policy of providing radio navigation services, restoration of damaged stations should form part of the disaster recovery plan. This should include surveying of a temporary reference station, provision of a power supply and erection of temporary antennae.

- b Virtual AtoN

Where it is likely that relief vessels will have the capability to receive AIS AtoN signals, the deployment of virtual AtoN from buoys, lighthouses, and ship or shore-based transmitters, offer a rapid response for the replacement of damaged or missing buoyage, or for additional marking of revised channels. For example, relief vessels may be of a greater or lesser draught than those which normally use the selected port, and alternative navigation channel marking may be appropriate.

Where not already in place, authorities should consider fitting AIS transmitters capable of broadcasting virtual AtoN to their service vessels, and should develop procedures for use of this equipment.

Virtual AtoN may also be used to provide guidance for routeing.



## 8. NOTES ON REPORTING

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To effectively assess the impact on navigation safety and the level of service required, it is important that operational teams describe the local situation in their area of responsibility.

An initial report should be prepared as soon as possible after the event and periodically updated as required. Additionally, a final report should give an overview on the organization's response to the disaster, including the performance of each operational team involved. The final report should also include a section on lessons learned.

A non-exhaustive list of pertinent information is included in section 11.

## 9. CONTRIBUTION TO OTHER AGENCIES IN DISASTER RECOVERY

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AtoN authorities may be able to contribute to disaster recovery by utilisation of support assets with the following capabilities:

- Search and Rescue
- Reconnaissance and logistic support (helicopters, drones)
- Hydrographic survey
- Utilities and supply

A major part of disaster recovery involves the supply of bulk goods such as food, fresh water, temporary housing etc. This may be facilitated by the opening up of affected ports. In addition to AtoN deployment, AtoN support vessels may be particularly useful in:

- Rescue and transfer of people
- Lifting capabilities to transfer stores or vehicles
- Command and control capabilities to support disaster relief staff, such as:
  - Long range communications capabilities, by satellite communication or MF/HF radio
  - Portable radio equipment (VHF, HF, satellite communication)
  - The facility to transmit photographs and video images by satellite communication, drones, etc.
  - Provision of paper or digital charts and charting facilities
  - Computers and printers
  - Hand-held GNSS receivers
  - Radars to support maritime surveillance
  - Collecting and transmitting navigation information
  - Meteorological support, access to weather analysis and forecast information, weather observations instruments (wind, temperature, pressure, etc.).
- Accommodation facilities for emergency services or disaster relief agency personnel
- Surplus electrical generation capacity
- Fire-fighting capability, with possibility to deploy equipped personnel to support land operations
- Potable water generators
- Kitchen facilities





- Refrigeration facilities
- Small boat provisioning and operating skills
- Helicopter support facilities
- Technicians to support re-establishment/repair of shore facilities (electricians, mechanics, etc.)

## 10. CONSIDERATION OF PREVENTION AND MITIGATION ACTIONS

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Each authority should consider and evaluate preventive actions that align with the type of disaster and the authority's capabilities or budget. Preventive actions can improve the time of response as well as minimize the cost associated with disaster recovery.

## 11. FINAL REPORT

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It is important to record the critical points and lessons learned of the event to ensure that disaster recovery plans may be improved.

This report may include the following:

- Description of events:
  - Nature of the event: strong winds, waves, earthquake, etc.
  - Duration of the event
  - Estimated time to return to full normal operational conditions
  - General consequences on road and port infrastructures, the status of telecommunication networks, etc.
  - Brief description of the most affected areas of navigation and indication of the types of mariners impacted (merchant ships, fishing boats, small craft, etc.)
- Impacts on AtoN:
  - Report of failures with assessment of damage
  - Report on return to functionality of critical and high priority AtoN.
- Action taken:
  - Description of intervention and implementation including details of actions such as mobilization of personnel, provision of equipment, and communication (order, soliciting outside help: Navy, Sea Rescue fleet, fire and safety personnel, etc.)
  - Lessons learned should be shared amongst IALA members and other relevant stakeholders.

## 12. POTENTIAL BACKUP EQUIPMENT FOR INVENTORY

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Based on risk assessment, authorities should maintain an appropriate level of emergency backup equipment related to:

- Repair of AtoN
- Deployment of temporary AtoN of similar or reduced performance
- Temporary standby power supplies



It is possible that the local power supply network could be damaged or destroyed. In some cases, solar-powered AtoN may provide an adequate solution in either the short or long term. These are relatively easy to deploy and are likely to be more reliable and safe than temporary main power supplies.

It is also possible that the local communications network, fixed or mobile, could be damaged or destroyed. Consider that any remaining network may be stressed by emergency service and personal communications.

## 13. DEFINITIONS

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The definitions of terms used in this IALA Guideline are found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

## 14. ABBREVIATIONS

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AIS	Automatic Identification System
AtoN	Marine Aid(s) to Navigation
ECDIS	Electronic Chart Display and Information System
ENC	Electronic Navigation Chart
GNSS	Global Navigation Satellite System
HF	High frequency (3 – 30 MHz)
PNT	Position, navigation and timing
VHF	Very High Frequency (30 MHz to 300 MHz)
VTS	Vessel traffic service