

**IALA Guideline No. ####**

**On**

**Disaster recovery**

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***AISM***Association Internationale de Signalisation Maritime ***IALA***

International Association of Marine Aids to Navigation and Lighthouse Authorities

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Guideline on disaster recovery

1. **INTRODUCTION**

Noting that human caused disasters are not covered by the scope of the guideline,

IALA recognizes the need for competent authorities to have fully executable plans to cope with natural disasters in their different forms. A Disaster Recovery Plan 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. Given that shore-based AtoNs may suffer damage including physical destruction or damage to the supporting structure, mechanical damage to the AtoN or loss of power supplies, this guideline should serve as a start point to restore safe navigation in a determined place.

1. **SCOPE**

The purpose of this Guideline is:

* To promote the awareness of the benefits of building a disaster recovery plan amongst IALA members.
* To establish some basic field of responsibilities and actions that can be taken by disaster stricken members in order to aid in the preparedness of service re-establishment.
* To assist the competent authorities to anticipate and overcome the difficulties that they can encounter during the aftermath of a natural disaster

1. **RESPONSIBILITIES**

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

* + ensure the immediate assessment of damage and its effect on the level of safety of navigation in a determined damaged area,
  + rebuild AtoN systems to re-establish or increase the availability of marine routes in which goods and any other resources required for disaster relief can be provided safely
  + ensure that all relevant information about affected AtoNs in the area concerned is transmitted to the hydrographic service for updating charts and other navigational documentation as soon as possible

1. **FIRST RESPONSE AFTER A DISASTER**

Priority of AtoN repair / implementation must be preceded by an assessment of marine operational requirements (e.g. some channels may need to be changed). It is also imperative that the authority identify immediately the expertise in personnel and build action teams for the needed disciplines in the given area, such as VTS, meteorology, surveyors, traffic control, etc.

Amongst other things, it is necessary to obtain the mission objectives, collect meteorological and oceanographic information, and assess the available equipment and staff. Based on the obtained information, a rapid missions' impact analysis has to be carried out in order to establish the best line of action.

For crisis response situations, the easiest way is to perform a risk assessment (probability/impacts) of the following stages and considering the described elements:

* First stage:
  + Positioning method: accuracy, reliability, data management, self-capability;
  + Oceanographic and Weather conditions: visibility, currents, swell;
  + Survey boat: seaworthiness, manoeuvrability, self-capability;
  + Survey method; accuracy, reliability, data management, self-capability, tide observation;
  + Area to survey: best, recommended and minimum option.
* Second stage, after defining the areas of action, assess the length of the operation by estimating:
  + Land preparation time;
  + Processing and plotting time;
  + Product / service appropriateness.
  + Established routes must be surveyed periodically, in order to account for large wrecks that may be rolling on the seabed. Additionally, at the surface it is necessary to monitor the floating debris, that might damage the AtoN and present a hazard to safe navigation;

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

1. **DISASTER RECOVERY PLAN**

Authorities will be in a better position to contribute to Disaster Recovery if they have developed contingency planning for such scenarios. Whilst it is difficult to anticipate every scenario, it is possible to develop a set of generic responses.

These responses should take into account that speed of response is often essential, as the most useful responses are those which are implemented within hours, or at most a few days, after the disaster event.

The Disaster Recovery Plan should include the development of joint plans with other 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 feedback improvements into 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 categories and relevance within the designed scenario, (e.g. DGNSS stations, as they may provide relevant information to measure land mass movements, support survey works by providing greater accuracy/integrity).

Marine-based planning should include:

* The ability to issue a general, basic initial warning by any emergency means;
* Immediate identification of the dangers;
* The contribution that the authority may be able to offer to other agencies;
* The available stores (including fuel) to deploy, and from which place or port (for precautionary reasons, critical stores should not be kept at vulnerable places);
* Buoyage stocks and availability, for deployment at short term;
* The shore-based staff that may reinforce ships staff, to assist with planning and communications roles, and other tasks related with disaster relief operations;
* A list of available survey-qualified staff;
* The available capabilities to collect and disseminate survey data, addressing following elements:
  + Existing geo-referenced information (chart data, AtoN, control points, images, …) and in which formats;
  + Portable / handheld Radio positioning sensors;
  + Angle and distance measuring instruments;
  + Depth measuring instruments and sensors (echo sounders);
  + Tide observation instruments (tide pole or gauges);
  + GIS capabilities to support the survey planning, data collection and provision of chart information (paper of digital format);
  + Data collection and data analysis software;
  + Plotting capabilities;
  + Shore-based planning should include:
* The available technical staff;
* The capabilities to deploy staff and spares;
* The spares (including fuel) holdings to facilitate the deployment of temporary shore-based AtoN;
* The buoyage spares holdings
* Capability to restore AtoN services, including DGNSS and AIS base stations;
* The capability to deploy electrical generators;
* The ability to Identify interference with other means of transportation

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

1. **OPTIONS FOR COMPETENT AUTHORITIES**

Aids to Navigation authorities may be able to support disaster recovery by:

* + Utilisation of AtoN support vessels to physically mark re-opened shipping channels;
  + Restoration of AtoN services where these have been damaged, in both short and long term
  + Provision of additional physical AtoN, or temporary Virtual AtoN to:
    - mark channels;
    - deliver recommend routes,
    - Mark cautionary areas.

Note: provision of virtual AtoN and AIS services relies on the availability of GNSS and AIS base stations;

* 1. **e-NAVIGATION**

Advantages of e-Navigation based solutions:

Mixed solution of positioning and communication systems, represents a strength and enhances the resilience of the overall system;

The use of digital information facilitates the updates of databases, for instance as hydrographic surveys are concluded or new AtoN are implemented, 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 info into the radar );

Virtual AtoN may be used to provide guidance to shipping.

Disadvantages of e-Navigation based solutions:

e-Navigation largely depends on electronic systems and on the provision and use of digital information. Deprivation of ENC information and / or radio navigation systems severely limits the capability to conduct navigation.

There is a trend in reducing Bridge personnel due to the implementation of systems such INS and IBS in the ships. Despite all the adopted measure to assure the integrity and reliability of the ships systems, those strongly rely on the provision of external services (e.g. ENC, PNT,…). This means that although the ship is fully operational, it can not use most of its navigational systems and must adopt traditional navigational techniques, which requires more bridge personnel that are no longer available.

Disruption of communication channels and networks will most probably affect the operation of a large numbers of Maritime Service Portfolios. Restoration of the full capability will obviously depend on numerous factors, namely on the type of information that it deals.

* 1. **DGNSS AND TERRESTRIAL BASED RADIO NAVIGATION SYSTEMS**

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

Where the AtoN 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 MF antennae.

* 1. **VIRTUAL AtoN**

Where it is likely that relief vessels will have the capability to utilise AIS AtoN, the deployment of Virtual AtoN from ship or shore-based transmitter offers a rapid response, either 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.

AtoN authorities should consider the fit of AIS transmitters capable of broadcasting Virtual AIS to their service vessels, and should develop procedures for use of these equipment.

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

* 1. **VISUAL AND RADAR AtoN**

In a first stage visual AtoN may represent the quickest and most reliable solution to provide guidance to shipping. Three key factors are to be considered for their adoption:

* Visual AtoN may be provided almost anywhere in short notice. Additionally, in their simplest design they don’t require any type of energy source (unlighted marks), but even lighted marks may be implemented in short time;
* In those scenarios we may need some time until the stabilization of the environmental conditions. It is relatively easy to adjust the position and configuration of the visual AtoN in accordance with the changing environment;
* In situations where the nautical chart or ENC are no longer reliable, visual AtoN may become the sole mean to provide navigational guidance. Visual AtoN support relative navigation techniques as opposed to radio navigation systems which provide an absolute position and therefore require chart information to be used. For instance, once a clear passage is identified, the implementation of one or more leading lines, possibly in conjunction with floating marks, is sufficient to support the execution of the passage plan.

When establishing floating aids or navigational channels, it is necessary to account for further changes in the seabed, as it will take some time for the stabilization of the sea bottom. These events may require changes in the buoy positions or alterations in the channel limits.

1. **NOTE ON REPORTING**

To quickly measure the impact of the events and the level of service offered to mariners, it is important to ask operational teams to report a description of the local situation in their area of responsibility taking into account the some broad requirements here mentioned.

An initial report should be sent as soon as possible after the event and updated when the reporting is not interfering with operational work. Also, a final report should present a reflection on the organization of the overall coordination and of each team facing such events, the balance sheet of the actions effort to return to normal situation, and lessons learned.

Content:

These reports must focus on the following 4 points:

* Description of Event:
* Nature of the event: strong winds, waves, earthquake, etc.
* If the event continues, estimated time to return to normal conditions allowing intervention to restore the situation;
* Brief description of the most physically affected areas of navigation and indication of the types of mariners impacted (merchant ships, fishing boats, leisure crafts, etc.);
* General consequences on road and port infrastructures, the status of telecommunication networks, etc.
* Impacts on AtoNs:
* Report of failures with assessment of damage (prioritization in the level of degradation of service to mariners);
* Report of the status of the areas of navigation qualified as sensitive (for example impossibility or difficulty to access to a port or a shelter), indicating the estimated time of recovery in each case.
* Action taken:
* Definition of intervention priorities and forecast implementation;
* Mobilization of resources for intervention;
* Details of actions such as mobilizing personnel and the provision of equipment (order, soliciting outside help: Navy, Sea Rescue fleet, fire and safety personnel, etc.)

1. **ANNEXES PROPOSED**

**Contribution to other agencies to Disaster Recovery**

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

* + SAR vessels;
  + helicopters (for reconnaissance and logistic purpose);
  + survey vessels;
  + utility purposes vessels;

**Use of AtoN support vessels**

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

* Survey and reconnaissance capability;
* Lifting capabilities to transfer stores or vehicles;
* Command and control capabilities to support disaster relief staff, namely:
  + Long range communications capabilities, by satcom or MF/HF radio.
  + Portable radio equipments (VHF, HF, satcom);
  + The facility to transmit photographs and video images by satcom;
  + Provision of paper or digital charts and chartings facilities;
  + Computers and printers;
  + Handheld GNSS receivers;
  + Radars to support maritime surveillance, and temporary VTS facilities;
  + Meteorological support, access to weather analysis and forecast information, weather observations instruments (wind, temperature, pressure, …);
* Accommodation facilities for emergency services or disaster relief agency personnel;
* Surplus electrical generation capacity;
* Fire-fighting capability, with possibility to deploy equipped personal to support land operations;
* Potable water generators;
* Kitchen facilities to support preparation of meals;
* Refrigeration facilities;
* Small boat provision and operating skills;
* Helicopter support facilities;
* Support of SAR operations;
* Technicians to support re-establishment/repair of shore facilities (electricians, mechanics, etc.)

**Potential Backup Equipment for Inventory**

Shore-based AtoNs may suffer damage including physical destruction or damage to the supporting structure, mechanical damage to the AtoN or loss of power supplies. In each case the response required will be different, and may involve the:

* Repair of AtoN;
* Implementation of temporary AtoN of similar or lesser output, at the same or different location;
* Use of installed or temporary standby power supplies.

In some cases, solar-powered AtoN may provide an adequate solution, in either the short or longer term. These are relatively easy to deploy, and are likely to be more reliable and safe than temporary mains power supplies.

It is likely that any local power supply network will be damaged or destroyed.

It is likely that any local communications network, fixed or mobile, will be damaged or destroyed. Any remaining network may be stressed by emergency service and personal communications.