Guideline on disaster recovery planning

1. **INTRODUCTION**

Given that AtoNs may suffer physical destruction or damage, IALA recognizes the need for competent authorities to have fully executable plans to cope with 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. This guideline should serve as a starting point for competent authority to develop an effective Disaster Recovery Plan to restore safe navigation in a determined area.

1. **SCOPE**

The purpose of this Guideline is:

* To promote 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 encountered during the aftermath of a disaster

1. **RESPONSIBILITIES**

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

* + determine the area impacted and ensure the immediate assessment of damage and its effect on the level of safety of navigation,
  + 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 is transmitted to the appropriate maritime service for updating charts and other navigational documentation as soon as possible.

1. **FIRST RESPONSE AFTER A DISASTER**

The re-establishment or alteration of AtoN must be preceded by an assessment of marine operational requirements (e.g. some channel markings may need to be changed). It is imperative that the authority identify immediately the required competency in personnel and build action teams for the needed disciplines in the given area, such as AtoN maintenance, 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.

* First stage considerations:
  + Positioning method: accuracy, reliability, data management, self-capability;
  + Oceanographic and Weather conditions: visibility, currents, swell;
  + Survey vessel: seaworthiness, manoeuvrability, self-capability;
  + Survey methods: 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 scale of the operation by estimating:
  + Land preparation time;
  + Processing and plotting time;
  + Product / service appropriateness.
  + Established routes must be surveyed periodically, for instance, in order 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 AtoNs 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.

1. **DISASTER RECOVERY PLAN**

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 of every scenario, it is possible to develop a set of appropriate generic responses.

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 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 dangers;
* The possibility of cross-contribution and resources 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 marine surveying competencies;
* The available capabilities to collect and disseminate survey data, addressing following elements:
  + Existing geo-referenced information (chart data, AtoN, images, etc.) and in which formats;
  + Portable Radio positioning sensors;
  + Angle and distance measuring instruments;
  + Depth measuring instruments and sensors (echo sounders, multi-beam, etc.);
  + Tide observation instruments (tide pole or gauges);
  + GIS capabilities to support the survey planning, data collection and provision of chart information (paper or digital format);
  + Data collection and post-processing software;
  + Plotting capabilities;
* Shore-based planning should include:
  + The available technical staff;
  + The capabilities to deploy staff and spares;
  + The plant, equipment and personnel to facilitate the deployment of temporary AtoN (including virtual AtoN);
  + The 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 including electrical generators;
  + 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 (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. **RESPONSE OF COMPETENT AUTHORITIES**

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 term of equipment and competency from neighbouring states or authorities

**INITIAL RAPID RESPONSE**

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 straight forward process to adjust the position and configuration of physical AtoNs in accordance with the 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 as opposed to radio navigation systems which provide an absolute position and therefore, to be used effectively, require up to date and accurate chart information. For instance, 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.

1. **ELECTRONIC BASED SOLUTIONS**

Advantages:

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 concluded 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 info into the radar );

Limits:

Failure to update ENC information and / or radio navigation systems severely limits the capability to conduct safe navigation.

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 may depend on numerous factors, some of which may fall outside the field of responsibility of the competent authority.

It is important to recognize that different vessels have different capabilities of receiving electronic signals.

* 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 antennae.

* 1. **VIRTUAL AtoN**

Where it is likely that relief vessels will have the capability to receive AIS AtoN signals, the deployment of Virtual AtoN from 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, AtoN authorities should consider fitting AIS transmitters capable of broadcasting Virtual AIS to their service vessels, and should develop procedures for use of this equipment.

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

1. **NOTES ON REPORTING**

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 organizations 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 and an example of a report form are included in the annexes.

1. **CONTRIBUTION TO OTHER AGENCIES TO DISASTER RECOVERY**

Aids to Navigation 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);
* hydrographic survey;
* utility 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:

* Transfer and rescue people;
* 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;
* Technicians to support re-establishment/repair of shore facilities (electricians, mechanics, etc.)

1. **ANNEXES PROPOSED**

**Reports**

These reports should include at least the following:

* 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.)

**Potential Backup Equipment for Inventory**

Authorities should maintain an appropriate level of emergency backup equipment related to:

* 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 main 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.