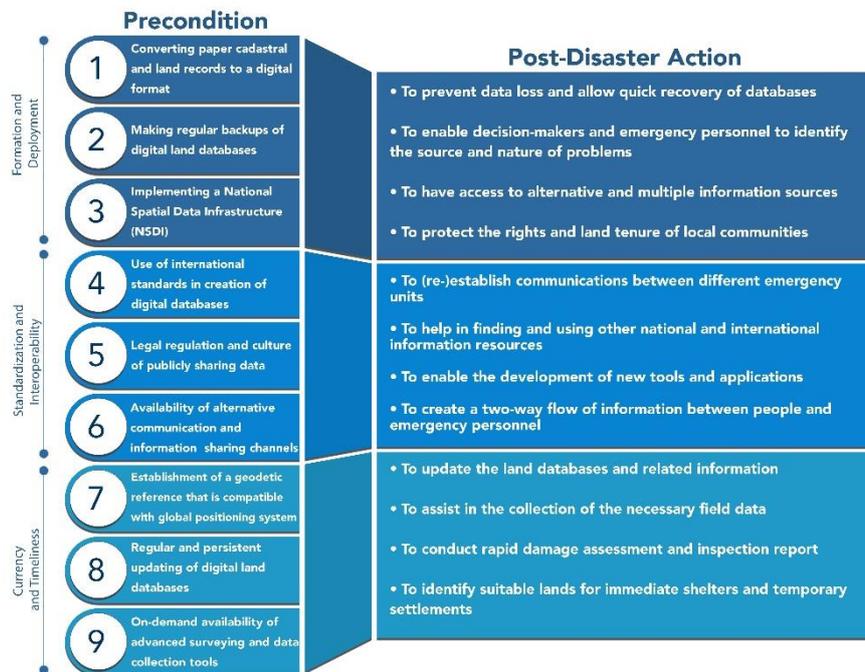


PRE AND POST DISASTER RECOMMENDATION FOR LAND RESILIENCE

The Land Administration and Geospatial Systems resilience checklist is to help disaster management personnel and agencies at the national level to understand the importance of developing and operating robust and sustainable Land Administration and Geospatial Systems in support of the post-disaster needs and actions. The checklist also can assist in anticipating the necessary steps to strengthen the resilience of LA and Geospatial Systems.



The checklist sets out three main categories of LA and Geospatial Systems resilience indicators, namely a) Formation and Deployment, b) Standardization and Interoperability, and c) Currency and Timeliness and provides an overview of the corresponding post-disaster actions for each category. There are also three preconditions under each category which define the preliminary characteristic attributes of healthy and resilient LA and Geospatial Systems. The preconditions act as a guide for a rapid, at-a-glance assessment of the existing or prospective national LA and Geospatial Systems. A brief description of the categories and components of the checklist is as follows:

Formation and Deployment

The Formation and Deployment category and its associated preconditions correspond to the establishment of functional, secure and stable national systems of Land Administration and Geospatial Information. The preconditions falling under this category are to ensure the availability and accessibility of the availability of minimum information needed to protect the rights of landowners and land users as well as to provide post-disaster decision makers with information needed to better understand the situation and make critical time-constrained decisions. The following preconditions should be checked to guarantee that LA and Geospatial Systems are in place and are likely to retain operational in post-disaster situations:

Converting paper cadastral and land records to a digital format

This precondition refers to the conversion of the conventional and paper-based cadaster and land registry records into digital databases and electronic records. In the absence of existing cadaster and land registry system, a digital system has to be developed from scratch.

Making regular backups of digital land databases

Making regular backups ensures that digital land records and geospatial data can be restored rapidly should a system crash, or data corruption occurs after a disaster. It also guards the data against any accidental loss or erasure and guarantees the continuity and availability of LA and Geospatial Systems at all times.

Implementing a National Spatial Data Infrastructure

Deployment of a National Spatial Data Infrastructure allows access, integration and sharing of spatial data between institutions and stakeholders in the spatial data community. It also provides a "one-stop" information centre for post-disaster needs and acts as a fundamental platform for all stages of disaster management. NSDI can facilitate discovery, obtaining and utilising alternative and supplementary LA and Geospatial data where information resources are limited, and main systems may be damaged.

Standardisation and Interoperability

This category refers to the capability of information and services exchange between various Land Administration and Geospatial systems to improve the operational and cost efficiencies in either pre-disaster or post-disaster situations. Standardisation of LA and Spatial Information along with enhancing the interoperability between various systems make it easier to integrate systems and achieve a sustained and consistent flow of information across different institutions and stakeholders. Three preconditions under this category and a brief description of each are as follows:

Use of international standards in the creation of digital databases

This precondition suggests a requirement for the adoption of international spatial information and service standards such as ISO 19115, ISO 19119, INSPIRE, or OGC as well as the widely-accepted geospatial data models and protocols in the design and development of the LA and Geospatial Systems. Fulfilling this precondition can have significant improvements in the advanced data discovery capabilities and effective data and service sharing between multiple stakeholders and systems.

Legal regulation and culture of publicly sharing data

Establishing the legal grounds for the development of a true ecosystem of publicising information across the various institutions and stakeholders at all local and national levels is the backbone of institutional acceptance and support for opening data and information. Development of such an open ecosystem backed up by legal regulations, and government policies can help all the institution involved in the creation and management of LA and Geospatial Information embrace the culture of data sharing and reuse. This precondition ensures that in case of any disaster or any circumstance causing loss of data, alternative and useful sources of valid information are accessible and reusable by both authorities and the public without any permission or approval required.

Availability of alternative communication and information sharing channels

Availability of alternative communication and information sharing channels such as social media sites and media sharing platforms coupled with robust and resilient communication networks such as mobile or satellite broadband can help to establish interaction and bidirectional flow of information between the public and the authorities. This precondition can greatly assist in benefiting from the knowledge of local people in updating LA and Spatial information databases, preventing land conflicts and helping in their resolution.

Currency and Timeliness

The currency of information is a perpetual requirement of LA and Geospatial Systems. Outdated cadaster and land registry information can lead to major land conflicts, especially after disasters where

the primary indicators of land boundaries are likely to be destroyed, distorted or altered. Routine tenure and land registry data collections and continuous updating of spatial information should be considered an important resilience factor of LA and Geospatial Systems.

Establishment of a geodetic reference that is compatible with the global positioning systems

Countries are encouraged to implement a more robust and high-precision geodetic reference system (e.g. ITRF-compatible datum) which is more closely aligned with global positioning systems. This will allow the fast and easy updating of land and geospatial information by using the power of high precision GNSS technologies and equipment.

Regular and persistent updating of digital land databases

Ongoing assessment and regular updating of the digital databases is the best practice to improve the timeliness of LA and Geospatial Information and minimise the gap between the real world and the digital records. Thus, regular and continuous updating of LA and Geospatial Information together with making ongoing backups (as outlined in 0) can promise a quick and efficient recovery of LA and Geospatial Information after a disaster.

On-demand availability of advanced surveying and data collection tools

Availability of advanced surveying equipment wireless sensor network (WSN) technology and unmanned aerial vehicles (UAVs) will provide disaster management decision-makers with quickly deployable and reliable equipment to collect information required for establishing situational awareness. At the same time, these technologies will be helpful for updating LA and Geospatial Systems in a timely and efficient manner.