

# Modernization of topographic mapping, success factors and lessons learnt

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## Abstract:

“Everything happens somewhere” is a popular phrase today, highlighting the importance of accurate and reliable geographic information. National Spatial Data Infrastructures (NSDI) are emerging in many countries as governments recognize the vast amount of geo-data being produced, which often remains unknown or inaccessible to other organizations. An NSDI channels this information to users across public, private, and academic sectors, driven by the availability and efficient production of geo-information.

Another significant driver is the Sustainable Development Goals (SDGs). Monitoring the progress of the SDGs requires extensive statistical data on economic, social, and environmental phenomena, all linked to specific locations on Earth. Therefore, reliable geo-information is crucial for a country’s SDG development.

Historically, topographic maps were created for military defense, detailing the terrain to be protected as sovereign territory. Today, their applications have broadened significantly, serving as foundational layers for environmental policy assessments, disaster management or documenting a nation’s landscape at specific points in time. These maps are crucial components of a National Spatial Data Infrastructure (NSDI), as they link thematic information to precise geographic locations, thereby connecting to a multitude of other data sources.

However, many countries today lack up-to-date topographic maps, often relying on outdated maps. The lack of funding or expertise to update these maps is a significant challenge. Some countries only update their maps when reliable source material, like government-purchased aerial photos or satellite imagery, becomes available.

Technological developments, using artificial intelligence techniques (GeoAI), bring additional opportunities to update and improve the current map production process. However this approach requires sustainable funds, unique expertise and knowledge. In other cases, countries depend on online mapping sources like Google Maps and OpenStreetMap, which, while useful, can suffer from inconsistent quality.

The modernization of the production process of a national topographic map is a key element in ensuring a sustainable availability of these maps in the future. Improving efficiency and cost reduction are important factors in developing these production processes. This modernization has a number of aspects that can be taken into account:

- a. Collaboration: cost reduction by collectively procuring the source data, i.e. aerial imagery
- b. Organization: application of workflow management principles, like LEAN and Agile, adjusting the production process with a focus on the value of the production steps for the user / customer
- c. Technology: automatic generalization of the topographic map series
- d. Innovation: GeoAI, using deep learning models to assist in the production of maps
- e. Avoid redundancy: next level of automatic generalization, by using the already existing key registers as sources for the topographic maps
- f. User-friendly feedback system that stimulates cooperation, cocreation and user engagement.

This paper details the ongoing initiatives undertaken by the Cadastre, Land Registry, and Mapping Agency of the Netherlands (Kadaster) to establish an efficient and future-proof production process for the national topographic map series. It highlights the lessons learned and identifies key success factors in modern map production process that becoming crucial source for a country’s SDI development.