International Cartographic Association
Association Cartographique Internationale

Informatization Era and Disaster Risk Reduction

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Keywords: Disaster Risk Reduction, Big Data (BD), Geospatial BD, Digital Earth, Sendai Framework, GEO, GEOSS, GGIM, DBAR, COPERNICUS and INSPIRE, Digital transformation, Geographical and Cyberspace, GIS and automation map design, dynamic mapping, Geospatial Artificial Intelligence (GeoAI), Geovisual Analytics (GeoVA), smart cities, digital twins, digital twins smart cities, Cartographic-psychological investigations, YouTube

Abstract:
The increasing frequency and intensity of natural disasters lead to justified expectations of new concepts for solving them and significant improvement in disaster risk reduction [DRR] supported by new methodologies and technologies. The abstract's author (further author) reflects on selected questions against the background of key global initiatives and clarifies some approaches, especially those socially oriented, associated with improving the whole process of DRR.
The Sendai Framework [SF], Agenda 2030 (Sustainable Development Goals-SDGs), or COPERNICUS are key enablers respecting the era of Big Data and its Geospatial one, and other available sources of digital data (GEO, GEOSS, GGIM, DBAR, and INSPIRE). World scientific and professional organizations such as ICA (especially the Commission on Cartography for Early Warning and Disaster Risk Management) are introducing new approaches to deal with Early Warning [EW], disaster risk management [DRM], and DRR, respecting the main tasks of SF global objectives and formulating and fulfilling its global indicators. Several are related to the umbrella approach of the International Society of Digital Earth [ISDE]. In connection with the Digital Earth concept. Annoni et al. (2023) and Annoni (2022) described the aspects of the „Digital transformation of global society“, which can be characterized by the „continuous development of Digital Channels, Digital Analytics, and Digital Business model(s)“. There is a huge demand for disaster risk management using digitalization as a key enabler for effective and efficient disaster risk management systems. Digital and intelligence technologies can help solve key aspects of the disaster management cycle. An urgent requirement is the incorporation of the latest approaches from cutting-edge scientific studies into practice in the form of comprehensible, well-thought-out applications (Ariyachandra & Wedawatta, 2023; Ford & Wolf, 2020; Kremers, 2022; Lienert et al., 2022; Lienert et al., 2021). The effectiveness of realising contemporary challenges depends on investigating relations between Geographical Space and newly established Cyberspace (Chen et al., 2023). The geographical space humankind is living, using, and still investigating and recognizing everyday challenges, but it has a new, strong, and, in many aspects, different partner - Cyberspace.
Artificial Intelligence [AI], Digital Analytics and Visualization, and Digital Twins play an important role in its development. AI is developing through Capabilities-based AI (narrow, general, and super ones) and Functionality AI (reactive machines, limited memory, theory of mind, and self-awareness). Cyberspace is generally considered a global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the internet, telecommunication networks, computer systems, and embedded processors and controllers. (Kirwan & Zhiyong, 2020)
This transformation brings opportunities and challenges to obtain valuable insights into how these two spaces (geographical space and cyberspace) can be mapped and interact with each other. The review of current challenges and future directions offered by close interactions between the two spaces, as illustrated in Fig. 1.

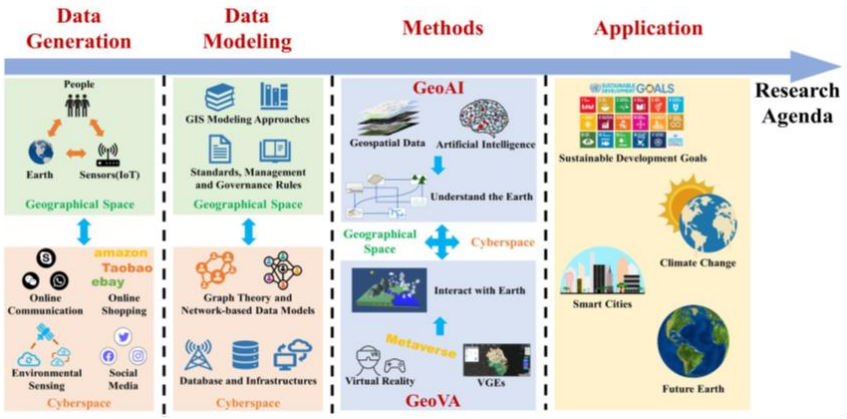

Figure 1 An integrated view of GIScience and Cyberspace, with perspectives offered by GeoAI and GeoVA (Chen et al., 2023, p.3)

Together, GIScience and Cyberscience may provide novel pathways for intelligent processing while raising new, complex challenges that should enrich our EW, DRM, and DRR approaches. Digital and intelligence technologies can help solve key aspects of the disaster management cycle. The author points out some already existing and new ones, for example:

- The creation of digital maps in the area of automation of existing ("traditional") processing and deployment of the new ("nontraditional") data and fast map creation with reduced error rate (experiences from the daily praxis of the Fire and Rescue Service of the Czech Republic. In addition, the source data was continuously updated and refined during the map creation process (Špulák, 2024).
- The project of "Dynamic mapping methods oriented to risk and disaster management in the era of big data". (Konečný et al., 2017-2019; Yang et al., 2018)
- Potentials of the Cartographic-psychological stream based on the cartographic communication model (Koláčcný, 1977). Konečný M. & Švancara J. (1986) published their first work on perception and (a)perception dealing with school children. Some cartographers understand that it was a real start of the psychological stream in Cartography developed mainly in the project Dynamic Geovizualization in Crises Management (Konečný et al., 2011).

Smart Cities [SC)], Digital Twins [DT], and Smart Cities Digital Twins [DTSC], the role of BIM, are the newest challenges for DRR. "DT is one of the most promising technologies for multi-stage management, and it offers significant potential to advance disaster resilience. Smart Cities (SC) use pervasive information and communications technology to monitor activities in the city. With increasingly large applications of DTs combined with big data generated from sensors in a SC, it is now possible to create Digital Twin Smart Cities (DTSC)" (Ariyachandra & Wedawatta, 2023). Seredovich et al. (2022) describe an effort to develop and apply the formation of digital twins as new products in construction and urban planning, to connect BIM and digital technical maps, to integrate monitoring results into the IoT and apply them to smart buildings and smart cities, and also to develop their use in dealing with extraordinary events. The author describes, in particular, the cartographic aspects of DT concerning DRR (with respect to the U.N. Habitat III conference conclusions). The most recent and probably the original approach (developed during the doctoral dissertation at SCI MUNI, Geography) of investigating disaster impact and recovery in YouTube content is provided by Hladík et al. (2024). The article's author tries to provoke a discussion on how to connect the described methods and their results to achieve better results in the effort to reduce the risk of disasters - DRR.

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