FORESIGHT FOR GRADUATE PROFESSIONALS IN DISASTER MANAGEMENT

Dimo Zafirov[1], Georgi Georgiev[2]

[1]Space Research and Technology Institute – Bulgarian Academy of Sciences
[2]Georgiev-consulting GmbH
e-mail: dimozafirov50@gmail.com; Georgi@georgiev-consulting.de

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Abstract: *This paper provides a precise analysis of typical disaster types in Bulgaria, categorized by internationally recognized classifications, supplemented with statistical information. It delves into existing systems, plans, and strategies for disaster management and response in the country, proposing targeted education and training activities to enhance disaster preparedness, particularly focusing on higher education and lifelong learning. Furthermore, the paper explores the potential for digitalization to revolutionize disaster management practices in Bulgaria.*

Introduction

Bulgaria's susceptibility to various natural and man-made disasters necessitates a thorough understanding of these phenomena for effective disaster management and response.

Disaster Types in Bulgaria: Bulgaria experiences the following typical disaster types:

- ***Natural Disasters:***
  - Floods: Approximately 80 % of Bulgaria's territory is prone to flooding, with an average annual loss estimated at €100 million.
  - Earthquakes: Bulgaria experiences moderate seismic activity, with historical earthquakes causing significant damage, including the 1977 Vrancea earthquake, which resulted in 120 casualties and extensive infrastructure damage.
  - Wildfires: Forest fires are prevalent, particularly during dry and hot summers. In 2020, wildfires affected over 10,000 hectares of land, causing ecological and economic losses.
  - Extreme Weather Events: Bulgaria faces extreme weather events such as storms, hailstorms, and heatwaves, impacting agriculture, infrastructure, and public health.

- ***Man-made Disasters:***
  - Industrial Accidents: Bulgaria's industrial sector poses risks of accidents, such as chemical spills and explosions. Notable incidents include the 2012 explosion at a munitions depot near Sofia, resulting in fatalities and extensive property damage.
  - Transportation Incidents: Road accidents, train derailments, and aviation incidents contribute to man-made disasters in Bulgaria, with fatalities and economic losses.

Foresight method

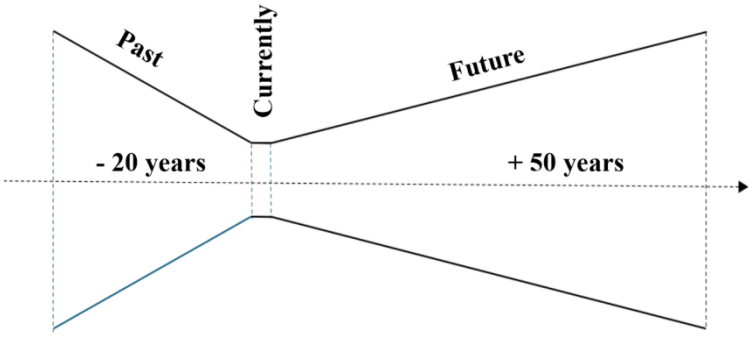

Fig. 1. Foresight method

Past

Systems, Plans, and Strategies for Disaster Management: Bulgaria has established comprehensive systems, plans, and strategies for disaster management and response, including:

- National Disaster Management System: Coordinated by the Ministry of Interior, involving governmental agencies, emergency services, and stakeholders.
- Disaster Preparedness and Response Plans: Developed at national, regional, and local levels, addressing specific disaster scenarios.
- Early Warning Systems: Utilizing meteorological, hydrological, and seismic monitoring networks to provide timely alerts.
- Search and Rescue Operations: Coordinated efforts involving emergency services, military units, and volunteers.
- Public Awareness and Education Programs: Aimed at raising awareness, promoting preparedness, and building community resilience.

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Currently

Normative basis for disasters in Bulgaria

Education and Training Activities for Disaster Preparedness: To significantly increase disaster preparedness in Bulgaria, targeted education and training activities are essential, including:

- Higher Education Programs: Integrating disaster management courses into university curricula, offering degrees in emergency management, risk assessment, and resilience planning.
- Professional Development Workshops: Providing training for government officials, emergency responders, and community leaders on disaster response protocols, crisis communication, and incident command systems.
- Public Awareness Campaigns: Launching public education campaigns on disaster preparedness, evacuation procedures, and emergency kit assembly.
- Simulation Exercises: Conducting tabletop exercises, drills, and full-scale simulations to test response plans, identify gaps, and enhance coordination among stakeholders.
- Community-Based Training: Engaging local communities through workshops, seminars, and training sessions on first aid, CPR, and community emergency response team (CERT) training.

Future

Desired state

Mobility
Disaster Resilient Housing
Critical infrastructure
Ecology

"Horizon scanning" for emerging technologies

Horizon Scanning has an important role in forward-looking, prospective, or anticipatory activities: it serves to explore futures, “emerging issues,” and signals of all kinds, and to evaluate the importance of “things to come.” During the last few years, different “Models of Horizon Scanning” have been developed through testing new methodological combinations and establishing specific “Horizon Scanning” institutions. Horizon Scanning (HS) approaches mainly serve to enhance resilient policy-making, address policy makers needs and concerns regarding new issues, to identify business opportunities by anticipating consumer and societal needs or to prepare society for less expected or rapid changes. The definition of Horizon Scanning used by the European Commission in the project on Horizon Scanning is the following:

Horizon Scanning is the systematic outlook to detect early signs of potentially important developments. These can be weak (or early) signals, trends, wild cards or other developments, persistent problems, risks and threats, including matters at the margins of current thinking that challenge past assumptions. Horizon Scanning can be completely explorative and open or be a limited search for information in a specific field based on the objectives of the respective projects or tasks. It seeks to determine what is constant, what may change, and what is constantly changing in the time horizon under analysis. A set of criteria is used in the searching and/ or filtering process. The time horizon can be short-, medium- or long-term.

Delphi прогнози

Horizon Scanning is a large part of the *Strategic Intelligence* phase of the strategy process described in the different briefs of EFFLA.

Key Trends

1. **Autonomy and Artificial Intelligence (AI)**
   - Development of autonomous drones capable of yes carry out missions without human intervention.
   - Using AI to improving navigation, object recognition and real- ime decision - making time.
2. **Integration with IoT (Internet of Things)**
   - Connecting drones to IoT devices for real-time data collection and analysis time.
   - Improving communication between the drones and others intelligent systems.
3. **Regulatory framework and security**
   - Developing new ones laws and regulations for air control space.
   - Improvement measures for cyber security for protect the drones from hacking attacks
4. **New ones Materials and Batteries**
   - Using light and strong materials for increasing time for flight and payload.
   - Developing new ones batteries and technology for charging for increasing autonomy.
5. **Multispectral and Hyperspectral Cameras**
   - Introduction of advanced cameras for more precise monitoring and data analysis.
   - Applications in the countryside economy, ecology and infrastructure monitoring.

Applications

1. **Military**
   - Intelligence missions and enemy monitoring territories.
   - Dotted striking and delivering materials to the battlefield field.
2. **Rural Farming**
   - Crop monitoring and precision agriculture.
   - Spraying pesticides and fertilizers.
3. **Transport and Logistics**
   - Delivery of small packages and goods to hard to reach places.
   - Using drones for inventory in warehouses.
4. **Medicine**
   - Delivery of medicines and medical equipment to distant regions.
   - Using drones for quickly organ transport for transplantation.
5. **Rescue Missions**
   - Search and rescue of people in disasters.
   - Rescue delivery materials and communication devices.

Challenges

1. **Regulations and Legislation**
   - Creation of unified international standards for control of drones.
   - Conflict resolution between the right to personal life and the use of drones.
2. **Security**
   - Protecting drones from cyber attacks and unauthorized access .
   - Systems development for detection and neutralization of hostile drones.
3. **Technically Restrictions**
   - Increasing time for flight and payload .
   - Improving the reliability and accuracy of navigation systems .

4. **Publicly Perception**
    - Overcoming public concerns regarding safety and privacy.
    - Increasing public awareness and confidence to the technologies for BLS through transparency and education.

Work Group
Expert Groups
Updates;
Expected schedule;
Action plan.

Conclusion

The drones flying systems offer huge potential for set transformation industries and improving the quality of life. Through combining technological innovation with adequate regulatory framework and public approval, BLS can yes they play key role in the future development of our society. The progress in the field of autonomy, the integration with IoT, the new materials and security will be the main ones engines on this one progress.

State of training of specialists with higher education for disaster and accident management in Bulgaria

Existing problems of training specialists with higher education for disaster and accident management.

Desired state of the future training of specialists with higher education in disaster and accident management.

Creating digital curriculum modules for graduate professionals in disaster and emergency action

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Recommendations

While Bulgaria has made progress in disaster management, opportunities for improvement remain, particularly in digitalization and education. Recommendations include:

- Investment in Digital Infrastructure: Enhance the resilience and capacity of digital infrastructure to support disaster management operations.
- Capacity Building: Provide ongoing training and professional development opportunities for stakeholders at all levels.
- Collaboration: Foster partnerships between government, academia, NGOs, and private sector entities to leverage expertise and resources.
- Public Engagement: Empower citizens through education, training, and participatory decision-making processes.

Conclusion

In summary, this work offers a precise analysis of disaster types and management strategies in Bulgaria, backed by statistical information. By implementing targeted education and training activities, Bulgaria can build a more resilient society capable of effectively mitigating and responding to disasters, while leveraging digitalization to enhance disaster management practices.

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References:

1. A. Cerqua, G. Di Pietro, Natural disasters and university enrolment: evidence from L'Aquila earthquake, Appl. Econ. 49 (2017) 1440–1457, https://doi.org/ 10.1080/00036846.2016.1218431.
2. D. E. S. A. Un, Strengthening Disaster Risk Reduction and Resilience for Climate Action through Risk- Informed Governance, 2022.
3. H. Baytiyeh, Developing effective earthquake risk reduction strategies: the potential role of academic institutions in Lebanon, Prospects 45 (2015) 245–258, https://doi.org/10.1007/s11125-015-9344-3.
4. C. V. Nguyen, N. Minh Pham, The impact of natural disasters on children's education: comparative evidence from Ethiopia, India, Peru, and Vietnam, Rev. Dev. Econ. 22 (2018), 1561–1589, https://doi.org/10.1111/rode.12406.
5. J. Lassa, M. Petal, A. Surjan, Understanding the impacts of floods on learning quality, school facilities, and educational recovery in Indonesia, Disasters 47 (2023) 412–436, https://doi.org/10.1111/disa.12543.
6. E. Q. Borazon, H.-H.H. Chuang, Resilience in educational system: a systematic review and directions for future research, Int. J. Educ. Dev. 99 (2023) 102761, https://doi.org/10.1016/j.ijedudev.2023.102761.
7. L. Gibbs, H. bin Jehangir, E.J.L. Kwong, A. Little, H. bin Jehangir, E. J. L. Kwong, A. Little, H. bin Jehangir, E. J. L. Kwong, A. Little, H. bin Jehangir, E. J. L. Kwong, A. Little, H. bin Jehangir, E. J. L. Kwong, A. Little, Universities and multiple disaster scenarios: a transformative framework for disaster resilient universities, Int. J. Disaster Risk Reduct (2022) 103132, https://doi.org/10.1016/ j.ijdrr.2022.103132.
8. D. Farris, R. McCreight, The professionalization of emergency management in institutions of higher education, J. Homel. Secur. Emerg. Manag. 11 (2014) 73–94, https://doi.org/10.1515/jhsem-2013-0074.
9. A. M. Esnard, B.S. Lai, C. Wyczalkowski, N. Malmin, H.J. Shah, School vulnerability to disaster: examination of school closure, demographic, and exposure factors in Hurricane Ike's wind swath, Nat. Hazards 90 (2018) 513–535, https://doi.org/10.1007/s11069-017-3057-2.
10. L. Czerniewicz, H. Trotter, G. Haupt, Online teaching in response to student protests and campus shutdowns: academics' perspectives, Int. J. Educ. Technol. High. Educ. 16 (2019) 1–22, https://doi.org/ 10.1186/s41239-019-0170-1.
11. M. A. Peters, H. Wang, M. O. Ogunniran, Y. Huang, B. Green, J. O. Chunga, E. A. Quainoo, Z. Ren, S. Hollings, C. Mou, S. W. Khomera, M. Zhang, S. Zhou, A. Laimeche, W. Zheng, R. Xu, L. Jackson, S. Hayes, China's Internationalized higher education during Covid-19: Collective student Autoethnography, Postdigital Sci. Educ. 2 (2020) 968–988, https://doi.org/10.1007/s42438-020-00128-1.