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PROCEEDINGS EDITORIAL: CMDR COE LEADERSHIP VISION FOR THE NEXT DECADE

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Summary: This editorial of 2025 CMDR COE Proceedings encompass the main current achievements in the Centre development and a clear vision of its leaderships for its next decade. The article defines areas of priorities, basic strategic goals and the approaches of their realization wile settles the expectations for the further organizational development. The presented analysis accents on weaknesses and opportunities for further development of the expertise and raising the Centre's status as NATO accredited international organization on new level excellence. Promoted strategic goals and initiatives, as well as performance management instruments and desired end state provide for a realistic vision for future development of CMDR COE capabilities and performance.

Introduction

The endorsement of NATO Strategic Concept 2022[3] reaffirms key purpose of the Alliance to ensure collective defence by development capabilities for the successful execution of three core tasks: deterrence and defence; crisis prevention and management; and cooperative security. Nations underscore the need to strengthen significantly deterrence and defence based on Article 3 [4] requirements as the backbone of the Article 5 commitment.

NATO applies a Global Programming Approach[5] to enable a timely, synchronized and continuous Allied forces capability's readiness by focused education, training, integration for deployment in NATO operations, missions and activities. Global

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[3] NATO 2022 Strategic Concept, https://www.nato.int/strategic-concept/;

[4] Resilience, civil preparedness and Article 3, https://www.nato.int/cps/en/natohq/topics_132722.htm;

[5] Global Programming: NATO's Training System, https://www.act.nato.int/activities/natos-training-system-global-programming/;

Programming and Bi-Strategic Command Education and Individual Training Directive 075-007[6] provide a comprehensive and timely response to the revealed needs of enhancing individual education and training, and serves as Strategic guidance for accredited NATO Education and Training Facilities (E&TF).

The leadership of Crisis Management and Disaster Response Centre of Excellence (CMDR COE) develops a strategic vision for the next decade in support of a successful implementation of NATO Strategic Concept 2022 and relevant strategic documents requirements. As a document of well recognised expert entity and part of accredited E&TF and NATO Disciplines Governing Authorities, CMDR COE vision present a comprehensive guidance for enhancing, enlarging and deepen the development of Centre's subject matter expertise and activities in support of strengthening NATO and Partner Nations' crisis management and disaster response capabilities. The CMDR COE activity is focused on **innovation, interoperability, and collaboration** to meet the evolving and future demands of the changing environment and support the Alliance readiness for timely conducting response operations.

CMDR COE's future intentions are targeted to enhance and diversify capabilities and products by integrating emerging technologies and digitalization, advancing research and knowledge sharing, expanding strategic partnerships, and delivering certified education and training. The execution of strategic vision will support the implementation of NATO policy, and execution of doctrine, concept and capabilities development programs and plans while pursuing an international recognition and a continuous validation as value-added solution provider.

The CMDR COE vision presents the Centre's priorities and strategic goals, describes the relevant initiatives and responsibilities for achievement the goals, and sets measurable indicators to monitor progress and support Centre's leadership decision-making. It might be used as a **robust framework** for a comprehensive guidance to direct the planning and execution of the Centre Programmes of Work (PoW) and ensure clear responsibilities and effective management of both planned initiatives up to 2030.

[6] New Updates to Bi-SC Directive 075-007, https://qa.sidecloud.net/news/new-updates-bi-sc-directive-075-007-what-you-need-know;

The application of an approach of continuous monitoring will ensure the Centre' leadership in achievement their goals for a continuous and value-added contribution to NATO resilience, readiness and response.

CMDR COE was established on 27 August 2013 by Framework Nation Bulgaria and Sponsoring Nations Greece, Hungary, Poland, and Romania, and accredited as NATO's 21st Centre of Excellence on 31 March 2015. Centre's multinational team unites military and civilian Subject Matter Experts (SME) and ensures high professional standards and continuous knowledge management and sharing. The current development shows that CMDR COE provides education and training, supports planning and conducting NATO and Partner exercises, provide SME for support of doctrine and concept development, as well as for the research, innovation, and Lessons Learned in the broader crisis management and disaster response (CMDR) domain, Business Continuity and Information and Knowledge Management NATO disciplines. Its cohesive multinational team of military and civilian Subject Matter Experts (SMEs) ensures highest quality products, interoperability and knowledge sharing across the Alliance.

The CMDR COE leadership sets as a main priority of Centre cooperativeness a continuously increasing subject matter expert contribution and value added to the Alliance transformative effort in crisis and disaster management. It stress on the provided E&T, research and analysis and the identification of expert interconnections and interdisciplinary linkages that support establishment a cross-institutional synergy. It is supported by effort to exemplify transformation of the latter into targeted contribution to concept and doctrine development, lessons-learned, as well as tailored E&T products for NATO.

A key priority of CMDR COE scientific accompaniment is application of a gradual re-introduction of resident events into an improved physical and technical environment. CMDR COE continues to apply the proven effectiveness option for hybrid participation in selected events, as well to deliver E&T online. The goal is to allow a diverse and wider participation across NATO entities, nations and partners, while minimising travel expenditures and related environmental footprint, to save time and resources while maintaining high possible standards' quality.

The Centre capacity to act as a catalyst for transformation in the crisis and disaster management domain is closely contingent upon the ability to forge fruitful partnerships with other SME entities and E&T facilities in CMDR Community of Interests (CoI) with a proven effectiveness. Therefore, this cooperation rests at the heart of the Centre and underpins the realisation of the Centre's strategic objectives. It supports building a common ground for collaboration and exchange knowledge and expertise with relevant stakeholders. Since 2018, CMDR COE is involved in capacity building support for the Jordanian National Centre for Security and Crisis Management (NCSCM). This project is a part of NATO's Defence Capacity Building (DCB) Trust Fund initiative and it was developed and coordinated by the NATO International Staff.

The CMDR COE also continuously strengthens its fruitful SME collaboration with the European Security and Defence College (ESDC) and with the EU Military Training Group (EUMTG) while acts as Department Head (DH) for the discipline on "Military Contribution to EU Disaster Response (DR), Humanitarian Assistance (HA) and Civil Protection (CP)". Currently, the CMDR COE supports a project on civil-military cooperation in climate-related emergencies and will continue to contribute for fostering and expanding the Centre's partnership network, including within the reinvigorated CoI on crisis and disaster management area. The leadership revamps the concept for CMDR COE CoI further emphasis on the exchange of knowledge and good practices, result-oriented engagement in projects and initiatives with a continuous expansion. That is why the Centre initiated the development of a brand new platform in order to support a better meeting of the needs and extended collaboration in a closer to reality virtual environment.

CMDR COE leadership will continue to develop the Centre's knowledge base and expertise on Business Continuity Management, resilience and civil preparedness, protection of civilians, human security, gender mainstreaming, building integrity and climate change with the intention to continue contributing meaningfully to NATO 360-degree approach to security. For instance, the effort of conducting a climate change's research revealed and will continue to have in future number specific implications on military activities, such as humanitarian assistance and disaster relief**,** examines the triple nexus of climate change, security and gender. That is why the Centre advocate the results of this study to be embedded in practice of planning and decision-making for the systematic integration of the gender perspectives. This practice requests for a

further deeper exploration of resilience knowledge, culture and practices, particularly societal resilience as a critical component in the processes of crisis prevention crises and emergency management, including precipitated by climate change and environmental degradation.

The CMDR COE will continue to keep a continuously enriching SME thematic scope of its activities to better and appropriately reflect security environment changes and future anticipated NATO, Nations and Partners reactions for a successful Alliance readiness not only to respond, but also to fulfil the Alliance main tasks set out in the Strategic Concept. The Centre will continuously follow the development in and seeking avenues for enlarging its productive cooperation on the areas of cultural property protection, consequence management, embedding Artificial Intelligence (AI), new and emergent technologies, participation in scientific researches and projects as a very important and value added parts of foreseen future.

Retaining a capacity to anticipate the intricate interplay of political, social, technological, economic and environmental challenges necessitates efficient allocation and utilisation of resources, especially within a growing level of ambition. Leadership support utilisation of different Business analysis models to help delivering CMDR COE objectives. Furthermore, the leadership leverages modelling and simulation capabilities to improve Centre's products and projects. CMDR COE Operational Laboratory (OpsLab) has substantially contributed to various research initiatives and to the improvement of training materials, particularly scenarios.

To anticipate the future requires preparing for tomorrow's challenges today. Doing so invariably involves tapping into the vast potential young people carry by providing them with opportunities for personal and professional advancement while benefiting from their skills and competences. The CMDR COE's Internship Programme allows cooperating with the brightest of minds and the most skilful and motivated of young professionals determined to be part of a team transforming challenges to collective security into opportunities for a more inclusive and safer future. The leadership pays attention on a systematically improving Centre paid Internship Programme convinced that the transfer of knowledge between and among generations is critical to prosperity and progress.

The year past is, as I am confident - the year ahead will continue to be a true example of professionalism and dedication to cementing the CMDR COE's position as a front-runner in the crisis and disaster management domain, and as a stakeholder in critical transversal topics. Excellence more than a mission for the Centre – it is a firm conviction in the benefits of hard work and constructive cooperation, and sharing effort on the way forward. Centre's strides become ever more confident as its team grows – the personnel was delighted to welcome consecutively two new Sponsoring nations – Romania and Hungary, and looking forward to continuing this process of enlargement and to further contributing to inclusive transformation.

In its way of highly qualified response to the NATO and nation's needs, the last years Centre achieved NATO Quality Assurance accreditation in 2019 and a successful re-accreditation in 2025, maintaining its status of NATO Education and Training Facility (E&TF) of excellence. CMDR COE is part of NATO Global Programming Governing Authorities[7] (GPGA) as Department Head[8] (DH) and the solutions provider for two NATO Disciplines - Business Continuity Management[9] (BCM) and Information Knowledge Management[10] (IKM). The achievements allow the Centre to apply a continuous effort in development and modernization of its infrastructure, digital, gaming and simulation capabilities in support of CMDR COE leadership decision-making, E&T, NATO and Nations' exercises. Nevertheless, the challenges of the limitations of unoccupied positions and resource scarcity, the CMDR COE continues to expand, deepen and focus its expertise, advanced training tools, modelling and simulation capabilities. The proper addressing these areas is critical to achieving the 2030 desired end-state and sustaining the Centre's leadership in the CMDR domain.

The intentions in the next years, CMDR COE develop a strategic path to achieve the Centre's desired end-state by 2030 through a clear, measurable, and achievable progress. It establishes the goals for and provides a framework for their effective and efficient achievement. It will serve as a strategic guidance for CMDR COE staff in

[7] Global Programming: NATO's Training System, https://www.act.nato.int/activities/natos-training-system-global-programming/;

[8] A NATO disciplines Department Head (DH) is a NATO-accredited entity, usually a Centre of Excellence (COE) or an international center, formally appointed to coordinate and ensure the Education & Training (E&T) program for a specific discipline across the Alliance.

[9] Business Continuity Management, https://coi.cmdrcoe.org/index.php?m_id=14;

[10] Information Knowledge Management , https://cmdrcoe.org/menu.php?m_id=76&i_id=488;

implementing the annual PoWs and advancing the Centre's long-term growth. The main goal is the Crisis Management and Disaster Response Centre of Excellence (CMDR COE) is to become an internationally recognized and respected hub that significantly contributes to the research, development, and enhancement of NATO, National, and Partner Nations' crisis management and disaster response capabilities. The following of this path will require CMDR COE is to act as a catalyst hub for the improvement of NATO, National, and Partner capabilities in crisis and disaster response through collaborative partnerships, innovative solutions, and the sharing of expertise.

Analysis and opportunities

One of the best scientific instrument for analysis is SWOT analysis. It might be used as a strategic assessment tool that allow examination of strengths and weaknesses against opportunities and threats encountered by CMDR COE. The utility of SWOT comparative and illustrative capacity allows for identification of correlations and introducing compatible and incremental changes within Centre working environment. The SWOT analysis allows the settlement of performance Indicators for identification of main challenges.

A deliberated application of SWOT analysis derive several areas of indicators to support strengthening of the Centre's future activities: flexibility of a multinational organization, valued expert recognition as NATO accredited organization; Department Heads responsibilities and functions; and a well-functioning quality assurance system. Additionally, the status of the Centre as independent expert entity provide for:

- needed flexibility of the leadership: in decision making;
- provision and manage own supply chain;
- freedom and flexibility when developing and delivering crisis management and disaster response relevant courses in NATO domains;
- usage of experienced subject matter experts;
- operating of a well-developed laboratory with modelling and simulation tools, and flexible architecture;
- support CMDR related activities;
- owning of web Centre's page;

- following own Internship Program;
- having a strong network and active partnership within the CMDR Community of Interest;
- maintain qualify facilities and faculties**.**

Simultaneously, the Centre working status and environment support manifestation of several weaknesses. Annual planning and financing provide for limitation of financed activities at Centre's Programme of Work, dependence of national authorities of sponsoring nations limited its role in the human resource management and insufficiency of expertise in important areas of Centre's responsibility because the expertise and responsibilities to experts are predetermined by national assignment process. Limitation of social capital made a highly complicated coordination. The Centre's equipment and insufficient access to NATO common funding provide for no faster enough development of digital resource that leads the library and online courses to be still in development phase, limited access and strong presence in the external community with Government and Nongovernment organizations.

At the same time, business model, status and operations of the Centre provide for some unique organizational opportunities:

- Active participation in NATO GPGAs as DH for BCM and IKM;
- Interest in CMDR courses by diversification topics and connected areas;
- DH obligations for development of new courses in BCM and IKM areas.
- ADL systems, mobile training teams;
- CMDR COE participation of in NATO doctrine, CD&E working groups;
- CMDR COE as NATO's main Community of Interests (CoI) information hub and platform;
- Unique LL hub for all NATO, Partners and national CMDR-related entities;
- Participation in NATO/EU Seminars/Workshops/Exercises and other activities;
- Participation of CMDR COE in CMDR Operations.

Looking at the weakness, the Centre's leadership have to a clear and continuous look at some of them that can rise as future threats:

- Increasing experts' workload without an increase in personnel;
- Budget constrains: fixed contributions, slight variations from incomes (e.g.: course fees), no financial flexibility, planning;
- Limited diversity of SMEs for executing the strategic plans/unfilled positions;
- Increased turnover of COE staff;
- Growth of competitors & withdrawal of a nation;
- Changes in the policy of the Framework / Sponsoring Nation.

The results for the application of SWOT analysis as a strategic management tool provide for defining CMDR COE strategic perspectives and next decade priorities. The strategic vision for the CMDR COE 2026–2030 future might be grouped in several general priority areas. The first one have to be focused on Centre output quality in support of the Alliance and nations' capability enhancement. Its practical measures will be directed toward general strengthening of NATO and Partner Nations' crisis and disaster response through utilization of innovative E&T, technologies, exercises, and expert operational support. At the same time, the strategic priority of internal staff training and capacity building remain unchanged because the need of delivering certified training and e-learning programs to improve readiness for military and civilian personnel. It has a direct connection with the priority area of policy and standardization support in order to ensure a continuous provision of subject matter contribution to NATO transformation – development of doctrine and policies, CD&E while at the same time ensuring needed alignment with the evolving requirements. The need of a uninterrupted alignment with strategic environment's needs and the speed of development of the science and technologies, Centre's leadership has to pay attention and provide for development and enhancement of own research and innovation capabilities. This area required particular attention on development and advancing new knowledge, learning and support SME development through scientific researches, experimentation and sharing knowledge and lessons-learned. The advancing in the other priority areas in impossible without collaborative partnerships,

cooperation and collaboration with similar NATO bodies, Nations, Partners, international organizations, academia, and industry to enhance CMDR COE interoperability. The framework of Centre's priorities will not be closed without defining strategic goals in the area of international recognition and excellence. The will cover the sustainment of high professional standards and active engaging in competing international forums and certifications.

The described framework of CMDR COE priorities is very helpful in formation a clear understanding of its current stage, and basic directions for its future development to reach the desired end state in strategic documents:

By 2030, the CMDR COE to strengthen, advance and promote its position as NATO's premier hub for crisis management and disaster response, delivering exceptional operational value to the Alliance and its Partners readiness and resilience.

Building on a decade of proven subject matter expertise (SME), experience and excellence, the Centre will continue to enlarge and deepen its NATO and international impact through a professional application of cutting-edge innovations, high-quality certified trainings, and proactive engagement in NATO transformation - doctrine, policy, concept development and experimentation. In this effort, CMDR COE will develops and operate a dynamic Community of Interests with partners and other NATO entities, International Organizations in order to provide high standards solutions that enhance the Alliance and Nations readiness, interoperability, and resilience against emerging complex risks, threats, and crises. The status of the Centre will elevate to a trusted, internationally recognized, and indispensable contributor to NATO's strategic objectives, security, and operational effectiveness—setting the benchmark for excellence in crisis management and disaster response.

CMDR COE Strategic goals 2030

Over the next decade, CMDR COE will focus its contribution on strengthening NATO's and Partners' capabilities to effectively anticipate, prepare for, prevent and respond to crises and disasters. The achievement of Centre's strategic goals will foster innovation, enhance collaboration, and ensure that the effort of improvement subject matter expertise will contribute to NATO's operational readiness and global credibility.

The strategic goals are defined after an assessment of current achievements and careful evaluation of future CMDR COE engagements and available capabilities.

While executing its mission, CMDR COE goal is to Enhance NATO CMDR Capabilities and Readiness to Conduct Crisis Response Operations. The achievement of this goal ensures of CMDR COE valuable contribution for equipping NATO and Partners with needed contemporary capabilities to support prevention and effective management of complex crises and emergencies with utilization of emerging technologies, fostering operational application in realistic training and exercises to support building interoperability and resilience. The key initiatives in realization this goal include:

- Timely integration leading requirements of emerging NATO strategic documents in CMDR COE plans and activities;
- Explore and appropriate application of new technologies like artificial intelligence, robots, unmanned vehicles and drones, modelling &simulation (M&S) tools;
- Providing SMEs in support of planning and conducting complex, realistic scenario-based trainings and exercises;
- Active participation in NATO, Nations and Partners and International research programs and projects;
- Support digitalization and modernization of CMDR COE infrastructure, staff management, research and E&T processes.

The achievements in realization of listed initiatives, directed to the execution of this goal will measured with several quality and quantity Key performance Indicators (KPIs):

- Number of innovative tools and technologies applied, tested, validated in trainings and exercises;
- Number of exercises supported or conducted;
- Number of Centre's participations in NATO, Nations and Partners and International research programs and projects;
- Number applied projects and tools for digitalization and modernization of CMDR COE infrastructure, research and E&T activities.

The second strategic goal of the Centre is to Diversify, Enlarge and Deepen Contribution to NATO Education, Training and Capacity Building. The support and

contribution of CMDR COE in the processes of building resilient Alliance and Nations capabilities requires a clear focus of Centre's leadership on continuous learning and internal expertise development. This requires a new approach of diversifying, enlarging and deepening provided certified education and training for NATO and Partners, as well as more effort in combining pilot and certified courses, application of e-learning and mobile training tools, embedding business and warfare gaming and exercises support to broaden their real impact on the expertise development.

The execution of several planned key initiatives will support achievement of this strategic goal:

- Development and conducting of new pilot and certified NATO and partner training courses and non-training solutions as Department Head of NATO Business Continuity Management and Information Knowledge Management disciplines;
- Continuous actualisation, renovation and enlarging subject matter area and topics of crisis and emergency prevention and management courses, as well as other research and E&T activities;
- Widening and increasing of E&T quality by application ran real support of scenario based military and business gaming, modelling and simulations in support of conducted courses;
- Integrate Business Continuity Management, Information Knowledge Management and Resilience knowledge and expertise in existing and future CMDR courses and non-course training activities;
- Integrate available and develop new Advanced Distribute Learning E&T solutions in CMDR COE training practices;
- Development and utilization of new e-learning modules to wider E&T target audience and CMDR COE Community of Interests.

To measure performance while executing these initiatives, CMDR COE will use several Key Performance indicators:

- Number of developed and conducted new Business Continuity Management and Information Knowledge Management courses and non-courses training solutions;
- Number of new and renovated CMDR courses topics;

- Number of applied business and warfare gaming and simulation tools in CMDR COE training and research activities;
- Number of personnel trained (military and civilian);
- Course completion and certification rates.

Another contemporary strategic goal of the Centre is provision of Focused subject matter expert support to the development and application of NATO policy, doctrine, concept and Experimentation. A practical achievement of this goal requires CMDR COE to enlarge and deepen its custodianship and contribution to NATO's policy, doctrine and concept development. The offering of advanced subject matter expertise and active experts' participation in the Alliance and Nations working groups will support alignment of NATO wide CMDR, BCM and IKM expertise and response practices with evolving Alliance needs.

A future focusing of the next key initiatives will support effective achievement of this strategic goa:

- Continuous development of CMDR COE internal SME in response and levering in accordance of emerging Alliance and Nation's needs;
- Research and conceptual SME support of development new and emerging NATO E&T disciplines and solutions;
- Provide subject matter expert advice in NATO working groups and committees;
- Contribute to the development and refinement of NATO, Nations and Partners doctrines, concepts and standards;
- Integrate NATO and International Standards in provided SME and conducted CMDR COE activities.

The appropriate tool for measuring the advance in this area are the following key performance indicators:

- Number of SME activities for support of NATO policy application;
- Number of doctrinal contributions or recommendations adopted by NATO.
- Number of participations in NATO CD&E working groups;
- Number of CMDR COE participation standardization meetings.

The strategic goal to continuously Apply Modern Methodologies and Tools for Research and Innovation, Lessons Learned and Knowledge Sharing

As certified forefront of development crisis and disaster prevention and response capabilities, CMDR COE will enlarge generation and application of cutting-edge research and innovation research and innovation methodologies and instruments. By conducting specialised studies, development and publish expert and white papers and lessons-learned reports on a robust SME knowledge and expertise sharing platform, the Centre will serve as an advance hub for research, innovation and providing SME within the Alliance.

The execution of specially planed key initiatives will support an advanced achievement of this strategic goal**:**

- Continuous effort to improve the existing and application new research and technologies instruments and products;
- Publishing and dissemination of SME annual research studies, white papers, and lessons-learned reports;
- Maintaining and continuously improving digital the own knowledge sharing platform and host workshops, conferences, and other events to foster innovation, information and expertise sharing in CMDR Community of Interest.

To measure the advance when work with these initiatives to achieve strategic goal, Centre's leadership will use several key performance indicators:

- Number of developed and implemented of new and innovative technologies, as well as research and development tools;
- Number of annually developed and published specialized research studies and publications;
- Frequency and usage metrics of the knowledge-sharing platform and participant satisfaction scores from workshops and conferences.

One of the most important goal when working in the Alliance environment is to Promote CMDR COI Collaboration and Centre's International Recognition and Excellence. Its following will strengthen CMDR COE role of the Alliance and globally recognized expert leader in crisis and disaster prevention and response. The Centre's active engagement in Alliance and international forums will foster collaboration, and pursuing continuous innovation and quality improvement, ensures a relevant, authoritative, and

trusted SME contribution. The continuous increasing of CMDR COE efficiency and effectiveness in the future will depend on the ability to maintain a strong, integrated network of Community of Interests across military, civilian, academic, industry and International Organisations' partners.

The achievement of this strategic goal is planned by execution of the next key initiatives:

- Development and maintaining strategic partnerships and Community of Interest as a network of military, civilian, academic, industry and international organizations partners – UN, EU etc. SME experts and organizations;
- Fostering further collaboration and information exchange by conducting joint NATO/Partners/EU/UN events, cross-institutional collaboration, and facilitating information and knowledge sharing to enhance SME CoI interoperability;
- Engaging participation in the Alliance and International Organization conferences and publications;
- Pursuing a continuous enlarging of collaborative cooperation and innovations, and International SME recognition of CMDR COE.

The application of several key performance indicators will provide the Centre's leadership when monitoring and measuring advances:

- Number of active partnership collaboration and cooperation activities and percentage growth of partner engagement year-over-year;
- Number of joint events, initiatives or collaborations with NATO and International Organizations annually;
- Recognition or citation of CMDR COE in international publications and forums;
- CMDR COE annual evaluation results and quality certification.

An Execution Framework for the Vision

The successful realization of the CMDR COE strategic vision 2030 relies on execution of listed feasible initiatives, clearly assigned staff responsibilities, annual monitoring of measurable outputs and products. The described strategic vision framework will serve as a tool to align CMDR COE planning and PoW execution with accountable

indicators, while ensuring needed progress toward achievement of strategic goals and desired end state. To ensure an effective implementation, CMDR COE structures and personnel will implement this vision into achievable objectives, feasible initiatives and activities of the annual PoW and short-term activities planning. Thereby, the execution of initiatives of the CMDR COE strategic goals will be incorporated annually into PoW to ensure that all initiatives and activities are carefully planned and funded.

The Centre leadership will provide continuous risk management to avoid negative impact and interruptions of CMDR COE operability. The achievement of strategic objectives requires monitoring, anticipating and mitigating risks that could hinder performance. Possible risks might include manifestation of operational and organizational challenges like evolving NATO requirements, delayed and insufficient funding, and technological limitations. Particular attention requires the vulnerability of personnel turnover and the need of specialized Subject Matter Experts, which could affect negatively the ongoing projects and institutional expert succession.

To address these challenges, the Centre's leadership will apply a proactive risk management approach, including early identification and risk assessments, and the implementation of mitigation strategies such as cross-training, documentation of critical knowledge, and prioritization of tasks execution in alignment with available resources. These risk management practices will ensure minimization the effects of the negative influence of unforeseen disruptions and CMDR COE maintaining CMDR COE full capacity to deliver value-added initiatives and activities.

An effective resource allocation will be fundamental to the successful implementation of the CMDR COE next decade vision. The Centre's leadership will apply a comprehensive approach to align available human capital capabilities, material and financial resources with the execution of listed strategic objectives. The personnel allocation to Centre's projects and initiatives will be based on available on hand expertise and presented priorities, while a continuous expert development will ensure maintaining staff competencies, required to meet existing and evolving needs.

Financial resources will be carefully allocated by transparent budget planning, prioritization and control to ensure the efficient delivery of the annual Programmes of Work and long-term organizational business continuity management and sustainability. COE infrastructure, technologies, and materiel assets will be allocated

and upgraded to support the execution of all activities. An optimized resource management will ensure that Centre operational products remain high quality, cost-effective, and adaptable to emerging requirements.

The progress toward application in practice and achievements from the CMDR COE strategic vision and objectives will be monitored and evaluated by internal performance reviews, based on measurement of quality and quantity performance indicators.

Conclusions

Today CMDR COE is widely recognized with its SME expertise, innovations, and contributions. Recently its planned development was tempered by emerging global social and geopolitical challenges, including the COVID-19 Pandemic and the war in Ukraine. The effort of management their influence affected the ability to fully expand Centre's activity and expert potential. An effective implementation of this leadership's vision in the next decade will support a new consolidation of Centre's staff effort to achieve future strategic goals. It will support an advanced contribution to NATO E&T, policy, doctrine, concept development and standardization, sharing knowledge and lessons learned while fostering utilization of innovations and emerging technologies. In the next decade, Centre will actively improve and strengthen its operational capabilities, readiness, contribute to NATO and Partners interoperability, ensuring their readiness to prevent and manage complex and evolving crises. By 2030, CMDR COE will reaffirm and elevate its reputation as a trusted, indispensable NATO accredited capabilities contributor - internationally recognized for excellence, innovation, and meaningful contribution to decade ahead Alliance collective security and resilience.

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3. Global Programming: NATO's Training System, https://www.act.nato.int/activities/natos-training-system-global-programming/;
4. New Updates to Bi-SC Directive 075-007, https://qa.sidecloud.net/news/new-updates-bi-sc-directive-075-007-what-you-need-know;
5. Global Programming: NATO's Training System, https://www.act.nato.int/activities/natos-training-system-global-programming/;
6. A NATO disciplines Department Head (DH) is a NATO-accredited entity, usually a Centre of Excellence (COE) or an international center, formally appointed to coordinate and ensure the Education & Training (E&T) program for a specific discipline across the Alliance.
7. Business Continuity Management, https://coi.cmdrcoe.org/index.php?m_id=14;
8. Information Knowledge Management , https://cmdrcoe.org/menu.php?m_id=76&i_id=488;

COMPREHENSIVE APPROACH TO CRISIS MANAGEMENT: FROM DISASTER RESPONSE TO COGNITIVE WARFARE (BULGARIAN CASE)

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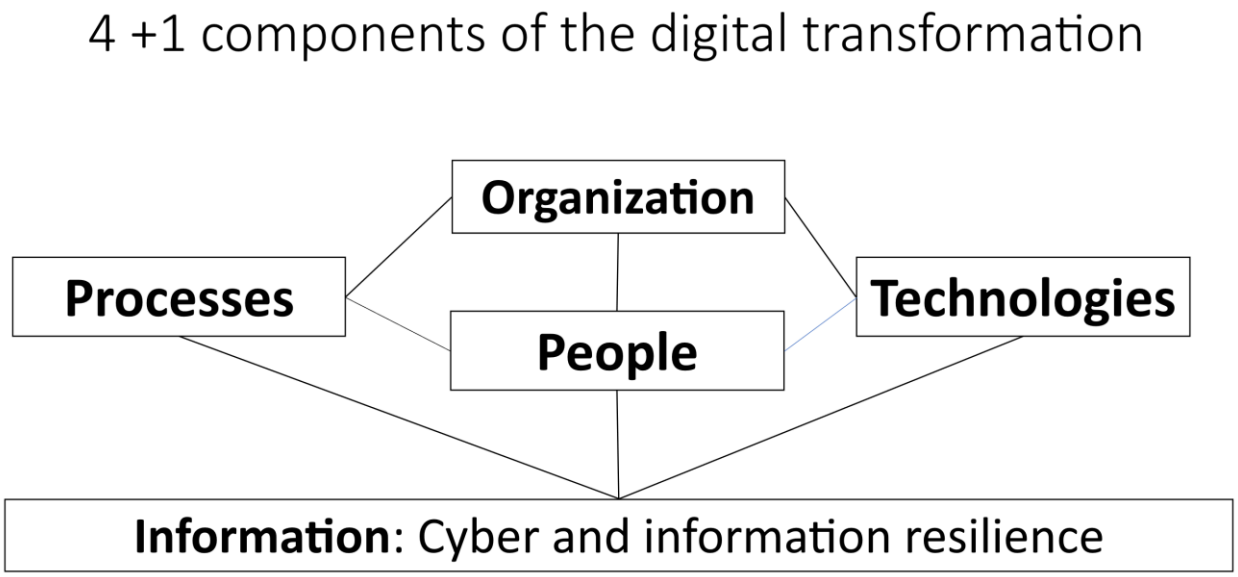
The presented text is a keynote lecture from the 2025 CMDR COE Annual Conference, held in June 2025.

Challenges of digital transformation in crisis management.

Crisis management and disaster recovery (CMDR) is a critical function of our societies as we live in risk environment and recently it undergoes additional transformation – digital transformation. As shown on the figure below there are 5 components under continuous change – processes, organization, technologies, but people as well for new competencies and all this is connected through the virtual dimension of the information environment, requiring cyber and information resilience (P-O-T-P-I pentagram).



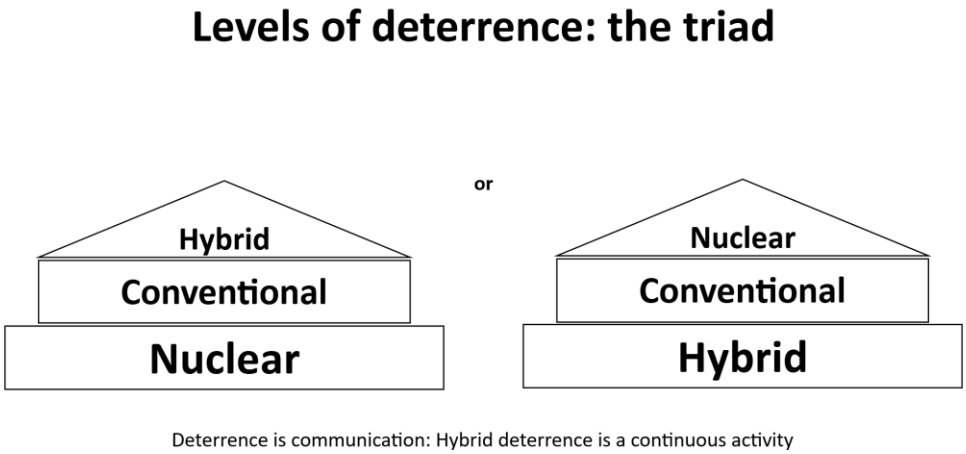
[1] IICT-Bulgarian Academy of Sciences, Chairperson AAB of CoE CMDR

In order to link CMDR with key NATO tasks we need to understand that in addition to obvious link to Crisis Management core task we have to consider CMDR as element of deterrence in a grey zone as well as area for even more intensive security cooperation. Our focus here is on virtual dimension, related to information and in particular cyber and information space with need for improving the resilience in these spaces.

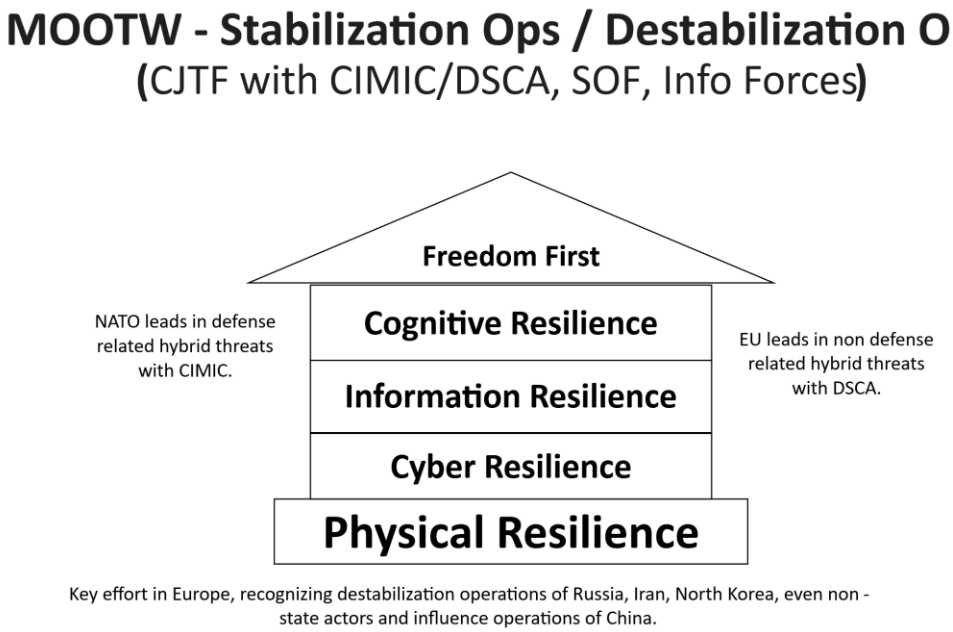
First task here is to define link between deterrence in a grey zone and information/cyber operations / resilience. Second task is by presenting and analytical model for information resilience to define a comprehensive approach with required capabilities development model to implement it. Final, third, task is to consider on the base of an example in Bulgaria a proposal for organization for information / cyber resilience as part of the CMDR endeavor. In conclusion is presented a view on required innovations for CMDR training to be adequate to the challenges of digital transformation and deterrence in a grey zone.

Deterrence and Crisis Management for Resilience.

Strategic stability in our world during the Cold war was based on deterrence in a triad of Nuclear, Conventional and to certain extend Hybrid deterrence as shown on the figure below. After the changes of 1989 and especially after 2006 we realize more and more, that hybrid threats are destabilizing the existing world order and deterrence have to put more attention to hybrid deterrence, recognizing that if it fails we have a risk of conventional and even nuclear conflict.

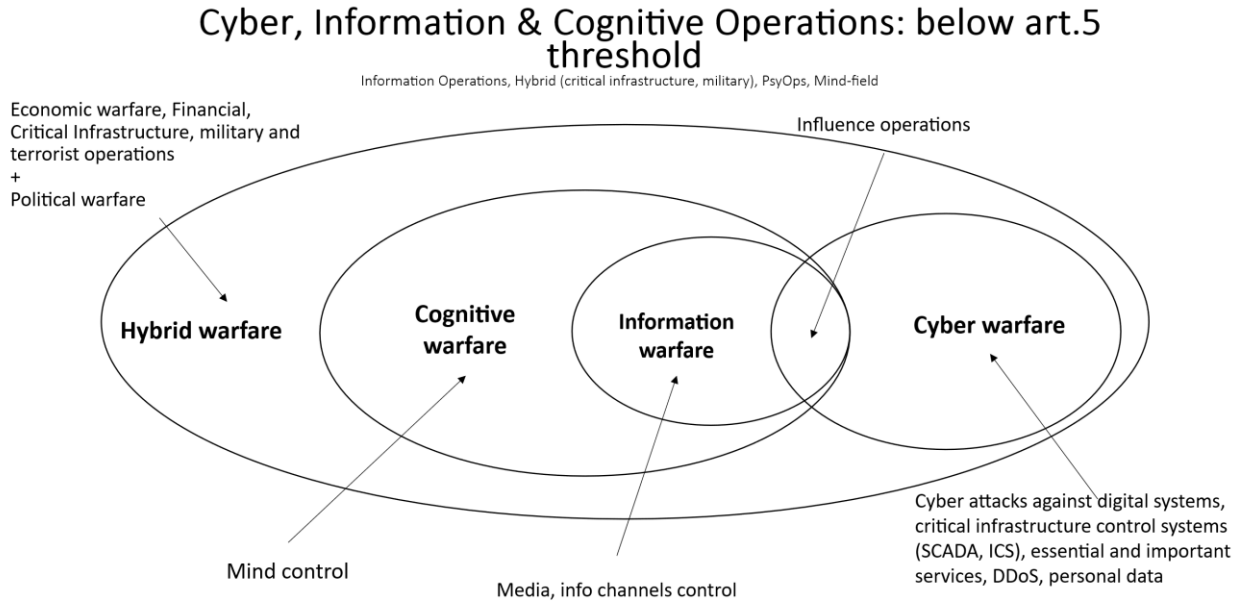


Biggest change is related to the nature of the hybrid deterrence – it is not static as conventional and nuclear ones. It required continuous operations to prove it, to demonstrate even superiority – especially on information and cognitive level in order to guarantee resilience on physical and cyber level as shown on the figure below.



Deterrence in a grey zone is with an ultimate goal to protect our Freedom from foreign influence and pressure. In the past NATO defined Military Operations Other Than war as very large continuum in order to identify requirements to military and to define the concept of Combined Joint Trask Force (CJTF) to perform such operations. On the

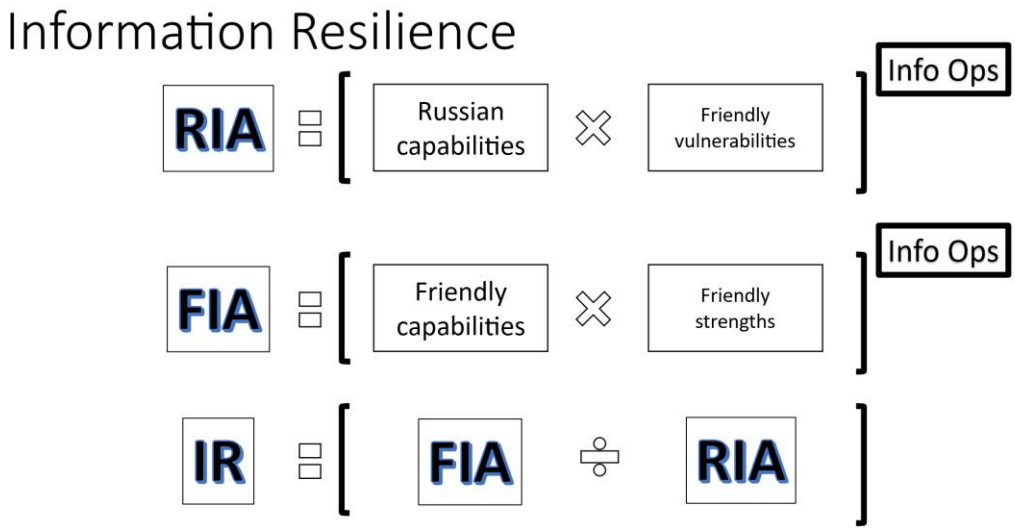
figure below the spectrum of operations other than war with focus on cognitive, information, cyber spaces is presented.



Our focus is on influence operations, where we see intersection among Cognitive, Information & Cyber operations. Specific challenge is to define resilience against influence operations, especially in the context of CMDR.

Analytical model of information (cyber) resilience & Comprehensive Approach to CM.

In order to define information resilience we will consider three key equations from the figure below, using the example of the most serious threat today – Russian information (indirect) activities. First, definition of Russian influence is calculated as multiplication of Russian capabilities and our vulnerabilities they exploit on the degree of number of info operations to exploit indirect actions in the information space. On the contrary, our positive influence is defined as a multiplication of our capabilities and strengths we exploit, on the degree of number of info operations to present these successes.



The key difference – source of real threat, but opportunity as well is that on Russian side we have authoritarian centralized system with concentration of resources and on our side we have highly distributed democratic system with a lot more resources in principle, but dispersed in many institutions, even states (as presented in the figure below). So the main challenge is to define such a comprehensive approach that maximize our assets to achieve maximum Information Resilience (IR) as a ration between friendly and Russian influence (indirect activities 0 FIA, RIA).

Analytics of the friendly influence:

Mil FIA = Own Mil FIA + CIMIC * (Gov FIA + Soc FIA)

Gov FIA = Own Gov FIA + DSCA*Mil FIA + PPP*Soc FIA

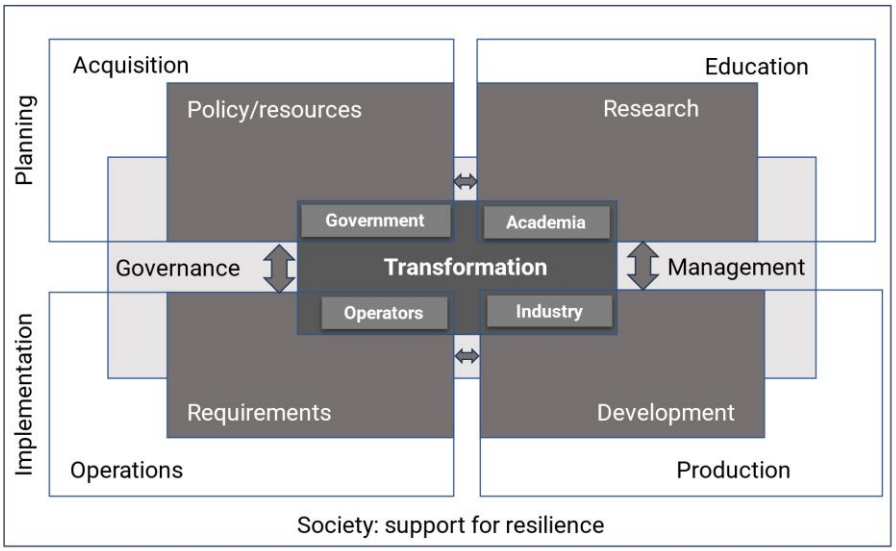
Soc FIA = Academia FIA + Business FIA + Citizens FIA + PPP*Gov FIA

Nat FIA = (Mil FIA + Gov FIA)*Soc FIA

NATO/ EU / Reg FIA = Common FIA * Nat_1 FIA * Nat_2 FIA * … * Nat_n FIA

21

When it comes to capabilities we have other challenge in free democratic societies as shown on the figure below – development of capabilities, especially transformational ones is complex process between Government, Academia, Operators and Industry at on least two cycles on different levels of collaboration. It requires time and resources, more that what centralized authoritarian system needs for development and using of their capabilities.

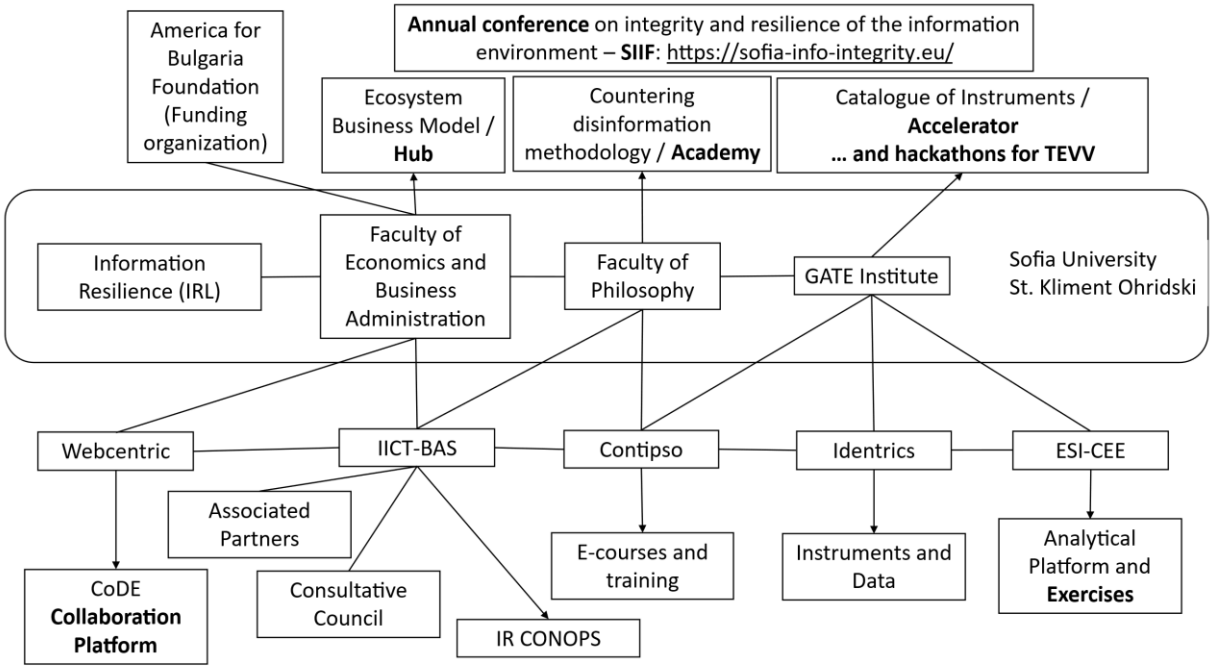


In order to support this complex planning, development and operations cycle is critical to develop robust organization for information resilience encompassing all elements from the figure above.

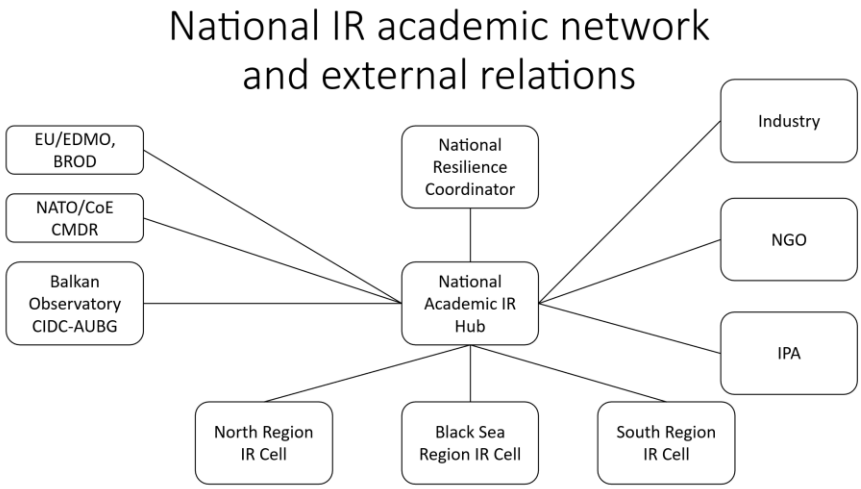
Organization for information (cyber) resilience.

To establish effective and efficient organization for information (cyber) resilience we need arrangements in the Government, Operators, Industry, Academia and international level collaboration in NATO and EU. With two projects (EDIH-Trakia, funded by Digital Europe Program and CoDE, funded by the America for Bulgaria Foundation) the efforts to implement proposed model in Academia and Industry is presented in collaboration with the Government and Operators. On the figure below the organization of the CoDE project (Counter Disinformation Ecosystem) is explained with the role of the Sofia University and Bulgarian Aacademy of Sciences from Academia with several innovative companies to represent industry. The goal is to

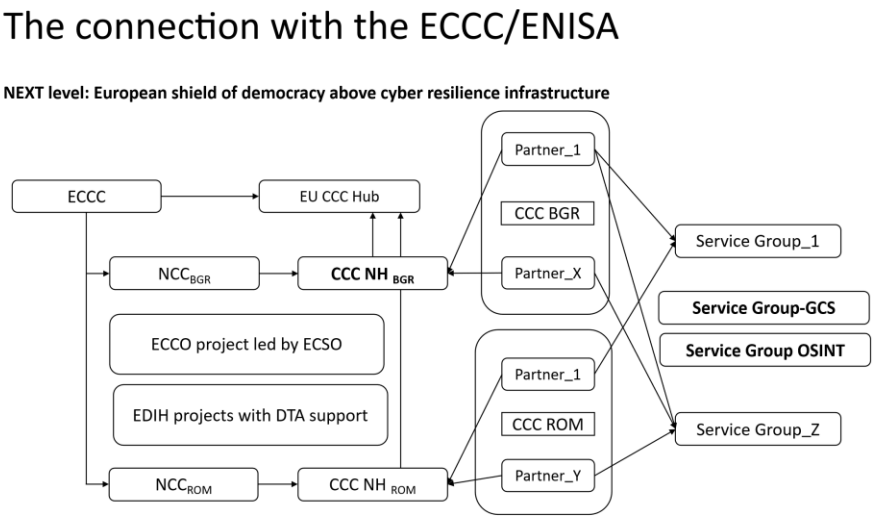
develop Academic Network for Information Resilience (ANIR) to provide instruments, training and environment for research and demonstration of the capabilities required.



In order further to strengthen capabilities and improve FIA on the figure below is presented a model how to integrate the National Academic Hub of ANIR with the Government through the National coordinator of Resilience, with administration at large through the Institute of Public Administration and on the other side to establish international relations with NATO (through CoE CMDR), EU (through EDMO network), regional hub in the American University (Center for Information Democracy and Citizenship – CIDC, AUBG). The Central hub covers the Sofia Region with 3 more elements of the IR network for the Black Sea, South and North regions of Bulgaria. Non-governmental organizations (NGO) are involved in the network as well together with universities and companies in CoDE.

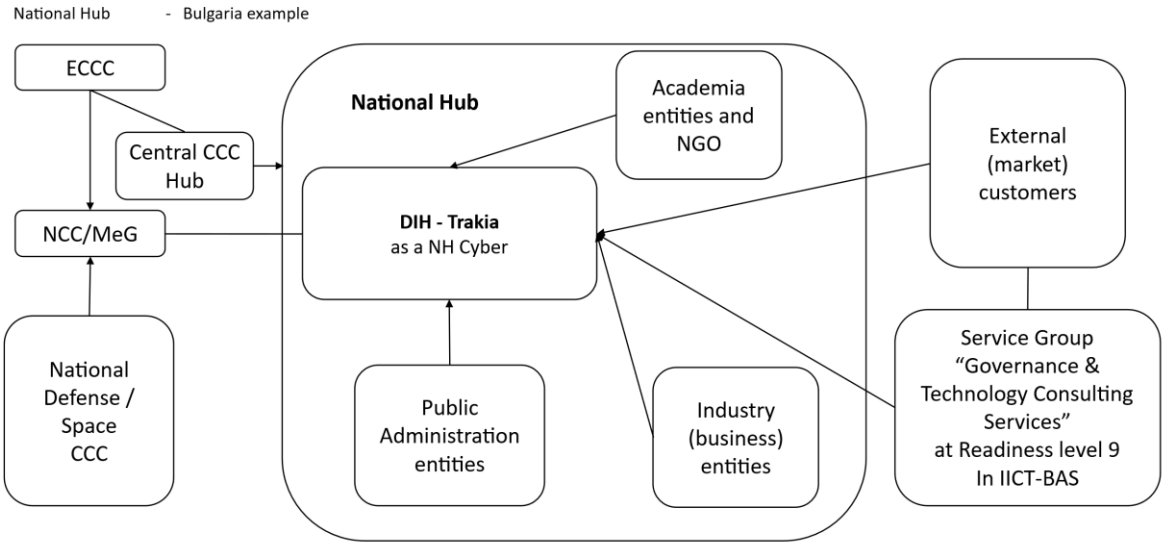


Under the Regulation 887/2021 of the EP there is Cyber Competence Community with European Cyber Community Center in Bucharest in relation to ENISA (EU Cyber Agency) – this community on EU level is an ecosystem for innovation in cyber security / resilience with expectation every member state (MS) to have a national CCC and national hub as shown on the figure below. With current consultations on European shield of democracy is expected to have a consolidation of the information resilience activities and resources, so it is very important to coordinate the developments in the cyber and information domain of the virtual dimension of the world.



In Bulgaria, following the participation in the Horizon 2020 project ECHO – one of the 4 pilot projects to shape and prepare the implementation of Regulation 887/2021 and currently under EDIH-Trakia as a National cyber resilience hub for the academic/SME ecosystem there is an opportunity to strengthen the National CCC as shown on the figure below.

The future – transition of the EDIH Network to CCC_{BGR}



As a next step the two ecosystems have to be fully harmonized if not integrated in one network for Cyber and Information resilience and as part of the overall CM system.

Key innovations in CMDR training needed.

In a complex environment of global strategic competition and digital transformation as well as climate change and other challenges we will see more and more CMDR operations. Information is critical, even not very well defined domain, together with Cyber forming the virtual dimension of the world we live in. Presented above points lead to the following conclusions:

1. Deterrence & Defense, Crisis Management, Security Cooperation – key tasks need to be considered in a continuum with persistent competition in a grey zone to exploit every vulnerability, including disasters and incidents;
2. Information is the key domain for permanent ops for exploiting vulnerabilities and essential aspect of CMDR;
3. Information resilience in CMDR requires a real comprehensive approach;
4. The Comprehensive approach requires new type of capabilities and IR organization;

5. Information resilience is a next level of cyber resilience towards cognitive resilience – cyber domain is a base to start with;
6. Academic network for information resilience is a base for the national effort, but not enough by itself – national/regional administration role is essential;
7. NATO and EU frameworks and cooperation between two alliances are crucial for information resilience and our main comparative advantage towards authoritarian states / organizations.

There is a specific aspect of change to be addressed through training, so to cope with the new challenges of digital transformation in CMDR we need to innovate in training at least in three directions:

- Cognitive warfare and use of AI understanding in decision making for a new level of information resilience, reflected in IKM arrangements;
- More case studies and realistic simulation, CAX to prepare for a comprehensive approach;
- New model for BCM, based on resilience and continuous active protection of our P-O-T-P-I from external threats.

As CoE CMDR is a department head both for BCM and IKM, it is of critical importance to position the center through at least 3 courses as a transformative instrument for NATO and Nations (and EU, even UN):

- IKM and cognitive warfare in the era of AI to support information resilience / superiority in CMDR decision making;
- BCM for resilience in time of crisis;
- Using case studies and hackathons / simulation games / CAX to enhance individual training with teamwork competencies for practice.

FROM READINESS TO RESILIENCE: MEDICAL PROFESSIONALS' PREPAREDNESS FOR CRISIS AND DISASTER MEDICAL SUPPORT

Elena VALKANOVA, Rumyana ETOVA[1]

Abstract: Effective disaster response in healthcare settings is increasingly critical in today's evolving security environment, where crises—ranging from natural disasters to chemical, biological, radiological, and nuclear (CBRN) incidents—demand rapid, coordinated, and sustained medical support. In this context, ensuring the ability of health systems to maintain core functions during and after emergencies requires a dual focus on individual and collective preparedness. The objective of this study is to assess the medical professionals' preparedness for proper crisis and disaster medical support. By the means of descriptive and comparative methods the available literature resources are analyzed to assess the challenges during the medical support for crises and disasters. A cross-sectional study was conducted among medical professionals from Plovdiv metropolitan area (Greater Plovdiv) to evaluate their readiness for disaster medical support. The findings underscore the importance of designing training programs that address both the individual and collective dimensions of disaster preparedness. Harmonizing personal competency with interprofessional collaboration can healthcare systems ensure a resilient and effective disaster medical response.

Assessing hemodynamic effectiveness

Effective disaster response in healthcare settings has become increasingly critical in today's complex and evolving global security environment. From large-scale natural disasters like earthquakes, floods, and hurricanes to high-impact technological and man-made emergencies—including chemical, biological, radiological, and nuclear (CBRN) incidents—the range of threats facing health systems is broadening and

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intensifying. [1, 2] These crises often occur without warning, disrupting essential services and overwhelming existing infrastructure.

In this context, healthcare systems are expected to deliver effective, coordinated, and sustained responses under extreme conditions pre-disaster professional standards and best practices. This can only be achieved through establishing disaster resilience and maintaining optimal readiness and capacity. [3]

The healthcare system can be conceptualized as comprising static components—such as infrastructure, equipment, and organizational structures—and operational components, including personnel, protocols, and dynamic service delivery mechanisms. Consequently, the preparedness of medical professionals—spanning physicians, nurses, emergency responders, and mental health specialists—emerges as a pivotal prerequisite for resilience. [4]

Medical professionals' preparedness must be developed on both individual and collective levels. A medical professional should possess the knowledge and skills to act, but also the to understand team dynamics, command structures, and risk assessment. Otherwise, their action can inadvertently jeopardize the safety and efficiency of a disaster response. [5]

The objective of this study is to assess the medical professionals' preparedness for proper crisis and disaster medical support. Using descriptive and comparative methods the available literature resources are analyzed to assess the challenges during the medical support for crises and disasters. A cross-sectional study was conducted from 1.07.2020 to 31.12.2020 using online anonymous questionnaire. Medical professionals from the region of Plovdiv were surveyed for evaluation of their readiness for disaster medical support.

Analysis, processing, and systematization of initial data as quantitative and qualitative variables were performed on the statistics software package IBM SPSS Statistics v.21. For all tests, the level of significance was set at $\alpha=0.05$. The grouping, coding, and analysis of open and semi - open questions was achieved with Microsoft Office Excel 2010.

Descriptive analysis was used to describe the structure of analyzed variables. Analysis of variance was used for quantitative variables and frequency distributions for qualitative data. Testing of statistical hypothesis was made with a Two Samples T-

Test and Chi-squared analysis ($\chi 2$). Correlation analysis was used to measure the strength of the linear relationship between variables. Graphical analysis is used for graphical depiction of data.

In the context of healthcare, readiness refers to the capacity of medical professionals and institutions to respond effectively to emergencies and disasters through pre-established knowledge, training, protocols, and logistical arrangements. It encompasses planning for disaster preparedness, role-specific education, infrastructure assessment, and procedural drills aimed at ensuring that health systems can deliver essential services during crises. Readiness is often operationalized through measurable elements such as personnel competencies, equipment availability, and communication protocols. However, readiness without frequent testing or real-world exposure can result in skill decay and procedural failure during actual emergencies. [6, 7, 8, 9, 10]

Resilience, on the other hand, extends beyond initial preparedness to encompass the ability to adapt, absorb shocks, and maintain core functions under prolonged or unexpected stress. It involves psychological endurance, organizational flexibility, leadership responsiveness, and post-crisis recovery capability. Resilience is not a static attribute but a dynamic quality that evolves through experience and learning. Readiness lays the foundation for resilience by equipping healthcare systems with the essential knowledge, skills, and protocols needed to respond effectively, adapt under pressure, and recover from crisis situations. [11, 12, 13, 14, 15]

While many nations—including Bulgaria—have formally integrated disaster medicine training into medical students’ curricula, evidence suggests that initial education alone is insufficient.[16] Without regular practice, real-world exposure, and institutional reinforcement, critical competencies can fade. Moreover, disasters demand more than technical proficiency—they require effective communication, psychological stability, and a clear understanding of interagency roles and responsibilities and coordination. [17]

In the recent years, the complicated security environment mandates medical professionals' preparedness for crisis and disaster response to be critically examined. Our team performed a survey among a total of 160 medical professionals, with a majority being women (64.4%, n = 103). The average age was 49.04 ± 0.81 years,

ranging from 22 to 67 years. Most respondents were within the 41–60 age group. Participants included doctors (63.1%), nursing specialists (8.1%), and other pre-physicians (28.8%). Workplace distribution was nearly even between pre-hospital care (45%) and Centres for Emergency Medical Aid (CEMA) (44.4%), with a smaller group in hospital care (10.6%). (Table 1)

Table.1 Distribution according to occupation and workplace

		Number	Percent %
Workplace	Hospital care	17	10,6
	Pre-hospital care	72	45,0
	CEMA	71	44,4
Occupation	Doctors	101	63,1
	Nursing and Midwifery specialists	13	8,1
	Specialists from Medical College	46	28,8

While all Bulgarian health professionals are required to undergo disaster medicine training, only 57.9% (n = 92) reported attending additional disaster or emergency aid courses. CEMA staff had the highest participation rate (82.9%), while those in pre-hospital care had the lowest (31.9%) ($p = 0.001$, $\chi^2 = 38.10$).

Disaster response drills and simulations are a key component of disaster medical support (DMS) preparedness. 83.2% recognized their importance but only 27.5% (n = 44) participated in such. Given the proven benefits, this percentage is considered too low. A lack of participation in disaster drills among medical professionals significantly undermines their ability to respond efficiently during actual crises, leading to delays in decision-making, poor coordination, and increased risk to both casualties and healthcare providers. [18] Respondents generally rated their disaster medicine knowledge as average, with significantly lower self-assessments reported among hospital and pre-hospital staff ($p = 0.001$), suggesting variability in confidence across different healthcare settings. (Fig. 1)

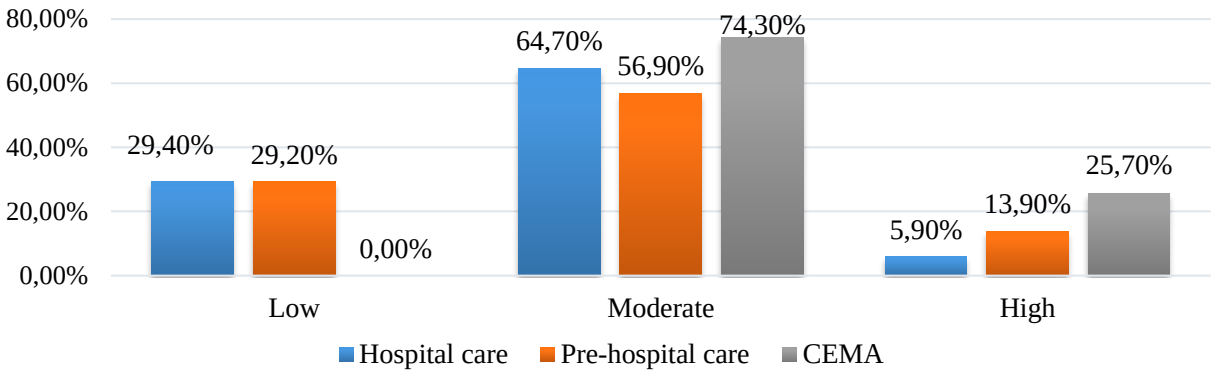

Fig.1 Distribution of self-assessment according to occupation

Approximately half of the respondents (50.3%) had real-world experience in providing medical care during mass casualty events. However, only 35% reported applying disaster medicine knowledge in practice. CEMA employees showed the highest levels of both experience and practical application (p = 0.001).

The finding that only 35% of healthcare professionals reported applying their disaster medicine knowledge in practice, while 50.3% participated in DMS, underscores a significant gap. This discrepancy may reflect the unpredictable and varied nature of disasters, which limits opportunities to use specialized knowledge in consistent ways. Standard procedures, often memorized during training, may not align with the fluid and context-specific demands of actual disaster situations, making them difficult to apply under pressure. Additionally, some professionals who have participated in disaster relief may have relied more on general clinical skills than on formal disaster medicine protocols, suggesting a disconnect between theoretical preparation and operational execution. This gap may also stem from psychological barriers, limited exposure to simulated scenarios, or insufficient reinforcement of knowledge through continued education and practice. The data suggests that while healthcare workers may receive initial instruction in disaster medicine, this knowledge is not always effectively translated into action when needed. [19, 20]

The majority of the surveyed health professionals (86.8%, n = 138) know who to report to in an accident. The high percentage of positive answers to this question implies a good knowledge of the organizational hierarchy. The data indicates that while a majority of respondents (66.7%) are familiar with communication protocols during disasters, a slightly lower proportion (59.1%) feel confident using communication equipment. This suggests that although general awareness of communication

procedures is relatively high, there may be a technical skills gap when it comes to operating the tools necessary for effective information exchange during emergencies. This disparity highlights the need for more practical, equipment-focused training to ensure reliable communication in crisis situations.

To assess medical specialists' familiarity with fundamental disaster medicine concepts, the survey included practical questions. Notably, only 33.1% of respondents understood the importance of sorting casualties, a figure that is concerningly low given the critical role triage plays in effective emergency response. (Table 2)

Table.2 What is the objective of disaster triage?

Answers	Number	Percent (%)
To identify the most severely injured and help them first	78	48,8
To help as many people as possible	53	33,1
To redirect resources from slightly to severely injured	9	5,6
To speed up casualties’	18	11,3
Triage is not done, it discriminates	2	1,2
Total	160	100,0

Triage relies on assessing hemodynamic effectiveness through indirect indicators. Only 16.2% (n = 26) of respondents were aware that capillary refill time reflects the state of microcirculation. No nursing professional gave a correct answer to this question ($p = 0.001$ $\chi 2 = 40.19$).

To study the reaction of medical workers to a chemical accident, we asked them what they would do if they observed a chemical accident with casualties. 46.9% (n = 75) consider the risk for their own safety and are waiting for permission to intervene. 43.1% (n = 69) of the respondents do not comply with the leading role of Fire Safety and Civil Protection in such situations. The nurses give the highest percentage of correct answers (66.7%), while doctors give the lowest (37.6%) ($P = 0.031$ $\chi 2 = 10.62$). The prevailing opinion among doctors is that they should intervene immediately, helping the more severely injured. This shows a concerning disconnect between individual initiative and collective protocol, especially in high-risk incidents: many medical professionals, particularly physicians, prioritized immediate action over safety and coordination.

Conclusion.

Disasters are fairly rare events. For many of the non-emergency medical professionals it could be an unprecedented experience. Despite that they must have specific knowledge and skills for provision of safe and adequate medical support in crisis and disaster situations. as our survey shows this is still not achieved – only the employees of CEMA show satisfactory level of disaster medical knowledge and skills, but even among them there are significant gaps.

All medical professionals should have base level of disaster medicine knowledge and skills for assuring their own and their patients' safety. This required level of preparation and training for achieving proficiency is difficult to achieve for the entire medical staff with the available and dedicated training programmes. As temporary measure for mitigating this unacceptable level of preparedness we propose every healthcare institution to appoint medical professionals who will undergo in-depth disaster medical training. They are to form a first level medical surge capacity healthcare system will rely on in case of disasters. More research is needed to prove the feasibility of this approach, to establish criteria for appointing these professionals and design the specific training programmes. We theorize that such training could be useful for larger scope of disaster relief providers, not just medical, considering that assuring medical teams' safety poses some limitations to their involvement.

To address these issues, training programs must move beyond theoretical instruction. Emphasis should be placed on practical, scenario-based learning, regular simulation drills, and interprofessional training that reflects real-world complexity. Strengthening these areas will bridge the gap between awareness and action, enhancing both the immediate readiness and long-term resilience of medical teams facing crises.

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THE SIGNIFICANCE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN MANAGEMENT OF NEW EMERGING CLIMATE-RELATED EPIDEMICS

Mariya GEORGIEVA, Rostislav KOSTADINOV [1]

Abstract: A lot of articles have been published recently revealing the occurrence of a novel for the region's epidemics related to climate change. Many regional health services have reported outbreaks of endemic for other geographical regions infectious diseases. The COVID-19 pandemic has undoubtedly proven the significant role of information and communication technologies (ICT) in medical support to the population affected by the new strain of the corona virus. The objective of this study is to analyze the significance of ICT implementation into pre-hospital care in case of epidemics due to newly emerged in the region pathogens due to climate change. By means of a descriptive method, the benefit of ICT use in prevention and mitigation on epidemic outbreaks is presented. The increased role of physician assistants and general practitioners in imposing epidemic eradication measures is also discussed. Based on performed research the requirements for a wider implementation of the available ICT- telemedicine, IOT, different medical wearables and virtual coaching have been highlighted. The significant role of physician assistants and general practitioners in ICT- use in preventing or eradicating biological threats has been proven along with the need for increased digital literacy among pre-hospital medical specialists.

Introduction:

Many articles have been published recently revealing the occurrence of a novel for the region's epidemics related to climate change. According to them, climate change creates conditions that favor the emergence and spread of infectious diseases. Changes in temperature and precipitation expand the geographical range and

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breeding seasons of disease vectors. Warmer temperatures speed up the development and replication of pathogens within vectors. Climate-related stressors can weaken the immune systems of both humans and animals, making them more susceptible to infections. Climate change can lead to displacement of populations and changes in animal migration patterns, increasing contact between humans and potential disease carriers. Increasing extreme weather events such as floods, droughts, and heat waves can directly impact health and create conditions conducive to disease outbreaks. Rising temperatures, altered precipitation patterns, and more frequent extreme weather events create new habitats for disease vectors, extend their breeding seasons, and can influence the survival and transmission rates of pathogens. (5, 17, 19, 23, 27, 29, 30, 31, 32, 33, 34)

Due to climate change, there is a potential increase in epidemics in some regions and the appearance of new epidemics in the geographic region. It is observed expansion of Vector-Borne Diseases, Spread of Tick-Borne Diseases, Waterborne Diseases, and Foodborne Diseases. Higher temperatures can lead to increasing the risk of epidemics which vector is the tiger mosquitoes such as dengue and West Nile virus. The tiger mosquito is spreading further north due to rising temperatures. Their outbreaks in central, eastern, and southern Europe could expand the risk to previously unaffected areas in northern and western Europe. Outbreaks of dengue have already been reported in Italy, Croatia, France, and Spain. The Spread of Tick-Borne Diseases is also expected. Ticks that carry Lyme disease and tick-borne encephalitis are expanding their range to higher altitudes and more northerly latitudes due to climate change. Mild winters and warm, humid summers are linked to a higher incidence of these diseases. Extreme precipitation events, such as floods, can contaminate water supplies, leading to outbreaks of waterborne diseases. Warmer sea waters, particularly in the Baltic region, are becoming more suitable for dangerous Vibrio bacteria, which can cause severe infections. Longer summer seasons associated with climate change can contribute to an increase in foodborne illnesses. Due to rising temperatures, a potentially deadly fungus, Aspergillus, could spread to more northerly parts of Europe, potentially affecting millions. Higher temperatures affect the spreading of sandflies and because of this, the infectious disease Leishmaniasis which is transmitted by sandflies, is also spreading northward and to higher altitudes in Europe. (4, 9, 19, 20, 22, 23, 26, 27, 29, 30, 31, 32, 33, 34)

Recently, reports from regional health services about outbreaks of infectious diseases that are typically endemic to other geographical regions. The European Centre for Disease Prevention and Control (ECDC) has noted a significant increase in locally acquired dengue cases in the EU/EEA in recent years. This phenomenon is increasingly observed and is linked to several factors, most notably climate change and increased global connectivity. It's crucial for public health authorities to monitor these trends, improve surveillance systems, and implement adaptation strategies to protect the population from these emerging health threats. The reports of endemic infectious diseases appearing in new geographical regions are a serious concern with significant implications for public health. Climate change and globalization are key drivers of this trend, requiring enhanced surveillance, research, and preparedness at regional, national, and international levels. The emergence of non-endemic infectious diseases poses significant challenges for regional health services. Healthcare professionals in these regions may be less familiar with the symptoms, diagnosis, and treatment of these diseases. Existing surveillance systems may not be designed to detect these new threats, and diagnostic capabilities may need to be expanded. Public health infrastructure may need to be strengthened to implement effective prevention and control measures, such as vector control and public awareness campaigns. Managing these new outbreaks can strain local healthcare resources and require resource reallocation. (13, 24)

While a direct causal link between climate change and the emergence of COVID-19 is still under investigation, there are several ways in which climate change and environmental factors are believed to be connected to pandemic and infectious diseases. Climate change can alter ecosystems and wildlife habitats, potentially increasing the interaction between humans and animals that carry novel viruses. As habitats change, animals may migrate or be forced into closer proximity with human populations, increasing the risk of zoonotic spillover events – the transmission of viruses from animals to humans. The origin of SARS-CoV-2, the virus that causes COVID-19, is believed to be zoonotic, originating in bats and possibly transmitted through an intermediate animal host at a market in Wuhan, China. While the exact role of climate change in this specific event is not confirmed, environmental changes that stress wildlife and alter their distribution can increase the likelihood of such spillovers. Changes in temperature and humidity can affect the survival and transmission of

viruses. Some studies suggest that lower temperatures and drier conditions might favor the spread of respiratory viruses like SARS-CoV-2. Climate change can exacerbate air pollution through increased wildfires and altered atmospheric conditions. Exposure to air pollutants can weaken the respiratory system and immune function, potentially increasing susceptibility to COVID-19 and the severity of symptoms. Studies have indicated associations between higher levels of air pollution and increased COVID-19 cases and mortality. (2, 5, 23)

The COVID-19 pandemic has undoubtedly proven the significant role of information and communication technologies (ICT) in medical support to the population affected by the new strain of the corona virus. In a time of lockdowns, social distancing, and overwhelmed healthcare systems, ICT became an indispensable tool for maintaining access to healthcare, disseminating vital information, and coordinating response. (6, 14, 15, 21, 36)

The objective of this study is to analyze the significance of ICT implementation into pre-hospital care in case of epidemics due to newly emerged in the region pathogens due to climate change.

By means of a descriptive method, the benefit of ICT use in prevention and mitigation on epidemic outbreaks is presented. The increased role of physician assistants and general practitioners in imposing epidemic eradication measures is also discussed.

Results:

Many authors highlighted in their publications the significant role of information and communication technologies (ICT) in medical support to the population affected by COVID-19. Across the globe, the rapid adoption and innovative use of ICT during the COVID-19 pandemic demonstrated its transformative potential in healthcare delivery and public health management during crises. (1, 3, 6, 7, 14, 21, 28, 36)

ICT systems were essential for collecting, analyzing, and sharing data related to the pandemic, including case numbers, hospitalizations, deaths, testing results, and vaccination rates. This data was crucial for identifying hotspots and bottleneck, providing evidence for implementing targeted interventions and restrictions, optimizing the distribution of medical supplies, personnel, and hospital beds, as well as facilitating the sharing of data for scientific studies aimed at understanding the virus and developing treatments and vaccines. It underscored the need for continued investment

in digital health infrastructure and the development of robust and accessible ICT health related solutions to enhance resilience in the face of future health emergencies. (7, 12, 28, 36)

The potential of ICT capacities for enhancement of medical support are still under research. The COVID-19 pandemic has demonstrated several ICT to enhance medical support and medical management:

1. The role and significance of ICT in controlling the spread and mitigation of biological area of damage

During an active epidemic, ICT becomes indispensable for controlling its spread and minimizing its impact. It is used for rapid case identification and contact tracing. ICT tools, such as mobile apps and digital questionnaires, can streamline the process of case identification and contact tracing. Real-time data entry and analysis allow for the swift identification of individuals who may have been exposed, enabling timely testing, isolation, and quarantine measures. ICT enables PAs and GPs to provide remote consultations, monitor patients with mild symptoms at home, and offer guidance on self-isolation and care. This reduces the burden on hospitals, minimizes the risk of nosocomial infections, and ensures continuity of care for a larger population. ICT platforms can provide real-time information on the availability of hospital beds, medical supplies, and personnel, enabling efficient allocation of resources to areas with the greatest need. This is crucial for optimizing the healthcare response during an epidemic surge. Real-time epidemiological data, visualized through ICT dashboards, provides public health officials and healthcare leaders with the information needed to make informed decisions regarding containment measures, resource allocation, and communication strategies. ICT facilitates seamless communication and coordination between different levels of the healthcare system, public health agencies, and other relevant stakeholders, ensuring a unified and effective response. (1, 10, 18, 25, 28, 35)

The role and significance of ICT in prevention of development of biological area of damage

ICT offers a powerful toolkit for proactive measures aimed at preventing outbreaks before they escalate. ICT enables the development of sophisticated surveillance systems capable of real-time data collection from various sources, including electronic health records (EHRs), laboratory information systems, and even social media

monitoring for early signals of unusual health events. This allows for the early detection of potential outbreaks, even at a localized level. By analyzing historical epidemiological data, environmental factors (potentially linked to climate change), and population movement patterns through ICT platforms, predictive models can identify areas at higher risk of pathogen emergence or transmission. This allows for targeted preventive interventions, such as focused vaccination campaigns or enhanced hygiene education in vulnerable communities. ICT facilitates the rapid and widespread dissemination of accurate information regarding disease prevention, hygiene practices, and vaccination schedules through websites, mobile applications, and social media. Targeted campaigns can be launched based on risk assessments, empowering the public to take proactive steps to protect themselves and their communities. ICT-driven early warning systems can integrate data from various sources to trigger alerts upon the detection of unusual disease patterns or environmental conditions conducive to pathogen spread, allowing for timely investigation and containment measures. (1, 3, 10, 14, 18, 25, 28, 35)

A descriptive analysis reveals the significant benefits of integrating Information and Communication Technologies (ICT) into strategies for preventing and mitigating epidemic outbreaks, particularly when coupled with an enhanced role for physician assistants (PAs) and general practitioners (GPs) in implementing eradication measures. PAs and GPs, often the first point of contact for individuals in the community, play a vital role in epidemic prevention and mitigation. ICT-integrated EHR systems can prompt PAs and GPs to be vigilant for specific symptom clusters or unusual increases in patient visits, contributing to early outbreak detection at the community level. ICT tools can provide PAs and GPs with readily accessible guidelines, protocols, and patient education materials related to epidemic control. Mobile apps can facilitate contact tracing and the monitoring of quarantined individuals within their practice. ICT enables PAs and GPs to extend their reach through telemedicine, allowing them to provide consultations and follow-up care to a larger number of individuals, including those in remote areas or under quarantine. ICT-enabled reporting systems allow PAs and GPs to easily contribute anonymized patient data to central public health databases, strengthening the overall surveillance effort and informing public health interventions. ICT platforms can be utilized by PAs and GPs to disseminate tailored health information and address community-specific

concerns regarding the epidemic, fostering trust and promoting adherence to public health recommendations. (3, 8)

Based on the experienced gain into pandemic outbreak the strategic implementation of ICT is paramount for enhancing our ability to prevent and mitigate epidemic outbreaks. By providing tools for early detection, efficient communication, data-driven decision-making, and optimized resource allocation, ICT strengthens the overall public health response. Furthermore, empowering physician assistants and general practitioners with ICT tools significantly amplifies their capacity to implement crucial epidemic eradication measures at the community level, forming a critical link in the chain of defense against emerging infectious diseases. Investing in robust and integrated ICT infrastructure within the healthcare system is therefore a vital step towards building resilience against future epidemic threats.

Conclusion

The significant role of physician assistants and general practitioners in ICT- use in preventing or eradicating biological threats has been proven along with the need for increased digital literacy among pre-hospital medical specialists. Facing potential epidemics due to newly emerged pathogens linked to climate change, investing in robust and integrated ICT solutions for pre-hospital care is not just beneficial but essential. It will empower first responders with the information, tools, and connectivity needed to effectively manage the initial stages of an outbreak, protect themselves and the public, and contribute significantly to the overall public health response.

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CONTEMPORARY BIOLOGICAL HAZARDS CHALLENGING HOSPITAL CRISIS PREPAREDNESS

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Abstract: In recent decades, numerous biological hazards—both emerging and re-emerging—have triggered hospital crises, severely testing the resilience and adaptability of healthcare systems. The COVID-19 pandemic, in particular, exposed critical weaknesses in hospital surge capacity and preparedness on a global scale. During the initial months of the pandemic, the readiness of hospital managerial staff to plan and adapt existing resources and capabilities was notably inadequate, often falling short of public expectations and operational demands. The objective of this study is to analyze the key shortcomings observed in medical crisis response during epidemics and pandemics. Using descriptive and comparative methods, the study reviews existing literature and draws on the authors' practical experience to identify the most frequent challenges hospitals face during biologically driven emergencies. Tthe study recommends targeted improvements in the education and training of hospital planners and medical management personnel. Strengthening these competencies is essential to enhance preparedness for future biological threats.

Introduction

In recent decades, numerous biological hazards—both newly emerging and re-emerging—have triggered a series of public health crises, severely testing the resilience and adaptability of healthcare systems. The spread of highly infectious diseases, often occurring with limited prior knowledge and under rapidly escalating circumstances, challenges the capacity for adequate response and management at both national and global levels.[1]

In this context, hospitals play a critical role as the primary infrastructure for responding to biological threats. They are not only responsible for admitting and treating affected patients but also bear the burden of maintaining routine and life-sustaining services at

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pre-crisis levels in accordance with best practices—significantly increasing the pressure placed upon them. The COVID-19 pandemic has most clearly underscored these challenges, exposing critical weaknesses in the readiness and adaptive capacity of hospital leadership.[2]

Even in the early stages of the pandemic, significant deficits were observed in the ability of hospital management to plan appropriately, mobilize resources, and reorganize hospital operations in response to evolving circumstances. In many cases, actions lagged behind public expectations and the operational demands of the situation. This highlights the urgent need to develop and implement more resilient, flexible, and integrated strategies for crisis planning and management—strategies that ensure effectiveness, coordination, and continuity of hospital services in the face of future biological emergencies.[3]

The aim of this study is to analyze key shortcomings observed in medical support systems during crises caused by epidemics and pandemics. Using descriptive and comparative methods, the study reviews existing literature and draws upon the authors' practical experience to identify the most common challenges faced by hospitals during emergencies triggered by biological hazards or agents.

A review of existing literature was conducted to identify the most frequent challenges hospitals encounter during emergencies caused by biological threats or agents. Descriptive and comparative methods were applied to juxtapose data from the available literature with the practical experience of the authors, who were directly involved in medical support activities during the COVID-19 pandemic.

As a result of in-depth analyses, critical shortcomings in the preparedness of healthcare facilities were identified.

Organizational Preparedness

Action Plans

Although all hospitals have developed crisis response plans based on national health protocols, gaps remain in their practical implementation. The hospital disaster action plan is a key tool for strengthening institutional preparedness, ensuring coordinated actions, efficient use of resources, and continuity of critical services during emergencies.

A review of the literature indicates that the most common deficiencies in hospital disaster plans include the lack of regular updates, inadequate staff training, and limited integration of realistic biological threat scenarios. [4] For instance, a national study assessing in-hospital preparedness for mass casualty incidents found that only 59% of hospitals had revised their all-hazard contingency plans within the last 12 months, and 44% conducted joint disaster exercises, highlighting gaps in regular plan updates and coordination. [5]

Additionally, many hospital disaster plans lack specific mechanisms for managing resource shortages. A systematic review analyzing 105 studies identified 82 factors affecting hospitals' functional preparedness, with 37 directly related to resource supply issues and 12 concerning existing guidelines and preparedness plans. These deficiencies can lead to delays in response and compromised safety for both patients and healthcare personnel.[6]

Previous research shows that most of the surveyed hospital staff in Plovdiv region demonstrated more than half of the respondents (56.6%) were not familiar with the hospital disaster notification system. Less than half of the medical specialists (42.7%, n=126) were informed about PPE that the hospital possesses. 88.5% of the medical staff did not know how many of the hospital beds can be used for disaster medical support. This lack of familiarity may have contributed to the operational challenges observed during actual crisis [7]

Our experience confirms these findings. At the onset of the COVID-19 pandemic, a shortage of several critical resources became evident. The planned and reserved supplies for staff protection, disinfectants, medications, and equipment proved insufficient, and the existing plans lacked mechanisms for the rapid and efficient procurement of the required quantities. In addition to the demonstrated inadequacy in ensuring the necessary material resources for an effective response and resources‘ sustainability, significant gaps in planning of human resources have been noted. The shortcomings were recorded in medical specialists provision for real medical support operations and for teams enhancement and exhausted and/or infected medics replacement.

The plans did not include effective mechanisms for expanding the capacity of infectious disease units or for restructuring departments and entire hospitals to accommodate infectious patients. The ability to secure qualified medical personnel was also limited. Furthermore, the planned financial support for carrying out medical

response activities proved insufficient, as it could not cover the increased operational costs and the reduced revenue of healthcare facilities during the pandemic.[8]

Crises Headquarters establishment, operability and efficiency

Crisis Management Headquarters

At the beginning of the epidemic, there was no operational crisis management headquarters in place to coordinate activities. The crisis response teams, which were supposed to be established at national, regional, and institutional levels to manage medical support, failed to ensure adequate communication during the early stages of the COVID-19 outbreak—a failure caused by a combination of factors. There was no clear vision regarding the roles and responsibilities of local response teams. Coordination between general practitioners and hospital staff was lacking, particularly in defining who should conduct the initial triage and what type of triage should be performed. There were also no designated isolation areas for suspected cases, nor were there pre-hospital triage points capable of separating “regular” patients from those suspected of COVID-19 infection. As a result, emergency departments and outpatient diagnostic-consultation units were tasked with triage duties without having designated facilities for that purpose.[9]

Communication

At the beginning of the pandemic, there was a lack of internal coordination and communication between regional and national health institutions. A scoping review of 33 studies found that 11 reported inadequate communication and coordination among healthcare providers as significant barriers during emergencies and disasters. [10]

Insufficient and unclear communication between hospital departments, among different hospitals, and between hospitals and Regional Health Inspectorates (RHIs) led to confusion in the processes of patient admission, treatment, and evacuation. Such gaps underscore the critical need for comprehensive strategies to enhance hospital crisis preparedness.[11]

We believe that the reported shortcomings in the planning and management of medical support led to the overburdening and exhaustion of all components within the healthcare system and contributed to the deepening of problems in other areas. [12]

The healthcare system’s readiness for an adequate and sustainable response in the event of a biological threat or outbreak—whether an epidemic or a pandemic—

fundamentally depends on the availability of well-trained and prepared medical personnel.

Medical Personnel

Training

Training hospital personnel is a key component of preparedness for managing biological threats. The existing literature highlights the absence of systematic and regular training programs, particularly in relation to infectious diseases and the correct use of personal protective equipment (PPE). The clinical complexity of conditions in COVID-19 patients, combined with knowledge gaps, lack of hands-on experience, and insufficient skills among parts of the staff, further emphasized the need for targeted preparedness. [13]

Survey, performed before the pandemic showed that most of the medical staff, i.e., 85.8%, believed that disaster drills are not held regularly in hospitals, 86.1%, did not participate in exercises. [14] Small percentage - 42.7% are informed about PPE that the hospital posseses. 18% know about the technical and medical resources dedicated for use by the teams enhancing disaster medical support.[7]

Restrictions related to social distancing significantly hindered the implementation of effective in-person training sessions. Additionally, efforts to expand medical teams by integrating external staff and volunteers with diverse professional backgrounds presented challenges related to their rapid onboarding and training. Inadequate preparation in infection prevention and intensive care delivery posed major risks to the safety of both healthcare workers and patients. [15, 16, 17]

Resource Capacity

The shortage of healthcare personnel led to significant pressure on the existing workforce. Teams in all medical facilities faced an intense workload, which exacerbated burnout, increased the risk of errors, and reduced the quality of care provided. The personnel deficit was most acutely felt in specialized and university hospitals, which were required to regularly adapt and reorganize their services in response to the pandemic’s dynamic phases. Staffing strategies were mostly reactive and implemented primarily during epidemic peaks. In this context, one of the main measures used to alleviate pressure on the hospital system was the temporary redeployment of staff from closed departments or suspended elective services to

COVID-19 units. According to Adams and Walls (2020), healthcare systems were forced to operate with limited staff while simultaneously expanding capacity, with some facilities reporting 30–40% absenteeism due to illness or quarantine. [18]

Weaknesses and inefficiencies in hospital sector decision-making contributed to increased stress levels among healthcare staff. Numerous authors have highlighted the diverse psychological impacts on medical professionals.

Psychological Aspects

Nearly all sources report the presence of both physical and mental health issues among healthcare personnel. At the beginning of the pandemic, due to the prevailing psychological climate in society, imposed isolation, physical distancing, restricted contact, and quarantine measures, staff experienced social, familial, and professional disruptions. A systematic review and meta-analysis found that the pooled prevalence of anxiety, depression, and insomnia among healthcare workers during the COVID-19 pandemic was 37%, 34%, and 39%, respectively. These mental health challenges were more pronounced among female healthcare workers and nurses. [19] Additionally, a national survey in the United States reported that 49% of healthcare workers experienced burnout, with nurses exhibiting the highest levels at 56%. COVID-19 infection, difficult working conditions, challenges associated with the use of personal protective equipment (PPE), and various social or family-related problems significantly affected their physical and mental well-being. [20]

The psychological burden was further intensified by widespread issues in hospitals related to insufficient material and technological resources, as well as medical infrastructure unprepared for operating under biological threat conditions.[21, 22]

Material and Technical Support

The COVID-19 pandemic exposed critical shortages in essential supply chain strategies. At the onset of the crisis, the availability of personal protective equipment (PPE)—including masks, gloves, and protective clothing—was critically low. During the peak periods of the COVID-19 pandemic, the shortage of respiratory equipment, patient monitors, oxygen supply systems, and essential medications posed significant challenges for hospitals. These deficiencies not only compromised the safety of

healthcare workers but also limited the capacity to provide timely and effective care to infected patients. [23, 24, 25]

Infrastructural readiness

Isolation units

A major challenge was the lack of specially designated zones for isolating infected patients from non-infectious individuals and others requiring medical care for unrelated conditions. This led to increased risk of cross-infection within hospital settings. As a result, the continuity of care for patients with chronic illnesses or acute non-infectious conditions was significantly disrupted, worsening overall health outcomes during the pandemic period.[26, 27]

Transport and logistics

The ability to rapidly transfer critically ill patients to better-equipped medical facilities was severely limited. This constraint often resulted in delays in receiving advanced care, especially for patients in remote or underserved regions. Consequently, the uneven distribution of healthcare resources intensified health disparities and placed additional strain on already overburdened local hospitals.[28]

Flexibility

Hospitals faced significant difficulties in reorganizing departments in response to the sudden surge in patient numbers. Given the lack of purpose-built facilities equipped to manage an emerging pandemic, both structural and non-structural challenges were identified. These included insufficient physical space and bed capacity, difficulties in managing patient flow (such as the absence of designated corridors for entry and exit), inadequate ventilation, and a lack of effective air filtration and disinfection systems. These issues stemmed from the general-purpose design of most hospitals, which were not specifically constructed to handle outbreaks of infectious diseases.[29]

Administrative and Regulatory Aspects

Legal Framework

The application of regulatory frameworks revealed several limitations during the COVID-19 pandemic, including delays in decision-making and insufficient flexibility in adapting measures to rapidly evolving situations.[30]

Financing

The closure of revenue-generating sectors due to anti-epidemic measures, combined with the rising costs of pandemic management, led to a sharp decline in hospital revenues. Increasing inflation, higher expenses for medical equipment, and shortages of healthcare personnel emerged as prominent macroeconomic and social factors. The 2021 Bulgarian state budget included an additional BGN 600 million (€307 million) for medical activities related to the pandemic. [31]

Monitoring and Accountability – Information Services

Documentation, data analysis, and reporting to the National Health Insurance Fund (NHIF), Regional Health Inspectorates (RHI), and the Ministry of Health (MoH) were essential tasks during the pandemic. However, the absence of a comprehensive and integrated system for recording and managing COVID-19-related data led to inefficiencies, inconsistencies, and significant time and energy loss for medical staff. In some units, statistical information had to be recorded manually and then re-entered electronically, resulting in parallel task execution. Furthermore, each unit operated with its own standalone information system, requiring duplicate data entry and contributing to informational and statistical confusion between departments. The solution proposed was to centralize all COVID-19 patient information within the National Health Information System and connect it to a unified information center.[32]

Conclusion

Modern biological threats, including the COVID-19 pandemic, have exposed significant weaknesses in hospital crisis preparedness and highlighted the need for a systematic and resilient approach to healthcare facility management. Staff shortages, fragmented training efforts, and the absence of adequate and adaptable emergency response plans hindered the effectiveness of the response in many healthcare institutions.

To address the identified challenges, this study recommends targeted improvements in the hospitals' contingency disaster response plans. They have to be modified and include:

1. Pre-disaster purchased and stored stock of personal protective equipment for biological threat in quantity that allows independent safe work of the medical and hospital staff for at least one week;

2. Pre-disaster purchased and stored medical resources – oxygen, fluids, consumables medicines, laboratory test etc. for a week independent work;
3. Defined medical and technical equipment supply chains – preferably three different sources, for assuring the hospital logistics;
4. Regular training of the medical and hospital staff – refreshing short (hour- or two) theoretical courses and practical drills on working under biological threat;
5. Theoretical and practical training of medical teams for assuring a reserve medical pool for specialists' replacement in case of prolonged epidemics or pandemic;
6. Key hospital personnel training focused on rapid establishing of Hospital Emergency Headquarters and chain of command;
7. Training medics for psychological support provision in case of mass biological casualties event;
8. Establishment of reserve and secure line for medical data exchange and storage.

These will increase the hospital planners, senior medical and entire hospital personnel capabilities. Strengthening their competencies for adequate and swift response in case of epidemics and pandemics is essential to enhance hospital resilience to future biological threats. In this context, investment in strategic planning and preparedness should be a top priority for healthcare systems aiming for resilience and efficiency in times of crisis.

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CYBERSECURITY AS A KEY FACTOR OF BUSINESS CONTINUITY MANAGEMENT IN TERMS OF CIVIL PROTECTION AND DEFENCE IN POLAND

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Abstract: In the article, the authors, based on the legal regulations contained in the Act on Civil Protection and Civil Defence, analysed the tasks and responsibilities of specific institutions, bodies and entities implementing civil protection and civil defence undertakings from the point of view of ensuring business continuity in the scope of cyber security. The results of the research indicate the importance of cyber security in terms of ensuring business continuity for specific actors in civil protection and defence undertakings in Poland. The article aims to present a catalogue of risks that may negatively affect not only the security of the population and critical infrastructure, but also the business continuity of key institutions, bodies and entities (Business Continuity Management - BCM). The identified risks make it possible to recognize the main challenges faced by actors responsible for protection and civil defence in relation to potential cyber threats. As a result of the analyses, recommendations have been formulated that range from the construction of a Secure State Communications System (SBLP) to the implementation of comprehensive BCM strategies aimed at maintaining operational continuity in crisis situations and ensuring resilience to potential cyber attacks.

Introduction

The legislator in the Civil Protection and Civil Defence Act adopted on 5 December 2024 does not explicitly describe any issues related to cyber security (Poland, 2024a). If you type the phrase ‘cyber’ into a text search engine, you will not get any search results. However, after a careful analysis of the document, it must be concluded that this is an area that can significantly affect the security of the population in both

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peacetime and wartime. The law introduces two concepts: civil protection and civil defence.

According to Article 2, Civil protection is a system consisting of public administration bodies performing tasks aimed at ensuring the safety of the population by protecting human life and health, property, including animals, infrastructure necessary to meet subsistence needs, cultural assets and the environment in a situation of emergency, hereinafter referred to as ‘civil protection bodies’, entities performing these tasks, hereinafter referred to as ‘civil protection entities’, and civil protection resources.

Civil defence, on the other hand, is the implementation of the tasks set out in Article 61(a) of the Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), done at Geneva on 8 June 1977. (OJ 1992, item 175 and 2015, item 1056), hereinafter referred to as the First Additional Protocol to the Geneva Conventions of 12 August 1949, to protect civilians from the dangers arising from armed hostilities and their consequences.

At the time of the imposition of martial law and during wartime, civil protection becomes civil defence and consequently civil protection bodies and actors become civil defence bodies and actors.

In summary, civil protection and civil defence, are concerned with public security in the broadest sense and with the state's ability to protect citizens, critical infrastructure and defend itself against both conventional and hybrid threats (including cyber attacks) in both peacetime and wartime.

The idea of the authors of this publication is not to try to create a state of anxiety arising from the threats we can identify in cyberspace (Pilarski, 2016), but to raise awareness of the key cyber threats that may be relevant during civil protection and civil defence tasks (Poland, 2016). It is of great importance in terms of business continuity management (BCM) (Poland, 2022) from the prism of the tasks performed by bodies and entities carrying out civil protection and civil defence tasks. Cyber threats occur but the most important thing is to determine how quickly institutions can come back to their tasks. The authors believe that raising awareness of the authorities and entities responsible for carrying out these tasks in both peacetime and wartime is crucial for the safety of the population (Poland, 2015, 2024c). This publication is one of the first

studies to address cyber security in the implementation of the tasks imposed by the Civil Protection and Civil Defence Act.

Material and methods

In the current geopolitical situation, due to the armed conflict taking place in Ukraine, European countries are conducting preparatory activities for a possible war. In Poland, the Law on Civil Protection and Civil Defence was adopted in 2025, regulating the activities of certain entities in the state, their tasks during peace and war in the area in question. The aim of this article is to analyse the adopted legal normative from the point of view of ensuring the continuity of actions of specific actors in undertakings ensuring civil protection and defence in Poland from the point of view of cyber security. One of the results of the research is the identification of a catalogue of threats/risks that may affect the performance of tasks by authorised actors. In addition, the authors, on the basis of the adopted threats, developed recommendations that should be taken into account in terms of ensuring the cyber-resilience of the implemented tasks for civil protection and civil defence in Poland (Republic, 2010, 2015).

Based on the adopted research area, the main research problem was formulated in the form of the following research question:

RQ: how important is cyber security in ensuring the continuity of operations of entities responsible for civil protection and civil defence in Poland?

The realisation of the adopted objectives and the main research question formulated in this way, will require answering the following specific research questions (RQ):

RQ1: who is responsible for ensuring civil protection and civil defence in Poland?

RQ2: what are the most important threats and risks from a cyber-security perspective that may affect the continuity of civil protection and civil defence actors?

RQ3: what measures should be put in place to ensure cyber resilience in the execution of tasks under the Civil Protection and Civil Defence Act?

As part of the research procedure, the research hypothesis presented below was formulated at the conceptualisation stage.

The entities indicated in the Civil Protection and Civil Defence Act that are responsible for tasks in the broad field of civil protection will use the domain of cyberspace in order

to achieve the set objectives. Due to the fact that cyberspace is a complex environment that is fraught with various types of vulnerabilities and threats from cyber criminals, it is necessary to identify the threats and risks that may disrupt proper civil protection processes. It is assumed that the safe use of cyberspace will be assured by the creation of a secure communications system of the state, which will provide the necessary services to ensure the continuity of activities performed by the actors responsible for civil protection and civil defence in Poland.

Within the scope of the conducted research, theoretical and empirical research methods were applied in the form of analysis of legal sources and available literature on the subject, analysis of phenomena and assessment of threats and risks that may affect the continuity of activities of actors responsible for civil protection and civil defence ().

The authors are currently conducting research in the problem area of this article within the project entitled: *Opracowanie założeń zintegrowanego systemu gromadzenia i przetwarzania wiedzy ratowniczej dla faz: przygotowania, zapobiegania, reagowania i odbudowy, na potrzeby ochrony przeciwpożarowej i ochrony ludności* (*Development of assumptions for an integrated system of collecting and processing rescue knowledge for the phases: preparation, prevention, response and reconstruction, for the needs of fire protection and civil protection*), carried out within the framework of the competition GOSPOSTRATEG IX of the National Centre for Research and Development (contract no. GOSPOSTRATEG9/001G/2022), where the Project Manager from the side of the War Studies University is Associate Professor Dariusz Wróblewski.

Civil protection and civil defence – identifications of key actors

In this part of the article, the authors, based on the legal regulations contained in the Law on Civil Protection and Civil Defence, have analysed the tasks and responsibilities of individual institutions, bodies and entities performing civil protection and civil defence duties from the point of view of ensuring the continuity of cyber security activities (Wróblewski, 2024, 2024a).

According to Article 5.1 of the Act, the tasks of civil protection and civil defence are performed by bodies and entities of civil protection and civil defence, depending on their powers and the type and scale of threats.

Civil protection and civil defence authorities include the following institutions.

Top level - national

1. The Council of Ministers
    - approves the Programme for Civil Protection and Civil Defence;
    - presents a report to the Sejm and Senate every 2 years.
2. The minister responsible for internal affairs
    - coordinates the national policy on civil protection and civil defence;
    - supervises the system at national level;
    - manages the reserves and the civil defence corps;
    - may authorise the Chief Commandant of the State Fire Service or the Government Security Centre to perform tasks.
3. Ministers in charge of government administration departments
    - supervise subordinate units;
    - train personnel, plan resources, analyse threats.
4. The Government Civil Protection Team
    - an advisory and consultative body to the Council of Ministers;
    - consists of representatives of various ministries and institutions (e.g. PSP, IMGW, RARS).

Provincial level

5. Voivod
    - coordinates activities at the provincial level;
    - issues decisions, organises evacuation, alerting, training;
    - supervises the activities of districts and municipalities.
6. marshal of the voivodship
    - supervises the activities of the voivodeship entities;
    - organises training, provides financial support to districts.

County level

7. district governor
    - coordinates civil protection activities at county level;
    - supports the municipalities; organises exercises, records resources.

Municipal level

8. mayor / town mayor
    - implements protection measures in the municipality;
    - organises shelter, evacuation, local warning systems;
    - maintains the Central Register of Collective Protection Facilities.

Civil protection and civil defence (executive) entities include, but are not limited to, the following institutions:

1. The State Fire Service.
2. Volunteer Fire Brigades.
3. The Government Security Centre.
4. Medical entities, emergency medical services.
5. Inspections: sanitary, veterinary, transport.
6. Caritas, PCK, scouting organisations.
7. Institute of Meteorology and Water Management.
8. Polish Waters, National Forests.
9. SAR, ASAR - sea and air rescue.

The tasks of these entities include, among others:

- emergency response;
- evacuation and shelter;
- first aid and humanitarian assistance;
- protection of cultural and environmental assets;
- cooperation with territorial authorities.

Only selected tasks of the various bodies and entities of civil protection and civil defence have been listed above (Stempien, 2024, 2024a). The full range of powers and responsibilities is contained in the law in question.

Catalogue of threats and risks

In order to identify the catalogue of hazards and their associated risks, it is important to bear in mind that these are not the same concepts. It is common that in the literature, hazard and risk are treated as synonyms. As defined in the NIST SP 800-30 Rev. 1 Guide for Conducting Risk Assessments, a threat is ‘any circumstance or event with the potential to adversely impact organisational operations (including mission, functions, image, or reputation), organisational assets, individuals, other organisations, or the Nation through an information system via unauthorised access, destruction, disclosure, modification of information, and/or denial of service’ (NIST SP 800-30 Rev. 1, Appendix B (Page B-1)), while risk is ‘a function of the likelihood of a given threat source's exercising a particular potential vulnerability, and the resulting impact of that adverse event on the organisation’ (NIST SP 800-30 Rev. 1, Section 2.2 (Page 8)). It is also important to define in the above definitions the term vulnerability, i.e. ‘a weakness in an information system, system security procedures, internal controls, or implementation that could be exploited or triggered by a threat source’ (NIST SP 800-30 Rev. 1, Appendix B (Page B-2)), through which a threat could exist or be mitigated if removed. In summary, a *threat* is a potential event or actor that could cause harm to an information system, such as a hacker or malware, whereas *risk* is the likelihood that a threat will exploit a vulnerability and the potential impact it would have on the organization (Pilarski, 2022).

On the basis of an analysis of the Civil Protection and Civil Defence Act, the authors have identified the most important threats that may arise in connection with the implementation of the tasks contained in the Act in question. The results of the study are presented in Table 1.

Table 1. Catalogue of threats/risks in the field of civil protection and civil defence in the aspect of cybersecurity

No.	**1.**
Threat name	Potential disruptions to the ability to transmit information in the technical and informational field (disinformation).
Threat identification	One of the tasks carried out within the framework of civil protection and civil defence is to prepare the population to prepare and behave properly in emergency situations. This is realised by informing citizens about potential and actual threats affecting their safety. In this case, a negative actor may introduce misinformation to create chaos and public discontent.
Probable vulnerability	A potential loophole in the notification system through mass communication media: TV, SMS, sound signals.
Risk	The likelihood of a hazard occurring is at a medium level and the impact at a high level. Risk mitigation relates to securing mass media notification systems and clearly identifying official information channels.
No.	**2.**
Threat name	Disruption of the supply chain for the provision of public services by infrastructure operators.
Threat identification	Disruption to critical infrastructure can affect the state's ability to provide essential public services necessary to protect the life and health of the population.
Probable vulnerability	Dependency on a single supplier, lack of redundancy and back-up storage facilities.
Risk	Likelihood: medium; impact: very high. Risk mitigation: diversification of suppliers and stockpiling.
No.	**3.**
Threat name	Destruction of IT infrastructure
Threat identification	Destruction of IT infrastructure makes it impossible to carry out civil protection in the scope of information, warning and rescue operations.
Probable vulnerability	Insufficient physical and logical infrastructure security.
Risk	Likelihood: medium; impact: high. Risk mitigation: implementation of business continuity and security plans.
No.	**4.**

Threat name	Potential attack vectors by cybercriminals.
Threat identification	Cyber criminals may launch targeted attacks against elements of the civil protection system, with the aim of creating disorganisation, chaos and public discontent.
Probable vulnerability	Software vulnerabilities, lack of network segmentation, poor access control.
Risk	Likelihood: high; impact: high. Risk mitigation: threat monitoring, penetration testing, training.
No.	**5.**
Threat name	Potential DDoS attacks.
Threat identification	DDoS attacks can block crisis management systems and information channels, making it difficult to take action in emergency situations.
Probable vulnerability	Lack of DDoS detection and neutralisation systems.
Risk	Likelihood: high; impact: high. Risk mitigation: implementation of anti-DDoS systems, network redundancy.
No.	**6.**
Threat name	Potential attacks on healthcare entities (ransomware, DDoS, APT).
Threat identification	Paralysis of hospital operations caused by a cyber-attack results in a lack of availability of healthcare services.
Probable vulnerability	Lack of backups, outdated IT systems, lack of network segmentation.
Risk	Likelihood: high; impact: very high. Risk mitigation: encrypted backups, infrastructure upgrade.
No.	**7.**
Threat name	Destruction, theft or loss of integrity of data related to population protection assets (ransomware).
Threat identification	Data related to civil protection assets may be targeted by ransomware attacks, making emergency management impossible.
Probable vulnerability	No data encryption, no access control, no auditing.
Risk	Likelihood: high; impact: high. Risk mitigation: information security policies, backup, encryption.
No.	**8.**
Threat name	Tasks related to cyber security at international level.

Threat identification	The Government Security Centre carries out tasks arising from Poland's membership in NATO and the EU, including building resilience to cyber threats. Failure to meet these obligations could result in a loss of coalition capabilities and a negative impact on national security.
Probable vulnerability	Lack of alignment of systems with international standards (e.g. NIS2, NATO CCDCOE), limited information sharing, low interoperability with allied systems.
Risk	Likelihood: medium; impact: high. Risk mitigation: implementation of EU and NATO recommendations, cooperation with international partners, development of national cyber security centres.
No.	**9.**
Threat name	Lack of civil protection and civil defence capabilities (APT, DDoS, disinformation).
Threat identification	Complex attacks may prevent civil protection structures from operating effectively, leading to chaos and lowering social resilience.
Probable vulnerability	Insufficient incident response procedures, lack of systems resilience testing.
Risk	Likelihood: medium; impact: very high. Risk mitigation: cyber resilience strategies and regular preparedness tests.
No.	**10.**
Threat name	Disruption to the Secure State Communications System (SBLP).
Threat identification	In peacetime and wartime, the SBLP becomes a key communication channel, and the lack of clear accountability can result in its paralysis.
Probable vulnerability	Unclear rules for taking over supervision and operation in wartime.
Risk	Likelihood: medium; impact: very high. Risk mitigation: regulate takeover of SBLP supervision, switching tests

Source: own elaboration.

The authors are aware that the above catalogue is not a closed one (Pilarski, 2022a). New threats and risks can be identified during the continuous process related to business impact analysis (BIA) in the implementation of civil protection and civil defence projects (Pilarski, 2017).

On the basis of the above analysis, it should be concluded that the catalogue of risks that can affect the disruption of the continuity of civil protection and civil defence entities is related to contemporary typical threats that cyber criminals use in cyberspace. Detailed information on the types of attacks can be found in ENISA (European, 2022, 2023, 2024) and NATO (Ertan, 2020) publications.

Recommendations related to cybersecurity

The carried-out research results in a proposal for cyber security recommendations that arise from the analysis of the Act. In order to ensure cyber resilience in future civil protection and civil defence activities, the following recommendations should be implemented in a systemic and not just selective manner. The implementation of the proposed solutions should include, first of all, actions to be carried out on a national basis, only secondarily actions requiring international cooperation. Actions in the international environment may be fraught with difficulties related to the scope and timing of their implementation, which is linked to the consent to their introduction by cooperating states, organisations and international actors.

Given that the domain of cyberspace is a complex and dynamically changing environment, constant changes in the area of threats and technological developments must be taken into account (Poland, 2010, 2022a, 2024). The above conditions indicate the necessity for the state to introduce certain measures:

1. Investment in research in modern technologies - the development of tools based on AI and machine learning is a key element in the implementation of advanced data analysis systems allowing for faster detection of anomalies and response to abnormal activity patterns, which will allow for more effective protection against new types of attacks. In addition, in the era of quantum computer development, research into national cryptographic solutions that are resilient to potential threats from quantum technologies is essential.
2. Building a cyber-resilient Secure State Communications System (SBLP) - this is a major challenge the organisers of the system (Kuyavian, 2025) must face, which should both provide all the necessary services required to perform tasks for civil protection and civil defence (Rzeczpospolita, 2025) but also be resilient to threats that may arise in cyberspace.

3. Strengthening the protection of critical infrastructure and the integration of defence systems - in this respect, continuous efforts on the part of critical infrastructure operators in identifying potential vulnerabilities that could lead to a successful cyber attack are essential. It is important to develop and implement specific security standards for IoT systems and smart city solutions. In addition, coherent coordination structures need to be established to enable the rapid exchange of information cooperation between authorities and entities responsible for cyber security, crisis management and civil protection and defence.
4. Implementing comprehensive business continuity management (BCM) strategies to maintain business continuity in crisis situations and ensure resilience to potential cyber attacks.
5. Strengthening cross-sectoral and international cooperation - in order to react faster to incidents (Ministry, 2024). One of the solutions is to continuously verify the correct functioning of the cyber security system in Poland to enable the exchange of information about new threats and incidents in cyberspace at the level of public administration, the private sector and services responsible for security in the country. Increasing international cooperation through joint exercises, training and exchange of best practices with allied countries can contribute to better defence against global threats in cyberspace.
6. Updating security regulations and standards - reviewing, updating and developing uniform national standards for critical infrastructure protection will minimise legal and technological gaps. It is necessary to pay special attention to systems using artificial intelligence in terms of legislation and ethical standards.
7. Systematic education and public awareness - it is important to invest in the development of cyber security experts' competencies, including training in new technologies, threat analysis and incident response. In addition, campaigning at the national level will raise awareness of cyber threats, which will contribute to building a culture of security at the community-wide level.

Implementing the above-mentioned recommendations related to cybersecurity will help to ensure not only an effective response to today's threats, but also proactive preparation for future challenges, minimizing gaps in current normative documents. A comprehensive approach and dynamic adaptation to the changing threat landscape is key to ensuring the security of the population and the stability of the functioning of critical infrastructure in Poland.

Conclusion

In this article, the authors have focused on the challenges that are involved in maintaining business continuity during civil protection and civil defence tasks in terms of the key factor of cyber security. The article identified the key authorities and actors as well as their tasks and powers. This allowed the identification of the threats that may arise. The authors created a catalogue of threats by analysing them from the point of view of vulnerability and the risks that may arise with a certain probability and the impact that may be felt. This made it possible to identify the area to be addressed in order to mitigate the risks. The resulting research material allowed for the articulation of recommendations that the authors believe should be implemented in a holistic manner.

According to experts in the area of cyber security, one of the most serious threats is ransomware attacks, which can paralyse institutions, organs and state entities key to ensuring the security of the population in both peacetime and wartime. Attacks of this type carried out by cybercriminal groups described by their nature as advanced persistent threats APT can significantly hamper the execution of tasks for the security of the population (Pilarski, 2020). It can be unequivocally stated that a Secure Government Communications System (SBLP) should, first and foremost, provide all the necessary services required to carry out tasks for civil protection and civil defence but also be resilient to threats that may arise in cyberspace. The authors are aware that this publication is a kind of prelude to further research to be carried out in the field of cyber security in order to meet the difficult task of civil protection and civil defence.

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ANALYZING DYNAMICS AND IMPACTS OF CONTEMPORARY PEOPLE MASS MOVEMENTS: A MULTIDISCIPLINARY EXPLORATION

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Abstract: The following paper is the result of a detailed analysis that concerns the dynamics and impacts of contemporary people mass movements. The topic represents a concrete issue in a global aspect, and it is a highly prioritised subject in NATO's agenda. The recent events from Russia's invasion of Ukraine have once again accentuated the importance of a properly structured response to similar events and the need for better mass movement management. Meticulous research is carried out in order to gather a precise knowledge of the environmental situation around this phenomenon through the review of a large amount of quantitative and qualitative data to deeply understand the main causes, dependencies, discrepancies, and tendencies related to people's mass movements. This approach aims to develop a clear framework and to assist the decision-making process concerning NATO member countries and allies by increasing the resilience and response capacity.

Introduction

Displacement within the modern global security system represents one of the most concerning topics that requires a proper monitoring approach in order to develop a strong level of preparedness and resilience inside of NATO. Today, displacement is characterised by more frequent and large-scale movements of people, who bring a major burden and hide a variety of threats for the Alliance. Managing displacement crises requires an adequate response to preserve the basic human rights of affected people and to protect the security of each member state and allies. However, this phenomenon owns a dynamic nature, as it evolves quickly and generates severe impacts on the surrounding or nearby areas. Such events are difficult to predict and require a solid background of resources, measures, and procedures. The evolution of these tendencies generates a substantial spectre of threats and risks that affect national borders, economic systems, social order, individual and collective security,

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fundamental global sectors, and international relations. Global experts also observe the presence of external governmental efforts to manipulate and instrumentalise people's mass movements in order to exert pressure on a specific state or to protect certain national interests. This means that events, which collect such complex characteristics, have the capacity to affect the geopolitical scene and international relations by eventually producing an elevated amount of vulnerability, instability, and uncertainty within the global, or regional security system.

This research paper explores the dynamics and impact of global mass movements, and it additionally breaks down the displacement concept through a deeper analysis of refugee crises, internally displaced people (IDP), and internal movements that are triggered by conflicts.

The main objective is to identify the patterns of people's mass movements, as well as the weak areas on which NATO must focus in order to improve its crisis management approach and to guarantee a stable security environment. The research also aims to support the development of a precise laboratory product within the CMDR COE that is able to effectively predict and simulate future mass movements towards NATO member states and allies through the application of artificial intelligence (AI).

The methodology of this research consists of the mixed methods research through the quantitative and qualitative review of data, statistical results, and official research papers. Finding a proper data storage service that collects truthful and relevant information represents a challenging task, so the research is purely based on the directly involved organisations and institutions – with some small exceptions - such as UNHCR, IOM, Frontex, World Bank, or IDMC.

Theoretical framework and general overview of conflict-related displacement

The historical time period of the 21st century is characterised by significant mass movement flows due to different and specific reasons that vary in relation to the current global and regional situation, especially considering the acting geopolitical spectre that is becoming more complex and unstable. Indeed, recent researches confirm that the "economic migrations" still lead the trends today, with the major centre represented by the EU, and more specifically Germany, which is considered one of the most preferred destination points for refugees or migrants. The main factors which assist this

tendency are represented by the aggravated social and economic conditions of people coming from external countries or underdeveloped regions, so harsh living conditions, economic backwardness, low income, unemployment, lack of job opportunities, high taxes, poverty, and underdeveloped labour markets are part of the main “push factors” that generate movements towards other areas where people could cover their basic necessities and elevate their social level of fulfilment. In such circumstances, people usually make the decision to move within the regional borders, so they regularly choose countries or areas from the same world region.[2]

In this sense, the paper aims to highlight the increasing significance and recurring nature of another specific type of people mass movement – forced displacement caused by conflict – which usually results in refugee crises, internal displacement, or internal movements. Today, displacements caused by conflicts or violence are increasing and represent a heavy challenge, which requires proper protection of social order and security environment.

A slight connection with the economic migration is possible within this specific phenomenon, because it regularly evolves within unstable regions or between two or more countries that are generally involved in a conflict or collision due to unresolved issues, tensions, or inequality. This means that a gap between higher and low income countries exists, and consequentially we meet a greater chance of future conflict events inside of areas and regions that are still underdeveloped or that host a significant volume of internal crises such as economic, political, military, ethnical, religious, etc. As a result, the effect of conflict on migration or displacement processes is higher for low-income country groups. The report Conflict as a Cause of Migration underlines some fundamental causes that lead to the evolution of conflicts, or that are part of their dynamics, and consequentially generate displacement:

- Corruption;
- Crime;
- Compulsory military service;
- Repression;
- Discrimination;

[2] Naydenov, 2018.

- War or oppression;
- Poor health care;
- Famine.[3]

In addition to these factors, it is also possible to include military operations, civil wars, unresolved historical disputes, damaged environments due to conflict, ethnic cleansing or religious tensions. These elements transform the original environment and lead to the destruction of fundamental infrastructures and processes, so affected people are no longer able to maintain their regular daily routine and are forced to flee in order to preserve their individual security. Personal integrity is endangered, as well as the respect of basic human rights, humanitarian law and the support of essential sectors. UNCHR[4] states the following groundbreaking information to further elaborate this phenomenon: “The number of people forced to flee persecution, conflict, violence, human rights violations and events seriously disturbing public order rose in 2024, reaching a record 123.2 million. This is an increase of 7 million people, or 6%, compared to the end of 2023. One in 67 people globally were forcibly displaced at the end of 2024. Slightly more than one-third of all forcibly displaced people globally were Sudanese (14.3 million), Syrian (13.5 million), Afghan (10.3 million) or Ukrainian (8.8 million). During 2024, millions of people were displaced, including an estimated 20.1 million within their own country and 5.4 million as refugees and asylum seekers. Over the last decade, the number of forcibly displaced people has almost doubled.” In addition, the official data states that the total global forced displacement has slightly decreased by 1% by the end of April 2025.

Although the international community estimates a slower development of forced displacement in 2025, the presence of global conflicts and pressure among several international actors is increasing. As a consequence, it is still difficult to predict whether the displacement trend is able to maintain lower dynamics or not, since the phenomenon is strictly related to the future development and termination of conflicts and episodes of violence or war.

The shift in the spheres of influence, the lack of geopolitical stability and order, or the unresolved regional disputes transform the global security system, and it proportionally

[3] Crippa et al. 2022

[4] UNCHR, 2025a, p.6

becomes less stable, while the international order faces a significant crisis in many aspects. The effects that represent the outcome of existing or future episodes of violence can cover a wide amount of sectors, and displacement is a direct result of modern changes. One of the most significant aspects, which is part of these specific events, represents the volume and the speed through which the displacement gets manifested. International, or internal displacement usually evolves quickly and involves a large number of individuals. This means that there is a higher possibility of generating significant people mass movement flows towards a specific region such as Europe, where heavy burdens and pressure are produced in terms of social acceptance of newly formed refugee flows, which require larger amounts of resources and policies that additionally load the main sectors and national stability, especially for countries that are part of the main destination areas.

This short introduction emphasises how important it is to distinguish migration from refugees' movements and internally displaced persons (IDPs) in order to structure a proper strategic approach in terms of people mass movements. A brief explanation of these fundamental concepts is included in this paragraph to support the analysis and reading process:

1. **Migration**: it is considered a voluntary movement of people towards a different area, country or region where better opportunities are provided. Migrants are usually not eligible for specific forms of support, which are granted for refugees and asylum seekers. It is also unlikely to see extremely high flows of migrants towards a certain country, especially when the speed of those processes is analysed. If some specific circumstances (such as severe financial crisis) get excluded, it is much more difficult to expect a sudden and quickly developed migration phenomenon;
2. **Refugee Crisis**: a forced displacement outside of specific national borders that occurred due to a form of violence, crisis or persecution, and that allows people to obtain the "refugee status". All participants within the Geneva Convention[5] are obligated to host the arriving refugees without the right to expel them or to send them back to the country of origin. People who have not been recognised as refugees but seek help and protection from serious violations of their human

[5] UNTC, 2025.

rights within the country of origin have the right to forward an asylum application under the “1951 Refugee Convention on the Status of Refugees”;

3. **Internal Displacement (IDP)**: it represents a form of forced displacement but within the national borders. Internally displaced persons (IDPs) usually move within the internal area of their country, and they do not obtain direct subsidies or international protection due to the existing governmental jurisdiction in the country of origin.[6]

The World Economic Forum[7] provides additional guidance about the current security environment through the latest Global Risks Report 2025, and it carries out an important survey among 900 global experts in relation to a long-term perspective, which covers the next 10 years. The results confirm that 62% of the participants expect catastrophic or elevated risks. The report also confirms that the current global risk landscape is led by “state-based armed conflicts”, covering 23% of the official list containing the current and most relevant global risks, and this data must be taken into consideration by international and national decision makers in order to strengthen their crisis management approach and resilience, especially in terms of possible involuntary and conflict-based displacement, which is considered the third in order social risk in the long-term, preceded only by “inequality” and “social polarization”. Figure 1 provides a visual representation of this statement.

[6] MSF, 2024.

[7] The World Economic Forum, 2025, pp.6-10..

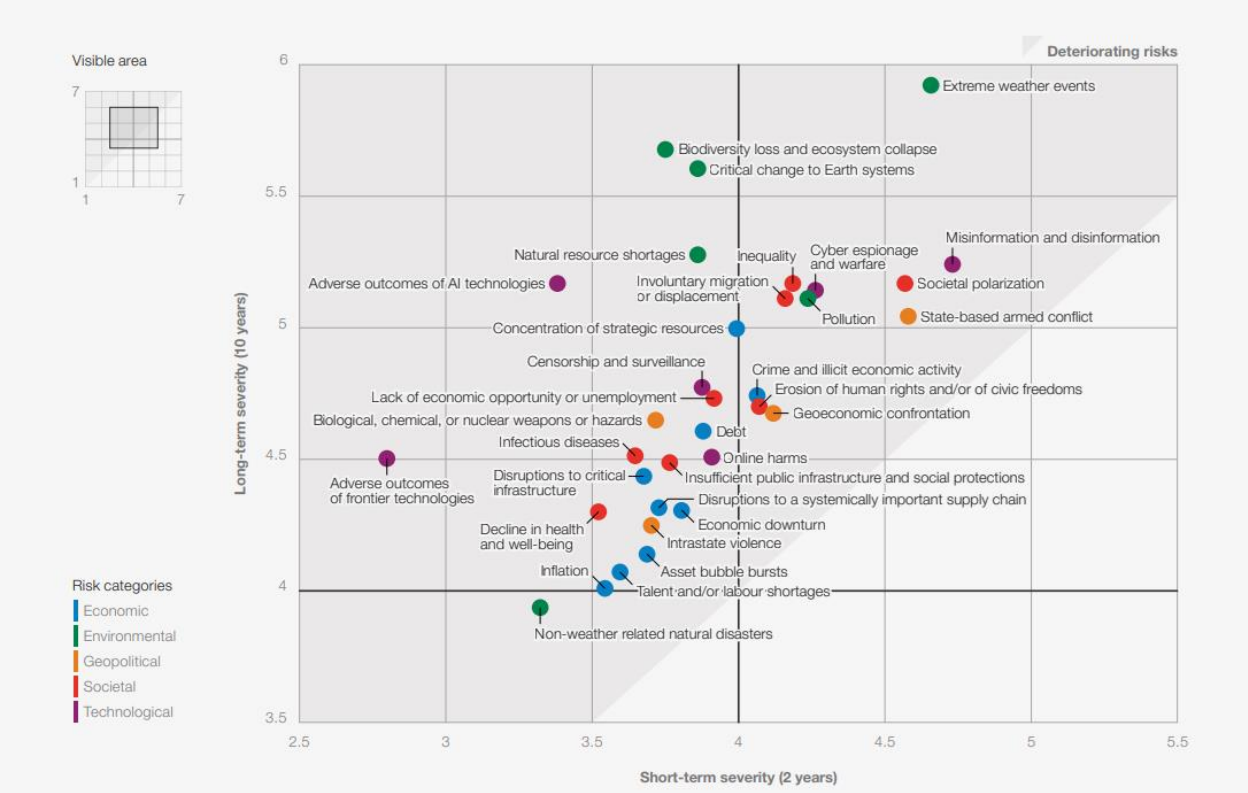

Figure 1. Relative severity of global risks over a 2- and 10-year period. (Source: World Economic Forum, 2025).

Evolution of conflict-induced displacement from humanitarian crisis to security threat

The concept of involuntary, or forced, displacement, especially when caused by conflict and violence, is a fundamental aspect that needs to be considered within the current security environment, and one of the main purposes of this paper is to answer the question of why this phenomenon is relevant and examined as a security threat first.

Although many experts do not consider migration and forced displacement as a real security threat, but they are more keen of portraying them as an instrument of manipulation and destabilisation followed by exaggerated narratives and biases about migration flows in general, it is still undeniable that such events require special attention, not only because they are capable of hiding malicious individuals and intentions that represent a future security threat for the international community and sovereign hosting or transit countries, but also because they tackle the concept of individual security related to the directly affected individuals.

Forced displacement, especially when conflict-related, is not a new global phenomenon. History provides a solid amount of information that is related to episodes of such humanitarian crises. Humanity witnessed severe conflict-induced crises, particularly during the 20th century. Some examples of the dimension of important critical events that were capable of generating significant forced displacement flows and refugee crises are:

1. World War I – approx. 15.0 million affected people originally from Europe (1914-1918);
2. World War II – approx. 60.0 million affected people originally from Europe (1939-1945);
3. Partition of India – approx. 20.0 million affected people originally from the Indian subcontinent (1947-1948).[8]

With the evolution of international relations and the development of the overall global systems, the connection between forced displacement and security environment acquired major relevance and became an important topic right at the end of the Cold War and more precisely during the 1990s when the UN Security Council made an official statement that recognised the forced displacement of people as a destabilising factor for the regional and international security. Migration of workers, refugees and irregular migrants transformed into an increasing phenomenon, and the end of the rivalry between the US and the Soviet Union, which characterised the Cold War, provided the opportunity for an international shift in the global processes that impacted the overall global relations. Non-military sources of risks such as environmental degradation, ethnic conflicts, terrorism, poverty, and human rights violations became more relevant than ever, and so new concepts such as “environmental security”, “human security”, and “common security” turned into a fundamental part of the daily agenda, which governments, NGOs, and other relevant bodies involved in the support of international security had to face. Within such a context, international migration became a highly relevant political topic that required a significant amount of attention and collective response.[9] The Syrian civil war and the complicated internal situation of Iraq, Afghanistan, and Libya contributed significantly to the evolution of the perception

[8] Wikipedia, 2025.

[9] Lohrmann, 2000, pp.4-5.

that existed towards people mass movements, so they were no longer seen as humanitarian crises only, but they became a real political and security issue, which was highly supported by the narrative of illegal border crossing, terrorism, refugees, etc., so public perception of similar events was significantly influenced and produced wrong stereotypes within the international and EU domain.[10]

What is most concerning about contemporary forced displacement events is the dynamics and complexity they hold internally. Indeed, Russia's invasion of Ukraine represents the most severe refugees crisis that Europe has faced after WWII, with slightly more than 5 million recorded refugees in Europe and more than 5.6 million recorded Ukrainian refugees globally.[11] A "Case Study" analysis is provided later in this paper to examine the distinctive elements of a contemporary example, supporting the purpose of the research.

An important characteristic of global people mass movements resides within the evolution of their existence. Recent conflict-induced movements are no longer seen as simple humanitarian crises that require immediate support for affected people and their basic survival necessities, but they also represent a real security threat for the international community, including NATO and the EU. The episodes of voluntary manipulation from governments are increasing, and the opportunities to support hidden risks and hazards through migration and displacement became more concrete.

Violence and conflict episodes are now more frequent and prolonged, especially in the short term spectre, and usually originate from areas that are part of already underdeveloped or aggravated regions. In addition, and as already mentioned within the previous paragraphs, official data from governmental institutions such as UNHCR show a negative aspect of global forced migration and IDPs, with numbers reaching record levels.

Today, crises of such nature and volume require not only a prompt and efficient humanitarian intervention to support the displaced population, but it is also necessary to guarantee proper coordination between institutions, organisations and the civil

[10] Toci, 2021, p.25.

[11] UNHCR, 2025b.

population to manage the crisis and to reduce the risk of further impacts on the affected hosting countries and communities.

Global conflict-induced displacement as part of the security system

When conflict-induced mass movements are analysed on a deeper level, it is important to focus on three main domains that are affected by the generated pressure and amount of threats, and they are, respectively the “individual”, “national”, and “international security”.[12] Conflicts and violence primarily impact the individual state of security that affected people usually perceive, and in terms of forced migration, their basic human rights are almost completely ignored, while the national and international stability are highly endangered due to the globalisation processes and interconnection which nowadays exist among countries and regions. This aspect emphasises the fact that risks and hazards within an open global system are capable of projecting their effects towards other actors, which are not directly involved, but a strict connection exists, and it includes the major sectors and governments in the contemporary and international community system.

The fundamental point of concern that this paper focuses on the first place regards the individual security. The reason for this choice resides within the importance of this security factor, since affected people on the impacted territory are directly involved and are considered as a first-line category that absorbs the effects of said crisis. The type of environment within which the phenomenon evolves generates risks for both internal and external security of affected people, so it is possible to register them within their country of origin and during the transition process that consists of the real migration flow towards safer international borders.

With episodes of violence it is more likely to confirm a complete lack of respect for human rights, especially under an unstable, corrupted, or weak governmental apparatus. People lose access to fundamental services, life security, protection, healthcare, infrastructure, home, education and labour, hygiene products and services, food, or water. UNCHR[13] also provides a brief exposition of some of the main risks that people face while moving from Africa to Europe, and the information is

[12] Lohrmann, 2000, p.4.

[13] UNHCR, 2024c.

generally related to displacement processes from other regions too. The organisation emphasises the following data: “Tragically, many of them die while crossing the desert or near borders, and most of them suffer serious human rights violations *en route*, including sexual and gender-based violence, kidnappings for ransom, torture, physical abuse, arbitrary detention, trafficking in persons and collective expulsions”. It also confirms that “the absence of critical services is placing refugees and migrants at great risk of harm and death and is also triggering dangerous secondary onwards movements. Some refugees and migrants underestimate the risks, while many fall victim to the narratives of smugglers and traffickers”. There are many examples of people losing their lives while travelling from Africa by improvised boats. However desperation, misinformation, and lack of proper education about safer options push them to seek assistance from traffickers and smugglers. In general, the most vulnerable ones are women and children.

On the other hand, living conditions of internally displaced persons (IDPs) could also be aggravated. On many occasions people who do not have the opportunity to move and flee the impacted area decide to move internally or seek humanitarian assistance within designated camps. However, this situation is useful to underline the fact that most of the time such groups of people are actually more endangered by residing in, or moving internally to the critical area since they represent a direct target or lack fundamental services and products that are needed for their survival. The situation in the area of Gaza is a proper example of how a specific conflict or crisis can affect IDPs, with people dying from starvation, violence, lack of healthcare, basic services, and the absence of protection for their human rights.

The second fundamental security factor that this research paper analyses is related to the concept of national security. Although refugees and migrants are not directly considered as threats per se, mass population movements could be seen as a potential source of future national instability in the host country, as well as a trigger of the development of criminal, asymmetrical, or hybrid threats and attacks towards a specific country. One of the most important aspects of national security threats provoked by forced migration is currently related to border stability and prevention against irregular border crossings or attempts. The EU has gained a significant advantage in this regard in recent years due to newly introduced regulations and restrictions, which require a strict approach concerning the management and

regulation of people seeking protection from an EU member state. However, pressure on territorial borders of transit and host countries remains constant and must be monitored in order to guarantee stability and collective security by preventing unauthorised individuals and criminal activities from entering the country or region.

Another important component that this paper analyses concerns the social aspect and how the local population reacts to or integrates external flows of displaced people. Public opinion and perception of forced displacement (especially when originating from specific regions such as Africa or the Middle East) are very much altered and affected by episodes of misinformation, lack of relevant information, or adequate media response, so in some specific cases displaced people within the host country are perceived as a negative phenomenon that most of the time is linked to singular episodes of irregular border crossing, criminal activities, terrorism, cultural anomalies, etc. Migration and displacement are "weaponised" and destabilise the public attitudes by supporting antagonistic responses to migrants and refugees. A similar approach is adopted by countries such as Italy, where there is no clear distinction between legal, illegal or asylum seekers.[14] An unstable public response is considered a crucial factor when migration and displacement topics are studied due to its relevance and the attitude to generate negative tendencies and approaches towards displaced people and migrants, such as xenophobia, radicalism, internal exclusion, social segregation and luck of trust. In some instances, migrants and refugees are perceived as "intruders" who disrupt the national identity of the host country. The possibility of a direct confrontation and misunderstanding between the local population and external groups of foreign people cannot be excluded. Some episodes of violent confrontations between local and foreign groups were recently registered in Spain during the month of July, and more precisely in the city of Murcia.

In addition to the abovementioned information, it is necessary to include the economic pressure that a specific host country faces during crises with such extension. Hosting displaced people not only puts additional pressure on border control and the social sphere, but it also increases the economic burden that the country in question faces in order to provide the necessary services, products and accommodation for displaced people, which require a high and proper amount of resources. On one side

[14] Toci, 2021, pp. 24-25.

displacement and migration are considered as a positive factor with a special impact on the labour market, since usually low-qualified labour positions are fulfilled by the newly integrated people, and this undoubtedly supports the economic growth within that specific country. However, managing and organising large flows of displaced people represents a challenging task since the host country must provide the necessary living conditions and accommodation while working on the official registration and legalisation procedures.

The internal national situation could be additionally complicated when large flows of displaced people are instrumentalised from surrounding countries with the intention to generate additional pressure and to manipulate the stability of certain regions or countries. A deeper review of this topic is provided lately in this paper.

In this sense it is possible to focus on the third domain within the security system, which is **international** security. Lohrmann[15] examines the international impact that displacement and migration might exert, and the outcome provides a brief overview of nowadays global response to such phenomena by confirming that it impacts "the relations between States, as movements tend to create tensions and burden bilateral relations, thus impacting upon regional and international stability".

Indeed, severe displacements of people from a conflict zone towards neighbouring countries or more developed regions might aggravate the international relations among them and bust the negative internal condition of already underdeveloped or fragile countries. Some of the most concerning aspects that negatively impact the international security system are the deliberate manipulation of mass population movements, the spread of terrorism, criminal networks and activities, and worsening geopolitical relations. On the other hand, regional conflicts and civil wars are increasing, which provide a solid background for additional political tensions.

U.S. and EU approach in managing forced displacement

A closer look at the U.S. and EU approach in managing large mass movements of forcibly displaced people in today's contemporary security system is required in order

[15] Lohrmann, 2000, p.4.

to produce a correct analysis of the overall global situation around people mass movements. The U.S. and Europe (especially EU member states) are considered the main destinations for migrants and forcibly displaced people, so this research paper reviews their approach in managing similar events in order to trace a clear view of their policy, which is reviewed to support the overall NATO strategic plan and to produce an adequate package of recommendations and proposed solutions.

The U.S. is considered one of the countries with the most generous response towards migrants and refugees, hosting large numbers of people in need of protection. In fact, the U.S. was the largest recipient of individual applications for protection in 2024, with approximately 729,100 applications.[16] However, during Donald Trump's first and second administrations, the American approach in this sense went through significant changes that now apply a much stricter policy in migration and displacement management. Similar national strategies in terms of people mass movements are often criticised and seen as possible trigger factors for additional international instability and tensions due to the inability to protect enough people in need and the eventual transfer of large groups of people towards other regions that might not be ready or supported to provide a proper response to the crisis.

The country has been historically operating through the so-called USRAP programme, which stands for the United States Refugee Admissions Program. It is regularly managed by the U.S. State Department in cooperation with competent agencies and organisations that assist the admission of refugees, and the process is usually completed through the support of the UN High Commissioner for Refugees (UNCHR), which first collects information and documentation from people in need of protection and then refers each individual to the State Department Resettlement Support Centers (RSCs) in order to complete the final interview and information control.[17] Asylum seekers may forward an application only if physically present in the U.S., and the process, as well as the required information for the application, is supported by the U.S. Citizenship and Immigration Services (USCIS). At the time of writing, President Donald Trump has implemented an executive order suspending the USRAP programme until further notice due to the inability of the country to host additional

[16] UNHCR, 2025a, p.2.

[17] Roy D., et al. 2025.

migration flows, especially in terms of refugees. In addition, the decision aims to protect important resources for Americans, as well as their safety and security, both individual and national. The decision took effect on January 27, 2025, and left already approved refugees for resettlement abroad, while those who are already resettled are currently without support.[18] Although the decision to suspend the programme was originally intended to last 90 days only, it has yet to be resumed.

In terms of national security, the U.S. currently operates towards another fundamental aspect in regard to irregular border-crossing, transnational crime and immigration, which aims to support the state of security for the country through the assistance of the U.S. Immigration and Customs Enforcement (ICE) agency. The latest data from June 2025 provides the following results, which the paper includes in Table 1:

Table 1. Immigration and Customs Enforcement

Type	**Record**	**Time frame**
Arrests	265K	Sep. 2023 - June 2025
Detainers	316K	Sep. 2023 - June 2025
Detentions	1.23M	Sep. 2023 – June 2025
Encounters	1.28M	Sep. 2023 – June 2025
Type	**Record**	**Time frame**
Deportations	144K	Jan. 2025 – June 2025
Flights	3K missions and 341K passengers	Oct. 2018 – May 2020
Risk classification assessments	330K and 347K	Oct. 2022 – Sep. 2023 Oct. 2021 – Sep. 2022

Source: Deportation Data Project, 2025.

The recent events in the U.S. along with the public mass deportations of illegal immigrants and criminal aliens, especially towards southern countries such as Mexico, were severely criticised, and additionally aggravated Donald Trump's public support. However, the American policy in terms of displacement and immigration management is still active and confirms the rigid position that the administration holds about the

[18] The White House, 2025.

topic. The official website of the U.S. Immigration and Customs Enforcement (ICE) has already published a substantial list of people who have been successfully either arrested (and detained) on U.S. territory or removed from the country. An official campaign under the name “Return to Mission” has also been published on the same website with the intent to recruit veterans to support ICE and to additionally secure the public and national integrity. The available positions might be: deportation officers; criminal investigators; general attorneys.[19]

A similar but more pragmatic approach is adopted by the states of the European Union, which agreed on a more rigid approach in managing displacement of refugees and asylum seekers in order to provide a clear set of procedures to guarantee protection and to secure the integrity of the European borders and population. Unlike the American position, the EU integrates a more conscious and open-minded solution, which is based on international cooperation and mutual support to provide a proper response in terms of granting protection, hosting legal migrants, and repatriating those people who are currently not legally eligible to reside within the EU by always considering their human rights and necessities. The EU strategic plan is described as follows: “The EU works to build comprehensive, tailor-made and mutually beneficial partnerships with key countries of origin and transit, covering all aspects of migration, including providing protection, addressing root causes, strengthening migration governance and management, fostering cooperation on return, readmission and sustainable reintegration, fighting migrant smuggling, and developing legal pathways”.[20]

The current framework the EU is following to manage migration and forced displacement of people is represented by the Pact on Migration and Asylum, which must be fully implemented by June 2026 and should focus on four main points, which are, respectively: secure external borders, fast and efficient procedures, effective system of solidarity and responsibility, and embedding migration in international partnership. Figure 2 provides a summary of the said framework through a visual representation.

[19] ICE, 2025.

[20] EEAS, 2025.

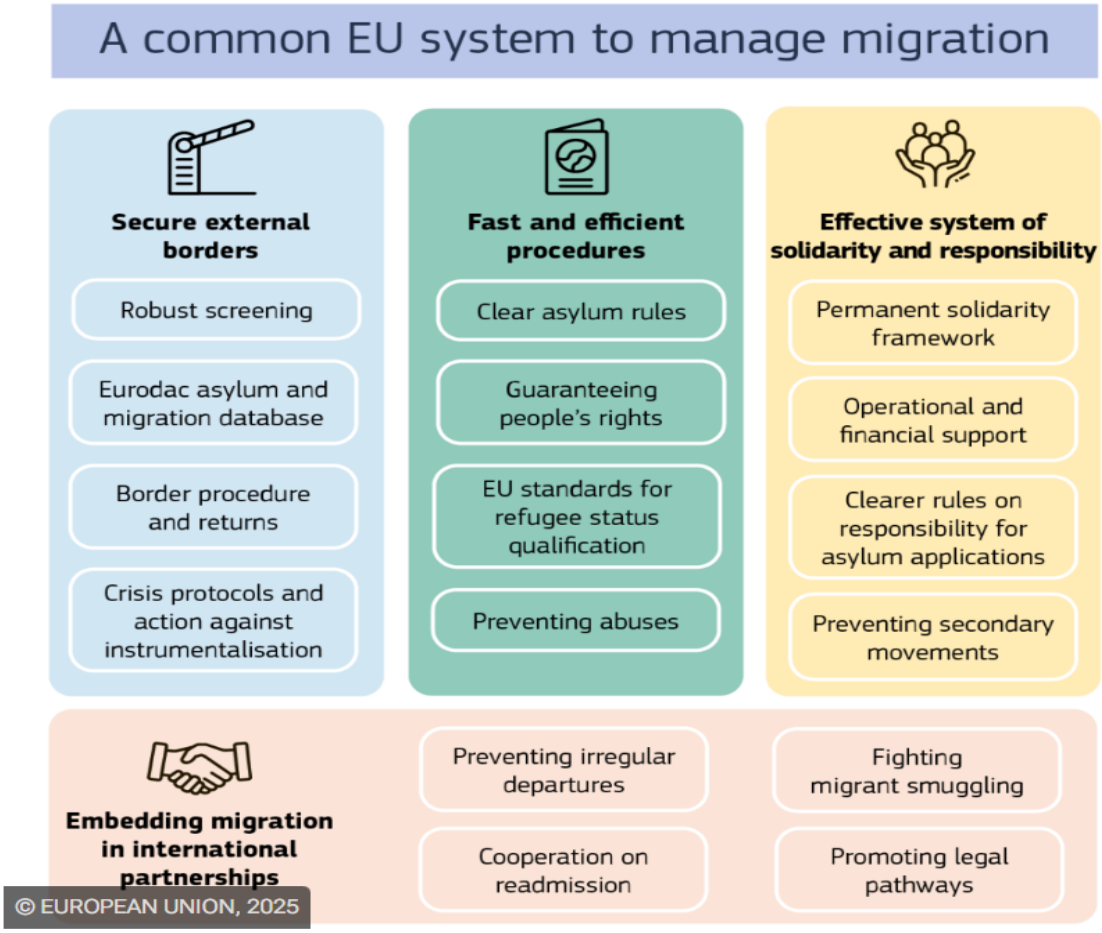

Figure 2. The Pact on Migration and Asylum. (Source: EEAS, 2025).

One of the most significant distinctive elements of the Pact on Migration and Asylum is the intent and effort to remove the excessive pressures on certain countries only and to balance the responsibilities and solidarity between Member States in terms of migration and crisis management.

The European Commission[21] confirms a positive outcome in relation to the results and current status of the framework. In addition, an official report was published on behalf of the Commission during the month of June in order to evaluate the progress and to point out the critical factors on which member states and partners should focus by 2026, and before implementing a new long-term Pact on Migration and Asylum. As an overall statement, the report confirms positive trends. However faster procedures and work are required in order to be able to cover the pre-defined deadline. The Pact focuses on the mutual cooperation between Member States, the European

[21] European Commission, 2025a.

Commission, EU Agencies, and international partners. In this sense, the EU is committed to providing a smooth, simplified and faster environment of work when it comes to managing people movements between member states and partners. The report emphasises the importance of common standards and coordination in order to support each country on a national level first. Agencies play a fundamental role in this regard, as they assist the overall procedures and identify challenges by eventually proposing proper solutions. The most important agencies, which are identified within the report, are:

- The European Union Asylum Agency (EUAA) – it supports member states in following the EU legal framework in terms of asylum and international protection;
- Frontex – it provides guidelines, tools, and support in the area of competence, as well as assistance and quality control around border protection, return of people, or risk assessments;
- eu-Lisa – assists the management of external borders, the registration of irregular immigrants and asylum seekers inside of the EU, and the definition of adequate rules and norms that are used to control the borders and the entire system of procedures around managing displaced people and immigrants. The EU operates through the Eurodac database in order to scan and manage asylum applications or detect and prevent the evolution of criminal activities or terrorism.

In addition, the Pact is financially supported by the EU. The report confirms that an additional amount of EUR 3 billion will be provided to the member states in order to support its implementation and to properly manage refugees from Ukraine. In this sense it is important to emphasise that although the EU provides support and guidance in this direction, it is still fundamental to maintain a constant development of each national implementation plan (NIP) that is in force inside of the member states' borders. Each one of them is required to develop a pack of rules to address the challenges by defining timelines, training sessions, procurement, and recruitment under the supervision and support of the Commission. Some member states are yet to submit their NIPs, and the procedure must be accelerated in the near future to comply with the requirements. Digitalisation processes are fundamental to providing continuity through the support of the EU tools and instruments. Bulgaria is pointed out

as an example of a member state that takes advantage of the TSI (Technical Support Instrument) support to modernise its IT systems and to guarantee the workflow in terms of asylum procedures.

Analyzing the dynamics

The theoretical aspect of this research paper laid the basis for the current conflict-based displacement dynamics study and provided a brief overview of the conceptual framework that the U.S. and the EU follow to manage such crises at the moment. This aspect gives the opportunity to dive into a more technical part, which analyses the main displacement crises and causes, the consequential trends, and the effect they produce on the surrounding environment with the intent to gather common elements that generate movements and displacement of affected people and to understand how they evolve and influence a certain region or system. In order to confirm the results from the produced information, the paper includes a “Case Study”, which reviews the Ukrainian crisis.

Tracking contemporary displacement causes

In its latest Global Trends 2024 report, UNHCR[22] identifies seven key displacement areas that have caused severe internal and cross-border movements of people, and they are, respectively Haiti, Sudan, the Democratic Republic of the Congo, the Syrian Arab Republic, Afghanistan, Myanmar, and Ukraine. The situation in the Gaza Strip should also be considered among these areas due to the worsening humanitarian condition of the local population. Although some of the abovementioned territories are not close or strictly related to NATO’s borders, it is still convenient to briefly analyse them in order to identify the main structural elements.

The analysis begins with the Americas, highlighting a difficult internal condition in Haiti, which contributed to an increase in displacement in 2024. “Persistent political instability and the consolidation of criminal gangs explain the rise in violence and displacement in 2024. A coalition of gangs known as *Viv Ansanm* carried out a growing number of coordinated attacks at the end of 2023 and throughout 2024. Assaults on

[22] UNHCR, 2025a.

government buildings and infrastructure during the first quarter of the year led to the disruption of services and the temporary closure of the airport. Some displacement sites were also temporarily closed, leaving many IDPs without shelter".[23] The internal instability that the country faces is a proper example of complex national security decay that severely affects the individual state of security and provokes important movements of people, especially of children and women, who are targeted by gangs and organised crime through an unprecedented violation of human rights. Episodes of gender-based violence, rape, sexual abuse, kidnapping and recruiting in gangs (specifically children) serve as an instrument of control over a significant part of the population.[24]

The roots of the challenging internal condition in Haiti originate back in the history when colonial exploitation was rising, and the country went through several periods of time under alternating control of global powers such as the U.S., France, or Spain. Consequences were severe, and the internal stability was highly affected, leading to political and military corruption. During the following years, several UN missions were carried out to relieve the crisis, but with no results. The lack of strong central and political power led to the formation of gangs and criminal activities, which continue to gain more stable positions and aggravate the political, economic, social and humanitarian crises in Haiti. This paper identifies an additional factor, which contributed to the forced displacement crisis, and it is more precisely related to natural disasters that aggravate the country's instability. Between 2010 and 2023, Haiti dealt with severe floods, earthquakes and hurricanes with intense impact on the territory. As of June 2025, more than 1.2 million people (11% of the Haitians) are registered as IDPs, which means that 55% of them are women and 53% are children.[25] "Almost half of Haiti's 11.9 million civilians require humanitarian assistance, and acute food insecurity affects more than 5 million people. The number of Haitian refugees and asylum-seekers grew by 72,700 during the year to reach 423,300. Almost all of them were hosted by other countries in the Americas"[26]. Some of them chose primarily the Dominican Republic due to the position of the national borders between the two

[23] IDMC, 2025, p.83.

[24] IDMC, 2025, p. 83.

[25] IOM, 2025a.

[26] UNHCR, 2025a, p.9.

countries. A look at the asylum applications from Haitians, shows also that 46.600 people in need of protection forwarded their requests to the U.S. by the first half of 2024.[27]

The overall review confirms an unstable country with nonexistent governmental control and support that is the result of high levels of corruption and historical factors. The evolution of organised crime provokes degradation in securing the individual safety and human rights and influences all of the fundamental national sectors that are necessary to guarantee the continuity of the respective processes, which serve as an engine for the country and its society. The generated violence, the lack of protection over the population, severe famine, health crises, or aggravated humanitarian situation allows the development of IDPs and refugees in search of protection and safety, as in Haiti.

The second area, which this research analyses, is part of the African continent, and it represents the crisis in Sudan, which is also the world's largest internal displacement case in modern history.

The cause of the deep internal crisis, which is worsening in time, is characterised by several important and distinctive factors, but the most critical one is represented by the ongoing *civil war* between the government's Armed Forces and the paramilitary force Rapid Support Forces (RSF), although the country is affected by a complicated historical background, which supported the nowadays unstable and violent environment in the region. Several civil wars took place during the 20th century due to a large division between what represents the majority of the population, so Muslims and Arabs, and the rest of the religious minorities that were represented mainly by Christians. The confrontation led to the division of the country between Sudan (officially named the Republic of Sudan) and South Sudan, and the internal situation of Sudan kept worsening, leading to the period of time between 1989 and 2019 when Omar al-Bashir became the leading president by bringing to life a strict dictatorship. In 2003 the Darfur War erupted in Sudan by carrying on a highly condemned genocide of the non-Arab population, and in this sense Bashar persecuted several religious minorities, including representatives of Christianity, Sunni apostasy, and Shiism, especially through the RSF. This fact brought public protests supporting democracy

[27] UNHCR, 2025a, p.48.

and a new government. The protests ended in a coup in 2019 led by the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) by establishing a transitional government. Uncertain years came without a proper governmental apparatus and with the presence of violent military representatives in the higher positions, such as General Abdel Fattah al-Burhan (on the side of SAF) and Mohamed Hamdan “Hemedti” Dagalo (on the side of RSF), who were incapable of concluding an agreement about the integration of the RSF into the SAF. In addition, it is possible to confirm that by 2022 they both covered high governmental positions during the so-called “transitional” period of time to civilian leadership and national elections. Disagreement on important aspects rose between Burhan and Hemedti, and the transition was hindered, leading to a military confrontation between the two parties in April 2023, when violent explosions took place in Khartoum, and Burhan and Hemedti accused each other of said events. Conflicts continued, and the RSF were accused of restoring the ethnic cleansing of minorities and for committing severe war crimes, including sexual violence against women and girls. Several international organisations and NGOs brought to light the outcome of such actions and confirmed the negative results and trends with a request for an immediate ceasefire. Today, the civil war between the two parties continues, and the humanitarian crisis worsens.[28]

At the end of 2024 a total of 14.3 million Sudanese people were displaced, with the majority of them being inside of the country or the neighbouring ones.[29] The number of registered IDPs in 2024 is around 11.6 million people, which is 2.5 more than in 2023. RSF and supporters have been accused of intentionally targeting humanitarian camps of displaced people, and this assists the worsening condition of local and civilian populations that face extreme poverty, lack of fundamental services, respect of human rights, clean water, and severe famine or food insecurity that affects more than 24.5 million people.[30] UNHCR[31] confirms that approximately 2.8 million people are registered as refugees and asylum-seekers in 2024, and most of them are located in Chad (1.1 million) with 65,000 more arrivals in 2025, Egypt (602,700) and South

[28] Center for the Preventive Action, 2025a.

[29] UNHCR, 2025a, p.8.

[30] IDMC, 2025, p. 38.

[31] UNHCR, 2025a, p.8.

Sudan (487,700). There is also an increasing number in refugees in Libya (+198,400) and Uganda (+50,400).

The third area that this research reviews is the Democratic Republic of the Congo, which represents an additional example of a worsening humanitarian crisis with severe displacement, violation of human rights (especially regarding women and girls who are brutally raped, abused, or forced to sell themselves to survive), and a growing military conflict that evolves regionally and implicates the intervention of international organisations and global leaders such as the U.N., the US, and China.

The country is marked by a complicated historical background followed by the ongoing military confrontation between the Congolese army and the rebel groups of the so-called “March 23 Movement”, or more commonly abbreviated M23, which represents a Congolese Revolutionary Army created and supported by the state of Rwanda (with a primarily Tutsi ethnic population). Before the current complicated and violent regional environment, the country saw several decades of more aggression, which began in 1996 with the First Congo War as a response to the genocide in Rwanda when approximately 1 million Tutsis were killed by the Hutu extremists. Consequentially, Hutu refugees fled to Congo, and a minor part of them hid extremist representatives. The Democratic Republic of the Congo was later invaded by the leading Rwandan (at the time Tutsi-led government) militants with the controversial intention to remove the Hutu minorities in the DCR, which still represented a threat for them. The relationship between the two countries deteriorated further and caused the explosion of the Second Congo War in 1998 when the former president Kabila distanced himself from his partners in Rwanda and Uganda and started the Rwandan demilitarisation in the eastern area of the DRC, giving the opportunity for the Hutu extremists to establish their presence once again. The response from Rwanda gave the start of the Second Congo War with a new invasion of the DRC. President Kabila was murdered in 2001, and his son Joseph Kabila took power and began implementing several peace agreements. However, the situation deteriorated again with the formation of the M23 groups, which supported the violent confrontation between the two parties. Indeed, the early stage of the 2025 witnessed a new violent wave of aggression when the M23 took control of the DRC’s city of Goma.[32]

[32] Center for Preventive Action, 2025b.

An additional factor worsened the regional stability around DCR due to the presence of important *natural resources* such as cobalt, uranium, copper, coltan, or gold. Not only have global powers such as the U.S., or China established their own companies within the territory to gain control over the resources, but global experts confirm that Rwandan military forces and M23 groups have been involved in special operations that aimed at establishing further control over the mines and excavation areas reach of said natural resources. “At the end-2024, 7.4 million Congolese were forcibly displaced, with more than 8 in 10 of them remaining within their country. Many of those forced to flee have been displaced several times. In 2025, the conflict has escalated further, triggering repeated internal displacement. Close to 140,000 people had also fled the country by early May 2025, primarily to neighboring Burundi and Uganda.”.[33]

The official statistics from 2024 show the latest data in terms of people movements from and within the DRC, and they confirm that 7.8 million are IDPs, 517,500 are registered as refugees or asylum-seekers in the DRC, 528,400 are IDP returnees, and 936,373 are considered refugees or asylum-seekers in neighbouring countries such as Angola, Burundi, RoC, Uganda, Rwanda, Zambia and the United Republic of Tanzania. Displaced people are forced to survive without shelter, basic services and products, protection (especially against sexual violence, gender-based abuse, and exploitation), food and water resources. Health issues such as the mpox epidemic are also increasing.[34]

It is important to mention that the crisis in the DRC does not represent the exclusive negative phenomenon on the African continent. Indeed the most recent information provides a further dive into the Sahel region, where severe displacement processes exist and constantly evolve. The territory is characterised by extreme episodes of violence, aggression, terrorism and unstable political and economic systems, which negatively affect the population and the already difficult living conditions. At the end of 2024, 2.1 million people are registered as IDPs in Burkina Faso, 507,000 in Niger, and 361,000 in Mali. The refugees and asylum seekers in these countries are equal to approximately 320,000. The Global Trends 2024 report provides some additional information about the people who chose to move outside of the national borders, and

[33] UNHCR, 2025a, p.9.

[34] UNHCR, 2025d.

they are, respectively 158,000 in Mauritania, 66,000 in Cote d'Ivoire, 40,000 in Togo, 16,000 in Benin, 29,000 in Italy, 15,000 in Nigeria, and 64,000 in other countries.[35]

Moving on to the fourth area, the paper examines the causes of displacement originating from the Syrian Arab Republic, which generates one of the most severe cases of forced displacement in contemporary history. The analysis confirms that the phenomenon is the outcome of two main causes represented by the civil war (which began in 2011) and the devastating earthquake that hit Türkiye and Syria in February 2023 by additionally aggravating the existing situation in the region.

The internal civil war represents the most relevant factor in terms of mass movement flows inside and outside of the country due to its high level of aggression and prolonged duration. As with the previously analysed crises, Syria also represents an example of a state with a difficult historical background, terrorism, and an unstable and corrupted government under a dictatorship regime (supported by Russia and Iran), which gave the opportunity for external actors to intervene (most often through proxies) in order to strengthen their international positions and national interests. The conflict evolved in 2011, as civilian and pro-democracy protests, carried on by citizens and rebel groups (supported mainly by Türkiye, some Gulf Arab states, the U.S., France, the UK, and Italy) opposed to the former leader Bashar al-Assad, turned into a violent confrontation with the acting government. In addition to the complicated internal situation, the Islamic State began putting efforts into aiming to control Syria and to establish a local affiliate of Al Qaeda (Nusra Front, which then merged with ISI and operated under the name ISIS/ISIL). Terrorist attacks were organised in Europe during the year 2015 and consequentially induced the military intervention of European countries (such as France), while on the other hand Turkish military forces were deployed against the Kurds in Syria. Several diplomatic attempts were made throughout the following years in order to resolve the crisis, but with no durable results. Violence and aggression continued on the territory through a complex confrontation coming from many directions and involved parties. The most recent events underlined some fundamental factors (which alleviated the displacement crisis by contributing to the growing number of people who decide to return to Syria), and they involves the defeat of the Islamic State in 2019, which lost control of all the occupied Syrian

[35] UNHCR, 2025a, p.24.

territories, as well as the decision of former President Assad to flee the country and take shelter in Russia in 2024.[36] Although the Islamic State was defeated, it still represents a serious threat to the country. The situation deteriorates additionally in 2025 as a consequence of new waves of violence between military forces from the new administration and supporters of the Assad regime. Monitoring efforts are required in terms of Israel-Syria relations as well, due to the worsening events in 2025. Recent news and information registered violent attacks on Syria's military HQ in Damascus and the establishment of Israeli military bases inside of the buffer zone in southwestern Syria, which is currently under UN control.

The overall conflict and extremely hazardous internal condition in Syria caused more than half a million deaths in total and generated an unprecedented flow of people mass movements with at least 13.5 million displaced globally.[37] International data shows that at least 6.1 million Syrian people are registered as refugees and asylum-seekers, and 7.4 million are IDPs. Türkiye hosts the majority of Syrian internationally displaced people (2.9 million), followed mainly by Lebanon (755,000), Jordan (611,000), Iraq (304,000), Egypt (147,000), Germany (788,000), and other countries (703,000).[38] As of the end of 2024, 768,000 Syrians are recorded as part of internal displacement movements within the country.[39]

The next displacement crisis that the paper analyses briefly regards the situation in Afghanistan, which nowadays is considered the largest protracted refugee crisis. Afghan people represent today the third largest displaced community from a global perspective after Syria and Ukraine due to the protracted conflicts, which persisted for more than 40 years, and a series of devastating natural disasters. The poor living conditions, the economic downfall, or the absence of a stable governmental apparatus significantly contributed to the instability of the country. However, the historical conflicts, especially the governmental transition of 2021, which was supported by the uprising power of the Taliban representatives, brought Afghanistan to one of its lowest points in contemporary history.

[36] Center for Preventive Action, 2025c.

[37] UNHCR, 2025a, p.6.

[38] UNHCR, 2025a, p.14.

[39] IDMC, 2025, p.44.

The analysis confirms that severe migration flows from Afghanistan began during the Soviet era first, when the Soviet forces invaded the country in 1979 to support the communist regime. By 1989, the Soviet forces were forced to flee after the support of the U.S., but the episode was followed by the imminent civil war (1992-1996), which was the result of the government's collapse. However, the situation worsened additionally in 1996 when the extremist Islamic group of the Taliban took control of the country and established the Islamic Emirate of Afghanistan. The regime of terror and the complete lack of respect for human rights, especially considering women and girls, contributed severely to the increase of people's mass movements. Although the country's internal condition was highly aggravated by the existing regime and difficult historical background, the region witnessed a new wave of mass displacement as a result of the September 11, 2001, attacks in the U.S., which led to "Operation Enduring Freedom" against al Qaeda and activated for the first time in history Article 5 of the North Atlantic Treaty. However, when the U.S. and the respective allies left the country in 2021, the Taliban took control over the territory once again by generating a new series of people mass movements.[40]

As of the end of 2024, approximately 4.2 million people were IDPs[41], while among the 6.1 million internationally displaced people, 90% of them live in Iran or Pakistan.[42] "There were 10 per cent fewer Afghan refugees reported at the end of the year (5.8 million). The Islamic Republic of Iran (3.5 million, -7 per cent) and Pakistan (1.6 million, -22 per cent)".[43]

The situation in Myanmar represents another example of a complicated internal condition that has an important repercussion on the local population by pushing millions of people to flee their homes and country.

As a former British colony, Myanmar is characterised by a difficult historical background and years of violence, with the latest episode being turned into a large-scale civil war. Indeed, the paper identifies two main causes that contribute to the displacement crisis concerning the country, and they are related to the ongoing civil

[40] Naseh, 2025.

[41] IDMC, 2025, p.65.

[42] Naseh, 2025.

[43] UNHCR, 2025a, p.10.

war and the ethnic persecution of Rohingya people, who represent a Muslim minority group in Myanmar.

The several decades that went from 1969 to 2011 consist of a historical period of time during which Myanmar was ruled by the military junta that essentially controlled all aspects of the country's daily life. However, an important step ahead was done in 2015 when the National League for Democracy (NLD), represented by Aung San Suu Kyi, won the elections, although it managed to maintain the positions only until 2021, when the army gained its power back in a coup, and Aung San Suu Kyi was detained. The response to the imminent crisis was the intervention of civilian protesters who soon took part in the violent confrontation with the military, and the aggression increased. In addition, the country faced one of the most violent ethnic cleansing episodes in 2017, when the military organised a campaign against the Rohingya people, who were stripped of their rights and were either tortured, murdered, or forced to flee. They are nowadays considered one of the largest stateless ethnic groups in the world. According to UNCHR[44] there were approximately 4.4 million stateless people in 2024, which includes 1.8 million Rohingya people in total. Due to the violent approach towards the Rohingya, the phenomenon has been highly compared to a genocide by the international community.[45] During the same year 655,500 Rohingya people were forced to flee to Bangladesh by joining the already displaced community from previous persecutions and bringing the total amount of displaced people to 923,200. A new wave took place a few years later and brought an additional amount of 118,300 people by May 2025.[46]

UNHCR[47] provides a substantial set of the latest data concerning the country's condition in terms of IDPs, international refugees and asylum-seekers. The Global Trends 2024 report confirms that the number of IDPs in Myanmar reached approximately 3.5 million people by March 2025, and in addition, 1.5 million people were registered as refugees or asylum-seekers who chose to move within the neighbouring countries. The official data from 2024 shows that 74,000 fled to India, 1

[44] UNHCR, 2025a, p.57.

[45] Ratcliffe, 2025.

[46] UNHCR, 2025a, p.19, p.21.

[47] UNHCR, 2025a, pp. 19-22.

million to Bangladesh, 3,000 to Indonesia, 129,000 to Malaysia, 81,000 to Thailand, 25,000 to Japan and 20,000 to other countries.

To further contribute to the research, the current paper briefly reviews the official data in terms of the crisis within the Gaza Strip, since it represents an important topic of conflict-induced displacement. The events within the territory are the consequence of historical rivalry, territorial disputes, extremism, and unresolved issues. However, the Israeli attack on the Palestinian territory in October 2023 caused an extended wave of displacement and fatalities. The humanitarian crisis along the Gaza Strip, at the time of writing, is one of the most devastating on a global scale. The latest official data confirm that more than 61,000 people have been killed, while 2 million are considered IDPs, which is more than 90% of the population.[48] The humanitarian aids and organisations such as UNRWA are currently banned from entering the Gaza Strip, unless explicitly permitted by the Israeli government. The levels of famine significantly increased during the last months, and the delivery of fundamental support from the international community is most of the time banned.

Definition of existing trends and impact on the surrounding environment

The World Economic Forum[49] analyses a fundamental aspect of the surrounding and future risks, which affect the global environment and the processes that derive from daily events and people's evolution. Based on its latest Global Risks Report 2025, it is expected to see an increase in the state-based armed conflict and violence which characterised the last decades. Episodes of violence and aggression, as well as the geopolitical tensions and the economic and technological rivalry among nations and global powers, constitute the bases for future confrontation and aggravation of international relationships, or the already unstable conditions of some regions or countries, which are incapable of providing a sufficient amount of security and stability for local people, who are often pushed to move in order to satisfy their basic needs, to preserve their security status, and to elevate their social position. Conflictual situations, violence, war, aggression, and lack of respect for human rights provoke the

[48] UNHCR, 2025a, p.9.

[49] The World Economic Forum, 2025, p.7.

erosion of a specific security system and generate people mass movements in neighbouring territories or developed countries. Considering the abovementioned information and the prediction of increasing episodes of conflicts, it is important to take action in time in order to build a proper response and to elevate the level of resilience within NATO and allies when it comes to managing crisis, which are related to displacement and migration flows.

The analysis of conflict-induced displacement confirms that 67% of people, who are considered refugees, still relocate within neighbouring countries. The current trends indicate that 73% of them relocate within low- and middle-income countries, while 23% remain within some of the least developed countries. This is particularly alarming, as international organisations report that, compared to the end of 2023, 9% more displaced people - approximately 8.4 million refugees - reside in these least developed countries, which means that significantly more pressure and burden are generated for territories that are already underdeveloped or unstable, and that face significant struggle to provide sufficient support for both local and hosted population. The current data shows that the number of global refugees faced a slight fall of -1% at the end of 2024, so approximately 42.7 million people are included within the official sets of information, and the disaggregated data provides the following demographic estimates in terms of age and percentage of the current refugee population:

- Male refugees ► 21% are between 0-17 years old, 27% are between 18-59 years old, 2% are 60+ years old;
- Female refugees► 20% are between 0-17 years old, 27% are between 18-59 years old, 3% are 60+ years old.

A decrease of -13% in 2024 is also calculated in relation to global asylum applications, which means that the total amount of requests at the end of 2024 is nearly 4.8 million. On the opposite side, the paper analysis confirms a growth in global IDPs, and the statistics evaluate an increase of approximately 9% in 2024, which means that the total amount of IDPs is nearly 73.5 million people (20.1 million more than the previous year). The disaggregated data for IDPs is currently not complete due to technical challenges in terms of data entry and registration. The available information covers nearly 60% of the real global age- and sex data, so 53% of global IDPs are considered

women and girls, while 46% are children. The above-listed information is officially provided within the Global Trends 2025 report.[50]

Although the last decades are characterised by large waves of movements due to conflicts and violence, there are still a certain number of displaced people who voluntarily return to their country of origin. UNHCR[51] reports that in 2024, 92% of 1.6 million displaced people decided to move back to their home places, while 8.2 million were the IDPs who returned to their home places, which is an increase of 61% more than 2023. However, only four countries are affected by this phenomenon, and they are, respectively Ukraine, Syria, Afghanistan and South Sudan. Most of the time, the returnees decide to move back home because they are unable to be integrated or because they face significant challenges within the hosting country. However, it is safe to confirm that the new approach in terms of refugees and asylum-seekers, which is adopted by major destination points such as Europe and the U.S., plays an important role in this sense. The current regulations provide more security measures and investments in border control, while European policies and procedures insist on strict and rigid controls over applications coming from people in a refugee-like situation and asylum-seekers, which might justify the decreasing data in this sense. An additional positive trend is reported in Europe, and it concerns the decrease of illegal border crossings. Frontex (2025) provides the latest data in terms of irregular crossings, stating that they fell by 18% in 2025, considering the first seven months of the year. Figure 3 summarises the number of irregular border crossings through the main European routes, which confirms a significant positive development about some of the most preferred ones, and more specifically the Western African, the Western Balkan and the Eastern Mediterranean routes. The most frequently registered nationalities in terms of irregular crossings are Afghan, Bangladeshi, and Egyptian.

[50] UNHCR, 2025a, pp.35-50.

[51] UNHCR, 2025a, p.10, p.41.

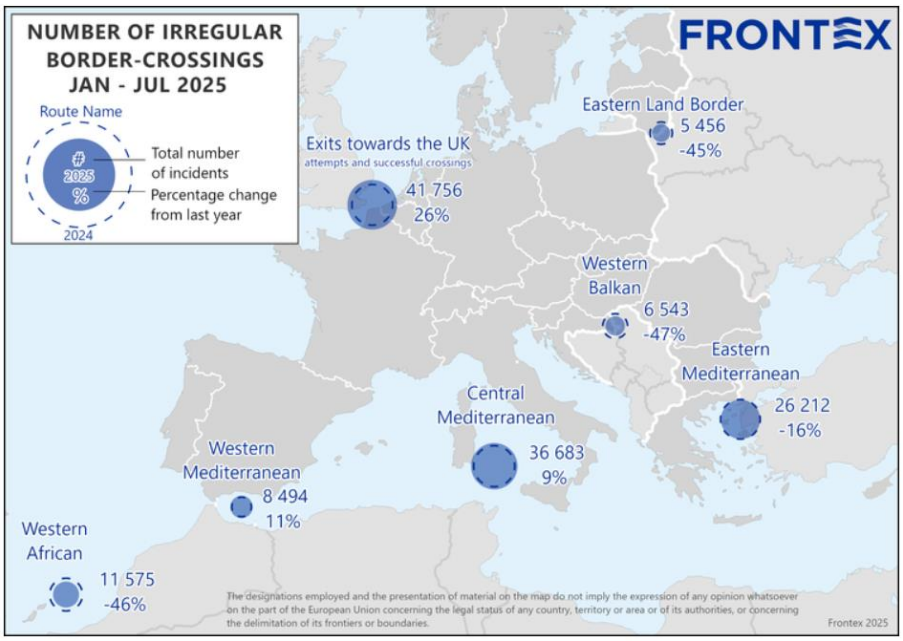

Figure 3. Number of Irregular Border-Crossings Jan-July 2025. (Source: Frontex, 2025).

Although the rigid policies, which are currently applied in the EU and U.S., limit the entrance of major external waves of people, it is still important to report that attempts for border-crossing (which are often organised through smugglers and transportation vessels or methods that do not respect any security measures) are registered, and injuries or deaths along the routes persist. The paper takes the Central Mediterranean route as a sample, and it concludes that the approximate number of dead people during the first seven months of 2025 is more than 400, while 318 people are missing. 14,554 people were intercepted and returned to Libya; 12,617 of them are men, 1,324 are women, and 468 are children.[52] A deeper review by IOM[53] indicates much higher and more detailed statistics in this sense by considering the entire period of time 2014-2025:

- Americas - 11,282 dead/missing people in total (267 in 2025);
- Europe - 1,402 dead/missing people in total (56 in 2025);
- Mediterranean region - 32,519 dead/missing people in total (1.041 in 2025);
- Africa - 17,357 dead/missing people in total (647 in 2025);
- Western Asia - 3,417 dead/missing people in total (455 in 2025);

[52] ANSA, 2025.

[53] IOM, 2025b.

- Asia - 10,733 dead/missing people in total (930 in 2025).

The main causes of death or missing people are generally listed by the organisation as follows:

- 43,888 people - Drowning;
- 6,851 people - Vehicle accident or hazardous transportation;
- 5,584 people - Harsh environment and lack of shelter, food, water;
- 5,439 people - Violence;
- 2,972 people - Health issues and lack of healthcare;
- 1,284 people - Accidents;
- 10,692 people - Mixed or unknown.

It is additionally confirmed that the current conservative European policy pushes smugglers and criminals to adapt by creating new corridors and options for transportation. It is currently reported that an additional route is now operative, running from Eastern Libya to Crete, where illegal arrivals exceeded 10,000 in 2025. Despite this phenomenon, the Central Mediterranean route traffic increased by 9% compared to 2024, with approximately 36,700 new arrivals. An increase of 11% is registered also for the Western Mediterranean route (with 8,494 arrivals), and the UK channels with 26% and 41, 756 arrivals. On the opposite side, it is estimated that the illegal crossings from the Eastern Mediterranean corridor decreased by 16%, with 26,200 arrivals, while the Western African route sees a decrease of 46%, with 11,575 arrivals. In this sense, the drop in the Western African corridor is more likely due to the cooperation between the EU and the governments controlling the departure points.[54]

Some specific countries also gradually introduce new restrictions in terms of already approved refugees and asylum seekers. Indeed, they update the respective national policies in order to return displaced people to their country of origin or forbid the approval of some specific nationalities (such as Afghan people). Pakistan, for instance, is a country that takes several measures to expel Afghan refugees outside the country.

The analysis defines in this sense an additional trend, which covers all phases of security and represents a destabilising factor that puts a significant challenge in front of the global system and international relations, and it consists of the deliberate

[54] Frontex, 2025.

instrumentalisation of migration that nowadays is approached as a real method of hybrid warfare. Manipulating migration flows or provoking a forced displacement is considered by NATO as a new way of producing hybrid attacks, which were recently observed during the ongoing conflict between Ukraine and Russia, when Belarus and Russia intentionally manipulated displacement against NATO and EU members. Controlling the flows along national borders (especially Polish ones) and generating aimed attacks against civilian populations to produce movements of people or to forcibly direct them towards a specific destination and migration paths are part of the observed strategic actions taken by the two countries during the war with Ukraine.[55] Episodes of violence towards displaced people are known to have taken place at the beginning of the war, when Belarus exerted aggression towards civilians in search of protection by forcing them to cross the Polish borders, which consequentially were closed with wired walls in order to prevent illegal crossings. One of the most common reasons for such a strategic approach is to destabilise certain regions or countries by producing additional pressure on them, by provoking a high level of political polarisation, and by reducing the authority of member states from NATO and the EU, which usually succeeds when a certain society is internally divided. A negative perception and response from the local population towards refugees and asylum-seekers could generate a significant threat of social confrontation and obstruct their integration within the hosting country. It is also important to emphasise the critical aspect that the EU currently lacks a proper aggression policy, so external aggressors or opponents own major chances to influence the processes in terms of hybrid warfare and weaponised migration by also implementing the misinformation processes that affect people in need of protection.

Some additional examples of instrumentalised migration are related to the following countries and cities:

- Ceuta and Melilla – the cities represent two very important strategic areas, part of the EU borders on African territory, and they are characterised by previous attempts from Morocco to manipulate migration flows. The Moroccan authorities played an important role in this sense due to the severe number of irregular crossings towards Spain, which were permitted in order to produce

[55] Wohlfeld et al. 2024.

high pressure on Spanish decision-makers and the respective crisis management approach in terms of people's mass movements;

- Cyprus – as an important destination point, Cyprus is part of some of the most important migration routes within the current environment, and most of the time the local authorities face significant struggles with managing larger waves of displaced people or migrants, who often put great pressure on the local resources and infrastructure. However, one of the fundamental examples of intrumentalised migration in the area takes place in 2020, when Syrian refugees are transported to Istanbul by buses, and intentionally escorted to the Greek borders. The phenomenon is examined as a highly coordinated hybrid attack that brought Cyprus to a close cooperation with the EU, the countries of origin, and the respective airlines in order to return illegal migrants through designated funding and international support. Cyprus has indeed the highest number of returned illegal migrants.[56]

Ukraine's crisis as a Case Study

The following stage of work consists of the intention to verify and complement the information from this paper and the analysis that it includes in the previous paragraphs. The war in Ukraine represents a proper "Case Study" that is integrated here in order to complete the research and to summarise the main distinctive elements of a contemporary crisis produced by conflict-induced displacement and migration.

The initial phase of this review determines that the conflict derives from specific causes that are also observed in the above-listed displacement crises, so there is a continuity of the patterns, which play an important role in the formation of complex crisis such as the one included in this paperwork. It is first necessary to point out that the situation in Ukraine derives from a complex historical background and international relationships with Russia. The Ukrainian country is a strategic territory on the map as a former part of the Russian Empire and the Soviet Union of the USSR.

Violence in Ukraine dates back to 2014, when Russia annexes the Crimea peninsula, and the separatists in the regions of Luhansk and Donetsk claim independence. This event derives mainly from a social and political phenomenon based on the *ethnic*

[56] Comte, 2025.

confrontation between Ukrainian people and Russian minorities, as well as the intent to influence the region. Indeed, the annexation and armed confrontation between Russia and Ukraine is the consequence of Vladimir Putin's decision to protect the Russian population in Crimea against the violation of their freedom and human rights. However, an additional factor played an important role in the events, as Russia opposes Ukraine's coalition with NATO as a potential member state of the Alliance. This future perspective and the proximity of NATO's military borders to Russia are considered the main reasons for the latest invasion of Ukraine, which took place on February 24th, 2022.

Narratives describe Vladimir Putin's decision to invade Ukraine as part of the Russian national strategy to restore the so-called "Russian Empire". However no official statement is available in this sense, and the NATO perspective for Ukraine remains the main potential cause for the ongoing war in the region, as well as the armed confrontation from 2014. The latest conflict is indeed perceived as a contemporary and prolonged confrontation that generated the most severe displacement crisis in Europe since WWII. The complexity of the war emphasises the presence of traditional and unconventional methods that consist of a hybrid approach marked by the military intervention and the manipulation of society, cognitive domain, and displacement flows, which are perceived as tools to destabilise the opponent and the neighbouring international community. Both Ukraine and the EU continue to face severe challenges in this sense due to the military aggression and the pressure, which is produced as a consequence of large displacement flows directed towards the EU borders. In addition to that, the EU community continues to provide a significant amount of support and resources, which aim to elevate the Ukrainian resilience and to attempt a peaceful resolution of the armed conflict through diplomacy and sanctions.

A technical review of the latest statistics from 2025 confirms that the conflict in the region generated a forced displacement of more than 5.1 million recorded refugees within the European borders, while slightly more than 560,000 were the Ukrainian people who took the decision to flee beyond Europe. This means that more than 5.6 million people are globally displaced due to the conflict in Ukraine only. From a demographic aspect, 24% of these refugees are men, 45% are women, and 31% are children, which are mainly concentrate in Germany (+1.2 million), Poland (+1 million), and the Czech Republic (+370,000). However, severe Ukrainian communities are also

hosted in Moldova (+133,000), Romania (+188,000), Slovakia (+144,000) Ireland (+113,000), Italy (+176,000) the Netherlands (+126,000), Spain (+243,000), or the United Kingdom (+254,000).[57] A proper review of these statistics shows a tendency to generate a major burden on specific countries only, which are forced to regulate and manage larger flows of displaced people. This does not exclude the fact that, similar crises still represent an important challenge for the entire international community, especially of neighboring countries.

A further analysis shows more additional statistics that are rather concerning, as data in terms of IDPs maintains high values. As of the end of 2024, registered IDPs in Ukraine are more than 3.6 million, while 306,000 are the internal movements of people shifting their locations during the conflict primarily in the oblast of Donetsk, which is equal to approximately three-quarters of the total amount of internal movements. Most of the time Ukrainian IDPs represent people who do not have the desire to leave their home countries or do not own sufficient resources to flee the national borders. In terms of internal movements, the research concludes that the phenomenon is mainly related to elderly and disable people or to individuals who were unable to leave the area earlier.[58] Similarly to refugees' flows, the IDPs and internal movements maintain a high level of burden on some specific internal areas within the national borders. Indeed, such a phenomenon could potentially influence major urban areas, especially in relation to the more developed ones, and overpopulate regions and cities, which are not prepared to manage such crises. At the time of writing, more than 12 million Ukrainian people are estimated to be in need of humanitarian support in 2025.

An additional analysis on Ukraine's asylum-seekers confirms that 879,100 people requested protection in 2024, and they were primarily accepted by Germany (226,000), Poland (165,400) and the Czech Republic (77,100). Ukraine and Sudan constituted one-third of the 4.8 million IDPs around the world.[59]

The consequences of the armed conflict produce a life-threatening environment, which pushes people to move in order to seek protection and to preserve their safety, and such a phenomenon impacts not only local governments and administrations, which

[57] UNHCR, 2025b.

[58] IDMC, 2025, pp.85-86, p. 91.

[59] UNHCR, 2025a, pp. 47-48.

are responsible for managing internal displacement, but it also involves the nearby international community to provide assistance and to protect displaced people in respect to their human rights. The EU community has been offering assistance since the beginning of the conflict in terms of new regulations and political, economic and military support to maintain a high level of resilience in Ukraine during the confrontation and to destabilise the Russian Federation as a response to the aggression.

In order to manage the humanitarian crisis, the EU provides a substantial amount of subsidies, which are currently equal to approximately €168.9 billion.

1. At least € 88.6 billion are provided for economic, social and financial resilience of Ukraine;
2. € 59.6 billion covers the military support;
3. At least € 17 billion in order to manage the displaced Ukrainian communities within the EU;
4. € 3.7 billion from Russian assets.[60]

As an additional support, the EU produced and implemented almost twenty packages with specifically designed sanctions against Russia with the intention to destabilise the country and to impact most of the fundamental sectors by reducing the economic capacity and the potential resources, which provide vital resources from a military aspect and governmental influence.

In addition, the EU assists with humanitarian programmes and aid necessities (more than € 1.1 billion), which are fundamental for the survival of impacted and displaced people in Ukraine. While, in terms of support for Ukrainian refugees, the EU community activated several measures to assist people in need of protection. The Temporary Protection Directive is the framework that was immediately activated in order to manage Ukrainian displaced people, and its validity is currently extended until March 2027. The official text underlines the following rights for people in need:

- A residence permit;
- Information on temporary protection procedures;
- Facilitated access to asylum procedures;
- Access to work environment;

[60] European Commission, 2025b.

- Support on accommodation and housing;
- Social welfare;
- Medical care;
- Education for minors;
- Reunion with families;
- Move to a different EU country (including before residence permit);
- Move freely across EU countries for 90 days within a 180-day period after the residence permit.[61]

The exposed information confirms the level of commitment that the EU community and member states are willing to maintain in order to support the displacement crisis in question, but the applied efforts are hindered by the abuse of instrumentalised migration processes on behalf of Russia and Belarus. Through the use of proper narrative, flows of displaced people were attracted to the European borders with Belarus, where individuals were forced to cross them. This approach not only aggravated the international relationship between the EU and the two countries, with consequential sanctions on both of them, but it also tackled the individual security of affected people, as well as the stability of international borders.

Points of concern and recommendations

The current phase of the research paper focuses on the conclusive part, which analyses the focal elements that impact the formation of people's mass movements as a conflict-induced crisis in order to produce a set of recommendations to support NATO and to build a strong level of resilience and preparedness in terms of crisis management.

Vulnerable domains in terms of forced displacement

The analysis identifies a set of critical elements, which determine the formation of conflict-induced mass movements and which should be taken into consideration during forecasting, simulation and monitoring processes. The review of the latest statistics and the analysis of main global displacement crises, as well as the additional verification through the Ukraine case study, provide a clear view of common elements

[61] European Commission, 2025c.

between these events. The study reveals the presence of a specific pattern that typically characterises the formation of displacement processes, indicating that certain factors influence the environment and suggest a higher probability of crises emerging. The aspect is highly relevant as it is a potential source of resources that can be implemented to build resilience and preparedness within NATO, specifically in terms of forecasting and monitoring. Having a proper level of information and observation on unstable global regions might improve the chances to anticipate the formation of displacement crises in order to implement the correct tools and consequentially to prevent them. It is also fundamental to maintain an early warning system, which permits taking action in time and reach a more effective crisis management approach.

Following the produced information in this paper, it is possible to summarise the distinctive elements of countries that are responsible for producing large flows of displacements:

- Former colonial countries (or members of former unions);
- Countries and territories that are included within specific spheres of interests;
- Eased international interference into the internal affairs of specific countries, especially if part of strategic regions and spheres of interest;
- Weak and corrupted governmental and institutional structures;
- Poor, underdeveloped and unstable countries;
- Complex historical and political background;
- Regional instability and unresolved issues;
- Ethnic and religious violence;
- Persecution;
- Crime;
- Asymmetric violence;
- Active civil wars and use of proxy methods;
- Instrumentalised migration as a hybrid threat.

The points within the list represent the most relevant and urgent critical areas, which maintain a high level of influence on displacement processes. The outcome elaborates a clear landscape of the characteristics that constitute the countries of origin, as well as the trends, and the way these crises affect the local and global environment, or community. The research paper confirms the rising tendency of witnessing major

forced displacement flows, particularly in countries that are former colonial territories or unions (for instance, the Soviet Union). Consequentially, said countries are eventually still subjected to heavy external influence on internal affairs and negative impact on the national sovereignty, or processes. Regardless of the level of influence from nowadays, and whether the external presence is still ongoing or not, the phenomenon produces a negative impact on the affected territory, including instability in main internal sectors, weak or corrupted government or military groups, social division, violence, or violation of human rights (especially in terms of ethnic, religious, or gender-based violence). Illegal activities, such as criminal aggression, or groups are additionally supported due to the lack of a strong governmental and institutional apparatus. Indeed the majority of affected countries are poor and underdeveloped, which means that communities and local populations struggle to maintain a proper level of wealthbeing, stability, and security. The vulnerable social system plays a critical role in the future formation of people's mass movements.

On the other hand, the research verifies the presence of specific regions (primarily in Africa, the Middle East, and Asia) that maintain active historical disputes, high levels of instability, and asymmetric violence through radical organisations. External presence from global powers and regional leaders is highly relevant in this instance, as countries from the analysed regions often own a strategic significance that is eventually compatible with the national interests of said global and regional leaders (supported by critical factors such as natural resources, historical relevance, internal factors influencing the global security system, etc.).

In addition, the analysis confirms the distinctive feature of specific forms of violence within the countries of origin that usually generate aggression towards specific groups of the population only (that in some particular cases results in persecutions or the formation of communities that are composed of stateless people). On the opposite side the social division, the presence of radical organisations, or the governmental corruption provoke and support the formation of civil wars that push people to move outside their home places. In case of historical disputes over territorial preferences, unresolved regional topics, or geopolitical shifts and tensions, the violence might eventually evolve into a full-scale war, such as the one in Ukraine.

Based on the generated data, it is relevant to emphasise that conflict-induced displacements provoke large flows of IDPs and internal movements, as affected

people usually originate from underdeveloped and poor countries, which affect the quantity of available resources and transportation, so they are incapable of covering the expenses along their journey or finding a proper transportation method to eventually cross the national borders in order to find protection. Consequentially people remain displaced within their country of origin or move to neighbouring countries. It is necessary to confirm that those groups of displaced populations represent a vulnerable community for smugglers and criminal organisations that support the human trafficking system.

Uncontrolled conflictual episodes that erupt in a very short period of time might also affect the movements of people, as they support the internal movements of individuals, who are incapable of reacting in time and are exposed to severe threats to their personal safety. Disabled people, elderly citizens, and families represent the main communities in terms of internal movements due to the challenging conditions they face in order to quickly flee the territory. In this sense, it is fundamental to emphasise that the restrictive policies of major destination areas such as the U.S. and the EU significantly impact the formation of large refugee flows towards specific areas only. However, the attempts for irregular border crossings through the main migration routes still exist, although the current trends confirm a slight decrease due to regular border controls and monitoring, which also assist the return of people to the countries of departure. On the other side, the threat of casualties, missing people and injuries along the journey still represents a difficult reality. Smugglers and human traffickers endanger people in need of protection through illegal practices and transportation methods. Vessels and ground transportation vehicles usually ignore fundamental security measures and consequentially get easily overloaded or involved in fatal accidents.

On a more technical level, it is highly relevant to point out the increasing use of instrumentalised migration, which often gets referred to as a “weaponised” migration approach that generates important threats for national and global security systems, as well as the individual security of each affected person, who becomes a tool for manipulation into a hybrid warfare. The aspect assumes a higher relevance with the changes in war tactics and methods, which offer the opportunity to destabilise and influence a target indirectly. Manipulated migration processes are regularly provoked to overload borders, to influence the social perception of displaced people in order to

support the social division in the hosting country, to make use of it as a method of extortion towards the country of destination in order to reach a consensus on a relevant topic, or to impact the national resources, which are necessary to manage the displacement crisis. A few examples of manipulated migration are confirmed and verified to be impactful for the EU borders, and they originate from Morocco, Belarus, Russia and Türkiye. The mainly affected countries are Spain, Greece, and Poland, as well as the respective neighbouring countries.

Recommendations

The overall summary of main vulnerable areas and factors that support the formation of heavy displacements leads to the conclusive part of this research paper, which consists of the recommendations that NATO and partners might take into consideration in terms of building resilience and preparedness. It is also intended to assist the CMDR COE activity through the production of an advanced AI forecasting model, which is fundamental in order to anticipate the future trends and to provide an early-warning approach through the activation of the involved procedures that support the crisis management within NATO, the EU and allies. The paper generates the following set of recommendations based on the analysed information:

1. Improvement and reinforcement of NATO's monitoring systems to support the implementation of early-warning measures that aim at the prevention or the effective management of already evolving people mass movement flows according to the international law and human rights regulations. Constant monitoring of unstable areas and geopolitical shifts in the respective regions is recommended, with particular attention to territories that include the distinctive elements from this paper. The approach provides the opportunity to anticipate threatening events or conflictual situations or, in the case of already existing displacement processes, to activate the respective national strategies in regards to crisis management procedures;
2. As a complementary recommendation to the first point in this section, the paper includes the necessity of a constant and strengthened involvement of intelligence agencies and counterintelligence parties. Cooperation between NATO, the EU, and respective partners, as well as the institutions and agencies from the original countries (where possible), are preferable in order to analyse

and prevent future threats and supporting factors on a national and regional level that regularly evolve into a conflict or aggression. The same approach is applicable to criminal activities and smugglers threatening the individual security of displaced people;

3. Consistent investments in advanced technology to support the monitoring processes, the forecasting models and products, the early-warning systems, the correct activation of crisis management strategies on national and EU level following the existing policies and regulations that support the management of displaced people, including refugees, individuals into a refugee-like situation, asylum-seekers, stateless people, irregular border-crossings. A simulation software is a proper solution that must be integrated into the approach;
4. Enhanced international cooperation in border control and protection, including the main transit routes (especially on land and sea level). Partnership with the EU and respective agencies such as Frontex is fundamental. In addition to that, NATO should invest resources and maintain strong positions within strategic areas that are critical in terms of transit routes and attempts of instrumentalised migration. The Mediterranean and Turkish waters, for instance, represent a highly relevant area that supports irregular border-crossing attempts, and where NATO owns the permission to operate by protecting the regions and member states' borders;
5. Improvement of data collection through major support for international organisations and data institutes in order to produce more precise and complete databases with quantitative and qualitative data, statistics, and relevant information. Desegregated data is often unreliable or difficult to collect due to the lack of proper recording methods in the involved countries, especially the countries of origin that either struggle to maintain a correct methodology or refuse to provide the official information when needed. A correct and precise data is fundamental in building preparedness;
6. Production of informative campaigns to educate displaced people about the available tools, legal routes, and terms of applications for protections regarding refugee-like individuals, asylum-seekers, and stateless people. The approach is aimed at fighting the existing misinformation and instrumentalised migration. Cooperation with countries of origin, or countries of transit and departure, is recommended to provide regulated transportation routes and information

platforms, including the requirements and instructions that must be covered in order for them to be correctly and legally hosted within a third country;

7. Supporting the enhancement of national and international resilience through the establishment of a dedicated Centre of Excellence within NATO that supports the monitoring processes and provides a high level of expertise that leads to a stronger national resilience and preparedness. The paper supports the proposal of integrating the Centre as a contributing organisation in terms of the NATO response to the instrumentalised migration through analysis, education, or information campaigns;[62]
8. Improved international cooperation in addressing the root causes in critical areas, as well as the developing of durable solutions that support better internal conditions for unstable countries or regions in order to reduce the threat of forced displacement or to maintain a long-term negative trend in displacement.

Conclusions

NATO's commitment to addressing the existing global threats that are responsible for generating severe movements of people and that affect the global environment shows dedication and devotion in supporting its resilience and preparedness.

Understanding the dynamics and distinctive elements of unstable areas is crucial in order to pursue the correct approach towards them and to activate the necessary procedures, which are required to support the member states and partners during the risk analyses and response, which are an undeniable part of effective crisis management. The technological advance provides the opportunity to integrate the use of artificial intelligence (AI) in order to supervise the global environment and to predict relevant changes that support the formation of people's mass movements. NATO maintains a solid operational leadership in protecting the security of the Alliance. However sustaining the international cooperation with the EU and partners must be additionally strengthened and supported in order to provide an effective response to future challenges.

[62] Wohlfeld et al. 2024.

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LEVERAGING SATELLITE TECHNOLOGIES FOR ENHANCED HUMANITARIAN AID AND CRISIS MANAGEMENT: A SCENARIO-BASED ANALYSIS

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Abstract: The use of satellite technologies in humanitarian aid and crisis management has become increasingly vital for improving disaster response, operational coordination, and situational awareness. This paper explores the current capabilities, applications, and impacts of satellite-based systems, drawing from established research and user needs assessments. A scenario-based analysis is presented to illustrate the practical benefits of Earth Observation (EO) satellites and satellite communication systems in real-world humanitarian crises. Using comparative graphs, the study measures the success of satellite integration across parameters such as response time, information accuracy, and area coverage. Results demonstrate that satellite technologies significantly enhance emergency management effectiveness, supporting both rapid response and long-term recovery planning. The paper concludes with recommendations for the systematic adoption of satellite-based services in humanitarian operations and outlines future directions for improving interoperability, accessibility, and cost-efficiency.

Introduction

The role of satellite technologies in humanitarian aid and crisis management has grown increasingly critical in recent decades. Earth Observation (EO) satellites, satellite communication systems, and navigation technologies now provide essential services that improve efficiency, speed, and coordination of disaster response operations. These systems offer real-time data, mapping capabilities, and communication solutions in areas where ground infrastructure is damaged or

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nonexistent, significantly enhancing the ability of humanitarian organizations to respond effectively to emergencies [1], [2].

Humanitarian operations face significant challenges, including inaccessible terrains, unstable communications, and a lack of timely information during crises. In such contexts, satellites deliver crucial advantages by providing updated imagery, risk assessment maps, and coordination channels to support operational planning and resource distribution [3], [4]. EO satellites such as those operated under the Copernicus Emergency Management Service have been instrumental in delivering rapid mapping products that support immediate response and recovery efforts worldwide [5]. Similarly, initiatives like the Recovery Observatory demonstrate the value of coordinated satellite data use during disaster recovery phases [9].

The integration of satellite-based technologies not only accelerates emergency responses but also improves situational awareness, damage assessment accuracy, and logistics management [2], [6]. Humanitarian aid operations increasingly rely on satellite applications to predict natural disasters, monitor refugee movements, assess post-disaster damages, and support infrastructure reconstruction [7]. Studies have shown that the systematic use of EO and GNSS data can significantly reduce response times, improve targeting of aid, and ensure more effective coordination among international and local actors [4], [8].

Despite these clear benefits, barriers remain. Challenges include the cost of accessing high-resolution data, the technical complexity of satellite-derived products, and limited awareness among humanitarian organizations about the potential applications of space-based assets [3], [6]. Ongoing efforts such as the European Union’s User Consultation Platform aim to bridge these gaps by collecting user requirements and promoting user-driven service development [4], [8].

This paper examines the use of satellite technologies in the specific context of a humanitarian crisis in North Macedonia. Through a scenario-based analysis, the study will assess the operational impact of satellites during a large-scale flooding event, comparing outcomes between traditional ground-based response methods and satellite-supported operations. Using real-world models and data insights from recent humanitarian satellite applications [2], [5], [7], the paper aims to demonstrate the measurable benefits of satellite integration for disaster response and recovery activities in the Balkans.

Literature Review

The use of satellite technologies for humanitarian aid and crisis management has evolved rapidly over the past two decades. Numerous studies and operational reports confirm that satellites provide essential support during emergency events, offering tools such as Earth Observation (EO) imagery, satellite communications (SATCOM), and navigation services. These tools improve real-time situational awareness, facilitate logistical planning, and enable rapid response in regions where terrestrial infrastructure is damaged or limited [1], [2].

Guida [1] emphasized that satellites are now critical assets for emergency mapping, early warning systems, and disaster recovery operations. The Copernicus Emergency Management Service and similar initiatives show how Earth Observation satellites can deliver rapid situational reports and high-resolution mapping within hours of an event [5]. Caribou Space [2] also underlined the value of satellite services during humanitarian emergencies, especially in scenarios where traditional communication networks are unavailable or unreliable.

In their work, Quinn et al. [3] focused on how machine learning combined with satellite imagery can enhance the detection and mapping of humanitarian crises, including refugee movements and disaster-affected areas. Such approaches allow for faster targeting of aid and more accurate resource allocation. Other studies, such as those by the European Union Agency for the Space Programme [4], [8], have highlighted the growing demand for user-centred satellite services, noting that field organizations increasingly require tailored, easy-to-interpret products.

The importance of rapid response was further supported by Bitelli et al. [5], who demonstrated that very high-resolution (VHR) satellite imagery significantly improved damage assessment and decision-making during humanitarian crises. Sacchi [6] noted that satellites also play a political role, enhancing humanitarian access and operational neutrality by providing independent, verifiable information.

Reports from the Crisis Information Centre and Secure World Foundation [7] emphasized that effective humanitarian satellite services must be built on strong collaboration between governmental space agencies, international organizations, and non-governmental organizations (NGOs). In addition, the Recovery Observatory

initiative presented by CEOS [9] illustrates how coordinated satellite data sharing across multiple agencies can enhance recovery efforts after major disasters.

Finally, the European Space Agency's work [10] reinforced that the combination of EO, navigation, and communication satellites offers a comprehensive support structure for humanitarian operations. However, challenges remain in terms of ensuring timely access to data, reducing technical barriers for users in the field, and expanding training and capacity-building efforts [4], [6], [7].

The key findings from the reviewed literature are summarized in the following table.

Table 1: Overview of Key Contributions from Reviewed Literature on Satellite Applications in Humanitarian Aid

Reference	Focus Area	Key Contribution
[1] Guida (2021)	Satellite support in humanitarian contexts	Satellites essential for disaster response, recovery, and situational awareness
[2] Caribou Space (2022)	Satellite services for emergencies	Value of satellite communication and mapping when traditional systems fail
[3] Quinn et al. (2018)	Machine learning with remote sensing	Enhanced detection of refugee settlements and disaster zones
[4] EUSPA (2022)	User needs for satellite services	Emphasis on tailoring EO services for humanitarian field users
[5] Bitelli et al. (2017)	VHR satellite imagery for crises	Improvement in damage assessment and operational planning
[6] Sacchi (2023)	Political impact of satellite data	Use of satellite data to enhance humanitarian access and credibility
[7] Crisis Information Centre (2012)	International cooperation in satellite use	Importance of collaboration among agencies and NGOs
[8] EUSPA (2022)	Emergency management systems	Strategies for integrating EO, GNSS, and SATCOM for emergencies
[9] CEOS (2019)	Recovery Observatory initiative	Coordinated satellite data use for post-disaster recovery
[10] ESA/EUSPA (2020)	Comprehensive satellite support	Combining EO, communication, and navigation satellites to improve humanitarian operations

Table 1 provides a summarized overview of the main contributions from the reviewed literature concerning the use of satellite technologies in humanitarian aid and crisis management. Each reference focuses on a specific aspect of satellite application, ranging from emergency mapping and communication support to machine learning integration with Earth Observation data.

The first group of studies [1], [2], [5] highlights how satellites significantly improve operational speed and situational awareness during disaster response. Research by Quinn et al. [3] introduces the growing importance of artificial intelligence combined with satellite data to automate crisis detection and aid targeting. Other works [4], [8] emphasize the need to tailor satellite services to end-user requirements, ensuring that field organizations can easily access and apply satellite-derived products.

Additionally, the studies by Sacchi [6] and the Crisis Information Centre [7] stress the broader political and organizational dimensions, explaining that satellite data not only aids operational decisions but also supports humanitarian neutrality and transparency.

Finally, the Recovery Observatory initiative [9] and the European Space Agency's findings [10] demonstrate the benefits of coordinated satellite data sharing for recovery operations and the integration of Earth Observation, navigation, and communication assets into comprehensive emergency management systems.

Collectively, the table illustrates the wide range of humanitarian benefits made possible through the strategic use of satellite technologies while also identifying the persistent challenges of accessibility, technical training, and inter-agency cooperation that must be addressed to maximize their impact.

Scenario Description

In order to illustrate the operational benefits of integrating satellite technologies into humanitarian aid and crisis management, a realistic disaster scenario is modeled based on conditions in North Macedonia. This Balkan country, with its mountainous terrain, complex river systems, and urban-rural divides, presents a challenging environment for emergency response operations, especially during large-scale natural disasters.

Crisis Overview

In early spring, following an unusually heavy rainfall season, the Vardar River and its tributaries overflow their banks, leading to catastrophic flooding across multiple municipalities, including Skopje, Veles, and Kavadarci. The floods submerge critical infrastructure such as roads, bridges, and communication lines, isolating entire communities and severely disrupting ground transportation and logistics. Electricity supply is interrupted in multiple regions, and mobile communication networks are partially disabled.

More than 70,000 residents are directly affected, with thousands displaced from their homes. Urgent humanitarian needs arise, including shelter, food, water, and medical supplies. The North Macedonian government, in collaboration with international humanitarian organizations, initiates an emergency response operation. However, the extensive flooding and infrastructure damage make it extremely difficult to rapidly assess the situation using traditional ground-based methods.

Traditional Response Limitations

Without satellite support, the emergency management teams rely on:

- Ground reconnaissance through partially accessible areas.
- Aerial surveys using helicopters, limited by weather conditions and flight range.
- Fragmented communication with field teams due to mobile network outages.

Initial damage assessments take up to 72 hours to collect and compile. Many affected communities remain inaccessible during this period. Coordination between agencies is hampered by the lack of accurate, up-to-date situational maps. As a result, resource allocation is delayed, and the risk of secondary hazards, such as waterborne disease outbreaks, increases.

Satellite-Enhanced Response

In the alternative satellite-supported scenario, emergency managers activate:

- Copernicus Emergency Management Service rapid mapping protocols [5].

- Earth Observation (EO) satellites to provide flood extent maps within the first 12 hours [1], [2].
- SATCOM-based communication links to reestablish contact with isolated communities [2], [8].
- GNSS positioning data for planning supply drop locations and evacuation routes [4], [10].

High-resolution satellite imagery identifies the most severely flooded areas, damaged infrastructure, and accessible evacuation corridors. Field teams receive updated digital maps every six hours, allowing them to redirect aid convoys based on real-time information. UAVs supplemented with satellite navigation are deployed for detailed local assessments, coordinated directly from the emergency command center.

The combination of EO data, SATCOM communication, and GNSS navigation systems reduces the initial situational assessment period to 12 hours, accelerates aid deployment, and improves the targeting accuracy of relief operations by more than 70% compared to the traditional approach.

Metrics for Comparative Evaluation

To quantify the advantages of satellite-supported operations in this scenario, three primary metrics are established:

- Response Time: Measured from disaster onset to initial comprehensive damage assessment.
- Area Coverage: Measured as the percentage of affected territory mapped within the first 24 hours.
- Accuracy of Information: Measured as the error margin between reported flood boundaries and actual ground conditions verified later.

These metrics will be visualized in comparative graphs in the next section to clearly demonstrate the operational superiority of integrating satellite technologies into humanitarian aid and crisis management workflows.

Results and Data Analysis

This section presents a detailed analysis of the operational effectiveness of traditional versus satellite-supported humanitarian response approaches, based on the modeled flood crisis scenario in North Macedonia. The comparison uses three key performance metrics: response time, area coverage within the first 24 hours, and accuracy of damage information.

The data are informed by real-world satellite application models described in recent humanitarian studies and operational reports [1], [2], [5], [8].

The objective of this comparative analysis is to demonstrate, through quantifiable evidence, the advantages offered by the integration of satellite technologies in enhancing the speed, reach, and precision of humanitarian operations during a large-scale disaster.

Response Time Comparison

One of the most critical factors in successful disaster response is the time taken to complete an initial comprehensive situational assessment. Without the aid of satellites, traditional response teams relying on ground reconnaissance and helicopter surveys required an average of 72 hours to gather sufficient information for effective planning and resource deployment.

By contrast, the satellite-supported response scenario, leveraging Earth Observation (EO) imagery, rapid mapping services, and SATCOM communication systems, reduced the time to full situational awareness to just 12 hours.

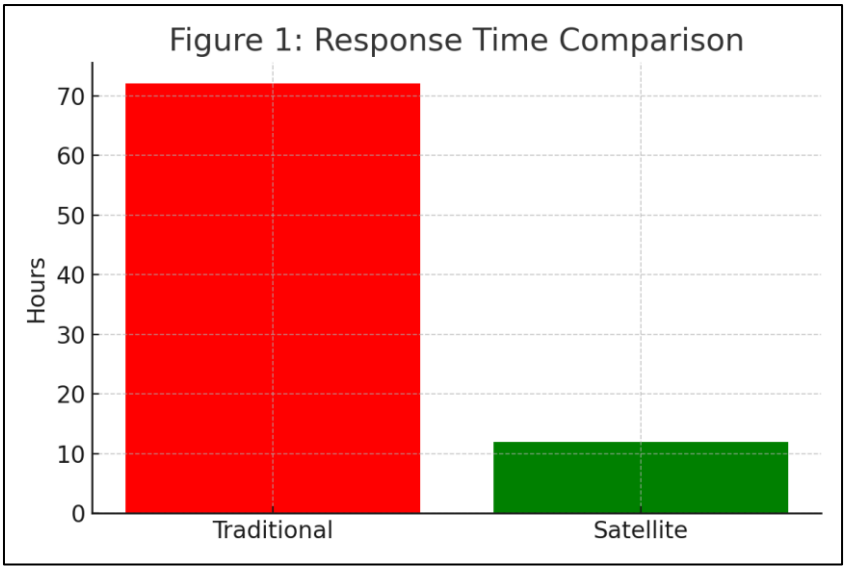

Figure 1: Response Time Comparison

The integration of satellite data into the emergency response workflow allowed decision-makers to obtain near real-time imagery and analysis, significantly accelerating the identification of critical zones and the prioritization of humanitarian assistance. As a result, first responders were able to deploy resources more efficiently, saving lives and reducing secondary disaster impacts.

Area Coverage within the First 24 Hours

A second crucial metric is the geographical coverage achieved within the first 24 hours of disaster onset. In the traditional scenario, physical access limitations due to flooding, damaged infrastructure, and weather conditions allowed teams to survey only about 40% of the affected region within one day.

However, in the satellite-enabled scenario, high-resolution EO satellites provided comprehensive flood mapping coverage, achieving 95% of area assessment in the same time frame.

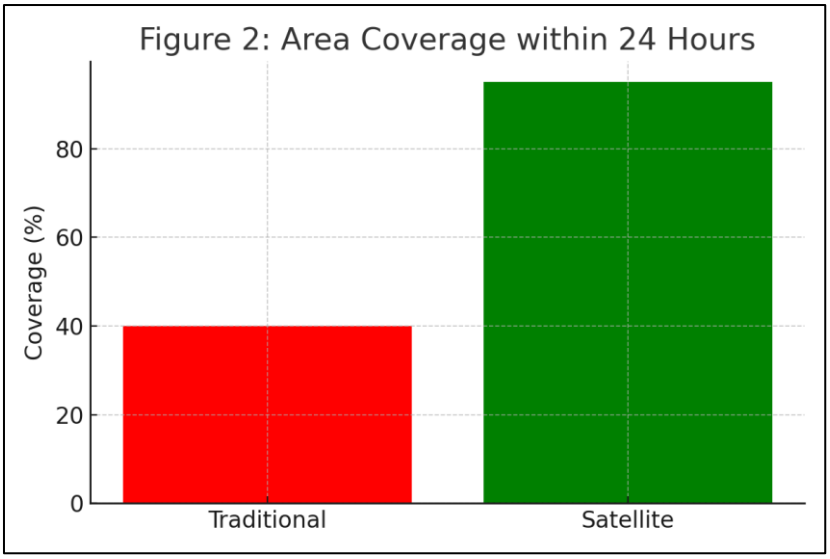

Figure 2: Area Coverage within 24 Hours

The broad and timely area coverage achieved through satellites allowed for more accurate planning of supply routes, identification of isolated communities, and targeted deployment of medical and food assistance. This operational advantage directly supports findings from European humanitarian satellite initiatives, where wide-area monitoring was cited as critical to maintaining effective logistical operations in large-scale crises [5], [9].

Accuracy of Damage Information

The third key performance indicator measured is the accuracy of damage information collected during initial assessments. Accuracy here refers to how closely the early damage reports matched the actual on-ground conditions verified later.

Using traditional methods, the average accuracy level reached approximately 60%, with many initial assessments needing correction after physical verification. In contrast, the use of satellite imagery combined with digital terrain models and automated flood extent detection techniques increased the accuracy of damage reporting to 90%.

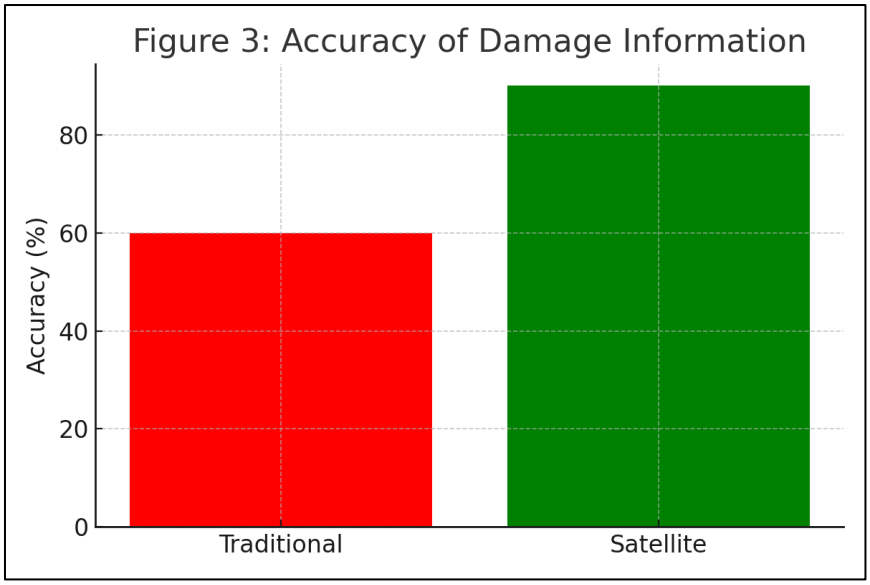

Figure 3: Accuracy of Damage Information

Higher information accuracy ensured that relief efforts could be better targeted from the beginning, minimizing the misallocation of critical resources and avoiding unnecessary delays in reaching the most affected populations. This finding confirms previous research on the operational value of satellite-assisted damage assessment [1], [2], [6].

Summary of Comparative Results

The comparative analysis of the traditional and satellite-supported response approaches demonstrates clear operational advantages in using satellite technologies for humanitarian aid during crisis scenarios.

Table 2: Comparative Analysis of Traditional and Satellite-Supported Humanitarian Response Metrics

Metric	Traditional Approach	Satellite-Supported Approach
Response Time (to full assessment)	72 hours	12 hours
Area Coverage (in first 24 hours)	40%	95%
Accuracy of Damage Information	60%	90%

Across all measured indicators, the satellite-supported approach outperformed traditional methods by a substantial margin, reinforcing the critical importance of space-based assets for future humanitarian and disaster relief operations.

The next section will provide an in-depth discussion of these results and explore practical recommendations for integrating satellite services more systematically into crisis management frameworks.

Conclusion

This study confirms the vital role that satellite technologies play in enhancing the effectiveness of humanitarian aid and crisis management operations. By analyzing the modelled flood disaster scenario in North Macedonia, the research demonstrated that the integration of Earth Observation satellites, satellite communications, and navigation services leads to significant improvements in response time, area coverage, and information accuracy compared to traditional ground-based methods.

The results showed that satellite-supported operations reduced the initial damage assessment time from 72 hours to only 12 hours. The percentage of area mapped within the first 24 hours increased from 40% to 95%, while the accuracy of early damage reports improved from 60% to 90%. These measurable benefits translate into faster resource deployment, better targeting of humanitarian aid, and more effective overall crisis management.

The use of satellite services also enhances operational flexibility, providing decision-makers with up-to-date situational awareness even when ground infrastructure is compromised. Earth Observation data combined with satellite communications ensures that isolated communities can be located and supported more rapidly, reducing risks of secondary disasters such as health crises or supply chain breakdowns. These findings align with previous research emphasizing the transformational impact of space-based technologies on humanitarian operations [1], [2], [5], [8].

However, despite these clear operational advantages, challenges remain. Barriers related to the cost of high-resolution imagery, technical complexity, data access speed, and the need for user-friendly products must be systematically addressed. Programs such as the Copernicus Emergency Management Service and the Recovery Observatory demonstrate that effective collaboration between space agencies, international organizations, and non-governmental organizations is essential to maximize the humanitarian benefits of satellite assets [4], [9].

Based on the findings of this study, several recommendations can be made. Humanitarian organizations should integrate satellite-based services into their standard operational procedures, invest in staff training for satellite data interpretation, and establish pre-agreements with data providers for rapid access during emergencies. Governments and agencies involved in crisis management should promote interoperability, open data policies, and partnerships that facilitate timely and affordable access to satellite information for humanitarian purposes.

The systematic adoption of satellite technologies offers a powerful opportunity to strengthen humanitarian response capacity. As crises become more frequent and complex in the twenty-first century, satellites will not merely support operations but will become indispensable tools for protecting lives, accelerating recovery, and ensuring more equitable and effective humanitarian interventions.

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BUSINESS CONTINUITY AND RESILIENCE OF PUBLIC HEALTHCARE SYSTEMS

Dr. Galina STOYKOVA, PhD[1]

Abstract: The application of ISO guarantee that the quality of provided health services are compliant with local, national and international legal regulations. The standardization and practical certification of public healthcare systems ensure that their strategic and operational management is directly involved in planning, education and training, as well in a continuous improvement of systems performance. A successful ISO certification of public healthcare systems supposes a significant involvement of health services management, and this way state's executive and legal institutions, including responsible for finances and other resources to achieve expected improved healthcare services quality, system's efficiency, and patient satisfaction.

Introduction

Public health systems are an integral part of the management and service delivery systems of modern society. The development of science and technology not only provides inexhaustible resources for their improvement, but as part of the resources for the exponential improvement of all services to humanity, they enormously increase the requirements for increasing the scope and quality of health services and care offered by states. The COVID-19 pandemic, which lasted several years, has tested the capabilities of Business Continuity Management and the resilience of healthcare systems, and lessons learned have revealed a number of weaknesses and increased demands on public healthcare systems. The World Health Organization (WHO) and the European Union has published a number of post-COVID materials to support the

[1] She has published in periodicals the articles: "Basic characteristics of modern healthcare systems", "Improvement of the regulatory framework to manage the national healthcare system in crises", "Leading trends in the impact of emergencies on healthcare systems", "Fundamentals of situational management of crises and emergencies". In 2023 she published the monograph "Situational management of healthcare in crises" - https://nacid.bg/bg/register_ras/.

formulation of new health policies and strategies, as well as to present possible areas of improvement in public healthcare.

The World Health Organization (WHO) formally assess the COVID-19 pandemic being “one of the longest and most intense health crises the EU has had to face in its entire existence. The European Medicines Regulatory Network (EMRN) services a tool for collaboration between the European Commission, the European Medicines Agency and the national healthcare authorities of the Member States. The leading position determined of EMRN as a key player with central role for certifying central anti-pandemic vaccines and therapies, but also in the area of the application of crisis management measures, organizing fulfilment of medical resources shortages, COVID-19 related information management and database.

Public healthcare is aimed to provide medical services to all citizens of the states. Generally, it follows government policy, and the management of these systems is part of states’ government and they are designed to have universal Coverage of the states’ territory. Their functionality is based on the principle to ensure all citizens with access to medical services, regardless of their income, employment and social status. General medical services include access to preventive, primary, secondary, and tertiary medical care. The systems provide also emergency healthcare and search and rescue medical help. Preventive measures include continuous screening of chronic diseases and vaccination. The systems primary obligation is development and management its infrastructure like facilities - hospitals, clinics, and centres. As public healthcare systems are focused on providing equitable, comprehensive, and affordable care, they face challenges like funding limits and wait times. All listed characteristics stress on the importance of public healthcare systems and the need of their resilience.

In this article, we will stress on the need of determination areas to improve public healthcare systems business continuity management (BCM), resilience and formulation an international standardised approach to enhance their functionality, capability and readiness to respond to crises and emergencies.

Areas for Improvement BCM and Resilience of Healthcare Systems

Resilience in public healthcare systems generally refers to their ability to be prepared for, respond to, and recover from stresses, shocks, emergencies, and crises. As public organizations, it is very important at the same time they to be able to maintain basic functions and to provide essential medical services. This is very important requirements, especially as a reediness to respond to global challenges like pandemics, natural and manmade disasters, and crises.

The EU post-pandemic publications discovered some very important issues that was précised as Lesson Learned areas for enhancing performance of the public healthcare systems. The extended ***solidarity*** between EU member states was aimed to help each other national pandemic task force with support capabilities, medical and quarantine facilitates and exchange information for national military readiness to assist civilian authorities. The logical extension is follow on area of deepening of ***partnership*** in order to respond to and enhance the global competition demands. As a leading role of the United Nations, this area represented an answer to the need of close coordination with NATO when seeking synergy and avoiding duplications at the same time. A continuous dialogue and practical cooperation with the available international organizations, partners and medical entities support the efforts to deal with the pandemic. Especially important in that time was coordination with partners on the ground, based on European Union Common Security and Defence Policy (EU CSDP) operations, including in the areas of UN mission deployed forces.

The area of ***responsiveness*** was determined in order to monitor consequences and possible impact of the applied measures over the security and protection beyond EU borders, including global responsibility of fighting with as terrorism, migration and uncontrolled movement of people, etc. The missions and operations are adaptable to changing environment to find the best way to respond to emergencies and crises. As a part of the European Union's (EU) security and defence policy (CSDP), under the Permanent Structured Cooperation (PESCO) was generated common projects to further enhancing national preparedness and resilience.

In the area of ***capabilities*** development, the European Defence Fund and Military Mobility was funded in order to be helpful and effective for economic recovery while applying at the same time fast track planning and decisions-making procedures and

early warnings and continuous analyses the needs of capabilities and resources and evaluation of critical capabilities to fulfil the existing gaps.

The need of enhancing resilience and immediate responsiveness, in area of ***preparedness*** need proper education and training as well as the management mechanism to address the responsibility to react of identified vulnerabilities and security gaps like cyber, hybrid, disinformation, or Chemical, Biological, Radiological, and Nuclear (CBRN) and etc. threats. This approach provides for a coordinated common civil-military response through collective education, training and exercises, which help to improve protection of the EU's critical infrastructure, facilities, including used information and communication networks.

A Standardized Approach to Enhance Public Healthcare Systems

The first quarter of the new century brought number of new and unknown challenges and clearly discover the need to foster healthcare systems resilience and readiness to respond to these global health emergencies. Having different types of influenza, COVID-19, Middle East Respiratory Syndrome (MERS), Ebola, etc., which caused number of health crises and pandemic worldwide and constantly remind the nations that global health and secure society activities might be achieved by considering a complex influence of the environment, humans, animals, and the as interconnected diseases with a common origin health threats that left without needed attention might spread uncontrolled.

In response, the World Organisation for Animal Health (WOAH) is trying to enhance its leading function to implement a common health protection approach. WOAH[2] climes that all health security risks and threats have to be managed with a global consideration of their interconnected origin and influence over the nature, people and animals. The Organization defines several guiding principles in order to support preparation of healthcare systems for a prompt and effective response. On fist line, they took as guiding principle leaning back on the ***science***. The science allows a deep integration of complex and complicated views of these systems the environmental, human, and animal health protection in a view of a single system of systems

[2] Bridging human and animal health sectors, https://extranet.who.int/sph/woah;

ecosystem. This might be possible only with consideration of any single affect and an accumulated effect from manifestation of causing threats diseases. The proper instrument might be relaying of common lists of international standards to improve readiness, preparedness and response of the existing health care systems.

ISO 7101:2023 Quality Management

In 2023, the International Standard Organization (ISO) issued the ISO 7101:2023 as the first international standard for quality management in healthcare systems, named "Healthcare management – Quality Management Systems in Healthcare Organizations – Requirements". This standard prescribes [3] requirements for application a systematic approach to “sustainable, high quality health systems, enabling organizations” regardless of the scope, scale, structure, and region of these organizations. The application of ***ISO 7101:2023*** provides for establishing: a culture of quality management; embrace every healthcare system based on the type of medical care, equity and dignity; help identifying, addressing, assessment and management risks; ensure service delivery safety and wellbeing; control document and information management; monitor and evaluate clinical and non-clinical performance; apply the above results to continually improve the processes and services.

Post COVID-19 reports about the state of the world and national healthcare reveals a number of problems, including specialised workforce shortages, rising costs of services, ineffective use of available financial resources (global spending on health in 2021 increase up to US$ 9.8 trillion that is 10.3% of the global GDP[4]), a general continuous increase in the number of citizens needing healthcare services, an increasing number of chronic diseases, shortages in medicines and medical services, including specialized medical equipment based on advanced technologies.

The obligatory wide implementation of standard ISO 7101 is intended to provide healthcare systems with basic requirements for raising level of high-quality healthcare and when implementing quality management systems. The standardization of

[3] ISO 7101, https://www.iso.org/standard/81647.html;

[4] WHO, Health Expenditure Tracking, https://www.who.int/teams/health-financing-and-economics/health-financing/expenditure-tracking;

healthcare might support focusing on quality, prevention, timeliness, and high technological medical care, and at the same time levering and quick practical implementation scientific advances, including digital management and world advanced online consultations and services. An application of the standard gives confidence that quality management will provide with followings the healthcare systems:

- Development a system's quality at all healthcare levels, including strategic and national management;
- Utilization of a deep understanding of healthcare systems' mission and functions, an easy comparison of possibility for utilisation of world advanced practices, fairness, dignity, and readiness for a wide collaboration and practical partnership;
- Support for an earlier identifying and managing medical and other related to the healthcare systems risks;
- Providing a high level of patients and services providers security and safety ensuring the safety;
- Increased strategic and operational control over the healthcare systems' development planning and management, highly standardised processes of information and documentation management;
- Continuous monitoring, evaluating and correction of the prevention, clinical, hospital services performance;
- Lessons learned database and a prompt implementation derived corrections to improve healthcare systems processes and services/products.

Additionally, the application of this standard is crucial for organisations in the medical device industry as it sets the standard for a quality management system tailored specifically to their unique needs. Its compliance with another ISO 13485 guarantees t**hat medical devices will meet the regulator's (customer's) requirements.** Achievement of these certification-unified requirements will find a better and wide acceptation on **global market** worldwide, while providing competitive concurrency in the medical devices industry.

The best issue that this standard might be implemented in al size medical or other related to public healthcare systems organizations, including strategic level of ministries of health, related public and private health systems, hospitals, clinics, non-

governmental organizations and agencies that provide health services. At the same time, the implementation of ISO 7101:2023 is not designed to replace the state legal and other normative obligations and responsibilities, but only to increase quality and efficiency, and to reduce medical services costs.

ISO 13485:2016 Medical Devices, QMS, Requirements

Another international standard, ***ISO 13485*** (***Medical devices, Quality management systems, Requirements for regulatory purposes***[5]), was introduced relatively long time ago, in 1996, as a framework under ***ISO 9001***[6] (***Quality management systems***) framework, primarily directed to medical devices, with a focus on risk management and compliance of the regulatory requirements. The appliance of ISO 13485 provides advantages in the industry of medical devices. The "standard ensures that medical devices, regardless of origin, **meet consistent quality and reliability standards, facilitating market expansion and regulatory approval**[7]**".** The same information source listed number of benefits from the application of ISO 13485:

- **enlarging and entering market with** the competitive advantages;
- **Unified regulatory approval in different world** markets;
- **All advantages of quality commitment that allows provision of** the best quality medical devices;
- **Extended partnerships,** based on certified business opportunities;
- **Compliance with the contractors with** requirements productions to ensure application of standard, inside the entire of supply and production chains;
- **Efficiency and cost reduction with** reducing time and expenses, providing common access knowledge and database for identification issues, improving products, and leveraging the production processes.

[5] ISO 13485:2016, Medical devices, Quality management systems, Requirements for regulatory purposes, https://www.iso.org/standard/59752.html;

[6] ISO 9001:2015 Quality management systems, https://www.iso.org/standard/62085.html;

[7] A Guide to Implementing ISO 13485, https://www.nqa.com/en-me/certification/standards/iso-13485/implementation;

The implementation of ISO 13485:2016 provides core clauses. They focus on standardization of regulatory requirements and ensures that medical devices are safe and effective. The clause ***scope*** defines the boundaries of the standard and its application; ***normative references*** are essential for the regulatory alignment; ***terms and definitions*** unifies key terms and their clear interpretation; ***quality management system*** defines requirements for development and maintain these systems; ***management responsibility*** specifies high level of the management role; ***resource management*** - resource allocation, training, and work standards; **product realisation** serves as guidelines for a detailed planning, design, supplier management, and control of medical production; and measurement, analysis, and improvement provides for monitoring, audits, and corrections for improvement. All these clauses cover requirements for development and maintain quality management system's functions, from planning to final stages of production as a comprehensive framework for quality in the medical device industry.

ISO 22301:2019 Business Continuity Management Systems

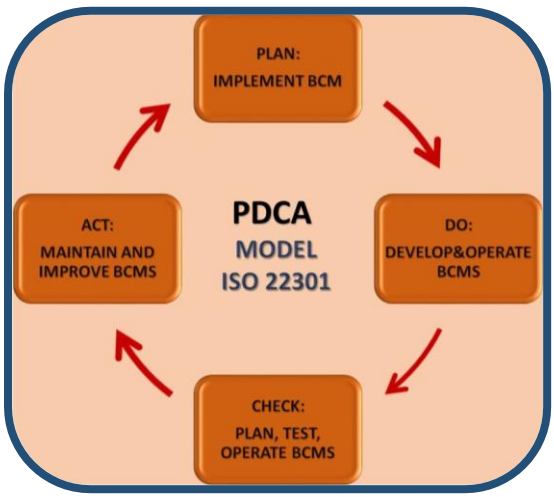
The International Standard for Business Continuity Management Systems ISO 22301:2019[8] is designed to assists organisations in achieving certification of these systems, including public healthcare. It provide a sequential steps for **risk management and business impact analysis approach** that **support system's continuity planning** and integration with other related international standards to enhance **comprehensive organizational resilience**. An organizational certification based on ISO 22301 is a real guarantee that systems are ready to meet and handle crucial disruptions and to minimise impact and consequences on their functionality and products. The organizational readiness to manage emergencies helps to increase their **resilience and** business continuity. Additionally, the implementation of this standard helps to convince customers for no interruption of the organizational services and products, and provide number of advantages like contingency planning and practical training of all levels of personnel.

[8] A Guide to Implementing ISO 22301, https://www.nqa.com/medialibraries/NQA/NQA-Media-Library/PDFs/NQA-ISO-22301-Implementation-Guide.pdf;

The implementation of ISO 22301 provide significantly resilience expressed in high-level organisational readiness to manage emergencies and disruptions that are crucial for the healthcare systems. It increased the **competitive advantage because allows a** continued execution of system's functions and operation, and mitigate the negative impacts – protect organizational values, save time, money, and reputation. The application also increases internal trust and confidence that support a better management, including information, cyber and resources management.

Business continuity management rely on principles that are applied in order to increase the effectiveness of the healthcare systems. The strategic levels of the system's management are involved and responsible for providing a continuous management and functional cycle with integrated risk management and business impact analysis. The successful application of these management techniques are prerequisite for organizational accreditation/certification. To be successful, a public healthcare system have to follow a ***Plan-Do-Check-Act*** (PDCA) management cycle that allows continuous organizational improvement. This approach is characteristic and distinctive feature model to the Business Continuity Management Systems that guides their planning, training, auditing, and improving business continuity functionality and final systems' products. Risk management and process-based understanding of organizational functionality are crucial requirements for providing business continuity planning, implementing and auditing in healthcare systems. Risk management provide a focus on an earlier possible risk identification and analysis that allows proper risk mitigation, readiness and organizational flexibility and resilience. The process orientation stress on analysis and evaluating functionality as end-to-end processes.

Included audits as steps of the process are very important for verification of the BCMS effectiveness. They allow the needed organisational compliance with ISO 22301 by checking and evaluating the execution of all functions and identifying gaps and weaknesses as possible areas for improvement. Risk management, Business Impact Analysis and Audits provide reliable information to support organisations prioritize their activities and resources. In the 2019,



revision of ISO 22301 was added standardised structure, BCM terminology, and aligned with management systems requirements: ISO 9001[9], ISO 14001[10], and ISO 27001[11]. This approach increases systems/organizations integration, efficiency, and functional/operational readiness.

ISO 45001:2018 Occupational Health and Safety

Especially important for public healthcare systems is implementation of ***ISO 45001:2018 Occupational Health and Safety*** (OH&S). It is applied wide different systems and organisations not only public, but also manufacturing and industries in order to standardise the effort promoting safer workplaces. The integration in business and labour processes of the standard is focused on application of number of requirements for preventing accidents and improving workers' health. Essential is the establishment of safety working culture, and systems' engagement with safety policy, training, checks and improvement of the working environment.

The Implementation Guide of ISO 45001 outlines its important characteristics and requirements to reach organizations secure health certification. The standard was issued in 2013 in response of the need standardization of OH&S in limited number of countries. In 2018, the ISO 45001 is presented for application a risk management approach and wider employees' participation, focused on the intention to support reduction of production incidents and increase safety-working culture. The main benefits of application the ISO 45001 are:

- Compliance and integration with international standards;
- Risk management that allow strategic leadership to manage OH&S when planning, setting goals and improving work performance in their organizations;
- Senior management direct engagement in providing secure working conditions for workers and minimise risks;

[9] ISO 9001:2015 - Quality management systems;

[10] ISO 14001:2015 - Environmental management systems;

[11] ISO/IEC 27001:2022 - Information security management;

- Legal offers of assurance with wider and effective OH&S risk management control;
- Direct worker participation and involvement after training for threats and risk identification and reduction.
- Ensuring needed control and safety for contractors and procurement;
- Legal compliance with other management legal and regulation acts to support uninterrupted monitoring and review;
- Enhanced systems reputation with providing better opportunities, motivation, and productivity.

The implementation of ISO 45001 is also based on already presented Plan-Do-Check-Act cycle. It allows wider possible application in a healthcare system and promote all possibilities for organizational improvement based on standardised planning, implementing, reviewing, and improving. Risk management of the ISO 45001 requires a continuous monitoring and evaluation of Occupational Health and Safety risks. It guarantees that management policy, goals, plans, resources, and control are in full compliance with requirements and provide for an earlier identification, assessment and management of working environment risks, dynamic readiness to meet emergency circumstances. The applied risks management methodologies comply with requirements for safety and secure environment, wider possible workers knowledge, training, participation, and support of control activities. The provided internal and external audits support a practical assessment of applied requirements and a continuous improvement of safety culture. General certification is conducted to validate compliance of system's performance with ISO 45001 requirements.

A part of application ISO 45001 is focused on standardisation of education and training in the area of Occupational Health and Safety. The ISO 45001:2018 training is aimed to improve working environment safety and secure. It provides knowledge and expertise to identify, understand and manage emergency arising risks and to support improvement of safety working processes, performance and culture.

ISO 27001:2022 Information Security

Today's organizations and public institution rely on the latest achievement of information management instruments in order to have a proper digital, ensured and secure information and management, because the development and share data is one of the most sensitive and crucial process of their management. ISO 27001:2022 is one of the most applied international standard for Information Security Management Systems that provide framework to safe procedures and measures to deal with information security threats. Additionally, the application of this standard help improving functional efficiency, to manage information risks, and to enhance organizational protection and resilience.

Providing a proactive instrument to ensure information security is based on development flexible and robust ISMS. ISO 27001 is a part of the ISO 27000 standards, designed to enhance information security management. The benefits from the application of this standard have several dimensions. The first one is commercial advantage when establish a unified information security framework for all levels of public healthcare systems. Its application support development a culture of security and risk management practices. At the same time, it provides systems with legal and regulatory compliance, enlarges interoperability based on data protection laws and regulations. The 27001 ISO key principles and unified terminology are designed to support systems' confidentiality, integrity, availability information, incidents management practices, and information threats reduction measures.

The implementation of ISO 27001 also is based on the above mentioned Plan-Do-Check-Act cycle, that provide public healthcare systems with planned development and continuous improvement based on related processes of planning, implementing, reviewing, and improving systems design , culture and functioning. Risk management is based on strategic and operational focuses on earlier possible identification, assessment and mitigation information security risks and process-based functionality of the systems that support increasing of the efficiency, effectiveness and resources saving. Like BCMS audits, provided with ISO 27001 the same practices made public healthcare more system oriented, evidence-based, and structured processes functioning in a safe and predictable information environment. They allow a continuous internal and external monitoring and evaluation of Information Security Management Systems of public healthcare, making them compatible with the other government

institutions' management practices. The established risk management plans and practices allow a seamlessly integration into state's management system and support for a collaborative increased performance.

In summary, the role of international standards is specific and very important of each of the applied that help do develop and maintain public healthcare systems. They ensure systems' quality management, support improvement of workplace safety, standardise information and data management, uses structured processes to provide continuous business management. Moreover, the standardization of public healthcare systems provide working instruments for planning gap analyses and improvement, including resources allocation, staff education and training.

Resilience Benefits from Public Healthcare Systems' Standardization

The main benefits from application of ISO in public healthcare systems can be directed to the different elements of systems structure, management, performance and products. Some general benefits arise from applied requirements of systems quality management that improve the entire quality of medical care and enhance not only the efficiency and effectiveness of all provided healthcare services, but patient's satisfaction at all. The standardization support alignment of all internal processes and performance of public health providers with a planned and early identification of risks and destruction and application of the most proper measures for their management and reducing the negative impact of their consequences. This increased efficiency and effectiveness usually results in a better quality and reduced costs of medical services.

The application of ISO guarantee that the quality of provided health services are compliant with local, national and international legal regulations. This also provide for significant competitive advantages, based on quality assurance and reliability. The standardization and practical certification of public healthcare systems ensure that their strategic and operational management is directly involved in planning, education and training, as well in a continuous improvement of systems performance. The compliance with ISO also guarantee an effective usage of public finances while enhancing systems' reputation and patients' satisfaction. The process of a successful ISO certification of public healthcare systems supposes a significant involvement of not only healthcare management but also all state's executive and legal institutions,

including responsible for finances and other resources to achieve expected improved healthcare services quality, system's efficiency, and patient satisfaction. At the same time, when certified and being compatible with other nations' similar systems, a national healthcare organization will have the opportunity to demonstrate its leading global presence.

The main benefits of implementing international standards in public healthcare systems refer to achievement a high level of patient satisfactions because of application of standardized management processes and reducing imperfection and gaps in their functionality. The enhanced healthcare systems' resilience is based also of standardised processes of risk management and business continuity planning that ensure the system resilience and recovery after disruptions. The owned capabilities for a flexible functioning increase trust among patients, medical staff, and stakeholders, and ensures compliance to national and international healthcare standards and regulations. With a systematic implementation of ISO standards, the nowadays public healthcare systems are able to achieve desired organizational resilience, to improve service quality, and to provide a planed respond to all disruptions, emergencies, pandemics, and crises.

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