sciendo

Land Forces Academy Review
Vol. XXVII, No 4(108), 2022

# EDUCATIONAL OPPORTUNITIES PROVIDED BY THE EXISTENCE OF CRITICAL INFRASTRUCTURES AT THE LEVEL OF SIBIU COUNTY IN THE FIELD OF TRAINING FOR RESILIENCE

**Dorel BADEA**
*"Nicolae Bălcescu" Land Forces Academy, Sibiu, Romania*
dorel.badea@yahoo.com

**Cosmin PIELE**
*"Nicolae Bălcescu" Land Forces Academy, Sibiu, Romania*
piele.cosmin@yahoo.com

**Diana RANF**
*"Nicolae Bălcescu" Land Forces Academy, Sibiu, Romania*
ranfd@yahoo.com

**ABSTRACT**

*This article intends to bring to the attention of specialists and the general public alike contemporary educational methods to be applied in training for the awareness and internalization of values specific to the field of societal resilience, with critical infrastructures as the central framework of approach, with their main characteristics related to the fragility of the state of security. The article has a concrete practical value due to its applicability at the level of a centrally located county in Romania. The main infrastructures with critical value for determining potential disruptive events are mapped using specialized software, followed by the presentation of some institutions necessary to be involved for implementation of table-top exercises and, in conjunction or separately, field study trips. As a central point of the research methodology, recent literature highlights are emphasized, which robustly materialize and contextualize the practical approaches presented.*

**KEYWORDS:** criticality, education, infrastructures, resilience, Sibiu

## 1. Introduction to the Role of Critical Infrastructures (CI) in Resilience Training

The contemporary security environment has brought to the fore over the past year the manifestation of a Russian-Ukrainian conflict that will add to military theory and practice new insights and lessons identified and learned. Among the perspectives brought to the fore is certainly that of critical infrastructure protection in military action and not least, critical infrastructure dimensioned as a pillar of societal and territorial resilience. In most official documents (e.g. national strategies, specific legislation, etc.) and works dealing with CI there is reference to them in relation to their functionality in society. Given that these assets, in fact socio-technical systems with varying levels of complexity and complication, contain a more or less developed technical component, a main category of risks stems from this direction. This aspect is

DOI: 10.2478/raft-2022-0036
© 2017. This work is licensed under the Creative Commons Attribution-Non Commercial-No Derivatives 3.0 License.

multiplying in terms of intensity given the trend of technical development in general and of ITC systems in particular. The picture is certainly completed in this discussion register by emerging and or disruptive technologies that are increasingly dynamic (intensively and extensively), of interest from both a military and civilian point of view. Cyber technologies, the use of drones, space technologies are just a few examples in trend that increase the performance of IC systems but bring with them other challenges in the spectrum of possible vulnerabilities and subsequent resilience.

Obviously, the issue of resilience has existed in different forms over time in relation to the level of development of society. People's increasingly diversified necessities have brought with them the need for society-wide services with ever higher performance requirements, which are also felt in the systems of water supply, transport, energy, health, etc. Basically, we are talking about a real system of systems that ensure everyday life and whose real value is felt in the event of disruptive events affecting normal functioning. These real macro-sensors, embedded in social contexts that go beyond the state of normality (war, epidemic, terrorist attack, disasters, etc.), have led people as individuals in society but also in organizations, and specialized public or private organizations, to ask themselves and find solutions to questions such as "what if?", "how quickly can we get back to normality?", "how can we proactively prepare ourselves in terms of effective intervention mechanisms?", etc. Societal resilience thus becomes a topical challenge.

The individual is object and subject in the IC activity, consumer of their products and services, therefore, in relation to the last mentioned quality; the resilience training efforts must have him/her in mind, as a citizen or specialist within an IC. Institutionally, models that bring different stakeholders into a collaborative space indicate the following categories of organizations that need to be involved in resilience training: academia, government and business.

Resilience therefore interconnects macro domains of activity – civil and military, economic and industrial, etc. – and is an organizational marker of business continuity. Cities are the macro-area where the consequences of resilience or lack thereof, are most visible. In this respect, the literature notes that: *"The contemporary urban settlements are not only networked, in the sense of being connected and interconnected through large engineering systems of pipes and wires, but they are also intelligent due to their expansion into outer spaces, namely the cyber and outer space. What would a city be without access to internet, or without telecommunications? The novel form of habitable settlement is automatically intimately connected to both technologies supporting modern lifestyle, as well as threats lurking in the shadows of such technologies, both using the same pathways to circulate and to operate. It falls from here that resilience, as a built-in capacity to absorb shocks of all kinds, is currently the only way in which the humanity could attempt to survive potential disasters"* (Botezatu & Bucovețchi, 2021).

## 2. Resilience Training – Theoretical and Practical Updates

Analyzing the Web of Science database, a total of 381 articles were found that dealt with the concepts of training and resilience in related titles. The earliest article appeared in 1988 and focused on turning failure into success by integrating resilience skills into organizational practice (Melnick, 1989). Among the newest articles, indexed in November 2022, there are topics on reducing stress among students by "training" resilience (Dijk et al, 2022) or testing a digital resilience training program also in the education system in response to the Covid-19 crisis (Ang et al, 2022).




Figure no. 1: *Grouping by field of articles in the Web of Science database that have dealt with the topic of resilience training between 1989 and 2022*

Figure no. 1 highlights articles that have dealt with resilience training in their content, grouped by domain. Only the top 15 domains that integrated more than 9 articles were selected. It can be concluded that medical or occupational specialists are most concerned with implementing the concept and raising awareness of the importance of resilience training. Fields such as management or economics generated only 4 articles each.

As an evolution, in the same database, it can be seen that in the last two years the concerns have changed, with more emphasis on the importance of resilience for occupational health with direct impact on institutional performance. The field of education has seen an evolution in resilience studies as a result of the pandemic crisis it has experienced.

A dynamic by year of articles can be seen in Figure no. 2. The concept has been noted and addressed in studies and research as early as 2018, before the pandemic crisis, and has seen a recent evolution in several fields. We can conclude that the most increased interest in resilience training has been in the period 2018-2020.

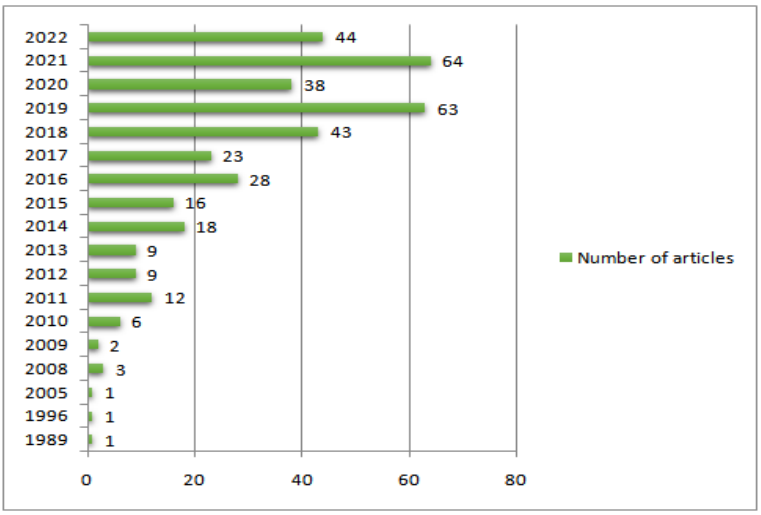



Figure no. 2: *The quantitative evolution of scientific concerns*

Among the authors who are the focal points of cluster formation are Frederick Hecht and Carter Lebares of the University of California who have looked at ways to reduce stress in the medical field, specifically among surgeons, by increasing resilience to combat burnout.

In terms of the connection of keywords in the articles analyzed, in addition to the areas in which resilience has been devoted and which we mentioned earlier, it is possible to see in Figure no. 3 the appearance of new ramifications with words from other areas such as management, critical infrastructures, organizational resilience, performance, education, etc.

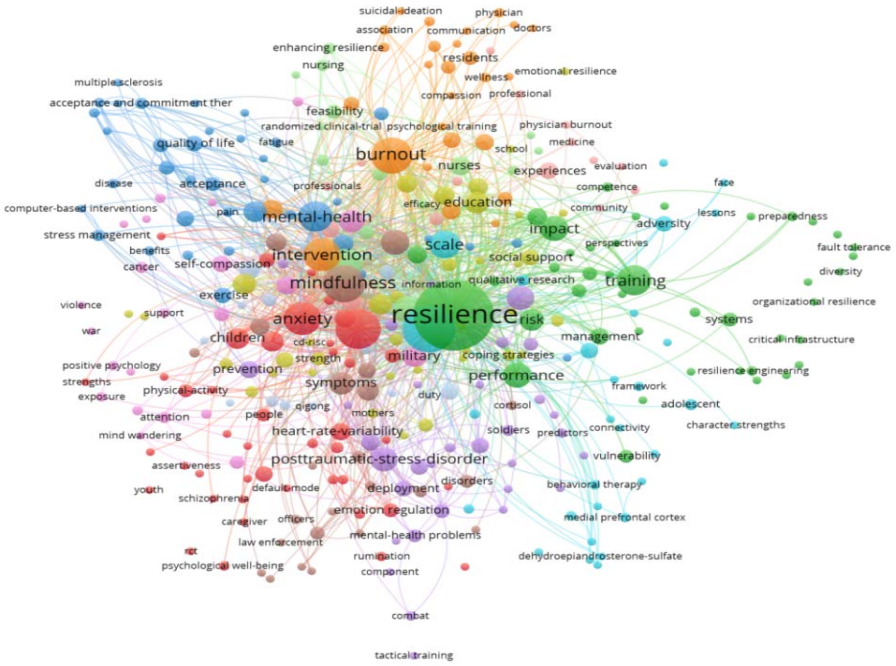



Figure no. 3: *Bibliometric network built on the interactions between resilience and training*

As the figure above (especially the left side) shows, multiple perspectives of resilience are related to aspects of medical and psychological characteristics of individuals or groups, i.e. a proper understanding and application of the values of resilience in society starts with ourselves. From a cognitive behavioral perspective, in an attempt to provide lines of effort for introspection and individual development in the area of resilience, Michael Neenan (2018) emphasized the importance of the following themes: understanding one's own interpretation of events, the educational value of adversity and seeking advantageous opportunities in such contexts, the need to relate to other people's actions (not to struggle alone in social isolation), the usefulness of perceiving resilience as part of life (in a normal order of things, not extraordinary), etc.

Table-Top Exercise (TTX) is essentially a training application widely used by public authorities, private organizations, academia and government agencies in the US space for training in a less formalized way in analyzing societal security impact situations and scanning the spectrum of desirable decisions in exposed contexts. At the national level, the actions initiated and carried out in the field of resilience management (including specific vignettes on critical infrastructure protection/CIP) by the Euro-Atlantic Centre for Resilience of the Ministry of Foreign Affairs and the New Strategy Center are remarkable. A topical training modality in the field of critical infrastructure and therefore CI resilience is online TTX, a dedicated platform supporting such approaches (Figure no. 4) being POSEIDON (Platform-based Operational System Events and Injects Distribution Online) developed by the Joint Research Centre of the European Commission (2021). The actual map, as a knowledge tool and a space for the implementation of a working scenario (and implicitly specific CI injections materialized in different phases of the exercise) plays a key role, further targeting the action of participants divided into different groups of things and expected to react accordingly. Underlining that *"the platform is very flexible and can accommodate numerous individuals and entities participating in exercises alone or in groups, with numerous features enabling the organization of every conceivable type of scenario"*, the paper by Theodoridis, Georgescu & Gârban (2021) provides further details for understanding the functioning of this application.

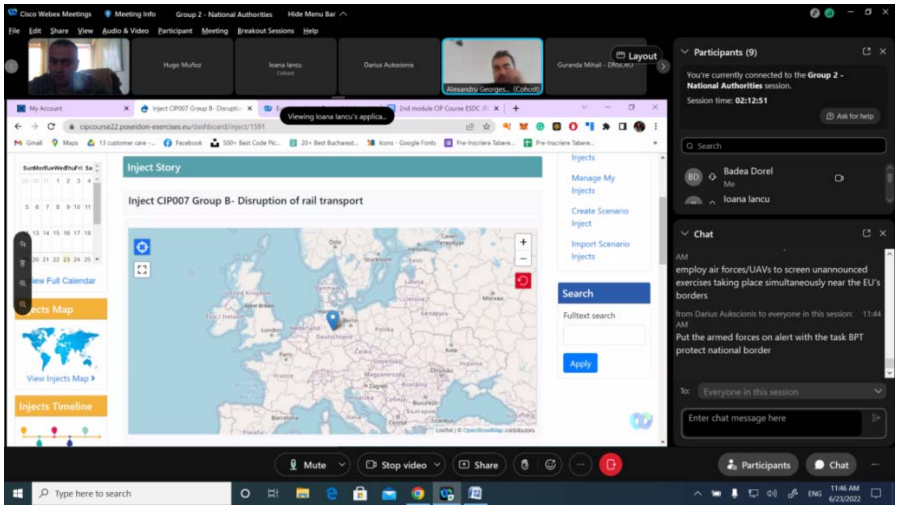



Figure no. 4: *Screenshot (own source) of the TTX time (National Authorities component) conducted on 23.06.2022 by ESDC/EEAS during the CIP course*
(With the participation of an LFA representative)

Generically, without specifying the field of activity, the objectives of planning and conducting a TTX are: *"to demonstrate the ability to use the Incident Command System principles; determine the effectiveness of the operational organization that manages the incident; assess the ability to establish and maintain communications during an incident; determine the adequacy of equipment, supplies, and facilities during an incident"* (MEMA, 2013).

## 3. Ways to Carry Out Resilience Training in Sibiu County

Sibiu County is geographically located in the central part of Romania, being a landmark of economic development from a regional point of view, with the capital city in Sibiu. Using the Military Map application (https://www.map.army), maps were generated in which, with the use of specialized symbolism provided by the software and public information available on the Internet, different types of existing infrastructures in the county and city that may have critical characteristics as well as associated risk events are highlighted, starting even from a presumed existing perception of this significance in the consciousness of citizens, to a general level of societal security culture.

At the level of Sibiu (Figure no. 5), these assets are located both in the central and peripheral areas.

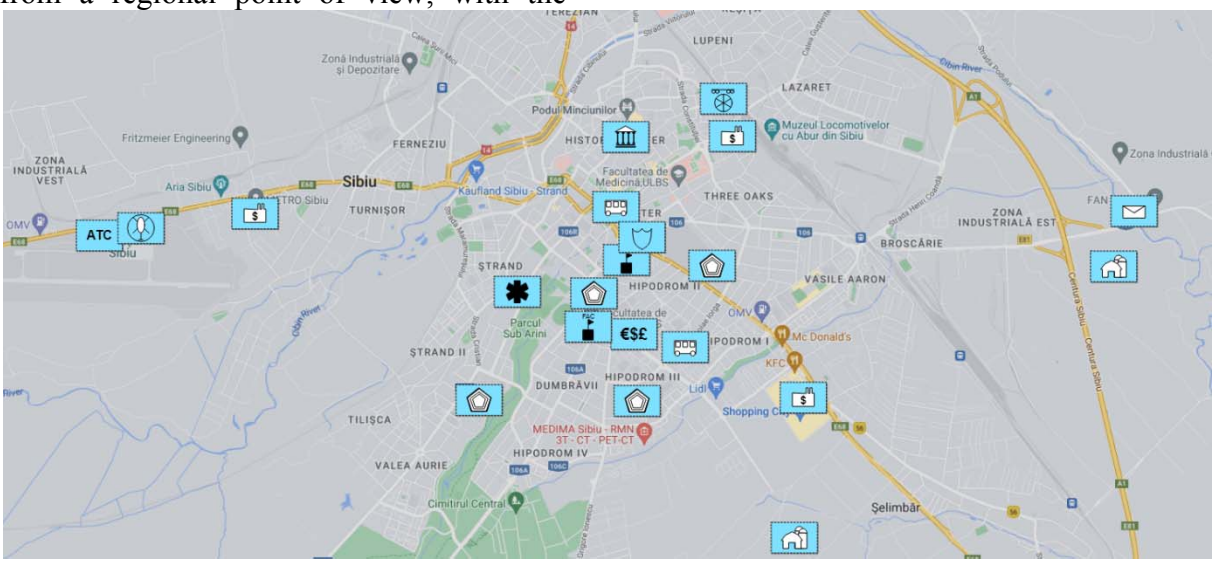



Figure no. 5: *City-wide provision of critical infrastructure*
(Source: Generated using software application)

The main possible risk events (Figures no. 6 and 7) at county and city level are managed through the Sibiu County Committee for Emergency Situations, which includes decision-makers on the whole spectrum of possible security impact incidents from the following institutions: Sibiu County Prefecture; County Council; Emergency Situations Inspectorate; Police Inspectorate; Gendarmerie Inspectorate; National Agency for Environmental Protection; County Agency for Payments and Social Inspection; Public Health Directorate; Sibiu Water Management System; Mureș Water Management System; Alba Water Management System; E-ON GAZ; SNGN Romgaz SA Mediaș; SNTGN Transgaz S.A. Mediaș; Transelectrica – Electricity Transmission Branch Sibiu; S.C. FDFEE Electrica Distribution; Sibiu Hydropower Plant; Territorial Structure for Special Problems; Airport; Romanian Road Authority, Sibiu Agency; National Roads Section; County Red Cross Branch;

"Apă-Canal" S.A.; Sibiu Garrison; "Roads and Bridges" Company; Sanitary Veterinary and Food Safety Directorate; Forestry Directorate; County Directorate of Special Telecommunications; Regional Road Traffic Service Railways; County Directorate for Agriculture; Sibiu County Building Inspectorate; National Land Improvement Agency, Sibiu Branch; I.S.C.I.R. – Sibiu Territorial Inspectorate; Sibiu County Commissariat of the National Environmental Guard; Sibiu County Ambulance Service; SMURD Sibiu; Sibiu County School Inspectorate; County Forest Guard; County Commissariat for Consumer Protection; County Public Service for Mountain Rescue; County Administration of Public Finances; Territorial Unit 345 Sibiu; County Directorate for Sport and Youth; Territorial Labor Inspectorate; State Inspectorate for Road Transport Control; General Directorate for Social Assistance and Child Protection; County Emergency Clinical Hospital; County Information Directorate; Regional Meteorological Centre Southern Transylvania; Military Emergency Hospital Sibiu; Sibiu Motorway Department; Sibiu Dog Training Centre; Head of Sibiu County Information and Internal Protection Service (Blaga, 2022).




Figure no. 6: *Representation of specific types of incidents in city infrastructures*
(Source: Generated using software application)

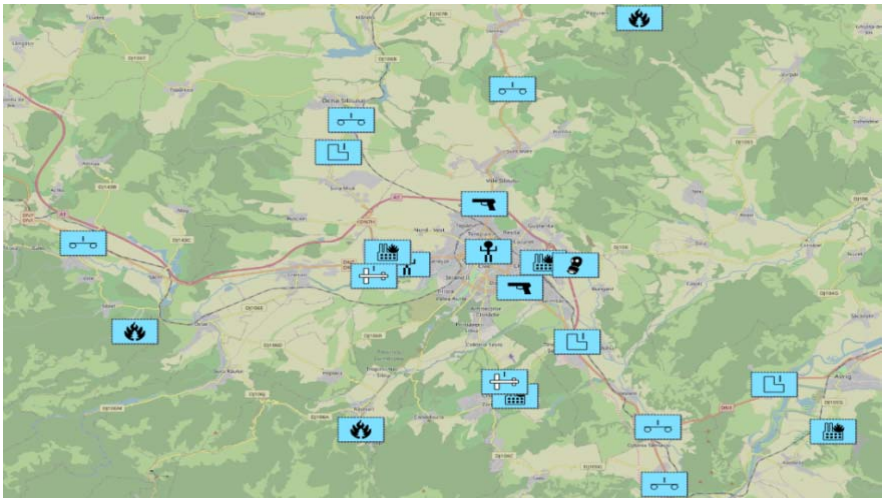


Figure no. 7: *Representation of specific types of incidents of certain infrastructures at county level*
(Source: Generated using software application)

Having built this overview of critical assets at the level of Sibiu County and of the authorities (some military, others civilian) responsible for the management of emergency situations, the question arises of finding optimal ways of training in the field, which will produce practical effects in the field of resilience. One such way, as already stated, is TTX. The location of the deployment can be given by the main educational institutions in Sibiu, the Land Forces Academy and "Lucian Blaga" University. A separate activity in the closing orplanning phase of the exercise could be a thematic field trip to recon critical infrastructures that will be subject to events (MEL/MIL) in the scenario.

Study visits to critical targets in Sibiu County can be a valuable educational tool, with concrete results in terms of security risk awareness, and at the undergraduate level, in the time saving of specific or more far-reaching subjects, in the framework of activities such as *A Different School*.

Bearing in mind (in a positive sense) the dependence of the current generation of pupils on ICT technologies, the idea of introducing augmented reality and virtual reality applications into the thematic caravans developed by the Department for Emergency Situations programs could also be applied to other age groups, to raise awareness of these types of infrastructure and their role in security.

The involvement of higher education institutions may also be essential in the development of educational programs dedicated to resilience (postgraduate or master's courses) to which representatives of the main institutions with critical value in terms of the type of infrastructure managed are invited to attend specialist seminars. At the same time, given the characteristics of the current security environment and the need to strengthen the security culture starting from the individual level, the issue of setting up a regional resilience training centre in Sibiu could be considered.

A particular opportunity for resilience training, based on scenarios in which specific CI incidents can be replicated, is provided, particularly on the CIMIC component, by the existence in Sibiu of Headquarters Multinational Corps South-East (HQ MNC-SE). It is worth mentioning for the theme proposed in the article (HQ MNC-SE, 2022) the work carried out by this military structure, from 7 to 11 November 2022, during The Human Security Conference, an activity organized in Sibiu by Supreme Headquarters Allied Powers Europe (SHAPE) and Allied Land Forces Command (LANDCOM), where representatives of NATO commands and international governmental and non-governmental organizations made presentations on a coherent, consistent and integrated approach to the protection of civilians, the protection of national assets, the protection of children in armed conflict, the enhancement of integrity in NATO-led operations.

## 4. Conclusions

Resilience training is a topical issue (see also the discussion on how to act at national level in the event of a blackout in Romania) that will have to be implemented within new educational paradigms, starting from individual awareness, with calibrated objectives for different age groups, of the security risks specific to everyday work. By their functional specificity, ICs provide resources necessary for human, individual and organizational existence, determining a *sine qua non* need to be at the heart of educational solutions for increasing territorial resilience. The design and implementation of such solutions can only be done with the involvement of all stakeholders with responsibilities in the field of security in general and IC security in particular, interdisciplinary, in collaborative models of the triple helix (mentioned in section 1) or quadruple helix (university – industry – government

– civil society). In Sibiu County there is a diversified typology of IC and the existence of two major universities (one civilian, the other military) is an asset for research in the field and the provision of the best educational deliverables for resilience training.

## REFERENCES


Ang, W.H.D. et al. (2022). Becoming More Resilient during COVID 19: Insights from a Process Evaluation of Digital Resilience Training, *International Journal of Environmental Research and Public Health, Volume 19, Issue 19*, doi: 10.3390/ijerph191912899.

Blaga, C. (2022). *Cine sunt membrii Comitetului Judeţean pentru Situaţii de Urgenţă Sibiu*. Sibiu Independent, available at: https://sibiuindependent.ro/2020/11/28/cine-sunt-membrii-comitetului-judetean-pentru-situatii-de-urgenta-sibiu.

Botezatu, U.E., & Bucoveţchi, O.M.C. (2021). Smart City Resilience: a System of Systems Approach. *The 16th International Scientific Conference "Defense Resources Management in the 21st Century"*, National Defense University "Carol I" Regional Department of Defense, Resources Management Studies Braşov, 13-18.

Dijk, S.W. et al. (2022). DEcreaseSTress through RESilience training for Students (DESTRESS) Study: Protocol for a randomized controlled trial nested in a longitudinal observational cohort study, *Contemporary Clinical Trials, Volume 122,* ISSN 1551 7144, https://doi.org/10.1016/j.cct.2022.106928.

Headquarters Multinational Corps South-East (HQ MNC-SE). *The Human Security Conference*, available at: https://mncse.ro/events/view/71.

Joint Research Centre of the European Commission. (2021). Available at: https://ec.europa.eu/newsroom/cipr/items/713816/en.

Melnick, J.(1989). Resilience Training Reaping Success From Failure, *Personnel, Vol. 66, Issue 3*, New Jersey, USA, 74 77, WOS:A1989T594000008.

MEMA. (2013). *Multihazard Emergency Planning for Schools (G364)*, available at: https://www.msema.org/wpcontent/uploads/2018/10/sm_09_conductingtabletops_nov2013.

Military Map Application, available at: https://www.map.army.

Neenan, M. (2018). *Developing resilience. A Cognitive Behavioural Approach (second edition),* Routledge, Oxon.

Theodoridis, G., Georgescu A., & Gârban, H.N. (2021). Lessons from a Didactic Table Top Exercise During a European Training Course. *International Journal of Cyber Diplomacy, Vol. 2*, 79-105.