2nd Fire Engineering & Disaster Management Prerecorded International Scientific Conference Védelem online cooperated with the University of Public Service 26th of April, 2022. Budapest, Hungary

Book of extended abstracts

Védelem Tudomány

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Welcome speech by Colonel Dr. habil. Gyula Vass

Dear colleagues and friends/Ladies and Gentleman,

My name is Colonel Gyula Vass, PhD., head of the Institute for Disaster Management of the Faculty of Law Enforcement at the University of Public Service. I am the Conference Chair of the 2nd Fire Engineering & Disaster Management Pre-recorded International Scientific Conference. I wish that you are well, I am glad to open the Conference here in Budapest, Hungary at the University of Pubic Service. I am delighted to welcome so many of you.

The last period was uncertainty for the entire World due to Covid 19 Pandemic, which affected and modified our lives and activities for the past months. The epidemic has now subsided, however, we can already find several examples for online conferences in the international level. One of the features of such conferences is that at the time of the conference, presenters are not required to be present in real time, even in the virtual conference space, because the presentations will be available in pre-defined videos on a pre-defined platform.

We organized a similar conference last year, which was very successful based on feedback from the participants of the conference. In view of the success, we are organizing it for the second time this year, hoping to create a tradition.

The primary goal of the 2nd Fire Engineering & Disaster Management Pre-recorded International Scientific Conference is to present the actual researches in the field of Fire Engineering. Lectures related to fire protection would dominate the conference, but covering the educational portfolio of the University of Public Service, Faculty of Law Enforcement, and Institute of Disaster Management. There will also be presentations in the topic of Safety and Security developed at the scientific level. The language of the conference is English.

I am pleased to inform you, that we have received video presentations by lecturers and researchers from 6 foreign Universities in addition to the 6 Hungarian universities. I would like to thank everyone for the presentation at the conference we organised.

I sincerely hope, you will enjoy our conference! I wish you all a very fruitful conference!

Thank you for your attention!

Colonel Dr. habil. Gyula Vass
Chair of the conference

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- Restás, Ágoston – University of Public Service, Budapest, Hungary

Chair of the conference: Colonel Gyula Vass, PhD

Co-chairs of the conference: Ágoston Restás, Qiang Xu, György Heizler,

Table of contents

Section B – Fire protection

Subsection 1

Chair: Zoltán Rajnai, Co-chair: Martin Zachar

1. Érces G. - Rácz S. - Vass Gy.: Fire safety of smart cities in the digital future
2. Krepuska A.I. - Nagy R.: Study of the control of smoke and heat extraction
3. Farkas J.: Psychological factors and consequences of post-traumatic stress disorder

Subsection 2

Chair: Linda Makovicka Osvaldova, Co-chair: Ferenc Varga

1. Rauscher J. - Mészáros I. - Vass Gy.: Pre-evacuation and pre-rescue preparation in healthcare institutions
2. Takács L.: The Notre Dame Fire – Case Study
3. Bodnar L. - Debreceni P.: Examination of wildfires in Hungary – Current challenges and answers

Subsection 3

Chair: Nicolae Ajtai, Co-chair: Judit Rauscher

1. Kamau J. - Muchiri B. - Wanderi M.P. - Restás Á.: Towards improving the physical fitness of firrst responders in Muranga county – Kenya
2. Hesz J. - Igaz-Danszky T.: Operation control decisions related to the alert, depending on the lenght of service
3. Rapheal T. - Ncube A.: The impact of shack fires on the people of J.B. Mafora Informal settlement, Bloemfontein, South Africa

Section C – Firefighting and rescue operation management

Subsection 1

Chair: Andrea Majlingova, Co-chair: Péter Pántya

1. Valek L. - Rácz S. - Horváth H.: Complex analysis of fires in industrial facilities
2. Horváth L.: Ergonomic approach to personal protective equipment for firefighters
3. Bohacsi B. - Rácz S. - Bisztán Z.: Firefighting in case of ship fires

Subsection 2

Chair: Danica Kacikova, Co-chair: Sándor Rácz

1. Debreceni P.: Challenges and opportunities in forest fire prevention in Hungary
2. Szeleczki D. - Pántya P.: Firefighters' life-saving activity, equipment and circumstances regarding to aircrafts
3. Nagy Gy. - Pántya P.: Hearing protection for firefighters

Subsection 3

Chair: Siviwe Shwababa, Co-chair: László Bodnár

1. Kovács N. - Pántya P.: The life-saving activity of firefighters, it’s means and circumstances
2. Bánhegyi R. - Rácz S.: Rescue of personnel with tracheotomy
3. Fekete A. - Pántya P.: Recent fire safety and security management challenges in Germany and Hungary

Subsection 4

Chair: Jayne Kamau, Co-chair: Rajmund Kuti

1. Shwababa S. - De Vos A.: Harnessing the use of UAVs in Wildfire mitigation among smallholder farmers
2. Horváth T. - Kováts L.: Improvised explosive device training in Afganistan
3. Riebel B. - Pántya P.: Winches on fire trucks

Section D – Disaster management

Subsection 1

Chair: Tlou Raphela, Co-chair: Árpád Muhoray

1. Berger Á. - Kátai-Urbán L. - Cimer Zs.: Soil liquefaction as a geological risk
2. Hábermeyer T. - Muhoray Á.: The possibility to adapt the INSARAG coordination structure and methodology during HILP events for guided international assistance
3. Teknős L. - Érces G.: Disaster Management of Smart Cities in the point of view of sustainable development

Subsection 2

Chair: Tomasz Zweglinski, Co-chair: Lajos Kátai-Urbán

1. Teknős L.: What is the place, role, task of law enforcement related to climate protection
2. Petrétei D.: USAR, MIMMS, DVI – Protocols for disaster response
3. Máté G.: The introduction and further development possibilities of the Special Prehospital Care Group in Hungary

Subsection 3

Chair: Zoltán Török, Co-chair: József Ambrusz

1. Almási Cs.S. - Cimer Zs. - Cséplő Z. - Kátai-Urbán L.: Road transport control of dangerous goods in Hungary
2. Szalkai I. - Óvári Gy. - Nicolae A. - Török Z. - Restás Á.: Prevention and decontamination Drone applications during the Covid-19 pandemic
3. Madikizela P. - Mutingwende N. - Ristvej J. - Tandlich R.: Microbial water quality in a local municipality during the level-three lockdown in South Africa

Subsection 4

Chair: Szymon Ptak, Co-chair: Galina Horváth

1. Vásárhelyi Ö. - Ambrusz J.: The hazards of ammonium nitrate with regard to disaster managment
2. Barina B.J.: The versatile metal uranium and it's multiple uses
3. Józsa M. - Dobor J.: International Nuclear and Radiological Event Scale (INES)

Section E – Safety and security

Subsection 1

Chair: Alexander Fekete, Co-chair: Péter Ruzsonyi

1. Tegyey A.C.: Variegation of security – mental security of the Helpers
2. Trapp L. - Farkas J.: Tactical training experiences of a critical infrastructure security guard in Hungary
3. Hornyacsek J. - Kovács G.: The potential of VR and Metavers in education and scientific research

Subsection 2

Chair: Julius Piwowarski Co-chair: Gábor Kovács

1. Msimang A. - Tandlich R. - Restás Á.: The ethical dilemma in off-label use of Colchicine in COVID-19 cases
2. Szalkai I.: Testing of an energy production plant with drone device
3. Parrag K.T. - Gál H.N. - Kátai-Urbán L. - Vass Gy.: Microplastics: What harm can they do, and how to prevent them?

Subsection 3

Chair: Johannes Belle, Co-chair: Alice Ncube

1. Balla J. - Kakócz K. - Németh G. - Vájlok L. - Vedó A.: Innovation in Border Security at Hungary's Schengen external border
2. Balla J. - Kakócz K. - Németh G. - Vájlok L. - Vedó A.: V4 joint efforts
3. Végső E. - Dobor J.: Practical application and demonstration of cobalt-60 isotope based on disaster management considerations

Subsection 4

Chair: Roman Tandlich, Co-chair: Jozef Svetlik

1. Raffai Zs. - Horváth H.: Safety aspects of public safety planning for the transport of dangerous goods
2. Végső A. - Horváth H.: Radioactive waste managment and storage in Hungary
3. Kiss N. - Dobor J.: The disaster management perspective on an industrial incident in Aznalcollar in 1998

Short bio sketches about the authors and presenters of the conference

Chair and Co-chairs of the conference

Colonel Vass Gyula, PhD (Chair of the conference)

Colonel Dr. habil. Gyula Vass was born in 1957. He has been leading the Institute of Disaster Management since 2017. Colonel Dr. Vass has master's degrees in civil engineer (1991) and fire engineering (1986). He defended his PhD thesis in the field of military sciences, disaster management in 2006 at the Zrínyi Miklós National Defence University. In 2016 he habilitated at Ludovika-UPS and from 2017, he is full-time associate professor. He has positions at Fire and Disaster Management organisations as a firefighter, fire prevention officer, industrial safety expert and different fire chiefs. He is a member of the Scientific Council for Disaster Management, the Technical Scientific Section for Nuclear Accident Prevention and the Nuclear Energy Certification Commission.

Restás Ágoston (Co-chair of the conference)

Ágoston Restás (Eng., ret. Firefighter Lt. Colonel) habilitated associate professor at the National University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management, head of the Department of Fire Protection and Rescue Operation Management. Restas holds mechanical engineering (1988), economist (1999) and disaster manager (2002) degrees. In 2008 Restás made his PhD thesis at the Miklós Zrínyi National Defense University, titled "Research and development of the aerial reconnaissance and extinguishing of forest fires". In 2013 Restas prepared his other PhD thesis at the Corvinus University of Budapest, titled "Decision-making of firefighting managers in emergencies". Habilitation was also passed in 2015 at the National University of Public Service, Budapest.

Xu Qiang (Co-chair of the conference)

Xu Quiang is a professor at the Nanjing University of Science and Technology. He obtained his Master degree and also his Doctor Degree of Engineering at the Nanjing University of Science and Technology. He made his post-Doctoral Fellow at "Fire Technology Group" in Commonwealth Scientific and Industrial Research Organisation, Australia. He participated in the National Scholarship Programme of the Slovak Republic for the Support of Mobility of Students, PhD Students, University Teachers, Researchers and Artists, Flammability and fire behaviour research of selected polymers for energy efficient buildings, Technical University in Zvolen, Slovakia. His research interests are characterization of flammability, Ignition and Flame Spread, Measurement and Test Methods for fire safety research, Calorimetry and Experimental Thermodynamics and Kinetics.

Authors and presenters of the conference

Almasi, Csaba was born on 23rd of November 1985 in Kecskemét. He has been working as a CBRN Reconnaissance Officer dealing with administration system of hazardous materials. He has experience in intervening and investigating needed to be accomplished at accidents occurring in transport or in dangerous establishments and involving dangerous goods and hazardous materials. He also has an experience in authority work supervising of all means of transport carrying dangerous goods. Almási has a BSc degree in agriculture engineering and an MA degree in disaster management. He began his PhD studies at the Doctoral School of Military Engineering at the University of Public Service in 2020, where he is currently an assistant lecturer as well. His research topic is "Investigation Procedure at Road Accidents Involving Dangerous Goods." The expected time for his thesis defence is spring 2024.

Ambrusz, József (PhD) - COL (Fire Service) József Ambrusz, Assistant Professor of the Institute of Disaster Management, University of Public Service, Acting Head of the Department of Disaster Management Operations. His studies are diverse, in 1993, he graduated from the Lajos Kossuth Military Academy with a degree in border guarding and boarding school pedagogy. In 1997, he obtained a certified degree in human resource management at the Budapest University of Economics. In 2014, he received a certified MSc degree in Defence Administration Manager at the University of Public Service. In 2019, he obtained a PhD degree at the Doctoral School of Military Engineering, University of Public Service with his thesis titled "Elimination of the Consequences of Disasters and the Possible Solutions of the Management, Command and Control of Engineering Tasks of Rehabilitation and Reconstruction".

Asante-Okyere, Solomon is currently a Lecturer in the School of Petroleum Studies, University of Mines and Technology, Ghana. He holds a PhD and M.Sc. from China University of Geosciences (Wuhan) and B.Sc. from Kwame Nkrumah University of Science and Technology (Ghana). His expertise is in the application of artificial intelligence/machine learning.

Balla, József, PhD. head of the border policing department at Ludovika-University of Public Service (Ludovika-UPS). He is a police colonel and police high councillor. He started his professional career at the Border Guard in 1993 and continued at the National Headquarters of the Border Guard and National Headquarters of the Hungarian National Police, General Policing Directorate Border Policing Department in Documentation, as head of Border Policing and Compensation Division head till 2015, for ten years. Associate professor, because has also been to teaching in higher education since 2003. He is the editor-in-chief of Határrendészeti Tanulmányok (Border Police Studies Scientific Journal), and the author about 80 publications. His research interests include schengen-compatible border guard training and education, integrated border management and biometric personal data in police control (biomertic identification).

Bánhegyi, Roland was born on 27 of July 1978 in Mohács. He was graduated in high school in 1999 and in the same year he applied for admission to a military school in Budapest. A year later he got his first assignment in Pécs like a platoon commander. Seven years later in 2007 he gave up the military life and became a firefighter. In 2010 he became a firefighter technician. He began his studies in 2017 at the University of Public Service and obtained the BSc degree in fire protection and rescue operations management as a Disaster Manager in Fire Protcetion and Rescue Control. He is interesting in the topic of firefighting in case of electric vehicles and firefighting in case of dangerous substances.

Barina, Balázs József was born on November 3, 1983, I live in the city of Tolna. My parents are both kayak - canoe coaches and teachers. Following their example, I also started kayaking, which filled my daily life for more than twenty years. I won medals at world and european competitions, I closed my sport's career as an national team athlete. I have been working as a firefighter since 2010 in the at the time one and only nuclear power plant in Hungary. During my service, I completed mandatory power plant courses and apart of them I acquired the Bsc degree in Fire Protection and Rescue Management at the National Civil Service University and I completed the University's Master's Degree in Disaster Management. Thanks to my studies, I have been in the position of officer for the third year. As unit leader, I consider the effective protection of the lives and health of the first responders to be my primary objective. I am currently a first year doctoral student at the Doctoral School of Military Engineering at the University of Public Service.

Berger, Ádám is an engineer at the Department of Water and Environmental Security of the University of Public Service. In the course of his work, he examines the spread of dangerous substances in water and in soil. Nowadays he is a doctoral student at the Doctoral School of Military Engineering of University of Public Services. His field of research is Disaster Management. The topic of his research is about the resistance developed by dangerous materials to remediation boards and large artefacts against the irreversible effects of accidents.

Bisztrán, Zoltán was born on 30 of May 1970 in Budapest. He has been working as a professional firefighter since 1991. His civil profession is civil engineer and marine technician. In 2001, he graduated at the University of Pécs as a technical lecturer in the field of fire protection. Now he is a master's student at the University of Public Service. Since 1994 he is a fire chief. Throughout his career, he has had various positions from intervening firefighter to the fire chief. He has many operator qualifications for small machines, fire trucks and special trucks. He also taught in elementary firefighting school. In 2001, he won the national professional firefighting competition with his team. He has received many recognitions, including two national commander's awards and four times the interior minister's award and praise. In recent years, he has been regularly involved in the intervention in case of major natural and industrial disasters.

Bodnár, László was born on 31 of January 1992 in Budapest. He began his studies in 2010 at the University of Public Service and obtained the BSc degree in defence administration as a Defence Administration Organizer and in 2016 the MSc degree in defence administration as a Defence Administration Manager. He began his PhD studies in 2016 at the Doctoral School of Military Engineering at the University of Public Service and defended his thesis in 2021. He is currently an assistant lecturer at the National Directorate General for Disaster Management, who works at the Institute of Disaster Management of the Faculty of Law Enforcement at the University of Public Service. His research topics are wildfires, firefighting and fires at Wildland-urban interface.

Bohácsi, Bettina is a firefighter lieutenant. She was born on 7 of March 1995 in Budapest. She began her studies in 2014 at the University of Public Service and obtained the BSc degree in disaster management as a Disaster Management Organizer. After that She became a master's student at the same university in Disaster Management in 2020. Now she is working at the National Directorate General for Disaster Management, Ministry of Interior. She's research interest is firefighting and technical rescue in case of vehicle accidents. She also writes her thesis on this topic.

Cimer, Zsolt is a chemical engineer, engineer-economist, fire protection engineer and associate professor. He is the vice dean of the Faculty of Water Science at the University of Public Service in Hungary. His research specialization is defence design, industrial safety, explosion protection and risk analysis.

Cséplő, Zoltán is a Col. of fire protection, chief of Industrial Safety General Inspectorate of the Capital Disaster Management Directorate, and has about twenty years of industrial safety's authority experience. He worked as a vocational instructor and military technical development engineer in the Hungarian Armed Forces. He took part in the introduction of international and European Union regulations on the prevention of major industrial accidents and supervision of dangerous goods in Hungary. He holds a MSc. degree in mechanical engineering. He has an education of disaster and fire protection manager, a security organizers and a dangerous goods safety adviser. He is currently a doctoral student at the Military Technical Doctoral School of the University of Public Service in Budapest.

Debreceni, Péter was born on 17th of March 1975 in Vác. He began his studies in 1994 at the University of Sopron and obtained the MSc degree in Faculty in Forestry in 2000. He has been working for Natinal Food Chain Safety Office as forest inspector since 2001. His research topic is forest fire prevention. His specialities are design and analysis of forest fire database, operation and development of fire ban system, preparing and developing forest fire prevention plans. He has been a member of EU Commission Expert Group of Forest Fire since 2006. He is awarded with bronze medal for volunteer support of Disaster Managent by Minister of Interior in 2020.

Dobor, József is an associate professorat the University of Public Service, Institute of Disaster Management, Department of Industrial Safety. Education: 2006 Eötvös Loránd University, Faculty of Science, MA in Chemistry; 2011 Eötvös Loránd University, Doctoral School of Environmental Sciences, Environmental Chemistry, PhD; 2018 University of Public Service, Diploma in Disaster Management, MA. Degrees: 2012, PhD, Eötvös Loránd University, Faculty of Science; 2018, habil. doc., University of Public Service. Assistant lecturer (2012-2013), senior lecturer (2013-2018), associate professor (2018-). Research areas: chemistry, chemical-biological-radiological damage detection, radiation protection, detection of industrial damage events, industrial safety. Address: Hungary, 1101 Budapest, Hungária krt. 9-11. Nationality: Hungarian, Email: dobor.jozsef@uni-nke.hu

Érces, Gergő is an architect, fire protection engineer, University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management, Department of Fire Protection and Rescue Operations Management, associate professor. After obtaining an MSc degree in architecture from the Budapest University of Technology and Economics in 2009, he received a fire protection engineering certificate in 2011 at the Ybl Miklós Faculty of Architecture of Szent István University. In the field of technical sciences, he obtained a PhD academic degree in 2019 at the Doctoral School of Military Engineering at the University of Public Service. His career started as a professional firefighter at the Budapest Fire Department in 2010, where he worked in the field of fire investigation and from 2012 he worked at the Capital Disaster Management Directorate in the field of fire prevention. Since 2017 he has been a lecturer in fire prevention courses at the Department of Fire Protection and Rescue Operations Management of the Institute of Disaster Management of the Faculty of Law Enforcement at the University of Public Service. At the university, he works as a research engineer in the field of disaster management and fire prevention.

Érces, Norbert was born on the 25. of August 1986, in Budapest. He has begun his studies in 2005 at Faculty of Mechanical Engineering at the Budapest University of Technology and Economics. During his studies, he chose to specialize in building service engineering. In 2014 he obtained an MSc degree in comfort building engineering, and this year he worked as a PhD student in the Department of Building Services and Process Engineering. He works as a department engineer since 2017 at the department. His research topic is investigation of biomass fired systems. His educational activities include HVAC system planning, gas supply, use of

renewable energy, air conditioning, laboratory measurements, water supply and sewerage.

Farkas, Johanna is an emergency psychologist, hypnotherapist with 20 years of work experience. I have a part-time job and a full-time job. My part-time job is related to education. I work as an Associate Professor for the University of Public Service at the Faculty of Law Enforcement at the Department of Criminal Psychology, I mainly train police officers. My full-time job is in the biggest Hungarian Children Hospital (called Heim Pál Pediatric Hospital), where I am the Head of the Department of Forensic Psychiatry. Our department is designed for the treatment of outpatients (e.g. youth psychopathy, deviant behaviour, etc.) and inpatients (e.g. suicide, psychosis, self-defeating behaviour) associated (or not) with antisocial behaviour. Our hospital is the only one in Hungary that treats patients (children and youth) with mental disorders and they are sometimes juvenile offenders (therefore, we often meet with police officers. My main areas of interest are criminal psychology and mental disorders.

Fehérvári, Sándor was born on 21st September 1981 in Budapest, Hungary. After completing his schoolwork in 2000, Sándor entered the Budapest University of Technology and Economics (BME). He received a Master of Science in Civil Engineering with a major in geotechnics, buildings, and engineering structures in 2006. During his university studies, he earned the Student Scholarship of the Hungarian Republic for four semesters, the Student Scholarship of the BME for two semesters, the Student Scholarship of the Faculty of Civil Engineering for two semesters. He won Hungarian National Students' Scientific Workshop in 2005. He was a PhD student at BME during 2006-2009, whereafter he received his summa cum laude PhD in civil engineering in 2009. In September 2009, he joined the Budapest Transport Corporation as a project manager for constructing the M4 metro line in Budapest, Hungary. Parallel to his industrial work, he was a senior lecturer later a college associate professor for tunnelling, foundation, and bridges at the University of Debrecen between 2009-2017. In 2017, he entered the Ybl Miklós Faculty of Architecture and Civil Engineering at Szent István University. The faculty joined the University of Óbuda in 2020. He is an associate professor and teaches various types of lectures regarding to construction materials. In 2021, Sándor was appointed to the head of the Department of Fire Safety and Construction Material Sciences. After graduating from the BME, Sándor received postgraduate diplomas in concrete technology, engineering-economics, and legal engineering. His main fields of interest are the effect of heat on concrete, tunnelling, transportation projects. Sándor is married and has a daughter.

Fekete, Alexander research focuses on studying the systemic interrelations of natural, technical and man-made hazards with social vulnerabilities and critical infrastructures. Interdisciplinary disaster risk management, risk governance, urban resilience, risk and crisis communication, and target levels of safety and security are recent research and educational activities. Alexander Fekete previously worked from 2009-2012 as a Project Officer at the German Federal Office of Civil Protection and Disaster Assistance in the field of Critical Infrastructure Protection. From 2005-2009 he was Research Scholar at the United Nations University – Institute for Environment and Human Security (UNU-EHS), conducting research on social vulnerability to floods and climate change adaptation. As a consultant he worked for WHO, the German Technical Cooperation (GTZ), and the German Committee for Disaster Reduction (DKKV). He has carried out fieldwork and workshops in Armenia, Iran, Japan, Sri Lanka and Switzerland. Alexander Fekete holds a diploma degree in Geography from the University of Würzburg a doctorate (Dr.-Ing.) from the University of Bonn and a Habilitation at University of Würzburg.

Gál, Henrik Norbert is currently a student in the National University of Public Service. He's studying water engineering and public service. Furthermore, he's studying IT Security, Cybersecurity, networking and ethical hacking at CeH. He got his first academic degree as a History-Geography teacher at SZTE. (University of Szeged)

Hábermayer, Tamás began his career on August 20, 2002 in the Szentendre Barracks of the Hungarian Armed Forces, after graduating from the Kossuth Lajos Faculty of Military Sciences of the Zrínyi Miklós University of National Defense as an artillery officer and lieutenant. He gained military peacekeeping experience in 2004 when he held a liaison position in the Central - South Multinational Division - Hungarian Logistics Transport Battalion in Iraq. After completing various responsible military positions (trainer, deputy squadron commander), he was transferred from the Hungarian Armed Forces to the Disaster Management staff at his request.
On 1 March 2007, he was appointed to the position of Head of the Civil Protection Branch Office of the Bács–Kiskun County Disaster Management Directorate, which he held until 31 December 2011. During this period, he took part in the protection against the 2010 floods in Felsőzsolca and the red sludge disaster, where he served as rescue and coordination commander. He developed his professional knowledge by obtaining the master degree of disaster management civil protection organizer, passing a law enforcement

professional examination and passing a law enforcement master's examination. In addition, in order to expand his legal knowledge, he graduated from the University of Szeged, Faculty of Law. From 1 January 2012 to 30 June 2013, he held the position of Deputy Commander of the Kalocsa Professional Fire Brigade of the Bács-Kiskun County Disaster Management Directorate. During the 2013 Danube flood, he worked as a defense manager on the Solt - Harta - Dunapataj defense line. From 1 July 2013 to 21 December 2014, he was the Deputy Inspector General of Civil Protection of the National Directorate General for Disaster Management of the Ministry of the Interior. As of December 22, 2014, he is currently the Deputy Director of the Tolna County Disaster Management Directorate.
As head, he is responsible for the general replacement of the director and for the professional management of the fire, civil protection, industrial security and integrated official work. He is married, father of two sons.

Hesz, József is an associate professor at University of Public Service, Institute of Disaster Management, Department of Fire Protection and Rescue Operations Management. He works at the National Directorate General for Disaster Management of the Ministry of the Interior. His research interests are: disaster management, fire protection, firefighting operations management.

Hornyacsek, Júlia is an associate professor in the Department of Military Leadership And Public Knowledge at the University of Public Service. She gained her professional experience in the field of civil protection in population preparation and disaster eradication coordination. For her teaching activities, she conducted scientific research on the protection of the population and increasing the resilience of the population. In particular, it analyses the tasks of carrying out rescue tasks, supporting them and preparing the personnel of defence organisations. In this context, the co-author, Gergely Kovács, a doctoral student, is looking for the possibilities of state-of-the-art IT tools for environmentally conscious preparation, efficient rescue and technical support.

Horváth, Hermina is an assistant lecturer at the National Directorate General for Disaster Management, who works at the Institute of Disaster Management of the Faculty of Law Enforcement at the University of Public Service since 2012. She was born on 17 of April 1988 in Szekszárd. She began her studies in 2006 at the Miklós Zrínyi National Defence University obtained the BSc degree in

defence administration as a defence administration officer and in 2009 the MSc degree in defence administration as a defence administration manager, disaster specialization. She began her PhD studies in 2013 at the Doctoral School of Military Engineering at the University of Public Service. Her research topic is emergency planning at railway marshalling yards, and dangerous goods transportation. She is also has a certificate of training as safety adviser for the transport of dangerous goods by road, rail and inland waterway. In addition she is the secretary at Scientific Students Association at the Faculty of Law Enforcement at UPS. She received the excellent lecturer title of the Institute in 2017.

Horváth, Lilla began her higher education in 2007 at Faculty of Bioengineering at Budapest University Of Technology and Economics. In 2013 she obtained an Msc degree in bioengineering and 2014 in Health and Safety Engineering. She has begun her PhD studies in 2021 at the Doctoral School of Military Engineering at the University of Public Service. She is currently a Health and Safety specialist at the National Directorate General for Disaster Management.

Horváth, Tibor is an associate professor at the University of Public Service, Faculty of Military Sciences and Military Training, Department of Military Strategy. He did his doctoral training and degree at the Miklós Zrínyi National Defence University, Doctoral School of Military Sciences. He graduated summa cum laude. His research interests are: Technical support for combat, examination of state and team fortification structures, Technical tools used in peace operations, procedures EOD and IED.C-IED.

Igaz-Danszky, Tamás is a doctoral student at the University of Public Service, Doctoral School of Military Engineering, employee of the Capital Directorate for Disaster Management, Operation Control Service. His research interests focus on the development of operation control service as a part of Disaster Management. He has been working for the Disaster Management for 16 years of which he has spent 12 years in Operation Control Service, until the present. In 2020 he graduate with an Msc degree in”Certified Disaster Manager” at the University of Public Service.

Józsa, Máté is 21 years old, studying at the University of Public Service majoring at disaster management. Presently he is in his second year specializing Industrial Safety. He will get his university degree in 2023. At the next year he will apply for Critical Infrastructure Protection Safety Liaison Officer's degree, because he would like to continue his studies there in the future.

Kajtár, László
Budapest University of Technology and Economics - Department of Building Service Engineering and Process Engineering
kajtar@epget.bme.hu

Kakócz, Krisztián began his professional career in 2001 at the Csenger Border Police Station of the Nyírbátor Border Police Directorate. In 2002 he was appointed as the commander of the "Nyírség" Border Guard company size special unit. After the integration of the Border Guard, he served in the field of training and then in the field of aliens policing. From 2008 he was deputy head of the Aliens Policing Department of the Szabolcs-Szatmár-Bereg County Police Headquarters, from 2010 he was head of holding centre, and from 2013 he was a senior officer in the Aliens Policing Department of the National Police Headquarters. Currently he is working as an assistant lecturer at the Border Policing Department of Ludovika University of Public Service. He is also a PhD student, and his research interests include the Hungarian aliens policing system and the detention of foreigners for law enforcement purposes. His scientific publications number is nine.

Kamau, Wanjiku Jane is a senior lecturer in the School of Public Health and Applied Human Sciences, Department of Physical Education, Exercise and Sports Science, Kenyatta University, Kenya. She is the immediate former chairperson of the department and director, Kenyatta University Community Outreach and Extension Programmes. She lectures in the Department of Physical Education, Exercise and Sports Science specializing in human physiology, Exercise physiology, and sports biomechanics. Dr. Kamau is a member of the Kenyatta University Ethical Review Board and The Kenyatta University wellness board. Her area of specialization is Applied Exercise physiology with special research interest in Use of Exercise in Prevention and Management of NCDs.

Kátai-Urbán, Lajos PhD (1969): Colonel of fire protection, associate professor, head of Department for Industrial Safety for the Institute of Disaster Management, at the University of Public Service (UPS), Budapest, Hungary. He is responsible for the establishment and development of the industrial safety's higher education system within the institution. He has been working for 14 years in the field of the prevention of industrial and transport accidents at the National Disaster Management Authority in Hungary. He was elected as a deputy chair of the UN ECE Industrial Accident Convention between 2004-2008. He obtained a Ph.D degree in military technical sciences (2005) at Zrínyi Miklós Defence University and habilitation degree (2015) at UPS, Budapest.

Kerekes, Zsuzsanna was born 1958 in Budapest. She began her hight studies in 1976 at the Pannon University in Veszprém, and obtained the MSc degree in chemical engineering, silicate chemistry specialization. She began her dr.univ studies in 1981 at the Doctoral School of Budapest University of Technology Faculty of Chemical Technology and Biotechnology. She has been an university lecturer since 1999-2020 at Ybl Miklós Faculty of Architecture and Civil Engineering Fire-safety Engineering Óbuda University as fire protection laboratory leader. She obtained a PhD degree in 2015 and habil degree in 2019. Instructor since 2019 at the University of Public Service. She has been working in her profession for 40 years in various fields: material structure research, ceramics, glass, analytics. Her research topic is "research and development combustion mechanism of non-combustible and combustible materials.

Király, Lajos was born on 22nd of April in Tatabanya. He began his studies in 2004 at the University of Szechenyi Istvan, Gyor and graduated as an environmental engineer and in 2014 the BSc degree in mechatronics engineer in Banki Donat Faculty of Obuda University. He began his PhD studies in 2016 at the Doctoral School of Military Engineering at the University of Public Service. He is currently an EHS task owner in a multinational chemical industry, who works in the automotive industry and has market lead worldwide. His research topic is "research developments in ATEX." The expected time for his thesis defence is spring 2021.

Kiss, Noémi is 23 years old, graduated at the University of Public Service majoring at disaster management last year. Currently studying for a master's degree in disaster management, and has been working at the disaster management since September 2021.

Komlai, Krisztina was born on 14 February 1989 in Pécs. She began her studies in 2007 at the Budapest University of Technology and Economics Faculty of Chemical Technology and Biotechnology and obtained the BSc degree in Chemical Engineering. She began her MSc studies in 2013 at the University of Pannonia and obtained the MSc degree in Materials Engineering. She completed her studies in 2021 as Fire Safety Engineer and her topic was "Fire resistance test of self-supporting double skin metal faced sandwich panels". She is currently a testing engineer at the Fire Testing Laboratory of ÉMI Non-profit Limited Liability Company for quality control and innovation in building.

Kovács, Gergely is a doctoral student at the University of Public Service, Doctoral School of Military Engineering. Over the past year, he has gained professional experience with several development companies, in the areas of digital transformation, virtual reality and augmented reality solutions and developments. He currently coordinates AR/VR developments as a consultant for several public investments. The University explores the possibilities of using Augmented Reality and Virtual Reality in the defence sphere, and within its research it specifically looks at the advantages and disadvantages of devices used in the AR/VR field.

Kovács, Norbert has been working as a subordinate firefighter at the Fejér County Disaster Management Directorate, Székesfehérvár Professional Fire Brigade for twenty-two years, he also often serves as a squadron commander. He lives in Székesfehérvár with his wife and twenty-four years old son. He applied to the University of Public Service to elevate his many years of experience to a higher level. He began his studies in 2019 at the University of Public Service, Faculty of Law Enforcement, Institute of the Disaster Management, BA degree in Fire protection and rescue management. He also participated at the Scientific Student Conference of this University as a speaker. His research topic is the fire engines and machines, technical equipment.

Kováts, Sándor Levente is an assistant lecturer at the University of Public Service, Faculty of Military Science and Officer Training, Department of Military Strategy. He is also a PhD Student at the University of Public Service, Doctoral School of Military Sciences. He studied at Eötvös Lóránd University, Faculty Social Sciences, International Studies (BA) and International Security and Defence Policy (MSc) at University of Public Service, Faculty of International and European Studies.

Krepuska, István András was born in 21 of July 1984 in Budapest. He began his studies in 2002 at the Budapest Tech Polytechnical Institution, Kandó Kálmán Faculty of Electrical Engineering and obtained the degree in 2006 as Electric Engineer. He continued his study from 2019 at Óbuda University and obtained the Msc Security Engineer degree at 2021. From 2021 he is a PhD student, under the leadership of Dr. Rudolf Nagy PhD. He is the managing director of ZKNet Kft. Member of Hungarian Chamber of Engineers. His work is design built-in active fire protection systems. The theme of his PhD research is the aging of the active fire protection systems.

Lin, Jiang received his PhD from University of Science and Technology of China in 2017, and BEng from Nanjing University of Science and Technology in 2012. Prior to join NJUST, Dr. Jiang was a postdoc researcher in State Key Laboratory of Fire Sciences, USTC, where he conducted discrete flame spread and safety of hazardous chemicals. Dr Jiang's research includes flame spread over solid combustible, pyrolysis and its kinetics of hazardous chemicals, and thermal ablation of charring materials. In google scholar, Dr. Jiang has over 40 publications and 600 citations.

Lublóy, Éva (1976), Phd, an associate professor in structural engineering, at the Budapest University of Technology and Economics. Her main fields of interesting are: fire design, behaviour of constructions materials at elevated temperature.

Madikizela, Phindile obtained his Master's of Scornce from Rhodes University in 2016. He works on the treatment of sanitation wastes such as faecal sludge and greywater. Phindile is currently in the final stages of completing his PhD.

Máté, Gábor was born in Budapest, in 1971. He started his carrier in aviation at the age of 14, as an aircraft electrician student. Immediately after the secondary school Gabor joined to the Air Ambulance Service. After nearly 8 years of active service as a HEMS technician he started his academic studies and gained degrees in aviation engineering (University of Nyíregyháza) and in aviation business management (TU Budapest). Gábor is the founder and former co-owner of the first private Hungarian aviation training organization, the Centro-Plane Central Flying Scool in Budapest, where he instructed the the new pilots as a certified flight instructor and training manager. He built his strong aviation background further at the swiss-owned cargo airline Farnair (pilot and training manager) and at the former Hungarian flag carrier MALÉV Hungarian Airlines Plc. as a Boeing 737 pilot. After the peaceful times in the aviation business he find himself in the middle of changes. He started his change-, and crisis management activities as the leader of tourism division of the Municipality of Budapest. Based on his achievements in the management of problem areas, in 2015 he was entrusted with the management of the National Ambulance Service as general director, which organization was struggling at the time. With this, Gábor returned to the roots of his ambulance service past. During this period, he also developed his studies by studying disaster management at the University of National Public Service and participated in the organization of the special pre-hospital care group (SPEC). He is currently involved -as aviation division director- in the procurement and entry-into-service tasks of state-owned aircrafts. He led the replacement of the Hungarian air ambulance helicopter fleet and the development of the Hungarian air lift capacity by introducing a new aircraft type to the existing system. He still holds a professional air transport pilot licence. He spends his free time with his family, enjoys hunting and sailing.

Mensah, Afriyie Rhoda

Education: Sept. 2016 - Oct 2020 Ph.D. in Mechanical Engineering at Nanjing University of Science and Technology, China. Prediction of flammability parameters with Machine learning methods. Sept. 2013 - June 2016 Masters in Automotive Engineering in Wuhan University of Technology, China. Performance analysis of Spark Ignition Engines. Sept. 2008 - June 2012 Bachelor of Science in Mechanical Engineering at Kwame Nkrumah University of Science and Technology, Ghana. Design of a horizontal drilling machine for creating ducts beneath tarred roads. Work: August 2021 – Present Postdoctoral Fellow at the Division of Structural and Fire Engineering, Lulea University of Technology, Lulea, Sweden. Oct 2020 – July 2021 Postdoctoral Fellow at the Department of Mechanical Engineering, School of Mechanical Engineering, Nanjing University of Science and Technology, Nanjing, China 210094. May 2019 - Sept. 2019 Mechanical Engineer at Semiland Company

Limited, Nanjing, Jiangsu, China. Aug. 2012 - July 2013 Research Assistant at Technology Consultancy Center, KNUST, Ghana. May 2011 - Aug. 2011 Assistant Mechanical Engineer at Interplast Ghana Limited, Accra, Ghana.

Mészáros, István is a former general director of technical affairs and security liaison officer (in field of Critical Infrastructures) by Semmelweis University. Organized a number of complex disaster management exercises in healthcare environment. In 2017 arranged the „Security specialist of the year" honourable award from Security Managers' Association in Hungary. Nowadays he is doctoral student in National University of Public Services, the topic of his research the complex business continuity planning in hospitals from disaster management side.

Muchiri, Bilha is a civil servant working in Murang'a county government as the Disaster manager/ Fire chief. She is trained on firefighting and fire prevention (Nairobi School of fire), Leadership management in fire service (Polish center for international aid, Poland) and supervisory management (Kenya School of Government). She heads the fire services and disaster management Unit. Ms . Bilha is currently the treasurer of the Chief fire Officers Association Kenya (CFOA-K), and a Board member of Kenya Red Cross Society, Murang'a Branch. Since Fire investigation is domiciled in her office, she has a special interest in the area, since Murang'a county and Kenya at large is facing both natural and man-made disasters that de-stroys livelihoods of the residents and especially fire. Specialization in fire investigation will be a big step towards resilience in the community.

Muhoray, Árpád PhD is a retired major general of civil protection, honorary university professor of University of Public Service. He graduated in the Military Academy of Armoured Troops Malinovszkij Rogyion Jakovlevics in former Soviet Union, in Moscow, his university degree is tank engineer. He served 25 years for the Hungarian Army, he was the commander garrison of town Zalaegerszeg. After the Army Mr. Muhoray joined the Hungarian Civil Protection, he was appointed to the county director of HDM in county Zala in 2000. Between 2002 and 2010 he was the Deputy Director General for Emergency Management of NDGDM, and commander of Operational Staff of Governmental Coordination Committee. Between 2010 and 2011 he was the director of Disaster Management Training Centre of NDGDM and in 2012- an assistant university professor of UPS in Institute of Disaster Management. Since 2020 honorary university professor. Mr. Muhoray obtained his PhD degree at the National Defence University in Budapest. He

made several researches in the Hungarian Disaster Management on country and county level.

Mutingwende, Nhamo gained his Ph.D. in 2018 at the University of Fort Hare, SA, in Biochemistry within the environmental research niche with a focus on emerging chemical and biological contaminants. He joined the Faculty of Pharmacy, Rhodes University, in 2019 as an assistant lecturer. Since then, he received postdoctoral positions in the Environmental Health and Biotechnology Research(EHBR) group, where he is still attached. He focuses on environmental research, management, and sustainability in his work. Dr. Nhamo is an active and professional member of the SACNASP (South African Council for Natural Scientists).

Nagy, György began his studies in 2013 at the Szent István College (BSc degree in horticultural engineering). He is a chief technical rapporteur since 2021 at the Pest County Disaster Management Directorate. Between 2014 and 2021 he was firefighter and technical security officer at the Professional Fire Department of Érd. From 2019, he is a student at the University of Public Service, Faculty of Law Enforcement, Institute of the Disaster Management. His specialization for Fire Protection and Rescue Operations Management. He participated at the Scientific Student Conference of this University as a speaker. His field of researches are the technical equipment of fire units, hearing protection of firefighters.

Nagy, Rudolf, PhD, Col, currently is an assistant professor at Óbuda University. He was a CBRN defence officer. He took part in industrial safety tasks. He was gained experience as an operations officer in NATO SFOR mission. After that became the Deputy Head of Emergency Management Department of Hungarian National Disaster Management. He has been teaching subjects of safety and security sciences since 2015 and as a leader is responsible for the fire protection engineering specialization.

Ncube, Alice is a senior lecturer, trainer and researcher at the University of the Free State (UFS), Disaster Management Training and Education Center for Africa (DiMTEC, South Africa. She holds a PhD in disaster management, a masters in disaster management and postgraduate diploma in gender studies. With more ten years' experience in disaster (risk) management, her research interests are social vulnerability and climate change, international forced migration, gender issues, climate change and adaptation resilience

and sustainable livelihoods of disadvantaged communities. Alice is also the programme director responsible postgraduate, masters' and PhD programs at DiMTEC.

Németh, Gábor began his career at the Hungarian Border Guard in 1990 as a patrol leader. He graduated at Zrinyi Miklós National Defence University in 2002 as a border guard manager. He served in various positions at the Border Guard till 2007. After the integration of the border guard and the police, he worked in the field of public security and order. Then, between 2010 and 2021, at the Police Education and Training Centre, he was responsible for the selection and training of police officers and civilian experts for foreign deployment in different peacekeeping missions. He also used to serve in different peacekeeping and other crises management missions in the Middle East and the Balkan region. Currently he is an assistant lecturer at the Law Enforcement Faculty Border Policing Department of Ludovika University of Public Service, giving lessons about border security, border control and border surveillance. He is also a PhD student at the above-mentioned University and his research area is the EU Common Security and Defence Policy and the Middle East.

Pántya, Péter began his studies in 2003 at the Tessedik Sámuel College (BSc degree in human affairs) later continue at the Miklós Zrínyi National Defence University (MSc an BSc) for Defence Administration Organizer (Disaster Management, Fire Protection and Firefighter) He began his PhD studies in 2008 at the Doctoral School of Military Engineering at the Miklós Zrínyi National Defence University. He is currently an associate professor at the Institute for Disaster Management of the Faculty of Law Enforcement at the University of Public Service. He also has a habilitation. His research topics are: fire and disaster management activities, technical equipment, and the raising of the efficiency of the fire organisations at the incidents.

Papp, Csenge is a graduate vehicle engineer who works at the Department of Mechatronics and Mechanical Engineering at Szent István University as an engineer. She plans to start her PhD studies in the near future at the same university. Her research interest are flammability testing of vehicle interior materials, vehicle fires and textile fires.

Parrag, Tamás is a research assistant at the Faculty of Water Sciences of the National University of Public Administration. He graduated from the University of Veszprém as a chemist. He worked for Hungarian water utility service providers as a laboratory manager and quality management manager for 8 years. He is a student and subject of the National Civil Service University Doctoral School of Military Engineering in the Prevention of Pollution by Industrial Wastewater, with a special focus on reducing the effects of micro-pollutants.

Petrétei, Dávid, a police major, graduated as a lawyer and started his police career in 2006 as a crime scene investigator. He is an expert in latent prints and published some papers on ridgeology and disaster victim identification (DVI), has presented in front of the Interpol DVI Working Group in Lyon, in 2018, on the fingerprinting of the deceased. He is a founding member of the DVI Ridgeology sub-working group. Got a certification from CEPOL in DVI and DVI Management. Took part in the establishment of the DVI Hungary, and attended 75% of Hungarian DVI operations as a PM team leader and fingerprint expert. Recently works at the National University of Public Service, Budapest, in the Faculty of Law Enforcement, Department of Investigation Theory, as an assistant professor. Member of the International Association for Identification (IAI) and the EU IAI.

Rácz, Sándor was born on 11 of April 1973 in Nyírbátor. He began his studies in 2010 at the University of Public Service and obtained the BSc degree in defence administration as a Defence Administration Organizer and after that the MSc degree in defence administration as a Defence Administration Manager. He began his PhD studies in 2015 at the Doctoral School of Military Engineering at the University of Public Service. He received his scientific degree in 2019. He is currently an assistant professor at the National Directorate General for Disaster Management, who works at the Institute of Disaster Management of the Faculty of Law Enforcement at the University of Public Service. He also worked at the Municipal Fire Department of Budapest and at the Professional Fire Department of Budapest District IX as a Deputy Commander.

Takács, Lajos Gábor
Budapest University of Technology and Economics, Faculty of Architecture Department of Building Constructions
E-mail: takacs.lajos@epk.bme.hu, ltakacs@epsz.bme.hu

Raffai, Zsófia is an industrial safety consultant at IMSYS Ltd., who has been working for the company since October 2021. Born on 27 January 1999 in Zalaegerszeg. She started her studies at the National University of Public Service in 2018, where she graduated with a BA degree in industrial safety. In November 2020, her thesis was awarded third place at the Faculty Scientific Student Conference, and second place at the National Scientific Student Conference in 2021. The nominated paper was awarded a scholarship for the New National Excellence Programme 2021/2022. Her research topic is the transport of dangerous goods and the system of public safety planning. She is currently a first year Master's student in the Faculty of Law Enforcement, Disaster Management, National University of Public Service.

Rauscher, Judit is architect and fire protection engineer. Is currently studying at Óbuda University Doctoral School on Safety and Security Sciences, her doctoral research focuses on evacuation in healthcare institutes. She has been dealing with evacuation for more than 10 years, including computer based evacuation simulation. She has presented her work and results in fire protection planning at more international conferences in recent years, and joined international organizations to further develop herself. In addition to work and study, she also participates in the preparation of legislation and in the training of the field of fire protection. Since the beginning of 2022 she is assistant lecturer at the Institute of Disaster Management (University of Public Service, Ludovika).

Renner, Sally Juliana is currently a PhD Mechanical Engineering student at Nanjing University of Science and Technology (NJUST) since 2019 under the supervision of Professor Xu Qiang and Associate Professor Lin Jiang. She received her Master degree in 2015 at University College of Education, Winneba (Kumasi Campus), and Bachelor of Technology (2014) with First Class honors at Cape Coast Technical University, Ghana. Also gain her Higher National Diploma (HND) in Mechanical Engineering in 2001. She has since been working as a research fellow at the laboratory in Cape Coast Technical University, teaching and

supervising student to perform fluid and mechanics of machines from 2003 until present. She has been involved in many academic activities since employed at the University including supervising student project works and teaching several engineering courses. She has specialized in the area of thermal analysis, material science, manufacturing process and quality control.

Riebel, Bálint fire sergeant has been practicing this profession for more than ten years, first as a volunteer and later as a professional. He has always attracted by technical rescue tools. Therefore, the lecture is about winches used in fire trucks. He began his studies in 2019 at the University of Public Service, Faculty of Law Enforcement, Institute of the Disaster Management, BA degree in Fire protection and rescue managment. He also participated at the Scientific Student Conference of this University as a speaker.

Ristvej, Jozef gained his Ph.D. in 2007 at the University of Zilina, SVK - EU, in Crisis Management. Since that time he received postdoctoral position as the Assistant Professor and in 2014 he has received position as Associate Professor and in 2019 Full Professorship at the Department of Crisis Management, Faculty of Security Engineering, University of Zilina. Since October 2014 is at the position of Vice-Rector for International Relations and Marketing at the university. In 2007 he participated in ISCRAM Crisis Management Summer School for Ph.D. students, in Tilburg, NL. In 2010 received the visiting scholar grant of Ruth Crawford Mitchell to the Center for Disaster Management at the Graduate School of Public and International Affairs, University of Pittsburgh, USA. In his work he is focusing on supporting the information systems in the area of the decision making process in crisis management. In 2012 was member of ISCRAM 2012 Conference organizing committee, Vancouver, Canada. He is an active member of the ISCRAM Association (Information Systems for Crisis Response and Management).

Sebő, Zoltán applied to become a professional firefighter after applying for compulsory military service in 1998. He started at the Érd Professional Fire Department in 1999, and completed the basic firefighting course this year. He began his career as a news attendant and then became a subordinate firefighter, after that a special operations manager, and now he is a crew commander. After passing the matriculation exams, he received training as a commander at the Disaster Management Training Center. He began his higher education at the Department of Fire Protection and Rescue Management of the University of

Public Service in 2019. He participated at the Scientific Student Conference of this University as a speaker.

Shwababa, Siviwe is a qualified environmental scientist who holds a PhD from the University of Free State, in Bloemfontein South Africa. His areas of expertise entail environmental management and governance, improved environmental performance, protection of natural resources, restoration of degraded ecosystems, climate change mitigation and the implementation of disaster risk reduction measures in vulnerable communities. His responsibilities involve undertaking specialised work relating to environmental assessment, prioritisation of environmental risk areas, managing disaster risk reduction projects and research. He has further participated meaningfully, in numerous research projects across South Africa and has published disaster risk reduction scholarly articles in Hungary, Portugal and Germany. He is an Associate Researcher at Rhodes University in Makhanda, South Africa.

Szeleczki, Dániel is 30 years old and he began his studies in 2019 at the University of Public Service (Faculty of Law Enforcement, Institute of the Disaster Management, BA degree in Fire protection and rescue managment). He is currently serving as a professional fire fighter for 8 years. He participated at the Scientific Student Conference of this University as a speaker. His research interests is the firefighter's intervention and lifesaving activities regarding to aircrafts.

Szalkai, István is a PhD student at the University of Public Service, Doctoral School of Military Engineering. He is in his 4th year and plannes to finish his thesis. He is an Internal Audit Manager at the Muncipal Public Services Co. Ltd. He began his studies at the Agricultural University of Gödöllő and graduated as an mechanical engineer. After that he graduated at thesame university as a teacher in mechanical engineering. He is also a environmental management engineer and jurist. His research interests are: dornes, desinfection and disaster management.

Tandlich, Roman is a PhD graduate from the College of Pharmacy at the North Dakota State University where he obtained a Doctor of Pharmaceutical Sciences in 2004. He has been working as a lecturer/senior lecturer and currently as associate professor in Pharmaceutical Chemistry and Biochemistry in the Faculty of Pharmacy at Rhodes University

since January 2008. Roman Tandlich's expertise includes bioethics, water and sanitation; and public health.

Tegyey, Cecília Andrea Consultant psychologist, works in Zala County Police HR Sercive since 2012. Also student of the University of Public Service Ph. D. in Law Enforcement. ORCID:https://orcid.org/0000-0001-6313-4418.

Teknős, László was born on 30 of March 1985 in Debrecen. He is an assistant professor at the Institute of Disaster Management of the Faculty of Law Enforcement of the University of Public Service, fire captain of the professional disaster management organization. Graduated in 2010 as a Certified Defense Administrative Manager, and in 2015 earned a PhD in Military Engineering. In 2021, received a degree in agricultural engineering from Szent István University. With his research on climate change and disaster management, he has participated in several Hungarian projects as a researcher, as has won various positions and awards in several national and professional competitions. He was named 'excellent lecturer' of the Institute of Disaster Management of the National University of Public Service in the academic year of 2017/2018. In 2020, he received the János Korponay Prize from the Hungarian Military Science Society and his short monograph entitled 'Disaster Management Tasks Due to the Effects of Climate Change and Extreme Weather' was awarded the Publication Level Award in the category of natural and technical sciences at the National University of Public Service. On November 26, 2021, 2st place in the tender announced by the Scientific Council for Disaster Management in 2021 with the project entitled 'Investigation, analysis and assessment of the growing tendencies of natural disasters and events from the perspective of disaster management'. His research interests include disaster management, environmental safety, social aspects of climate change, sustainable development dilemmas, current issues of European Union environmental policy, analysis and evaluation of the probabilities of natural disasters, their damaging effects, flood protection, theory and practical logic system of catastrophe science.

Tlou, Raphela PhD, Lecturer (The University of the Free State, Bloemfontein, South Africa). Research interest: I am a socio-environmental scientist, with an interest in how the social issues interface with the environment holistically. I developed an interest in human-wildlife conflict because I believe human and animals can live together in harmony . Since joining the UFS, and teaching the mental Disaster Mental Health ; Public and mental health modules, I developed a strong interest

in the Psychosocial impacts of disasters and will be focusing my research and creating a niche around that. Education: I hold a PhD in Conservation Ecology Specialising in Zoology from the University of the Witwatersrand, my Msc is in social Sciences specialising in Disaster Management from the University of the Free State. My undergraduate Bsc degree (obtained with 10 distinctions) with majors in Zoology and Botany is from the University of South Africa. My PhD research focused on the impact of crop raiding on subsistence farming community adjacent protected area in the rural South African community. My areas of interest include conservation biology, biodiversity, I am more of an Animal, Plant and Environmental Sciences person, leaning more to animals (human and non-humans). I am also interested in Risk Reduction, impact studies to understand socio-environmental problems and Biological invasion.

Török, Zoltán, Associate Professor at the Faculty of Environmental Science and Engineering, within Babeș-Bolyai University of Cluj-Napoca, chemical engineer and PhD in Chemistry. His research focuses on chemical risk analysis connected with land-use and emergency planning, risks associated with tailings management facilities and disaster risk management. He was member in several national research project and partner leader of 2 international projects, co-author of 33 publications (18 Clarivate Analytics papers and author of one book).

Trapp, László completed his military service in 1999, and since then he have been working in law enforcement without interruption. He has served in Bosnia and Herzegovina, in the Republican Guard (nowadays it calls Riot Police), in the National Tax and Customs Administration, and since 2016 he has been a training officer of the Military Law Enforcement Centre of the Hungarian Defence Forces. His responsibilities include planning, organizing and implementing the professional training for soldiers of the Military Police. He is specialised to the field of action tactics. He prepares the personnel to implement legal, professional and proportionate actions. He teach the practical application of coercion measures and their mechanisms. He prepares soldiers for the personal tasks closely related to action tactics, methods of bomb research and related obligations. He strives to train our soldiers to be able to assume and strive to train our soldiers to be able to assume and perform law enforcement duties.

Vájlok, László began his professional career in 1995 as a border guard at the Hegyeshalom Border Police Station of the Győr Border Police Directorate. Between 1998 and 2002 he was a lecturer at the Border Police Department of the Police College, then between 2002 and 2008 he was a senior officer

at the Border Police Department of the National Command Headquarters of the Border Police. Since 2010 he has been Head of the Border Police Department of the National Police Headquarters, and since 2019 he has been a lecturer at the Department of Border Police at the National University of Public Service

Valek, Levente was born on 14 November 1985 in Budapest. He is a firefighter since 2010 in Budapest. He started his studies at the University of Public Service, in disaster management as a BA student. He graduated as a Disaster Management Organizer in Fire Protection and Rescue Operations Management. Since 2021, he has been a master's student in Disaster Management at the University of Public Service. Now he is a firefighter at the Professional Fire Department in Budapest District XIX. His research interests are firefighting and fire protection of industrial plants.

Vásárhelyi, Örs is a student in his final year at the Disaster Management Master's faculty of the University of Public Service. Örs Vásárhelyi was born and lives in Budapest. He completed his high school graduation in Vörösmarty Mihály grammar school. Then he was admitted to the University of Public Service, specialising in Disaster Management Industrial Safety. In 2017 he participated in the XXXIII OTDK competition where his work received an award. He obtained his Bachelor of Arts degree from the university. Following his graduation, he continued his studies at the University of Public Service. However, due to Covid-19, he had to interrupt his education. In the meanwhile, in 2021, he graduated from Mymove Fitness School and has become a sport instructor in bodybuilding and fitness. He worked as a manager of a fitness center in Gödöllő, Hungary. In 2022, he is expected to obtain a master's degree in Disaster Management. Örs Vásárhelyi's plan for the near future is to gain admission to the Doctoral School of Military Engineering.

Vedó, Attila PhD. started his professional career in 2007 at the Border Police Station Drávaszabolcs of the Pécs Border Police Directorate and since then he has been working in the Border Police Service. From 1 February 2013, he headed the Border Police Department of the Siklós Police Station until 31 December 2017. Since 2019, he has been a senior lecturer at the Border Management Research Workshop of the St. George College. Her research interests include the history and development of the Hungarian border police, she has 46 scientific publications.

Végső, Alexandra is 19 years old, studying at the University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management. Presently she is in her second year specializing for Industrial Safety. She will get her university degree in 2023. At the same year she will apply for the master course, because she wants to continue her studies there in the future.

Végső, Eszter is 20 years old, studyig at the University of Public Service in Budapest. She is in second year at disaster management, specializing for Industrial Safety. She will get her university degree in 2023. She wants to contine her study at the university in the future.

Wanderi, Peter Mwangi has over 30 years of research, teaching and community engagement both in mainstream physical education & sports as well as in entrepreneurship and youth empowerment; served as Acting Vice-Chancellor at Mount Kenya University (MKU) between November 2019 and April 2020; Currently coordinating several local and international, inter-disciplinary and multi-institutional projects at Mount Kenya University including serving as the Overseer of the United Nations Academic Impact SDG 10 on Reduced Inequalities Hub; Also, serves as Graduate Enterprise Academy's Overseer, which is MKU's youth job creation forum. His most outstanding grant projects he is involved in are Leuphana University's (Germany) Students Training for Entrepreneurial Promotion (STEP), the Erasmus + sponsored African Higher Education Leadership in Advancing Inclusive Innovation for Development (AHEAD) and two DAAD sponsored projects, namely, Collaboration of Entrepreneurial Universities (CEPU), and African Centre for Career Enhancement & Skills Support (ACCESS). He was instrumental in the establishment of Chandaria Business Innovation and Incubation Center at Kenyatta University prior to joining MKU.

Extended abstracts of the conference

The extended abstract topics of the conference are divided into five sections:

Section A – Fire engineering

Section B – Fire protection

Section C – Firefighting and rescue operation management

Section D – Disaster management

Section E – Safety and security

Section A – Fire engineering

Király, Lajos – Bodnár, László – Kerekes, Zsuzsanna- Restás, Ágoston

COMBUSTION OF DICHLOROMETHANE WITHOUT FLASH POINT

Abstract

Dichloromethane (DCM) has no flash point in a conventional closed tester, but it forms flammable vapour-air mixtures at approximately 100 º C or higher. It has a lower explosion limit of 13%, and an upper explosion limit of 19% in air. DCM primarily presents a toxic hazard and is usually non-flammable in most but not all conditions. However, the mixture, containing methanol or isopropanol, may become flammable under certain circumstances [1]. The measurement of DCM as a toxic hazard, and as a flammable hazard, in these situations is not a simple task. There is no guidance on the selection and use of gas monitors under these potentially dangerous and typically difficult circumstances [2]. It is therefore necessary to characterise existing technologies for measurement of these gases/vapours in order to assess their suitability as reliable monitors for testing the atmosphere and personal monitoring [3]. This paper reports on experiments development, which focuses on methylene chloride, CH_2Cl_2, in reaction environments relevant to combustion. Appropriate previous literature is reviewed and experimental studies, which are performed over wide range of conditions are presented. The experimental data of this study and data in the literature are used to test (validate) a model which is developed to emulate CH_2Cl_2 combustion and incineration.
Keywords: Dichloromethane, flash point, explosion

Introduction

There is ongoing research in all three areas of professional disaster management [4] [5]. Some of these belong to the fire protection [6][7] and fire engineering topics [8]. Dichloromethane (DCM or methylene chloride) is an organochloride compound with the formula CH_2Cl_2. This colourless, volatile liquid with a chloroform-like, sweet odour is widely used as a solvent. Although it is not miscible with water, it is polar, and miscible with many organic solvents [9].

DCM's volatility and ability to dissolve a wide range of organic compounds makes it a useful solvent for many chemical processes.[1]In the food industry, it is used to decaffeinate coffee and tea as well as to prepare extracts of hops and other flavourings. Its volatility has led to its use as an aerosol spray propellant and as a blowing agent for polyurethane foams.

These chlorinated compounds are known to inhibit hydrocarbon combustion processes, increase the levels of carbon monoxide (higher CO to CO_2 ratios), and form high molecular weight compounds and soot in flames.

A number of studies on the high temperature reaction of chlorinated hydrocarbons have been performed. Weissman and Benson. studied the high temperature (1200 -1300 K) decomposition

of CH_3 Cl and CH_3 Cl/CH_4 mixtures. They reported C2 hydrocarbons as the major products of their experiments, and that CH_3 Cl was a sort of catalyst for formation from Senser et. al. investigated PIC (Products of Incomplete Combustion) formation during the eaction of CH_2Cl_2, /CH_4/Air in a laminar flat flame at

Methods and experiments

***Background*:** Based on flash point measurements previously carried out in the fire protection laboratory of the Óbuda University, the flash point of the material could not be detected because the liquid boils at 40 °C and becomes a gas without flame activity.

Purpose of the analysis: Based on the literature references on dichloromethane, it can be assumed that the substance can still exhibit explosion or combustion activity when exposed to higher temperatures. To detect and verify this, specific measurement conditions were set up.

***Equipment used in the test*:** The heat source was provided by a horizontal iron core, the temperature of which could be adjusted by means of a control unit connected to it (Figure 1.). Thermocouples were used to measure the temperature at two points, one to measure the temperature of the iron core and the other to measure the internal temperature of the metallic vessel placed on the iron core. The flame source used was a 3-4 cm high propane flame.

***Test procedure*:** The iron core was gradually raised while DCM was continuously dripping. In a first step, the reaction of dichloromethane with heating only (without flame source) was investigated by dropping the droplets in an aluminium vessel placed on an iron core (Figure 2. a). In the second step, the reaction of the material in a thick-walled copper alloy vessel placed on an iron core was also observed by dripping, in the presence of a flame effect throughout (Figure 2. b).

Results

Table 1- Dripping results without ignition source**:**

Iron core temperature	**Inside space temperature**	**Observations**
315 °C	235 °C	chemical reaction not visible
350 °C	285 °C	chemical reaction not visible
430 °C	335 °C	chemical reaction not visible
440 °C	350 °C	chemical reaction not visible
	435 °C	chemical reaction not visible
Results: Dichloromethane shows no combustion properties up to 435 °C without an ignition source		

Table 2 - Dripping results with flame effect:

Iron core temperature	Inside space temperature	Observations
250 °C	150 °C	Chemical reaction not visible
	200-220 °C	Flashes in the lower zone of the flame
408 °C	310 °C	Flashing and pyrophoric characteristics
480 °C	340 -350 °C	Flashing and pyrophoric characteristics
503 °C	370 °C	Definite flame activity
Results: The first flash appeared at 310 °C		

Conclusions

Heat causes the droplets to immediately turn into a gas. The resulting gas did not show any combustion activity up to 435 °C without an ignition source. When using an ignition source (propane flame), gases over 310 °C show combustion activity.

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Fehérvári, Sándor

EFFECT OF NON-HABITUAL SUPPLEMENTARY CEMENTITIOUS MATERIALS ON THE HARDENED CEMENT PASTES EXPOSED TO HIGH TEMPERATURE

Abstract

A study was directed to analyse the influence of some, non-habitual supplementary cementitious materials, such as magnetite, chamotte, perlite, boron carbide and the more ordinary powdered quartz on the behaviour of hardened cement paste exposed to high temperature. Hardened cement paste specimens with two water/fines ratios were investigated heated to 7 heat steps up to 900 °C. Residual compressive strength, relative residual compressive strength and the Temperature Endurance values were compared.Our studies have proved that the perlite used as supplementary cementitious material has an outstanding performance and favourable effect even at high-temperature ranges. It is also presented that the low melting point of the boron carbide results in secondary bindings and compressive strength increment at 900 °C.

Keywords: fire, strength, magnetite, perlite, boron carbide, powdered quartz, chamotte

Introduction

In this presentation, our experimental results of the temperature endurance of hardened cement pastes consisting of different dosages of powdered quartz, magnetite, boron carbide, powdered chamotte and perlite with ordinary Portland cement was summarized. Two water/fines ratios and seven heat steps were used. After exposing the specimens to the heat, compressive strength was measured. Compressive strengths, relative compressive strengths and the Temperature endurances values were compared.

It has been assessed that the absolute residual compressive strength of the pure ordinary Portland cement pastes consisting of only 20% of supplementary Cementous materials was higher in the low heat ranges; still, its results decreased faster over 300 °C. Increasing the dosage of the supplementary materials with a constant water/fines ratio, the strength increment of the pure ordinary Portland cement pastes were lower than the heterogeneous result. The perlite addition resulted in the most prolonged nearly constant strength curves in both cases, and the boron carbide showed the secondary, noncementous bindings at 900 °C.

Evaluating the relative residual compressive strength values, it has been determined that the lower heat range's results of pure ordinary Portland cement paste were higher if the supplementary materials dosage were 20%, but were lower or equal with 35% dosage. Also, in both cases, the performance of ordinary Portland cement at mid- and high-temperature range were more moderate. The effects mentioned above of perlite and boron carbide were noticeable. Using a special relative compressing strength base, 300 °C, it is certified that at both dosages at 900 °C from all the tested materials tree group could be aggregated: First the boron carbide with its peculiar performance at 900 °C, second the perlite and the powdered chamotte resulting a bit lower value, and third magnetite, powdered quartz and the pure ordinary Portland showing the worst relative residual strength parameters. Comparing the Temperature Endurance values for the whole heat range, it is noticeable that at 20% dosage, the results are nearly the same for all curves except the perlite, which is much higher. Nevertheless, counting just the mid- and higher heat ranges (300-900 °C), the results of the heterogenous pastes were higher. The 35%

supplementary material containing mixtures result was always higher than the reference pure ordinary Portland cement values both the whole and the mid- and high heat ranges. Summarising the results, it could be determined that adding perlite to the cementitious matrix has a remarkable effect on the residual compressive strength behaviour. The boron carbide peculiar habits at 900 °C because of the melting supplementary materials, causing secondary bindings that affect the residual strength increment at 900 °C.

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Komlai, Krisztina – Papp, Csenge – Vass, Gyula – Kerekes, Zsuzsanna

EFFECT OF DIFFERENT INSULATION CORE MATERIALS ON FIRE PROTECTION OF SELF-SUPPORTING SANDWICH PANELS

Abstract

Domestic legislation imposes fire protection requirements on sandwich panels as non-loadbearing structures. In order for manufacturers to be able to demonstrate compliance with these requirements, tests in fire testing leboratories are required. In our work, we dealt with large scale tests performed in the Fire Testing Laboratory of ÉMI Non-profit LLC. The aim of our paper is to organize the different types of sandwichpanels into system, and to compare the test results and draw conclusion. After reviewing the literature related to the topic, we discussed in detail 11 test specimens from 3 different manufacturers, based on the type of thermal insulation core, the design of the joints, and the installation of the sandwich panels.
Reviewing the results, it has been shown that the type of thermal insulation core has a significant effect on fire resistance performance, a distinction must be made between vertical and horizontal orientation and this must be made known to market participants [1], [2]. Furthermore, it is important to pay attention to the quality of the installation, either during testing or during construction, because features may develop even before the fire, which can negatively affect the behavior of the structure during a possible fire.
Keywords: sandwich panel, standard, resistance to fire

Introduction

Regulation (EU) No 305/2011 (CPR) lays down uniform rules for the marketing of products within the European Union. In addition, it includes an assessment of the performance of construction products. A key part of this is the fire safety of buildings [3] [4]. In Hungary, the relevant Member State requirements are laid down in Decree 54/2014. (XII. 5.) of the Ministry of the Interior, ie the National Fire Protection Regulations (OTSZ). The technical and test background for this is provided by national fire protection standards. The aim of our work is to test the fire resistance of self-supporting (non-load-bearing) metal-reinforced sandwich panels that are standard and non-standard. In our fire protection laboratory, we deal with real-scale fire resistance tests, during which we also have the opportunity to observe the behavior of metal-reinforced sandwich panels. [5], [6]. The results of the tests may contribute to the understanding of the fire behavior of the sandwich panels, to the detection and analysis of possible installation or structural defects, and to the revision of the technical standards currently in force.

Methods

In the case of testing sandwich panel wall structures, the above standard, MSZ EN 1363-1: 2020 shall be applied in conjunction with the test standard MSZ EN 1364-1: 2016 8 Fire resistance tests for non-loadbearing elements. Part 1: Walls) [9], [10]. This standard specifies a method for determining the fire resistance performance of non-load-bearing walls [7]. A representative sample of the element is exposed to a specified regime of heating and the performance of the test specimen is monitored on the basis of criteria described in the standard [8]. Fire resistance of the test element is expressed as the time for which the appropriate criteria have been satisfied". The test results are directly applicable to similar structures where the following modification(s) have been applied and the structure still meets the design rigidity and stability requirements.

(a) height reduction; b) increase of wall thickness; c) increasing the thickness of the components; (d) reduction of linear dimensions of boards or panels; (e) reduction of spacing of supporting columns; (f) reducing the distance between anchorage centers;

Test models were developed, installed and tested in the Fire Testing Laboratory of ÉMI Non-profit LLC

Results

Table 1 - The structures were classified according to Chapter 7 of the MSZ EN 13501-2: 2016 standard.

Model marking	Fire resistance class	Boundary condition occurred
M1	E 60 / EI 60 / EW 60	-
M2	E 120 / EI 180 / EW 120	-
M3	E 30 / EI 30 / EW 30	maximum temperature rise ≤180 K
M4	E 20 / EI 20 / EW 20	maximum temperature rise ≤180 K average temperature rise ≤ 140 K
K1	E 30 / EI 45 / EW 30	sustained flaming (t ≤ 10 s)
K2	E 90 / EI 90 / EW 90	-
P1	E 30 / EI 30 / EW 30	-
P2	E 30 / EI 30 / EW 30	maximum temperature rise ≤180 K
P3	E 30 / EI 30 / EW 30	maximum temperature rise ≤180 K average temperature rise ≤ 140 K
P4	E 60 / EI 60 / EW 60	maximum temperature rise ≤180 K average temperature rise ≤ 140 K
P5	E 30 / EI 45 / EW 30	maximum temperature rise ≤180 K

Conclusions

Reviewing the results, it has been shown that the type of thermal insulation core has a significant effect on fire resistance performance, a distinction must be made between vertical and horizontal orientation and this must be made known to market participants. Furthermore, it is important to pay attention to the quality of the installation, either during testing or during construction, because features may develop even before the fire, which can negatively affect the behavior of the structure during a possible fire Modifications of the sheet metal material are

permissible as they do not significantly affect the fire resistance results. In contrast, even a small change in the thermal insulation core can result in significant differences in the results of fire resistance tests. Therefore, switching from one core material to another is not allowed and the result for one core material producer cannot be extended to another core material producer.

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Papp, Csenge – Kerekes, Zsuzsanna – Rácz, Sándor

FIRE PROTECTION CHARACTERISTICS OF SHIELDING AND THERMAL INSULATION CURTAINS

Abstract

Curtain materials today are more plastic-based, mainly polyester. But they are also made of PVC, aramid, polyethylene. All of these plastics are highly combustible [1] [2]. Due to the requirements of use, they are retarded, which must be checked by standard measurements. There are a wide variety of flammability tests. In our work, we chose an additional method that shows flame propagation not only in normal air but also in the case of artificially increased oxygen content. The aim of our studies was to determine the effectiveness of different burn retardation processes on different textiles, ie the burning phenomenon [3]. Our results show that, in our opinion, mandatory requirements are not sufficient to specify the flammability of a substance. Despite the fact that the spread of flame gives a proper quality rating, the textile can still be made combustible [4]. In our work, we chose an additional method that shows flame propagation not only in normal air but also in the case of artificially increased oxygen content. This allows us to display “hidden” combustion properties that are not allowed by standard specifications. Complete with oxygen index measurement.

Samples

We selected commercially available blackout and blind curtains, all of which were flame retardant (FR) according to the manufacturer's data sheet. The textiles were very diverse: single-layer (homogeneous), two-layer, one layer with a plastic coating, loosely and densely woven The samples were manufacturer-certified without exception.

Table 1 - Test samples. Created by the Authors.

	Type	Nature
1.	Shielding technique	lubricated back, recycled, FR
2	Shielding technique	recycled, FR
3.	Shielding technique	for silver coating on the back (light reflection, thermal insulation), FR [5]
4.	Shielding technique	PVC-polyester composition, FR
5	Shading technique	Impregnated, transparent, non-FR
6.	Textile	Translucent FR, Batist, 100% Polyester IFR with zinc weight
7.	Textile	Dimout FR, 100% polyester FR
8.	Textile	Blackout FR, 100% polyester + coating
9.	Textile	Furnishing & Upholstery velour FR, 100% PES IFR
10.	Textile	FR Light filtering, 100% polyester FR
11.	Textile	Translucent FR

Methods

Mandatory specification: EN 13 772, [6] which contains the following:

1. Step: Vertical flame spread measurement (EN 11 925)

2. Step Vertical flame spread measurement with radiant panel (EN 13 773 or ISO 6941) [11]

3 . Step: Additional or control test: Limiting Oxygen Index test (LOI) measurement (ISO 4589 or ASTM D2863**)** [7] [8].

Results

The condition preheated with the radiant panel does not differentiate between combustible and non-combustible sample groups. The hidden and thus the real differences in combustion were the differences in the atmosphere with increased oxygen content. The FR designation does not indicate actual non-flammability. No flame spread is observed in a normal atmospheric atmosphere.

Suggestions

We recommend grouping and classifying textiles based on an oxygen index, because based on flame propagation studies, it is not possible to realistically compare tissues, flame propagation can only be typical in air. I would recommend the following 4 categories for classification:

- LOI <21 combustible materials
- 21-27 non-combustible materials
- 27-39 Self-extinguishing media
- LOI <39 flame retardant materials

It must be taken into account in case of reconstruction [9].

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Renner, Juliana Sally – Mensah, Rhoda Afriyie – Lin, Jiang – Xu, Qiang

A COMPARATIVE STUDIES OF FLAMMABILITY PROPERTIES OF NEW AND OLD WOOD.

Abstract

Three species from new and old cypress, pine and fir wood were used to evaluate potential flammability among the species by employing small-scale and bench scale experiment. Based on the measured flammability parameters, pine and fir wood had higher peak heat release rates, shorter ignition time than cypress which had an increased residues about 20% higher than the other species. More hazardous gases and smoke production rate were recorded for new wood. Each variable analyzed was significantly affected by the specie considered with its density, the ignition time decreased as the external heat flux increases from 25 kW/m^2 to 50 kW/m^2.

Keywords: Flammability, Old Wood, New Wood, Calorimetry, Heat Release Rate, Time, Temperature.

Introduction

Wood is considered one of the oldest and most readily available building materials preferred over the years. Architects around the world are increasingly using wood for construction and building both residential and non-residential houses as well as manufacturing of furniture's, wall decors etc. Wood in any form either fresh or old are used in various applications having remarkable properties such as small bulk density, low heat conductivity, good mechanical property ect [1,2].

Wood has been in existence from ancient passed and has proven to have an unlimited service life if maintained and preserved from factors such as weathering, fire, moisture and so on [3]. Ancient wooden buildings that have been maintained for several years had a continuous historic covering which represent the culture and the heritage of the people. However, wood has a limitation, it is a combustible material like any other polymeric materials. Its intrinsic flammability or low resistance to burning give rise to serious potential fire risk [4]. In actual fact, its threat and susceptibility to fire have brought about unwanted fires resulting in injuries, accidents, loss of lives and destroyed many buildings.

The fire risk of wood or any other polymeric materials can be best assessed by different methodologies to measure the fire performance. Fire experiments are classified under small, bench and large scale depending on the sample requirements. For example, thermogravity analysis test (TGA), microscale combustion calorimetry (MCC), cone calorimetry etc based on standard protocols are used effectively to measure flammability properties. Many extensive research has been done using these techniques to predict fire risk and have provided useful flammability measurements information to ascertain fire safety for wooden buildings. Rowell et al. [5] utilized TGA, DTA, DSC and Cone Calorimetry test to evaluate fire behaviour of wood and the outcome correlated well with each experimental method. A relatively fire calorimetry developed is the MCC which is used to determine both pyrolysis and combustion of wood material has been used to study several flammability parameters including heat release rate, total heat of combustion, pyrolysis temperature, char yield etc [6]. Hostikka and other co workers [7] measured the HRR of birch wood from TGA, MCC and Cone Calorimetry test protocols. The results from MCC (method A), showed a slight increase of total mass losses compared to TGA. Also, the peak temperature under heating rate of 20 K/min was observed to be lower than the corresponding values from the TGA. The predicted values in cone calorimetry

at varied heat fluxes was observed to provide a good prediction for HRR from first-order single-step reaction scheme.

Combining these techniques will give a more insight in determining fire properties or flammability parameters for wood samples and serve as a reference tool to predict flammability measurements from bench and small-scale experiments [8]. In this present paper, two pyrolysis modes of MCC (method A and B), TGA and Cone Calorimetry test is used to measure and assess flammability properties of old and new wood samples. The results will provide a useful information on pyrolysis and combustibility of new and old wood as building materials and also help to give more comprehensive knowledge on how new and old wood species differ in their fire performance.

Objectives

The objective of the study is to compare the flammability properties among wood species selected for both fresh and old wood. The first step is to measure the flammability parameters of the wood with three experimental methods thus; thermogravity analysis (TGA), microscale combustion calorimetry (method A and method B) and cone calorimetry test. Some of the parameters which includes mass loss rate (MLR), peak heat release rate(pHRR), peak temperature(pT), time to ignition (TTI), total heat release rate (THR), heat release capacity (HRC), combustion gases etc are estimated. The results will be used to assess wood flammability with different densities. Also, the outcome will give a critical insight into the processes pertaining the characterization of fire properties of both new and old wood and to have a predictive insight for fire performance of these wood species.

Method

In this experiment, three wood species were selected thus; cypress, pine and fir for a comparative study. Among them, each wood specie includes fresh wood that has been felled as well as old wood obtained from ancient buildings. The fresh wood obtained by felling wood was taken as wet wood and the other part dried to use as new wood for the experiments. Next the wood was cut in different directions; cross cutting where the wood samples are been cut perpendicular to the grain whereas string cut also done along the grain of the wood. Additionally, the samples were selected from medullary heart, heartwood and sapwood with different densities. The wood samples were labelled as follows: new cypress; N-BM, old cypress; O-BM, new pine; N-SM, old pine; O-SM, new fir; N-HS, old fir; O-HS respectively. Three experimental tests were chosen for fire property evaluation. They include thermogravimetry test, microscale combustion calorimetry and cone calorimetry.

Thermogravimetry test: This technique is used to study the thermal stability of samples. It measures mass loss rate, temperature, time with the sample size 2.4 to 5mg in this case. The temperature set to a range of 25 and 800 ^{o}C with a flow rate of 60 ^{o}C/min. Nitrogen and oxygen flow conducted under 100 mL/min and heating rate of 5, 10, 15 and 20 K s^{-1}.

Microscale combustion calorimetry test: This procedure is used to determine several of the parameters related to flammability. The test sample size was 2.5 mg to 3.1 mg under pyrolysis temperature between 0 to 600 ^{o}C and combustion temperature set to 900 ^{o}C. Oxygen and nitrogen flow rate selected at 20 and 800 cc/min under a single heating rate of 1 K s^{-1} for both method A and method B.

Cone test: The experiment was conducted under the external heat radiant power of 25, 35 and 50 kW where each experiment was repeated three times with different densities. Through the cone calorimetry test, we can obtain the heat release rate (HRR), mass loss rate (MLR), time to

ignition (TTI), smoke production rate, combustion gases and other parameters of different densities. This characterization complies with ISO 5660 standards.

Findings/ Results

From the TGA results, the curves showed three stages of thermal decomposition or thermal breakdown of organic matters and volatiles from the wood samples. For wood pyrolysis, thermal degradation occurred in the three main components, thus the hemicellulose, cellulose and lignin [9]. The mass loss rate (%) of the initial sample is displayed as a function of temperature. The first stages (23 ^{o}C-130 ^{o}C) were due to evaporation and consequently highly volatile matters in the wood specimen. The second stage where major weight loss occurs at the peak temperature then followed by a rapid decay (360- 420 ^{o}C). Generally, there was a decrease of mass residue in air environment than in nitrogen. Nevertheless, old cypress wood in air environment experienced a wide range of temperature at 430 ^{o}C -798 ^{o}C due to wood specie and chemical constituents (lignin) which is thermally stable compared to the other samples.

MCC results shows higher pHRR in method B than method A for all the wood samples which was due to the test procedures and also no significant residue was obtained. However, both old and new cypress observed with lower pHRR which indicates low flammability characteristics than the other samples.

The cone calorimetry test results observed some differences in time to ignition, pHRR, ignition flameout among wood species. Smoke production rate for all the old wood samples were reduced after 300 s. It is however unfortunate that CO and CO_2 yields were increased in new wood due to moisture content although there were some variations among the wood species. At the external heat fluxes of 25 and 50 kW/m^2 there was some decreased percentage of residue as the heat fluxes increases.

Conclusion/suggestion

The fire risk of flammable materials such as wood is a key factor in effectively evaluating fire performance of the wood materials exposed to fire conditions. Measuring flammability parameters with many techniques are relevant to compare variations between wood species to ascertain the rate of heat release, mass loss rate, time to ignition and other combustion gases. From the experiments these conclusions are outlined as follows.

- Fire properties of different species of new and old wood were obtained
- TG analysis in air environment were slightly lower than nitrogen environment
- MCC experiment, method B showed significantly higher peaks of HRR than method A.
- The cone calorimetry results showed that, the differences in densities and type of wood resulted in a significant variation in flammability parameters.
- Improvement was observed from time to ignition, low heat release rate for Cypress.
- Among the wood species for both new and old, cypress wood is quite likely to be a positive specie in regards to reducing its natural propensity to burn and therefore considered as less flammable.

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Lublóy, Éva – Vass, Gyula

EFFECT OF FIRE ON CONCRETE STRUCTUES

Chemical changes in the concrete

Chemical processes which take place in the cement and concrete during the changes in temperature can be investigated by thermal analysis (TG / DTG / DTA). TG (thermogravimetric) and DTG (derivative thermogravimetric) curves allow quantitative analysis of mass-related transformations. DTA (differential thermal analysis) curves can be used to monitor the evolution of exothermic or endothermic processes in the samples.

At about **100 °C**, weight loss is caused by the water which evaporates from the macropores. The ettringite ($3CaOAl_2O_3 \cdot 3CaSO_4 \cdot 32H_2O$) decomposes between 50 °C and 110 °C [1,2]. At about 200 °C, further dehydration processes take place, which lead to further weight loss. The weight loss of specimens with different moisture content is different until total amount of water is released from the specimen. Depending on the initial moisture content, the difference in weight loss is significant, especially in case of lightweight concrete. No additional weight loss depending on the initial moisture content can be detected between **250 and 300 °C.** The decomposition of the non-carbonated portlandite ($Ca(OH)_2 \rightarrow CaO + H_2O \uparrow$) occurs between a temperature of **450 °C and 550 °C.** This process causes an endothermic peak and also further weight loss [3].

In case of normal concrete, the recrystallization of quartz from α to β quartz causes a low intensity endothermic peak at **573 °C**. The conversion of quartz results in a volume increase of 5.7% [4], which causes significant damages in the concrete. Above this temperature, the concrete has no significant load bearing capacity. **At 700 °C**, the CSH (calcium silicate hydrate) compounds decompose with further water loss. This also results in volume increase and in further loss of strength [5]. As an effect of the chemical and physical changes in the concrete, the strength properties of the concrete also change.

Spalling of concrete

According to the literature, there are several reasons for spalling. Papers [6-9] have established that the reasons for the separation of the concrete surface are the following:

- release of water
- thermal expansion of quartz aggregate,
- detachment of the aggregate,
- low tensile strength,
- dense reinforcement,
- rapid heating,
- asymmetric heating,
- thin structural parts of the cross-sections,
- cross-sections with variable thickness,
- clamped supports at the ends,
- stresses from the heat load,
- corners and rounded structural parts,
- prestressed and compressed parts,
- free water in the concrete,

- low permeability,
- water in the closed pores.

Recently, due to the development of the concrete technology, we can create much denser concrete structure e.g. high-strength and self-compacting concrete (HSC and SCC). Many researchers have dealt with the behaviour of HSC in fire. According to *Hertz* [6], beyond HSC, even high density concrete is dangerous regarding explosive spalling [7-9] (eg. concretes containing silica fume). Hertz's experiments showed that in many cases, spalling of the surface occurred during cooling. The critical air temperature for spalling is 374 °C. It has been found that below a humidity of 3-4%, the probability of spalling is very low. Spalling of HSC is usually caused by stresses which arise during the increase of the temperature. In the case of conventional concretes, the internal pressures from water vapour - that is leaving from the concrete – cause delamination.

Probability of spalling is influenced by the following factors [6]:

- external factors: the characteristics of the fire and the magnitude of the external loads on the structure;
- geometrical characteristics: geometrical properties of the structure, thickness of the concrete cover, number and location of reinforcing bars;
- composition of the concrete: size and type of aggregate, type of cement and admixtures, number of pores, addition of polypropylene fibres, steel fibre reinforcement, moisture content, permeability and strength of the concrete.

The permeability of concrete has significant effect on fire induced spalling, due to their low permeability the HSCs experience higher levels of spalling than normal strength concretes (NSCs), where permeability is higher [10].
In case of reinforced concrete structures, it is important to prevent spalling in case of fire, because the detachment of the surface decreases the fire resistance and load bearing capacity and it also makes the rescue work more difficult. Due to the detachment of the surface the failure of the structure occurs much earlier, as the steel bars are no longer protected and can warm up much faster, which leads to a very rapid loss of tensile strength.
Lot of experiments have shown that the risk of spalling is significantly lower when we use polymer fibers. This is because the pore structure formed during the burn out of the fiber network reduces the risk of crack formation [13-15].
Many experiments have been carried out on large specimens, particularly in case of hydrocarbon fires which are typical for tunnels. Experiments by *Mörth, Haberland, Horvath and Mayer* [16] on tunnel elements (length 11 m, height 2 m) have shown that spalling did not occur during a fire (temperature load with 1200 °C) if polypropylene fibre reinforced concrete was applied.
Similar results were experienced by another research group in Austria [17], during tests carried out on compressed plates. In case of conventional concrete, a two-hour fire load caused spalling, while this was not noticeable in case of plates with polypropylene fibre reinforcement.
The standard MSZ EN 1992-1-2 [18] provides additional rules for HSC, which are as follows:

- During the design of structural elements, the properties of the concrete and probability of spalling must be taken into account.
- Three classes are defined for the strength values and two classes are defined for spalling. The recommended strength classes are: Class 1 for C55/67 and C60/75, Class 2 for C70/85 and C80/95, Class 3 for C90/100.
- In case of HSCs, special design methods must be used and reduction of strength values must be done by the methods valid for HSCs.

- Between grades C80/90-C90/105 (Categories 1 and 2), concrete surfaces that are directly exposed to fire may suffer explosive spalling. To avoid this, the following methods should be used:

  - Method A: Reinforcement mesh with a minimum concrete cover of 15 mm. Diameter of the wires is ≥2 mm, with a pitch ≤ 50×50 mm. The nominal value of the concrete cover of the main reinforcement should be min. 40 mm.
  - Method B: It has to be demonstrated by testing that no spalling of concrete occurs.
  - Method C: Use of a protective layer to prevent spalling.
  - Method D: Addition of min. 2 kg/m^3 monofilament polypropylene fibre to the mixture.

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Sebő, Zoltán – Pántya, Péter

POSSIBILITIES OF USING BATTERY-OPERATED AND HYDRAULIC RESCUE CUTTING EQUIPMENT DURING FIRE INTERVENTIONS

Introduction

Firefighting and technical rescue are the main tasks of the firefighters [1]. These can happen for example in case of wildfires [2], extreme weathers [3], hazardous substances [4] other type of fires [5] [6] and also after a disaster [7]. Managing these interventions are also important [8] [9] [10]. In the topic of technical tools, we can also find some papers [11] [12], but the Authors will investigate the possibilities of using battery-operated and hydraulic rescue cutting equipment during fire interventions. The aim of examination is to investigate the applicability of battery-operated and hydraulic rescue cutting equipment during various firefighting interventions. In connection with the applicability of the tools, there were several measurements which tool can be used in how long, and the material used for the measurement can be cut. This research is mainly concerned with the applicability of rescue tools.

Results

The analysed Holmatro GCT 5111 EVO 3 advantages are: faster assembly, faster cutting, lack of hoses thus reduces the risk of accidents. It can be moved more efficiently over longer distances with less energy, lower noise level. This units disadvantages are: battery life is shorter, there are no interchangeable tools.

The analysed Holmatro CU4035 advantages are: work without vibrations even opening and closing, recessed I-bolt fits in tighter spaces. The disadvantages are: heavier weight, requires at least two people to operate, presence of hoses, risk of tripping, possibility of hose damage, and high noise level.

Conclusion

It can be stated that the use of a battery rescue device can in many cases speed up the interventions, reduce the possibility of panic in the case of a trapped injury due to its lower noise level, and the lack of hoses minimizes the risk of accidents.

Not only can it be used effectively in traffic accidents, but its use in building intrusions to remove gratings is worth considering.

The indisputable advantage of a traditional device is that various accessories needed for backup can be quickly connected to it, thus increasing the efficiency of the device.

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Section B – Fire protection

Érces, Gergő– Rácz, Sándor– Vass, Gyula

FIRE SAFETY OF SMART CITIES IN THE DIGITAL FUTURE

Introduction

Nowadays, smart urban development principles occupy a prominent place in contemporary urban planning and development. In line with international trends, nations, almost without exception, have a smart urban development strategy. The evaluation system supporting the smart development strategies of Hungarian settlements defines complex indicators in six thematic subsystems: smart mobility, smart environment, smart people, smart living conditions, smart governance, and smart economy. One of the main aspects of monitoring the smart living conditions subsystem is safety. The secure settlements of the future will consist of a complex system of smart systems built on a network of smart buildings, which will fundamentally determine safety based on prevention, including fire safety. In this monitoring topic, the researchers research how the future of fire protection - one of the cornerstones of safety - is evolving for smart settlements made up of intelligent buildings. The base of the research is the Digital Prosperity 2.0, It is a very important social program, not just an informatics project. It underpins the structure of the digital state, besides the fields of digital competencies and digital economy. This program needs a comprehensive digital infrastructure, which defines its determinative areas: digital safety, smart city and digital government. In this system the research team examines the development of fire protection in the light of the digital future.

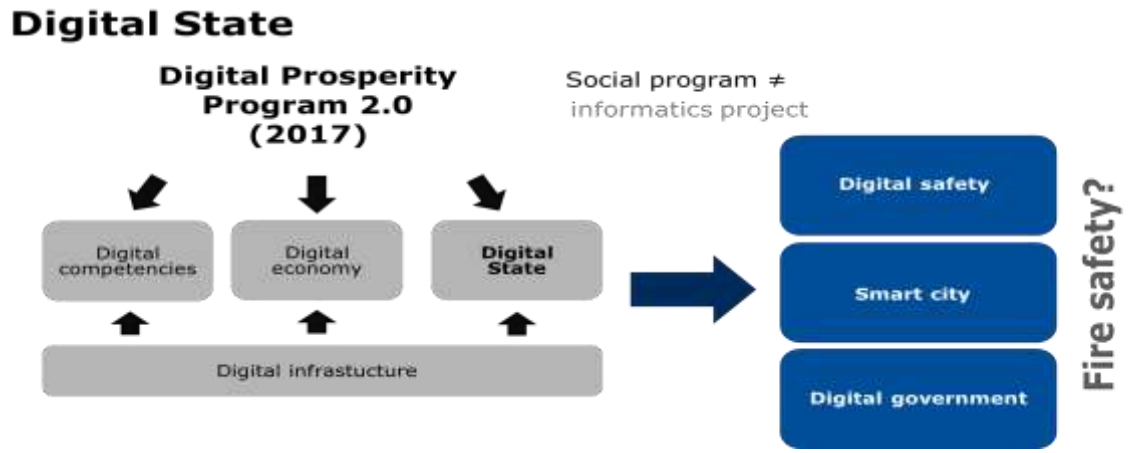

Figure 1 – Digital State. Created by the Authors.

Methods

The researcher's main goal is to develop a preventive safety in a smart fire protection network in smart cities, which are based on settlement plans and using building information modelling and management in the planning period. To reach this goal the researchers investigated the potential of digitalized settlement planning tools. They reviewed the regulations of the new

Hungarian methodological fundamentals of the one settlement one plan directive. The researchers analysed the intelligent settlement development tools which use building information modelling and management, geographic information system and common information models.

The ***hypothesis*** is that the researchers can integrate BIM-based complex digital fire protection into the fire protection network in the smart cities directive, which is based on the new digitalized one settlement one plan regulation.

Smart city subsystems

Smart city is the most comprehensive term. As defined by the British Standards Institution smart city is a methodology, which is one of the methodologies of settlement development. Settlement development stands from a lot of parameters, but there is some priority factors in the point of view smart development. The smart city methodology system can be broken down into six subsystems.

These subsystems are:

- smart mobility
- smart environment
- smart people
- smart living conditions
- smart governance
- smart economy

The Hungarian model of the smart city methodology classifies disaster management as part of the smart environment subsystem, but here raises it only the possibility of natural disasters. According to our conclusion drawn from our complex investigation, the right subsystem to develop fire protection is the *smart living conditions* category, because all of the direct safety factors belong to this subsystem. The National Laboratory of Safety Technologies, which develops the complex planning framework for safety technology developments in Hungary, was established at the University of Public Service in 2021, The laboratory's activities include the development and even market introduction of new technologies for public safety and disaster management. The research field of the authors can be found in the safe settlement subproject. The researchers are researching the settlement planning tools, which will be introduced from 2027. This will be the direct foundation for the comprehensive design of smart cities in Hungary.

Smart buildings – intelligent buildings

To build this comprehensive system, the researchers examined the smaller components of the system. They are now researching what constitutes the main elements of the system, what the determining factors are, and how they interact. The researchers are looking for the smallest factor that can have a decisive impact on the fire safety situation of a smart system.

To do this, the researchers need to look at smart buildings. The first question is why a smart building is smart. Smart buildings can be intelligent buildings. They can work with minimal human intervention or without human intervention. Smart buildings have collective intelligence, which provides automation for them. So smart buildings have a higher level of operation than normal buildings. They can do automatic measurements, analysis and evaluation. These important properties form an intelligent network platform, which is the basis of smart fire protection in smart buildings. To use this intelligent network platform for fire safety, we need to integrate five defining parameters such as data collection, data analysis, automatic controls,

decision preparation and automatic learning attribution (into it). If these are available, a fire protection network can be set up in the system.

What about a classic fire network? A very simple fire protection network stand from a lot of fire protection parameters, for example: fire department, evacuation, fire alarm system, fire intervention protocols, protection against heat and smoke, etc. These parameters are connected with one another. Using the network research method, we can determine the centres of gravity and the determining centre of the network. Nowadays, the centre of a general network consists of a fire alarm system and intelligent network platform. The other parameters affect the fire protection situation of the system to varying degrees.

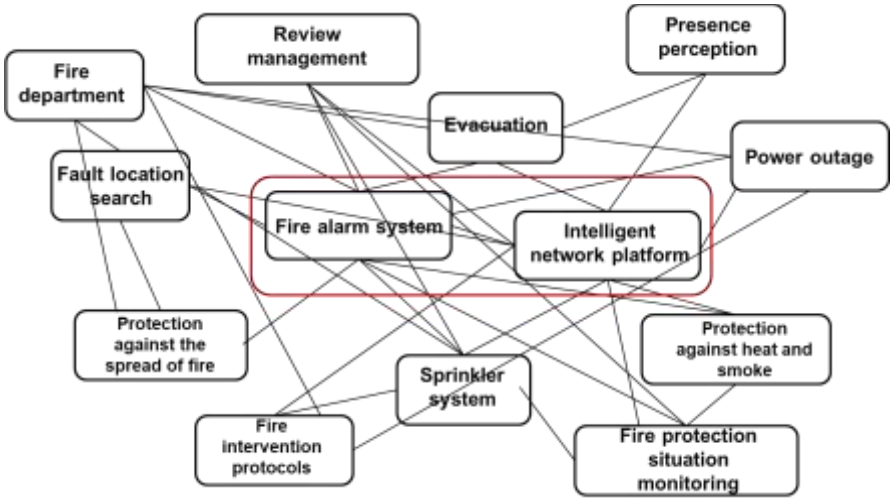

Figure 1 - Fire protection network. Created by the Authors.

Fire protection of smart buildings and BIM

The defining centres of gravity of the fire protection network can be parameterized and placed in the system as data. In order to generate such data, we have to use building information modelling. We can create data with either a closed BIM or open BIM procedure. The information that we can create comprises a three-dimensional data set. This data set in the different BIM levels provides information about the parameters that we would like to investigate and analyse. We distinguish 4 BIM levels nowadays. BIM level zero, which is an obsolete level nowadays, was the traditional design with data printed on paper. The CAD (Computer Aided Design) appeared at this level. On the first level we can use two or three dimensional models. The second level involves using real building information in the form of IFC (Industry Foundation Classes) files. This method opens a new level for BIM and standard ISO BIM at level 3. In our research, we analyse BIM level 2 to integrate fire safety information into the complex fire protection systems, in order to have a decisive preventive influence on the fire safety situation of the smart building.

How can we do this? First we need to code the legal requirements of fire protection. For example a fire resistance limit. The second step is to integrate the BIM information. For example we have to create a fire resistance performance. Then we need to use fire protection algorithms, for example a fire barrier wall in BIM model to prevent the spread of fire. We want to do a complex, comprehensive analysis, therefore, we use fire protection engineering methods too, for example temporary protected space information in case of evacuation simulation. With this complex methodology we are able to perform holistic tests.

Results

In summary, the researchers have proved that they can integrate BIM-based complex digital fire protection into the fire protection network, which is based on the new digitalized one settlement one plan regulation. The method that the researchers deduced is suitable for data extension for smart cities, which are based on digital settlement plans. With building information modelling, using common information models and geographic information systems, the researchers can create complex data in an intelligent platform. Using this platform, they can create a complex fire protection network with disaster management algorithms. Finally, the researchers can provide individual fire protection with a comprehensive methodology of network research.

Conclusion

In this research, the researchers explored the available options. The only system that is network-connected to disaster management is the fire alarm system. It is the connection between the smart city and fire protection. The conclusion is that all of the next steps must be based on this, because all of the real-time data is derived from this system. In real-time, we can control the integrated BIM information through the fire alarm system.

Another conclusion of the research is that BIM-based complex digital fire protection systems should be integrated into this system to develop a fire protection network. This fire protection network could be the key to create individual preventive fire protection.

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Krepuska, András István– Nagy, Rudolf

STUDY OF THE CONTROL OF SMOKE AND HEAT EXTRACTION

Abstract

Nowadays the essential active component of fire safety is the smoke and heat extraction of buildings. The smoke and heat extraction organized in a system can be natural, mechanized or the combination of both (hereafter HFR). According to the currently valid smoke and heat extraction Fire Safety Technical Guideline (TvMI 3.3:2020.01.22. – hereafter TvMI) the control panel components of the mechanized smoke and heat extraction a significant amount of state signals have to continuously supervise, process and show for the responsible persons/supervisors. The successful proceed of the smoke and heat extracting is a needed condition so that the evacuation of the building happens without any harm of humans and also the protection of the building's is ensured until the fire brigade arrives.

Keywords: Smoke and heat extraction, natural ventilation, artificial ventilation, smoke extraction control

Introduction

Today in Hungary there is only one regulation and one technical guideline exist in connection with smoke extraction. The currently valid regulation is the Regulation of Ministry of the Interior Nr. 54/2014 (XII.5) which is the National Fire safety Rules that we call OTSZ [1]. The technical guideline that is used as a standard is the Technical Guideline - Protection against heatand smoke spread (TvMI 3.3:2020.01.22). The OTSZ defines, which buildings must be protected with smoke extraction and give a minimum basis information as well. The technical guideline defines more precisely the technical description of smoke extraction. It is important to state that the technical guideline defines just the minimal of the protection level. Smoke and heat extraction can be functioned by natural ventilation or artificial ventilation [2] [3] [4] [5].

Objective

Our main objective to study of the whole lifecycle of the smoke and heat extraction systems from the view of the operation and from the view of the fire safety.

Methods

During our research we collected primary data's, to know deeper the national regulations and the mostly used systems. During our technical analysis we examine how to avoid the faults due to the system's obsolescence and also how make easier the usage.

Results

The OEM control panels provides a failsafe working and good supervision but just with OEM parts. Reliable protection with limited system size.

The individual control solutions granted an almost unlimited system size, but without the exact regulation the goodness of this control depends the quality of the materials and the professional competence of the designer and installer team.

Conclusion

The whole lifetime of the active firefighting system according to fail-safe operation is mostly influenced by the manufacturer existing devices and 3rd party devices that we want to use. The technical level of the used elements and the suitability of the state feedbacks guarantee the adequate fail-safe operation. It is suggested to expand the defined minimum state signals with detailed state signals. Therefor a faster error exploration is ensured.

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Farkas, Johanna

PSYCHOLOGICAL FACTORS AND CONSEQUENCES OF POST-TRAUMATIC STRESS DISORDER

Abstract

Introduction: Post-traumatic stress disorder (PTSD) is one of the most common psychological consequences among road accident survivors. Failure to provide psychological treatment could have serious and long-term effects. Several intervention techniques can be implemented, with different results in impact evaluations. In this study, we examine the psychological effects of a road crash through a case study.
Methods: A case is presented of three victims aged 32-44 with symptoms of PTSD who received psychoeducation and therapy aimed at processing the memories of a road traffic crash (RTC).
Results: Following psychoeducation and psychodiagnostic, Cognitive Behavioral Therapy (CBT) in hypnosis seemed to be effective in reducing the prevalence and severity of symptoms, and therefore no further interventions were required.
Conclusions: Possible implications of psychoeducation and intervention and future directions are suggested. As first responders – such as firefighters – tend to have more vulnerability factors for PTSD due to the nature of their tasks, the use of CBT techniques in hypnosis for psychological well-being may need to be addressed in further research.
Keywords: victims, first responders, firefighters, hypnosis, Cognitive Behavioral Therapy

Introduction

Every year, around 1.3 million people die and injure as a result of road accidents (WHO, 2021). The General Assembly of the United Nations has set a target to halve the number of deaths and injuries from road crashes by 2030 (UN, 2020). The issue is also a public health priority (Watson, 2019). Among accident survivors, there can be short- and long-term psychological consequences observed (Palmera et al., 2016). Due to differences in data collection methods, it is difficult to provide reliable statistics on how many survivors are affected; but there is a clear understanding of the nature of mental disturbances that occur as a result of road crashes, which affect not only victims but also first responders (Regehr & LeBlanc, 2017). Most commonly, depression, anxiety, driving phobia, and post-traumatic stress disorder are present, although the prevalence of mental disorders shows extreme variability across studies (Cocker & Joss, 2016). Several studies have shown that extreme stress increases the likelihood of developing mental disorders in the long term (Antoniuk et al., 2018). First responders are generally at higher risk of developing PTSD because their duties put them at regular risk of traumatic stressors. There is substantial literature examining risk factors for PTSD, symptom presentation, and comorbidities in this population. Among firefighters, the most common causes of disease are poisonings, accidents, but not least the consequences of psychological trauma (Szubert - Sobala, 2000). Also one of the most notable studies focusing on firefighters is the research by Wilson and colleagues (2016), who reviewed several studies and statistical data (Statistics Canada, 2013) to identify PTSD prevalence rates in several high-risk groups in Canada. They found prevalence of PTSD in terms of proportions as follows: soldiers, 8%; police officers, 8-32%; corrections professionals, 17-26%; firefighters, 17%; and paramedics, 26% prevalence of PTSD. Research conducted in Canada in 2014 found that 40 first responders ~~had~~ committed suicide linked with PTSD symptoms (Trinh, 2015).
A mention must be made of the Hungarian study Hornyacsek (2012), who found that the majority of firefighters are strongly affected by traumatic events, especially the death of

children and deaths that could have been prevented. The most difficult ways of carrying out their duties are when a colleague is injured/dead, where they cannot help even with great effort, or their work is made difficult by the reaction of relatives. The symptoms of acute stress subside in 1-3 minutes on arrival at the scene but have long-lasting effects after the traumatic event. They cope with these experiences mostly by talking about what happened with colleagues, spending time with family, playing sports, and pursuing hobbies.

Objective

Through a case study, We present the symptoms of PTSD of three people a fatal traffic crash and a possible way to treat PTSD. We conducted in-depth clinical interviews based on the DSM-5 predictors of PTSD (American Psychiatric Association, 2013). The most significant predictors of PTSD are rumination about the trauma, perceived threat to life, lack of social support, persistent physical problems, previous emotional problems, previous anxiety disorder, involvement in litigation/compensation, being exposed to a fatality during the RTC, feelings of anger, previous depression, peritraumatic dissociation, and initial emotional distress (Heron-Delaney et al., 2013).

Method

Symptoms of PTSD are recognized and treated according to National Institute for Health and Care Excellence (NICE) PTSD Guidelines (NICE, 2018). Although several questionnaires are available to measure PTSD (e.g. Checklist for DSM-5; Weathers et al., 2013), validated questionnaires are limited in Hungary. The Impact of Experiencing Stress (IES-R, Weiss and Marmar 1996; Perczel-Forintos, et al., 2018) and the Posttraumatic Stress Disorder Diagnostic Scale (PDS, Foa 1995; Perczel-Forintos, et al., 2018) are applicable. In-depth clinical interviews were conducted based on these and focused on the following areas:

1. Stressors (e.g. direct exposure, witnessing the trauma, indirect exposure to aversive details of the trauma, usually in the course of professional duties such as those of the firefighters);
2. Intrusion symptoms (e.g. unwanted upsetting memories, nightmares, flashbacks);
3. Persistently re-experienced traumatic event, avoidance of trauma-related stimuli after the trauma (e.g. trauma-related thoughts, feelings, or external reminders);
4. Negative thoughts or feelings that began or worsened after the trauma (e.g. inability to recall key features of the trauma, exaggerated blame of self or others for causing the trauma);
5. Trauma-related arousal and reactivity that began or worsened after the trauma (e.g. irritability or aggression, risky or destructive behavior, difficulty concentrating, sleeping).
6. Symptoms last for more than 1 month.
7. Symptoms create distress or functional impairment (e.g. social, occupational).
8. Symptoms are not due to medication, substance use, or other illness.

Using the principles of intervention, the focus was on client support, psychoeducation, and CBT in hypnosis (Schumm et al., 2022; Daitch, 2018).

Results

Two of the victims had moderate PTSD symptoms, and one had mild PTSD symptoms more than one month after the accident. We used CBT in hypnosis following the psychodiagnostic phase. The treatment methodology was trauma-focused, which directs on the memories of the traumatic event, and the thoughts and feelings associated with the traumatic event. Due to the positive impact of the psychological intervention, other interventions were not required, relatives were not involved, and it was unnecessary to connect with a support group.

Conclusion

Acute post-traumatic stress disorder usually resolves after a month, but PTSD can develop at any age as a result of a traumatic experience. If symptoms persist for more than three months, a diagnosis of PTSD can be made. Symptoms may start six months after the traumatic event, in which case it is late PTSD. If people seek treatment months or years later, PTSD can still be treated, but it may be difficult to treat if it is associated with another mental disorder (Haugen et al., 2012). Recently, several systematic reviews have been conducted on the treatment of PTSD, with pharmacotherapy recommended in severe cases (Guina et al., 2015). Lewis et al. (2020) have shown Eye Movement Desensitization and Reprocessing and Trauma-Focused Cognitive Behavioural Therapy to be the most effective, based on impact studies, and are included in the NICE recommended psychological interventions. These were complemented by evidence for the effectiveness of Prolonged Exposure Therapy (PET) and Cognitive Processing Therapy (CPT) (Lewis et al., 2020). During PET, the clients processed their traumatic memories step-by-step together with real-life situations related to the traumatic event. They learned to face the trauma and started to think about it differently, and this reduces the incidence of PTSD symptoms. A specific type of cognitive behavioral therapy is CPT, where the client learns to modify their inadequate beliefs about the trauma. It is recommended that, in addition to the intervention techniques listed by NICE, the use as well as effectiveness of PET, CPT, and CBT in hypnosis in the treatment of firefighters need to be investigated.

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Rauscher, Judit– Mészáros, István– Vass, Gyula

PRE-EVACUATION AND PRE-RESCUE PREPARATION IN HEALTHCARE INSTITUTIONS

Keywords: evacuation, hospital, preparation, business continuity

INTRODUCTION

In Hungary, the National Fire Protection Regulations issued by the Ministry of Interior Decree 54/2014 (XII.5.), based on the evacuation capability, the following categories should be taken into account when planning evacuation: persons capable of independent escape and persons with limited escape capability. The latter category includes persons who are able to escape with assistance and persons who are incapacitated, who can be rescued without preparation, rescued with preparation and not rescued with preparation.

Annex B of the Fire Protection Technical Guideline on Evacuation provides examples of the different categories for ease of use. However, the current version of FPTG: 2.4:2021.07.15 does not provide any further guidance on the tasks and processes of preparation.

In an in-patient care facility (typically a hospital), an evacuation process does not end at the designated assembly point, as the facility is responsible for the patients and their treatment must be maintained. One of the best ways of doing this is to have temporary protected spaces of the same technical capacity available within the hospital [1]. If it is not possible to maintain treatment in the institution, it is necessary to arrange for their transfer to another institution through the National Ambulance Service.

CHARACTERISTICS OF PERSONS IN HOSPITAL

In a typical hospital, there are many different types of persons who are present at the same time in terms of their ability to escape, and they can be classified into the following groups on the basis of the Regulation and the FPTG:

- visitors, staff - persons able to escape on their own and with assistance (under guidance);
- outpatients - persons who are able to escape on their own and escape with assistance (physical assistance or direction), possibly without preparation;
- in-patients - persons escaping independently or with assistance after preparation, persons who can be rescued with preparation, persons who cannot be rescued with preparation (they are on a machine of which there is no transport machine or none at hand);
- patients in operating theatres - persons who can be rescued by preparation, persons who cannot be rescued by preparation (they are on a machine without or without a transport machine at hand).

However, the distribution of people is not predictable, cannot be decided in advance, depends on the current state of the patient population within a hospital and even within a ward, and therefore requires a continuous, dynamic risk assessment by staff in the evacuation process.

PREPARATION TASKS FOR INPATIENT WARDS

For an inpatient unit, the following tasks are required in the event of an evacuation. None of these can be omitted - except in the event of a life-threatening emergency - and their order is sequential.

1. Provision of documents for patient identification

In inpatient care, the institution is legally responsible for the patient's condition, safety and belongings, with the main focus on ensuring continuity of care. To this end, the patient must be identifiable at all times during his or her movements and must carry the patient documentation necessary for his or her care. There are various ways of doing this (e.g. digital identification bracelet, fever card, rescue triage tag, etc.)

2. Determining the order of patients' rescue

The order of discharge is determined primarily by the condition of the patients. To determine the condition of patients, the principles of triage are applied by the medical staff during performing and coordinating the evacuation. The triage approach means the classification of patients according to their condition. [2,3]

Within the fire compartment affected by the fire, for the patients closest to the fire:

E0: Persons in the room affected by the fire.

E1: Children, newborns, visitors. Patients who are not connected to medical equipment and are capable of self-rescue. People who are wheelchair users.

E2: Care recipients who, after preparation, require 1 person to assist them. For example, patients who can be placed in a wheelchair or can only move with a walking aid.

E3: Care recipients who, after preparation, require 2-4 assistants to rescue them.

E4: Intensive care patients who require more than 4 assistants to rescue them.

E5: Care recipients with the lowest chance of survival.

3. Ongoing threatment activity

As the primary function of the hospital is business continuity, i.e. to ensure the continuity of the healing activity, the ongoing healing activity must either be closed or maintained in the event of an evacuation. Currently, this is what is typically meant by "preparation" in professional terminology.

If the ongoing treatment or investigation can be suspended at any time, it must be stopped in the event of an emergency and any devices or connections that could impede escape/rescue must be removed. This may require the assistance of medical staff.

If the treatment in progress cannot be suspended, the availability of treatment tools and equipment must be ensured even during the movement. If these are next to the patient in a mobile form, it is recommended that they are secured/attached to the mobility device. If they are not there directly, the transport machines, hand-held devices should be transported to the starting point. It is then necessary to ensure the transfer of the patient to the transport machines.

4. Preparing the patient for physical mobilisation.

If the patient cannot be rescued with his/her own bed, transporting available device - empty - to the patient (e.g. patient bed, patient trolley, wheelchair, stretcher, evacuation mattress, etc.) [4,5]. Repositioning and, if necessary, fixing the patient on the rescue device. This is likely to require the assistance of several key staff, some of whom may be non-medical professionals.

The time required to physically move the patient is essentially not part of the preparation time, but it does have a knock-on effect.

If the rescue device used is to be used repeatedly for another patient, the preparation includes the need to move the patient again to the "receiving bed or chair" in the temporary protected space to release the device.

The definition and development of these processes is a joint task of the fire safety specialist, the medical technologist and the medical professionals responsible for the given institutional area. During design phase of a hospital a good basis may be the medical technology programme or, in the case of an existing hospital, information from the practice surveyed.

CONCLUSION

Based on the above reflection, in inpatient care, it is not only the preparation for physical movement that is really needed during an evacuation, as we traditionally think about the issue.

It also turns out that typically patients cannot escape or be rescued without preparation. Even those patients who are physically able to do so cannot leave on their own, given that the hospital is responsible for them and they must take their patient records with them (unless this can be done automatically). So although the legislation currently includes a category of "rescue without preparation", this is not implemented in such institutions due to liability issues and sustainability of treatment and should be taken into account in the planning processes.

It would be advisable, on this basis, to reconsider the legal categories and, if necessary, review the definition of their requirements. There should also be a new category for persons who are self-rescuing after preparation.

In preparing the legislative amendment, the above line of thought has been incorporated, with the cooperation of the authors, into the next edition of the FPTG on Evacuation, with the addition of Annex B for awareness-raising purposes. This will be in force in Hungary from 13 June 2022 for new design processes, but may also serve as a guide for rethinking the rules of use.

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Bodnár, László – Debreceni, Péter

EXAMINATION OF WILDFIRES IN HUNGARY- CURRENT CHALLENGES AND ANSWERS

Abstract

The global climate change is a big challenge for the society. From the five most likely risk factors, four are related to climate change. The global climate change has many consequences for example the rise of extreme weather events and the change in precipitation. According to the climate scenarios, the temperature will rise in the future. It gives more option to ignite the combustible biomass, so huge number of wildfires are expected in the future in Europe. In this paper, the authors examine the development of fire risk in Europe and the number of wildfires in the last decade in Hungary. In addition, they also draw an attention to other social processes (suburbanization) that can increase the fire risk in some areas. These are the so-called Wildland-urban interface (WUI) areas. In the paper the Authors examine the fires at the WUI on an observation plot by using GIS spatial analyses. Finally, they make suggestions for preventing the WUI fires.
Keywords: wildfire, Wildland-urban Interface, fire danger, statistic

Introduction

Wildfires are one of the most common natural disasters, which may threat human life and property. The number of forest fires in Europe is constantly increasing, mainly due to global climate change and human negligence. But economic processes also have an impact on wildfires. As a result of urbanization and suburbanisation, residential areas have now developed that are close to the wildland areas, so the society is getting closer and closer to the environment. These areas are called Wildland- urban interface (WUI) in the International literatures. The WUI is an area, where houses meet or intermingle with undeveloped wildland vegetation [1]. The identification of WUI areas is not yet present in all countries, so research is incomplete also in Hungary. During the presentation I would like to speak about the first results in the topic in Hungary [2] [3]. The last few years have given many examples of major wildfires worldwide. One such fire was the Portugal wildfire in 2017, which resulted in the deaths of more than 60 people. But it is enough to mention the fires of the Amazon rainforest from 2019 (before covid pandemic), which also received a big attention in the media. There were a huge number of large wildfires also in Australia during the fire season in 2020. These fires resulted one of the greatest devastations in the history of the country [4]. After the international examples, I would also like to say a few words about national forest fires. The year 2022 is very dry and rainless in Hungary. As a result of it more than 5 000 vegetation fires occurred till the end of March. This number is already reaching the annual average of previous years [5].

Methods

In order to achieve the research objectives, Authors examined the relevant national and international literatures on the topic. They also made discussions with international experts on the subject. The main direction of the research was the analysis of statistics on wildfires in Hungary in the last 10 years. To analyse the WUI areas in the country and used geo-information systems for the investigation. They performed the GIS Spatial analyses with topoXmap, developed by Hungarian GIS experts.

Results

Authors analysed the development of fire risk in the European Union. They have found some interesting data in the website of the European Forest Fire Information System (EFFIS) [6]. It predicts higher forest fire risk in central Europe between the period 2041-2070. In the Carpathian Basin rain will become more uneven and the average daily temperatures will also increase. It gives a higher opportunity to ignite the combustible biomass.

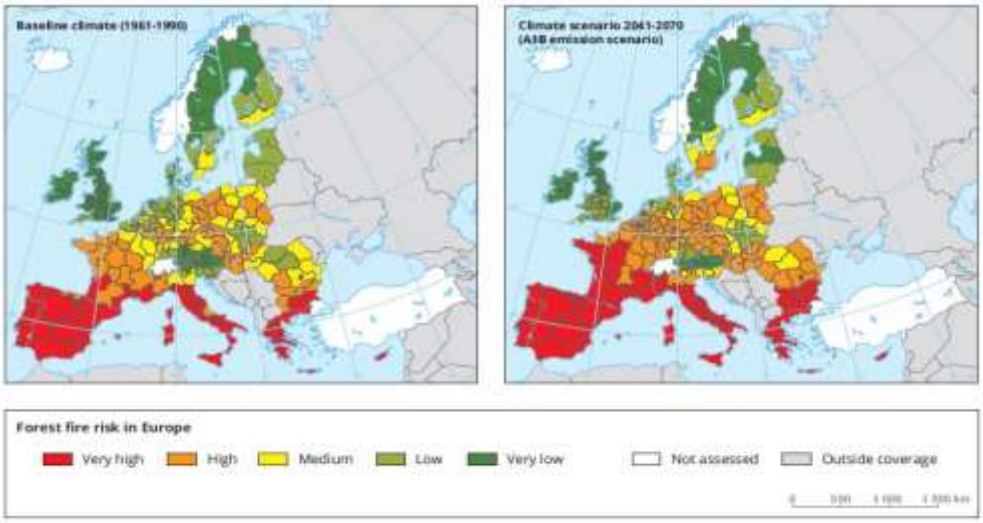

Figure 1 - Forest fire risk in Europe. Soruce: [6].

In the following we can see the number of wildfires in the last decade in Hungary. Authors divided the wildfires from the forest fires. The reason for this is that every outdoor fires occurs in Hungary is registered as a wildfire, but only some of them are generated in the forest. According to the figure it can be stated that the number of wildfires are very different in each year. The annual average of wildfires is about 5000 fires.

Table 1 - Statistic on wildfires in Hungary. Source: Forest Fire Database, National Food Chain Safety Office

Year	Wildfires (included forest fires)		Forest fires	
	Number of fires	Burned areas (ha)	Number of fires	Burned areas (ha)
2011	8,436	24,662	2,021	8,056
2012	15,794	90,668	2,657	14,115
2013	4,424	8,020	761	1,955
2014	5,535	25,140	1,042	4,454
2015	5,057	14,938	1,069	4,730
2016	2,531	3,414	452	974
2017	6,782	13,761	1,454	4,934
2018	2,981	3,016	530	906
2019	7,296	13,922	2,088	6,541
2020	4,339	6,230	1,239	2,895

With regard to fires, it is also important to determine when the fires occur during a year. This is the so- called fire season. In Hungary there are two fire seasons. The first is the early spring period, before the greening of the vegetation. It starts at the end of February and lasts until the

end of April. After this period the number of wildfires decreases, but on the 1st of June it will increasing again. This is the 2nd fires season, which is in the summer and lasts until the end of September. During the analysis of wildfires, it is also important to mention in which part of the country they occur. These areas are mainly in the region of northern Hungary, in the Southern Great Plain and in the capital Budapest and the agglomeration.
After this examination, the question arises: Does wildfires threat human life or property? The answer to the question is yes. The risk of wildfires can be related to the risk of the combustible fuel [7] and to the risk of residential areas [8]. This is the basis of fires at WUI. When houses meet with undeveloped wildland vegetation so-called, WUI areas can developed and when houses intermingle with undeveloped wildland vegetation, so-called Wildland-urban Intermix areas can developed. The difference between the two is illustrated in Figure 3.

Figure 2 –WUI and WUI mix areas in Hungary. Source: Authors.

The closer a wildfire occurs to residential areas, the greater is the risk of fires. That is why Authors analyse the fires in the WUI zones in Hungary. Fires occurred less than 500 metres from the residential area belong to WUI zone 1. Fires from 500 to 1000 metres from the residential area are in WUI zone 2. The boundaries of the zones vary by 500 meters. The number of fires in WUI zones 1 and 2 is important to us for the analysis. Based on the statistical data, it can be stated that in a year many fires occur close to the settlements.

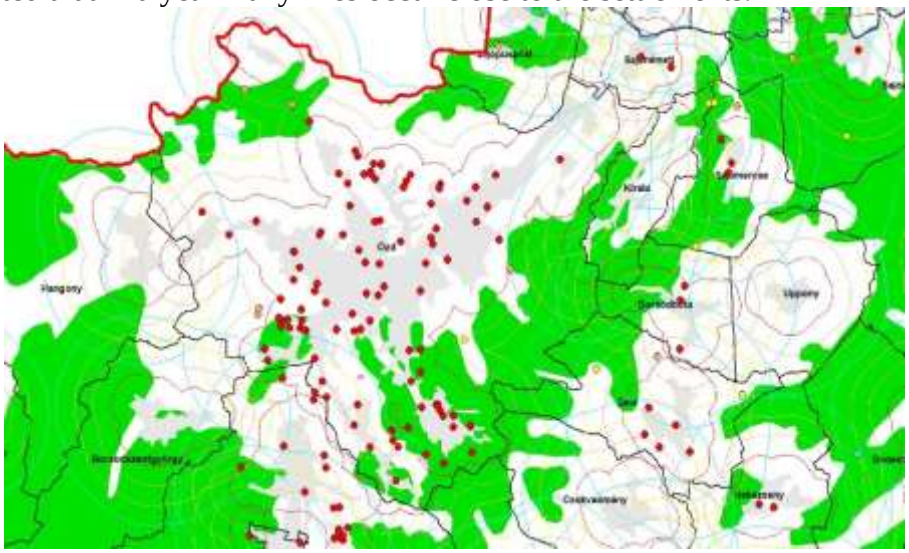

Figure 3 –Fires occurred in the WUI zones. Source: National Food Chain Safety Office.

To prove this, Authors selected an observation plot where we examined wih GIS the occured wildfires. The observation plot is in Hungary, Borsod-Abauj Zemplen County, nearby the town

Ózd. Points market in red occured in WUI zone 1. Points marked in orange occurred in zone 2. As we can see, most of the fires are generated close to the residential area. This also proves that wildfires can endanger the residential areas.

Conclusions

During the research, authors proved that WUI areas (interface and Intermix WUI) were also developed in Hungary. Many of these fires from the last decade occurred near the residential areas. These fires can pose a greater threat, especially during the so-called fire seasons. These could pose a major challenge to the disaster management in the future, so the issue is very important. Volunteer fire departments can also provide a solution to the problems of these fires, because they can put out these fires locally in a short time [9]. The authors proved it by using GIS analyses at an observation plot of the country. Another challenge is to examine the law enforcement aspects of wildfires as post-natural disaster recovery [10] and the current issues in disaster management [11].

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Kamau, Jane – Muchiri, Bilha – Wanderi, Peter – Restás, Ágoston

TOWARDS IMPROVING THE PHYSICAL FITNESS OF FIRST RESPONDERS IN KENYA

Introduction

A first responder is a person with specialized training who is among the first to arrive and provide assistance at the scene of an emergency, such as an accident, natural disaster, or terrorist attack so that at the early stages of a disaster incident, they can protect and preserve life, property, evidence and the environment. Over the years, Kenya has been exposed to a variety of disasters such as fires, droughts, floods, landslides, HIV/AIDS, human conflicts, drug abuse, traffic accidents, oil spill, industrial accidents and terrorism, among others (Government of Kenya, Ministry of Special Programmes Office of the President (2009). Disaster response is one of the four phases in disaster management whose primary aims are to rescue from immediate danger and stabilization of the physical and emotional condition of survivors which go hand in hand with the retrieval of the dead and restoration of essential services such as water and power (Kelly, 2020). According to Substance Abuse and Mental Health Services Administration [SAMHSA] (2018), first responders are usually the first on the scene to face challenging, dangerous, and draining situations. They are also the first to reach out to disaster survivors and provide emotional and physical support to them. These duties, although essential to the entire community, are physically and mentally strenuous to first responders and with time put them at an increased risk to a wide range of medical and mental health conditions (SAMHSA, 2018, GoodTherapy, 2016). In addition, the response requires physical exertion with extreme susceptibility to injuries. From a physical activity and fitness standpoint, first responders are referred to as 'tactical athletes'- because of the physically demanding nature of their jobs. They need optimal fitness through appropriate levels of physical activities. Among the physical fitness components specific to a first responder are cardiorespiratory endurance, muscular strength and endurance, flexibility and body composition. According Storer, *etal*., 2021, firefighters require high levels of aerobic and musculoskeletal fitness and appropriate body weight and composition to safely and effectively meet the heavy work demands of firefighting. These authors argue that if this is not attained, it would result into a mismatch between ability and demand, which may result in triggering cardio- or cerebrovascular events. Chizewski,Box, Keisler and Petruzzello (2021) indicate that despite the physical strain firefighting places on the human body, majority of career and volunteer firefighters fail to maintain the needed levels of physical fitness to function safely and efficiently while on duty. Over time, this could lead to deleterious health outcomes among the firefighters and the first responders. Exercise plays a major role in injury prevention among the first responders. The notion that first responders expend as much energy during an emergency as the players in a game of football has been supported by several studies that have demonstrated the need for high levels of physical fitness in first responders (Becky, 2009). However, due to the observed mismatch of physical demands of firefighting and physical fitness levels among the first responders, cardiac incidents and overexertion are the leading causes of deaths. For instance, cardiac incidents alone accounts for 40-50% of on duty death among fire fighters

Chizewski,Box, Keisler and Petruzzello (2021) indicate that fire-fighting and disaster response involves various aspects of physical fitness including Cardiovascular endurance, muscular strength and endurance, power, agility and flexibility.

Cardiovascular fitness determines one's ability to participate in vigorous physical activity for extended periods of time. Firefighting is physically demanding because the response is

physically laborious under extreme environmental conditions for extended periods coupled with intense levels of stress. Flexibility is the ability of the joint to move through its full range of motion. It is important to the first responders whose work involves strenuous physical activity, restrictive areas, slippery or unsafe conditions, heavy loads, requirement for rapid movement. Carrying heavy equipment to the scene while dressed in suffocating insulated clothing for the case of firefighters and being expected to perform at full capacity puts tremendous demands on strength and endurance of the first responders (Becky, 2009). Firefighting and rescue work involves moving the body in different positions. Therefore, the muscles need to be strong at every position within their normal range of motion. Muscular fitness would encompass strength; which is the maximum amount of force a muscle can generate during a single contraction, power; which is the rapid generation of force or ability to move loads quickly and endurance; which is the ability of the muscle to perform repeated contractions for a prolonged period of time (Becky, 2009).

Body composition refers to the make-up of the body in terms of relative percentages of body fat to fat free mass (Becky, 2009). Studies have shown that individuals with higher BMIs and lower levels of physical fitness are more likely to experience injury while on duty and perform poorly on work related physical tasks when compared to their more fit counterparts (Chizewski, Box, Keisler & Petruzzello, 2021). These authors further note that for every one unit increase in body mass index, job disability increased by 5%. Additionally, fire fighters with a BMI of $\geq 30.2 kg.m^2$ has significantly increased risk in experiencing work related injury when compared to firefighters whose BMI was $<27.2 kg.m^2$. Therefore, promoting physical fitness and physical activity among the first responders may be a cost-effective strategy to target the modifiable risk factors by promoting behavior change to reduce risks of cardiac events. Such risk factors may include obesity, high blood pressure, smoking status, poor nutrition, poor hydration and lack of physical activity and physical fitness. To prevent first responders from suffering the aforementioned cardiovascular or cerebrovascular events, and to ensure that they are physically fit to continue discharging their duties, the intervention of physical fitness professionals would be important to identify the physical fitness needs of the responders to guide development of physical health support solutions.

Objectives

This study will be guided by the following objectives; 1) To assess the physical activity levels of the first responders in the Fire Services and Disaster Management Unit in Murang'a county,2) Find out if there are existing physical training programmes for the first responders in the Fire Services and Disaster Management Unit in Murang'a county,3) Assess the physical fitness levels of the first responders in the Fire Services and Disaster Management Unit in Murang'a county, and 4) Develop, and implement physical fitness support intervention programmes for the first responders in the Fire Services and Disaster Management Unit in Murang'a County. However, this paper confines itself to the first and fourth objectives only.

Methods

This pilot study targets Murang'a county Fire Services and Disaster Management Unit. The unit was established in the year 2013 after devolution and comprises of 38 personnel deployed in 3 functional fire stations. A baseline study targeting all 38 first responders in Murang'a county was conducted using Rapid Assessment of Physical Activity (RAPA) questionnaire which was administered through google forms. The objective was to find out if the first responders are active, and is to be followed up with measurements of the specific fitness components. This will further inform development of fitness program tailormade to intervene on the physical fitness of the first responders in Murang'a county. It is hoped that if this pilot study yields

positive outcome, it will be scaled up for implementation in all the other 46 Fire Services and Disaster Management Units in the entire country, using Murang'a County as the model unit.

Results

The results indicated that 21 first responders participated in the study comprising of 66.7% males and 33.3% females. In terms of age, Majority of the first responders (81%) are aged between 26-35 years, while those aged between 36-45 years and above 45 years being fewer at 9.5% each. This indicates that the workforce in Murang'a County Fire and Disaster Management Unit is relatively young and with appropriate support, have many years to work in the unit before retirement. Most of the responders (90.5%) are firefighters and majority of them have a work experience of 1-5 years (47.6%) or 6-10(47.6%) years with only 7.8% of them having a work experience of above 10 years. This Indicates a relatively moderate experience in disaster response for majority of them.

In terms of Participation in Physical activity, those who indicated that they participate in light or moderate physical activity but not every week were more (90.5%), than those who do not participate in PA at all (9.5%). However, even those who indicated that they participate in light to moderate PA every week, they reported that they do it for less than 30 minutes per day and in less than 5 days per week. These results indicate that there is low participation in light to moderate physical activity on weekly basis by the first responders in Murang'a county. The result further indicates that even for those responders who engage in moderate PA it is less than the recommended amount by ministry of Health -Kenya in the National Action Plan on Physical Activity 2018-2023 , whereby for adults aged 18 -64 years, PA should include recreational or leisure time physical activity, transportation (e.g. walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities. The Ministry guides that, in order to improve cardio respiratory and muscular fitness, bone health and reduce the risk of NCDs and depression, adults aged 18–64 years should do at least 150 minutes of moderate intensity aerobic physical activity throughout the week, or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous intensity activity.

In addition, the first responders were asked if they engage in vigorous PA every week for at least 20 minutes or 3 times in a week. Majority (61.9%) of the respondents indicated that they do not engage in vigorous PA, while (38.1%) indicated that they participate in vigorous PA at least for 20 minutes for 3 days in a week. This shows that the level of vigorous PA among the first responders in Murang'a county is low because it does not meet the recommended amounts by the ministry of health-Kenya whereby they should engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous intensity activity. It is important to note that these recommendations are not for the first responders but for the general Kenyan population and for purposes of maintaining good health and wellbeing. Thus, the first responders should even be engaging in a higher amount/ level of PA than what is currently recommended in terms of intensity, duration and frequency. Surprisingly, majority of the respondents reported to be participating in activities to increase their muscle strength (71.4%) and flexibility (90.5%), Meaning for the two components (muscle strength and flexibility) the first responders are meeting the recommended levels by the Ministry of Health Kenya whereby they perform PA involving major muscle groups on 2 or more days a week.

Conclusions

The study responded to objective one on levels of PA. It is noted that the first responders in Murang'a county do not engage in adequate amount of PA as recommended for basic health and wellbeing, let alone for them to be able to meet the daily demands of their job. From the observations that were conducted on the unit, there are no established facilities to support participation in PA such as gymnasium, or an open field. In addition, there is no existing programme to guide participation in PA. Perhaps this can explain why there is low participation in PA by the first responders. These observations and findings point towards the need for a follow-up study to assess the physical fitness attributes of the first responders in Muranga county so as to guide the development of physical fitness training programme that will target individual responders in the specific fitness components.

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Igaz-Danszky, Tamás – Hesz, József

OPERATION CONTROL DECISIONS RELATED TO THE ALERT, DEPENDING ON THE LENGHT OF SERVICE

Abstract

Since 2012, almost 10 years ago, each county has had its own Operations Control Service, the only exception was the capital, where it has existed since the 1970s. At the Service there are newcomers and old hands as well. The research sought to answer the question of decision related to the alert how depending on the length of service. The respondents answer 6 special questions on an interview style discussion, about 6 special data sheets. Based on their responses to the questionnaires presented, the study concluded that time on the field makes little difference to their basic decisions about alerting. The newcomers quickly get the grip, and gave the same answers in the main things as old colleagues. The real difference was in individual insights and ideas. These ideas depended largely on the respondent's previous experience, and strongly reinforce the importance of teamwork.

Keywords: Operation Control Service, teamwork, alert decision, invidual ideas, invidual experiences

Introduction

After 13 years of experience of Operation Control the question has arisen: „How much does the time spent in the field matter in our work?”, further explained: “Does someone who has been working here for many years make better decisions and faster in the process of alarm?”. This is the idea behind the research presented below, which seeks to answer the question.

Objective

The research was designed to prove or disprove the following hypothesis: "For specific incidents where the information available is not sufficient to make a clear decision, the older operation control dispatcher in the field make better decisions, while newcomers are more likely to give their answers following the requirements defined by the regulations and are less likely to dare to deviate from that."

Method

The survey was conducted with 12 respondents. Of these, 10 were from the Capital Operation Control Service and the other 2 were from other areas of the Directorate. They made their decisions on the basis of the (deliberately insufficient) information provided by the 6 data sheets presented to them and answered the 6 questions asked of them. The survey method used was a questionnaire survey, with answers given by respondents during an interview-style discussion. There were no pre-recorded answers, which make it somewhat difficult to process the responses, but at the same time personal experiences and thoughts were more visible, giving a more nuanced picture of the responses. The events respondent are asking about are not clearly identifiable situations. This requires some degree of improvisation and intuition, which depends largely on the knowledge and experience of the operator.

Results

An analysis of the respondents' decisions revealed that, contrary to the hypothesis, there is no significant difference between older and newer workers. All of the respondents' main motives behind their decisions to raise the alarm was essentially the same. As well as the time need for decision-making. The only thing that can be pointed out is that the older respodents was more confident in their decisions. Nevertheless, the research also showed that teamwork is a very important part of the operations management activity. In many cases, individual ideas on how to deal with an incident, independent of the group breakdown, emerged alongside the mandatory elements, often to the advantage of the alerting process as a whole.

Conclusion

Although the survey is not significant, it does show the nature of Operation Control Service work, especially in the capital. On this basis, the hypothesis was refuted. It should be pointed out that the main criteria for issuing theoretical alarms were the time factor, the risk to human life, the presence of fire or the presence of a dangerous substance. Of course, all 4 option can be attributed to the risk to human life. The study has shown that the newly recruited operations controllers quickly get to grips with the job and generally manage events well. However, the study also showed that, beyond the basic decisions and choices, there is a predominance of individual ideas, insights and perspectives that add a very positive dimension to the work being done. Based on this, a further interesting investigation may be whether the decisions of operations management staff are typically more cognition-based decisions or rather shortened in time to rather classical "critical analytical thinking" type decisions. Events such as the ones in the example do not occur every day, but it can be said that 80,000 alerts per year are sufficient to allow the above-mentioned decision situations to occur.

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Tlou. D. Raphela –Ncube, Alice

THE IMPACT OF SHACK FIRES ON THE PEOPLE OF J.B MAFORA INFORMAL SETTLEMENT, BLOEMFONTEIN, SOUTH AFRICA

Abstract

Energy and poverty, prevalent in under-resourced communities, are key contributors to shack fires worldwide. The marginalised, energy-poor, especially in South Africa rely on flammable hydrocarbons, such as paraffin, for energy services. The fuels are burnt in inefficient and unsafe ways leading to serious impacts on exposed communities. Within cramped informal settlements the impacts of shack fires on these communities are pronounced. With electricity connections, the number of igniters will be reduced, for examples lights will be used instead of candles.
Keywords: Shack fires, paraffin use, informal settlement, age, gender, sustainable living

Objective

Based on the above, we examined the effects of informal settlement fires in J.B. Mafora informal settlement, Bloemfontein in the Free State province in South Africa focusing on health vulnerabilities of this community.

Methodology

We adopted a mixed method research approach; combined with a relatively broad literature study to capture the complexity of the related issues. The contextual focus includes the macro-economic factors that contribute to the environment in which informal settlement fires occur. Data was collected through semi-structured interviews and analysed descriptively and inferentially. We applied Generalized Linear Mixed Models and multinomial Logistics Regression to investigate the health vulnerabilities of the study community due to shack fires by using the two most critical demographic variables when it comes to vulnerability assessment; gender and age.

Results and discussions

We found a very negligible number of respondents (n=2) were above 60 years of age. In addition, most respondents (22.0%) had only Junior secondary Education and most households had 3 to 5 inhabitants (46,6%). Furthermore, most of the respondents own their houses (71.38%) and they have stayed for above four years in their dwellings (67%). Interestingly, 95% of the respondents use open fire for heating and cooking.

We found significant differences for the ‘yes’ and ‘no’ responses and gender when respondents were asked what sources of fuel they are using for cooking and heating. The highest number of

reports were from females and paraffin was the highest fuel source reported for cooking and heating.
These results shows some pattern between paraffin usage and the female gender and could indicate the highest number of females reporting sick during winter seasons as compared to their male counterparts. Indeed, paraffin fumes has been reported by a lot of studies to bronchitis related illnesses. The fact that a lot of males did not report paraffin as a source of fuel and cooking shows the inequalities as far as gender is concerned in developing countries.
Furthermore, this study found, statistical differences for the 'yes' and 'no' responses and the interaction between gender and the responses when respondents were asked the distance of health care facilities from their dwellings. Surprisingly the highest number of males responded to this question as compared to females. Generally, males are reported to avoid going to health care facilities, this could be the reason why they response to the distance question. Nevertheless, the distance question was asked to established the easy access to health care facilities in case fire burns needs to be attended to. Access to health care facility can predict the health vulnerabilities of communities at risk of fire hazards.
The results of the multinomial logistics regression revealed a significant relationship between the age of the respondents and the fuel source used for cooking and also for age and the fuel source used for heating. Interestingly, the majority of the respondent were between the age group of 46-55 across all variables. This study showed some health vulnerability of the study community based on two critical demographic variables, gender and age. However, since the Disaster Management is now focussing resilience of communities, a follow-up study in this community needed so that the resilience of this community can be measured especially now since the COVID-19 pandemic has exposed other vulnerabilities and coping capacities of communities around the world. This does not take the fact that gender and age as revealed by our study should be ignored as predictors when it comes to Disaster Management.

Recommendations

Proactive intervention strategies are required and should include the broadening of access to safe and sustainable energy. We advocate greater enforcement of home appliance standards and targeted support for the distribution of proven alternative energy technologies, such as liquefied petroleum gas and solar power. Support and advocacy from professional and citizen groups would be necessary to ensure that government prioritises the safe energy requirements of poor citizens.

Conclusions

Our study confirms ealier studies, that indicated age and gender as predictor of responses and especially when it comes to vulnerability to health related issues. Also, the study showed other variables that are usually ignored in the fire disaster management that be useful in assessing health vulnerabilities related to shack fires. More studies within government should consider these variable especially with the surfacing of the Health disasters in the 21st century to facilitate the attainment of the SDG 11 that aims to renew and plan cities and other human settlements in a way that offers opportunities for all, with access to basic services, energy, housing, transportation and green public spaces, while reducing resource use and environmental impact. The results further relate to the view that informal settlement fires are a social issue and not only an operational issue that exacerbates health issues. The broad social, and health vulnerabilities pertaining to shack fires are shown by our study.

Section C – Firefighting and rescue operation management

Valek, Levente – Rácz, Sándor – Horváth, Hermina

COMPLEX ANALYSIS OF FIRES IN INDUSTRIAL FACILITIES

Abstract

Technological development in industrial areas and the increase in the area of large cities caused by urbanization and population growth have also posed a significant challenge to the industry. The industrial areas were divided into 3 parts. Companies with good economic background have relocated their production and storage areas into modern areas. Companies that depended on infrastructure and performed weaker, remained in the big cities. Due to the increase in the area and the lack of development, many of them were ruined or got new owners, who passed the area on to smaller companies. These areas are characterized by large improvements or no improvements at all. As a result of it, they have now become a major disaster risk, which needs a response. The objective of the research is to use the analyzed information to find solutions for the efficient and safe firefighting and the prevention of large-scale industrial fires.

Keywords: industry, firefighting, brown zone, design

Methods

During the examination of industrial areas, we did fieldworks and local knowledge classes in 4-6 hours a day, on average for 8 weeks in Budapest and its agglomeration. We examined the industrial areas and the building structures such as their characteristics, design, behavior of spatial distribution in case of fire and its effect on the intervention. We examined the connections between the tasks and problems during a real intervention, and we analyzed the effectiveness and professionalism of the various measures. We also proved the possibility of a solution and its effectiveness with a practice. During the research we also analyzed the national and international case studies and relevant literatures and legal frameworks of the topic.

About the industrial areas

The industrial areas were divided into 3 parts [1]. The first part is the so-called brown zones, which are already surrounded by cities. In the absence of these improvements, they were sold in several parts [2]. Today, these areas are evolving independently with more internal transformations and more functions. The second type is the Modern lightweight industrial areas. They are owned by companies with adequate capital. The developments have already been designed in accordance with the legal regulations and standards in force. They have units equipped with extinguishing and alarm systems as well as additional intervention elements. In the third type, there is a hybrid mixture of these. Here the old factory buildings have been modernized with new lightweight structures [3].

- Old building structures, partial corrosion of supporting structures, large amounts of contaminants that cause rapid fire spread.
- it is characterized by a maze-like location and an illogical territorial division.

- The design of narrow streets and relatively low overhead cables and utilities hinders the rapid movement of fire trucks and the efficient use of special vehicles.
- Old fire hydrants, improper maintenance or obsolete design, it can lead to a water shortage area, which can only be solved by long-distance water transport.
- Damage to firewalls, application of breakthroughs without adequate fire prevention, facilitates the spread of fire to another fire section

The area is difficult to approach with large fire trucks [4]. That is why many recommend to use aerial vehicles if it is possible [5]. They do not allow the driver to stop outside the rubble or to move the truck quickly if it is necessary. The fire resistance of structures with different properties played a significant role in the tests. The fire resistance of the materials is shown in Figure 1 as the changes in the strength and stability of the materials.

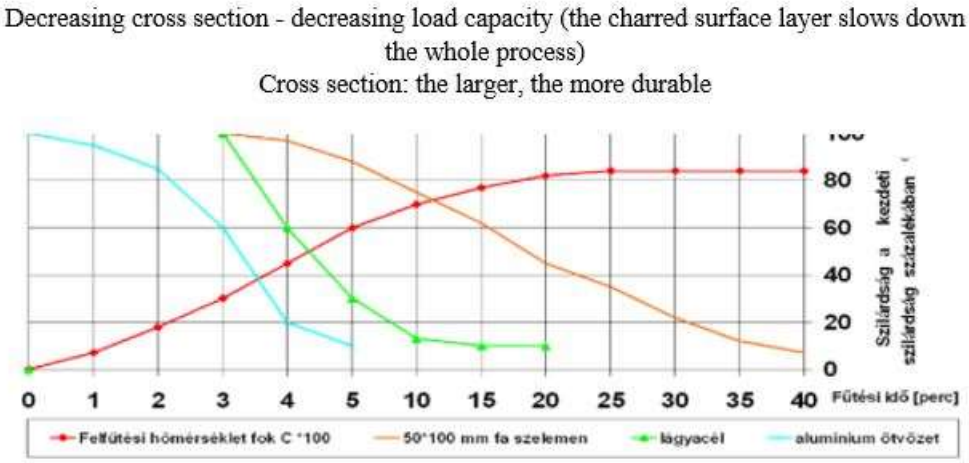

Figure 1 - Variation of the load capacity of different structures as a function of time.

Results

The results of the research showed the need to keep the given industrial objects under constant control. One solution is for the authority to carry out increased inspections, thus facilitating appropriate fire safety developments [6]. Research has also shown that the preparation of a Firefighting and Technical Rescue Plan (FTRP) not only for the greatest source of danger. Additional hazards should be ranked based on available information. This would have to be done either per building or per production unit in a so-called sectional Firefighting and Technical Rescue Plan. This includes information such as the floor plan of the building, the location of the utilities, the installed fire protection equipment, and the exact dimensions of the building. Alternatively, this data can be used to determine the safe working time frame. I defined it so: „*The safe working time frame extends from the generation of fire to the point where the building's support structures lose their load-bearing capacity and strength due to thermal and other physical effects and only external extinguishing is possible due to the collapse*". At this time, the saving of property is possible, and internal firefighting can also be done safely. The efficiency of the sectional Firefighting and Technical Rescue Plans was proved in an assembly practice at the Thermal Power Plant in Kispest. Competent firefighters are effectively prepared for the greatest source of danger [7]. It was closed with a result of over 95% during the last exercise. However, for the second biggest threat, firefighters and the fire chief did not have adequate information. During the exercise, the gas receiver was burned, which can also indirectly trigger a chain reaction. The installation was carried out in two steps, in the first step only the local specialist was informed and intervened. In the second step, the

other part of the firefighters intervened with the data of the sectional Firefighting and Technical Rescue Plan developed for the area. The measurement result showed a 25% faster intervention, as shown by the figure on the slide. An additional benefit of sectional Firefighting and Technical Rescue Plan is the prevention of over- and under-alarms, which can result in more effective and safer interventions. As a third result, a safe working time frame was defined. Based on the processed data, We have illustrated in a diagram that the point can be precisely delimited, after which the required force and equipment increase significantly and the saved value is reduced to zero.

Summary

Investigating and examining the fires in industrial areas is one of the most important tasks today. As industrial areas develop, so do the hazards. In addition to prevention tasks, the risk of industrial areas can be significantly reduced through the development of interventions and stricter regulations. It can also increase the effectiveness of the intervention. As a result of the research, the intervention of firefighters can also be made more economical. The use of sectional Firefighting and Technical Rescue Plans avoids the risk of a possible over- or under-alarm. This would also have a reducing effect on the costs of the intervention, which would also increase the saved value and efficiency. The importance of further research is as serious and necessary a task as the study of wildfires caused by global warming, and it also has an environmental role of a similar scale.

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Horváth, Lilla

ERGONOMIC APPROACH TO PERSONAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS

Abstract

During the firefighting and technical rescue activities, it is not possible to fully ensure a non-hazardous and safe working environment with collective protection, as they may be exposed to numerous mechanical, biological and chemical effects. Occupational safety regulations come into force during the construction and maintenance of fire departments, as the central issue is to protect the safety and ability of the workforce to protect both life and property. The use of personal protective equipment during interventions may provide an adequate level of protection. The weight and design of the personal protective equipment and equipment worn during firefighting affects the human body, so the author highlights the ergonomic and psychological factors in this area. Finally, there are some solutions that can reduce the number of accidents during firefighting and technical rescue.
Keywords: firefighter, occupational health and safety, accident, personal protective equipment

Introduction

Since the Middle Ages, mankind has always been concerned with fire protection. Technological advances generated by urbanization have also made firefighting equipment more efficient and professional. These ongoing changes are forcing firefighters to adapt to the challenges in the best possible way, both in terms of their expertise and their protective equipment.
The unified disaster management organization in Hungary was established in 2012, since which significant changes took place in the system of tasks. In the field of disaster protection, the foundations are provided by Act XXXI of 1996 on fire protection, technical rescue and fire brigade and Act CXXVIII of 2011 on Disaster Protection and Amendments to Certain Related Acts law. The national body for disaster management is the National Directorate General for Disaster Management (BM OKF) of the Ministry of the Interior, and the regional bodies are the County Disaster Management Directorates and the Capital Disaster Management Directorate. Its local bodies are the Disaster Management Offices, which are divided into three levels: Disaster Management Offices, Professional Fire Brigades and Disaster Management Guards. Disaster management is based on three areas: fire protection, civil protection and industrial safety.
During firefighting interventions, firefighters have to perform various, in many cases dangerous, tasks. According to section 1 (2) of Act XCIII of 1993 on occupational safety and health “those working in Hungary have the right to safe and healthy working conditions”. It is the employer's responsibility to provide the employees with appropriate personal protective equipment and also to review and inspect them regularly.
The intervention staff plays an important role in the operation of a country, as the protection of critical infrastructures is of utmost importance from national security point of view. As we know, power supply is the most important element in this area, so a possible fire damage could cause huge losses. Taking this into consideration, personal protective equipment plays an important role when intervention firefighters work in hazardous environments.
Only regular personal protective equipment may be used in fire departments, which should be regularly maintained and replaced by members of the staff with appropriate professional knowledge. In addition, at the beginning of the course, and later continuously in the barracks,

education and further training related to the correct use will take place at the Disaster Management Education Center.
Due to climate change and technical developments that can be felt by all (eg solar panels, electric vehicles etc.), it is necessary to address not only the everyday use, but also the maintenance and the firefighters' responses to emergencies. Personal protective equipment must provide the highest level of protection against sudden or unexpected hazards. Tamás Berek, József Csurgai and Andrea Farkas in their article titled “Adaptation possibilities to the consequences of climate change in the field of public service” discuss at length the factors influencing climate change that can have an impact on the work of intervening firefighters in several respects.
In addition, technical developments (eg solar panels, electric vehicles, etc.) have raised a number of new and unprecedented problems, which is why it is necessary to place great emphasis on continuous training, which is currently provided by Disaster Management.
The weight and design of the personal protective equipment and professional equipment worn during firefighting greatly influences the impact on the body, so I consider it important to take into account and emphasize the ergonomic factors in this field, which are becoming more and more important nowadays. As discussed in Juhani Smolander, Kalev Kuklane, Désirée Gavhed *Effectiveness of Light-Weight Ice-Vest for Body Cooling While Wearing Fire Fighter's Protective Clothing in the Heat excess* weight can impair endurance against physical and thermal exertion.
Continuing on the topic of the issue of ergonomics, it is worth mentioning that the psychological stress and its long-term effects experienced by the intervening firefighters, also reduce the resilience of the human body. Michael N. Sawka, Lisa R. Leon, Scott J. Montain's scientific paper *Integrated Physiological Mechanisms of Exercise Performance, Adaptation, and Maladaptation to Heat Stress* demonstrates the responses to heat-induced stress in the human body based on cellular research. I also consider these research results and scientific analyzes to be important because it clears to what extent a radical and / or long-lasting change in an external factor affects the human body. Thus, in my opinion, there is a possibility in my research topic that could preserve the health status of firefighters for a longer period of time, as they need to obtain a suitable qualification from a health, physical and mental point of view, according to the relevant legislation.
Dr. Ágoston Restás's article *Psychology on the Fire Frontline deals with patterns of behavior during and after the procedure*. In my opinion, the field of psychology is not a negligible topic either, as the development of personal protective equipment and professional equipment used by firefighters is closely related to their mental capacity and responses to problems. That is, the tools are more complex and need to be handled professionally and quickly, even in stressful situations. The introduction of further innovative tools and techniques in this field is also justified from the point of view of national defense, as the personal protective equipment of the intervention staff will be able to increase the efficiency of the interventions with the development of technology (eg to stay in the fire). After all, if a damage event can be eliminated earlier in time, the loss and material damage can be minimized which is important from the point of view of the national economy.

Objective

My aim is to determine the technical and ergonomic characteristics of the personal protective equipment currently in use. After collecting this data, I will answer whether similar issues have arisen in other countries and if so, what kind of solutions will help the staff.
My additional goal is to propose a (new) personal protective equipment that is both ergonomically and technically up-to-date and appropriate for long-term interventions.

In addition, my goal is to determine the psychological burden on the intervening firefighters during firefighting and technical rescue. That is, whether personal protective equipment strengthens safety awareness, or whether there are individuals whose physique (size, weight) makes the activity more difficult both physically and mentally.

Methods

The basic idea of my research is the examination of the currently known environment of interventions, the examination of the personal protective equipment in use from several aspects. Based on the obtained results, my research objective is primarily to research a personal protective equipment that can be used to avoid the long-term damage to the human body caused by a long-term interventional firefighting career, thus increasing the level of protection and ergonomic compliance.
For the purpose of all this, I study the relevant literature, the research results published in domestic and international scientific publications.
In addition, I use primary research methods (questionnaire survey and interview) to learn about the users' own experiences and opinions on the ergonomic characteristics of the personal protective equipment, which is the driving force behind the research. The questionnaire survey is planned to be self-completion, as I consider free speech to be of great importance in the ergonomic aspects, as I believe that convenience as a concept cannot be defined using a specific scale. In the case of an interview, I plan a semi-structured interview, including a soft interview, as more honest answers require a friendly atmosphere and a relationship of trust.
In the case of the interviews, I evaluate the responses in text format and use them highlight individual characteristics. Through the conversations, I hope that the real problem will appear, which will help to focus on the point that appears in the proposal section of the article.

Findings/results

The short-term goal / result of the research is to give the author a general idea of the technical and ergonomic characteristics of personal protective equipment for firefighters, both domestically and internationally. In addition, it collects and evaluates the personal opinions and experiences of the staff through questionnaires, which will help with improvements later on.
Using all this data, the author develops proposals for a new type personal protective equipment for disaster management and fire protection in the technical and legal fields. In addition, the author proposes new personal protective equipment that provides more effective protection for the human body from an ergonomic point of view (especially with regard to musculoskeletal disorders).

Conclusion/suggestions

In the course of my research work, using international literature, technical descriptions, standards, the topics and experiences of lectures given at international conferences and the empirical studies I have conducted. I will produce research results that can be used to improve the safety of life and avoid accidents of intervening firefighters, as well as to reduce the number of accidents at work and minimize damage to health.

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Bohácsi, Bettina – Rácz, Sándor

FIREFIGHTING IN CASE OF SHIP FIRES

Abstract

Hungary is the country of water. There are several rivers and lakes in the country with continuous boat traffic, sometimes also with large ships. The Danube River is an important trade and tourist route. The traffic on ferries and passenger ships on Lake Balaton is significant during the sailing season. For sporting purposes, a huge number of small boats appear on waters. It is the most common on the Tisza River and Lake Tisza. Due to heavy traffic, there is still a possibility of an accident or fire on board. The Authors examine the firefighting possibilities in such a dangerous environment.

Keywords: firefighting, fireboat, ship fire, tactic, safety

Introduction

The rules for fighting against ship fires are described in Chapter VIII of the 6/2016. Annex 1 of the NDGDM instruction, Fire fighting tactical regulations [1]. The intervention is governed by the Act XLII of 2000 on water transport [2] and the 57/2011. (XI. 22.) NFM Decree on Navigation Regulations [3]. Navigation rules are important in case of watercraft accidents, so firefighters should be familiar with signs and signals along the waterway. Interveners during these kind of fires operate essentially under these laws. It is important to note that the chapter on ship fires in the Firefighting Tactical Regulations applies in connection with the other chapters.

Methods

The authors examined and evaluated the legislations related to the topic. They compared it with the findings of their own research to flip through the conclusions. In addition they have been studied the previous publications and PhD dissertations and made professional consultations with experts in the field. The authors have also analysed the accidents in the transport sector in recent years.

Results

After analysis, the authors determined that, on average, there are about 25 incidents in a single day that require firefighting or technical rescue from the fire brigades. Examining the transport sectors between the period 2017 and 2021, it can be stated that 97% of the whole transport-related accidents are road accidents. In addition, firefighters have to intervene in watercraft accidents on average in almost 19 cases a year. The statistics are shown in Figure 1.

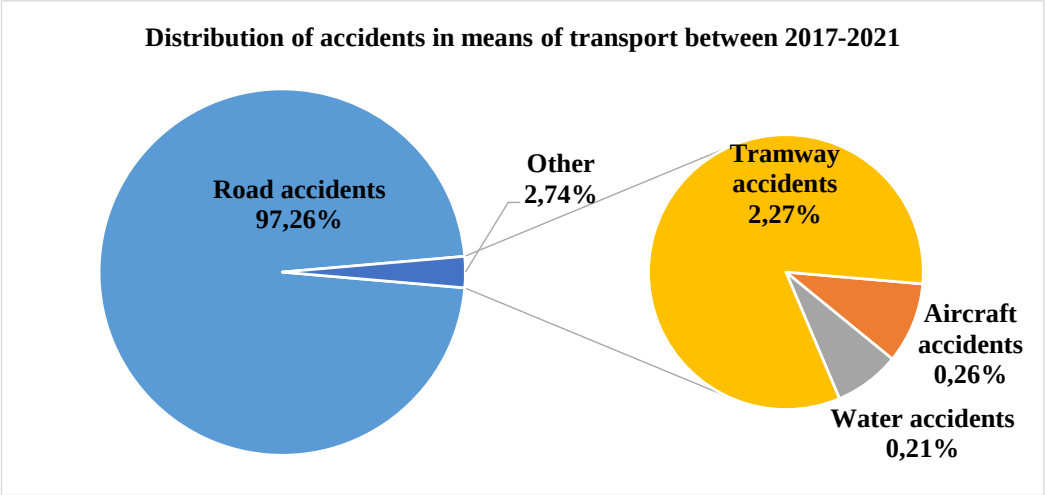

Figure 1-Distribution of accidents in means of transport between 2017-2021. Source: Database of National Directorate General for Disaster Management, Ministry of the Interior.

In case of a ship fires, it is important to know whether the ship is a passenger ship or a carrier. Also important is the size of the ship, length, width, dive and the free side height. During the firefighting, the type of fuel, the transport methods of the transported materials, their quantity and quality are important to know. From a tactical point of view, the position of the ship is also determinant. If the vehicle is near the shore, it can be suppressed from land, otherwise only from water. So if the ship can still be moved, it is necessary to try to run and moor the ship. This serves a more effective intervention. However, other ships and coastal artefacts should not be endangered by the fire. During the reconnaissance, information must be collected from the captain of the ship or NAV INFO, which is a 24-hour dispatch service. In addition, the staff of the ship should also be contacted. They can inform the interveners what kind of activities they have carried out in connection with the rescue and they can also report on other dangers that may exist. During the reconnaissance, it must be ascertained whether the ship is transporting dangerous substance. In case of hazardous substances, the distance of the accident from the residential area and from offshore installations must be assessed. Of course, the hazardous substance also pollutes the water [4] [5]. It is necessary to know the characteristic of the materials on board, the method of stabilization the cargo and the consequences of the transported material coming into contact with water. The fire chief can study the ship's and transport documents, take into account the visible signs of the ship, the labels and signs placed on the packages. The day and night markings on ships carrying hazardous substances are illustrated in Figure 2.

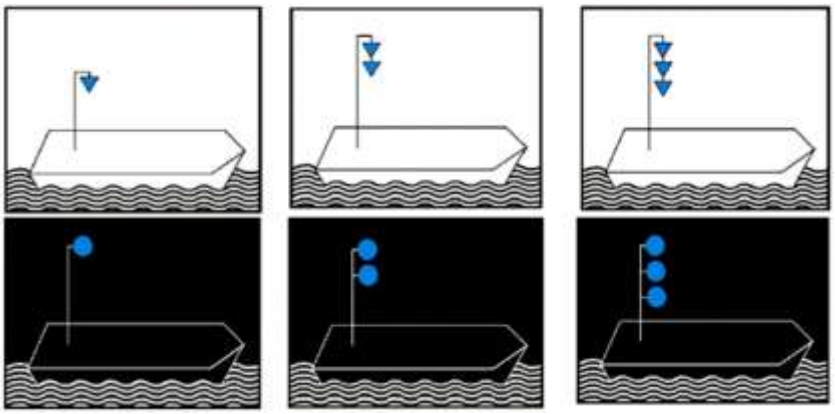

Figure 2 - Day and night markings for ships carrying dangerous substances, Source: [3]

Even in the case of ship fires, the first and most important task is to save human lives. Life saving should be carried out with several rescue teams, if necessary, in such a way that it does not affect the location and direction of the intervention. If it is not enough to save people from the burning, enclosed places on board during the life-saving, then a continuously available rescue instruments or lifeboat is required to leave the vehicle. During the intervention, the ship should preferably be approached from the windward side and from the direction of the drift. When entering into a burning place, firefighters should be prepared for the possibility of backdraft and the possibility of immediate retreat should always be considered. The structure of the ship can dangerously weakened by heat, so it may be necessary to cool it. The stability of the ship can change due to the incoming water or the movement of the transported goods. The fire chief must also consider these effects during an intervention. Radio communication may be lost during the intervention, so alternative radio communication options must also be prepared. Administration must always be kept of interveners, if there are several entry points, communication must be possible between the interveners. In case of ship drifting, a collision may occur. Firefighters can also be prepared for this, but it cannot be said in case of, stranding, which happens unexpectedly. Firefighting can be done from water, shore, or from both directions, using the appropriate tools [6]. The ship's own extinguishing installations, other equipment and if it is necessary, pumps can applied (Picture 1).

Picture 1 – Pumps during an intervention. Source: Pest County Search and Rescue Service.

Conclusions

Knowledge of the markings in the Navigation Rules is important in case of ship fires. In order to increase the efficiency of the intervention, the authors suggest to organize such trainings to the firefighters. The effectiveness of such trainings has already been proven [7] [8]. The authors also suggest the installation of the essential parts of the Navigation Regulations from firefighting and technical rescue point of view thus supporting the operation control of fire trucks. In most parts of the Tisza river, even if the ship runs ashore, it is not possible to approach the fire site from the road. Due to the long distances on Lake Balaton, the chances of reaching the shore are reduced. For these reasons, it would be important to acquire further firefighting ships. Intervention in hard approachable places is also a problem [9] [10] [11]. So another suggestion is to procure floating pumps to provide water in places that are difficult to reach for the firefighter. As firefighters do not have a daily routine in connection with the ship fires, the authors suggest organizing more specialized trainings for this purpose.

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Debreceni, Péter

CHALLENGES AND OPPORTUNITIES IN FOREST FIRE PREVENTION IN HUNGARY

Abstract

European Forest Fire Information System (EFFIS) reports show that the temporal and spatial patterns of wildfires in Europe are changing. Fire situation in Hungary shows similar trends [1]. The causes behind these recent trends are complex. In response to these trends, a priority should be greater attention to land-based fire prevention practices as part of integrated fire management. In the frame of this study, I would like to examine opportunities to develop the Hungarian system in the light of a new European approach.

Keywords: effective forest fire prevention, fire regulation, land-based fire prevention, forest fire risk estimation

Introduction and objective

There was an extremely dry spring. In the first three months of this year, we had more fire events than in previous 10 years [2]. Many fires occurred despite the authorities have responded in time and a total fire ban was ordered from mid of February. Total number of fires was more than five thousand this spring. We are expecting or estimate this trend will be repeated in the following years, so we have to be prepared and develop our forest fire prevention system.

Method

In my study I have analysed the current legal environment and the tasks of different actors. I have focused on new European approach which can be a good basis for the development of the Hungarian forest fire prevention system.

Findings/results

I have been studying Hungarian approach which contains forest fire prevention activities [3]. Based on my study I think Hungarian regulations contain all the necessary rules and responsible authorities. Regular trainings help to expand knowledge of staff. Studying the system and statistics, it can be said that farmers do not take into account the conditions that exist during high fire risk periods. This causes a large number of wildfires (including forest fires) which became a major task for fire departments in the whole country. We have to see and realize that farmers want to use fires for destroy fuel load. It is possible, but we have to create and prepare the conditions, requirements and rules [4]. A possibly solution to adopt of EU fire risk assessment system into Hungarian system.

The new EU approach focuses on land-based wildfire prevention which contains six main elements.

The danger components of wildfire risk relate to the ignition and propagation probability of a fire. Mapping and estimating forest fire risk means that we have been discovering external and internal drivers. Climate change, land-management and use, weather and people influence wildfire risk [5]. The composition and structure of a forest, including the topography of the site where the forest is located, as well as the activities influencing the forest tree composition also have an impact on wildfire risk and its occurrence.

Governance is a key aspect of wildfire prevention, by defining who is responsible for wildfire protection, including prevention and management, and who is responsible for landscape planning and forest management.

It is very important forecast the risk and study the drivers of wildfires. This can be done by building resistant and resilient landscapes and societies based on the prior estimation of the wildfire risks, coupled with appropriate management of the forest and of the human activities taking place therein. A planning comprises several stages as scoping and survey, risk assessment, implementation, monitoring and review.

According to different circumstances, fuel load management can reduce combustion risks. In an appropriate setting, prescribed fires are desirable due to their role in supporting land-use, and ecosystems and the increased wildfire resilience that they bring by removing fuel load. Skills on fuel-loads and knowledge on fuel-load distribution are therefore important to facilitate the management of prescribed fires, to understand the dynamics of wildfire propagation and to develop efficient wildfire management plans.

People are often a cause, so their role is key in any prevention strategy. People need to be aware of which activities, under which conditions, can lead to an uncontrolled wildfire, but also which activities can contribute to mitigate the risk [6].

Common strategy to wildfires means that people need to be informed and educated about wildfires so that through their actions they do not increase fire risks but, on the contrary, actively support the mitigation of wildfires.

We should focus on mapping and estimating forest fire risk and exploration of its main elements. Hungarian authorities have competencies and knowledge to prepare common strategy to wildfires [7]. The main task for the near future is to develop and integrate the elements of fuel management into prevention system according to conclusion explained down below.

Conclusion/suggestions

Wildfires prevention should be a priority in preparing forest management plans. Planning should take into account relevant species selection. Fuel management can reduce combustion risks. It needs to be prepared and applied fuel management methods. Changing climatic conditions require forecasting the risk and drivers of forest fires. It is important to increase European-wide awareness and a common understanding of forest fires.

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- Act No. CXXVIII of 2011 concerning disaster management and amending certain related acts
- Act XXXI of 1996 on the Protection Against Fire, Rescue Work and the Fire-Service
- Act LIV of 1996 on Forests and the Protection of Forests (repealed)
- Act No. XXXVII of 2009 on forests, on the protection and management of forests
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Szeleczki, Dániel– Pántya, Péter

FIREFIGHTERS' LIFE-SAVING ACTIVITY, EQUIPMENT AND CIRCUMSTANCES REGARDING TO AIRCRAFTS

Introduction

For the topic of this thesis, we have chosen the life-saving activity of firefighters, its equipment and circumstances, where possible tactical firefighting measures and general structural knowledge regarding aircrafts will be presented [1]. In addition, analysis of the scope of fire service units serving both within and outside of airport environments will be conducted. The aim of this thesis is to review the events related to aircrafts, the tactical technicalities of firefighting, participating units in damage control [2], methods and constraints of life saving, as well as the unique and indispensable instruments associated with these [3]. During the analysis, the authors illustrate the hazards linked to aircraft incidents, deficiencies with training and experience gaining, for which it will be proposed possible solutions [4].

Saving lives is the first and most important task of firefighters. Life-saving can occur with almost any intervention. Of course, large fire sites pose always a major threat [5] [6] [7].

- Effective implementation of firefighting and life saving [8]
- Incrased air traffic, expanding the number of passengers
- Application of innovative materials in aircraft

Figure 1 - Traffic between 2012 and 2018.

Methods

One author (Szelecki) conducted research in person in Debrecen (HU), at the Fire Service Training Academy of Grof Szechenyi Odon (Gróf Széchényi Ödön Tűzoltó Kiképző Akadémia) where he had the opportunity to analyse and investigate the tactical elements of firefighting and life-saving actions associated with aircrafts.

Investigating the different special tools, equipment. Also made a questionnaire about the knowledge of different firefighters.

Conclusions

This presentation gives an overview of interventions and life-saving activities to aircraft events.

The research conducted can help verify proper training, experience and technical preparedness. Also gives feedback to analyse the rapid and efficient control and intervention of such a unique incident. Moreover the execution of safe and effective life-saving activity, in all three periods of disaster management [9] [10].

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Nagy, György– Pántya, Péter

HEARING PROTECTION FOR FIREFIGHTERS

Abstract

One of the most common occupational injuries today is hearing loss, which is the tenth most common occupational disease in the European Union. Noise-induced hearing loss usually occurs when a person spends too much time in a noisy work environment, which is often the case for firefighters. The noise of small machines used in interventions, as well as the operating noise of the pumps built into the emergency equipment, as well as the noise made by the distinctive audible signal or the rescue tools, can affect the hearing safety of firefighters. The use of hearing protectors may therefore be at least as justified as the use of any of our other personal protective equipment.

Keywords: hearing protection, firefighter, statistic

International perspective on hearing protection

In Massachusetts, the hearing of 319 firefighters was examined, of whom 46 (14%) had hearing impairment. At the same time, the hearing of 319 ordinary people was examined, where only 16 people (5%) had a hearing problem.

A focus group study on 2 fire departments means that firefighters in the bar are aware that they are working at high noise levels during an accident, yet do not use hearing protection [1] [2] [3]. Firefighters explained that the use of hearing protection interferes with their communication [4] [5] [6], and in many cases is incompatible with other protective equipment [7] [8] [9], making their use comfortable [10] [11] [12].

Results

(NIOSH - National Institute for Occupational Safety and Health) is urging fire departments to establish a hearing loss prevention program to ensure adequate hearing protection.

- devices with an appropriate noise emission limit
- continuing education
- communication earcups [13] [14].

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Kovács, Norbet – Pántya, Péter

THE LIFE-SAVING ACTIVITY OF FIREFIGHTERS, IT'S MEANS AND CIRCUMSTANCES

Abstract

Examination of the life-saving activities of firefighters and its possibilities and circumstances. We presenting an efficient design that can make a significant difference in the field of firefighting and life saving. A practical exercise, drill was conducted to investigate life-saving from smoke. Life-saving was performed on the basis of three methods, under the same conditions, with the aim of examining the effectiveness of the three methods and the life-saving activities of the interveners. How much can they put the rescue mask on the injured in a smoke-saturated room. What a difficulty it is to move the stretcher and to navigate in the smoke and break down with the lifeline.

Introduction

Eliminating accidents is a complex task, especially if have to save lives at the same time. It is important to prepare for these, because we can expect a human presence almost everywhere, these situations can be accidents, extreme weather conditions, fires [1][2]. In each case, the life-saving method is different [3]. Working in a respirator protector involves (breathing apparatus, SCBA) not only physical exertion, but also high mental pressure [4]. Without proper equipment and tools, it would be unfeasible for firefighters to carry out life-saving. Protecting life, apart from all these dangers, is a cutting-edge task that requires special skills and knowledge [5]. Saving lives and property is a dangerous and enchanting part of the job [6][7].

Methods

A practical drill conducted and the literature was analysed. The exercise was performed with three two-person teams. The first team did the rescue in the traditional way, with only a rescue rope, a lamp, a radio, a life-rescue mask and a plank tensioner. The second team performed in a thermal camera respirator built into the Scott Sight mask, carrying a rope, lamp, radio, life mask and plank tensioner. The third team carried a hand-held thermal camera, carrying a rope, a lamp, a radio, a life mask and a plank tensioner.

Results

A table was created in which the data related to the save was recorded, the results of the three teams were marked in a different colour for the sake of clarity (first team: black, second team: blue, third team: marked in red).

Table 1 – Results of practical drill. Created by Norbert Kovács.

Post	Inlet pressure bar	Entry time hours / minutes	Time to find a person is hours / minutes	Start start hour / minute	Arrival hour / minute	Outlet pressure bar	Exhausted air bar
First team	300	09:54	09:59	10:02	10:04	180	120
	300	09:54	09:59	10:02	10:04	200	100
The second team	300	10:14	10:18	10:24	10:25	160	140
	300	10:14	10:18	10:24	10:25	190	110
The third team	300	10:37	10:42	10:49	10:51	220	80
	300	10:37	10:42	10:49	10:51	200	100
first team color: black			second team color: yellow			third team color: red	

All three life-saving were carried out in a short time. Rescues with thermal camera were faster because they were easy to navigate in opaque smoke. A positive experience with handheld and masked thermal imagers is that the thermal imager built into the mask facilitates rescue work. The downside is that you can not share the image shown by the thermal imager with your peers. It was not too much trouble to fit the life mask in the opaque smoke either [11].

Moving the stretcher in the crowded cellar was very cumbersome and time consuming [8][9][10].

Conclusions

The thermal camera built into the mask is the perfect solution to save lives because both of our hands are free. Tactical measures and rules of conduct need to be further developed, in particular with regard to emerging threats [12]. A comprehensive system needs to be developed to allow systematic inspections of buildings and the professional rescue of people in distress.

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Bánhegyi, Roland – Rácz, Sándor

RESCUE OF PERSONNEL WITH TRACHEOTOMY

Abstract

The most important function of the fire-department is to save lives. Certain incidents can be anything from house fires to rescue operations but a fire-fighter always strives to save people from harmful situations as fast as possible with as little collateral damage as possible. Every single operations is different, they are never the same because of that no-one knows what to expect exactly at the scene. During operations there can be conditions that complicate the situation, such conditions can be a stairway full of smoke, a vehicle crashed beyond recognition or it could be that the to be rescued personnel has some kind of medical condition that make the rescue impossible to be carried out with the usual rescue practices, tracheotomy is such a medical condition. Tracheotomy is a medical procedure which is a small incision, it is used to save lives when someone's windpipe or trachea is closed off. This ancient medical procedure was documented on Egyptian tablets as long ago as 3600 BC. [1] In this study I examined how this medical procedure influence the usual rescue practices in case of operations inside spaces thick with smoke considering Hungarian rescue pragmatics, also the study compares Our own practices with practices from abroad.

Keywords: tracheotomy, lifesaving, research methods

Introduction

Tracheotomy has been used for centuries for respiratory atresia. Nowadays tracheotomy is used to manage mechanical and functional respiratory atresia. Medical professionals use tracheotomy when there is no other method to keep the respiratory system open or said system needs to be kept open for a longer period [1] [2]. The most common reasons for the procedure are tumors, growth, swelling or ulcers in the upper respiratory system which block or reduce the free path for air to flow [3]. People with perfect medical condition are not the only ones who might need rescuing! Saving people with tracheotomy won't be an easy task. Their rescue requires special attention provided the rescue is from or through a space or an area which is heavy with smoke or doesn't have breathable air. The difficulty comes from the fact that people who had tracheotomy performed on them are unable to use their noses or their mouths to breath, there only option is the surgically placed trachea cannula or the trachea opening where the cannula used to be. For firefighters this poses a great challenge when rescuing from a smoke occluded area or space. The equipment used in their rescue has to ensure the ability to breath as that is a basic need [4]. During life-saving operations finding the to-be rescued personnel and approaching them is already a difficult task. When entering closed spaces full of smoke first responders use a life-line. [5] Fire-fighter in Hungary a simple life-line while fire-fighters in Germany use specially manufactured ones. There are orbs on the life-line at certain set distances. These orbs or balls are set in the following manner. Going from outside to inside first there is one orb then there is a bundle of 3 orbs after that the pattern repeats itself. These orbs on the life-line glow in the dark and their placement bears meaning. The bundle of 3 balls leads to harm's way and solitary balls leads to safety. In Hungary rescue personnel use the wall, the wood and the diver technic to search for people these methods were developed based on practices from abroad [4]. In the US they use a different approach, before entering, the building is divided into sections which are assigned a letter to help first-responders to navigate. During rescue operations they put emphasis on speed and use harnesses and seat harnesses.

Methods

I researched Hungarian literature as well as literature from abroad regarding tracheotomy, my sources included studies from the internet and other printed studies. To get a deeper understanding I interviewed officers from Hungarian fire departments as well as teachers of firemen, the purpose of these interviews were to understand their stand and knowledge about tracheotomy.

Results

The rescue hood is a verified equipment for rescuing personnel so I inspected its abilities for rescuing people who underwent tracheotomy. For tracheotomy patients breathing is conducted through an opening at the lower portion on their necks, the rescue hood in its fixed position does not cover this opening so when rescuing somebody with a trachea opening the rescuers must not tighten the fixing cord of the rescue hood. The rescue hood can be placed quickly on the persons head and without tightening it the hood will cover the trachea opening thus ensuring the patient's breathing needs. The rescue hood receives pressurized air so the smoke outside the hood cannot penetrate its openings, to test it, I inspected this effect in a closed space occluded by smoke. If we turn the rescue hood relative to the vertical body position of the tracheotomy patient the rescue hood is able to provide air to the patient, therefore the pressurized air won't be blown to the trachea opening.

Figure 1 - Baranya County Disaster Management Directorate, rescue hood video [7].

The rescue hood's main disadvantage is the fact the hood uses the rescuers air-supply so using it will shorten the time-span available for the rescue.

Dräger manufactured a compact and sturdy rescue equipment system, (Dräger RPS 3500) the systems air supply is independent from the fire-fighters own air-supply. The rescue equipment only weights 5,3 kilograms. The equipment is stored ready to use, and pre-attached with a rescue hood so it can be used to rescue personnel who underwent tracheotomy. The systems main advantage is the air-supply which is independent from the fireman's air-supply.

Tracheotomy is performed on children even infants not just on adults. Since rescue hoods can't be used on children or infants their rescue demands even more special attention. To rescue

children experts use a special rescue bag. This special bag is made in different sizes accepting children from 40-110cm in height and 25-45 in terms of weight. The special bag provide a safe and comfortable rescue option for children. Inside the bag the children are fastened with velcro-ties and closed off with zippers, the rescuers use color-graded harnesses to fix the bag position. The air intakes provide air to the children inside the bag. During a house fire using the bags harnesses the children can be safely suspended from a window or a balcony for rescue. The bags shortcoming is that it can't be used to rescue children from a space which is heavily affected by fire or smoke.

Figure 2- Baby rescue bag. Source: https://www.singingrock.com/baby-rescue-bag

Conclusions

In my mind Hungarian fire-fighters do not lag behind fire-fighters from abroad neither in equipment nor in terms of expertise. We use many best practices that are common with fellow fire-fighters abroad, however there are abilities that we should consider bringing home to us. The idea of dividing up a building to A, B, C, and D parts to help first responders navigate is a good one, moreover the marking system provided by FEMA hold real promise in the future. Using these ideas we could be more effective without further financial investment.

Regarding the rescue of personnel who underwent tracheotomy I think that the fire-fighters of our nation are much more educated in the correct use of the rescue hood [8].

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Fekete, Alexander– Pántya, Péter

RECENT FIRE SAFETY AND SECURITY MANAGEMENT CHALLENGES IN GERMANY AND HUNGARY

Abstract

The objective of this study is to analyze the recent issues of fire safety – protection and security management in two countries, Germany and Hungary. The present challenges of these fields are in wide range from the fire intervention possibilities in lithium-ion battery or solar panel circumstances to the civil protection tasks in different fields such as floods in last year and the situations in Ukraine. More risks are common and parallel in both countries.
Keywords: fire safety, security management,

Introduction

The social changes and technological advancements in themselves present new challenges for the defence sector, such as fire and civil protection, disaster management.

The present situation in Ukraine also cause unexpected tasks for all civil protection, disaster management organisations in Europe. The natural disasters, like in floods in last year and the other kind of disaster, like Covid-19 pandemic causes more challenges in this and the next years.

During day by day fire interventions the fire units find more and more events where the new technologies (lithium-ion batteries, photovoltaic - solar panels) made damage or the circumstances special by their presence. These are also and raising challenges.

The aim for this study to enlighten these operational and research fields for the professional and volunteer members of the responsible units and the researchers in these fields.

Methods

The authors used analysis of the disaster management, civil protection organisations in these fields. The aimed organisations are in Europe, mainly in Germany and Hungary. The preventive and the intervening units and their possibilities and capabilities were analysed also.

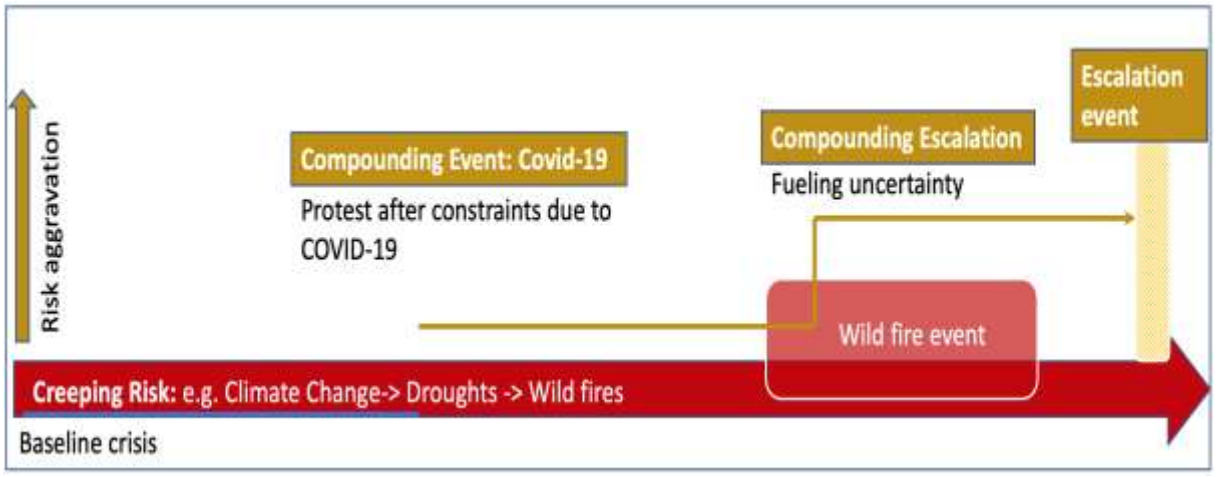

Figure 1 - Baseline crisis. Created by Alexander Fekete.

Results

The risks and challenges are similar in both countries. The man-made and the natural disasters affected and can affects these states and theirs citizens, the personal and national assets.

It is worth for both countries to improve the risk-based incident planning for fire brigades. On it, the using of geographic information systems (GIS) can be very helpful.

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Horváth, Tibor – Kováts, Levente

IED (IMPROVISED EXPLOSIVE DEVICE) TRAINING IN AFGHANISTAN

Introduction

Recently, more and more articles, studies, papers, diploma works, and scientific dissertations have been published in the Hungarian literature on improvised explosive devices (IEDs). All of them well represent how, depending on different the level of education and social acceptance, the problem posed by IED threat is interpreted in Hungarian professional circles. It would be difficult to argue with the IED situation outlined in these scientific papers, which is why we do not even attempt to do so in this study. However, we state that based on past IED events and learning about the development course of IED events, it will take years to analyze and research the threat posed by IEDs because the threat still exists in the present, moreover, it continues evolving and transforming. It is clear that the research into IEDs have not been completed yet at international level, and research into this threat is still necessary and indispensable in the future.

In the present study, because of the importance of the issue, we wish to examine another aspect of the impact of IED threat, specifically the characteristics of countering-IED activities. However, it seems important to state at the beginning that it is not the defence against IED as an explosive device that we want to formulate our thoughts and arguments about. In our opinion, countering-IED activities are no longer only about the deactivation and destruction of such explosive devices but rather about all coordinated activities that can prevent the installation of a device itself or about influencing the events preceding IED events.

As active engineer officers, we know precisely that when dealing with IED threats, in many cases, many experts focus on the IED itself as a problem. This is also why an IED as an explosive device and its problem, including the presentation of the appropriate solution – within military circles – has been the responsibility of combat engineers since the very beginnings. It has to be admitted – based on our mission and operational experience – that while the focus was on the explosive device itself, the military had no inherent objection to this approach. However, since countering IEDs (C-IED) has expanded significantly and transformed according to NATO's interpretation as well, we believe that the relevant roles and responsibilities need to be reinterpreted and reconsidered.

Once a high ranking military leader said, “who else could manage this task than you (the engineer officer - from the authors’ source)”, which is a very flattering approach to combat engineers, but it also raises a large number of professional issues. This is why we regard it necessary to clarify the extent combat engineers are able to conduct C-IED tasks and when professional C-IED tasks need to be transferred in a different direction and field of responsibility.

The issues outlined above are so complex that we do not even undertake in this study to analyze them, broken down into individual situations, or identify the boundary between the responsibilities of engineers and other experts in conducting C-IED operations. However, it should be stated at the outset that IED threats appear differently in every environment. The interpretation of the danger is different if the C-IED tasks are to be completed during a mission, in a culturally, historically, etc. foreign social environment (e.g. KFOR – Kosovo, ISAF – Afghanistan, etc.) or in our own national territory, or in accordance with Article 5 of the North Atlantic Treaty, on the territory of a NATO member state.

Consequently, our objective is to provide a comprehensive picture of the capabilities that can contribute to the performance of C-IED tasks as a whole, the capabilities and capacities that can have an impact on the management of individual IED emergencies. In our study, we have specifically taken the NATO approach as a basis and we do not want to examine the extent to which the Hungarian Armed Forces is able to meet particular capabilities or the steps to be taken to develop such capabilities.

Description Of C-IED Tasks

When introducing C-IED, we always start with defining an IED, the type of explosive explosive materials we may encounter, and the nature of dangers presented. Without disputing the correctness of this approach, we wish to present C-IED tasks from the other side of the problem. According to the current interpretation of C-IED, an IED as a tool – in spite of the fact that it poses the greatest threat and takes a significant number of casualties – is not a top priority in NATO's C-IED approach. Today, it is the system, network and organization behind IEDs that NATO considers to be the most dangerous. Deactivating, restricting, or changing the conditions necessary for the operation of such organizations comprise a really important task and also the largest challenge.
C-IED tasks and the basic pillars of C-IED, have not changed. The same three determinants (AtN, DtD, PtF) are used, which are based on the "Understand & Intelligence ". The operational-level interpretation of these tasks is clearly defined in NATO's "Allied Joint Doctrine for Countering Improvised Explosive Devices" (AJP-3.15 (C)) C-IED doctrine. The interrelations and priority of the three pillars mentioned above also depend to a large extent on the different operations and their individual phases. The priority of tasks in a peacekeeping mission is obviously different from that of a NATO Article 5 operation. The priority is also different when an IED emergency is not significant, and it is different if the threat significantly affects the success of operations. Therefore, a commander must always be aware of the nature of an IED threat and be able to determine exactly the extent, the means, and the way he intends choose to deal with a particular IED emergency in order to reach the C-IED end state for the success of a particular operation.

The Role And Postition Of The C-Ied Complementary Capabilities

In the comprehensive approach of C-IED, it is essential for the successful execution of tasks to have the capabilities that, when applied together and in a coordinated manner, enable the achievement of the set goals. These capabilities are nothing more than the resources required to perform C-IED tasks in order to reach the C-IED end state specified by the commander. It is also important to clarify at the outset that there are only two units that can be labelled C-IED in NATO's interpretation. One is the so-called "Weapon Intelligence Team" (WIT), which is officially referred to in NATO as "Level-1 Technical Exploitation", that is tactical level investigation team. The other unit is the "Level-2 Technical Exploitation", which comprises a criminal laboratory that can be installed in an area of operations and is capable, within certain limits, to analyse and evaluate the evidence collected in the area of operation. It should also be noted here right in the beginning that the development of these capabilities was based on real IED threat. Such units integrate the capabilities of other branches and special elements that are able to operate in other operational environment, in a completely independent fashion. Thus, for example, a conceptual WIT small unit is normally a four-member group (its composition also depends on the concrete nation, the operational situation, etc.), which represents the capabilities of reconnaissance, military operations, military police, and Explosive Ordnance Disposal.

As outlined above, in addition to engineers, C-IED tasks require other services, branches, and special elements as well, as they are capable of providing information and data that can be effectively used in C-IED tasks. Thus, if it is necessary to define "C-IED Enablers" (AJP-3.15 (C), i.e. additional capabilities that contribute to C-IED tasks, then it is expedient to formulate it as *"those resources and capabilities that are directly or indirectly capable of achieving the set C-IED goals, influence, contribute to or even carry out the tasks specified for the C-IED"*. These additional elements can be found in any operation, in their individual phases, and at all levels of military command (tactical, operational, strategic, and even political levels).

Therefore, looking only at the above stipulations, our statement that C-IED tasks have long been not only and exclusively the mission of engineer units and staffs can be well traced. Moreover, in the later analysis it will be presented that the comprehensive approach to C-IED tasks is not dominated by engineer subunits and special tasks, but rather by reconnaissance and operational cooperation, which will bring the expected and determined success. In order to support this statement, we now examine the C-IED complementary capabilities and the way they can contribute to the end state defined by the commander.

Additional Skills And The Objectives To Be Achieved Through Them

The comprehensive approach to C-IED also requires that the available forces be able to support C-IED tasks and contribute to the expected success based on their primary assignment. In all five services of NATO (land, air, naval, special operations, and cyber), there are forces, capabilities, and sub-capabilities that can affect C-IED missions.

In accordance with its definition, an IED is basically a tactical weapon that can achieve strategic effects, therefore under normal circumstances, individual tactical level capabilities in the C-IED environment can have a significant impact on the objectives set at higher leadership levels. See the 2004 attacks at the Madrid railways resulting in the withdrawal of the Spanish forces from Iraq, or the exponential developments of the EOD capabilities in the HDF in 2008-09, induced by the cases of Hungarian EOD troops killed in action in Afghanistan in 2008. Therefore, each capability is interpreted on the basis of the level of their added value to the C-IED objectives and not according to the deployed capabilities. Priority is irrelevant here, as it has previously been interpreted, because according to the phases of operations, priorities change, may change, or the operations themselves induce different needs in different IED emergencies.

Riebel, Bálint – Pántya, Péter

WINCHES ON FIRE TRUCKS

Absract

In this study, we demonstrate that the vast majority of fire engines should be equipped with winches. Therefore, in our presentation we present this structure, along with its special accessories. As well as what considerations should be taken into account when selecting such a structure.

Keywords: winch, fire truck, intervention

Introdution

In Hungary, there are various tools on fire trucks for firefighting and technical rescue purposes. These tools can be use in case of several interventions such as wildfires [1] [2], industrial accidents [3] [4], technical rescue [5], building fires [6] or other interventions [7].

Hungarian fire trucks and the winch

Figure 1 - Hungarian fire trucks and the winch. Source: [8].

Figure 2 – Anothr Hungarian fire trucks and the winch. Source: [8].

Selection criteria

- What tasks do we want to use the winch for?
- What kind of car will mount it on?
- Other influencing factors…

Summary

In summary, the structure that was used thousands of years ago is a very useful helper for firefighters in all period of disasters [9]. Its fields of application are very diverse. Whether used in traffic accidents or post-storm damage, a winch can always be a great help. Reading the criteria set up to select the right device, we can see that a winch with a load capacity of 100 kN would be just right for Hungarian fire trucks.

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Section D – Disaster management

Berger, Ádám – Kátai – Urbán, Lajos – Cimer, Zsolt

SOIL LIQUEFACTION AS A GEOLOGICAL RISK

Abstract

The causes and consequences of disasters and crises depend on a number of factors. Accordingly, a distinction is made between natural dangers and dangers of civilizational origin. This presentation will focus on the study of geological event and their effects within natural danger, where hydrological and meteorological danger are also considered as triggers.

Keywords: disaster, geological danger, earthquake, soil liquefaction, structural damage

Introduction

Throughout human history, there have been many disasters. Natural ones include the earliest recorded earthquake that destroyed Sparta in 464 BC. Among civilisation-related dangers, for example, the Kolontár red sludge disaster in Hungary in 2010. Climate and geological changes, population growth, scientific progress, the expansion of industry and agriculture, and the evolution of world politics are all factors that could lead to future crises with high loss of life and property. Prevention means respecting and enforcing a sound legal and regulatory environment, developing forward-looking town and country planning, and developing and applying modern and safer technologies.

Objective

The presentation will show a form of geological danger in which the other two natural danger are also used as triggers. This geological danger is the event of soil liquefaction, which occurs mainly during earthquakes (which can also be triggered by successive explosions). Water-saturated soil then suddenly changes from a solid to a liquid state. During this event, the vibrational waves that accompany earthquakes cause the soil to compact, reducing the pore volume between the grains. If these pores were saturated with water, the relatively low water pressure prior to the quake increases as the volume decreases. If this process takes place several times in a short period of time, the pressure of the pore water can reach the pressure of the soil layers above it, so that the soil particles can easily move relative to each other. As a result, the soil will behave like a high-density liquid. The soil will therefore lose its load-bearing capacity, causing the soil layers to deform and the structures in the affected area to sink, tilt or, in extreme cases, sink completely.

Soil liquefaction mainly affects loose granular or moderately compacted soils with poor drainage capacity. Examples include sand, loess, silty sand, and sand and gravel with impermeable layers. These are most commonly found near river beds, lakes or seas.

Soil liquefaction can cause damage to the built environment in various ways. On the one hand, it can affect the foundations of structures, the loss of the supporting capacity of which can lead

to displacement and subsidence of the structure. On the other hand, it can also damage underground and near-surface piping networks (e.g. water, sewage, gas). In this case, the additional local stress at the point of force transfer in the pipe sections may cause a fracture or the pipes and sewers may be lifted by the liquefied soil. In the third case, the flowing soil can break into the structure, causing damage to the structure and machinery.

Methods

The territory of Hungary is covered by surface and underground watercourses, and its surface is typically covered by sedimentary, sandy or loamy soils. Since the resistance of soils to liquefaction depends mainly on their density, granularity, texture and moisture saturation, it is appropriate to investigate these parameters. The geological maps of Hungary provide a basis for this information. Given that the event of soil liquefaction is triggered by successive earthquake waves occurring within a short period of time, it is also appropriate to examine the exposure to earthquakes.

In Hungary, an average of 100-120 earthquakes of less than 2.5 magnitude are recorded each year, which are not felt by the public. On average, there are 4-5 earthquakes that are felt around the epicentre (magnitude 2.5-3.0) but do not yet cause any damage. On average, a major quake is recorded every 15-20 years. Magnitude 5.5 to 6.0 quakes, so quakes causing major damage, occur every 40 to 50 years. The earthquake near Petrinja on 29 December 2020 had a magnitude of 6.5, followed by several smaller to larger aftershocks.[1]

As far as Hungary is concerned, earthquakes of catastrophic magnitude are very rare, but quakes causing serious damage in the vicinity of the epicentre have occurred several times in history (1763 Komárom, M=6.3; 1810 Mór, M=5.4; 1911. Kecskemét, M=5.6; Eger, M=5.0, 1925; Dunaharaszti, M=5.6, 1956; Berhida, M=4.9, 1985) and cannot be excluded in the future.[2] Following the 1911 Kecskemét and 1956 Dunaharaszti quakes, mud volcanoes were observed at several locations, providing evidence that soil physics and seismicity in Hungary can trigger the event of liquefaction.[3]

Results

The surface geology of the Danube area is mainly composed of river sediment, sand and gravel soils.[4] Another important factor for soil liquefaction is the water saturation of soil pores. The water table at rest below the surface along the Danube typically varies between 1 and 4 metres.[5] In terms of riparian areas, the right bank is particularly at risk of movement and is typically exposed to surface and linear erosion. In addition, several areas have been observed, for

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example bed sliding, swelling, wind-blown landslides, collapse, bank slides and creep.[6] Looking at the history of earthquakes in the area, there have been several small and one medium-sized quake along the Danube. Most of the recordings were in the Komárom and Budapest areas, and the largest (M=6.3) was in the former.[7]

Conclusions/suggestions

The above describes the triggers and consequences of a geological danger. Soil liquefaction can occur when the pores of a structurally suitable soil (looser grained soils) are saturated with water and this medium is subjected to several shock waves within a short period of time. As a result, the previously solid layer suddenly becomes a liquid, losing its load-bearing capacity and causing damage to the built environment.

Within the structural analysis section of the official design documentation, it is recommended to complement the seismic load analysis with a soil liquefaction susceptibility and rate modelling (for example FEM). This is because the additional geotechnical parameter obtained from the model may justify, for example, the use of jet grouting or vibro-flotation deep foundation techniques.

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Hábermayer, Tamás – Muhoray, Árpád

THE POSSIBILITY TO ADAPT THE INSARAG COORDINATION STRUCTURE AND METHODOLOGY DURING HILP EVENTS FOR GUIDED INTERNATIONAL ASSISTANCE

Introduction

The International Search and Rescue Advisory Group (INSARAG) is a professional group nominated by the UN in order to strengthen the effectiveness and coordination of the international urban search and rescue assistance. It was established in 1991, and since then it fills its purpose – to facilitate coordination between the various international USAR teams who make themselves available for deployment to countries experiencing devastating events of structural collapse due primarily to earthquakes. The group has significant knowledge, how to assist a disaster affected country in an earthquake situation. Government and disaster management leaders must be prepared to face the increased numbers of the high-impact, low probability (HILP) events or occurances, that can arise unexpectedly and randomly, unpredictible and have harmful effects on the population. If the HILP occurs, not only for earthquake events can the INSARAG coordination system and methodology be effective for guiding the international assistance. Behind the scenes, INSARAG contains a respectful and usable net of professional experts, who are dealing with extreme situations daily and they can help to assist a disaster affected country.

Keywords: INSARAG, international coordination, HILP events

Objective

INSARAG has a system how to coordinate efficiently the international teams and entities during earthquake situations. The way of doing it can be a flexible method for any kind of disaster HILP events. The objective is to shape the system usable for any international coordination.

Recent INSARAG methodology

Participants of the international coordination:

- Disaster affected country
- Countries who want to send international assistance
- United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA)
- United Nations Disaster Assessment and Coordination Team (UNDAC)
- Local Emergency Management Authorities (LEMA)
- International USAR Teams (nomally belong to a country or other international organisation[8]) (USAR Teams)
- International Emergency Medial Teams (EMT)
- Other organisations and relevant individuals[9]

[8] for example: European Union
[9] governmental and non governmental, agencies, individuals, etc.

The structure INSARAG coordination

1. Entity: Reception and Departure Center (RDC)

   The RDC is established by the LEMA/UNDAC, or the first arriving INSARAG USAR Team, in collaboration with local airport/entry points authorities. The RDC is established to coordinate the incoming international USAR Teams and other humanitarian assistance, and reports this to the LEMA through the OSOCC.

2. Entity: On-Site Operations Coordination Centre (OSOCC)

   With the permission of the disaster affected country, OSOCC may be established by the UNDAC team close to the LEMA, to coordinate the international responders and support the national authorities. It initiate inter-cluster coordination mechanisms such as health, water, sanitation, and shelter. OSOCC has two core objectives. First to rapidly provide coordination and information management between international responders and the government of the affected country, and secondly to establish a physical space to act as a single point of service for incoming response teams, notably in the case of a sudden-onset disaster where the coordination of many international response teams is critical to ensure optimal rescue efforts.

3. Entity: Urban Search and Rescue Coordination Cell (UCC)

   The UCC is a specialised and integral part of an OSOCC during an earthquake or collapsed-structure emergency. If not already established by the national authorities/LEMA, it is established by the first incoming USAR Team to assist and coordinate multiple international USAR Teams during the search and rescue phase of a disaster.

4. Entity: Urban Search and Rescue Sector Coordination Cell (SCC)

   The SCC cell is a part (defined sector) of the global USAR coordination.

5. Entity: Local Emergency Management Authorities (LEMA)

   The local disaster management authorities of the affected country (if exist).

6. Entity: other organisations, who are assisting LEMA or the USAR teams

   All organisations, who are supporting the LEMA and the international teams.

7. Tool: Global Disaster Alert Coordination System (GDACS), Virtual On-Site Operations Coordination Centre (VOSOCC) and INSARAG Coordination Management System (ICMS)

The structure of suggested disaster HILP coordination[10]:

Participants of the international coordination:

- Disaster affected country
- Countries who want to send international assistance
- Preferred International Coordination Organisation (ICO)
- Special Disaster Assessment and Coordination Team (SDAC)
- Local Emergency Management Authorities (LEMA)

[10] for example: major disaster accident coming from from transporting dangerous material

- International Response or Support Teams (IRT or IST)
- International Emergency Medial Teams (EMT)
- Other organisations and relevant individuals

The structure of suggested disaster HILP coordination:

1. Entity: Reception and departure center (RDC)

The RDC is established by the LEMA/SDAC, or the first arriving INSARAG USAR Team, in collaboration with local airport/entry points authorities. The RDC is established to coordinate the incoming international Response or Support Teams and other humanitarian assistance, and reports this to the LEMA through the OSOCC.

2. Entity: On-Site Operations Coordination Centre (OSOCC)

With the permission of the disaster affected country, OSOCC may be established by the SDAC team close to the LEMA, to coordinate the international responders and support the national authorities. It initiate coordination mechanisms such as health, water, sanitation, and shelter as well as special alarm and monitoring systems. OSOCC has two core objectives. First to rapidly provide coordination and information management between international responders and the government of the affected country, and secondly to establish a physical space to act as a single point of service for incoming response teams, notably in the case of a sudden-onset disaster where the coordination of many international response teams is critical to ensure optimal rescue efforts.

3. Entity: Disaster Coordination Cell (DCC)

The DCC can be a specialised and integral part of an OSOCC during a disaster HILP event. If not already established by the national authorities/LEMA, it is established by the first incoming USAR Team to assist and coordinate multiple international USAR Teams during the search and rescue phase of a disaster.

4. Entity: Disaster Sector Coordination Cell (DSCC) The SCC cell is a part (defined sector) of the global USAR coordination.
5. Entity: Local Emergency Management Authorities (LEMA) The local disaster management authorities of the affected country (if exist).
6. Entity: other organisations, who are assisting LEMA or the IRT, IST All organisations, who are supporting the LEMA and the international teams.
7. Tool: Global Disaster Alert Coordination System (GDACS), Virtual On-Site Operations Coordination Centre (VOSOCC) and INSARAG Coordination Management System ICMS). Specialised other systems[11]

Conclusions / suggestions:

HILP events can be absolutely variable. In order to successfully handle such situations, we must adapt effective ways, how to solve the situations. In our case, the The possibility adaptation of the INSARAG coordination structure and methodology during HILP events can provide effective guided international assistance.

[11] for example: chemical monitoring systems, public alarm systems

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Teknős, László – Érces, Gergő

DISASTER MANAGEMENT OF SMART CITIES IN THE POINT OF VIEW OF SUSTAINABLE DEVELOPMENT

Introduction

Strict adherence to agreements and action plans at professional conferences and world summits related to climate protection and sustainable development requires and demands local societal action in addition to global collective thinking, which cannot spare Hungarian law enforcement that complies with and operates in accordance with strict legal requirements. In the opinion of the authors, the fulfilment of this goal will certainly affect the domestic law enforcement as well. Nowadays, smart urban development principles occupy a prominent place in contemporary urban planning and development. In line with international trends, nations almost without exception have a smart urban development strategy. Disaster management for the smart cities of the future must address today 's challenges, from the effects of climate change to the challenges posed by refugee crises, in order to ensure a high and sustainable level of safety for the population. Disasters linked to climate change have a serious impact on the environment, on economy, and on society. So we have a lot of important tasks to manage this problems. One of our main goal is, to develope a smart disaster management network useing the methods of smart city methodology to build a disaster management big data base. Ont he way to climate neutraity, the role of domestic law enforcement agencies must be examined. Our comprehensive methods are to investigate the possibilities in smart city strategy, and research the monitoring topic in smart living subsystem in the point of view disaster management.

Methods

The data related to disaster management were processed by the analysis of the statistical database of the National Directorate General for Disaster Management of the Ministry of Interior (‘KAP-online’) and disaster management yearbooks (2000-2020) according to the author’s annual Sustainability Programs and annual records. The daily reports of the Central Office of the National Directorate General for Disaster Management of the Ministry of Interior were also processed and evaluated by the authors. The authors used the calculator at https://www.carbonfootprint.com/calculator.aspx to determine the carbon-dioxide value of electricity and gas consumption in disaster management. The research work was hampered by the fact that – although the analysis of the effects of climate change and the study of sustainable development have a wide international and domestic literature – their analysis and evaluation from the point of view of law enforcement, including disaster management and police aspects, are significant in international and domestic databases and publications. A few papers discuss the carbon footprint of the professional disaster management organisation and the police, however no Hungarian source is related to the calculation methodology itself and its results.

About smart cities

There is no generally accepted definition about it: the most common three expressions are: digital city, intelligent city, smart city. Smart city is the most comprehensive name. As defined by the British Standards Institution smart city is a methodology, which is one of the methodologies of settlement development. Settlement development stands from a lot of parameters, but there is some priority factors in the point of view smart development. The smart city methodology system can be broken down into six subsystems. We differentiate 6 smart city

subsystems, which are: smart mobility, smart environment, smart people, smart living, smart governance, smart economy.

The hungarian modell of the smart city methodology classifies Disaster management into the smart environment subsystem, but here raises it only the possibility of natural disasters. According to our conclusion from our complex investigation, the right subsystem to develope disaster management is the *smart living* category, because all of the direct safety factors belong to this subsystem. To justify our suggestion we investigated all of the monitoring topics in the smart city subsystems. We collected, systematized, and evaluated the topics in terms of disaster risk primarily in relation to climate change. So we analyzed among others for example: education, environment, climate, governance, economy, safety, traffic. etc. In general, disaster management also belongs to the topic of safety, so after our quantitative research, we conducted more comprehensive qualitative research in this topic, in the field of smart living subsystem.

Disaster management principle in smart cities

We summerized the main monitoring topics of smart living, which were: housing, social situations, health, lifestyle and safety. In terms of the research, which focused disaster management, the most appropriate monitoring topic was the safety topic. It is one of the most important monitoring topic of smart living subsystem, but all of this topics belong to the special field of disaster management, based on our comprehensive quality research.

Personal safety is a critical issue in smart city programs. General security and safety enhancements are part of a complex process. A comprehensive smart disaster management network must be part of this complex system. Therefore, we are analyzing the available disaster management options in a national research within the framework of National Laboratory of Safety Technologies in the Safe settlement subproject..

We have declared 4 main tasks, what we have to do, to create a smart disaster management system. We have to measure parameters which are in context of disaster management, so we can create a smart and big data collection. Based on the collected data we can create a smart prevention, what can be determined by calculations. With this prognosis we create a smart disaster protection, what we can manage with effective and targeted crisis management.

Results

In summary: what we have achieved so far? We identified the location of disaster management development in the field of safety, which is one of the subsystem of smart city. We determined how to integrate the base of smart disaster management into the available system of disaster management, on the basis of which we proposed the creation of a disaster management network. The question immediately arises here: Does Disaster Management have a place, a role, and tasks in climate protection?

The answer is yes, of course, it based on the national climate strategy and based on the smart city strategy too. Results in the field of emission reduction include the rationalization of real estate, infrastructure, the replacement of vehicle equipment, waste management, etc. Regarding the formation of the approach, in January 2011 the National Directorate General for Disaster Management of the Ministry of the Interior (hereinafter: NDGDM) appointed an environmental commissioner and established a working group in order to enforce the sustainability goals and criteria set by the Ministry of the Interior. In terms of adaptation, we analyzed the effects on firefighting interventions, examining the professional commonplace that extreme weather is an additional task for the firefighters.

In terms of shaping attitudes, in the coordination and participation of the Institute of Disaster Management of the Faculty of Law at the National University of Public Service, there are courses in the basis of the education such as sustainable development, environmental protection, environmental safety, disaster prevention, master's degree in environmental protection, meteorology and climatology. In January 2011, the National Directorate General for Disaster Management of the Ministry of the Interior appointed an environmental protection and sustainability commissioner and established a working group in order to enforce the sustainability goals and criteria set by the Ministry of the Interior. The disaster management has participated in many environmental, sustainability and climate change-related tenders and projects, within the framework of which a wide range of information directly or indirectly provided the population with information that has presumably increased or shaped their climate awareness, also helps to shape attitudes.

Figure 1 - Connection between sustainability and disaster management. Created by the Authors.

Conclusion

The answer to the question of whether a professional disaster management organisation should play a role in the triple climate protection system is yes. The professional disaster management organization will (has) an increasing role in climate protection - a key priority focus – adaptation. The advantages of the measures taken for sustainability include the modernization of disaster protection buildings, doors and windows, energy supply systems, significant reduction of operating costs, improvement of the price – value ratio of buildings demonstration effects (beautification and renovation of buildings, public buildings, environmental awareness) will contribute to the country's long-term safety of energy supply and competitiveness. The tasks undertaken to meet the criteria of sustainable development clearly increase the high level of implementation of the conditions set out in the basic mission.

Based on the above we explored the available options. Such a system that is network-connected to disaster management is could be a detector system. It could be the connection between the smart city and disaster management. Our conclusion, that all of the next steps must be based on this principle. An other conclusion of our research was, that into this system should be integrate

city-level disaster management systems to develope a disaster management network. This network could be one of the subtopics in the field of safety monitoring system.

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Teknős, László

WHAT IS THE PLACE, ROLE, TASK OF LAW ENFORCEMENT RELATED TO CLIMATE PROTECTION

Abstract

Nowadays, the professional issues of climate policy, climate protection and sustainable development have come to the fore, and due to their ecological, social and economic effects they have become significantly more valuable at the governmental, law enforcement as public levels. Strict adherence to the agreements and action plans reached at local conferences and world meetings requires and demands – in addition to global thinking – local community-wide actions, which cannot exist without law enforcement in accordance with legal regulations. On the one hand, due to their mandatory response obligation to today's security challenges, and on the other hand, their activities have a significant ecological footprint, and their organisational activities involve the emission of harmful substances. In this presentation the author seek the answer to the question of how compatible the current and future green innovative developments are due to the mandatory disaster protection and police modernisations due to the modern management of security challenges.

Keywords: security, law enforcement, climate protection, adaptation

Introduction

In this paper, the author examine – in addition to the security aspects of global climate change – international trends, the security-related professional content and forecasts of various scenarios and reports. [1-4] The relationship between climate protection and state involvement is also examined, as well as the compulsion of growing social security needs, the measures are taken by the professional disaster management organisation and the Hungarian police for sustainability, especially in terms of emissions reduction, adaptation and attitude formation. The author seek the answer to the question of how compatible the current and future green innovative developments are due to the mandatory disaster protection and police modernisations due to the modern management of security challenges.

Methods

Based on keyword search, I analysed the quantitative data of publications. WOS database found a total of 69 results for the keyword 'law enforcement and climate protection '– in the title and in the abstract – in the period between 1992 and 2021. WOS database found a total of 289 results for the keyword 'law enforcement and climate change' in the period between 1997 and 2021. These are distributed as follows: the vast majority is of journal articles (260), but 24 review articles and 5 editorials were written on this topic. It can be *concluded* that the international discourse on law enforcement and climate change takes place mainly in journals and mostly in articles. The data relating to disaster management were processed by the analysis of the statistical database of the National Directorate General for Disaster Management of the Ministry of Interior ('KAP-online') and disaster management yearbooks (2000-2020) according to the author's annual Sustainability Programs and annual records. The daily reports of the Central Office of the National Directorate General for Disaster Management of the Ministry of Interior were also processed and evaluated by the authors.

I used the calculator at https://www.carbonfootprint.com/calculator.aspx to determine the carbon-dioxide value of electricity and gas consumption in disaster management.

Results

In Hungary, law enforcement agencies include the police, the penitentiary organisation, the professional body of disaster management and the civilian national security services. This publication only seeks sources for police and disaster management, as information on penitentiary organisations and civil security services are more difficult to access [5]. The question immediately arises here: Does Disaster Management have a place, a role, and tasks in climate protection? The answer is yes, based on the national climate strategy 2. Aspects of the professional disaster management organisation, as the law enforcement agency under the Ministry of Interior, in order to promote sustainable development carries out environmental planning and management, monitoring and analysis of legal sources related to environmental protection and their sustainable use in procurement; analyses life cycles; prefers companies with environmental management system; sources locally; encourages the procurement and used of material- and energy-saving equipment in the office, such as double-sided printing or the use of 're-paper'. Furthermore, the continuous reduction of the specific annual energy and water consumption, the increased use of renewable energy in the case of organisational operations, the most economical use of natural resources, conscious resource management, increasing the amount of waste sent for recycling, reducing the amount of generated waste, creation of conditions for selective waste collection, optimisation of car usage, modernisation of the vehicle park, as well as the development of bicycle storage facilities. Encouraging environmentally conscious behaviour, providing electronic knowledge sharing for its staff, sharing sustainability information, and making wider use of online communication opportunities. Supporting the recreation of employees, improving healthy working conditions. Improving placement of the staff, projects of constructing barracks, modernisation and renovation.

Figure 1 - Examples of disaster management activities in support of sustainable development based on the triple division of climate protection. Created by László Teknős [6].

Regarding the formation of the approach, in January 2011 the National Directorate General for Disaster Management of the Ministry of the Interior (hereinafter: NDGDM) appointed an environmental commissioner and established a working group in order to enforce the

sustainability goals and criteria set by the Ministry of the Interior. In 2014, it developed its environmental policy, in 2015 it created Decree 6/2015 on the issuance of the Sustainable Development Regulations of the Ministry of the Interior. Director-General Action No.

Figure 2 - Examples of police activities in support of sustainable development - emission reduction. Source: created by László Teknős [6].

In the book chapter 'Police and Sustainable Development', Police Colonel Dr Gyula Németh writes that the police must also monitor the expectations, obligations, etc. related to international and domestic sustainability, which, according to the author, also promotes the economic management of environmental and budgetary resources. [7] According to him, the fulfilment of the sustainability goals will reduce the energy and utility bills burdening the operational budget, saving resources for other investments and developments, which will stimulate the national economy in terms of the size and real estate portfolio of the organisation.

Conclusions

It can also be stated that the disaster management and the police follow the principles of environmental protection and sustainability of the Ministry of Interior. They are increasingly paying attention to using only the energy they need, which will ultimately save them money for further development. Despite the fact that the task system of the examined organisations is diverse, they strive to perform tasks in a more environmentally conscious manner, keeping in mind the performance of the tasks arising from their basic purpose on a professional level.

Overall, the answer to the question of whether law enforcement should play a role in the tripartite climate protection system, is yes. The role and responsibility contributes to improving the performance of the national economy (see 'EEOP' or 'KEHOP' projects) and it can be stated that the tasks undertaken to reduce carbon footprint of climate protection meet the criteria of sustainable development and clearly increase the high level of implementation of the basic conditions (increasing adaptability), as the modern vehicles, equipment, facilities, more modern barracks, administrative principles, more advanced response methods, etc., all increase professionalism and the (responsive) capacity of professional organisations, which together contribute to the protection of the environment and the sustainability of law enforcement.

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Petretei, Dávid

USAR, MIMMS, DVI – PROTOCOLS FOR DISASTER RESPONSE

Abstract

This poster presentation gives a short and brief summarization of three disaster response methodologies and protocols. The USAR for the urban search and rescue, in collapsed buildings and other dangerous environments. The MIMMS for the major incident medical response, for disasters involving dozens of injured people. The DVI for the disaster victim identification, the recovery of dead bodies and body parts after a mass fatality incident, and establishing scientifically sound identification. In Hungary, all three protocols have already been implemented. All of the three protocols can be involved at the same time, after a mass disaster event, so a pre-established cooperation system, or, at least, a sound knowledge of each other's working order and competencies should be crucial. The author is a founding member of the DVI Hungary, with forensic and fingerprint background, so this poster focuses on the cooperation through a DVI point-of-view.
Keywords: mass fatality incident, disaster, victim, identification, USAR, search, rescue, INSARAG, Interpol, MIMMS, medical, triage.

Introduction

The HUNOR is the Hungarian heavy urban search and rescue team, qualified by the INSARAG. Its responsibility is the search for injured people in collapsed buildings, heavy vehicles, or any urbanized environment affected by earthquakes or other disasters.

The MIMMS is an abbreviation of Major Incident Medical Management & Support, which is a widely accepted protocol to deal with mass disasters with a huge amount of injured people. The MIMMS protocol has already been implemented by the OMSZ (Hungarian National Ambulance Service). The protocol consists of command and communication, adequate zones for the operation and the deployment, complex system for the operational, tactical, and strategic management. Ont the other hand, it usually applies a simplified triage system, which can be taught very fast and effective, to sort and organize injured people according to the degree of injury.

The DVI is an abbreviation of disaster victim identification. It is an abbreviation for the process, how to deal with mass fatality incidents, how to achieve scientifically sound, forensic-based identification for dead bodies, body parts, human remains, and how to reconcile them to the missing person. On the other hand, DVI is a standing working group of Interpol, which publishes a guide for the DVI process and orderly reviews the standardized forms. The Interpol has had a DVI working group since 1980 and Hungary has had its group, the DVI Hungary, since 2018.

Hunor

The Hungarian USAR unit is the „HUNOR", (Hungarian National Organization for Rescue Services), a part of the National Directorate General for Disaster Management, Ministry of the Interior (NDGDM). HUNOR is a heavy urban search and rescue unit, consisting of twelve groups, and 210 members. It can be used at the domestic (Hungarian) level, during interventions outside the EU and within the EU. It will start operating in Hungary within 3 hours in Budapest, within 8 hours in the countryside, and within 48 hours abroad. [1]

It is responsible for searching, locating, and rescuing victims trapped under collapsed buildings, derailed trains, etc. Providing first aid as needed until transported for further care.

Components: management (management, communication & coordination, planning, media & reporting, evaluation & analysis, security). Search (with dogs also), detection, and isolation of hazardous substances. Rescuing (demolition operations, cutting, lifting and moving, special operations with ropes). Medical care, including care for victims, team members, and search dogs. Summarized, its components are management, logistics, search, rescue, and healthcare.

HUNOR has its official qualification from the INSARAG of the United Nations.

Insarag

The International Search and Rescue Advisory Group (INSARAG) is a global network of more than 90 Member States and organizations under the United Nations umbrella. It was established in 1991. INSARAG deals with Urban Search and Rescue (USAR) related issues and aims to establish minimum international standards for USAR teams and methodology for international coordination in earthquake response. [2-3]

United Nations General Assembly Resolution 57/150 of 16 December 2002 is clear that international USAR should supplement existing in-country capacity such as local rescuers, also reinforcing the importance of timely coordination of these resources. (The resolution was reaffirming the Resolution 46/182 of 19 December 1991.) [4]

Mimms

Major Incident Medical Management & Support delivers a simple, reproducible framework for planning and response to major incidents and disasters. This benefits casualties by ensuring scarce resources are effectively managed, reducing the risk of poor response, and doing „the most for the most". [5-8]

MIMMS is a synergy of joint experience. A structured military-style approach to managing crisis is combined with civilian exemplars of practice and research. Translated into multiple languages and running in 12 countries, MIMMS is the national and international standard for planning and response to multiple casualty incidents.

The basic principles of MIMMS can be described with the acronym CSCATTT: Command, Safety, Communication, Assessment, Triage, Treatment, Transport. The scene of the major incident should be divided into three zones: bronze for the actual incident, silver for the responders, and gold for the area which has not been directly affected.

Victims should be labeled during the initial triage: T1 with a red label for the seriously injured, T2 with a yellow label for the moderately injured, T3 with a green label for the lightly injured (i. e. who can walk). A black or white label can be used for dead bodies, and T4 with a blue label can be used for the very seriously injured people, who can not be saved even with disproportional efforts.

DVI

The Disaster Victim Identification (DVI), the scientifically sound identification of victims of mass fatality incidents, is a particular, complex, interdisciplinary field of modern forensics and police sciences. DVI is not only the term for the methodology but also a name of an organization. The DVI has been a standing committee of Interpol since 1980, which issues Interpol DVI

Guide and DVI forms, connects the 190 Member States, and helps identify victims of mass disasters. [9]

The basic philosophy of Interpol DVI is an interdisciplinary approach, standardized procedures, preparation for organization and training, and, last but not least, respect for dignity and humanity. The DVI methodology contains four different steps. The scene recovery, the PM (post mortem investigation, with the pink form), the AM (ante mortem investigation, with the yellow form), and the reconciliation (the identification). There are two main classes of identifiers, the primary identifiers, and the secondary identifiers. Any of the primary identifiers may be able to establish an exact identity on their own, secondary identifiers are usually not capable of doing so on their own. Primary identifiers are the fingerprints, the dental records, and the DNA. Secondary identifiers are the anthropological findings, medical findings, tattoos, scars, jewelry, and other personal belongings. It is also important to stress that visual identification can be very unreliable and therefore this form of identification should not be considered alone. [10]

The Hungarian DVI unit is the „DVI Hungary", established in 2018, and first deployed in 2019, after the Hableany sightseeing cruise ship sunk. [11-12]

The Cooperation

One possible scenario for the cooperation of the three protocols can be a mass fatality incident when a train derailed, the wagons capsized. There could be dozens of seriously, severely, and lightly injured people. Also, many dead bodies, most of them were mutilated and deformed. In this scenario, only the HUNOR could conduct the search and rescue activities, other units could not work under the wreckages. The HUNOR could recover any injured people and every dead body or body part, and send them to the silver zone. On the silver zone, the OMSZ could do the initial triage according to the MIMMS protocol. DVI scene recovery teams should deal with the bodies and body parts, which are recovered by the HUNOR from the wreckages. One separated DVI team needs to monitor the red, yellow, and green-labeled injured people, who are transported or directed to hospitals. This would prevent the loss of any relevant information. This separated DVI team also needs to record all data about the other field units, their name, organization, contact details, etc. Also the name and contact details of the injured people, and the name of the hospital, where they are transported.

This cooperation can only be smooth only with the three command posts working in the same place and could share all incoming information in real-time.

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Máté, Gábor

THE INTRODUCTION AND FURTHER DEVELOPMENT POSSIBILITIES OF THE SPECIAL PREHOSPITAL CARE GROUP IN HUNGARY

Abstract

The aim of my research is to outline the positive overall social impact that can be achieved through the expected health gains and the management of safety risks through the presentation of the operation and results of the Special Prehospital Care Group so far, as well as the analysis of further development opportunities.

Keywords: Social impact, disasters, threats, ambulance personnel, hot rescue, law enforcement, safety, disaster relief, counter-terrorism, emergency care, universities, on-site treatment, health consequences, CBRN, chemical, biological, radiological, nuclear, incidents, healthcare, crises, pandemics, effective cooperation

Introduction

In our age, in addition to the already well-known emergencies, disasters and threats, we must be prepared for new types of potential threats. As is well known, ambulance personnel should not be directed to operating areas in hot rescue or law enforcement cases until their safety is guaranteed. But what happens when those who start care are “exposed” to all the circumstances that could endanger their lives and physical integrity? What happens if contamination or other previously unknown threats are revealed during care?

The Aim of the Concept

The most important elements of the effective cooperation of the system are the mutual knowledge of the functioning of the partner bodies, the use of appropriate communication - “common language”, clear definitions - and the provision of initial and refresher trainings based on a common training theme.

The participants in the cooperation are organizations designated for:

- rescue,
- disaster relief,
- counter-terrorism,
- emergency care,
- management of central stockpiles and resources,
- the medical faculties of universities dedicated to providing appropriate training.

Results

The training of special pre-hospital care groups (SPEC) was started within the National Ambulance Service in 2016 with the participation of medical faculties, counter-terrorism and disaster management agencies.

To date, we have trained more than 200 first responders in this interdisciplinary field. The national ambulance service has a SPEC operational procedure, but there is still plenty of room for further research and development.

The team took part in the following deployments after the training:

2016

2nd degree of readiness for terror threat (Budapest)

2017

Honvéd (military) Hospital-NAS mass accident practice (Budapest)

Budapest Int'l Airport emergency - practice

„Viking 2017" Complex defence management practice on the river Danube

2018

Defence practice Nógrád county (Szecsény)

Layered protection (Budapest, 10th district)

NATO SRBIJA (Serbia)

2019

„ Vigorious Warrior" 2019 NATO (Romania)

„FUSION 19" Complex civil-military health crisis practice (Komárom)

Budapest Int'l Airport emergency - practice

Rescue of MS. "Hableány" motor vessel sunk in a waterway accident

COVID-19 patients relocation [1] [2] [3] [4] [5] [6] [7].

Conclusions

The goal of the concept is increasing the medical safety, the primary and further training of specialists and experts playing prominent roles in crisis management. Preparation is essential for migration induced situations, for on-site treatment of the health consequences of CBRN (Chemical, biological, radiological and nuclear) incidents, for healthcare crises, pandemics, disasters and liquidation of their consequences and improving effective cooperation.

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ROADSIDE INSPECTIONS OF TRANSPORTING DANGEROUS GOODS IN HUNGARY

Abstract

The authors introduce the activity and procedures of the Hungarian industrial safety authority in the field of supervision of the transport of dangerous goods.

Keywords: ADR, inspection, industrial safety, protection against major accidents, dangerous goods, Hungary.

Introduction

In Hungary, the Agreement on the International Carriage of Dangerous Goods by Road (ADR) was promulgated by legislative decree 19 of 1979, after a serious accident occurred in Aszód, and entered into force on 18 august 1979. In September of 1976 a truck carrying liquid ethylene crashed into a house after a turn. The tank was igniting for more than 20 hours. [1] The Hungarian legislation is based on the adaptation of the regulations on the checks laid down in international agreements, in line with EU requirements. The authority's power to check is included in the laws specific to each mode of transport and their implementing regulations.

The complex Disaster Management system of Hungary

The Hungarian Disaster Management system is based on three main pillars, fire protection, civil protection and industrial safety. Industrial safety deals with manmade disasters, major accidents and other events endangering human health and life, the environment and critical assets. From the point of view of the Disaster Management Act, industrial safety deals with four further pillars; critical system components covered by the regulations about critical systems and installations, dangerous establishments or dangerous activities, the transportation of dangerous goods, and prevention of nuclear incidents. The development of the Hungarian system for industrial safety has a history of 15 years. The new legal regulation on industrial safety entered into force on 1 of January 2012. Beyond the supervision of hazardous activities and critical infrastructure elements, there are also appeared disaster management tasks of the authorities linked with the shipments of dangerous goods. The Act of 2011 concerning Disaster Management and Amending Certain Related Acts (Disaster Management Act), by modifying the laws on transport, created the legal background for Disaster Management to carry out independent checks on the transport of dangerous goods by rail, inland waterway and air as well, together with imposing fines and inspecting accidents. The implementing decree of transport laws was introduced in 2011 as well. Companies involved in rail transport are subject to notification requirement to Disaster Management concerning their transport activities. Based on the act on air transport, the implementing decree concerning the air transport of dangerous goods entered into force on 1 January 2015. It covers the rules of authority checks and fines imposed by Disaster Management, empowering it with the licence to check, fine and to carry out on-the-spot actions related to air transport. The local or regional bodies of National Directorate General for Disaster Management (NDGDM) may carry out independent checks on air transport of dangerous goods. The checks can be performed by them on the area of other Disaster Management authorities as well, with the consent of the National Directorate General for Disaster Management. [2]

Legal bases of the transportation and inspection of dangerous goods in Hungary

The Hungarian legislation is based on the adaptation of the regulations on the checks laid down in international agreements, in line with EU requirements. The authority's power to check is included in the laws specific to each mode of transport and their implementing regulations.

In Hungary, Annexes A and B to the Agreement on the International Carriage of Dangerous Goods by Road and on the Domestic Use of Dangerous Goods in Hungary, 2 July 2021, 387/2021. (VI. 30.) and ITM Decree 39/2021 (VII. 30.) on the domestic application of Annexes A and B to the Agreement on the International Carriage of Dangerous Goods by Road (ADR) shall apply from 31 July 2021.

The European Union requires Member States to apply a uniform structure to the rules on the transport of dangerous goods by road, rail and inland waterway in Directive 2008/68/EC. Today the Act I of 1988 on Road Transport establishes the right of the disaster protection authority to independently inspect and fine. The law sets out the procedure for imposing a fine in accordance with the right of review. The bodies responsible for inspection are the transport authority, the police, the customs authority and the Disaster Management authority. These authorities are therefore also entitled to monitor compliance with the rules on the transport of dangerous goods in the event of an accident, ie to determine whether the accident is linked to a breach of a transport rule and, if so, exactly which rule. However, experience shows that the investigation of such a complex accident is in all cases carried out by the Disaster Management, which is required by internal rules to carry out the investigation. Disaster Management Mobile Laboratories have the appropriate personal protective equipment, measuring instruments, consequence analysis software and procedures to use them, as well as the knowledge to prepare for possible population protection measures to investigate such a complex incident.

Government Decree 1/2002 (I. 11.) on the uniform control procedure for the transport of dangerous goods by road, which prescribes the application of a uniform control procedure in Hungary within the European Union. In order to ensure the effectiveness of prevention in Hungary, the national industrial safety inspectorate of the National Directorate General for Disaster Management manages the tasks of the disaster protection authorities in connection with the investigation of accidents. The infringements are fined in a basis of Government Decree No 156/2009 (29.VII.) on the amount of fines for infringements of certain provisions relating to the carriage of goods and passengers by road and road transport, and on the duties of the administrative authorities in relation to the imposition of fines.

According to the road transport law mentioned above, the transport authority, police, Disaster Management and customs authorities are entitled to check and impose fines regarding the transport of dangerous goods, the carrier, the road vehicle and its crew, the dispatcher of the goods, the temporary storage, the packager, the loader, the recipient and the appointment and qualification of the safety advisor. [3] The decree on the uniform procedures for checks on the transport of dangerous goods by road, coming into effect on 1 March 2002, is considered a basic implementing regulation. The local and territorial (county level) authority of National Directorate General for Disaster Management is entitled to conduct checks. The local and territorial authority of Disaster Management may conduct independent checks on the area of another Disaster Management authority, with the prior consent of the central organ of the Disaster Management authority. The checklist for inspections is specified in the annex to the Government Decree No 156/2009 (29.VII.) on the amount of fines for infringements of certain provisions relating to the carriage of goods and passengers by road and road transport, and on the duties of the administrative authorities in relation to the imposition of fines. The authority may take samples of goods for laboratory examination. In the case of infringement, the authority imposes sanctions and immobilizes the vehicle, in line with a separate decree of fine.

The infringements shall be assigned to the following risk category for the purpose of determining the amount of the fine, where category 1 is the most serious. Risk category 1 means infringements of the regulations on the transport of dangerous goods which involves a high risk of death, serious personal injury or significant damage to the environment. Risk category 2 means infringements of regulations on the transport of dangerous goods which involves a risk of personal injury or damage to the environment. Risk category 3 means infringements of the regulations on the transport of dangerous goods (ADR) with a low risk of personal injury or damage to the environment. [4]

Some examples for most serious infringements are here:

- Carriage of dangerous goods excluded from transport under the ADR
- Leakage and scattering of dangerous goods
- Transport by an unauthorized mode of transport or by an unsuitable means of transport or a means of transport in an unsuitable technical condition
- Bulk transport in a container that is structurally unsuitable
- Transport with an expired approval
- Use of packaging without approval
- Use packaging that does not comply with the packaging instructions for dangerous goods
- Failure to comply with special packaging requirements
- Failure to comply with the rules for stowage and securing of cargo
- Failure to comply with the rules on stacking
- Non-compliance with the permitted degree of filling
- Failure to comply with the quantity limit per transport unit
- Transport of dangerous goods without any indication or information
- There are no markings or labels on the vehicle, tank or container
- Lack of information in the transport document on the transported goods (eg UN number, proper shipping name, packing group)
- The driver does not have a valid training certificate
- Violation of the ban on the use of fire or open flame

Summary

The authors of this paper briefly presented and assessed the legal system of the Hungarian Disaster Management system, and the inspections and checks of hazardous activities in Hungary. Dangerous goods are mainly transported by road, but increasingly by rail, inland waterways and air. EU rules and regulations on the different modes of transport have been incorporated into Hungarian legislation. EU legislation based on the international convention on the transport of dangerous goods was introduced into the Hungarian legal system around the turn of the millennium. The Disaster Management authority has gained considerable enforcement experience in the control of the transport of dangerous goods. In summary, the

Hungarian safety authority, as part of the Hungarian Disaster Management organization, has applied European and international industrial safety standards. It should also be noted that the Hungarian legislation and its official instruments ensure a high level of protection of human life and the environment in Hungary.

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Szalkai, István– Restás, Ágoston– Óvári, Gyula – Ajtai, Nicolae – Török, Zoltán

PREVENTION AND DECONTAMINATION DRONE APPLICATIONS DURING THE COVID-19 PANDEMIC

Introduction

A pandemic is an epidemic of an infectious disease that has spread across a large region, for instance multiple continents or worldwide, affecting a substantial number of individuals. The Covid 19 pandemic changed our lives. New answers had to be found to the new challenges. It has also changed scientific research, and resulted in a huge number of publications on the subject. In the field of disaster management research Authors analysed the innovative tools [1], the international examples [2] and the humanitarian measures during the pandemic [3].

It has already been proven that drones can be used effectively in almost any type of disaster. It could be a forest fire [4], an industrial accident [5], soil pollution [6], reconstruction [7], risk assessment [8], technical rescue [9] and firefighting [10], the drones mean an effective solution.

Objectives

- Analyze the latest applications and summarize your experience;
- Taking stock of good practices, supporting their development;
- Classification of typical drone applications;
- Identification of critical points, risks and their reduction.
- Determine the basis for future research work.

Methods

- open source information, news, journals
- videos of social media
- own experiences (firefighting, disaster management, precision agriculture)
- On-site measurements, laboratory tests
- logic consecvences, graphic analysis, basic mathematical formulas.

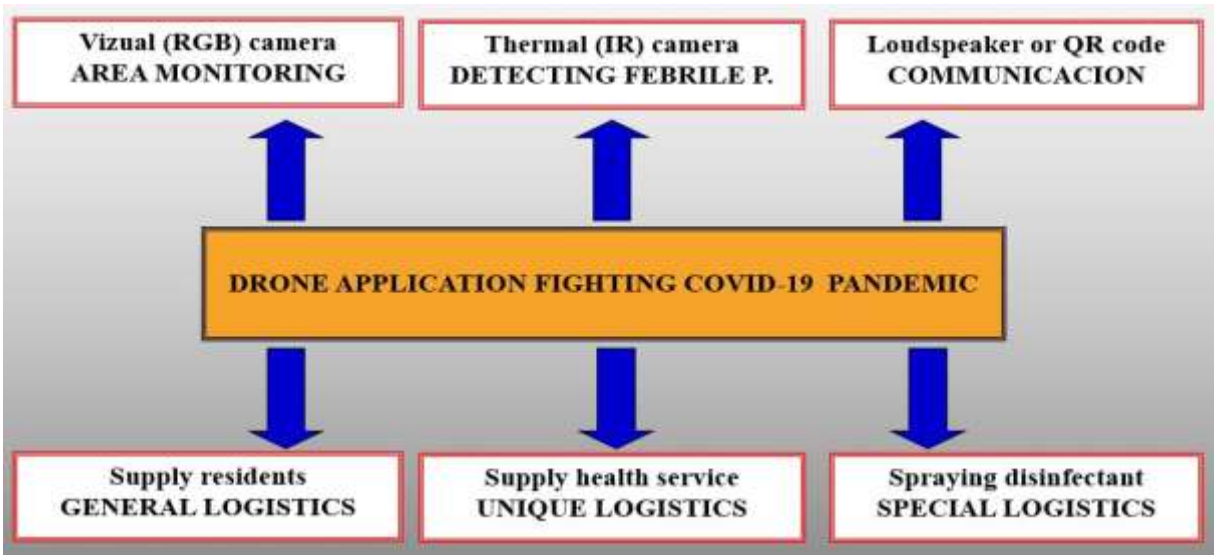

Figure 1 - Drone applications supporting pandemic management.Created by the Author.

Area monitoring

- Absolute effectiveness: there is no alternative solution
- Relative effectiveness: a) less resources is enough than the alternative solutions
- Relative effectiveness: b) monitoring time is longer than the alternative solutions
- Relative effectiveness: c) frequency of the monitoring is higher than the alternative solutions
- Economical effectiveness (efficiency): now it has limited importance

Detecting febrile people – thermal (IR) camera

- Focusing on limited area (street, square, park, market, block house)
- Sensing thermal anomaly (higher body temperature – fever – infection)
- Detecting and separating febrile people
- Controlling rule follows (quarantine)
- Reduce the risk of infection spread (preventing close contacts)

Communication – loudspeaker, QR code flag

- Limited area (targeted persons, groups, places)
- Loudspeaker – real time communication, quick information
- QR code - mobil app is required – pre-planned, actual information
- Focus on the target (place, person – crossing border)
- Actual information

General logistics tasks – supply residential

- Supply residential with essentials – no shopping
- Shopping means higher risk for infection –
- Mass supply is not possible – targeted groups (older, disabled, infected)
- Reducing contacts reduces the risk for infection

Unique logistic tasks – supp. health services

- It is the most critical service managing pandemic
- Testing potential infected persons, managing and treating them
- Separating the infected peoples from others
- Reducing work load of public health services
- Keeping social distances gives higher safety level

Special logistic tasks – disinfection

- Disinfecting smaller or larger area
- Reducing the spread of infection (object - human)
- Keeping work safety level high
- Disinfection, decontamination

Summary

- Using drones is not an option but an obligation!
- There are six, well defined applications
    - Area monitoring – RGB cameras
    - Sensing thermal anomaly – IR cameras
    - Communications – QR code flag or loudspeaker on board
    - General logistic tasks – supply essential goods
    - Unique logistic tasks – supporting public health services
    - Special logistic tasks – disinfection
- Good practices require more researches, tests, experiments in each group!

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Madikizela, Phindile - Mutingwende, Nhamo – Ristvej, Jozef – Tandlich, Roman

MICROBIAL WATER QUALITY IN A LOCAL MUNICIPALITY DURING THE LEVEL-THREE LOCKDOWN IN SOUTH AFRICA.

Abstract

Makana Local Municipality in the Eastern Cape Province of South Africa had suffered from a drought and water scarcity by the time that the COVID19 started. In June 2020, the COVID19 lockdown was relaxed to level three and microbial water quality was sampled at the Rhodes University campus and at a middle-to-high-income suburb in Makana. There is a clear lack of faecal contamination of the municipal drinking water at the Rhodes University campus in 100 % of samples. At the same time, the rate of faecal contamination of the municipal water in the middle-to-high-income suburb was equal to 67 % and the results were similar as during the harshest phase of the COVID19 lockdown. Data such those from the current study are needed to manage multiple disasters occurring at the same time. Resilience of the Makana population can be improved by continuous production and availability of microbial water quality data. Such data can be used to facilitate mitigation and increase preparedness in terms of water provision and the assessment of secondary/cascading effects of disasters in Makana Local Municipality.

Keywords: the H_2S test kit, faecal contamination, early-warning, resilience.

Introduction

Microbial drinking water quality has been examined by various authors during the COVID-19 period. Herniwanti et al. (2021) reported data from Indonesia for the period in December 2019 and measured the MPN concentrations of *Escherichia coli* and coliform bacteria. All sampled drinking water sources contained the concentrations of *E. coli* below 0 MPN/100 mL, while the coliform concentrations ranged from 8 to 350 MPN/100 mL (Herniwanti et al., 2021). The coliform concentrations exceeded the regulatory limit of 50 MPN/100 mL (Herniwanti et al., 2021). García-Ávila et al. (2021) studied and modelled the residual chlorine concentrations in a drinking water system in Azogues City, Ecuador. The authors results indicated that the average chlorine concentration was equal to 0.87 mg/L in the distribution tank, which was above the Ecuadorian standard of 0.3 mg/L (García-Ávila et al., 2021). At the same time, the residual chlorine concentration was below the WHO limit of 0.5 mg/L in 45 % of the nodes (García-Ávila et al., 2021). That WHO limit had been recommended to combat the SARS-CoV-2 virus in drinking water systems (García-Ávila et al., 2021). The municipal drinking water supply in Makana Local Municipality was found to be faecally contaminated during the harshest phase of the COVID19 lockdown (Tandlich, 2020). This has been a continuation of previously reported problems in the local municipality, which is located in the Eastern Cape Province of South Africa (Luyt et al., 2011; Malema et al., 2018; Tandlich, 2020). Malema et al. (2019) found that alternative water resources, e.g. rainwater harvested at the household level in the Makana Local Municipality, contained microbial contamination. In June 2020, the COVID19 lockdown was relaxed to level three (see https://www.gov.za/covid-19/about/about-alert-system; website accessed on 4th April 2022). The H_2S test kit was used to conduct a follow up examination of the microbial water quality in Makana Local Municipality.

Materials and Methods

Methodology of Malema et al. (2018, 2019) and Tandlich (2020) was used to prepare and conduct the H_2S test kit analyses. Spellbound Labs was also the supplier of the peptone powder, cysteine hydrochloride, deoxycholate, K_2HPO_4, ferric ammonium citrate and Teepol surfactant. The H_2S test kits were prepared in the microbiological laboratory in the Faculty of Pharmacy at Rhodes University prior to the onset of the COVID19 lockdown. Incubations were performed in at room temperature, as reported already by Tandlich (2020). After the relaxation of the COVID19 lockdown on 1st June 2020, additional water sources around the Rhodes University campus were sampled using the H_2S test kit, following the same procedure as in Malema et al. (2018, 2019) and Tandlich (2020). Samples were taken at the Rhodes University campus and in a middle-to-high-class suburb in the Makhanda area of the municipality. Two municipal taps, as well as gloves worn by the sampling author, were chemically sterilised on the outside of the taps with 70 % ethanol (Chemstores, Rhodes University, Makhanda, South Africa). The taps were open and five H_2S test kits were filled to half o volume with the sampled municipal drinking water. Then the kits for each sample were incubated at temperatures between 19 and 27 °C. Results of the H_2S test kit were evaluated as demonstrated in Table 1.

Results and Discussion

Results of the microbial water quality from the level-three lockdown in Makana Local Municipality in South Africa are shown in Table 2. There is a clear lack of faecal contamination of the municipal drinking water at the Rhodes University campus in 100 % of samples. At the same time, the rate of faecal contamination of the municipal water in the middle-to-high-income suburb was equal to 67 % and the results were similar as during the harshest phase of the COVID19 lockdown (Tandlich, 2020).

Table 1 - The mechanism of processing of the qualitative signal in the H_2S test kit for quantitative one processing in the current paper.

Quantitative H_2S test kit score	Positive H_2S test kits in a particular sample	Qualitative H_2S test kit signal
0	0	Water sample is free of faecal contamination
1	1-4	Possible faecal contamination of the water sample
2	5	Confirmed faecal contamination of the water sample

Results such as those from the current study are important to gain understanding about the potential cascading effects of the COVID19 pandemic, e.g. the compromising of personal hygiene adherence by the population under the coronavirus cordon sanitaire.

Table 2 - Results of the microbial water quality analyses in Makana Local Municipality in June 2020.

Quantitative H_2S test kit score	Time into the level-three lockdown	Positive H_2S test kits in a particular sample
Rhodes University Campus	1	0
Kingswood suburb	1	1
Rhodes University Campus	3	0
Kingswood suburb	3	1
Rhodes University Campus	14	0
Kingswood suburb	14	0

Resilience here will be defined in relation to the right to access to safe drinking water and a healthy environment, as well as in dealing with the impacts of climate on these rights. This resilience will be related to the functioning of the Makana population inside a "domain of attraction", as defined based on the Foucauldian notion of anatomo-politics (Vilcan, 2015). In more detail, the understanding of the microbial water quality of the alternative water resources can contribute to the understanding of which of the alternative water resources can be exploited to maintain a sense of normalcy, through the maintenance of the water access and provision for domestic uses such a drinking and laundry, during the outage of a municipal drinking water supply. That type of the microbial water quality data will provide an indication about the possibility of the Makana population to 'bounce back' from a lack of municipal and safe drinking water supply, based on the construct, dimensions and the indicators of the South African norms and legislation. Using the microbial water quality data, such as those from this study, can be used to increase the preparedness and mitigation measures in the water-scarce Makana Local Municipality in line with the Kimberley model of disaster risk management (Cyganik et al., 2003).

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Vásárhelyi, Örs – Ambrusz, József

THE HAZARDS OF AMMONIUM NITRATE WITH REGARD TO DISASTER MANAGEMENT

Abstract

Ammonium nitrate is an essential substance for the chemical industry. This chemical has a wide range of use. The most common ones are fertilizers and explosive compounds. The utilization of ammonium nitrate-based fertilizers is prevalent in the agricultural sector all around the globe. Despite their broad application, these fertilizers have been found to be the main cause of many fatal industrial accidents throughout the past century. The timeliness of the subject of this paper is evidenced by the continuously occurring catastrophes and ever-changing and updated security standards. The purpose of the study is to emphasize the risks and dangers associated with ammonium nitrate and the importance of adhering to the prescribed security guidelines in order to reduce the occurrence of disasters. A case study is used to demonstrate what can befall in the absence of lawful regulations and proper security measures.

Keywords: ammonium nitrate, fertilizers, industrial safety, disaster management, regulations

Introduction

The function of fertilizers is intended to enhance and add to the nutrients that are naturally present in the soil. The goal of their production is to raise the crop yield while creating a sustainable economical environment. The study mainly examines the industrial safety risk of using ammonium nitrate, providing insight into the hazards of production, storage, and transportation.

Methods

Owing to the topic's actuality, it is necessary to constantly monitor legislation, case studies, and accidents. The author used inductive and deductive methods for the analytical analysis and for processing the source work found in the literature. The writer observes the current legislation in force, as well as the practical implementation, seeking the difficulties in implementation in particular. This article was conceived to raise attention/awareness of the hazards of nitrate-based fertilizers and the importance of using precautions to minimize the occurrence of potential hazards.

Appearing hazards during the production

During the fertilizer production main pollutants are generated i.e. NO_x; SO_2; HF; NH_3 and dust. From the site of production, NH_3 may leak or noxious gases may appear as by products of the explosion or combustion of ammonium nitrate. These could endanger public health. [1]

Hazards of the storage

Ammonium nitrate has a couple of hazardous properties: risk of explosion, flammable, in large quantities is an oxidizing agent. In Hungary, the 36/2006 (V.18.) FVM decree regulates the storage of ammonium nitrate-based fertilizers. The active substance content of the fertilizer must be preserved and its physical and chemical deterioration must be prevented. Solid fertilizer can be stored only with roofed, on solid surfaces, where rain and inland water drainage is solved, and the displaced product can be collected. The storage of the different active substance bulk

fertilizers must be separated from each other and the documentation and data of the product must be indicated visibly. Liquid fertilizers can only be stored in a tank-container that is free of dripping and the material of the tank-container does not react with the liquid product. Completely filling the tank-container is strictly forbidden, because of the thermal expansion. The labels on the sides of the tank-container have to be waterproof. Fertilizers with an ammonium nitrate content of 28% or above should be stored under conditions that prevent recrystallization due to thermal cycles, in a closed place that is protected from sunlight and free from moisture. [2] In the case of outdoor storage, the same rules as indoors apply, except that bulk fertilizer must not be stored outdoors. The products need to be even more protected against the weather and the absorption of moisture and contaminants must be prevented [3].

Transport hazards

The applicable rules for road and rail transportation of ammonium nitrate-based fertilizers are defined by ADR and RID. The table in Chapter 3.2 of ADR classifies ammonium nitrate-based fertilizers UN1942, UN2071, and UN2067 into the third transport category, meaning that the maximum permitted transport quantity is 1000 kilograms or liters. [4]

The UN has also published a recommendation for the safe transportation of NPK fertilizers. These guidelines are the following:

- the product must be kept away from high heat sources during the transport,
- Avoid accidental heating, as at temperatures above 120 ° C the decomposition processes begin, most of which take place in the presence of irreversible and decomposing toxic gases such as HCl, NO_x, and Cl_2. [4]

Ammonium nitrate as an explosive precursor

Due to the new EU regulation, 2019/1148 EU decree restricts the purchase and use of ammonium nitrate-based fertilizers only for the public. The EU has tightened regulation due to its war against terrorism. Products that nitrate concentrated higher than 16% are only bought by the eligible companies and professional users, them verified by each transaction. [6]

Case study – beirut explosion

On August 5, 2020, a fatal disaster struck the Lebanese capital, with many casualties in both human lives and property damage. At least 2,750 tons of ammonium nitrate-based fertilizer were destroyed. The outbreak was presumably caused by a series of human omissions. The disaster was enormous, with 204 people killed in the blast. The damage costs an estimated 10-15 billion dollars. Ultimately, irregular storage and a lack of authority controlled to the disaster. Haroun Mahgerefteh, a chemical engineer at Univerisity College London, explained that the massive detonation was caused due to large amounts of ammonium nitrate being stored in one place for many years unregulated, trapping humidity and causing clumping of particles together that resulted in an explosion of increased magnitude [6] [7] [8].

Conclusion

Today, nitrate-based fertilizers, especially ammonium nitrate are as prone to industrial disasters as they were a century ago. The use of ammonium nitrate as a fertilizer can be replaced by several other, safer, and even more effective non-ammonium nitrate-based fertilizers. But the popularity of ammonium nitrate is unchallenged to this day, mainly due to its versatility and easy production. Full compliance with safety standards and regular, rigorous inspections worldwide can minimize the risk of another major disaster [9] [10].

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Barina, Balázs

THE VERSATILE METAL URANIUM AND IT'S MULTIPLE USES

Abstract

Uranium is a common metal, it can be found in a wide range of locations on earth, it's scattered throughout the earth's crust, with the average concentration of 3-4 ppm according to Vajda 2004 [1]. The first industrial use dates back to 1850, U was used in glass production. Since the 40's uranium is widely used in the military and in the nuclear industry, most commonly used as shielding for radiation sources and as fuel in nuclear reactors, less frequently in it's natural state, more frequently in enriched form. We cannot give up on its use because its application are very diverse. However, the dangers of application and the possible polluting effects must be taken into account, both during use and interventions.

Keywords: Natural Uranium, Uranium Isotopes, U-235, Depleted Uranium, CANDU

Introduction

Uranium is a common metal, it can be found in a wide range of locations on earth, with the average concentration of 3-4 ppm according to Vajda 2004 [1]. The first industrial use dates back to 1850, since the 1940's uranium is widely used in the military and in the nuclear industry, most commonly used as shielding for radiation sources and as fuel in nuclear reactors, less frequently in it's natural state, more frequently in enriched form [2].

Objective

With my research and the presentation of its results, my goal is to explore the ways in which uranium is used, to describe its dangers. Then, with further research on it, I will develop appropriate intervention procedures for resolving damage events.

Method

For my research I was using secondary research methods which encase:

- Document analysis, extensive study and processing of documents;
- General comparison, generalization, and chronological test method;
- Analytical logic, literature and legal research relevant to international and national level

Findings

Natural Uranium

Uranium is a silvery-grey metal in the actinide series of the periodic table. A uranium atom has 92 protons and 92 electrons. Uranium is weakly radioactive, the half-lives of its naturally occurring isotopes range between $1{,}592 \times 10^5$ years to $8{,}09 \times 10^{15}$ years according to Norman E. 1981 [3]. The isotopes of natural uranium are uranium-238 which accounts for almost 99,28% uranium-235 with 0,72%, and uranium-234 with 0.0052%. Uranium has the highest atomic weight of the primordially occurring elements it's density is 19.1 g/cm3. Natural uranium can be used to fuel CANDU type nuclear reactors. According to the World Nuclear Association there are 27 CANDU reactors in operation [4]. CANDU is nuclear reactor type developed in Canada. The word composition stands for Canada – Deuterium – Uranium, it reflects the key role of heavy water which serves as moderator (and Uranium of course). This reactor type is

loaded with natural uranium. CANDU reactors use about 25 - 30% less mined uranium than a comparable light water reactor. The fuel is made of uranium oxide powder compressed into pellets and placed in to the fuel rods. Thirty seven fuel rods are bunched together to complete a cylindrical fuel bundle. Due to the use of heavy water as moderator uranium does not need to be enriched [5]. (Heavy water as a moderator is 1700 times more efficient than light water according to D. Jackson and H. Tammemagi 2009. [6]) Heavy water is kept relatively cool at 70°C using a separate cooling system and is circulated through purification systems to ensure its quality. The reactor configuration of a CANDU is atypical, the fuel bundles are arranged horizontally not vertically, and are placed inside pressure tubes within the reactor vessel. The reactor core needs to be more extensive than comparable light water reactors when we want to reach the same output capacity [7].

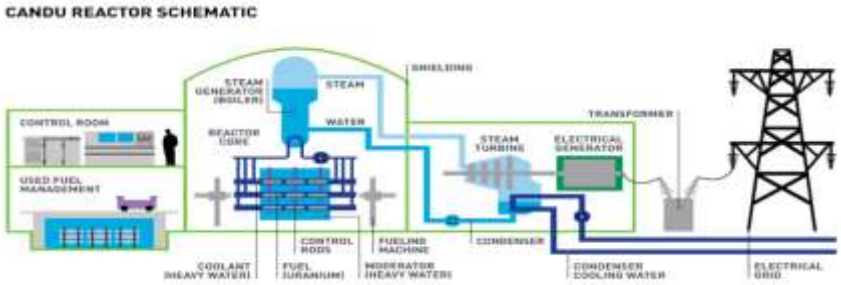

Figure 1 - CANDU reactor schematic by. Source: [7]

Uranium-235

Uranium is the main fuel for nuclear reactors. In order to make nuclear fuel, uranium goes through various refining and enrichment procedures. There are several enrichment processes utilized worldwide. They are: gaseous diffusion, gas centrifuge, laser separation. Gaseous diffusion was the first commercial process used in the US to enrich uranium. Gas centrifuge enrichment is the current process for commercial enrichment in the United States. The laser separation technology is under development for possible use to enrich uranium. Molecules can be excited by photoexcitation. Lasers can increase the energy in the electrons of a specific isotope, changing its properties and allowing it to be separated.

The enrichment process increases the uranium-235 concentration from it's natural level to between 3% - 5%. While the enrichment process uranium in a gaseous form (uranium hexafluoride). Uranium hexafluoride is fed into centrifuges, that separate it from the heavier uranium-238. The centrifuges also separate DU. The enriched uranium is converted into uranium dioxide powder, then it is compressed fuel pellets and heated. The pellets will be inserted into fuel rods [8]. 1000 g of natural uranium after the enrichment procedure and used in a light water nuclear reactor for power generation enables the generation of 45,000 kWh of electricity, this corresponds to nearly 10000 kg of mineral oil or 14000 kg of coal [9].

Picture 1 - Uranium pellets and fuel rods / edited by the author. Source*:* www.rosatom-centraleurope.com/press-centre/news/tvel-to-supply-fuel-pellets/

Depleted Uranium

Depleted uranium is a by-product of the enrichment procedure of natural uranium for nuclear fuel, it is a dense metal which is 1.7 times as dense as lead is and is 40% less radioactive than the starting material [8]. DU mainly emits alpha particle radiation, which doesn't have enough energy to penetrate through the human skin, but when inhaled ore ingested it can cause serious health hazards. Because of it's high density depleted uranium is primarily used as shielding material for radiation sources such as Ir-192, but it can be used to build sailboat keels and trim weights for airplanes. DU's physical and chemical properties make it more than suitable for military uses. Given it's high-density depleted uranium can be used in tank armour, shielded between layers of steel plate. Armour made of depleted uranium has a higher level of resistance to penetration by conventional anti-armour ammunitions than normal hard rolled steel plate armour. Due to its physical properties DU projectiles can have smaller diameter, less aerodynamic drag and deeper penetration because of higher pressure at point of impact. Kinetic energy penetrators made of DU have a pyrophoric nature (on impact with target, they ignite). Depleted uranium can be used as neutron reflector, in fission bombs. A dense tamper like DU rises the effectiveness of the explosion [10].

Suggestions

Uranium and its isotopes are more commonly used than we anticipate, the areas of application range from the energy sector to civilian and military field. But Uranium also has it's dangers: exposure to uranium can result in chemical and radiological toxicity. High concentrations affecting the kidney can cause damage, in extreme cases it can cause renal failure. If intakes are high, uranium is likely to become a chemical toxicological problem before it is leads to radiological damage, but once inside the body it also irradiates the organs [11]. We cannot give up the use of uranium because its application is very diverse. However, the dangers of application and the possible polluting effects must be taken into account, both during use and during interventions.

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Józsa, Máté – Dobor, József

INTERNATIONAL NUCLEAR AND RADIOLOGICAL EVENT SCALE (INES)

Abstract

The International Nuclear and Radiological Event Scale (INES) is a tool for communicating the safety implications of nuclear and radiological events to the public. The background the INES was developed by the IAEA and the Nuclear Energy Agency of the Organization for Economic Co-operation and Development in 1990.

Keywords: INES, radiological, nuclear, international

Intorduction

The scale was originally used to classify incidents at nuclear power plants, and was then expanded and applied to all civilian nuclear industry installations. It has subsequently been expanded and further adapted to meet the growing need to communicate about the importance of all events related to the use, storage and transport of radioactive materials and radiation sources. Member States use INES to provide a numerical rating indicating the importance of a nuclear or radiological event. Events are assessed in seven stages. The scale is logarithmic that is, for each increment of the scale, the severity of the event increases by a factor of approximately 10. Events are considered in terms of: impact on people and the environment, impact on radiological barriers and control, impact on defence in depth and events without safety significance are rated as Below Scale/Level 0 and events that have no safety relevance with respect to radiation or nuclear safety are not rated on the scale [1] [2].

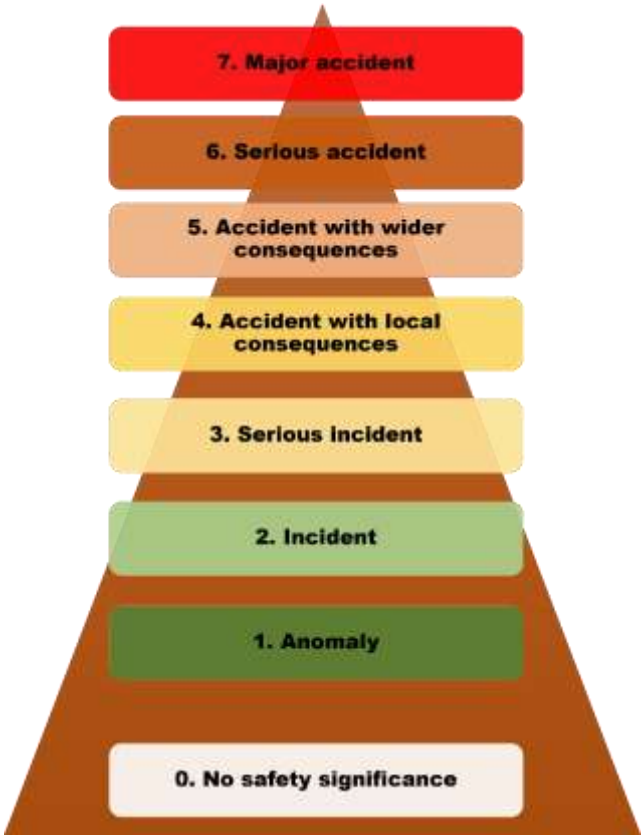

Figure 1 - The International Nuclear and Radiological Event Scale, by authors based on [1].

Methods

In addition 80 IAEA Member States have designated INES National Officers. Member States are encouraged to share information on events rated at Level 2 and above and events to attracting international public interest through the IAEA supported Nuclear Events Webbased System, which the lists publicly events that were reported in the past twelve months. The INES scope covers events at facilities and activities involving radiation sources. This is used for the rating of events that result in the release of radioactive material into the environment and in the radiation exposure of workers and the public [1].

Results

Also used for events that have not actual consequences, but where the measures put in place to prevent them did not function as intended. INES should not be used to rate events resulting from procedures to where people are intentionally exposed to radiation as part as of a medical treatment. [1] INES is deliberated for use in non-military applications and only relates to the safety aspects of an event. INES should not be used to assessing or comparing safety efficiency between facilities, organizations or countries. It also should not be used to activate emergency response actions. INES should be used as part as of a communications strategy, locally, nationally and internationally.

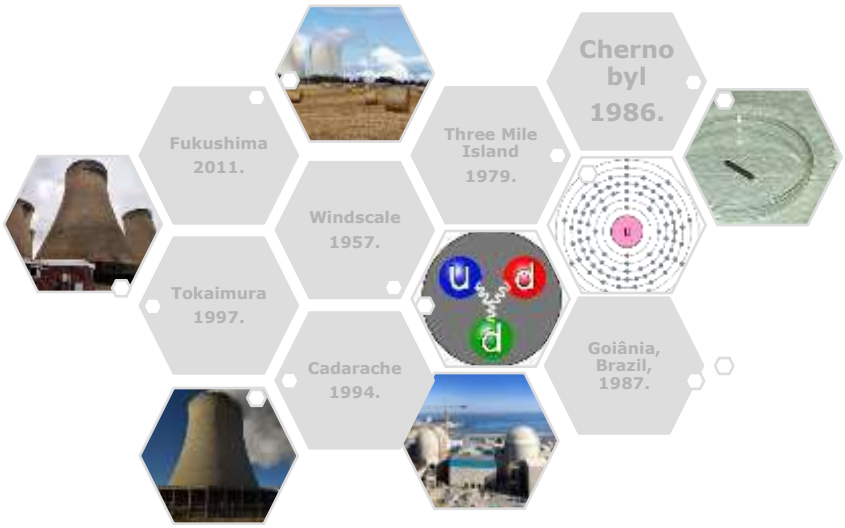

Figure 2 - Practical examples of INES events, by authors based on [1] [2] [3].

The rating of events in terms of their impact on the people and the environment takes account of the actual radiological impact on workers and members of the public and the environment. The evaluation is based on either and the doses to people or the amount of the radioactive material released. Where it is based on dose, it also takes account of the number of people who obtain a dose. Events must also be rated using the criteria related to defence in depth and where

suitable and using the criteria associated to radiological barriers and controls at facilities, in case those criteria give rise to a higher rating in INES. [2] This is accepted that for a serious incident and an accident, it may not be possible during the early stages of the event to determine accurately the doses received or the size of a release. Although, it should be possible to make an initial estimate and thus to assign a provisional rating. It needs to be thought that the purpose of INES is to allow to prompt communication of the significance of an event. In events where a significant release has not occurred and this is possible if the event is not controlled, the provisional level is likely to be based on what has actually occurred so far. It is feasible that subsequent re-evaluation of the consequences would necessitate revision of the provisional rating. The scale should not be confused, with emergency classification systems, and should not be used as a basis for determining emergency answer actions. [3] Evenly, the extent of emergency response to events is not used as a basis for rating. Details of the planning against radiological events and vary from one of the country to another, and this is also possible that precautionary measures may be taken in some cases even where they are not fully justified by the actual size of the release. For these reasons, this is the size of release and the assessed dose that should be used to rate the event on the scale and not a protective actions taken in the implementation of emergency response plans. The process for applying these criteria is summarized in the flowcharts in Section 7. Although, this should be noted that for events associated with transport and radiation sources, this is an only necessary to consider the criteria for doses to individuals when there is a significant release of radioactive material [1] [2] [3].

Conclusions

The highest four levels on the scale include the definition in terms of the quantity of activity released, defining it is size by its radiological equality to a given number of terabecquerels of ^{131}I. The choice of this isotope is somewhat arbitrary. It was used because the scale was originally developed for nuclear power plants and I would generally be one of the more and more significant isotopes released. The reason for using amount released rather than assessed dose is that for these larger releases, an actual dose received will very much depend on the protective action implemented and other environmental conditions. If the safety actions are successful, the doses received will not increase in proportion to the amount released.

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Section E – Safety and security

Tegyey, Andrea Cecília

VARIEGATION OF SECURITY – MENTAL SECURITY OF THE HELPERS. THE EVALUATION OF THE QUESTIONNAIRE OF THE LAW ENFORCEMENT SERVICES REGARDING THEIR STRESS LEVEL INSIDE WORKING ENVIRONMENT

Abstract

For each member of the law enforcement services is a must based on the legal obligation, to have the proper health, psychic and physical condition. In my article i would like to analyse the relevance and the suitability of the Occupational Stress Questionnaire for Law Enforcement Services (in Hungarian: Rendvédelmi Szervek Munkahelyi Stressz Kérdőíve, abbreviation: RMSK) which is in use since many decades during psychical examinations. *Methods*: During my work when I examine the psychical conditon of the members of the related people I used the Occupational Stress Questionnaire, created for the members of the Law Enforcement Services. *Results*: Members of the Law Enforcement Services are receiving a high level of stress and psychical strain, and this factor can be examined properly by the RMSK. *Conclusions*: Even though it is clear, that according to kinds of the literature the RMSK is a valid and proper questionnaire based method overall, there is still a need for further investigation, if it is valid and if it's provides the same result regarding every department of the Hungarian Law Enforcement Services.

Introduction

To establish a legal relationship for the regular members of the law enforcement services is a must, to have the proper health, psychic and physical condition according to the Hungarian law 2015. XLII / 33. § c. point. These types of examinations are also regulated according to the directive of 45/2020 (XII. 16.) issued by the Ministry for Home Affairs.

The directive 45/2020 (XII. 16.) 70. § (1)issued by the ministry for home affairs demonstrate that the medical examination has to cover the below mentioned environments:

1.) Psychical stability;

2.) Psychical loadability;

3.) Sources to handle the psychical/mental „strain" inside the work environment and in tasks during service time;

4.) Assessment of any relevant alternatives for stress handling.

The above mentioned factors can be analyzed by several psychical methods (e.g. instrument Questionnaire methods, projective tests, etc.), however the among the relevant methods we can find the RMSK, which is an own questionnaire of the psychologist of the law enforcement services, published for the first time by Szabó (2009).

Objective

In my current article my goal is to analyze and investigate the relevance factor of the RMSK. I will present also the part, which refers to the question if the RMSK is enough appropriate to fulfill its main goal, to measure the level of psychical/mental „strain" inside the work environment that the members of the law enforcement services are receiving during service time. The question appears: Is the RMSK has the proper validity from a statistical point of view?

Method

The RMSK can be separated into 2 bigger parts: one part about the work and workplace (with 116 items) and another about individual, personal factors (with 83 items). The questionnaire measuring each item on a so called „Likert scale" between 1 and 6.(Szabó, 2009; Fridrich, 2015; Tegyey 2018; Borbély, 2020a). Beyond that, the first big part is split into 2 environments: The first one provides a list of happenings connected to the working environment with negative effects and negative experiences, the other one provides 75 potential statements by mixing the factors and the list of daily problems until all the facts and events, which can have/cause a negative impact on an individual's performance inside the work environment. In the end after the proper statistical analysis, the 199 items long questionnaire gives the result based on 26 scales. The question appears: can we consider the RMSK as valid a questionnaire from a statistical point of view? Szabó (2009) proved, that the RMSK questionnaire can be considered as a reliable and stable point for a psychologist during the examination of an individual. The results of her examinations have been confirmed, therefore we can declare, that overall the Cronbach-α index of the questionnaire is valid for the questionnaire. (0,939) (Fridrich, 2015; Tegyey, 2018).

Conclusions

The RMSK has been used several times during several scientific kinds of researches. (Szabó, 2009; Fridrich, 2015; Tegyey 2018; Borbély, 2019; Borbély, 2020a; Borbély, 2020b; Borbély; 2021). Furthermore I would like to declare, that according to the experience and opinion of psychologists who work for the law enforcement services, the questionnaire is considered as an easy informative method of examinations (Farkas and Horváth, 2020; Farkas, Sallai and Krauzer, 2020). The most informative items can be found between the items which are related to the work and to the work environment, which statement and experience are in correspondence with the differences experienced during the tests of the scales of Cronbach-α, publiced by Fridrich (2015), and Tegyey (2018). The content and the structure of the questionnaire is appropriate, it can be considered as an informative method, which provides relevant information during psychical examination. It is capable and appropriate for the psychical examinations off the members of the law enforcement services, it can be used as an additional method among other psychical examination methods. Furthermore it is also appropriate for usage in scientific research. However we need to highlight, that in some places and in several cases the definition of the items is obsolete, therefore it has to be developed. The review of the questionnaire would be also important from the validation point of view. Nevertheless the questionnaire is available for each and every department of the law enforcement services (including: police, disaster management and the penitentiary system). It is also a relevant fact, that the scientific publications founded between the references below are the results of the examinations made only among the regular members of the police. Considering this based on scientific needs and demands it would be very important to check, that how accurate the questionnaire is and check if similar results would bear among other departments of the law enforcement services (Farkas, Krauzer and Sallai, 2020).

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Trapp, László – Farkas, Johanna

TACTICAL TRAINING EXPERIENCES OF A CRITICAL INFRASTRUCTURE SECURITY GUARD IN HUNGARY

Abstract

Introduction: The ever-changing environment is leading to a continuous transformation of security organizations and the expansion of their tasks, which is why research into guarding tasks and guarding activities is becoming increasingly important. We investigated the training requirements of security guards whose duties include protecting critical infrastructure. *Methods:* A questionnaire was used to assess the training conditions of a security guard unit (105 participants). *Results:* The results show that the shortness of tactical training, the long time between training sessions, the lack of tactical tools, and the small amount of training materials were the key issues. *Conclusions:* Armed security guards perform important activities in the protection of critical infrastructural facilities and their preparedness is therefore of paramount significance which could be improved by more effective training.
Keywords: tactical – armed security guards - psychology

Introduction

The formation and organizational development of security guards are closely linked to social, economic, and technological changes, shaped by the needs and tasks of protection (Lippai, 2021). Hungary has a large numer of critical infrastructural facilities that need to be continuously protected (Nyitrai, 2017). These tasks are performed by security guards (armed security guards) (Lippai, 2021:b). Damage to these objects (energy supply, water supply, transport, health, finance, ICT, etc.) has an impact on the functioning of the whole country. The structure, role, and the duties of security guards have been subjects of much research, but there are still unexplored areas in the training of security guards (Lippai, 2021:c). Security guards perform complex tasks (Act CLIX of 1997; Act CXXXIIII of 2005; Act C of 2012; Act XLII of 2015), including ensuring the security of guarded objects in case of an unexpected event (e.g. armed attack, industrial accident) and the use of coercive measures (BM Decree 27/1998).

Objectives

The law details the duties of security guards but prescribes outdated firing drills (e.g. sized for military ranges, not for close combat). The exercises are not feasible in reality and require the use of inappropriate equipment. A further problem is that the training of various armed security forces varies in terms of expertise, intensity, and quality.

Training needs to be reviewed to ensure that the basic principles of the policy (legality, professionalism, security, proportionality, effectiveness, and objectivity) are fully adhered to. We looked at how security guards protecting critical infrastructural facilities perceive the quality of their training and their expectations.

Areas of activity of security guards

Security guards protect all objects, activities, and cargoes that are vital for the supplies to the population and the functioning of the state. If the deployment of the Hungarian Defence Forces and/or other law enforcement agencies is not justified but guarding is necessary, the Security Guard performs this task (Sóti, 2019). They perform their duties in institutions, at borders, airports, and they protect the production, storage, and transport of products that are prone to

causing disaster. This includes nuclear, explosive, radioactive, toxic, flammable, environmentally hazardous materials, and materials of public health concern.

Aspects of the emergence and development of security guards

Changes in several areas have contributed to the emergence of security guards today, including:

1. vigilant protection: the physical presence of the guards protects the area, the object, and the security of the events;

2. mechanical defence: the main objective is to create obstacles to make it more difficult or impossible for the attacker to penetrate the protected object.

3. tactical protection: e.g. providing the building and its personnel with appropriate protective equipment and having an emergency plan;

4. tools development, IT development: technological development has led to very rapid development of the tools used by armed security services (Tóth - Tóth, 2014).

Tasks of security guards

Security guards have the rights and duties to take action (Gotthilf, 2009), and it is of utmost importance that they know the professional profile of the protected object (Kiss et al., 2019), to prevent a possible attack or natural disaster (Kondás, 2015). They should be familiar with the location, function, and operation of special security equipment in the facility, the location of chemicals in the facility, as well as their handling of these in case of fire. Guards serving in critical infrastructure must be commences constantly alert, as their failure to do so could have an impact on the operation of the whole country.

Action training for security guards

Security guards undergo physical and psychological tests, after which their training begins. For critical infrastructure, younger people are typically not recruited, and great emphasis is placed on selecting the right people. They undergo nine or ten professional training courses a year, and their readiness and physical fitness are checked (Imre et al., 2012). In Hungary, tactical training has been part of the training programme since 1983, and self-defence training has also been introduced (Houguel, 1983). As armed security guards use the same coercive tools as members of the Police, except the uniform, they undergo similar training. The training system can be divided into the following areas: communication skills, first aid, self-defence, psychological skills, situational training, and firearms training.

Method

The study involved 105 participants. A self-administered questionnaire was completed by members of a security guard unit protecting a specific critical infrastructural facilities. The questions addressesd the following areas: pre-training needs, security organization, quality of training materials, their availability, learning environment, the usefulness of aids, and instructor competencies.

Results

The answers to the questions revealed several problems in the field of tactical training. These include short training time to acquire competencies, several months between training sessions, lack of personal protective equipment/simulation tools, an excessive amount of course material, and the factors of the trainings. These factors not only make it difficult to develop competencies but also limit the achievement of training objectives.

Conclusion

Security guards perform a complex set of tasks requiring a solid professional background and comprehensive training. During their training, they must learn not only how to use tactical tools, but also how to apply legal, psychological and communication skills. The study of the training system for security guards and the results of the research have outlined several areas for improvement and the need to develop and standardise training programmes.

Suggestions

If the guards did not organise their training exclusively themselves and if there were specific recommendations, the differences in training between the guards could be avoided. Furthermore, the continuous development of guards and equipment should be ensured. Improvements could be made by making at least four firearms training courses a year compulsory or by changing and modernising these courses. Skill levels must be constantly maintained or improved. Regular training days and training in groups of a maximum of 15-20 people could also increase efficiency (Szabó, 2014).

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Hornyacsek, Júlia – Kovács, Gergely

THE POTENTIAL OF VR AND METAVERS IN EDUCATION AND SCIENTIFIC RESEARCH.

In the business world and in a rapidly changing digital technology environment, using the latest digital solutions and technologies is key to staying competitive. The question is whether these revolutionary innovations should be applied to education and scientific research. Can we use these platforms without adequate digital competence and application skills, or are these digital processes more of a hindrance to education or research in such environments.

The Covid-19 epidemic has affected the daily lives of around 1.6 billion students in 192 countries, or 91% of the world's student population. This disruption has led to the emergence of online education as an important new platform. (At the same time, 29% of students do not have access to the online world.) In many ways, the digital divide is wider today than ever before. However, we have the opportunity to ensure that the integration of emerging technologies continues to accelerate and that online education becomes an integral part of education. We know that the new EU directives in education and research strongly support the use of the latest digital processes and platforms. Of course, EU trends are also reflected in national targets at home, and in many cases universities and research institutions are ahead of the EU average.

Extended realities (XR), virtual reality and augmented reality (VR and AR), are an emerging frontier in research. They represent a new 3D medium in which the physical constraints of the real world can be set aside. The commercial prospects of XR have led to major investments by some of the world's largest technology companies, including Facebook, which has changed its name to Meta. The next decade will see the emergence of a whole new, fundamentally spatial domain of information and interaction. The resulting changes in our lives and society will be wide-ranging and worth studying in their own right, but XR and the metaverse are not just a new topic to be explored, they are already a means of research and a way of dissemination. Like the printed word and the internet, this new medium of information exchange will go from being a curiosity, considered by many to be a novelty today, to becoming a ubiquitous tool in our future work.

How seriously should higher education take this metaverse if the tech giants are to take it seriously? Should teachers, staff and administrators in higher education and research follow suit?

The spread of the metaverse - a term for an environment that allows immersion in virtual reality, originally coined by Neal Stephenson in his 1992 dystopian cyberpunk classic Snow Crash - has been widely mocked by comedians, technology and political journalists, even ridiculed by the Icelandic government. But Microsoft has announced a $75 billion acquisition, motivated - at least in part - by a desire to gain a firmer foothold in the metaverse. Outside of the tech industry, giants like Disney, Nike and the NFL have also stepped in and are working hard to make sure they don't get left behind in this virtual reality space.

Last summer we tested the latest developed in Hungary VR platform (One with Nature Metavers) where it was shown in several cases that such a world can be so realistic for the user that instinctively several tried to put objects down on the "table" or leaned against it. In this space it is easy to deceive the senses, to feel that the virtual world is real.

The promise of the metaverse, if it gets anywhere in higher education, is less likely to be a fully virtual university, more likely to be a tool to take us further along a trajectory we are already following - technology as a tool for efficiency, or as a tool for community building and collaboration i.e. experiential learning. Unfortunately, the metaverse can reinforce existing problems of access and inequality. The question is, who will be left out of higher education if expensive VR headsets become a common expectation?

Universities should consider all technological innovations for our institutions and our students. In other words, the question higher education institutions should be asking themselves about the introduction of metavers is: how are our institutions using technology to fulfil our mission? How are we using new innovations to facilitate student collaboration, learning and community building? How does a new platform improve our ability to understand the world and collaborate with colleagues? At the same time, how do we address the inevitable inequalities?

Universities around the world are on the same starting line. They need to innovate and pioneer new approaches and tools to enable all kinds of university activities online. They need to develop their own distinct meta-perspective that is suitable for human interaction while supporting students' creativity and collaborative thinking.

It is already clear that the universities best equipped with digital infrastructure and competent human resources will be the new leaders - wherever they are.

Successful education needs the full support of communities and equal access to opportunities. Technological breakthroughs must benefit everyone. To do this, the private and public sectors must work together to create more effective learning opportunities and help strengthen global resilience to this and future epidemics.

Not surprisingly, interaction and communication in online learning is not so easy. Physical distance can create a sense of isolation and loneliness among learners and teachers. To counteract these feelings and encourage participants to interact, metavers allows instructors to create learning spaces where they can collaborate, learn together and socialise. Using their avatar, everyone can connect with each other, see each other, easily share files, interact with objects. These features encourage learners to connect with classmates and teachers, enhancing the learning experience.

The main technologies supporting the metaverse are Augmented Reality (AR) and Virtual Reality (VR). Specifically, users are equipped with headsets and/or glasses that allow them to immerse themselves in the virtual world. VR and AR allow learners to participate in simulations as if they were physically there. 3D illustrations can help them understand how a piece of machinery works or what a mathematical concept looks like in real life.

Academics need the time and space to play and explore, to be inspired by and get to grips with this technology. In 2022, XR research will be mostly closed-loop, with individual research groups or departments having a lab, but there is rarely any joint thinking between institutions about how to create an environment that meets the research they want today and need tomorrow.

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Msimang, Asante – Tandlich, Roman – Restás, Ágoston

THE ETHICAL DILEMMA IN OFF-LABEL USE OF COLCHICINE IN COVID-19 CASES

Introduction

Pandemics are on the increase due to globalization and the exploring and integration of the natural world into human lifestyle (Patel et al., 2015). Planning becomes important in mitigating these disasters. Amongst other things, mitigation and preparation should include strengthening health system infrastructure, setting systems that enable a rapid response to reports of an event and a proficient Incident Command system. In the wake of a disaster such as a pandemic there is often obscure prescriptions by doctors and irrational drug use by patients. This is as a result of the accompanying panic and false information. Off-label use of medicine takes centre stage during a pandemic in a race to find treatment and sometimes due to a lack of resources. During the Covid-19 pandemic, the repeated lockdown phases, closed borders (both on land and by sea) and slowed down administration, resulted in medicine shortages in healthcare centres One can conceptualise how off-label use would add an extra burden on the already scarce drug supply.

Before prescribing off-label use-medicines to patients', health professionals' need to: weigh the possible benefits of giving the drug vs not giving the drug and possibly having the patients' health detoriate with further disease complication – non-maleficence and beneficence. Patient autonomy also plays a role when the drug is dispensed over the counter – though pharmacist can provide information on the effects of a drug the patient has a right to still pursue drug purchase. Not to mention the potential law-suits practitioners face should a patient who was prescribed an off label use medicine experience adverse effects. The world health organisation (WHO), encourages rational use of medicines meaning that medication prescribed should1) be in line with patients' clinical needs 2) in an appropriate duration. In addition, and more specific to the matter at hand, the WHO requires that the pharma therapeutic treatment be "at the lowest cost to the patient and their community". It is unclear if this Is with reference to the actual monetary cost of the medicine or 'value' of a life – both are relevant. This paper aims to review the clinical studies on colchicine in Covid-19 patients as well as the possible ethical dilemma that would accompany off label use of colchicine in South Africa.

Keywords: Colchicine, Off-label use, COVID-19,Disaster Management, Ethics

Colchicine

Colchicine is an alkaloid with the chemical formula N-(5,6,7,9, tetrahydro-l,2,3,10, tetramethoxy-9 oxobenzo hep-tain-7-yl) (Ben-Chetrit & Levy, 1998). Colchicine is an anti-inflammatory drug and works by (1) decreasing macrophage expression of 1L-1B; (2) Decreasing the release of cytokines such as TNF-A; (3) Inhibiting the activity of leukocytes and further inhibiting the release of lytic enzymes, and reduces the endothelial expressions of selectins. It was only in 2009 that colchicine was approved as a standalone treatment of acute gout flares and familial Mediterranean fever. The drug was previously approved for use only in combination with other drugs(FDA).

Gout

Gout is a condition resulting from monosodium urate crystals deposits in articular and non-articular structures of the body. Hyperuricemia occurs when the blood uric levels are above 0.42 mmol/L. Treatment of hyperuricemia in the South African context includes uric lowering

agents such as Allopurinol and Probenecid. Gout attacks are caused by an immune response to the urate crystals. The gout attacks commonly occur in the first metatarsophalangeal joint but can also occur in the hand joint and can go to the upper limbs when the disease is poorly controlled. The prescriber's objective is to offer pain relief and termination of the gout attack, prophylaxis for gout attacks and serum uric acid lowering treatment. During a gout flare, the patient cannot use the affected area and experience tenderness upon the affected area. Polyarticular flares are often accompanied by fever and chills.

Table 1- Stages of Gout

Asymptomatic hyperuceamia Normally no signs or symptoms, acute gouty attack is possible during this stage. Crystals start to form in joints.	Acute gouty Acute gouty attacks (podagra) normally occur at one articular joint. The intense pain is accompanied by inflammation, tenderness, swelling and loss of function in affected joint.
Inter-critical gout This occurs after the subsidizing of an acute gout attack after colchicine/NSAID administration. However, if chronic treatment is not employed, more frequent and severe attacks occur.	Chronic tophaceous gout Tophi forms on bones as a result of a lack of treatment .The tophi causes joint destruction and bony erosions.

Figure 1: The stages of gout are shown to highlight the phase at which gout attacks are likely to occur and the end results of a lack of chromic treatment of the gout.

Drug treatment of acute gout attacks

Non-steroidal anti-inflammatory drugs (NSAIDs) are given in the first 3 days of initial drug treatment of Gout as gout attacks are precipitated then. Chronic tophaceous gout and hyperuricemia is indicated by repeated acute gout attacks, the presence of tophi, renal impairment or urinary tract stones. NSAIDs are contraindicated in patients with hypertension, renal impairment, cardiac failure and angina pectoris as they have a tendency to delay renal perfusion. Impaired renal perfusion causes sodium retention and in the previously mentioned conditions patients become at higher risk of high blood pressure, stroke and heart attacks and lead to heart failure. In cases where NSAID use is contraindicated due to an underlying condition, peptic ulcer disease or known NSAID hypersensitivity, Colchicine is used. Corticosteroids are also an option in treating an acute gout attack. According to the South African Medical formulary, the maximum adult dose for colchicine should be 2.5mg over 24 hours is and should not exceed 6mg over four days. In the elderly a dose of 3mg should be spread over 4 days and in cases of renal impairment (GFR < 10ml/minute) colchicine should be avoided. Prolonged prophylactic therapy using colchicine is not recommended. Colchicine has a narrow therapeutic window.

Ethical dilemma in off-label use of Colchicine in South Africa

A 2017 research paper by an American university scholars stated that rheumatology is an ‘underfunded’ speciality in Africa having a stated 1;35 000 ratio of patients to rheumatologist. This negatively affects patients as there is sometimes misdiagnosis and thus delay in treatment for rheumatological disorders such as Gout. This suggests that with the available stats there are still undiagnosed gout suffers going without treatment.

Pharmacies in public clinics and hospitals are provided drugs from their respective pharmacy depots. If a pharmacy has a surplus drugs on-hand it is then distributed to nearby clinics that may be experiencing a shortage at the time. The South African government awards tenders for drug supply and orders according to drug dispensing trends,amongst other things. With that said Colchicine would most likely be given on a trend basis of Colchicine prescriptions. The added off-label prescription could result in a shortage of colchicine due the unaccounted and new drug dispensing patterns. In 2009 South Africa saw a serious shortage of oral Dinoprostone (Trade name Prostin E, Pfizer) which is the only oral dosage form available in South Africa. Dinoprostone is used to induce labour and registered with the MCC for this purpose. In South Africa a common (and off-label) use of the drug includes the emergency use in the maintenance of ductal patency in neonates. Without treatment with Dinoprostone the neonates become critically ill and can die of heart failure or pulmonary hypertension. Pfizer contacted obstetrics/gynaecologists on the foreseeable shortage, however the same message was not relayed to paediatric cardiologist. The result was an obviously a disastrous lack of life saving drugs for paediatric patients. Pfizer claimed that they are not legally allowed to discuss off label use, hence the lack of communication with cardiologist specialists.

Should a case of a colchicine shortage occur, medical practitioners would first need to weight which patient would be more deserving of colchicine treatment, the COVID-19 patient or a patient experiencing a gout attack? The COVID-19 burden could possibly be reduced by the new vaccine roll out in South Africa. Even through the government’s efforts by making the vaccine available to citizens, patients cannot be forced to accept the vaccination. Eminently, patients cannot be punished for choosing not to receive the vaccine by being disqualified for treatment in case they do contract the virus. Secondly the question arises of whether it would be ethical to prescribe colchicine to a COVID-19 patient based on the limited efficacy and

safety research and studies, thirdly is it ethical for a medical practitioner to go against the NEMLC recommendations to only use the drug under clinical study settings. The principle of beneficence and the principle of non-maleficence in this case are almost in discord. On one hand the medical practitioner should not withhold treatment that could potentially assist a patient, however, with 'insufficient' evidence of drug affect, the practitioner needs to avoid harming the patient at all costs. Though off-label use prescriptions are not illegal, lawsuits can ensue if the patient experiences adverse effects.

Higher costs of medicines are also associated with off label drug use. Since it is not a proven treatment, medical aid schemes are mostly reluctant to pay for such cases. Added to that low drug reservoirs due to the sudden increase of colchicine dispensing due to off label use. This opens up opportunity for the black market trade of sub-standard Colchicine.

Objective

This study seeks to examine the potential ethical dilemma's linked to off-label use, particularly in the context of Colchicine administration in COVID-19 patients. Paired with research conclusion from Corona clinical trials.

Method

I performed a search for publicly available resources for trial studies post March 2020. From these I identified studies on patients that had tested positive for the SARS virus and been administered Colchicine and/or alternate treatment.

Findings/results

Colchicine became a point of research due to its anti-inflammatory properties, it's wide availability, a known safety profile and low immunosuppressant effects. Preliminary studies have shown that Colchicine administered to Covid-19 patients (1) reduced mortality and (2) reduced overall chances of the disease becoming severe to a point whereby hospitalisation into an intensive care unit is needed (Aggarwal et al.,2021). The positive results from the six studies were not statistically significant. However, the review paper concluded that further investigation should be considered to determine the drug's efficacy. In a separate case, a 46-year-old Covid-19 patient was administered Colchicine at 0.5mg 3 times a day (Anderson et al.,2021). The patient's chest pains resolved, and the need for oxygen reduced as his dyspnoea improved. Though it was just one patient, the case report strongly motivated further research into Colchicine's role in reducing myocardial, and lung inflammatory responses after the patient improved just 48 hours after receiving treatment.Parra-Medina et al.(2021) recommended using Colchicine in the pandemic because the possible benefits exceeded the harm the drug could do. A study proved that the drug could reduce the chances of cardiovascular incidents in patients that suffered from coronary artery diseases (Xia, Yang, & Qian, 2021).The COLCORONA studies, a randomized placebo-controlled trial, came underway in March 0f 2020 and were concluded in December of 2020. Early treatment on the onset of COVID-19 only slightly reduced the chances of hospitalization. Study participants receiving Colchicine only showed modest effects the study also noted gastrointestinal adverse events. The PRINCIPLE study, with participants numbers much smaller than the COLCORONA study noted no benefit attributed to the use of colchicine and soon halted studies due to the lack of significant positive outcomes. Thus, the United States COVID-19 treatment Guidelines Panel discouraged the use of colchicine in non-hospitalized patients outside of a clinical study setting. The Panel also recommended that hospitalized COVID-19 patients should not be given Colchicine.

The South African National Essential Medicine list sub-committee therapeutic guidelines sub-committee (NEMLC) made a strong recommendation against Colchicine use as Covid-19 treatment unless it's in an approved clinical study setting. The rationale behind the sub-committee's decision was that the safety of the drug and risk of serious adverse effects was uncertain and there was insufficient evidence of relevant benefits. Meta analysis studies post June 2021 echoed similar results: there was little to no benefit of Colchicine in hospitalized patients with moderate- severe form of COVID-19. Similarly in non-hospitalized patients who experienced moderate or no symptoms the administration of Colchicine showed slight effectiveness in decreasing the chances of death and hospitalization.

Conclusion/Suggestions

After rigorous studies, it has been widely accepted that Colchicine is not effective for COVID-19. This can be taken as a learning curve. Although the drug has been quoted as 'accessible', 'widely available', and 'inexpensive', this is relative as context plays a big role, particularly in the disaster management capacity of South Africa. The decision-making model should provide an approach that takes into consideration the social, political and ethical factors.

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Szalkai, István

TESTING OF AN ENERGY PRODUCTION PLANT WITH DRONE DEVICES

Objective

We use drones for many purposes. It can be useful in the detection [1] [2], prevention [3] [4] and also in the intervention [5].The main direction of the research used is the development and development of a group of sensors that cannot be obtained commercially, and which can be connected to a drone and are suitable for transmitting experienced, measured data, connected to an appropriate data transmission system. I am looking for scientifically sound solutions for how drones can be used to measure technical data related to the operation of power generation plants, and how the measuring devices built on the developed drone platform can be integrated into the measuring devices that monitor the operation of these plants.

Development in two directions:

1. Designing drone applications for the transport of sensors

2. Development of sensors from commercially available base units for drone-guided measurements

Research and development project

In most cases, in the case of the examinations necessary for the evaluation of the official operating permits necessary for the operation of energy production plants, as well as in the technical supervision of industrial equipment, in most cases, in difficult and dangerous working conditions, highly experienced professionals must work in industrial areas or on operating equipment [6].

The data of direct manually directed measurements and visual checks will be processed, documented and analyzed in further office work after an on-site inspection. These inspection and inspection works are often preceded by significant scaffolding and crane preparation work. This is all time-consuming tasks and involves significant costs. Recognizing a truly measurable market demand, I included in my research tasks the development of a drone sensor system that would be unique and novel both in the life of the companies operating energy production plants and in the life of the companies that produce the measuring device [7].

The measuring device or group of measuring devices installed on the drone device to be created as a result of the development process would significantly reduce the duration of operational test work and measurements, increase the accuracy of the evaluation, simplify the conduct of repeated tests, and increase compliance with the ever-tightening occupational safety and health regulations as a very important aspect

If the technical development objectives were met, more cost-effective tools would be available to the operators of dangerous plants and to their investors and contractors when they are established

Testing of an energy production plant with drone devices

The technology, which is gaining ground in civilian life, has been transferred from the military industry and the practice of law enforcement forces to the civilian sphere, and the planned pilot application should also set the following milestones, so the following processes must be carried out in the technical design of drones and measuring sensors [8]:

Drone device from the side:

- in the course of development, the configuration of the unique drone structure in the following steps: selection of a drone type (taking into account load-bearing capability, flight controller, ground control station, protection and high-resolution occasional hyperspectral camera);
- the compilation of one or two experimental devices;
- the integration of the sensor and the drone platform, possibly the use of permanent fitting solutions, including docks;
- the development of stabilizing and fastening devices for work;
- the design of manipulator arms adapted for measurements;
- in the case of autonomous operation, the recording of the coordinates of the predetermined measuring point;
- calibration of a drone.

Sensor from the side

- determine the most appropriate measurement procedure or procedures;
- the selection of a sensor, taking into account the accuracy required for the measurement, the range and tolerance of the measurement, the speed of measurement, the method and the weight and possibly the shape of the measuring sensor;
- the fixability of a measuring device, as described on the drone side;
- how measurement results are transmitted or the collection of measurement results.

Selection of available drone tools

Testing and applicability of the drone and the sensor attached to it;
In accordance with the objective of the research, R&D&I results in the creation of a sensor group capable of performing technical measurements that are not yet available in trade. It can be connected by a drone and capable of transmitting experienced and measured data using an appropriate data transmission system.

Users can save significant costs, as well as avoid work processes that are also harmful to health;
Drone technology should be divided into at least three industrial, operational user circles, where you can select drone technology from a wide range of user groups within the areas:
Drone equipment for military and disaster management purposes, including police and border protection tasks.

Drone devices developed for the performance of service-like tasks: mapping, transport, visual observation of large-scale industrial equipment, utility systems.
Agricultural and forestry drones (land control, tools developed for the monitoring of wild and farm animals). These good solutions are already appearing in the education [8]. Among others [9], this is also a significant challenge.

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Parrag, Tamás – Gál, Henrik Norbert –Kátai-Urbán, Lajos

MICROPLASTICS: WHAT HARM CAN THEY DO, AND HOW TO PREVENT THEM?

Abstract

In this paper, we're about to explain how microplastics damage living organs, as human ingestion and seafood water risks grows bigger and bigger as time past, and how humanity tries to act to ensure the downfall of microplastic pollution. Society has become increasingly reliant on plastics since commercial production began, which resulted in a massive microplastic contamination regarding our environment. Those microplastics could cause many illness, especially regarding ingesion, not to mention its negative effect on the flora and fauna as well

Keywords: human health, microplastics, chemical reactions

Introduction

Nowadays more and more scientists are working on the problems concerning microplastics, and they work has its results already. For example, chemists at Cornell University have discovered a way to use light and oxygen to upcycle polystyrene—a type of plastic found in many common items—into benzoic acid, a product stocked in undergraduate and high school chemistry labs and also used in fragrances, food preservatives, and other ubiquitous products.

Tarleton State University researchers have demonstrated that food-grade plant extracts, especially those from okra, have the power to remove microplastics from wastewater. Dr. Srinivasan, the Endowed Munson Research Professor of Chemistry at the Texas university, and her team have been investigating more healthy alternatives to the commonly used flocculant, polyacrylamide.

It is imperative that we talk about the harmful effects of microplastics, especially those which are find its way into our body. More and more research results shows us that we must tread carefully on this path, because it has many damaging factors concerning the human body.

Objective

The presentation is a short summarization regarding the harmful effects of microplastics. It is meant to discuss the possibility of solutions concerning the matter on topic, the current scientific results, and the conncecting aspects of it.

Methods

At the Cornell University, they used rather empiric methods, for the light experiment they used plastic items, and they have found that three items—a white coffee cup lid, Styrofoam and a clear lid—degraded efficiently [1].

As for the study regarding microplastics in human lungs; samples were taken from tissue removed from 13 patients undergoing surgery and microplastics were found in 11 cases [2].

Results

The results proved that micropalstic can be found almost every part of the human body where they can travel through blood flow, and that not exclude animals as well [4]. Result are proved that these microplastic particles are around us almost everywhere, from the highest mountains to the deepest oceans. The main problem is not unconditionally are the microplastics, as the harmful materials which get attached to it, and find its way to the human body.

Conclusions

Conclusions are fairly simple concerning the matter at hand, we must support researchers any way possible to encourage them to continue their work for the best interest of humanity. Furthermore, we must continue the investigation for the exact effect of microplastics concerning human body, and even more, our environment. As more and more scientifically empowered results came into surface, we will be able to determine the exact projects we need to support to prevent the negative effect of microplastics prevail. The numbers speak for themselves: Today, between 19 and 23 million metric tons of plastic litter per year end up in the waters of the world [5] – that's two truckloads per minute, which compells us to make our move as soon as possible. The air, the water, and the surface both needs immediate help, as microplastics now can be found even in the arctic ice [6] [7], but there are treaties and agreements which could help the situation, which proves that the world is not completely negligent toward the situation.

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Németh, Gábor – Kakócz, Krisztián – Vedó, Attila – Balla, József – Vájlok, László

INNOVATION AT HUNGARY'S EXTERNAL BORDERS

Keywords: border security, border control, development, artificial intelligence

The primary objective the establishment and maintenance of the Schengen, the area of freedom, security, and justice, is to allow the free movement of persons, vehicles and goods without stopping them at the common borders of the participating Member States. While at the same time very important harmonizing and strengthening the surveillance and control of the external borders of the area. The conditions for entry of third-country nationals are checked, inter alia, on the basis of a unified rules. Hungary has been a full member of the Schengen area since 21 December 2007, and our country has been fully devoted to the secure our 1103 km external borders. To develop a reliable border control system using modern technologies is essential.

For technical development we can use national and EU sources. The targeted use of community solidarity funds and resources also provides support for the creation and maintenance of a modern border security system. The EU resources are for the development of law enforcement cooperation, border protection and migration management. These are linked to border control at the Schengen external borders and to guaranteeing the security of the Schengen area. The resources are significant. According to the plans, nearly 70 projects are expected in the Borders and Visa Facility in the next few years, and the potential source is about HUF 50 billion.

The main aim of these projects is to implement and maintain the Integrated Border Management. including border control. Cooperation between Member States, cooperation with third countries supports the effectiveness of Integrated Border Management. The pillar of the success and it is very important part of the work is the application of modern technologies like using artificial intelligence in border control.

In the implementation process of these modern technologies include:

- to create of a research and development system, which can effectively support the future implementation;
- promoting interdependent developments, networking and system integration;
- strengthening the use of biometrics;
- and developing Artificial Intelligence in this field.

The future of border policing is determined by the quartet of automation, biometrics, robotics, and artificial intelligence. Using this quartet, we can ensure the quick but reliable and secure border control system.

Supporting the development of the border police service on a scientific approach also is a priority which include:

- Assessment of research and development needs;
- Defining a research and development strategy;
- Tender monitoring and search for potential international and national partners;
- Market research and assessment of international experience, use the knowledge of our partners;
- Preparation of studies, share our own experience;

- Organization of professional and scientific conferences focusing on Artificial Intelligence in border security.

Development of an automatic control system at land border crossing points. implementation of professional „smart" border crossing points. and an online passenger warning system based on the support of artificial intelligence are not an utopia.

Three directions of research and development that are already based on the foundations of the previously mentioned (automation, biometrics, robotics and artificial intelligence), Without machine vision and image analysis, these innovations can not be developed.

Requirements in the future in border control:

- optimization of human resource management (human presence can be reduced in the short term, and in the long run the human intervention can be completely eliminated);
- risk-assesment based implementation of selective and differentiated passenger control;
- reducing the time needed to carry out an inspection; reducing passenger waiting times; but at the same time increase security.

Operating the smart crossing points need administrative regulation. All of the procedures, movement controlled by Artificial Intelligence working on the basis of biometric data, image analysis, these are ensuring the order at border crossing points, flow of passengers, increasing passenger safety, and crossing point security; The operators only supervise the procedures and interfere if it is really needed e.g. arrest someone.

The technology also can support the work when temporarily the border control re-established at internal borders, like it was in the time of pandemic. A risk-assessment based filtering technology supports the effective control. The technology can also be used during in-depth inspections when we intend to filter illegal migration and human trafficking on the motorways.

The development of technology is continuous, and at the same time the development of legal regulations at national and international level is taking place. All conditions are available for the implementation of the modern technology. The future is with us right now.

Németh, Gábor – Kakócz, Krisztián – Vedó, Attila – Balla, József – Vájlok, László

VISEGRÁD 4 BORDER SECURITY RELATED COOPERATION „JOINT EFFORTS" EXERCISES

Introduction

The countries of the Visegrad 4 cooperation are facing with same security challenges. The organized crimes, trafficking of human beings, illegal migration, drug, and weapon smuggling, etc. posing serious threat to all EU member states, including Poland, Czech Republic, Slovakia and Hungary as member states of Visegrád 4 cooperation. The crimes do not stop at state borders. International cooperation is needed to take effective action against this cross border organized crime activity. It is becoming more and more common for Hungarian police officers to serve abroad under the EU or other international cooperation and also foreign police officers to serve in Hungary. For this reason, Hungary initiated to organize a joint training and a Command Post Exercise for the border security agencies of the Visegrád 4 countries in 2017. Polish Border Guard, Czech, Slovak, Hungarian Police were involved. All of the relevant agencies welcomed the opportunity and fully supported the event. It was a Virtual exercise, no boots on the ground. The focus was on Practicing the operational planning activity. Organize and manage wide scale of border security and pubic security operations.
Keywords: border security, training, coordination, cooperation

Objective

The overall objective of Command Post Exercise to enhance the multinational operational cooperation within the Visegrád 4 law enforcement agencies, in order to manage a mass migration crisis. The EU Common Security and Defence Policy (EU CSDP)[12] legal and operational framework was used in the time of exercise. Exercise location was the territory of a fictional country, called Republic of Threshold land.

Security Related Cooperation

According to the scenario, Threshold land is a war-torn country Rule of law is not functioning in its territory. There is High rate of corruption. Thousands of migrants leaving the region. This chaotic security situation poses a serious threat to the Union. Therefore, the EU launched a Police Mission in 2010 (EU Mission in Threshold land - EUMITH) to support the stabilization process. The Visegrád 4 countries offered a battalion-sized police unit to the mission. Mission Head Quarters located in Csopak, where one of the training bases of Hungarian Police Education and Training Centre located. The whole event took place at this compound.

A fictional country, but real maps were used during the exercise. Csopak located in Veszprém county near the lake Balaton and the territory of the county was the fictional country. The boundaries of Veszprém - Somogy and Veszprém - Fejér counties were designated as the Republic of Threshold land's state borders.

Altogether 56 officers coming from the four countries and 3 guest officers from Germany participated in the exercise as a staff of the Visegrád 4 Battalion. Most of the 39 acted as the battalion commanders, company commanders, platoon commanders, and other staff members. The remaining 20 officers as the member of the exercise control group were responsible for to create different inputs, incidents which the participants had to respond to. In the time of the

[12] https://www.eeas.europa.eu/eeas/eu-security-defence-and-crisis-response_en?s=287

exercise, we used military terminology because there is no unified international terminology in law enforcement e.g. to name the different units. And during the exercise, a virtual international battalion had to be commanded. The battalion consisted of four national companies from Poland, Czech Republic, Slovakia and from Hungary.

Joint training

During the first three days, there was a joint training. Participants practiced the command work, every single step of it. How they can plan, organize, and manage law enforcement operations. They learned the basic principles of border and public security related information gathering. Collecting open and secret information related to organized crime that affects border security. How to analyse, evaluate the information obtained. Then based on this evaluation how they can plan and organize the operation. They also learned how to manage law enforcement operations. Also the training was a good opportunity for team building: the law enforcement officers from different countries who had never worked together before had the chance to get to know each other and familiarize themselves with their future tasks and challenges.

After completing the training activity, a 54-hours day and night exercise began, where participants had to respond to various events. They had to operate the battalion HQ and four companies HQ. They had to organize the border control, border surveillance activity in the territory of Threshold land and to deal with the challenges which were indicated by the exercise control. Such as mass migration or crowed and riot control activity at the border. Cooperation and coordination were essential between the national elements to manage the different challenges. During the Command Post Exercise, the Exercise Control Unit and the Situation Centre created almost 100 different incidents to which the battalion HQ staff had to make the appropriate response. The battalion commander and his staff needed to analyse all information coming from the Exercise Control and from the subordinate units. They had to plan, organize and manage all border security and public order and security operations conducted by the "virtual battalion". The main aim was to enhance the operational planning capacity on multinational level.

Some of the major incidents the participants had to handle:

- A small boat discharged 200 illegal migrants in a harbour near the border. Three of the migrants fell into the water. The task was to plan, organize and manage the search and rescue operation on the shore and on the water, at the same time manage the collection and registration of a large numbers of migrants as well.

- Later, information was received about a couple of hundred migrants gathering at the other side of the border, trying to enter by force. The local police tried but was not able to prevent the illegal crossing (in spite of a high number of casualties among the migrants). The task was to plan, organize and manage the CRC activity and rescue operation.

- In another case, information was received about violent local extremist groups gathering near a temporary refugee camp, trying to enter by force to provoke a clash with its residents. The residents of the camp were ready to fight back. The task was to plan, organize and manage CRC activity. Handling the situations and giving proper responses to different incidents required high quality teamwork, coordination, cooperation and collaboration between the different elements of HQ level. The various HQ elements analysed the received information, organized and managed specific operations, had to make the appropriate response (e.g. to send reinforcements,

special units, organize and manage an evacuation, organize and manage logistical support, maintain communication with local and international stakeholders, etc.).

Result

The participants found the common voice very quickly. It was a great opportunity to learn from each other, share the knowledge, enhance the interoperability. The proper information flow between the HQ and Operation Centre and between the HQ and tactical level was also crucial.

After finishing the event, everyone from the participating services wre very satisfied with the outcomes and agreed that this kind of cooperation must be continued. Also, we agreed that the Polish police must be involved in this kind of activity in the future. And maybe some small units should be deployed on the ground and conduct operations together.

Next step in the cooperation is the „Visegrád 4 Joint Efforts 2022" exercise in Poland organised in June of this year. A long-term aim is to create a core team from the participating officers coming from the four countries and they can be deployed at any time if it is needed. We have to broaden cooperation with other partners (national, international, e.g. Frontex). In the future we also should organize the event on annual bases, rotating the host countries.

Végső, Eszter – Dobor, József

PRACTICAL APPLICATION AND DEMONSTRATION OF COBALT-60 ISOTOPE BASED ON DISASTER MANAGEMENT CONSIDERATION

Abstract

Radioactive isotopes have been used by mankind for more than 100 years in industry and health care. Their role is now indispensable. Their dangers must of course be known, but they can be used optimally under the right criteria. In this publication, the authors describe the dangers of the radioactive isotope cobalt-60 and the importance of its use.

Keywords: Co-60 radioactive isotope

Introduction

An isotope is a variant of a chemical element in which the number of protons is the same but the number of neutrons is different. There are several variants of elements with different atomic weights, these are radioactive isotopes. There are many isotopes per element, so we distinguish them by their designation, for example: ^{59}CO, ^{58}CO. Radioactive isotopes have lower energy levels and are therefore radiation-hazardous. Cobalt-60 is the most stable radioactive isotope of the 28 isotopes of cobalt. Based on its physical properties, it is a hard, grayish-blue metal with a half-life of 5.26 years [2, 3].

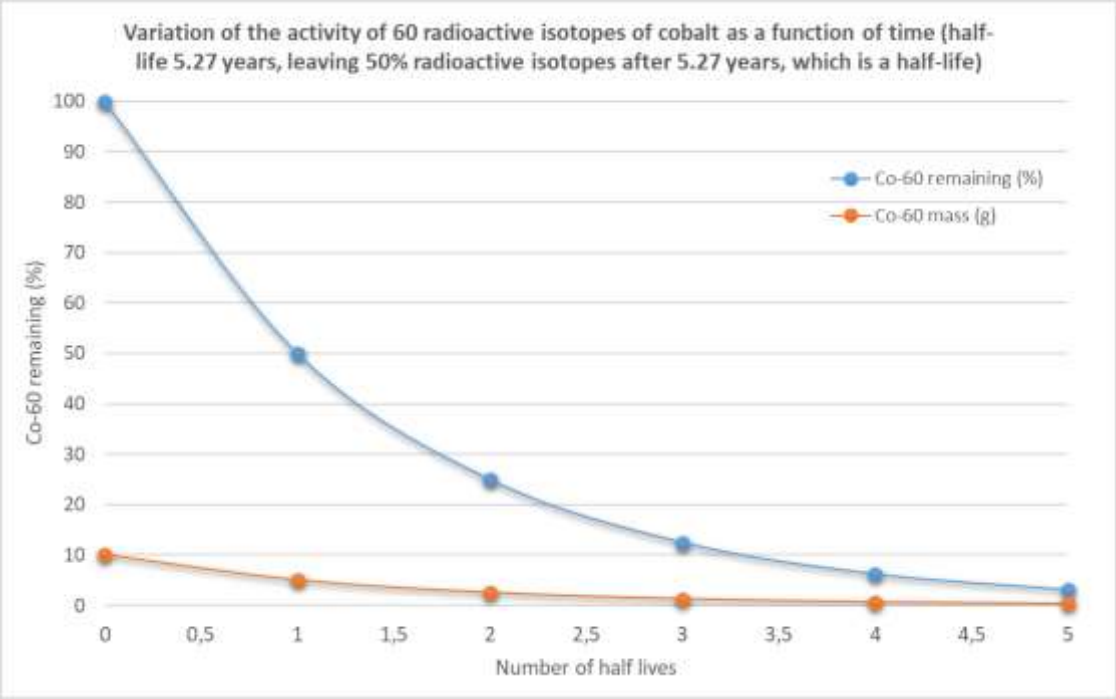

Figure 1 - Variation of the activity of 60 radioactive isotopes of cobalt as a function of time.

Usage

Because of to its radioactivity, it is used in medicine for radiotherapy. It emits two gamma rays with energies of 1.17 and 1.33 MeV. The diameter of the radiation source is 2 cm, the edge is slightly smeared, this is called the radiation halftone. Complicating radiation protection is the fact that it tends to form fine dust. This isotope can be used for 5 years, but even after that it is highly radioactive.

Findings

It is favored in industry because it is easy to produce. Its industrial use is therefore very diverse. It is used for industrial radiography, for example to check the integrity of welds, for density measurement, for example to measure the density of concrete, to check the level of tanks. It is used to sterilize medical devices and waste because it can kill bacteria and microorganisms. Instead of heat treatment, it is also used to gamma-sterilize foods. [1, 3]

Conclusion

Cobalt-60 is a stable radioactive isotope that has been used by mankind for decades in medicine and industry. This is due to the fact that it is one of the most stable isotopes and easy to produce. It is used in medicine for the radiotherapy treatment of cancer patients, while it has a wide range of uses in the industry. However, this isotope can only be used for five years, but its strong radiation remains after that. It is important that you always follow the appropriate safety precautions when using it to protect yourself.

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Raffai, Zsófia – Horváth, Hermina

SAFETY ASPECTS OF PUBLIC SAFETY PLANNING FOR THE TRANSPORT OF DANGEROUS GOODS

Abstract

Today, the volume of freight transport has increased significantly, both domestically and internationally. The transport and storage of an increasing number of materials that pose extreme dangers has become increasingly important. As a consequence, plants and establishments dealing with such materials are required to comply with national and international regulations and standards. These guidelines will not only help to protect the organisation against various threats, such as a terrorist or sabotage attack, but will also contribute to efforts to improve the security and resilience of the transport sector.

Keywords: security, public safety plan, dangerous goods presenting a high risk to public safety

Introduction

All organisations that carry out activities involving dangerous goods must define their own rules on the measures they will take to ensure that the requirements are met. For any establishment or undertaking involved in the transport of dangerous goods, safety must be an integral part of its quality assurance and management system. Terrorism and illegal migration, which threaten activities involving dangerous goods and pose a high risk to public security, are a cross-border problem and I therefore consider it necessary to analyse this issue. I will explore the topic from a perspective that reveals the current problems and challenges of our changing world in relation to the transport of dangerous goods by road. In my choice of topic, I have tried to choose one which is less researched, which may be of interest to people who are not directly involved in dangerous goods, and the topicality of the subject under study has also played an important role. I will focus on an aspect of the subject of my research which shows that safety can be maintained by various preventive and protective means. In turn, risk analysis of the threat factors can greatly increase the level of preparedness. It is on the basis of these factors that I have chosen this topic.

Objective

The aim of my research was to present something new on this topic to those involved in the transport of dangerous goods and to those interested in the subject. I am looking for answers to the questions I have raised on the subject of whether the transport of these substances is properly regulated, whether stricter regulation is needed and whether the public should be made more aware of the risks of dangerous goods activities, which pose a high risk to public safety. My aim is to use various research methods to find answers to the aforementioned hypotheses and to obtain more relevant information on the documents and organisations that regulate the transport and storage of dangerous goods posing a high risk to public safety.

Method

I will analyse the international and national legislation on the subject and illustrate the potential risks through case studies. I use a flowchart to analyse the different points that a safety adviser employed by an establishment must go through to determine whether the establishment is covered by Chapter 1.10 of the ADR Code. Finally, I will use a SWOT analysis to identify the strengths, weaknesses, opportunities and threats of the subject of my research.

Findings

The public security plan is prepared by the security adviser employed by the establishment, based on the general situation of the establishment. It is important that the public safety plan meets both national and international legal requirements and professional standards. The basic objective of the public safety plan is to identify risks arising from the activities of the establishment that could lead to serious accidents that could endanger the surrounding residential and community areas, other establishments outside the boundaries of the establishment. Great emphasis must be placed on identifying and assessing the safety risks arising from the activities of the establishment, and on taking and implementing the necessary protective measures. Particular attention must be paid to training and further training in order to control the risks. Knowledge of the subject is important not only for those who carry out activities involving these substances on a daily basis, but also for those who live near plants, routes or rest areas where such activities take place. Particular attention should be paid to public safety planning for individuals who handle radioactive materials, since even small quantities of these materials can be misused in a terrorist attack.

Conclusion

In summary, my research has answered my assumptions in the introduction that better information to the public about activities involving hazardous substances that pose a high risk to public safety is necessary. Knowledge of the subject is important not only for those who carry out activities involving these substances on a daily basis, but also for those who live near plants, routes or recreational areas where such activities take place. Particular attention should be paid to public safety planning for individuals who handle radioactive materials, as even small quantities of these materials can be misused in a terrorist attack.

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Végső, Alexandra – Horváth, Hermina

RADIOACTIVE WASTE MANAGEMENT AND STORAGE IN HUNGARY

Abstract

Nowadays and in the future the accumulation of radioactive substances is a significant burden on society. The management, transport and storage of radioactive materials requires constant supervision and control. From the end of the twentieth century, there was an increase in the use of nuclear activities, which were used for various purposes. Nuclear activities were first used for military purposes. Subsequently, nuclear activities were used for Peaceful Uses of nuclear energy, for industrial, medical and research purposes. Regardless of the different purposes, nuclear activity will in any case result in radioactive waste. The number one safety concern in the storage of radioactive waste is that it does not endanger human life and health, the natural environment and values today and in the future.
Keywords: radioactive waste, radioactive storage, transportation, control, ADR

Introduction

Substances containing radioactivity and unsuitable for other uses in addition, those whose user or holder does not wish to recycle them later are called radioactive waste [1] [2]. The Nuclear Waste Policy Act says the government carries out the disposal of radioactive waste in Hungary [3]. The design of radioactive waste storage facilities should ensure the safety of workers, the public and the environment. In the course of planning, this means the first and most important aspect. In order to prevent the appropriate the radioactive substances in facilities, continuous checks are needed. Operators of installations must ensure the training and preparation of personnel which may be modified by the size of the installation, the activities carried out there, the radioactive stockpile and the associated hazards. The operator is also responsible for ensuring that the personnel understand and comply with the safety rules and prepare them to respond to various emergencies and accidents. The content requirements of the emergency plan are as follows identification and response of personnel to accidents and emergencies, establishment of responsibilities, take measures provision of equipment for the protection of workers [3].

The design and operation of radioactive waste storage facilities shall ensure the radiation protection of workers and the general public. It is necessary to adhere to the principles of radiation protection, the purpose of which is to avoid deterministic effects, to keep the probability of occurrence of stochastic effects as low as possible. Thus, the following three principles must be adhered to: justification, optimization and limitation. The essence of the principle of justification is that an activity involving radiation exposure can only be carried out if the social benefit of the activity is greater than the harmful consequences. The principle of optimization is that protection is designed in such a way that the additional dose load for exposed persons is as low as reasonably achievable and therefore as low as possible. The essence of the principle of restriction is that certain barriers can not in any way exceed. For example, radioactive materials cannot be intentionally added to food, feed, cosmetics and toys furthermore, it is forbidden to employ younger than 16 years of work that would be exposed to radiation [3].

Methods

In order to achieve the research goals, the authors reviewed the domestic and international literature on the topic. International experts have also been consulted on the subject. The main direction of the research was the transport, storage and disaster prevention control of radioactive waste in Hungary.

Results

During storage the radioactive waste can be characterized by their properties. Radioactive waste may be characterised by physical, chemical, pathogenic properties, half-life, activity concentration, stock and type of radionuclide [4]. The results of this are documented in an inventory Journal. Radioactive waste can be classified into several classes, there is no integrated international rule for this. Radioactive wastes may be solid, biological, liquid and non-flammable, liquid and flammable and airborne, based on their state of state. Radioactive waste can be low, medium and high activity based on heat development. In the disposal and storage of high – level radioactive waste, it is important that the consideration of heat generation is not negligible. Radioactive wastes can be low – activity radioactive waste, medium – activity radioactive waste and high – activity radioactive waste. Based on the half-lives of radionuclides found in radioactive waste, they can be short – lived radioactive waste, medium – lived radioactive waste and long – lived radioactive waste [4].

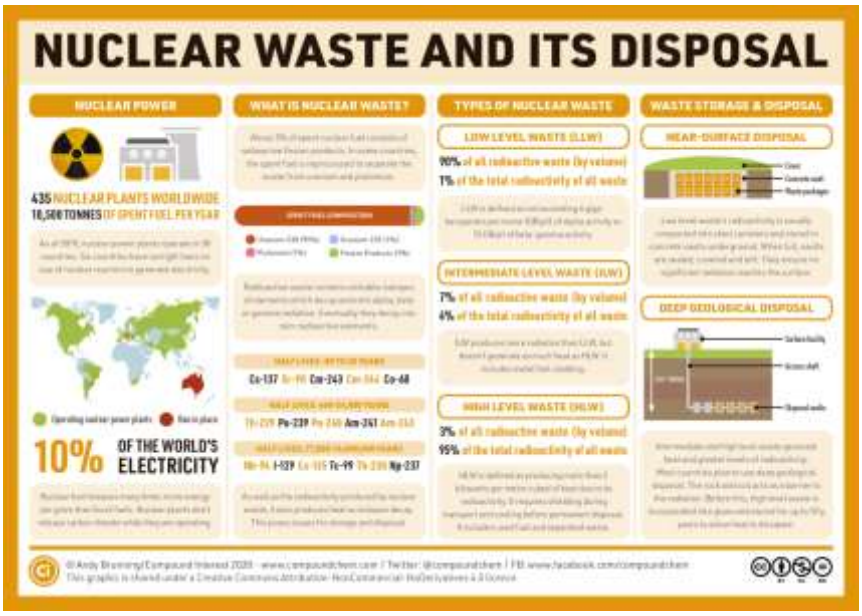

Figure 1- Nuclear waste and its disposal. Source: [5].

One part of radioactive waste management is waste processing. The following sub – processes form the entire processing process. The first step is to collect waste, this is followed by preliminary rating and temporary storage then transporting waste, waste processing which may vary depending on the state and class of waste transport and temporary storage of processed waste, and finally the final disposal of waste. In the waste processing of solid radioactive waste, the following process takes place: compaction and pressing, incineration, fixation. In the process of waste processing of liquid radioactive waste, there are a lot of volume reduction options, which include the evaporation, combustion, drainage, filtering and ion exchange of radioactive components. Collective feature of the processes listed above is that the volume of radioactive material decreases. In the process, the volume reduction is followed by

solidification. Solidify materials by cementing and bitumening. The process of consolidation is clearly the increase in the volume of the substance, which will be less economical in placement however, it is possible to avoid the fact that radioactive isotopes in the waste are avoided in the environment. For medium to high – activity wastes, vitrification can be used during solidification, which is a more economical process. During the vitrification process, the solid waste is mixed into melted glass, which is more captured by radioactive contamination. It is important to mention that the structure of the glass is resistant to the heat development of high - activity waste [6].

Radioactive waste in the Earth 99% low and medium activity radioactive waste, the final disposal of which is a task of considerable cost. There are two types of containers: near – surface and underground waste containers. The near – surface waste containers are 15 – 30 meters deep. The underground waste containers are at least 300 meters deep. Waste containers are found in many places around the World. In Europe the two largest waste containers are located in France and England. Located in Hungary the Püspökszilágy Radioactive Waste Treatment and Disposal Facility which suitable for the storage of low and intermediate level radioactive waste. Also located in Hungary the Bátaapáti National Radioactive Waste Repository which suitable for the storage of low and intermediate level radioactive waste from the NPP. Furthermore, located in Paks the Spent Fuel Interim Storage Facility, which suitable for the spent nuclear fuel assemblies. Respectively in West Mecsek the Investigation area for the deep - geological disposal facility which suitable for the high level radioactive waste and spent nuclear fuel [7].

Ministry of the Interior National Directorate General for Disaster Management, Department of dangerous goods deals with the control of the transport of dangerous goods by road like radioactive waste transportation too. It also manages the control and sanctioning of the transport of dangerous goods and the official tasks related to the investigation of accidents [8][9].

Conclusion

The storage and transport of radioactive materials and waste in Hungary is based on appropriate legal bases and is controlled by disaster management. Shipments of radioactive waste are also subject to the rules of the relevant international legal bases, so compliance with the rules applied by disaster management is appropriate and legitimate. The establishment of the high-level radioactive waste repository planned in the Western Mecsek Mountains will have a major impact on the transport of radioactive waste in Hungary. therefore, the role of disaster management will also increase. It is therefore important that they receive appropriate training to carry out the inspections properly.

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Kiss, Noémi – Dobor, József

THE DISASTER MANAGEMENT PERSPECTIVE ON AN INDUSTRIAL INCIDENT IN AZNALCOLLAR IN 1998

Abstract

The Spanish incident had serious consequences that contributed to the amendment of 16 December 2003 to Directive Seveso 2, which covers the management of ores and mining waste. Directive 2006/21/EC provides for waste classification, soil and subsoil stability assessment, detailed risk assessment, emergency planning and in 2004 the Environmental Liability Directive was adopted to prevent and remedy damage.

Keywords: zinc, silver and copper pollution, disaster damage restoration

Introduction

Zinc, silver and copper were extracted from the Seville mine. A total of 4 million tonnes of rock were mined every year. On 25 April 1998, in the early hours of the morning, a landslide caused a breach in the mine's tailings dam. The incident resulted in the pollution of 80 km of river and 10,000 hectares of agricultural land with 3 million tonnes of sludge and 4 million tonnes of acid mine drainage. The table on the left shows the proportions of the spilled sludge and the substances present: iron and sulphur were predominant, but arsenic, lead, copper and zinc were also present [1].

The surrounding rivers affected agricultural land and a marshy area at the DOÑANA National Park. The slurry stored there had a significant metal content and, because acid was used in the processes, was acidic. The capacity of the sludge reservoir was 32.6 million cubic metres. The dam around it was 30 metres high.

Within 7 hours of the accident, the contaminants had reached the DOÑANA National Park, but the reefers had cordoned off the national park with a protective wall, so much of the contamination was concentrated in a nearby canal. One factor affecting the harmful was the high inland water level due to the rains in the weeks preceding the event [2].

Soil replacement had to be carried out urgently before the autumn rains to avoid the infiltration of toxic substances into the soil. 800 people, 500 trucks and 150 earth-moving machines were involved in the clean-up. By the end of 1998, 5 million m3 of sludge had been removed from the area. Some areas were cleaned up in 1999 and 2000.

Thanks to the rapid response, groundwater was not contaminated. During the damage event, 7000 hectares of pasture and 3500 hectares of agricultural land were contaminated. The fields were previously used for rice, wheat and fruit production. The operator paid farmers €6 million for the damage to their crops [3].

50 000 people in the region affected by the disaster. The mine employed 500 people, who lost their jobs for months after the disaster. The DOÑANA National Park suffered only minor damage. The disaster also resulted in 30 tonnes of dead fish, 220 kg of crabs and 12,000 birds. Large numbers of rabbits, frogs, goats and horses also died.

Findings

The mine was closed permanently in September 2001. For 5 months, the consumption of well water, hunting, agriculture and livestock farming were banned. Several people suffered minor burns from the acid slurry while trying to save their pets. Following the accident, agricultural marketing cooperatives refused to buy produce from riverside gardeners and cancellations were made at nearby hotels. The total cost of repairing the damage was €240 million, part of which was financed by the European Union. In 2004, a European rehabilitation programme was implemented, where the vegetation was restored [3][4].

The collapse of the dam was caused by design and construction errors, overfilling of reservoirs and the transformation of the soil structure, which was exposed to acidic sludge. There had been signs of this before, in 1995 and 1996 gas was found to be unstable as leaks were observed, but the authorities continued to allow mining activity. Following the inspection, the operator installed a geotechnical monitoring system in the dam structure to check for any displacements. My monitoring survey, carried out a few weeks before the accident, did not reveal any major defects [3][4].

Conclusion

Two years after the Spanish accident, the Tisza cyanide spill occurred. Because of the seriousness and recurrence of this type of accident, European legislation governing the management of mining waste has been tightened. The Seveso 2 Directive, amended on 16 December 2003, covers the management of ores and mining waste. Directive 2006/21/EC provides for the classification of waste, soil and subsoil stability assessment, detailed risk assessment, emergency planning and the Environmental Liability Directive was adopted in 2004 to prevent and remedy damage.

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