

# The Role of Geodetic Surveyors in Disaster Management

**Duncan MOSS (United Kingdom), Vladimir KRUPA (Croatia) and Michalis KALOGIANNAKIS (Greece)**

**Key words:** Capacity building; Cartography; Education; Geoinformation/GI; Land management; Positioning; Remote sensing; Risk management; Spatial planning; Young surveyor; Disaster Management cycle; Geodetic Surveying; Training.

## SUMMARY

The IX CLGE Conference of the European Surveyor on the theme of '[The Role of Geodetic Surveyors in Disaster Management](#)' and [CLGE General Assembly](#) held in Paris (FR) from 9 to 11 November 2023 brought together surveyors, geospatial experts, and subject matter experts from across the public, private, and academic sectors to share experience and best practice and to consider the increasingly important role that geodetic surveyors should play both now and in the future in the field of disaster management.

This was a unique occasion to specifically focus on how geodetic surveyors across Europe, as members of the wider geospatial ecosystem, contribute to various aspects of disaster management as seen through the lens of a series of real-life case studies. The event concluded with the signing of the 'CLGE Paris Declaration' which acknowledges the range, scale and complexity of the disaster challenges that we all face.

The CLGE Paris Declaration establishes a number of commitments about how we can all work together to strengthen the contribution of surveyors, promote the role of our profession more widely, and cooperate with kindred bodies such as FIG, the Forum of Regional Bodies and inter-governmental organisations.

This paper will explore and share what we have learned from our colleagues across Europe and what we can do at national and international level to begin to adopt globally the commitments made by European Surveyors in the CLGE Paris Declaration and to make a positive contribution to disaster management.

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## 1. INTRODUCTION

The need for accurate, up-to-date, accessible and shareable geospatial information in the context of disaster management has never been more important and is widely acknowledged by all stakeholders across our broad geospatial community including professionals, academics, governments, NGOs and inter-governmental organisations.

Geospatial information is increasingly used across the various stages of disaster management from prevention, preparedness, response, recovery and reconstruction, however the level of adoption and implementation varies widely both within and between countries and according to the type of disaster. There are many reasons for this differential adoption relating to; policy, governance, finance, data, capacity and technological capability.

The report '[2022 Disasters in Numbers](#)' released by the Centre for Research on the Epidemiology of Disasters, UCLouvain (BE), highlights the huge challenges and threats that we all face. The '[Emergency Event Database EM-DAT](#)' recorded 387 catastrophic events and disasters worldwide in 2022 resulting in the loss of 30,704 lives and affecting 185 million individuals with economic losses totalling around US\$ 223.8 billion. As a result, developing the data, tools, processes, frameworks, and best practice to manage natural disasters more effectively is becoming an increasingly urgent global priority.

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This paper will explore and share what we have learned from our colleagues across Europe and what we can do at national and international level to begin to adopt globally the commitments made by European Surveyors in the CLGE Paris Declaration and to make a positive contribution to disaster management.

## **2. IX CLGE CONFERENCE OF THE EUROPEAN SURVEYOR - THE ROLE OF GEODETIC SURVEYORS IN DISASTER MANAGEMENT**

The IX CLGE Conference of the European Surveyor on the theme of the ‘The Role of Geodetic Surveyors in Disaster Management’ was held in Paris (FR) on 9 November 2023. The theme of this Conference was also CLGE’s theme of the year for 2023. In recent years CLGE has adopted a theme of the year which provides a focus to engage our membership through various events and activities during that year, for example the CLGE General Assemblies, conferences, workshops and declarations. We also encourage our National Member Associations to promote the theme of the year and hold associated events.

In recent years the CLGE theme of the year has included: Professional Ethics (2019), Sustainable Development (2020), Women in Surveying (2021), Blue Surveying (2022) and Disaster Management (2023). This was particularly timely in 2023 given recent earthquakes in Croatia and Türkiye as well as the war in Ukraine. In 2024 the CLGE theme of the year is ‘Skills for Tomorrow: Are We Ready?’ which will examine the future skills that the surveying profession will need, including the skills required to deliver the commitments in the CLGE Paris Declaration. Indeed, the CLGE theme of the year for 2025 is likely to be focused on Education and in particular the surveying curricula that will be required to underpin the Skills for Tomorrow and so on.

The IX CLGE Conference of the European Surveyor on the theme of the ‘The Role of Geodetic Surveyors in Disaster Management’ was an in person in/hybrid event with almost one hundred people attending in person and up to 750 people attending online globally. The Conference was well publicised by our French colleagues from l’Ordre des Géomètres-Experts (OGE) and from la Fédération des géomètres francophones (FGF) across their networks and so there was high participation from across France, French speaking countries around the world as well as the entire European wide CLGE membership.

Following the Opening Session the [overall Conference Programme](#) took the form of four key content sessions. The first session focusing on the situation in the host country, France, and the ensuing three sessions were structured around the classic disaster cycle of preparedness, response and recovery

- Session 1 – Activities of Geodetic Surveyors in Disaster Management in France
- Session 2 – The Role of the Surveyor in Disaster Preparedness
- Session 3 – The Role of the Surveyor in Disaster Response

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## - Session 4 – The Role of the Surveyor in Disaster Recovery

These four very informative content sessions were followed by a moderated panel discussion and the Conference concluded with the presentation of the first full draft of the CLGE Paris Declaration which drew upon the presentations and discussions during the day. The draft of the Paris Declaration was discussed and revised during the CLGE General Assembly over the following two days and was signed and published at the close of the General Assembly on 11 November 2023.

A short synopsis of each session presentation follows immediately below which will give the reader an overview of the breadth and depth of the topics discussed at the Conference. This provides insight into the impactful areas in which our profession is active and the value that we are collectively bringing to society. The paper also serves to make the amazing work of our many Conference presenters more visible to a wider global audience and encourages our fellow professionals worldwide to engage with this important subject matter.

### **2.1 Session 1 - Activities of Geodetic Surveyors in Disaster Management in France**

This Session which was focused on the situation in the host country started with a presentation by Elisabeth LEBLANC & Jacques DÉsir from IGN (Institut national de l'information géographique et forestière) the French National Mapping Agency with the title '*Production et partage de données dans les temps de la crise*' (Data production and sharing of data during crises) and discussed the mission and role of IGN, data and online services offered during crises. The importance of and access to sovereign official data was emphasised. Focus was given to a standing IGN Lidar capability to collect data for surface modelling in connection with flooding either in preventative (preparedness) mode or rapid deployment during a response to collect up-to-date data.

The second presentation in this Session by Michel GREUZAT, an OGE member from the private sector, was '*Environmental assessment by the surveyor: a relevant tool for risk prevention and management*' examining the role for surveyors in preventing and reducing the impact of disasters through expertise and services in the field of environmental impact assessment as this facilitates the identification, anticipation, mitigation of risks and helps put into practice the strategy of '*éviter, réduire, compenser*' (avoid, reduce, offset/adapt).

Thirdly Philippe CACHOD, another OGE member, presented the topic of '*Land planning, an environmental compensation tool for rural territories*' which looked at disasters through the lens of the environmental, social and economic impacts of the development of agricultural and forest lands. This embodied some aspects of the so-called ecosystems services' and drew out the distinction between the letter and the spirit of relevant planning laws. A planning law with a wide list of often difficult to balance mandates including: sustainable development, the preservation of local characteristics, improving the demographic balance between urban and rural areas, maintaining production while ensuring biodiversity, biomass and the capture or reduction of greenhouse gas emissions, balanced/mixed local economy, economic

diversification, reconfiguration of public services, natural hazard prevention, heritage and landscape protection, and the preservation of water resources was discussed.

The fourth and final speaker in this Session was Jean-Yves MAS an OGE member from the south-west of France who focused on *'The surveyor and forest fire risk prevention'*. The speaker provided some stark data on the increasing prevalence of forest fires and how surveyors are using UAS based airborne thermal imaging as a means of monitoring fire zones and detecting fumaroles. This capability is key to monitoring underground smolders and can provide early warning of the re-ignition of previous fires. In one example a fire at Lake Hostens was still burning one year later. The UAS data is also being used to assure public safety by analysing whether the burnt ground is at risk of collapse. Mr MAS went on to discuss the surveyor and *'les Obligations Légales de Débroussaillage'* (Legal Clearing Obligations) which are part of the Code Forestier and apply to the maintained clearance of vegetation from private and public property and how mapping these is a collaborative work between surveyors, engineers and experts in data analysis. Finally the role of web services such as the [Geofoncier](#) platform and the [Oùdébroussailler](#) (visualisation of legal obligations of where to clear) website were highlighted.

## 2.2 Session 2 - The Role of the Surveyor in Disaster Preparedness

Prof. Dr, Haluk ÖZENER, Director of the Kandilli Observatory and Earthquake Research Institute -Bogaziçi University (Turkey) kicked off this Session with his presentation on *'Earthquake and tsunami potential of Turkey and its vicinity: from historical records to the present.'* This covered the long history of earthquakes in the region and their impacts on people, property infrastructure as well as liquefaction and surface deformation. The speaker discussed the evolution of the sophisticated GNSS based monitoring and early warning systems that have been developed for earthquake and tsunami at the Kandilli Observatory and Earthquake Research Institute Regional Earthquake-Tsunami Monitoring Center. There are future plans for the densification of the sea level monitoring stations in the Sea of Marmara region by a further 20 stations.

Mr Etienne SAINT-AUBIN another OGE member from France presented his work on *'Construction and urban development in flood-prone areas'*. A review of the different types of flooding – riverine, groundwater, surface run-off and coastal – was followed by an exposition of the work of surveyors on construction within flood zones which was presented in three stages. Stage 1: site investigations using: a range of historic and recent data, 3D topographic survey, soil hydrogeology, collection of local resident witness statement evidence. Stage 2: planning such as: document preparation, risk assessment and prevention for a neighbourhood scale rainwater management plan. Stage 3: project design activities such as: housing construction, replacement of agricultural greenhouses, creation of a wastewater sanitation network with a discharge station to withstand up to 3m of water during exceptional flood conditions, creation of commercial and industrial zones, assessing water table level suitability for the provision of autonomous sanitation (septic tanks) and for basements of communal buildings.

Finally in this Session Denis LACHAUD also an OGE member from France spoke about his work on project to restore a world-famous ecclesiastical building ‘*3D scanning for heritage preservation and reconstruction: the example of the spire of Notre-Damede-Paris cathedral*’. Cultural heritage faces many risks including fires, earthquakes, intentional destruction and erosion. There are also challenges associated with any conservation or restoration such as; incomplete documentation, inaccurate documentation, lack of an overall inventory, absence of baseline scans or surveys prior to damage occurring. 3D laser scanning is a key tool for such projects, but the conservation requirements need to inform the precision and point density requirements in order for the desired result to be achievable. It is thanks to the skill and experience of the surveyor and the appropriate operation of advanced technology that a 3D model of Notre Dame Cathedral before the fire has been assembled which has been key to delivering the ‘*identical reconstruction*’ which is now nearing completion.

### **2.3 Session 3 - The Role of the Surveyor in Disaster Response**

This session opened with a presentation from Ukraine about the role of surveying and 3D modelling in the preservation of cultural heritage, but with a rather different context to the immediately preceding presentation, this time the context of war. This presentation was more focused on pre-emptive laser scanning and modelling of important cultural heritage that is at risk of destruction at any moment. Mr Andriy HRYVNYAK, Skeiron gave the presentation ‘*Project #saveukrainianheritage: challenges, solutions and vision of preservation of monuments during the war*’ which started with the example of the destruction by bombing of the Mariupol Theatre. The presenter and his colleagues had been inspired by how surveyors had used laser scanning and 3D modelling to great effect to help rapidly restore Notre Dame Cathedral (see immediately above) and had initiated an urgent programme to laser scan (terrestrial and UAS) and model some 250 important sites across Ukraine which will be curated in an official Government registry for future use.

This Session went on to consider the role of spaceborne remote sensing with Ms Teresa MARTINEZ RECHE, European Union Agency for the Space Programme (EUSPA) presenting ‘*Enabling applications in disaster management: the EU Space Programme*’. The speaker briefed on the six pillars of the EU Space Programme – EGNOS, Galileo, Copernicus, GOVSATCOM, Space Situational Awareness and Others – which are brought together under the leadership of EUSPA. Further detail was presented on the EU Space Programme for Disaster Management and in particular Copernicus and the Emergency Management Service (CEMS) which delivers Exposure Mapping, On Demand Mapping and Early Warning & Monitoring. This was followed by real life examples and applications for disaster response using space borne assets in different combinations and configuration according to the situation at hand. Examples from Europe such as the volcanic eruption in La Palma (ES) were presented but examples from around the world were given such as an industrial accident in Matanzas, Cuba – underlining the global nature of these powerful geospatial capabilities

The final presentation of this Session, *'The critical role of authoritative geospatial data in resilience'*, was given by Mr Duncan MOSS, Ordnance Survey (OS) from the United Kingdom (UK), who is also the lead author of this paper. The speaker opened by stating how importantly disaster management is being taken at the global level citing the work being done by The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) and in particular its Geospatial Information and Services for Disasters Working Group. He spoke about the importance of aligning our work to official Risk Registers giving the example of the National Risk Register in the UK, which for example identifies the *'Loss of Positioning, Navigation and Timing (PNT) services'* as a key risk and how OS is working to mitigate GNSS threats and vulnerabilities. Mr Moss highlighted the collaborative work of the UK Natural Hazards Partnership and how *authoritative geospatial data* is key to both hazard impact science and hazard warning communication. He gave real life examples of how official geospatial data is used for resilience, training exercises and for the safe running of major political and multi-sport events. He concluded by stressing the importance of Data, Tradecraft, Partnerships and Innovation.

#### **2.4 Session 4 - The Role of the Surveyor in Disaster Recovery**

In this Session we returned to the subject of earthquakes. Firstly, from Mr Ali IPEK, President of the Turkish Chamber of Survey and Cadastre Engineers (Turkey) who presented *'Technical and Humanitarian Studies of Surveyors after the 6 February Earthquakes in Turkey'*. Mr Ipek reminded us of the widespread impact across 11 provinces, with damage to more than half a million buildings and assets. Ten surveyor colleagues lost their lives and the homes and offices of approximately 100 Chamber members were destroyed. He spoke movingly of the solidarity and generous support of surveyors, including financial support donated by CLGE and its members. The speaker went to describe how the Turkish Chamber organised and mobilised a team of rapid mapping volunteers to undertake emergency aerial mapping with UAS and how they worked in partnership with Government to share the outputs on official cloud based services. This was augmented by volunteer surveying teams who monitored the movements of heavy damaged buildings in order to ensure the safety of the search and rescue teams. The Chamber's Photogrammetry and Remote Sensing Commission analysed Sentinel 1 SAR data (part of the Copernicus programme) and reported surface deformations, horizontal and vertical displacement. Furthermore, the Chamber developed a Mobile GIS Application for the management of humanitarian assistance. The speaker concluded by articulating the importance of collaboration both nationally and internationally, voluntary and civil contributions, open data, the skills of surveyors and above all solidarity.

Keeping with the theme of earthquakes Dr. Ilija GRGIC, Croatian State Geodetic Administration (Croatia) brought a different perspective with his presentation *'Data centre disaster recovery following the earthquake and new products for the prevention of natural disasters.'* Dr GRGIC spoke about the importance of business continuity planning (BCP) and disaster recovery in the context of the recent earthquake in Croatia. He described various disaster vectors that may lead to the need to enact such plans be they natural or anthropogenic, accidental or deliberate. Practical points to consider for an appropriate BCP were given. The

audience was introduced the terms ‘RTO - recovery time objective’ and ‘RPO - recovery point objective’ and the four tiers of data centre disaster recovery. As well as describing the robust resilience plans put in place by the Croatian State Geodetic Authority (SGA) the speaker explained new data, products and services that have been developed to support users and citizens in disaster scenarios such as earthquakes and floods.

The final speakers of the Session were Mr Martin HRDLIČKA and Mr Ondřej HRDLIČKA, from the Czech Association of Entrepreneurs in Geomatics (Czech Republic). They spoke on the topic of ‘*How surveyors prepare for reconstruction during an ongoing conflict – the necessity of Utility Cadastre*’. Starting with a short geopolitical history of the region and the proximity of the Czech Republic to Ukraine the focus moved to the impacts of war on surveyors and their work. Current surveying projects in Ukraine were explained, which are limited, but mainly focused on infrastructure. The speakers highlighted the high level of skills and education of Ukrainian surveyors and how they had been successfully employed on projects in the Czech Republic, for example the ‘Digital Technical Map - Utility Cadastre’. Other European countries were encouraged to think about how they could provide work for Ukrainian surveyors. The Utility Cadastre in Ukraine was presented and how pilot projects had commenced despite the ongoing war. Finally, they concluded by highlighting the #Drones for Ukraine initiative which had donated some 70 drones to the value of €85k by the time of the Conference.

## **2.5 Moderated Panel Discussion**

This Session engaged the perspectives and options of four experts:

1. Prof. Dr. Haluk ÖZENER (Turkey), Director of Kandilli Observatory and Earthquake Research Institute, Bogaziçi University
2. Alina SUSHCHYK (Ukraine), Head of the International Cooperation Division of the State Service of Ukraine for Geodesy, Cartography and Cadastre
3. Pierre BRIOLE (France), Geophysicist, Director of the Geosciences Department at Ecole Normale Supérieure
4. Fabien PALFROY (France), Surveyor, Specialist in coastal risks

The Session Moderator, Mr Duncan MOSS, firstly posed two questions to each panelist which were specific to their situation or expertise. This was followed by a set of more general questions:

1. *‘Thinking about the Disaster Management lifecycle of prepare, respond, recover and from what you have learned today where do you personally think geodetic surveyors can make the largest impact and why?’*
2. *‘What do you think we could do from an education and experience perspective to engage geodetic surveyors more in hazard evaluation or disaster management?’*

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3. *‘Where are the biggest gaps in capacity and capability for effective disaster management?’*

These set questions followed by interactive questions from the audience.

This was a rich discussion and it is simply not possible to provide full details in this short paper. However, some of the high-level points discussed included:

- sharing of data
- citizen science
- education
- open standards, data and software
- (near) real time access to data
- increased density of sensors especially in coastal areas and offshore
- augmentation of scientific sensor network data by citizen smartphone apps
- development of global products from spaceborne remote sensing such as [European Ground Motion Service \(EGMS\)](#)
- investment in and modernisation of National Spatial Data Infrastructures including:
  - coordinate reference systems (both horizontal and vertical)
  - content and data
  - cartographic products
  - web services
  - access control
  - cyber security

The points made during the Panel Discussion plus the points made in the four content sessions were all synthesized and fed into the draft of the CLGE Paris Declaration.

### **3. THE CLGE PARIS DECLARATION**

The speakers, pannelist, delegates at the Confernce as well as at the General Assembly all contributed to the CLGE Paris Declaration. The key elements of the Declaration are the conclusions and the commitments, which will now be discussed.

The Conference concluded and acknowledged that:

- Disasters, whether natural or man-made, have become more frequent, more severe, and more widespread in recent years, affecting more people than ever before.
- The reasons can vary, and include climate change, population pressure, and direct or indirect human action.
- The range of threats and disasters is constantly evolving and increasing for example the increasing range of technological risks.
- That we are now experiencing a permacrisis.
- Disaster management is a multi-disciplinary activity involving a variety of actors and professions from the public, private, voluntary, and academic sectors.
- Geodetic surveying, geospatial data, and applications are increasingly critical to disaster preparedness, response, recovery, and reconstruction.
- What our profession can offer in this field needs to be more widely understood.

Before we can begin to solve any problem in life we firstly need to recognise and acknowledge the problem exists, which is a really important step, but equally importantly we need consensus. The CLGE Conference of the European Surveyor on the theme of ‘The Role of Geodetic Surveyors in Disaster Management’ and the following ‘CLGE General Assembly’ gave us the ideal forum to achieve both. Therefore, the first part of the CLGE Paris Declaration explicitly and deliberately does just that. Firstly by acknowledging that the occurrence of disasters is increasing in multiple dimensions simultaneously, as is their impacts on people and places. We also acknowledge that the causes are multi-factorial and continually evolving. We find ourselves experiencing ongoing and concurrent crises, a state which we have termed a ‘*permacrisis*’. We acknowledge that disaster management is a ‘*team sport*’, we need to act together with other professions and groups, but the work of our profession is becoming increasingly important and pervasive as our Conference demonstrated. Finally we acknowledge that we all need to do more to make what we do both known and understood. Following this we need to inspire action which is why the second part of the CLGE Paris Declaration is concerned with commitments to which we can all aspire to and begin to adopt.

The Conference committed us to:

- Continue to support our members in disaster response and reconstruction across Europe.
- Showcase how our profession can help to solve real-world problems.
- Promote the role of surveyors in the acquisition and management of high-resolution spatial data relating to cultural heritage to support preservation and reconstruction.
- Support continuing professional development relating to the application of our profession to disaster management.

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- Encourage all European surveyors, especially young surveyors, to develop skills, domain expertise, and tradecraft to support effective disaster management.
- Embrace innovation and technological developments to improve disaster management.
- Invite law and decision makers to enact legislation that promotes and enforces the use of geospatial data, products, and services for disaster prevention and disaster management.
- Cooperate with kindred surveying bodies such as FIG and the Forum of Regional Bodies.
- Monitor the actions of intergovernmental bodies to understand how we can contribute to and align with their initiatives.
- Act in the public interest, to promote resilience for all European citizens and continue to support the UN-Sustainable Development Goals.

Commitments are an important next step, but the real value comes when these are turned into actions and positive impact. On a practical level CLGE has been supporting members and colleagues across Europe who have been impacted by recent disasters such as in Croatia, Türkiye and Ukraine, this is an initiative we aspire to sustain, but of course this relies on the continuing solidarity of members. We encourage colleagues around the world to consider how they might be able to support their members in times of crisis. Our Conference in Paris was an important first step in showcasing how our profession can support disaster management and this paper at the FIG Working Week 2024 is another significant step in globalising this message with colleagues from around the world. More needs to be done and we need to socialise our message beyond our profession, talking with each other is great but it's not enough. We can contribute better in the field of disaster management with increased domain expertise and tradecraft, these can be learned through education and experience, including for example taking part in civil protection response exercise which are organised in most countries. Why not look at developing related CPD through national surveying associations? Technology and innovation are evolving rapidly and so are the requisite skills so we need to consider the 'Skills for Tomorrow'. There is opportunity for our profession, particularly national associations to influence the development of supportive legislation. We know we are more effective when we work together globally which is why it is important to be working with FIG and the Forum of Regional Bodies as we are doing here at the FIG Working Week 2024. We also need to align what we do with work at a global level such as UN-GGIM, UN FAO and the World Bank. It is more important than ever that we collectively and individually continue to act in the public interest, to promote resilience for all citizens and continue to support the UN-SDGs.

The challenge is great and there is much to do, this can feel overwhelming which is a risk to inaction. So, let's keep focused on the positive of what we can do, and make sure we join the conversation and promote the message. The more that are engaged the more who will act.

## 4. DISCUSSION

There are many conferences globally on the topic of disaster management, and even on the role of geospatial information in disaster management. However, we believe our Conference in Paris was probably unique in that it put the focus specifically on exploring the role of the surveyor in disaster management. We recognise of course that we work as part of a wider geospatial ecosystem and indeed within inter-disciplinary teams and environments. Nevertheless, it is useful to consider the distinct contribution that the surveying profession is making. Why is this necessary?

- To recognise and celebrate the contribution of our profession
- To make what we do and the value that we bring to society more visible
- To help better understand the global challenges that we all face
- To inspire heart and minds and encourage future generations to join our profession
- To expose opportunities where we could contribute more in this domain
- To think about the skills and learning required to deal with disasters in future

All of the presentations were individually fascinating and inspiring, but that was arguably most striking was the combined depth, breadth and positive impact of our activities. *‘The whole is greater than the sum of the parts’* as it is said in English. This was made more impactful by hearing about all these real-world examples and case studies in one single day.

The Conference in Paris evidenced how surveyors are active in all parts of the disaster management cycle be that preparedness, response or recovery and reconstruction. Some are working in the private sector while others are working in the public sector, some also work in the voluntary sector from time-to-time. Some are working as sole practitioners, others in larger organisations. Some are focusing on the application of their technical skills, others are more focused on using their legal skills, in many cases both, and all are applying their so called ‘soft skills’. Some are concerned with (hyper) local initiatives, others with projects at a regional or national scale and some are concerned with global activities. For some surveying is their job, for some they are surveyors working in other allied domains. Some are making unseen contributions as part of a wider value chain, others are leading highly visible projects. Some work has immediately visible benefit and impact, for others the value of their work is realised over longer timescales. In some cases people are working as volunteers and out of solidarity. But whatever we are doing and wherever we are working surveyors across Europe are very engaged in disaster management. Every contribution we make, be it small or large, seen or unseen is equally valuable in the fight against the impacts of climate change, natural disasters, or the impact of war.

The IX CLGE Conference of the European Surveyor on the theme of ‘The Role of Geodetic Surveyors in Disaster Management’ has made our contribution more visible than before but

there is always more to do both in Europe and around the world. We encourage our fellow surveyors across the globe to engage with this important topic.

#### **4.1 Call to Action**

We urge you our readers to engage your members, your colleagues and your fellow professionals in your own countries and world regions on this important topic.

Why not consider holding your own conferences and events on the theme of ‘The Role of Geodetic Surveyors in Disaster Management’. Start by discussing what you already doing well and celebrate that. Identify the gaps where there is room for improvement and what you need to do to close those gaps. In particular we encourage you to involve young surveyors everywhere and embrace their skills, creativity passion and commitment.

Please read the CLGE Paris Declaration carefully and consider how you can begin to adopt its ten commitments where you are. Why not think about a similar Declaration of your own, building on the CLGE Paris Declaration and adapting it to your circumstances.

Finally lets as one united surveying profession, and as part of the wider geospatial community, keep engaging and acting with respect to our important role in disaster management through our many fora and networks and in our daily professional lives. The call to call to action has never been more urgent.

### **5. CONCLUSION**

The IX CLGE Conference of the European Surveyor on the theme of ‘The Role of Geodetic Surveyors in Disaster Management’ has established an evidence base of real world examples and case studies across Europe of the value that we bring to the domain of disaster management.

As a profession we are going to need to enage more and more in the field of disaster management and we need to prepare ourselves and future generatons of surveyors accordingly.

The acknowledgements and commitments in the CLGE Paris Declaration are, when put into practice, a step forward in helping us to be understood and recognised for what we do today, but also inform how we might evolve to meet the huge societal challenges ahead. We encourage all across our profession from whichever country or world region to engage and act.

### **IN MEMORIAM**

We dedicate this paper to the memory of Mr Joseph Pascual, President of l’Ordre des Géomètres-Experts, who died suddenly on 28 February 2024. Joseph opened our Conference

in Paris in November 2023. He was a signatory to the CLGE Paris Declaration and was instrumental in drafting the text for example contributing the key phrase '*That we are now experiencing a permacrisis*'. Joseph Pascual devoted his entire career to promoting our profession. We remember him with appreciation and fondness and will always be grateful for his support and friendship.

## **WITH THANKS**

CLGE would like to acknowledge and thank all the team at the l'Ordre des Géomètres-Experts (OGE) in France for their work in organising and staging the IX CLGE Conference of the European Surveyor on the theme of 'The Role of Geodetic Surveyors in Disaster Management' without whose support the event would not have been possible. We thank la Fédération des géomètres francophones (FGF) for engaging their members across the wider French speaker world. We give a heartfelt thanks to all our Conference speaker and panellists who willingly gave their time and freely shared their experience and wisdom. Last, but not least we thank our audience both in person and online without whom there would have been no conference.

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[2022 Disasters in Numbers](https://www.cred.be/sites/default/files/2022_EMDAT_report.pdf) released by the Centre for Research on the Epidemiology of Disasters (CRED) Institute Health & Society (IRSS) – Université catholique de Louvain, Clos Chapelle-aux-Champs, Bte B1.30.15, 1200 Brussels, Belgium  
[https://www.cred.be/sites/default/files/2022\\_EMDAT\\_report.pdf](https://www.cred.be/sites/default/files/2022_EMDAT_report.pdf)

[Emergency Event Database EM-DAT](https://www.emdat.be/) released by the Centre for Research on the Epidemiology of Disasters (CRED) Institute Health & Society (IRSS) – Université catholique de Louvain, Clos Chapelle-aux-Champs, Bte B1.30.15, 1200 Brussels, Belgium  
<https://www.emdat.be/>

[The CLGE Paris Declaration](#)

## **BIOGRAPHICAL NOTES**

### **CLGE**

The Council of European Geodetic Surveyors or Comité de Liaison des Géomètres Européens (CLGE) was founded in 1962 and is the European wide umbrella body which represents and promotes the interests of the geodetic surveying profession in the private and public sector in Europe. CLGE is a member of the Forum of Regional Bodies (FORB).

### **Duncan MOSS**

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The Role of Geodetic Surveyors in Disaster Management (12749)  
Duncan Moss (United Kingdom), Vladimir Krupa (Croatia) and Kalogiannakis Michalis (Greece)

FIG Working Week 2024

Your World, Our World: Resilient Environment and Sustainable Resource Management for all  
Accra, Ghana, 19–24 May 2024

Duncan MOSS is a Vice President of CLGE and was the Director of the The IX CLGE Conference of the European Surveyor on the theme of '[The Role of Geodetic Surveyors in Disaster Management](#)'. Duncan is a Fellow of the Royal Institution of Chartered Surveyors (FRICS) and a member of the RICS Land and Natural Resources Professional Group Panel. He has almost 40 years' experience working for Ordnance Survey (OS), the British National Mapping Authority. Duncan's role at OS involves leading on the provision of support and expert advice to government and public bodies on the best use of geospatial information in the context of disaster management and resilience including relating to natural hazards and major events.

### **Vladimir KRUPA**

Vladimir KRUPA is the President of CLGE. Vladimir is a CIO and Project Manager in the design company, 'Zavod za urbanizam i izgradnju d.d. Osijek' responsible for spatial data, information technology and development. After the establishment of Croatian Chamber of Chartered Geodetic Engineers in 2009. he was a member of the Management Board and from 2013 to 2019 he was the President of Croatian Chamber of Chartered Geodetic Engineers.

### **Michalis KALOGIANNIKIS**

Michalis KALOGIANNIKIS is the Secretary General of CLGE and was a Vice President for two terms. Michalis was first elected as President of the HARSE (Hellenic Association of Rural & Surveying Engineers) in 2016 and is now the outgoing President. He has significant experience in private-public sector relations (Ministries, Municipalities, etc.) and is CEO of GREEN Estate (Topo GES) where he is actively involved in the field using technological advanced solutions related to topography, geospatial data management, photogrammetry, cadastre and property management.

### **CONTACTS**

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