

HPSC0160 – Warnings For All

Course Syllabus

2023-24 session | Prof Carina Fearnley | c.fearnley@ucl.ac.uk

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This module presents an exciting opportunity to be taught by experts in both the Department of Science and Technology Studies, and the Institute of Risk and Disaster Reduction, and engage with the work of the UCL Warning Research Centre, the world's only academic Centre dedicated to the study of warnings for both natural hazards and human made threats.

In December 2004, over 250,000 people in 11 countries died from a tsunami in the Indian Ocean because there was no warning system in place. The importance of warning systems has been established by the global research and practitioner community. Yet, to date, research on how to make hazard warnings effective, reliable, sustainable, and actioned remains limited. Given the complex and multiple disciplines, actors, and institutions involved, warnings require an inter- and trans-disciplinary approach to ensure silos are broken down, and that research is orientated towards real-world problems, and finding sustainable solutions.

This module brings together both academic and practitioner knowledge around what hazard warnings are, how they are designed, how they operate, and how to make warnings effective and actionable. This requires bringing a wide range of disciplines together that review disaster risk reduction for all natural hazards, science communication, science policy, understanding risk and uncertainty at scales from the local to the global. Whether warnings are technological, automated, community based, anticipatory, or responsive, this module explores the value of the people-centered warnings, and the need to create inclusive and multi-hazard warnings. Contemporary case studies will be explored throughout the course.

Basic course information

Moodle Web site:	https://moodle.ucl.ac.uk/course/view.php?id=35003
Assessment:	Project work in two parts: 30% - Oral Presentation (~5 mins) 70% - Report (2,000 words)
Timetable:	Wednesdays 11:00 – 13:00
Prerequisites:	No prerequisites
Required texts:	See reading list below and the online reading list.
Course tutor(s):	Course convenor: Prof Carina Fearnley and Dr Sarah Dryhurst
Contact:	c.fearnley@ucl.ac.uk and s.dryhurst@ucl.ac.uk
Web:	http://www.ucl.ac.uk/sts/staff/fearnley
Office location:	22 Gordon Square, Room 1.2a
Fearnley office hours:	Please email to arrange a time in person or online
Teaching Assistant	N/A

AI Tools: Category 2: AI tools can be used in an assistive role See details at:

<https://www.ucl.ac.uk/teaching-learning/generative-ai-hub/using-ai-tools-assessment>

Schedule

UCL Week	Lecture / Seminar	Lecture Date	Lecture Topic	Activity / Guest Lecturer
6	1	10/01/24	Introduction to Warnings and Alerts and why they are important (CF)	Outlining the case study for the module
7	2	17/01/24	Case studies: Building national and local warning networks (CF & SD)	Dr Mirianna Budimir (Practical Action)
8	3	24/01/24	Deciding and communicating to create effective warnings – qualitative approaches (CF & SD)	Simulation exercise on volcano warnings (CF)
9	4	31/01/24	Operating Warning Systems during intersecting crises: peace and conflict situations (CF & MH)	Dr Maryam Rokhdeh (UCL WRC) on warnings in conflict areas
10	5	7/02/24	Designing warning systems: co-production, inclusivity, accessibility, and poverty (CF & MG)	Mhari Gordon (IRDR / WRC) on warnings for marginalised people
11		12/02/24	Reading Week	
12	6	21/02/24	Perception and communication of risk and uncertainty – mixed methods and quantitative approaches (SD)	Rebekah Yore (UCL IRDR) – on micro insurance / humanitarian perspectives
13	7	28/02/24	Assessment: Oral Presentations on key policy solutions (CF&SD)	
14	8	6/03/24	Governance of warnings: building policy in an age of climate change (CF)	Ben Webster (REAP) – on making warning policy at UK and UN levels
15	9	13/03/24	Building warnings for the future: role of tech, talking, and time (SD & CF)	Nick Buchan (USL STS) on future warnings / Misinformation scenario (SD)
16	10	20/03/24	Integrating and Evaluating Warnings: assessing warnings success and their sustainability (CF & AC)	Dr Jon Stone (IFRC) on the IFRC and the Last Mile
Submission of Mock Consultation Report: how to enhance warnings 27/03/24				

CF – Carina Fearnley, SD – Sarah Dryhurst, MK – Maryam Rokhdeh, MG – Mhari Gordon, AC - Kim-Anh Chau

Assessments

%	Description	Deadline	Word limit
30	Assessment 1: Oral Presentations on key policy solutions	Class on 26/02/24	Assessed in class – (lecture 7) ~ 5 minutes
70	Report	27/3/24	2,000 words

Coursework

Assessment 1: Oral presentation on key policy solutions (30%)

An oral presentation during class time based around the case study (see below). Each student is required to present their key findings and suggestions for warning policy solutions, and this will be discussed and debated within the group.

Assessment 2: Report (70%)

A mock consultancy report for a mock client reviewing how to enhance a warning system in a specific area demonstrating the application of academic knowledge and practices.

Criteria for assessment

The departmental marking guidelines for individual items of assessment can be found in the STS Student Handbook. Individual marking criteria for each assessment will be made available on Moodle.

The Case Study

During 2023-24 the module case study will be based on Kutupalong, the world's largest refugee camp. In August 2017, armed attacks in Rakhine State, Myanmar forced hundreds of thousands of Rohingya to flee their homes. Many fled to Bangladesh, which led to the establishment of Kutupalong that has over 931,000 refugees.

The [Rohingya refugees](#) face a number of challenges in Kutupalong from severe conflict and violent backgrounds, to political and economic challenges, however they also face a number of different natural hazards, one of the primary ones being monsoons. The yearly monsoon season is devastating to Rohingya refugees, causing widespread flooding and damage to shelters. In May 2023 Cyclone Mocha struck Bangladesh and Myanmar, the most severe storm to hit the region in recent years, causing widespread destruction, particularly to the Rohingya people. Following this event, this module focuses on this event to generate key policy recommendations to enhance warnings for the Rohingya people, and to provide a report for the United Nations on how to enhance warnings for refugee camps, based on the Rohingya case study.

Aims & Objectives

Aims

This module brings together key thinkers, debates, and cutting-edge research on how society has, currently, and may engage with warnings and alerts for hazards / threats for the most vulnerable populations.

The module investigates the key issues in relation to warning governance, how to build a warning system, how to create effective warning and alert systems, and how to design and evaluating warning systems from the local to global scale providing a wide range of stakeholder perspectives.

In addition, a number of relevant practical approaches and methodologies will be applied via case studies, and a case study simulation to demonstrate the challenges faced in developing and using warnings to manage large global complex problems.

Vital contextual information covering disaster management, humanitarian operations, working in different regions globally, and strategies for crisis management and response will be considered to help integrate warnings practices.

A wide range of case studies will be integrated from a number of local, regional, and global contexts.

Learning Outcomes

On completion of this course, students should be able to:

1. Describe and critically assess **key theories and frameworks** on warning and alert systems.
2. Summarise the **key issues and debates in warnings** for a wide range of stakeholders on different levels of scale.
3. Develop considered warning systems fit for purpose
4. Evaluate the key aspects that make an early warning system effective
5. Synthesise and **communicate possible solutions** to the challenges of warnings using a range of case studies discussed in class.

Reading List

Core readings:

There are no specific key text books on the topic, however the best core text books are:

Smith, K., Fearnley, C.J., Dixon, D. P., Bird, D. K., Kelman, I. (2024). *Environmental hazards: assessing risk and reducing disaster*. 7th Edition, Routledge.

Golding, B. (2022). *Towards the “Perfect” weather warning: bridging disciplinary gaps through partnership and communication* (p. 270). Springer Nature. <https://link.springer.com/book/10.1007/978-3-030-98989-7>

Other Key texts:

Glantz, M. H. (2007). *Heads Up! Early Warning Systems for Climate, Water and Weather*.
<https://unu.edu/publications/books/heads-up-early-warning-systems-for-climate-water-and-weather-related-hazards.html#overview>

Golnaraghi, M. (Ed.). (2012). *Institutional partnerships in multi-hazard early warning systems: a compilation of seven national good practices and guiding principles*. Springer Science & Business Media.
<https://link.springer.com/book/10.1007/978-3-642-25373-7>

Zschau, J., & Küppers, A. N. (Eds.). (2013). *Early warning systems for natural disaster reduction*. Springer Science & Business Media.
https://www.springer.com/gp/book/9783642632341?utm_campaign=3_pier05_buy_print&utm_content=en_08082017&utm_medium=referral&utm_source=google_books#otherversion=9783642559037

More hazard specific texts:

Amaratunga, D., Haigh, R., & Dias, N. (Eds.). (2021). *Multi-Hazard early warning and disaster risks*. Springer. <https://link.springer.com/book/10.1007/978-3-030-73003-1>

Brown, M. E. (2008). *Famine early warning systems and remote sensing data*. Springer Science & Business Media. <https://link.springer.com/book/10.1007%2F978-3-540-75369-8>

De Franco, C., & Meyer, C. (Eds.). (2011). *Forecasting, warning and responding to transnational risks*. Springer. <https://link.springer.com/book/10.1057/9780230316911>

Fearnley, C.J., Bird, D.K., Haynes, K., McGuire, W., Jolly, G. (Eds.), (2017). *Observing the Volcano World: Volcano Crisis Communication*. Springer - available for free to download as an ebook or separate chapters: <https://www.springer.com/gp/book/9783319440958>

Funk, C., & Shukla, S. (2020). *Drought Early Warning and Forecasting: Theory and Practice*. Elsevier. <https://www.elsevier.com/books/drought-early-warning-and-forecasting/funk/978-0-12-814011-6>

Musavi, S. H. A. (2019). *Early Warning-Based Multihazard and Disaster Management Systems*. CRC Press. <https://www.routledge.com/Early-Warning-Based-Multihazard-and-Disaster-Management-Systems/Musavi/p/book/9781032653617>

Sene, K. (2008). *Flood warning, forecasting and emergency response*. Springer Science & Business Media. <https://link.springer.com/book/10.1007/978-3-540-77853-0>

Wenzel, F., & Zschau, J. (Eds.). (2010). *Early Warning for Geological Disasters*. Springer. <https://link.springer.com/book/10.1007/978-3-642-12233-0>

Zommers, Z., & Singh, A. (Eds.). (2014). *Reducing disaster: Early warning systems for climate change* (p. 9789401785983). Berlin: Springer Science+ Business Media. <https://link.springer.com/book/10.1007/978-94-017-8598-3>

Essential and other readings:

All essential readings will be listed on and available via Moodle, unless specified. Further details on readings for the module and assessments will be posted on Moodle.

You are encouraged to start your own research to find readings and sources that relate to the module materials, and to take a general interest in key public engagement debates, controversies, and breakthroughs throughout the module.

Key Reports:

Collins, A., Maunder, N., McNabb, M., Moorhead, A., & van Aalst, M. (2009). World Disasters Report 2009-Focus on early warning, early action: <https://www.ifrc.org/en/publications-and-reports/world-disasters-report/wdr2009/>

<https://www.undrr.org/publication/global-status-multi-hazard-early-warning-systems-2023>

UNDRR (2006) International Strategy for Disaster Reduction Platform for the Promotion of Early Warning: <https://www.unisdr.org/2006/ppew/>

UNDRR (2006). Global survey of early warning systems <https://www.undrr.org/publication/global-survey-early-warning-systems>

UNDRR and WMO (2022) Global status of multi-hazard early warning systems: Target G. <https://www.undrr.org/publication/global-status-multi-hazard-early-warning-systems-target-g>

United Nations Office for Disaster Risk Reduction and World Meteorological Organization (2023). *Global Status of Multi-Hazard Early Warning Systems*. Geneva, Switzerland.

<https://www.undrr.org/media/91954/download?startDownload=true>

WMO, W. (2018). Multi-hazard early warning systems: a checklist. In *Outcome of the first Multi-hazard Early Warning Conference* (Vol. 22). <https://library.wmo.int/records/item/55893-multi-hazard-early-warning-systems-a-checklist?offset=>

Key Online Journals:

The International Journal of Disaster Risk Reduction (IJDRR) -

<https://www.sciencedirect.com/journal/international-journal-of-disaster-risk-reduction>

Disaster Prevention and Management - <https://www.emerald.com/insight/publication/issn/0965-3562>

Disasters: <https://onlinelibrary.wiley.com/journal/14677717>

Progress in Disaster Science - <https://www.sciencedirect.com/journal/progress-in-disaster-science>

Environmental hazards: <http://www.tandfonline.com/loi/tenh20>

Environmental Science & Policy: <https://www.journals.elsevier.com/environmental-science-and-policy/>

Outline of lectures:

This section provides additional details of the materials addressed each week.

1. Introduction to Warnings and Alerts and why they are important (CF)

People commonly visualize a Warning System as a fire alarm, a siren, or colour code, however, warning systems are much more complex. This lecture introduces warnings and alerts by addressing what they are, how they are defined, and the variations of them both in terms of different hazards, functions and purposes, geographies, people, and organisations, and the role they play in society. This lecture will also provide an overview of the module and assessments.

During the seminar the case study for the module will be introduced and discussed, and some background context in relation to cyclones in Bangladesh will be outlined, alongside an introductory activity.

Key readings:

Fearnley, C., & Kelman, I. (2021). Enhancing Warnings. <https://nationalpreparednesscommission.uk/2022/01/enhancing->

[warnings/#:~:text=This%20report%20by%20Dr%20Carina,of%20hazards%2C%20stakeholders%20and%20sectors.](#)

Garcia, C., & Fearnley, C. J. (2012). Evaluating critical links in early warning systems for natural hazards. *Environmental Hazards*, 11(2), 123-137.

Kelman, I., & Glantz, M. H. (2014). Early warning systems defined. *Reducing disaster: Early warning systems for climate change*, 89-108.

Quansah, J. E., Engel, B., & Rochon, G. L. (2010). Early warning systems: a review. *Journal of Terrestrial Observation*, 2(2), 5.

Sorensen, J. H. (2000). Hazard warning systems: Review of 20 years of progress. *Natural hazards review*, 1(2), 119-125.

Case study:

Ahmed, B., Sammonds, P., Saville, N.M., Le Masson, V., Suri, K., Bhat, G.M., Hakhoo, N., Jolden, T., Hussain, G., Wangmo, K. and Thusu, B., (2019). Indigenous mountain people's risk perception to environmental hazards in border conflict areas. *International journal of disaster risk reduction*, 35, p.101063.

Akhand, M. H. (2013). Disaster Management and Cyclone Warning System. *Early Warning Systems for Natural Disaster Reduction*, 49

Alam, A., Sammonds, P., & Ahmed, B. (2020). Cyclone risk assessment of the Cox's Bazar district and Rohingya refugee camps in southeast Bangladesh. *Science of the Total Environment*, 704, 135360.

Foyjonnesa, I. R., Eti, F. Z., Alam, M. M., & Paul, G. C. Impact assessment of tropical cyclone MORA along the coast of Bangladesh and recovery measures.

Kamal, A. M., Hossain, F., Ahmed, B., & Sammonds, P. (2022). Analyzing the 27 July 2021 rainfall-induced catastrophic landslide event in the Kutupalong Rohingya Camp in Cox's Bazar, Bangladesh. *Geoenvironmental Disasters*, 9(1), 17.

Lejano, R.P., Rahman, M.S. and Kabir, L., (2020). Risk Communication for empowerment: Interventions in a Rohingya refugee settlement. *Risk Analysis*, 40(11), pp.2360-2372.

Zaman, S., Sammonds, P., Ahmed, B., & Rahman, T. (2020). Disaster risk reduction in conflict contexts: Lessons learned from the lived experiences of Rohingya refugees in Cox's Bazar, Bangladesh. *International journal of disaster risk reduction*, 50, 101694

2. Case studies: Building national and local warning networks (CF and SD)

This lecture examines the varying scales involved in warnings, often dependent on the scale and frequency of the hazard/hazards. From international, to national, to local, one of the most challenging aspects of warnings is working across the varying scales and different governance and institutional factors, as well as cultural and political. The concept of the warning value chain will be introduced alongside the role of warnings within disaster risk reduction and humanitarian actions. A range of warning case studies will be discussed to highlight lessons identified, and some of the challenges of operating warnings at varying scales, and integrating them within Disaster Risk Reduction actions.

The guest lecture is provided by Dr Mirianna Budimir from Practical Action who will provide some insights into working on warning systems across a range of nations and hazards, and some of the challenges of building warning networks.

Key readings

- Cole, T. W., & Fellows, K. L. (2008). Risk communication failure: A case study of New Orleans and Hurricane Katrina. *Southern Communication Journal*, 73(3), 211-228.
- Day, S., & Fearnley, C. (2015). A classification of mitigation strategies for natural hazards: implications for the understanding of interactions between mitigation strategies. *Natural Hazards*, 79, 1219-1238.
- Fearnley, C. J., & Dixon, D. (2020). Early warning systems for pandemics: Lessons learned from natural hazards. *International journal of disaster risk reduction*, 49, 101674.
- Kelman, I. (2006). Warning for the 26 December 2004 tsunamis. *Disaster Prevention and Management: An International Journal*, 15(1), 178-189.
- Šakić Trogrlić, R., van den Homberg, M., Budimir, M., McQuistan, C., Sneddon, A., & Golding, B. (2022). [Early Warning Systems and Their Role in Disaster Risk Reduction](#). In *Towards the "Perfect" Weather Warning: Bridging Disciplinary Gaps through Partnership and Communication* (pp. 11-46). Cham: Springer International Publishing.
- Seng, D. S. C. (2012). Improving the governance context and framework conditions of natural hazard early warning systems. *IDRiM Journal*, 2(1), 1-25.
- Voight, B. (1990). The 1985 Nevado del Ruiz volcano catastrophe: anatomy and retrospection. *Journal of volcanology and geothermal research*, 44(3-4), 349-386.
- Wilkinson, E., Weingartner, L., Choularton, R., Bailey, M., Todd, T., Kniveton, D., & Venton, C. C. (2018). Forecasting, hazards, averting disasters: Implementing forecast-based early action at scale.

3. Governance of warnings: building policy in an age of climate change (CF)

Early warning should be embedded within national risk reduction strategies and activities. On 18th March 2015, representatives from 187 national governments signed the Sendai Framework for Disaster Risk Reduction (2015–2030). In doing so, they formally committed to improving their national assessment of, and risk reduction from, natural and human initiated hazards. This lecture reviews how warnings are governed, and how nations acknowledge and address risk accountability, and risk responsibility through warnings. The UN Early Warning For All initiative is driving the agenda on how warnings should be governed, and this is increasingly being related to climate change warnings and adaptation. On a more local scale, the role of community based warning systems are critical, and relate to topics of co-production of knowledge and citizen science. The concept of multi-hazard warning systems will be explored, and we will discuss the challenges of implementing these systems, alongside the growing pressures to standardise warnings.

The guest lecture is provided by Ben Webster, Head of *The Risk-informed Early Action Partnership (REAP) Secretariat* who will provide invaluable insights into how governance and policy is made in the context of warnings providing a global and local perspective.

Key readings

- Fearnley, C. J., McGuire, W. J., Davies, G., & Twigg, J. (2012). Standardisation of the USGS Volcano Alert Level System (VALS): analysis and ramifications. *Bulletin of volcanology*, 74(9), 2023-2036.
- IFRC (2020) [Community early warning systems: guiding principles](#)
- Neußner, O. (2021). Early warning alerts for extreme natural hazard events: A review of worldwide practices. *International Journal of Disaster Risk Reduction*, 60, 102295.
- Potter, S. H., Scott, B. J., Fearnley, C. J., Leonard, G. S., & Gregg, C. E. (2018). Challenges and benefits of standardising early warning systems: a case study of New Zealand's Volcanic Alert Level System. *Observing the Volcano World: Volcano Crisis Communication*, 601-620.

REAP (2024) The Roles of State and Non-State Actors in Early Warning and Early Action.
<https://www.early-action-reap.org/launch-new-reap-paper-consultation-roles-state-and-non-state-actors-early-warning-and-early-action>

Ripple, W. J., Wolf, C., Newsome, T. M., Barnard, P., & Moomaw, W. R. (2020). World scientists' warning of a climate emergency. *BioScience*, 70(1), 8-100.

Tupper, A. C., & Fearnley, C. J. (2023). Disaster early-warning systems are 'doomed to fail'—only collective action can plug the gaps. *Nature*, 623(7987), 478-482.

4. Operating Warning Systems during intersecting crises: peace and conflict situations (CF &MR)

This lecture explains how warnings operate in function and some of the key challenges involved in their smooth running, including issues related to coordination and methodologies. Early warning should be embedded within national and international multi-agency response and coordination systems. However, many countries are consumed by conflict, multiple hazards / threats, and a lack of resources, and are unable to provide timely and trusted warnings to their citizens. This lecture explores how warnings are managed in peace and conflict situations, how foreign, humanitarian, NGOs, and private sector organisations assist in running warning systems, although the result is often a practical hybrid of conflicting doctrines and incompatible assets.

Dr Maryam Rokhideh (UCL Warning Research Centre) will provide some practical and theoretical perspectives based on her experiences working in the humanitarian sector in conflict areas.

Key readings:

Bolin, B. and Kurtz, L. (2017) Race, Class, Ethnicity, and Disaster Vulnerability. *Handbook of Disaster Research*, pp 181–203.

Buhaug, H., & Uexkull, N. v. (2021). Vicious Circles: Violence, Vulnerability, and Climate Change. *Annual Review of Environment and Resources*, 46(1), 545-568.
conflict contexts. London: ODI.

GFDRR Disasters, Conflict and Fragility: A Joint Agenda -
<https://www.gfdr.org/sites/default/files/documents/5.%20Discussion%20Paper%20on%20Disasters%2C%20Conflict%2C%20and%20Fragility.pdf>

Peters, K. (2021). Beyond disaster vulnerabilities: An empirical investigation of the causal pathways linking conflict to disaster risks, *International Journal of Disaster Risk Reduction*, 55.

Peters, K., Peters, L.E.R., Twigg, C. and Walch, C. (2019). Disaster risk reduction strategies: navigating
Rokhideh, M. (2016). Fixed Subjectivities and the Intertwined Reality of Suffering and Survival in the Democratic Republic of Congo. In *American Anthropological Association Annual Meeting*.

Rokhideh, M. (2017). Peacebuilding and psychosocial intervention: the critical need to address everyday post conflict experiences in northern Uganda. *Intervention*, 15(3), 215-229.

Rokhideh, M. (2021). Leveraging the Peacebuilding Potential of Cross-border Trader Networks in Sub-Saharan Africa. Washington, D.C.: RESOLVE Network.

Walch, C. (2018), Disaster risk reduction amidst armed conflict: informal institutions, rebel groups, and wartime political orders. *Disasters*, 42: S239-S264.

5. Designing warning systems: co-production, inclusivity, accessibility, and poverty (CF)

This lecture reviews how warnings and alert levels are designed, and the various iconographies and styles used. However, beyond this, it is vital to examine the qualitative methodologies used to make warnings

relevant to all and the role of public engagement and co-production. To make warnings truly inclusive everyone needs to be involved in the design of warnings that cover and respond to the full range of human characteristics. These include sex, gender, sexuality, age, race, ethnicity, caste, disabilities (e.g., physical, mental, and cognitive), religion, languages, communication forms, and precarity (e.g., detained, undocumented, homeless, asylum status). This lecture will review how inclusivity works and how to implement beyond any single characteristic, in multiple cross-cutting characteristics, classed as 'intersectional'. Case studies will be used to highlight implementation of inclusivity and to highlight where key gaps remain.

Mhari Gordon (UCL Warning Research Centre / IRDR) will provide a guest lecture. Using interactive and participatory approaches has been strongly suggested as the best way to design and manage warnings which are locally contextualised. It is proposed that all stakeholders share with and inform each other of their understandings of hazards, risks, and mitigation strategies. Gaining knowledge from different situations, contexts, and people allows for the possibility of overcoming some inherent issues of disaster communication not being contextually situated, considering the diversity of needs and abilities of individuals and communities, as well as creating more effective disaster warning systems and preparation procedures. This is of particular importance for members of society who are typically marginalised. For example, asylum seekers and refugees have been found to experience forms of marginalisation, in addition to experiences of racism, harassment, and insecurities in their countries of asylum. It has been found that these can act as predefined limitations of how they may prepare, respond, and recover from hazards and disasters. Disaster communication and warnings has the potential to significantly reduce impacts of disasters, however, they must be designed and used in an inclusive and accessible manner.

Key readings

Chmutina, K., von Meding, J., et al. (2021) 'How the English Language Dominates Disaster Research and Practice', *E-International Relations*. Available at: <https://www.e-ir.info/2021/01/18/how-the-english-language-dominates-disaster-research-and-practice/>

Marlowe, J. et al. (2018) 'A New Guiding Framework for Engaging Diverse Populations in Disaster Risk Reduction: Reach, Relevance, Receptiveness, and Relationships', *International Journal of Disaster Risk Science*, 9(4), pp. 507– 518.

Sou, G. and Cei Douglas, J. (2019) *After Maria: Everyday Recovery from Disaster* (a graphic novel). Available at: <https://gemmasou.com/creative-research/>.

Uekusa, S. and Matthewman, S. (2017) 'Vulnerable and resilient? Immigrants and refugees in the 2010–2011 Canterbury and Tohoku disasters', *International Journal of Disaster Risk Reduction*, 22, pp. 355– 361.

Yore, R. et al. (2023) *Designing Inclusive, Accessible Early Warning Systems: Good Practices and Entry Points*. Available at: <https://www.gfdrr.org/en/publication/designing-inclusive-accessible-early-warning-systems-good-practices-and-entry-points>.

Further readings:

Guadagno, L., Fuhrer, M. and Twigg, J. (2017) *Migrants in Disaster Risk Reduction: Practices for Inclusion*. Geneva. Available at: https://publications.iom.int/system/files/pdf/migrants_in_drr.pdf (Accessed: 1 December 2022).

Hall, S.M., Sou, G. and Pottinger, L. (2021) 'Ethical considerations in creative research: design, delivery and dissemination', in N. Von Benzon et al. (eds) *Creative methods for human geographers*. London: SAGE Publications, pp. 49– 60.

Khan, M. et al. (2022) 'Epistemological freedom: activating co-learning and co- production to decolonise knowledge production', *Disaster Prevention and Management: An International Journal*, 31(3), pp. 182–192. Available at: <https://doi.org/10.1108/DPM-03-2021-0070/FULL/PDF>.

Lejano, R.P., Rahman, M.S. and Kabir, L. (2020) 'Risk Communication for Empowerment: Interventions in a Rohingya Refugee Settlement', *Risk Analysis*, 40(11), pp. 2360–2372. Available at: <https://doi.org/10.1111/risa.13541>.

Marlowe, J. et al. (2022) 'Disaster communications with resettled refugees: Six principles of engagement', *International Journal of Disaster Risk Reduction*, 67. Available at: <https://doi.org/10.1016/j.ijdrr.2021.102672>.

O'Brien, S. et al. (2018) 'Language translation during disaster: A comparative analysis of five national approaches', *International Journal of Disaster Risk Reduction*, 31, pp. 627–636. Available at: <https://doi.org/10.1016/J.IJDRR.2018.07.006>.

Ogie, R. et al. (2018) 'Disaster Risk Communication in Culturally and Linguistically Diverse Communities: The Role of Technology', *Proceedings 2018*, Vol. 2, Page 1256, 2(19), p. 1256. Available at: <https://doi.org/10.3390/PROCEEDINGS2191256>.

Translators Without Borders (2017b) Putting Language on the Map in the European Refugee Response Putting Language on the Map. Available at: <https://translatorswithoutborders.org/wp-content/uploads/2017/04/Putting-language-on-the-map.pdf> (Accessed: 28 May 2023).

Translators without Borders and Oxfam (2021) Six tips for humanitarians working with interpreters on sensitive topics. Available at: <https://translatorswithoutborders.org/resource/tip-sheet-interpretation-and-sensitive-topics-en/> (Accessed: 28 May 2023).

6. Perception and communication of risk and uncertainty – mixed methods and quantitative approaches (SD)

In week 6 we will learn about perception and communication of risk and uncertainty. In the first half of the session, we will study the distinction between risk and our perception of risk, and why risk perception matters in the context of warning systems. We will also learn a bit about how our brains process risk and uncertainty information, and about the factors that are most influential on our risk perceptions. Next, we will consider what makes for 'good' communication of risk and uncertainty, and how we might evaluate the effects of our warning communications on an audience. We will draw on examples from numerous risks, including things such as hurricanes, earthquakes and infectious diseases.

In the second half of the session, we will have a guest lecture from IRDR's Rebekah Yore. Rebekah is a part time PhD student and has worked with a number of humanitarian organisations on various preparedness projects and response operations. She focusses on themes within microinsurance, warning systems and transitional shelter and housing in her research. Rebekah's section of the lecture will discuss the challenges around communicating risk and issuing warnings for extreme strength hazards based on her own work, looking at some of the successes and failures from the Philippines, the Caribbean and Japan.

Key readings:

Dryhurst S., Schneider C.R., Kerr J.K., Freeman A.L.J., Recchia G., van der Bles A. M., Spiegelhalter D. & van der Linden S. (2020) Risk perceptions of COVID-19 around the world, *Journal of Risk Research*, 23:7-8, 994-1006, DOI: 10.1080/13669877.2020.1758193

Freeman A. L. J., Kerr J., Recchia G., Schneider C. R., Lawrence A. C. E., Finikarides L., Luoni G., Dryhurst S. and Spiegelhalter D. (2021). Communicating personalized risks from COVID-19: guidelines from an empirical study *R. Soc. open sci.* **8**: 201721

Naylor, Faure Walker & Suppasri (2018) Early Warning, evacuation and temporary housing of the elderly affected by the Great East Japan Earthquake and Tsunami -. *International Journal of Disaster Risk Reduction*, *31*, 302-310 [<http://dx.doi.org/10.1016/j.ijdrr.2018.05.022>]

Slovic P., Finucane M.L., Peters E. & MacGregor D.G. (2007). The affect heuristic. *European Journal of Operational Research*, *177*, p 1333-1352

van der Bles A. M., van der Linden S., Freeman A. L. J., Mitchell J., Galvao A. B., Zaval L. and Spiegelhalter D. J. (2019). Communicating uncertainty about facts, numbers and science. *R. Soc. open sci.* **6**: 181870

Yore R. & Faure Walker J. (2021). Early warning systems and evacuation: rare and extreme versus frequent and small-scale tropical cyclones in the Philippines and Dominica. *Disasters*, **45**, 691-716.

7. Assessment: Oral Presentations on key policy solutions

Oral presentations for Assignment 1 will take place during the session. Key policy recommendations for the assigned module case study will be presented. The presentations and discussions will be peer reviewed and form peer learning.

8. Deciding and communicating to create effective warnings – qualitative approaches (CF)

This lecture reviews the common challenges arising from seeking to develop effective warnings. This includes examining who is making the decisions and how, what communication protocols are in place, and how standardisations of warnings work to serve both local and national (and sometimes international) interests. A key to making warnings work is integration and embedding them as long-term social processes that integrate preparedness, response, recovery, and mitigation. Tools to do this can be developed by integrating education, exchange, and engagement across the many stakeholders at different levels (from community to government), and over differing time scales to build, operate, and maintain effective early warning systems. Additionally traditional and indigenous knowledge is critical for effective warnings and several examples will be discussed.

A simulation exercise for an erupting volcano will be conducted so students can see how successful they were in saving lives based on warnings.

Key readings:

Doyle, E. E., & Becker, J. S. (2022). Understanding the Risk Communication Puzzle for Natural Hazards and Disasters. In *Oxford Research Encyclopedia of Natural Hazard Science*.

Doyle, E. E., Johnston, D. M., McClure, J., & Paton, D. (2011). The communication of uncertain scientific advice during natural hazard events.

Fearnley, C. J. (2013). Assigning a volcano alert level: negotiating uncertainty, risk, and complexity in decision-making processes. *Environment and Planning a*, *45*(8), 1891-1911.

Fearnley, C. J., & Beaven, S. (2018). Volcano alert level systems: managing the challenges of effective volcanic crisis communication. *Bulletin of Volcanology*, *80*, 1-18.

Fearnley, C. J., Bird, D. K., Haynes, K., McGuire, W. J., & Jolly, G. (Eds.). (2018). *Observing the volcano world: volcano crisis communication*. Cham: Springer International Publishing.

Haynes, K., Barclay, J., & Pidgeon, N. (2008). The issue of trust and its influence on risk communication during a volcanic crisis. *Bulletin of Volcanology*, 70, 605-621.

Lindell, M. K., & Perry, R. W. (2012). The protective action decision model: Theoretical modifications and additional evidence. *Risk Analysis: An International Journal*, 32(4), 616-632.

Mileti, D. S., & Sorensen, J. H. (1990). Communication of emergency public warnings. *Landslides*, 1(6), 52-70.

Potter, S.H., Kreft, P.V., Milojev, P., Noble, C., Montz, B., Dhellemmes, A., Woods, R.J. and Gauden-Ing, S., (2018). The influence of impact-based severe weather warnings on risk perceptions and intended protective actions. *International journal of disaster risk reduction*, 30, pp.34-43.

Rahn, M., Tomczyk, S., Schopp, N., & Schmidt, S. (2021). Warning messages in crisis communication: Risk appraisal and warning compliance in severe weather, violent acts, and the COVID-19 pandemic. *Frontiers in psychology*, 12, 557178.

Strahan, K., & Watson, S. J. (2019). The protective action decision model: When householders choose their protective response to wildfire. *Journal of Risk Research*, 22(12), 1602-1623.

9. Building warnings for the future: role of tech, talking, and time (CF & SD)

This lecture explores how warnings of the future may look. This includes looking at the role of technology (cell broadcasting and social media, and GIS), the need to talk effectively (community based and driven warnings) and looking forward in time (more extreme climatic hazard events, more displaced populations). Whilst technology provides opportunities for remote monitoring, community-based early warning mechanisms that are hard-wired into a country's risk reduction governance structure provide a more cost effective and efficient early warning mechanism for impending hazards, impacts and loss. However, for marginalised or displaced populations this is not as easy to implement, so we discuss some future solutions that include redundancy, multi-hazard warnings systems, and sci-fi movies.

A guest lecture by Nick Buchan (UCL Warning Research Centre / STS) will highlight the role of warnings for longer term unknown hazards and how warnings can be used in the context of existential, and future hazard risks. A simulation on misinformation will be run.

Key readings

de Cordoba Farini, C. F. (2023). Are current warning and responses systems suitable to respond to emerging infectious diseases?. *Research Directions: One Health*, 1-29.

Fekete, A., & Sandholz, S. (2021). Here comes the flood, but not failure? Lessons to learn after the heavy rain and pluvial floods in Germany 2021. *Water*, 13(21), 3016.

Funk, C., Shukla, S., Thiaw, W.M., Rowland, J., Hoell, A., McNally, A., Husak, G., Novella, N., Budde, M., Peters-Lidard, C. and Adoum, A., (2019). Recognizing the famine early warning systems network: over 30 years of drought early warning science advances and partnerships promoting global food security. *Bulletin of the American Meteorological Society*, 100(6), pp.1011-1027.

Little, H. (2022). The science communication of 'Don't Look Up'. *Journal of Science Communication*, 21(5), C01. And the film: <https://www.netflix.com/gb/title/81252357>

Ord, T., Mercer, A., and Danruther, S., (2001) [Future Proof: the opportunity to transform the UK's resilience to extreme risks](http://amirrorclear.net/files/future-proof.pdf). The Centre for Long-Term Resilience. <http://amirrorclear.net/files/future-proof.pdf>

- Prasad, A. (2022). Anti-science misinformation and conspiracies: COVID–19, post-truth, and science & technology studies (STS). *Science, Technology and Society*, 27(1), 88-112.
- Ripple, W. J., Wolf, C., Newsome, T. M., Barnard, P., & Moomaw, W. R. (2020). World scientists' warning of a climate emergency. *BioScience*, 70(1), 8-100.
- Smith, K. R., Grant, S., & Thomas, R. E. (2022). Testing the public's response to receiving severe flood warnings using simulated cell broadcast. *Natural hazards*, 112(2), 1611-1631.
- UNISDR (1997), 'Report on Early Warning for Technological Hazards.' Accessed via:
<https://www.unisdr.org/2006/ppew/whats-ew/pdf/report-on-ew-for-technological-hazards.pdf>

10. Integrating and Evaluating Warnings: assessing warnings success and their sustainability (CF and Ana (Kim-Anh Chau))

This lecture reviews the important role of how to integrate warnings within the broader Disaster Risk Reduction and Climate Change Adaptation community, whilst also considering how we evaluate warnings. What makes them successful, and how can we measure this? How can warnings be sustainable? We explore some of the answers to these tricky questions alongside how to integrate traditional and indigenous knowledges into warnings, to bring different knowledges together.

The guest lecture by Ana Chau (UCL Warning Research Centre / IRDR) focuses on the evaluation of warnings in particular, and why this is important.

Key readings

- Aguirre-Ayerbe, I., Merino, M., Aye, S. L., Dissanayake, R., Shadiya, F., & Lopez, C. M. (2020). An evaluation of availability and adequacy of Multi-Hazard Early Warning Systems in Asian countries: A baseline study. *International journal of disaster risk reduction*, 49, 101749.
- Glantz, M. H., & Ramirez, I. J. (2018). Improvisation in the time of disaster. *Environment: Science and Policy for Sustainable Development*, 60(5), 4-17.
- Hoffmann, D., Ebert, E. E., Mooney, C., Golding, B., & Potter, S. (2023). Using value chain approaches to evaluate the end-to-end warning chain. *Advances in Science and Research*, 20, 73-79.
<https://doi.org/10.5194/asr-20-73-2023>
<https://blog.metoffice.gov.uk/2022/11/01/the-importance-of-evaluation-for-early-warnings/>
- Lenorovitz, D. R., Leonard, S. D., & Karnes, E. W. (2012). Ratings checklist for warnings: A prototype tool to aid experts in the adequacy evaluation of proposed or existing warnings. *Work*, 41(Supplement 1), 3616-3623.
- Masinde, M. (2014, September). An effective drought early warning system for sub-Saharan Africa: Integrating modern and indigenous approaches. In *Proceedings of the Southern African Institute for Computer Scientist and Information Technologists Annual Conference 2014 on SAICSIT 2014 Empowered by Technology* (pp. 60-69).
- McBride, S.K., Bostrom, A., Sutton, J., de Groot, R.M., Baltay, A.S., Terbush, B., Bodin, P., Dixon, M., Holland, E., Arba, R. and Laustsen, P., 2020. Developing post-alert messaging for ShakeAlert, the earthquake early warning system for the West Coast of the United States of America. *International Journal of Disaster Risk Reduction*, 50, p.101713.
- Meléndez-Landaverde, E. R. & Sempere-Torres, D. (2022). Design and evaluation of a community and impact-based site-specific early warning system (SS-EWS): The SS-EWS framework. *Journal of Flood Risk Management*: pp. 1-16.

Quansah, J. E., Engel, B., & Rochon, G. L. (2010). Early warning systems: a review. *Journal of Terrestrial Observation*, 2(2), 5.

Rabonza, M. L., et al. (2022). "Learning From Success, Not Catastrophe: Using Counterfactual Analysis to Highlight Successful Disaster Risk Reduction Interventions." *Frontiers in Earth Science* 10. <https://doi.org/10.3389/feart.2022.847196>

Wogalter, M. S., Conzola, V. C., & Smith-Jackson, T. L. (2002). based guidelines for warning design and evaluation. *Applied ergonomics*, 33(3), 219-230.

Important policy information

Details of college and departmental policies relating to modules and assessments can be found in the STS Student Handbook www.ucl.ac.uk/sts/handbook

All students taking modules in the STS department are expected to read these policies.