Session 6: Fire Technology for Social Resilience

Human-centered Approach to Wildfire Research

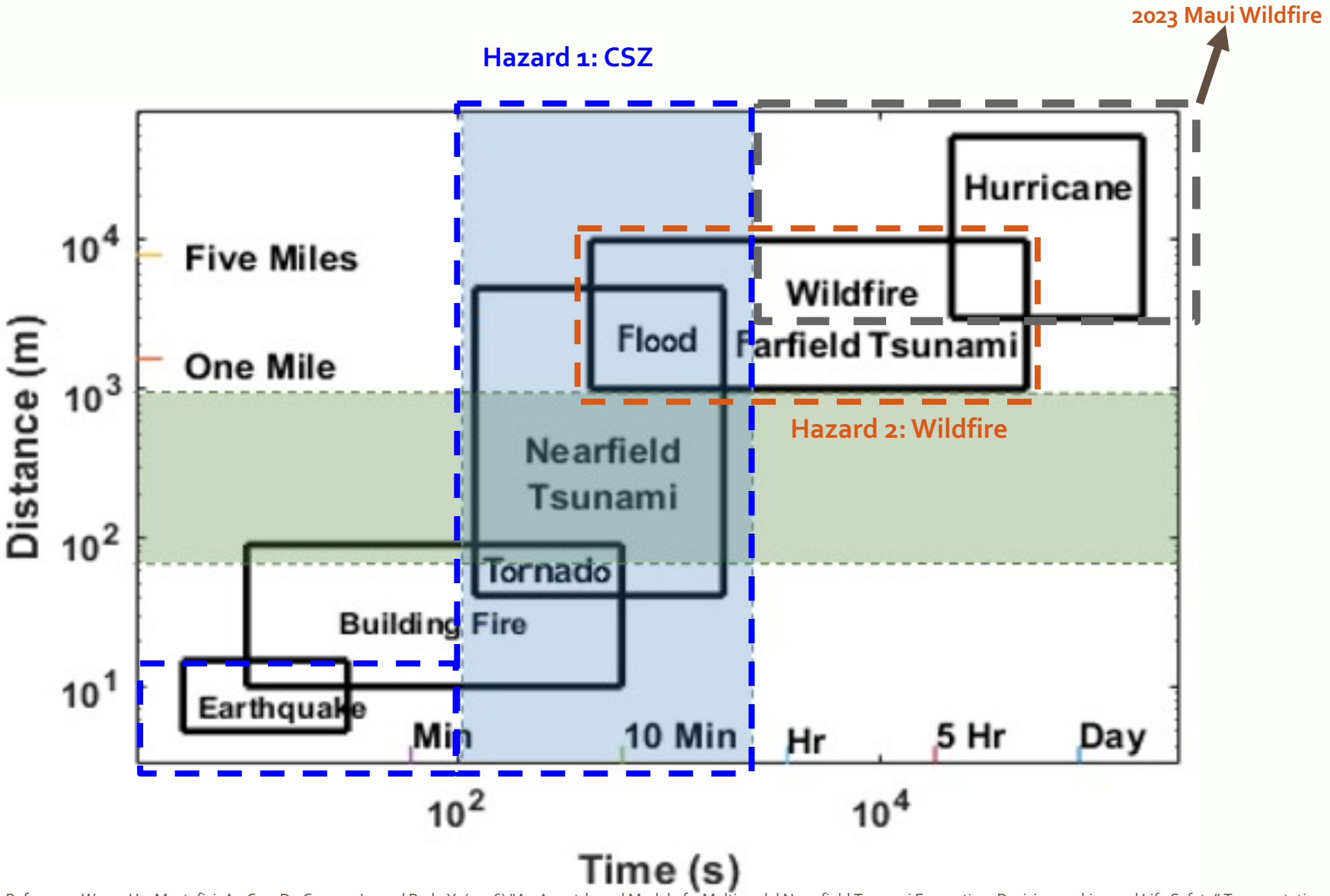
Haizhong Wang, Ph.D., Professor
School of Civil and Construction Engineering
Oregon State University, Corvallis, OR 97331, USA

The Social-Ecological Consequences of Future Wildfire in the West: A Workshop
National Academy of Science, Irvine, CA, June 13-14, 2024

The 2020 Almeda Fire

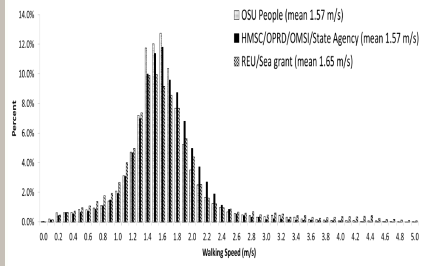
Sources: Photo was taken by Dan Caples, Ashland Fire & Rescue Captain, shared by Kelly Burn, Ashland Emergency Manager

Temporal and Spatial Footprints of Various Types of Disasters

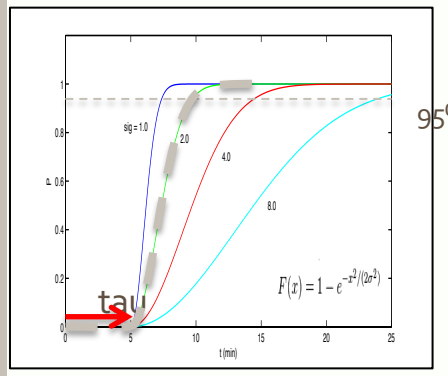


Reference: Wang, H., Mostafizi, A., Cox, D., Cramer, L., and Park, Y. (2016) "An Agent-based Model of a Multimodal Near-field Tsunami Evacuation: Decision-making and Life Safety" Transportation Research Part C: Emerging Technology, 64, 86-100.

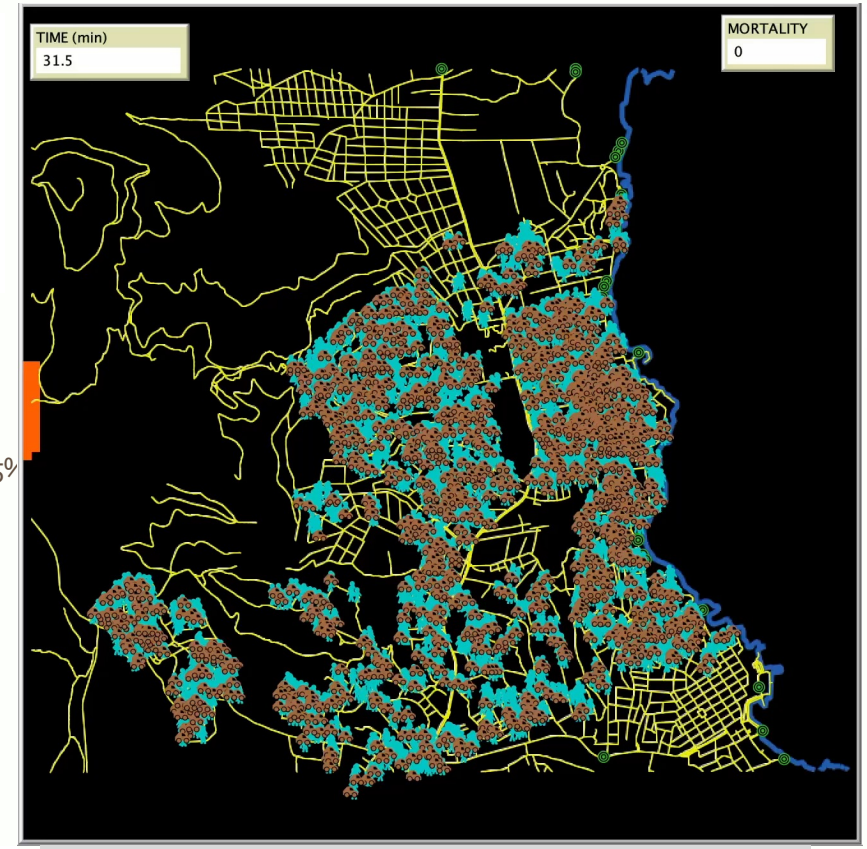
Case Study: The 2018 Attica Wildfire in Greece – from Mati to Maui



Walking/Driving Speeds

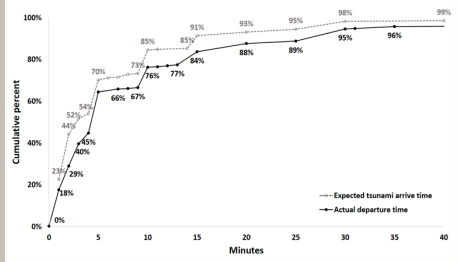


Milling Time



Wildfire Propagation (FlamMap)

Evacuation Route Systems



Hazard Arrival Time and Departure Time

Evacuation Shelters

Reference: (Siam et al., 2023), Tweedie et al. (1986) , Sorensen (2000), Lindell and Prater (2007)

Session 6: Increasing Social Resilience of Wildfire through Technology

Critical Knowledge Gaps (CKG)

CKG 1: Human Dimension: *Decision-making under Uncertainty for Residents, Tourists, Emergency Managers/Community Leaders*

More on Public, but less on Emergency Managers who issue warning or alerts

CKG 2: Infrastructure Dimension: *Warning and Transportation*

Warning: Either no warning at all or warning messages come too late for life safety

Warning decision structure from communities and variations

Transportation: Evacuation route system availability and capacity, multimodal

CKG 3: Natural Dimension: *Model wildfire spread in rapid, accurate, and cost-effective manner to inform critical decisions regarding how much time is available to protect a community*

FlamMap/FARSite/Fsim

Critical Research Needs (CRN)

CRN 1: Integrated and Interdisciplinary Approaches/Methods: Breaking silos and **integrating multiple disciplines, datasets, and community knowledge**

Use Data to Drive Models

Bottom-up Approach

CRN 2: Sheltering Research for Wildfire: communities need protective shelters, Temporary Refuge Areas (TRAs), Co-design and co-production with communities

Shelter technology innovations in Australia

Sheltering behavior & capacity research

Costs

CRN 3: Decision Support Tools/Scenario Analysis Tools: to assess warning failures or successes and connect the warning, milling processes with the evacuation decision behaviors in disaster fires

Need tools/systems to monitor evacuation progress during an event

Leverage large-scale cell phone and social media data

Notes: credits also goes to Dr. Tom Cova, Dr. Michael Lindell for discussions.

Thank you for your attention!

Any Questions?