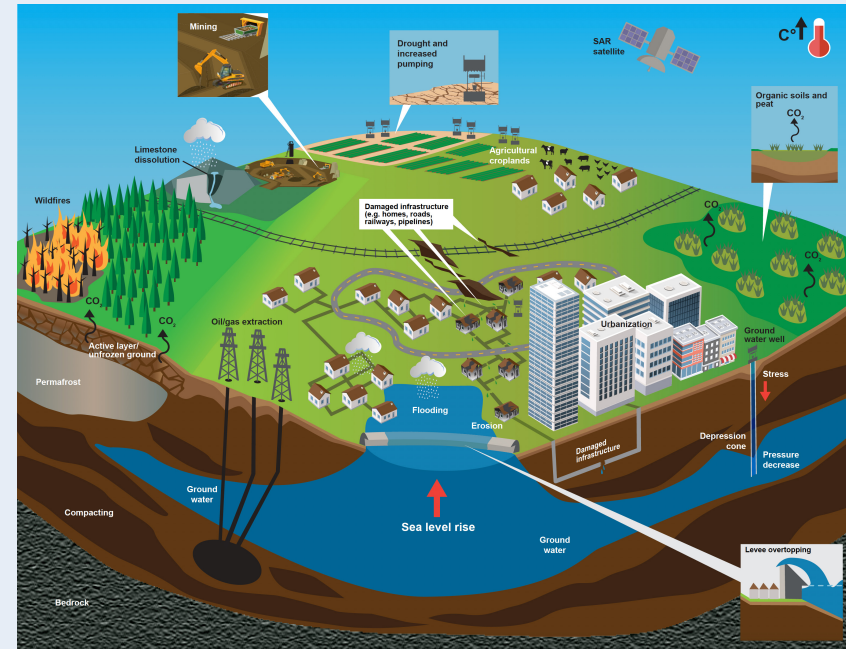


Land Subsidence Drivers, Interactions, and Cascading Impacts: Opportunities and Insights

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Drivers of Land Subsidence (LS)

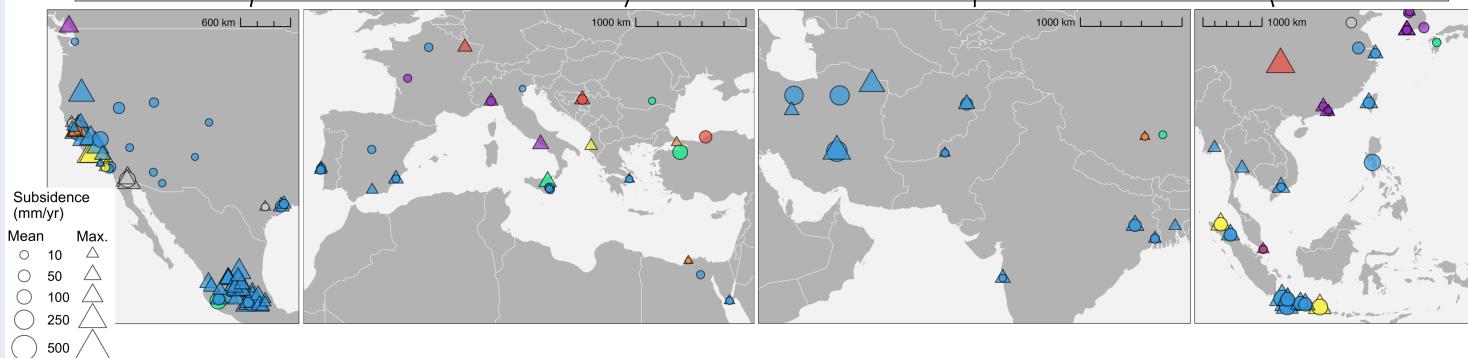
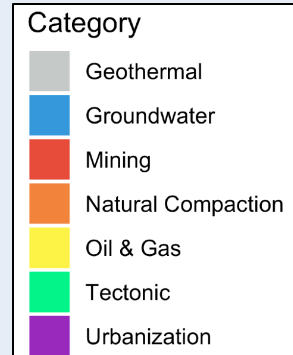
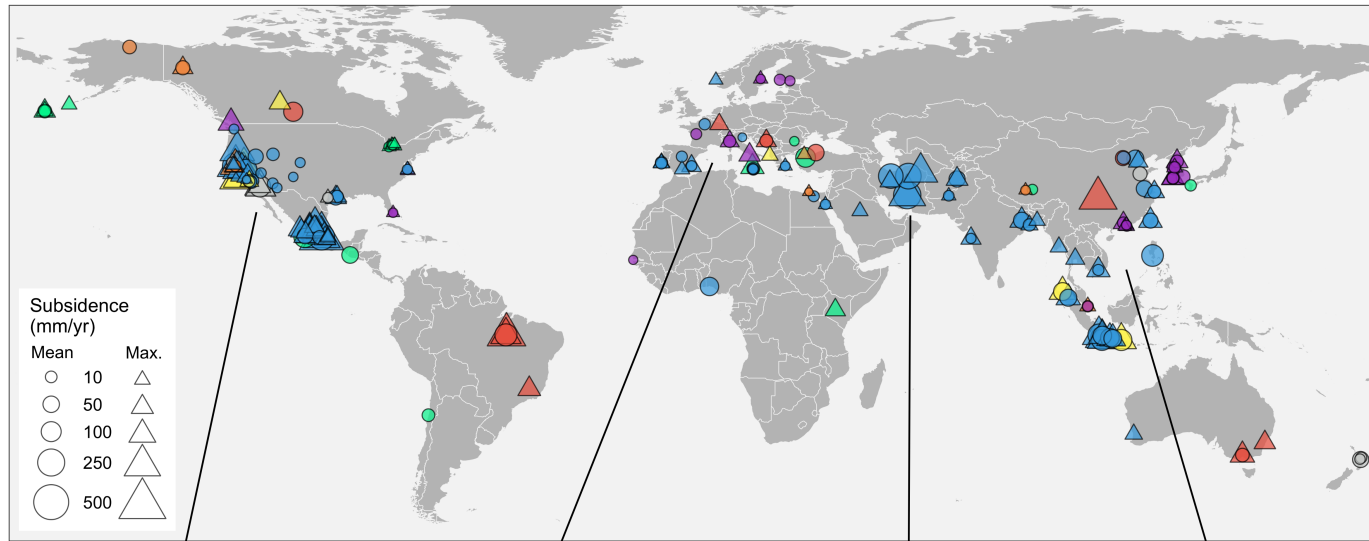
Examples

- Compaction
- Permafrost degradation
- Natural resources exploitation
- Peatland burning
- Dewatering
- Urbanization

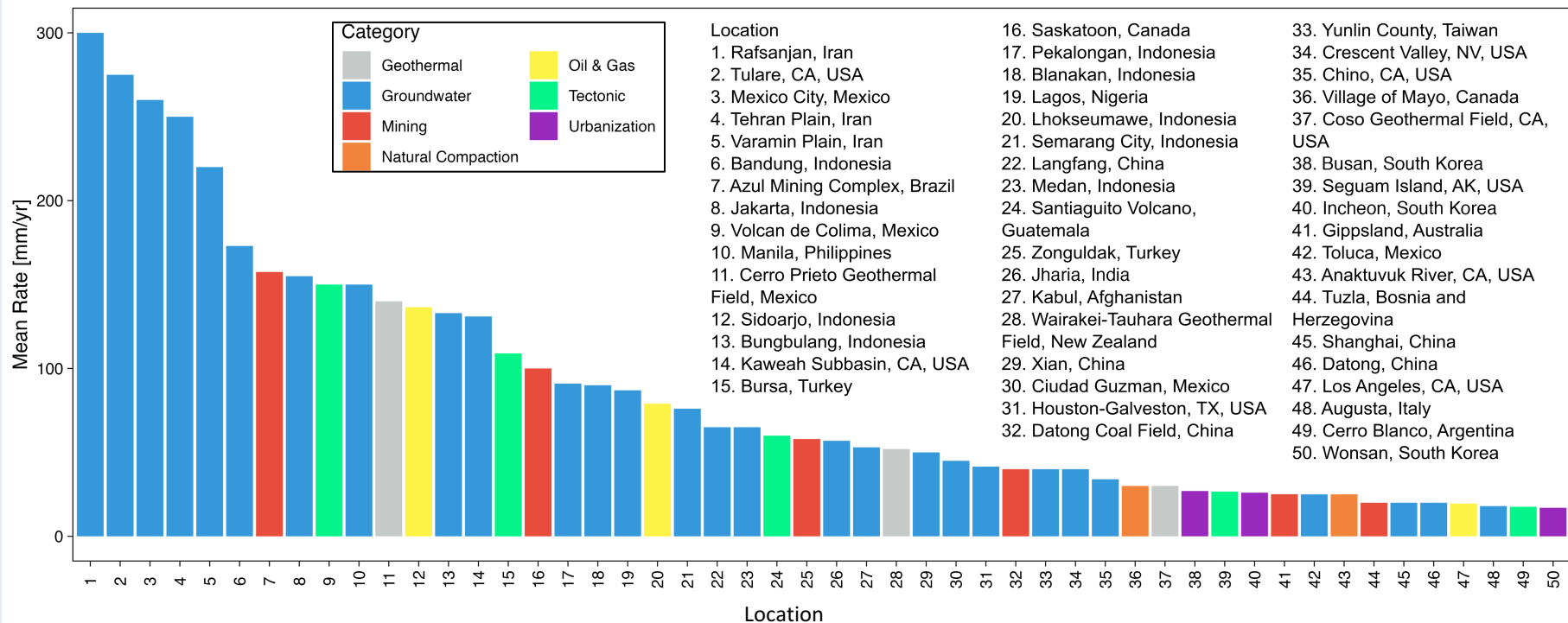
LS Impacts



Global Mean and Maximum LS Rates and Drivers

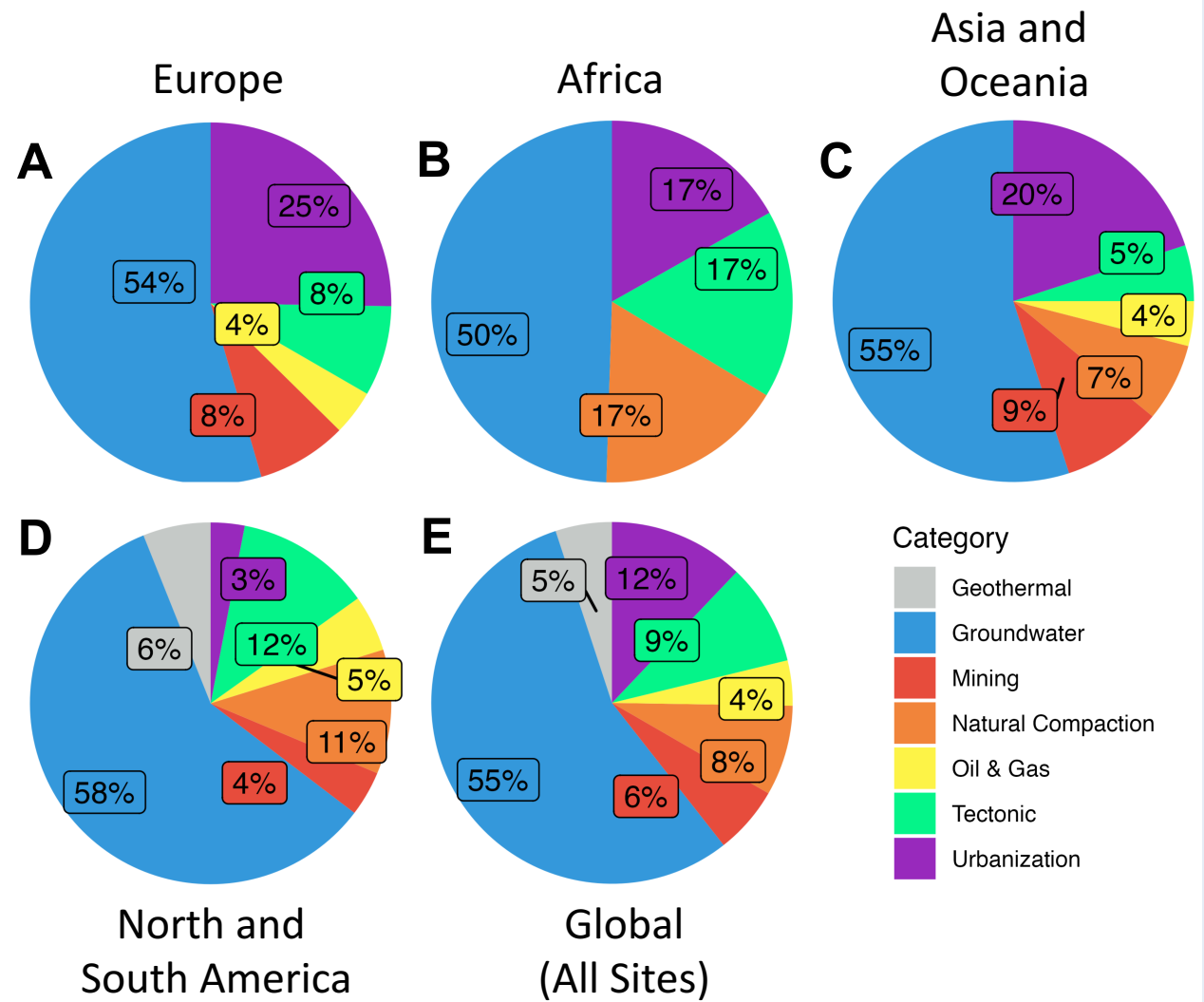


Top 50 Largest Average LS Rates Across the Globe



Breakdown of LS Drivers by Region and Type

Anthropogenic drivers of LS are predominant across the globe



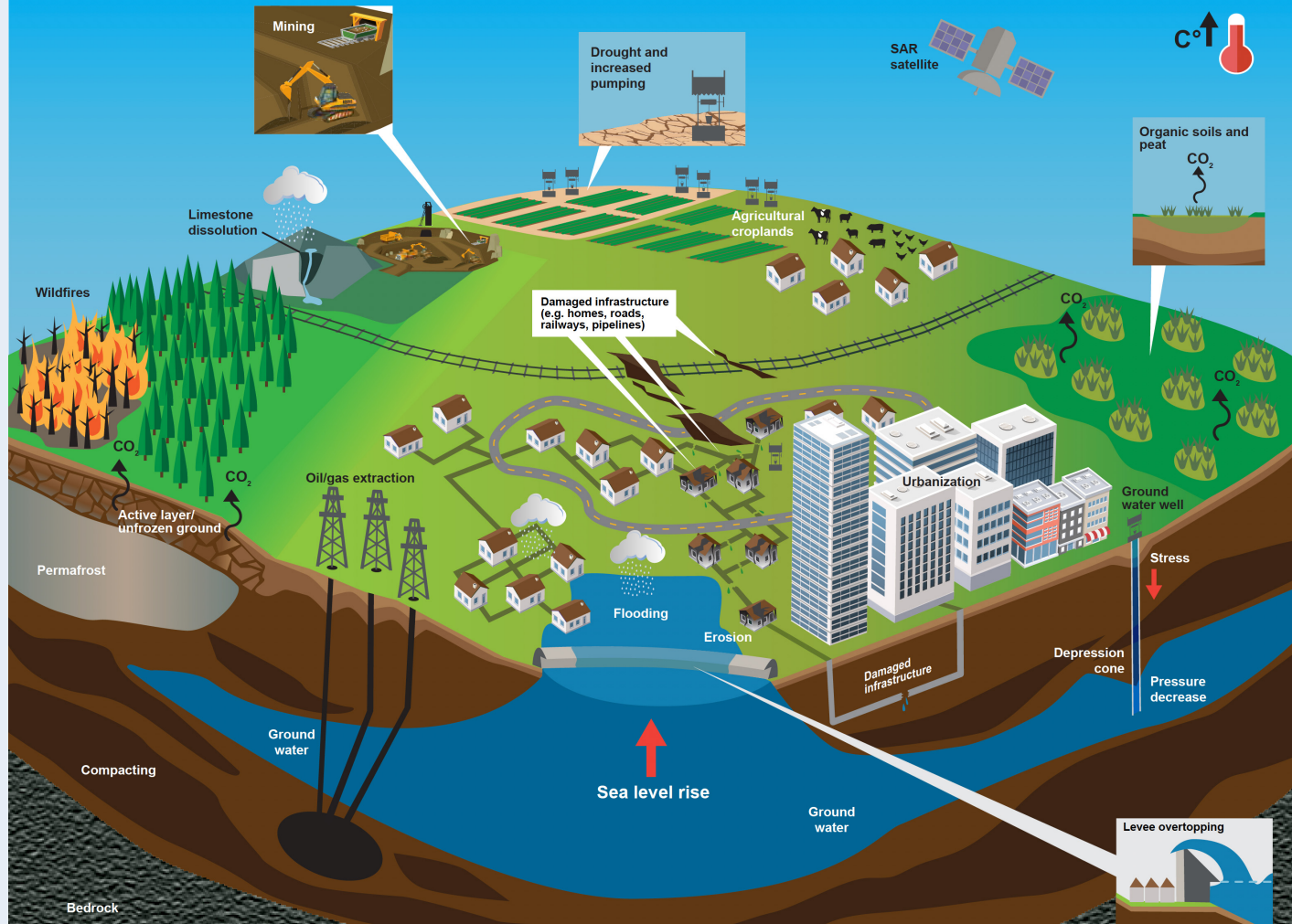
Interplay of Climate Extremes and LS Impacts

Climate and Compounding Extremes

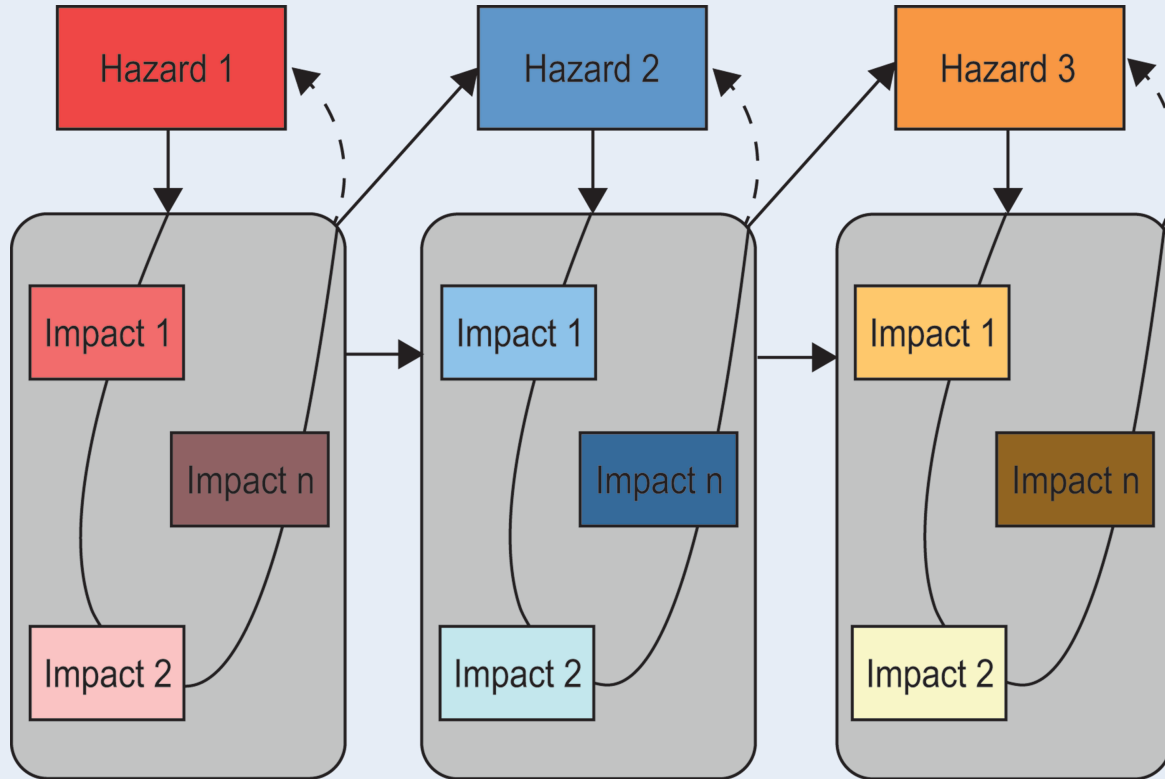
- e.g., flood, drought, wildfire, sea level rise

Impacts

- e.g., damaged roads, pipelines, irrigation systems; permanent loss of aquifer capacity; release of CO₂ from soil to atmosphere

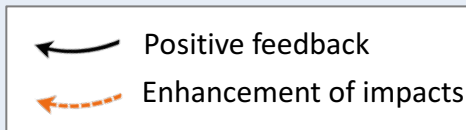
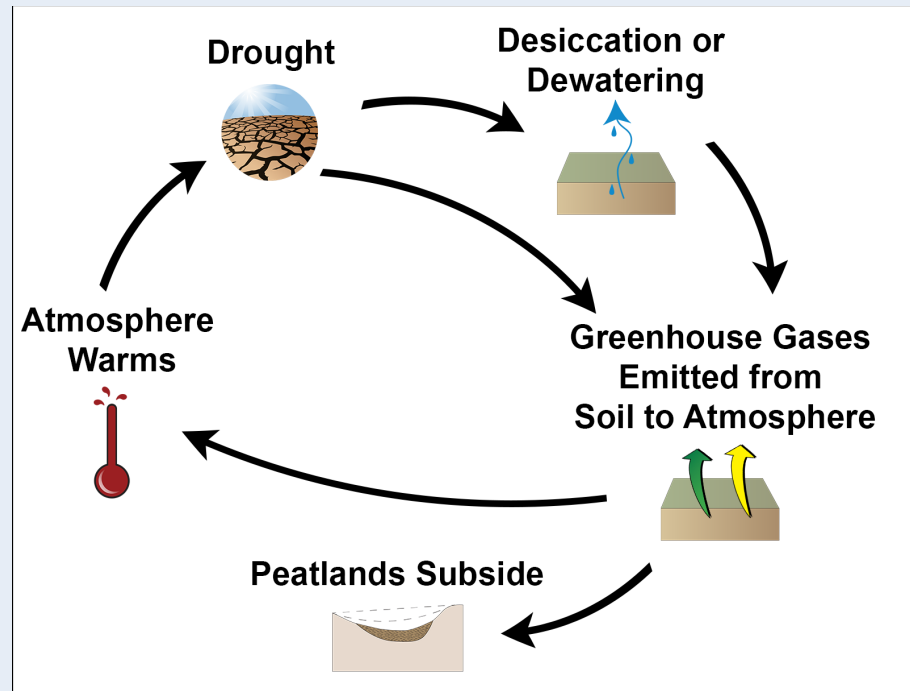
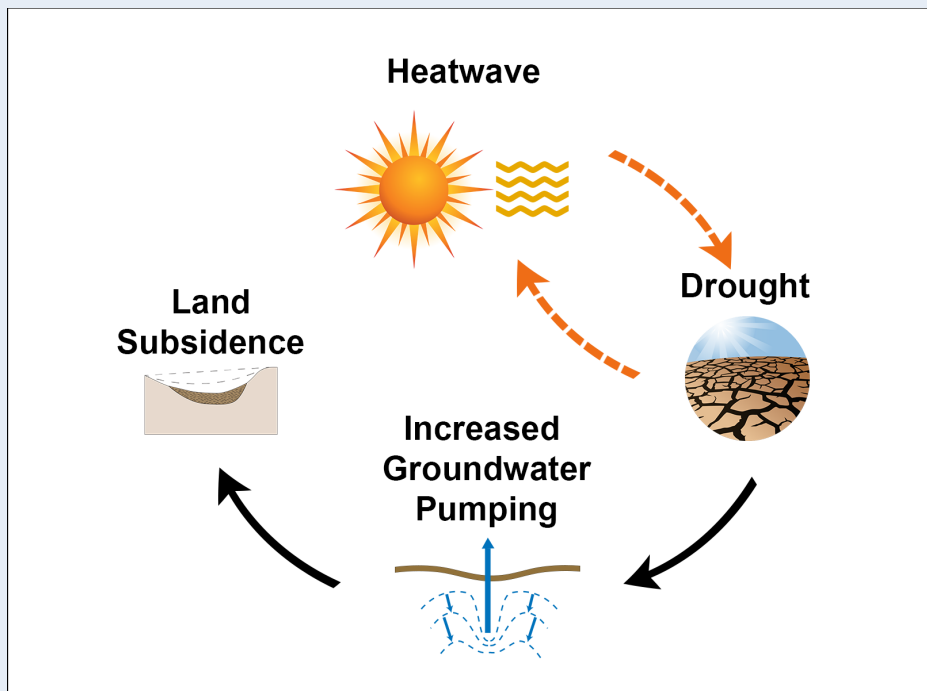


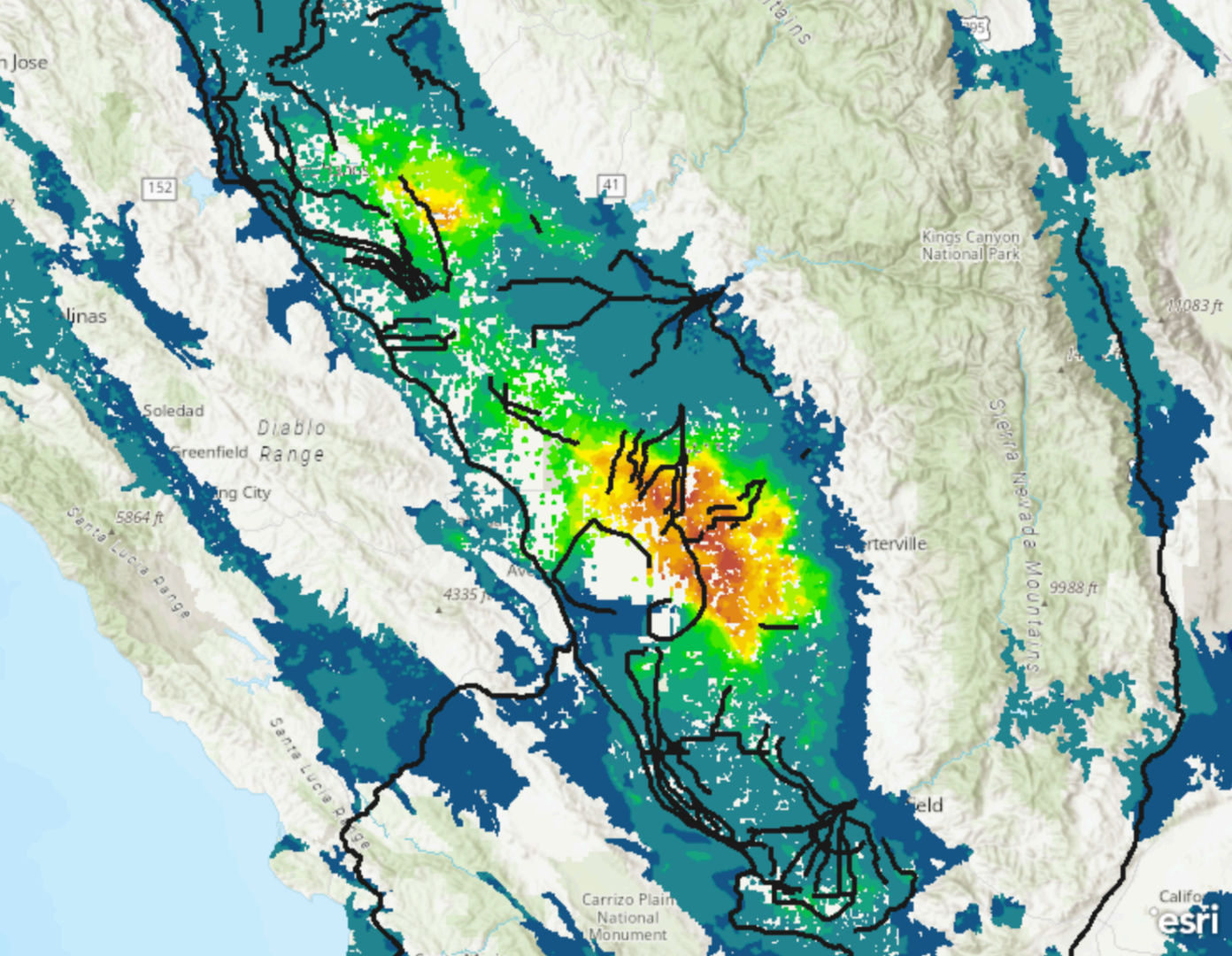
Impact Cascades and Feedbacks



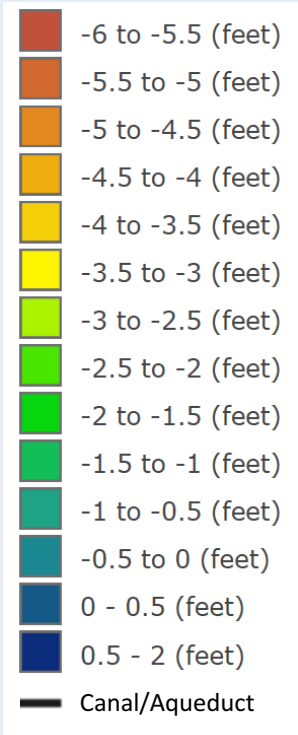
A *necessary* component of understanding cascading impacts lies in observing and modeling their significant role in *feedbacks*

Interplay Between Drought and LS



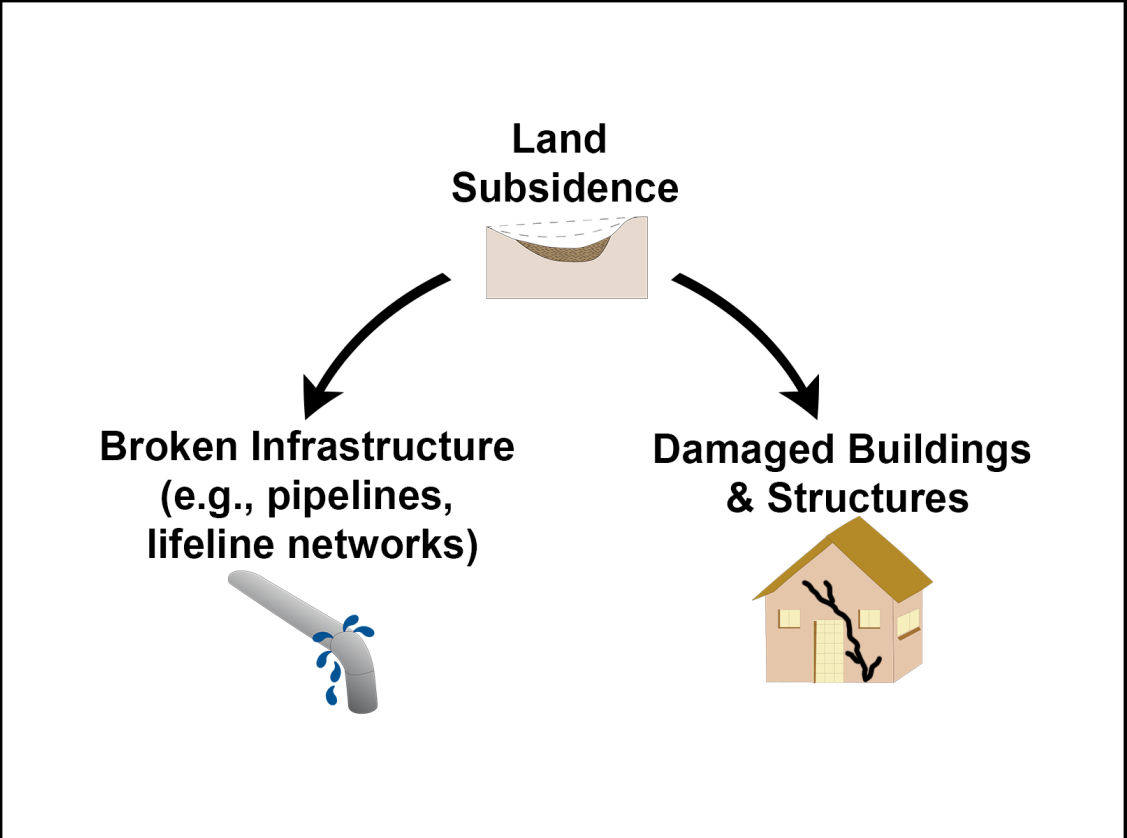
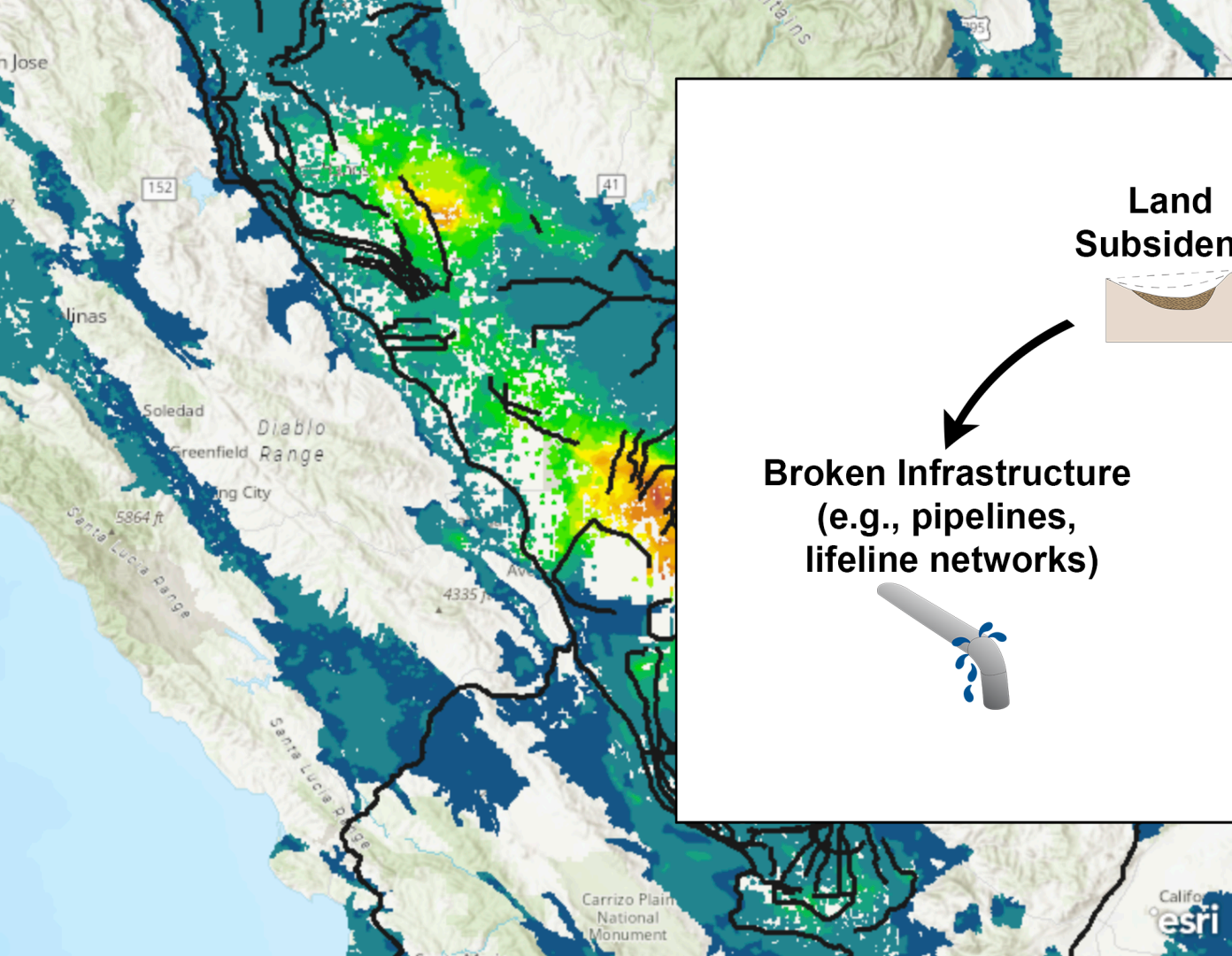


Total Subsidence from 2015-06-03 to 2022-07-01

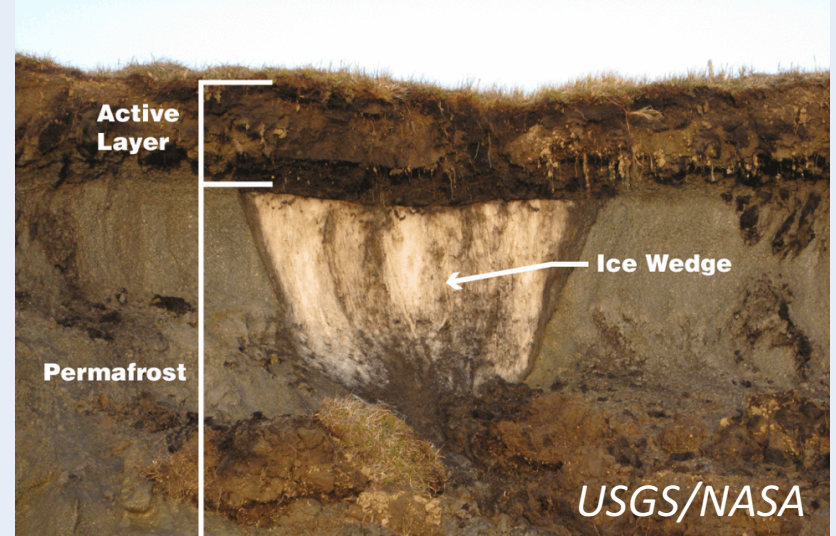
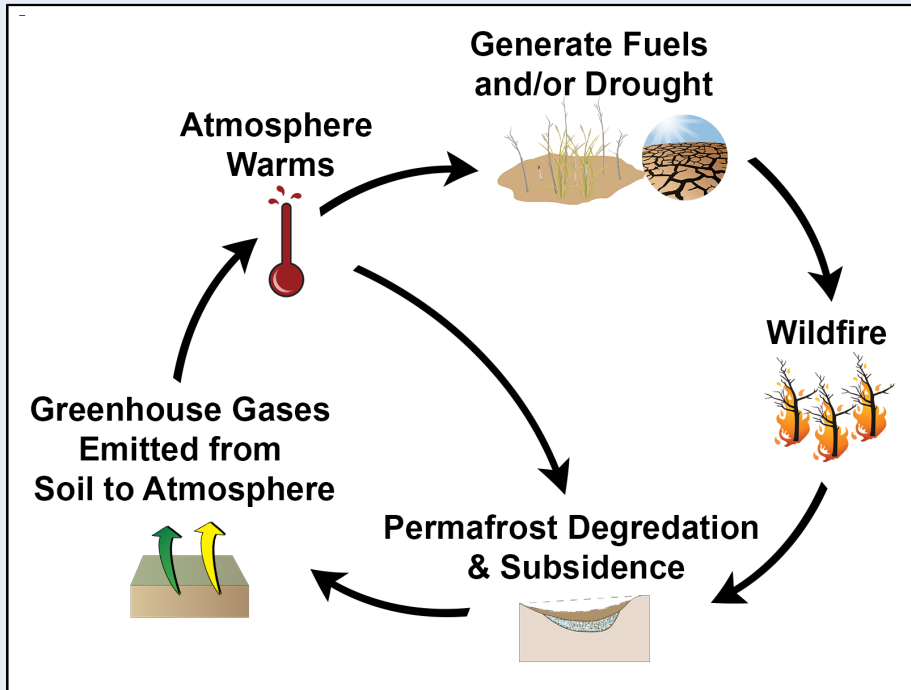


Data Source: CA DWR





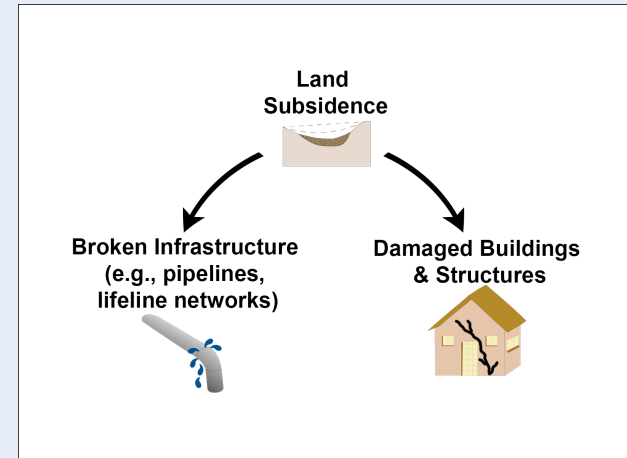
Permafrost-Carbon Feedback Loop



Conclusions

To improve LS mitigation and adaptation strategies,

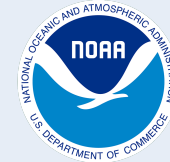
- There is a need for global mapping of LS and developing common global LS frameworks and integrated models
- We must continue to better understand the interplay among LS impacts, climate and compound extremes, and land-cover and land-use changes
- Concerted, interdisciplinary efforts are needed



Acknowledgements

Huning et al. (2024). Global land subsidence: Impact of climate extremes and human activities, Rev of Geophys, 62, e2023RG000817.

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Thank you!

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