

Caught between extremes: Understanding compound risk during drought-to-flood events in the Horn of Africa



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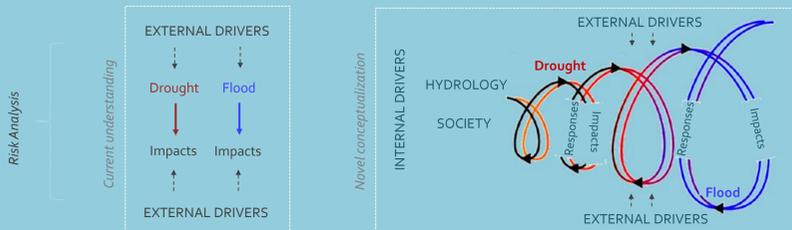
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PERFECT STORM: 'STORYLINES OF FUTURE EXTREMES' (2021-2025)

Motivation

Despite the large economic losses and casualties, cascading drought-to-flood events are rarely studied. Impacts are still often attributed to drought or flood, thus failing to take into account the mechanisms that arise from the interaction between these extreme events and between them and the society.

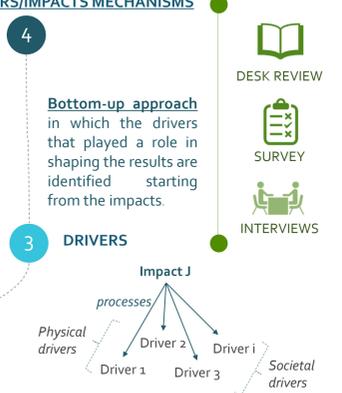
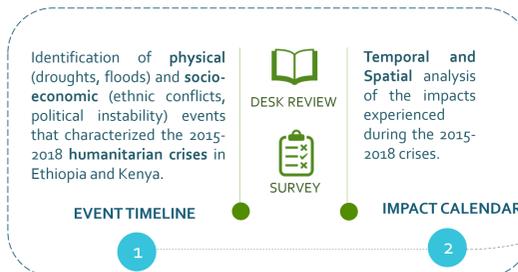
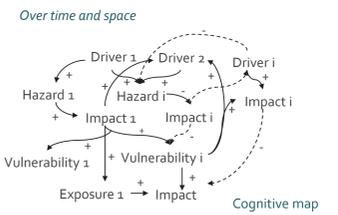


Droughts and floods are caused by extremes of the same hydrological cycle and hence are correlated by dynamic feedbacks, strongly interlinked with human processes. These interactions increase in complexity in **fragile contexts**, where internal ethnic conflicts, unstable governments, and high levels of poverty could affect the hydrosocial system.

Objectives & Methods

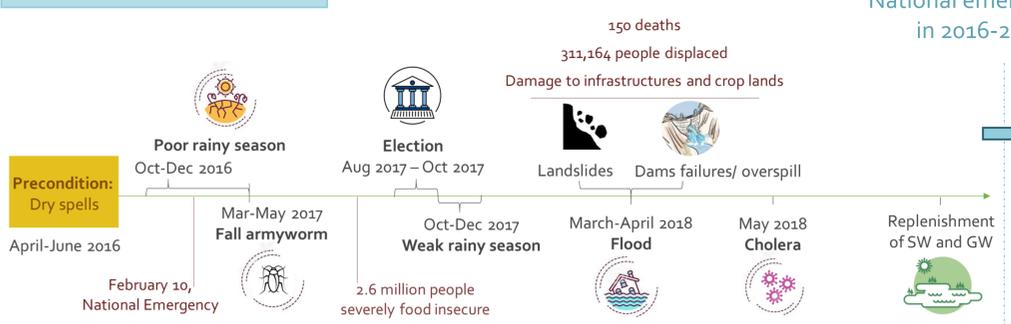
Research Objective:

Investigate spatiotemporal interrelations between risk components across the societal and physical systems in a fragile context, during cascading drought-to-flood events



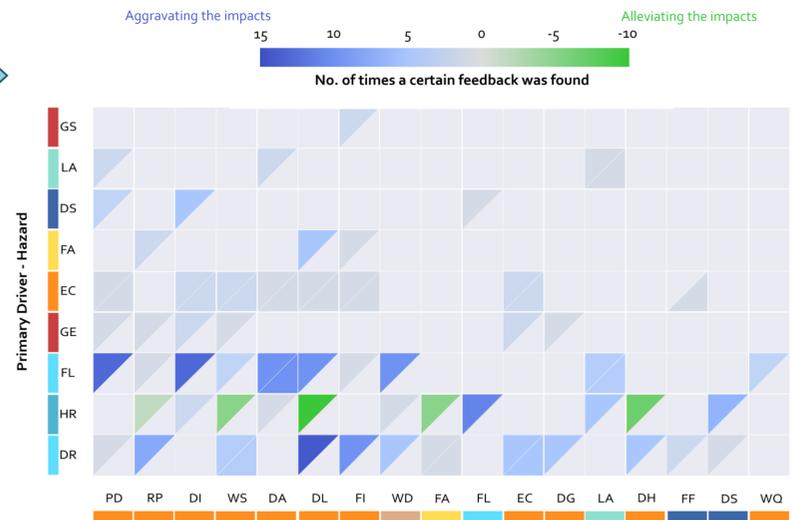
Results & Discussion

1. Events timeline from 2016 to 2018

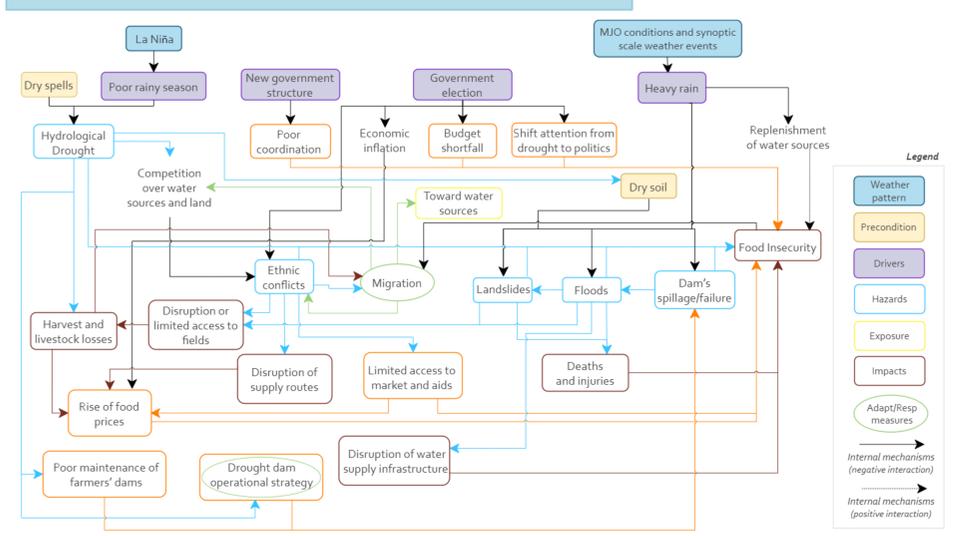


KENYA
National emergencies in 2016-2018

2. Heatmaps: drivers & impacts



3. Interactions between risk components (physical and societal system)

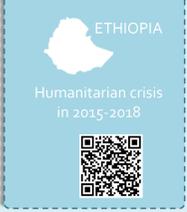


- Heavy rain after the drought alleviated impacts only in certain areas.
- Prolonged government election and the new government structure exacerbated drought-related impacts;
- Increased exposure and vulnerability to floods due to some drought response/adaptation measures;
- Reinforcing mechanisms between Drought, Migration & Conflict;

GROUP	KEY EVENT	CODE
HYDROLOGICAL	Flood	FL
HYDROLOGICAL	Drought	DR
GEOPHYSICAL	Landslide/Mudslide	LA
ATMOSPHERIC	Heavy Rain	HR
BIOPHYSICAL	Dam's Spillage/Failure	DS
BIOPHYSICAL	Forest/Bush Fire	FF
PLANT/ANIMAL PESTS	Fall Armyworm	FA
DISEASE OUTBREAKS	Water-Borne Disease	WD

GROUP	KEY EVENT	CODE
SOCIO-ECONOMIC	Ethnic Dispute/Violence	EC
	Food Insecurity	FI
	Population Displacement	PD
	Rise of Staple Food Price	RP
	Death and Injuries	DI
	Damage to Infrastructure	DA
	Damage to Livestock/Crops	DL
POLITICAL DISRUPTION	Decline in GDP	DG
	Decrease in Hydro-Power	DH
	Water Shortage	WS
POLITICAL DISRUPTION	Poor Water Quality	WQ
	Government Election	GE
POLITICAL DISRUPTION	New Government Structure	GS

- Drought and flood have the highest number of correlations with the experienced impacts;
- Heavy rain resulted to alleviating interactions that helped to restore water resources.



Conclusion

The 2016-2018 humanitarian crisis was the result of **multiple interacting physical and societal events**;

Compound mechanisms of same interactions change over **time** and **space** according to socio-economic and topographic characteristics

Compound mechanisms can **increase** or **decrease** disaster risk;

Coping mechanisms/response to a hazard may lead to an **increase** in **vulnerability** and **exposure** to other hazards;

