Double burden of mine water and the prospect of corporate sustainability as adaptation strategy in Ghana

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Introduction

- Mine water management involves sourcing and allocating water resources, managing site diversions and drainages to enable production activities, managing water discharge and quality aspects in compliance with regulatory and other reqiurement.

- Mining influence of local surrounding hydro-sociological systems abound in literature (AMD, drainage water quality and sediment transport etc).

- Hydroclimatic regime on mine water system are hardly considered.

Problem

- Managing mine water by adhoc approach is unsustainable amidst local effect of global environmental changes

Figure 1: Managing contaminant overflow due to intensified rainfall

- Uncordinated (deparmental based) mine water management is costly, leads to unproductive conflict and blame game.

Figure 2: Failing embarkments and sediment transports into tailigs due to intensified rainfall

- Increasing climatic variability will worsen existing mine water challenges including mine-affected communities and their resources

Figure 3: Decant flowing into nearby farmlands and pits due to intensified rainfall

Study objectives

- Characterize vulnerability of mine water to operational practices and changing climate using the adapt to coexist framework
- Provide empirical perspectives corroborating the need to address the vulnerability
- Argue for watershed approach in mine water management as adaptation strategy in West Africa

Methods

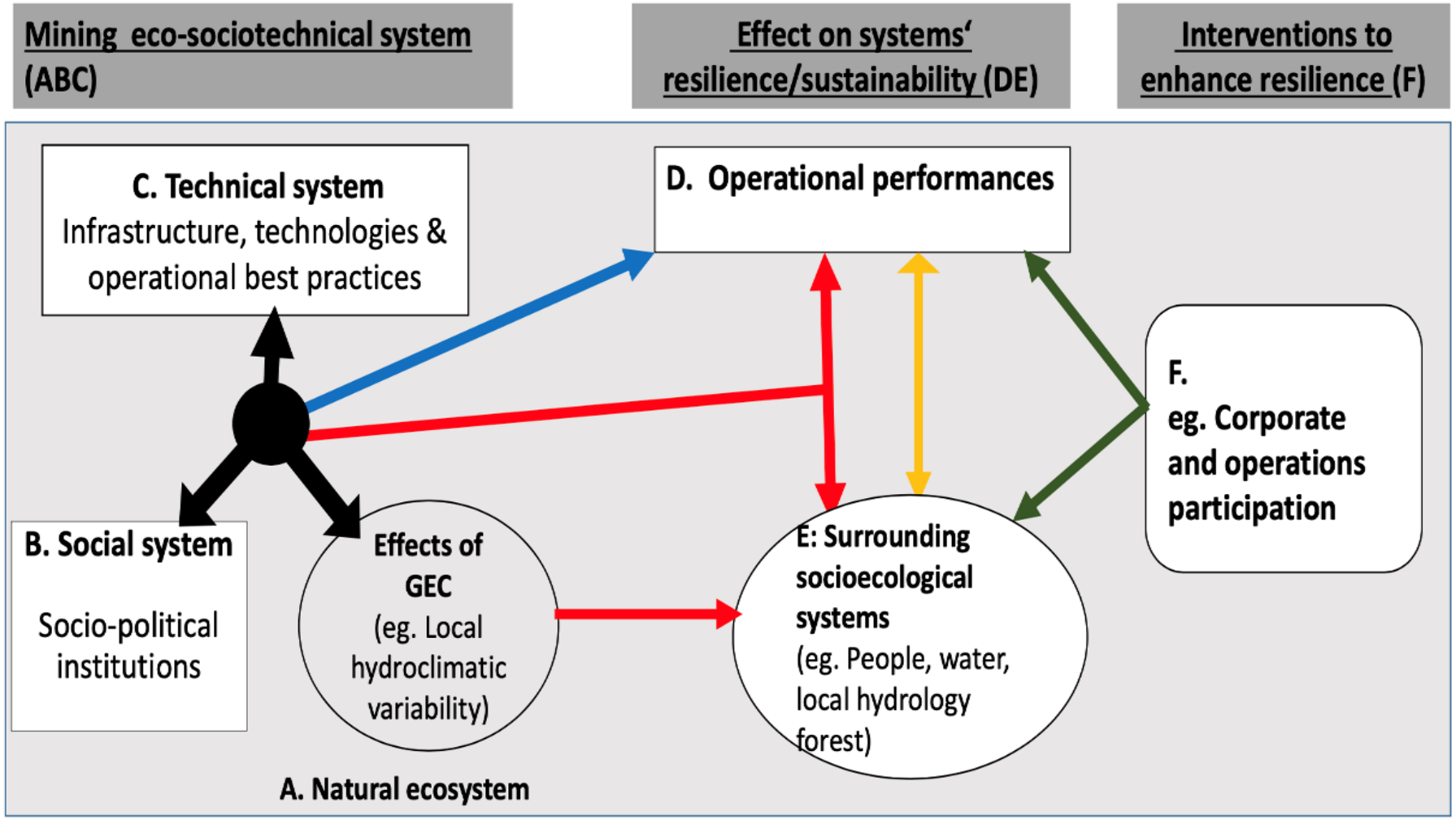


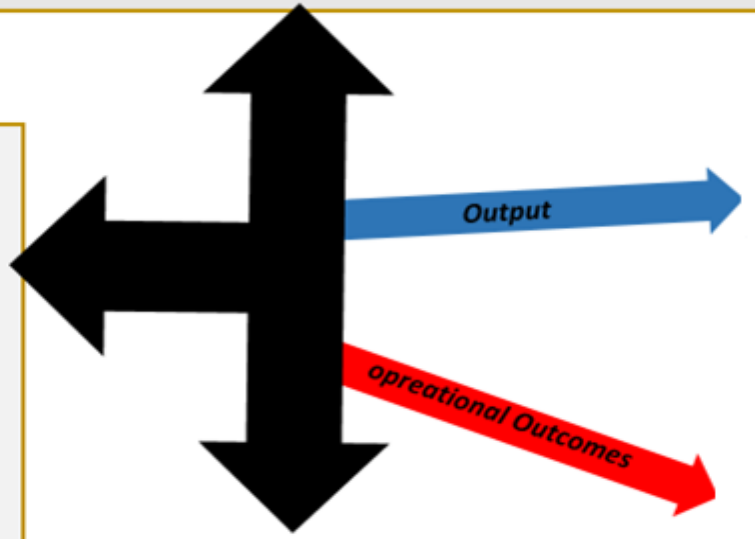
Figure 4: Adapt to coexist framework (Source: Tannor, 2024)

Characterizing mine water interactions

1. Mine water resources is a sociotechnical system (ABC)

C. Key mine water structures and practices

- Upstream diversion and drainage channels
- Dam and impoundment construction
- Raw water dam and impoundments
- Pit sumps, dewatering, and discharging systems
- Tailings impoundment and seepage management
- Return water sump and Decant dams
- Erosion and sediment control structures
- Reclamation and Closure practices (eg. water quality and ARD management structures)
- Mine water balance and management plans



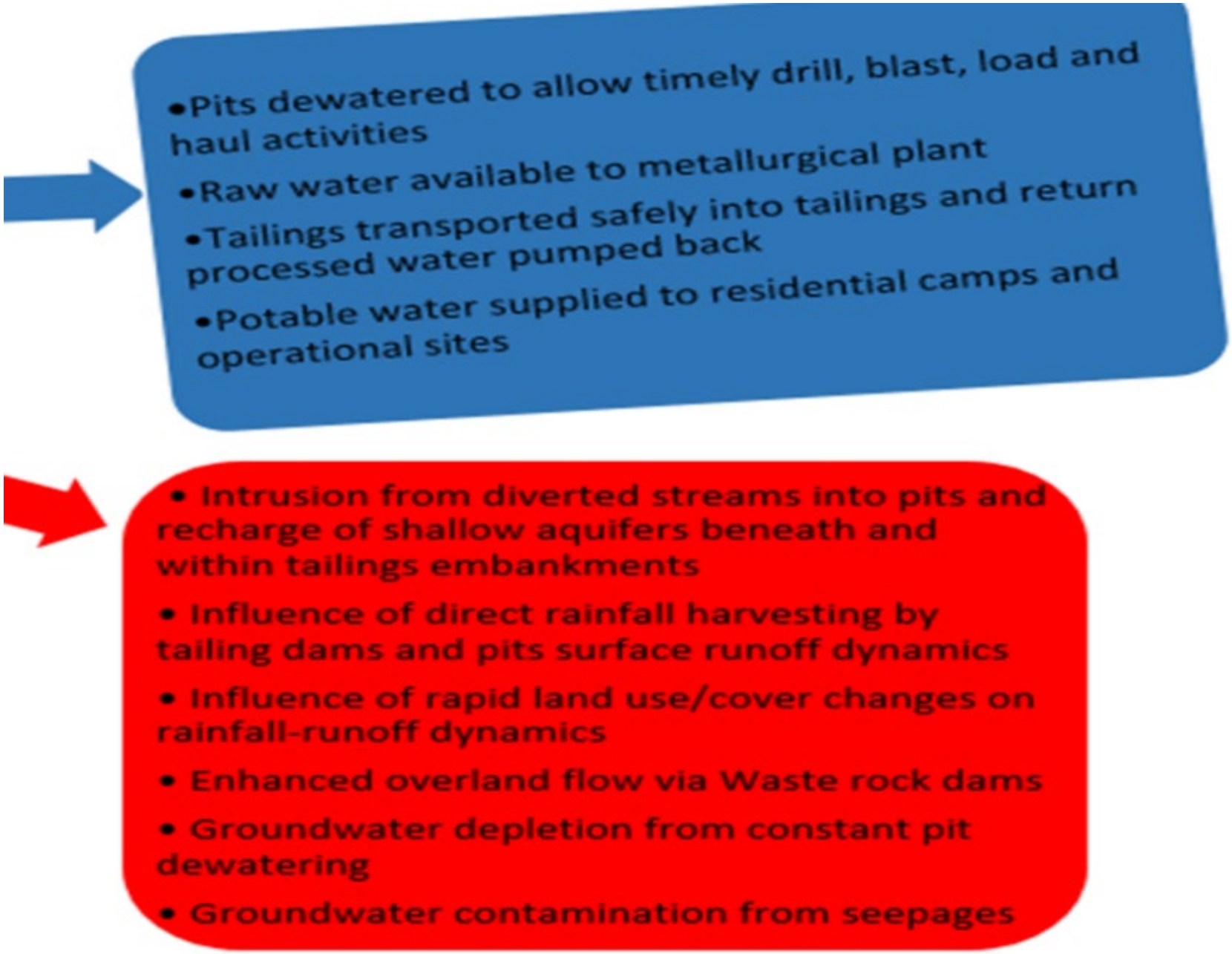
B. Socio-political institutions of mine water management

- Water Resources Commission, Act 522 of 1996
- Ghana Water Policy, 2007
- Ghana Water Use regulation, 2001
- National Integrated Water Resources Management Plan, 2012
- Ghana dam safety regulation, 2016 (L.I. 2236)
- Ghana Environmental Guidelines for mining in production Forest
- Corporate water management policy and strategies
- Environmental Assessment Regulations ()
- Environmental Certificate Schedule by Environmental Protection Agency, Ghana
- Mining and Minerals (general) Regulation, 2012, (L.I.2173)
- Health, Safety and Environmental regulation, 2012 (L.I.2182)
- Community Water and Sanitation Agency

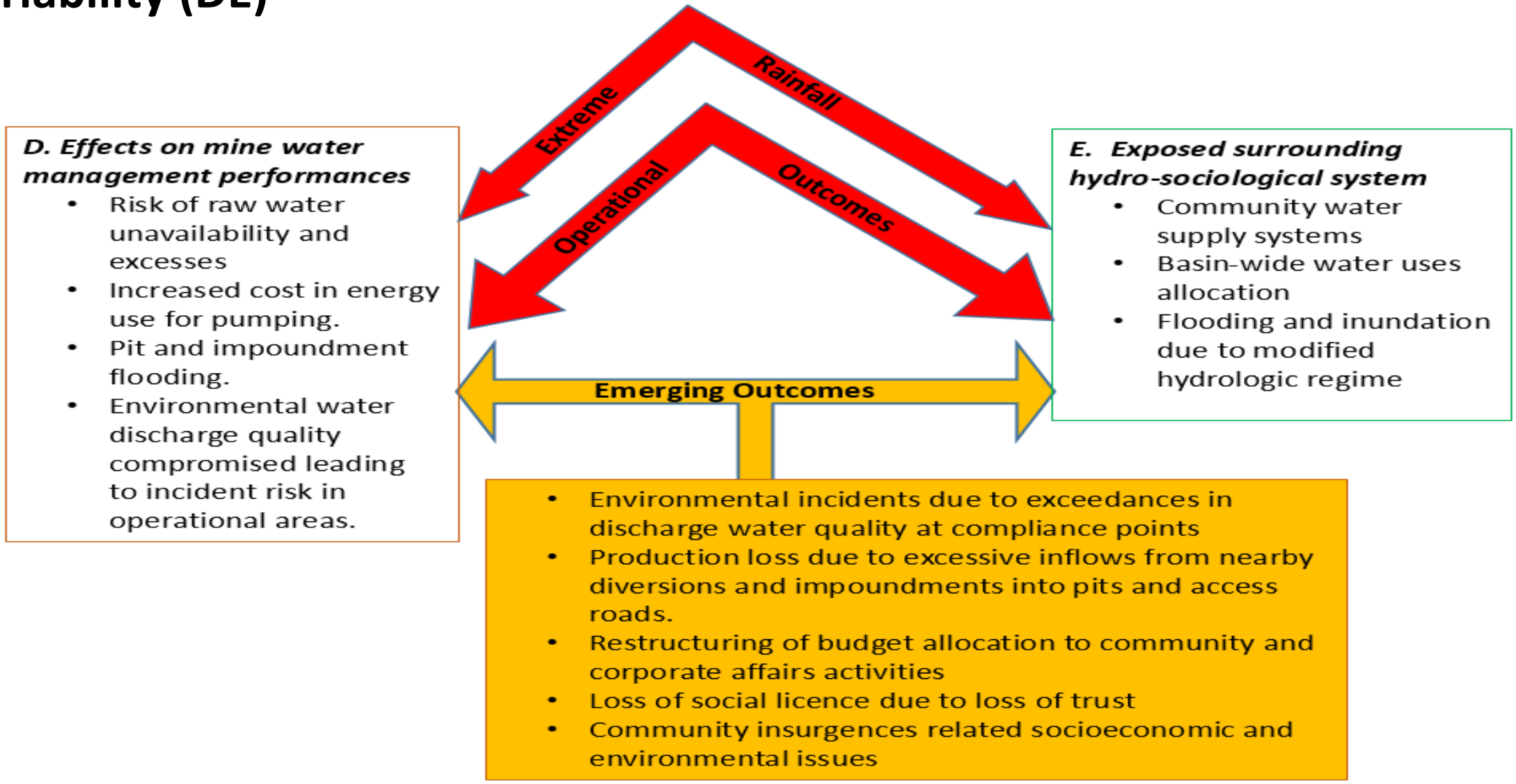
A: Local climatic variability:

Increased extreme climates across southern Ghana (eg. intensified rainfall, windstorms, and increased temperature

2. Optimizing mine water Output and Outcomes depends on operational practices



3. Mine water and surrounding sociohydrological systems are simultanously exposed to operational outcomes and local climatic variability (DE)

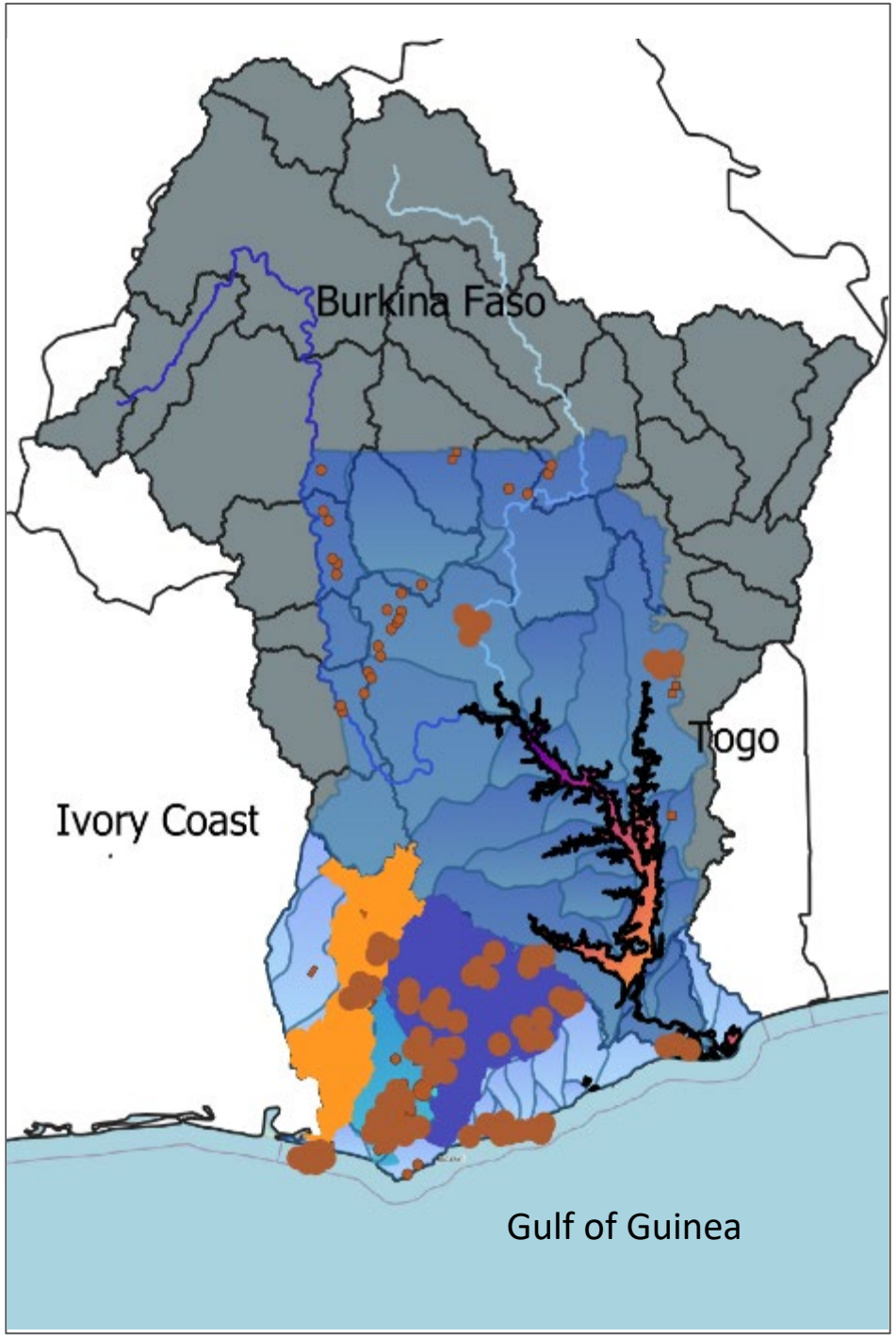


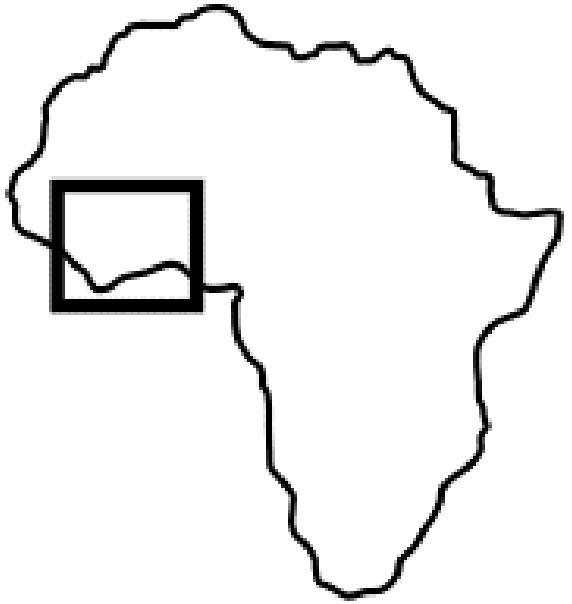
The Case of southwestern Ghana

- **Vulnerable mine water system affect mine performances**

Aspects of operational performances	Mine-take watershed	Extent of Vulnerability			
		Non	low	High	
Mine planning and production scheduling	Pra & Ankobra	1	3	8	12
	Tano & Ankobra	6	11	31	48
		7	14	39	60
Mine Water Balance	Pra & Ankobra	0	1	11	12
	Tano & Ankobra	2	7	39	48
		2	8	50	60
Pit dewatering and site drainage management	Pra & Ankobra	0	1	11	12
	Tano & Ankobra	1	3	44	48
		1	4	55	60

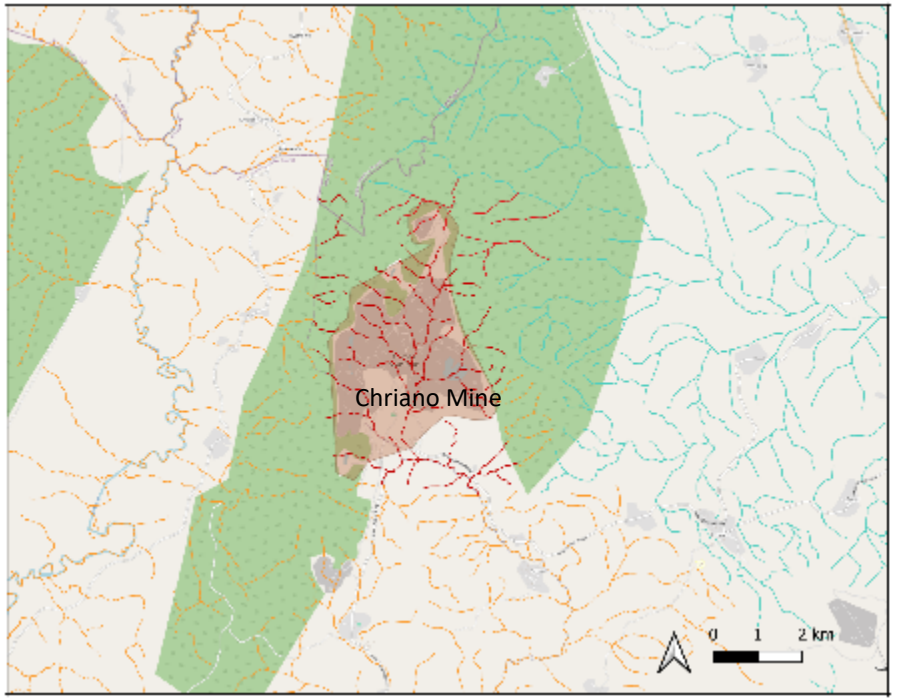
Table 1: (Source of data: field Survey conducted by Author)

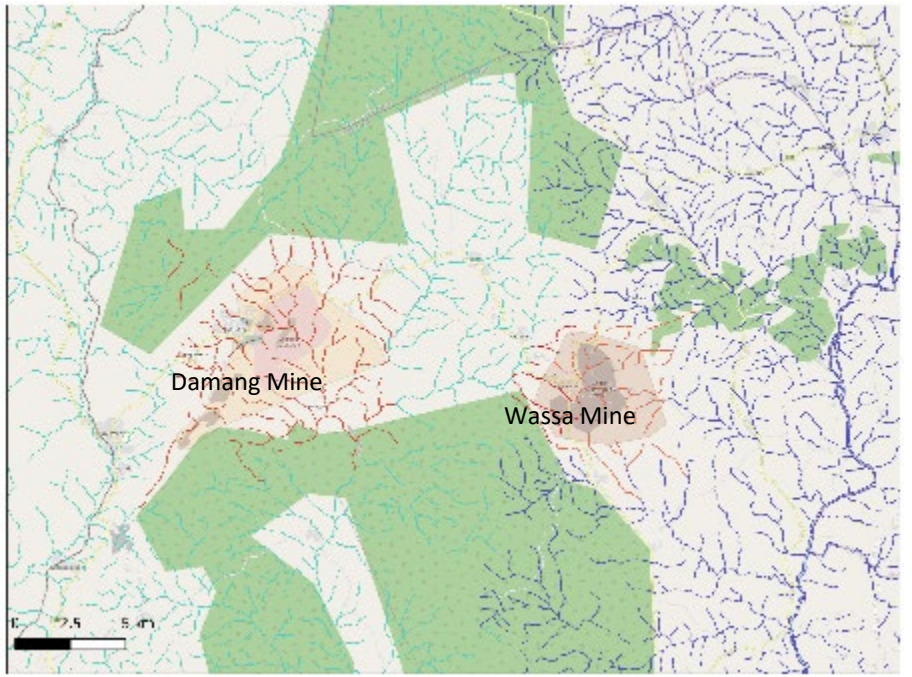




Hydrology and Mining in Ghana

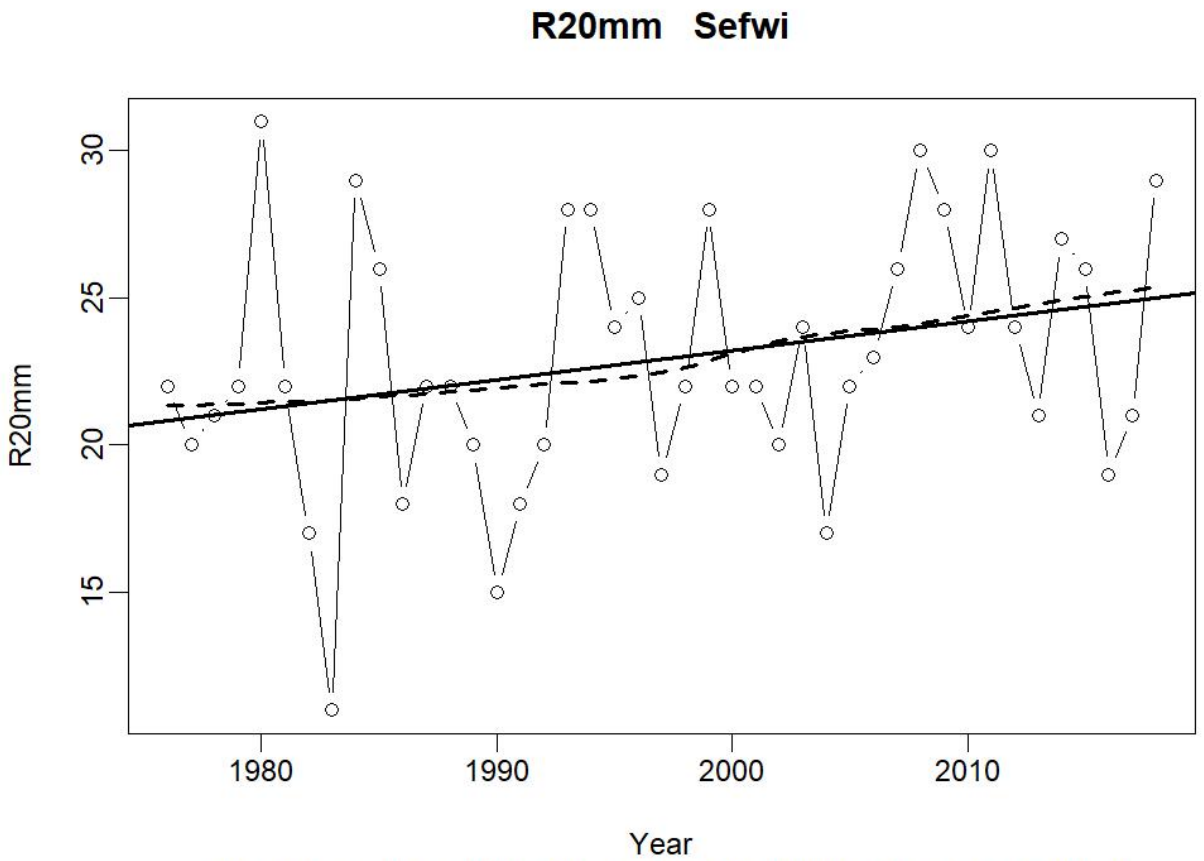
- Selected mine watersheds
- Tano/Tanoe
- Ankobra
- Pra
- Lakes
- LSM & ASM mining operations
- Drainage Basins of Ghana
- White_Volta
- Black_Volta
- Volta Basin
- Ankobra_hydro
- Westafrica

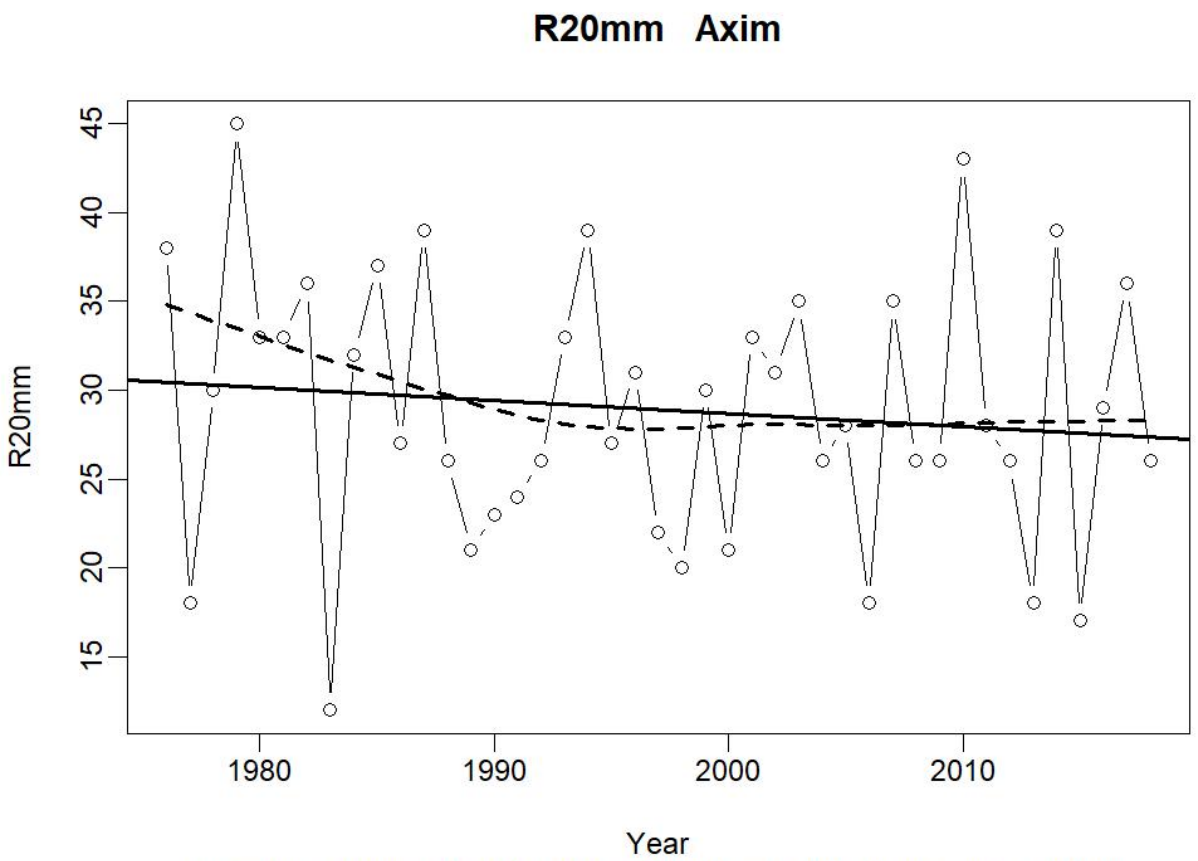




The Case of southern Ghana

- *Ghana is a climate hotspot including extreme rainfall and temperature*

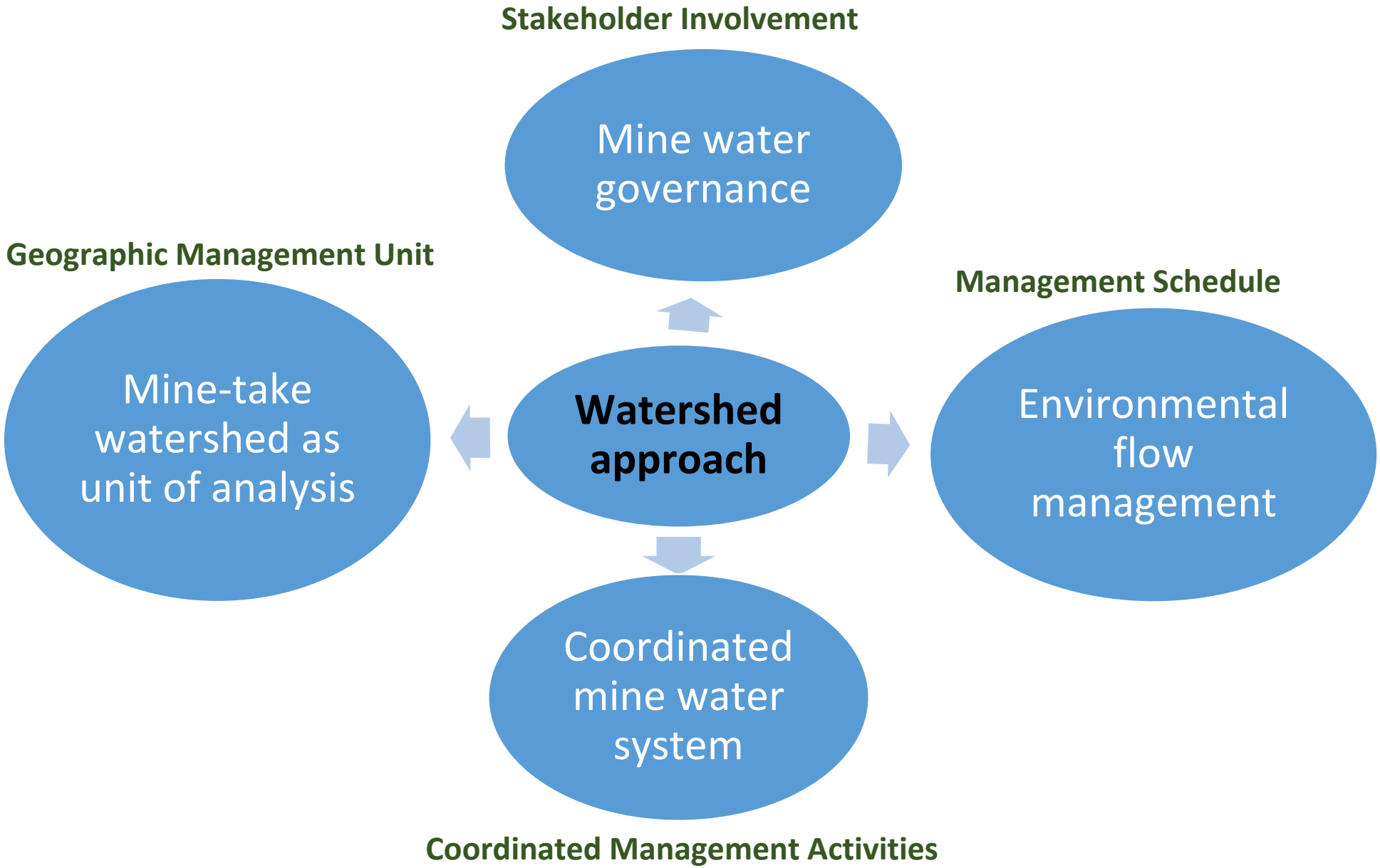




Trend in extreme rainfall events across mine-take towns in southern Ghana (Source: analyzed by Author)

NB: R20= Very heavy raindfall days (1976-2018)

F. Interventions: integrated mine water using watershed approach



Conclusion

- Mine water is a complex technical system which generates both operational output and outcomes
- Operational outcomes and changing climate will double burden mine water system's performances
- Sustainable mining is not attainable without managing double burdened mine water and surrounding systems.
- Watershed approach to mine water management can operations performance and secure „social license“..

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Thank you