An agent-based model for testing the impact of policy options on flood displacement in Sudan

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The IGAD region in East Africa has experienced a rise in the occurrence and severity of floods over time, as a consequence of climate variability and change. Among member states, Sudan stands out as one of the most affected by recurrent floods, suffering significant damage to houses, livelihoods, infrastructure, and economic activities. Areas along the River Nile, in particular, are often affected by riverine flooding. These events continue to displace thousands of people annually in the country, while immobility in the face of disasters is also an issue. In response to this challenge, the design and implementation of effective flood risk mitigation policies have become paramount, addressing both physical and socio-economic perspectives.

The aim of this research was to develop an agent-based model (ABM) to simulate human behavior and assess the impact of policies on flood displacement patterns in seven locations in Khartoum State, Sudan. To lay the groundwork for the ABM, a household survey was conducted to collect information about the socioeconomic characteristics, flood displacement experience, and risk perceptions of the resident population. The ABM operates as a tool for modeling the behavior of autonomous household entities in various 30-year hazard and policy scenarios. Policies, tested both individually and in combination, include the Early Warning System, the Awareness Programme, the Basic Income Programme, the House Repair Programme and the Build Back Better Programme.

In the model, households' actions and decisions within the different flood and policy scenarios depend on their personal characteristics. Elements that influence the decision to move or stay include risk perception, socioeconomic characteristics, and flood damage. This innovative model serves as an instrument for estimating the volume of displacement, evacuation, and immobility across different scenarios. It supports the identification of the most effective intervention strategy for the context under consideration.

The focus of the presentation is on the results of the comparative policy analysis derived from the ABM simulations. These findings are also instrumental in supporting local and national decision-

makers in mitigating the risk of flood displacement and immobility, thereby strengthening the resilience of communities to flood challenges.