

Ahead of the Storm: From Reaction to Proaction



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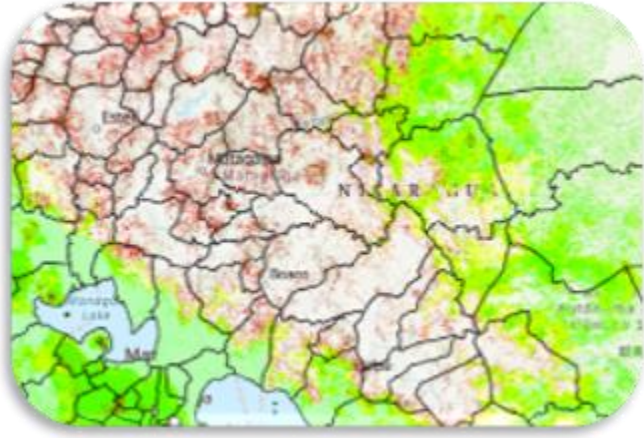
Ahead of the Storm Vision



The Problem
Extreme weather events are increasing, with devastating impacts on children



The Gap
Children are often neglected in disaster planning; response is reactive, and too late



The Opportunity
We can leverage analytics before the crisis for proactive response

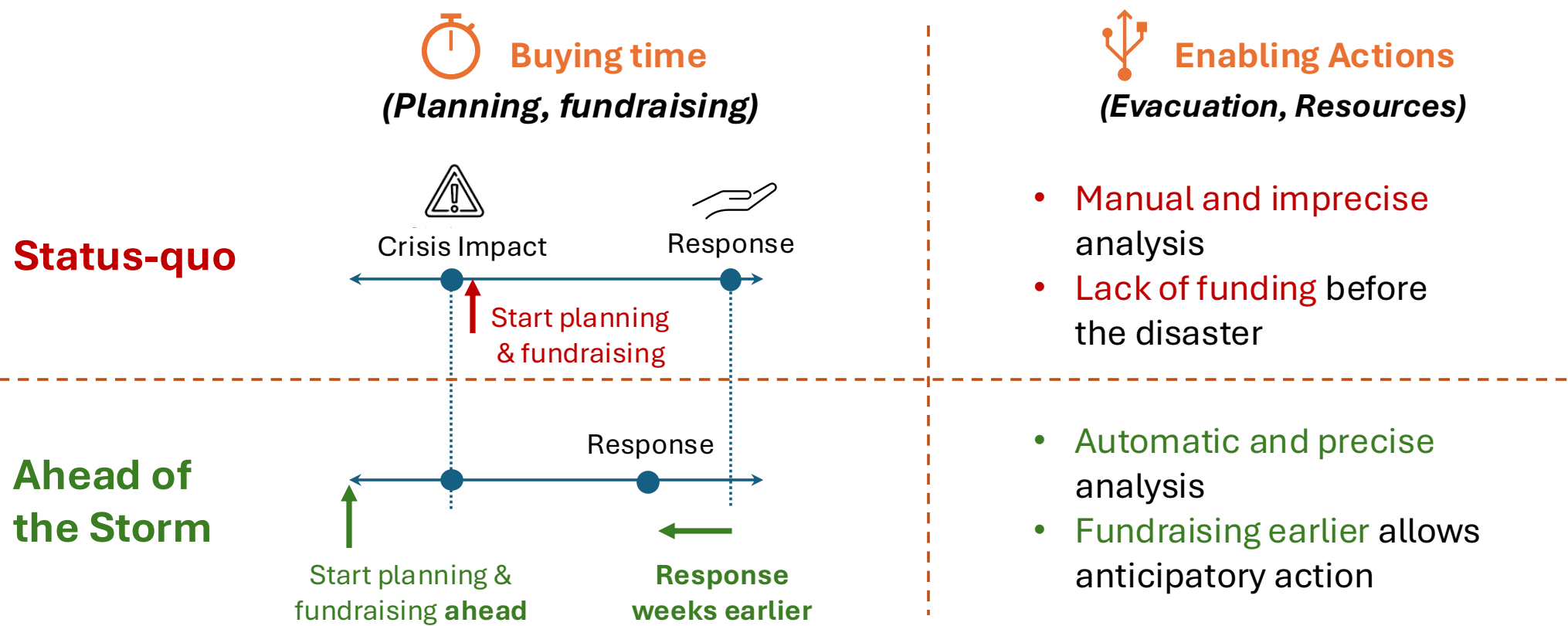
The Vision
Transform disaster response from reactive to proactive by conducting children-focused analytics *ahead of the storm* to protect children before disasters strike

Emergency Response: Status-Quo

	Prior to crisis	In anticipation of crisis	After the crisis
Activity	Preparedness	Early Warning	Crisis Impact (e.g. Hurricane) Need Assessment & Response
Actions	- Risk analysis - Resource preposition	- Resource preposition/protection - Evacuation - Initial planning - Fundraising	- Need assessment - Supply of resources - Fundraising
Trade-off	- No info on future hurricane - Lack of funding - Proactive - A lot of time to act	- Time sensitive - Proactive - Good info on future hurricane	- Reactive - Very urgent - Certainty of where to act

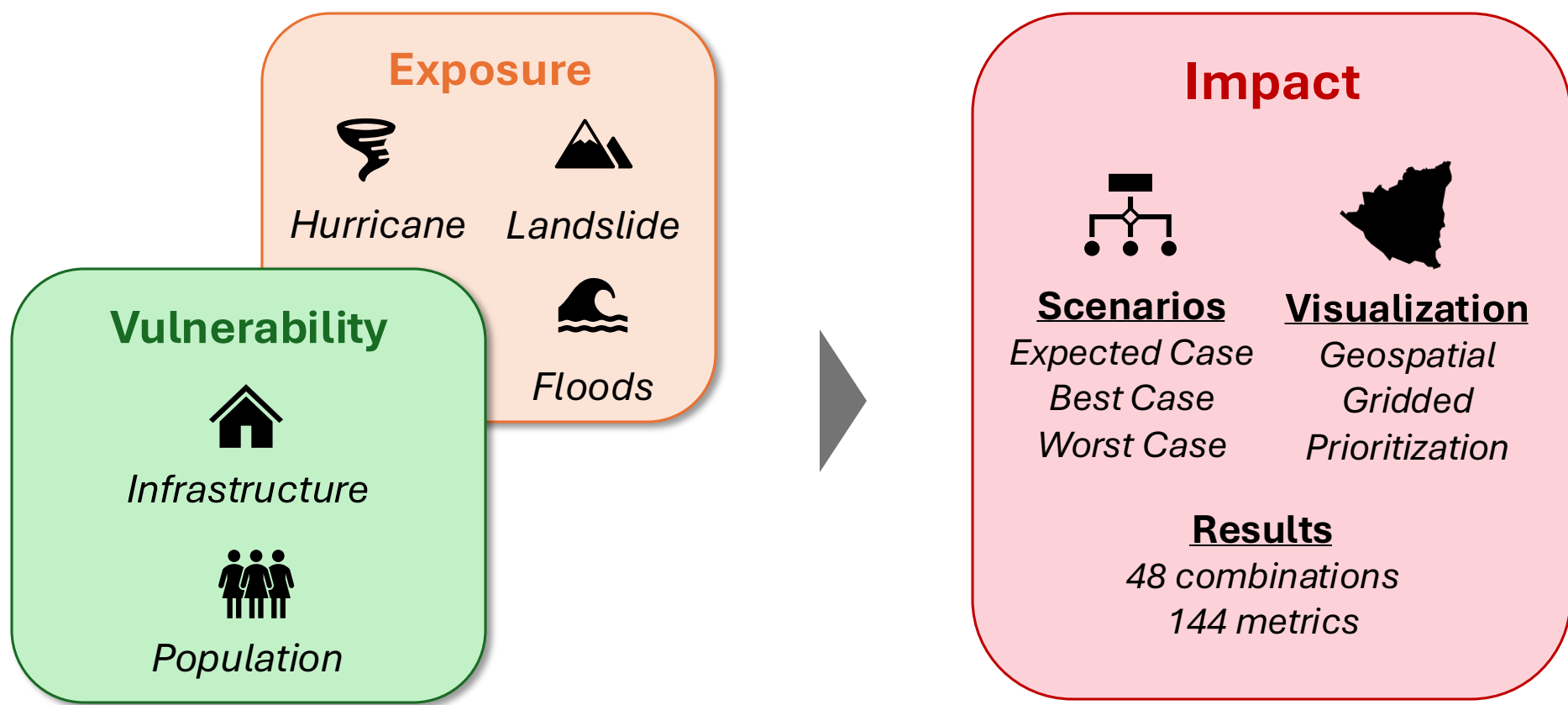
In Anticipation of Crisis: Impact-Based Forecast

Motivation: Buying Time and Enabling Actions



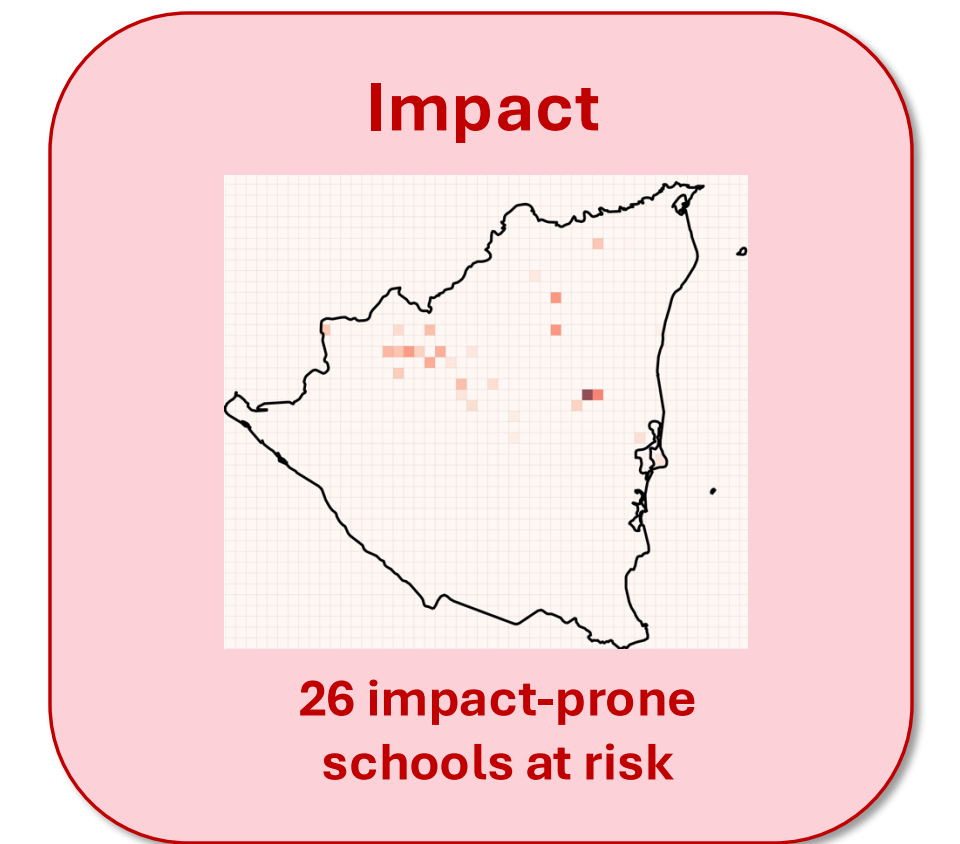
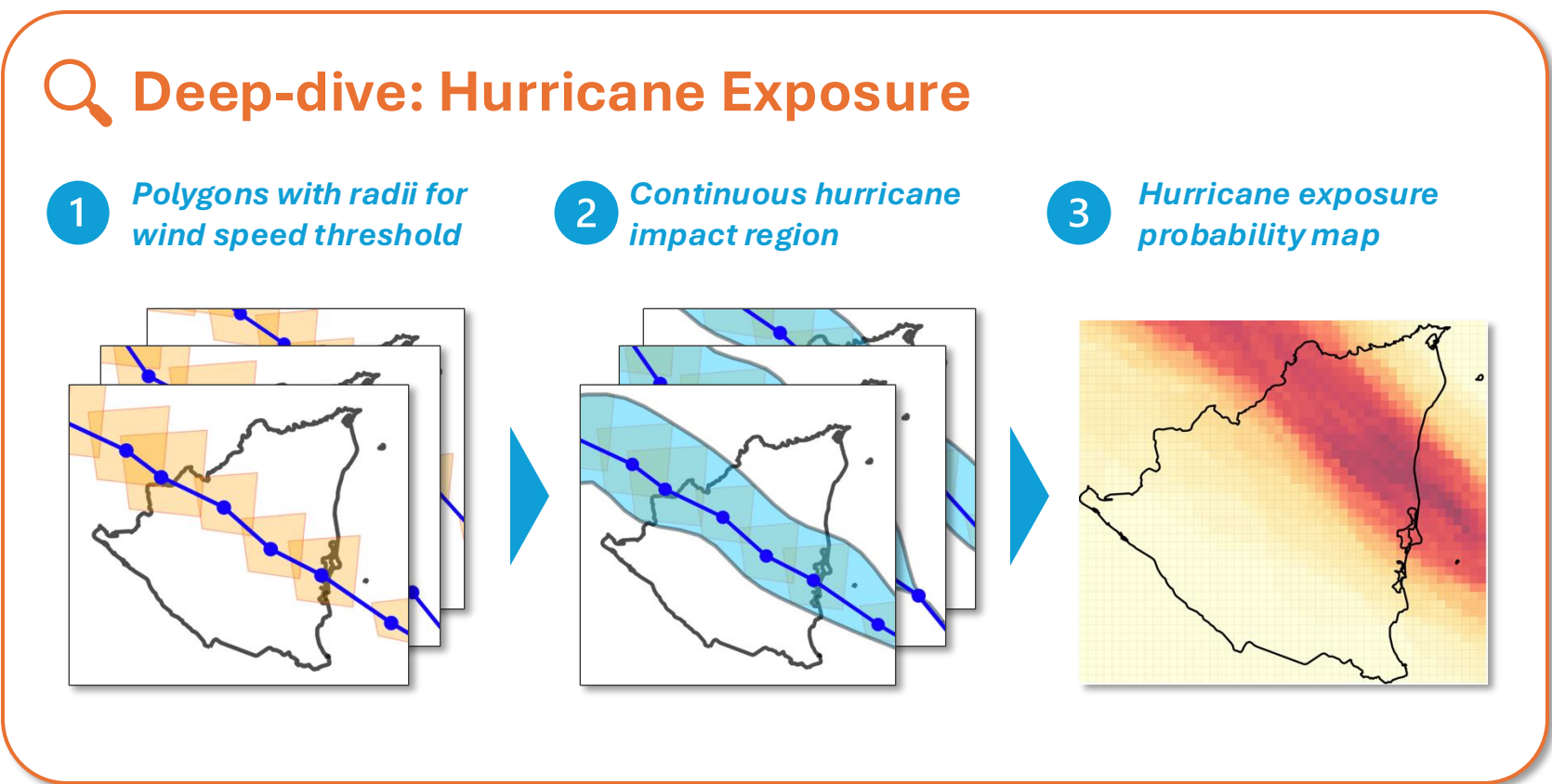
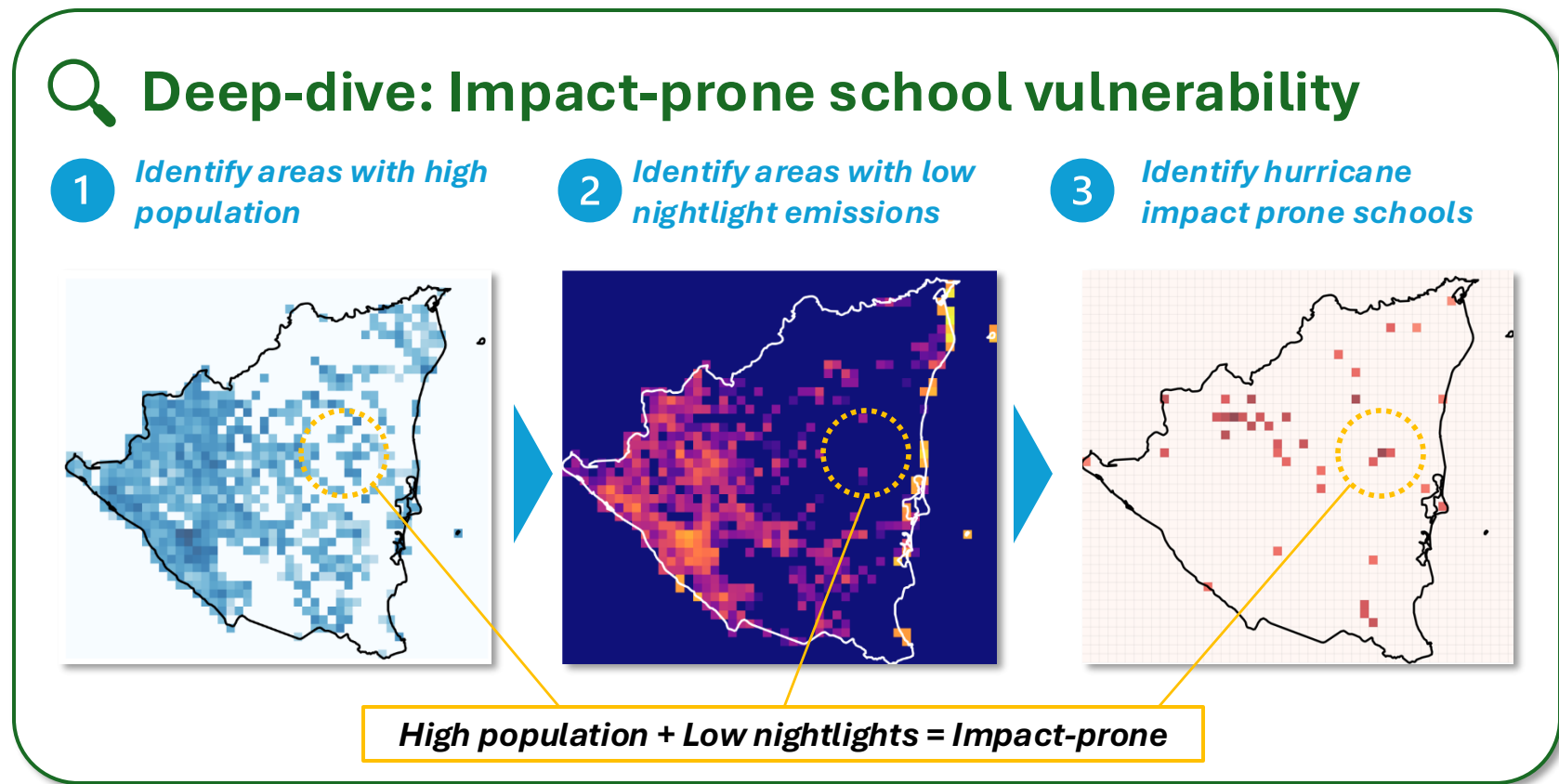
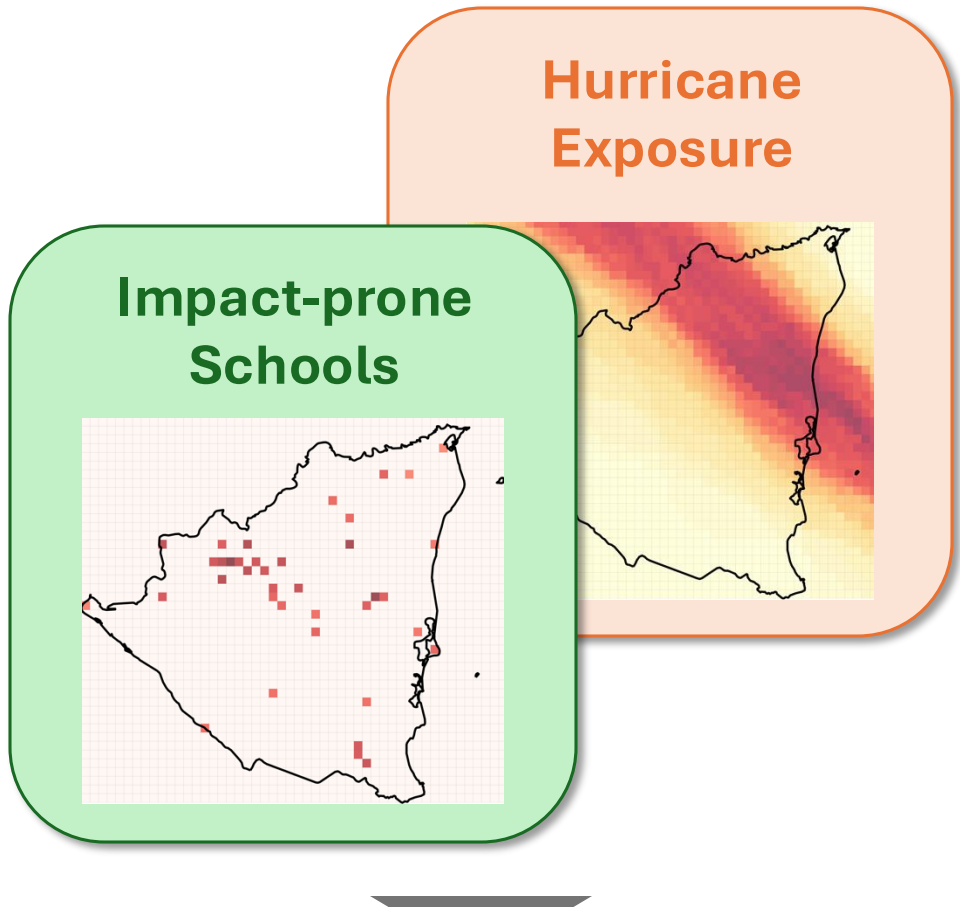
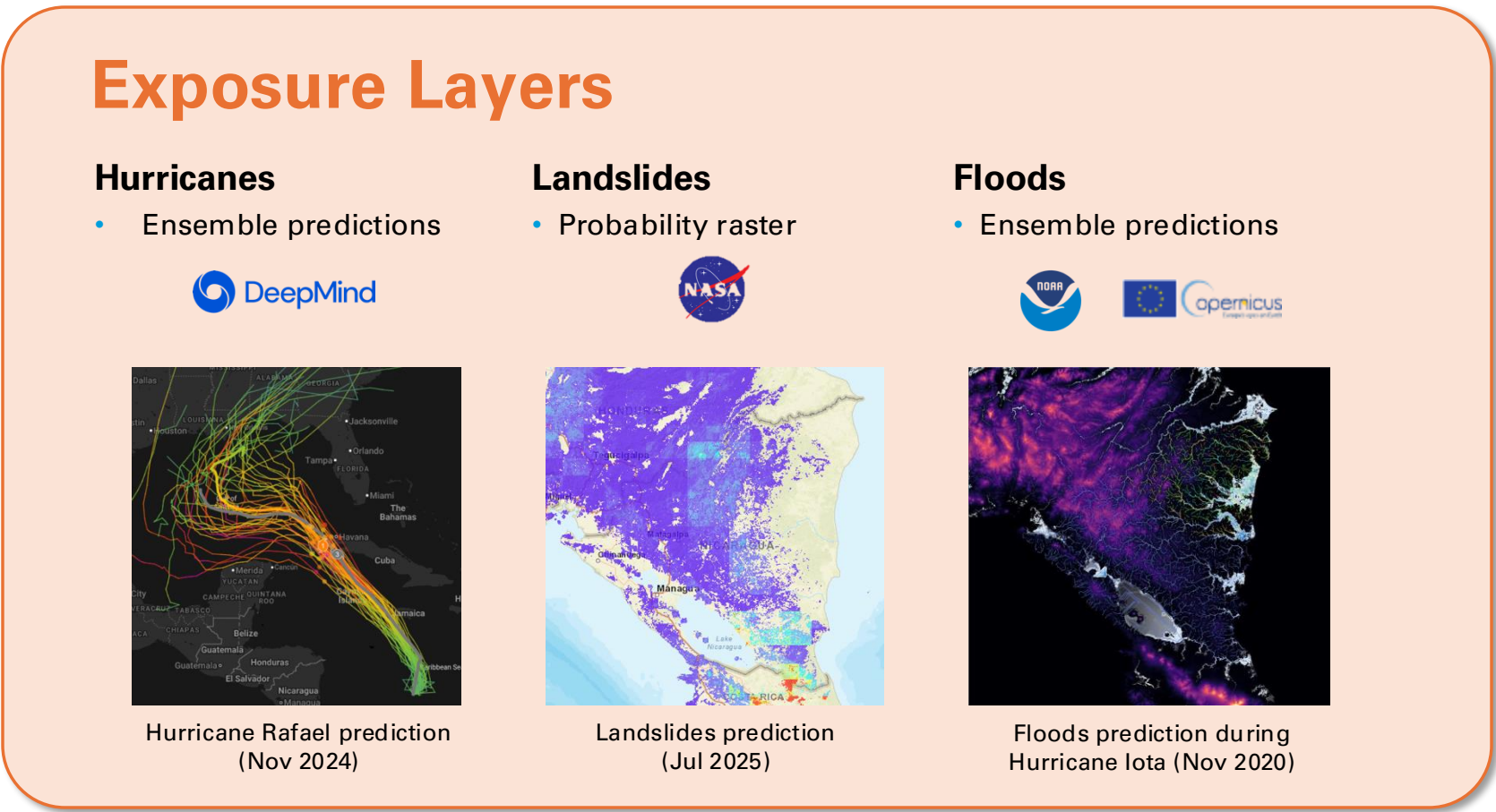
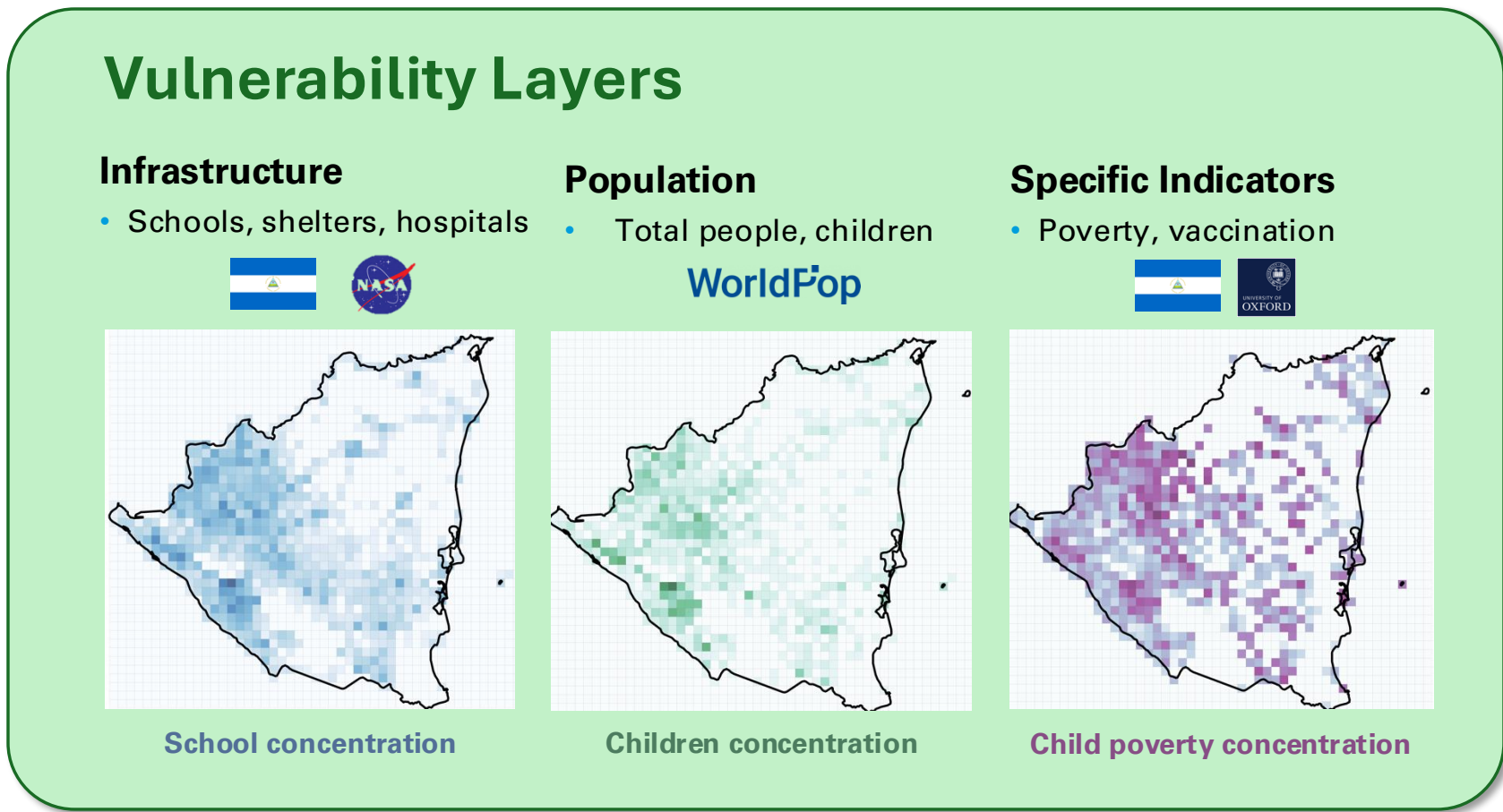
General Framework

Idea: A modular, scalable framework integrating diverse data layers.



Methodology: Impact = Exposure x Vulnerability

Example Result



Prior to crisis: Prepositioning Optimization

Benefit (Eta & Iota)

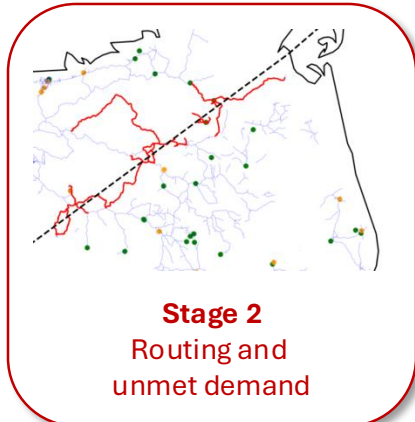
Methodology

Motivation: Prepositioning under uncertainty remains difficult and manual.

Results: greater demand satisfied

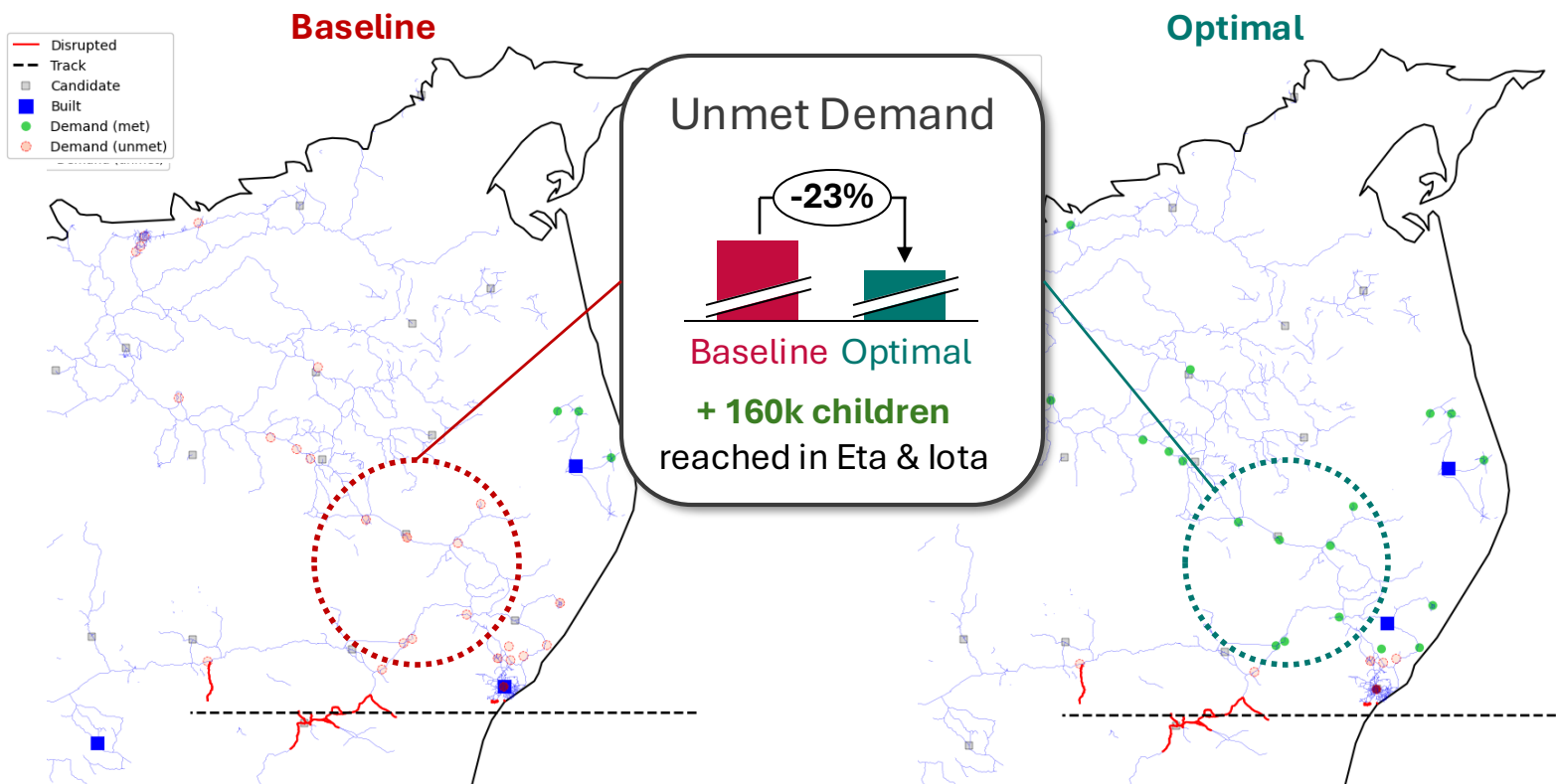
The need

Stochastic Optimization via Benders Decomposition



$$\min \sum_{i \in N} h_i f_i + c_r \sum_{i \in I} r_i + \sum_{s \in S} \pi_s \left(\sum_{(i,j) \in A} c_{ij} x_{ij}^s + M \sum_{j \in J} w_j^s \right)$$

stochastic scenarios



Impact-Based Forecasting

+700k children
served in Latin America

+\$1.7M
funding raised

Prepositioning Optimization

+160k children
reached in Nicaragua