HIWeather

HIWeather: the challenge of predicting disasters

Brian Golding
UK Met Office
Bristol University, UK
co-chair WWRP/HIWeather

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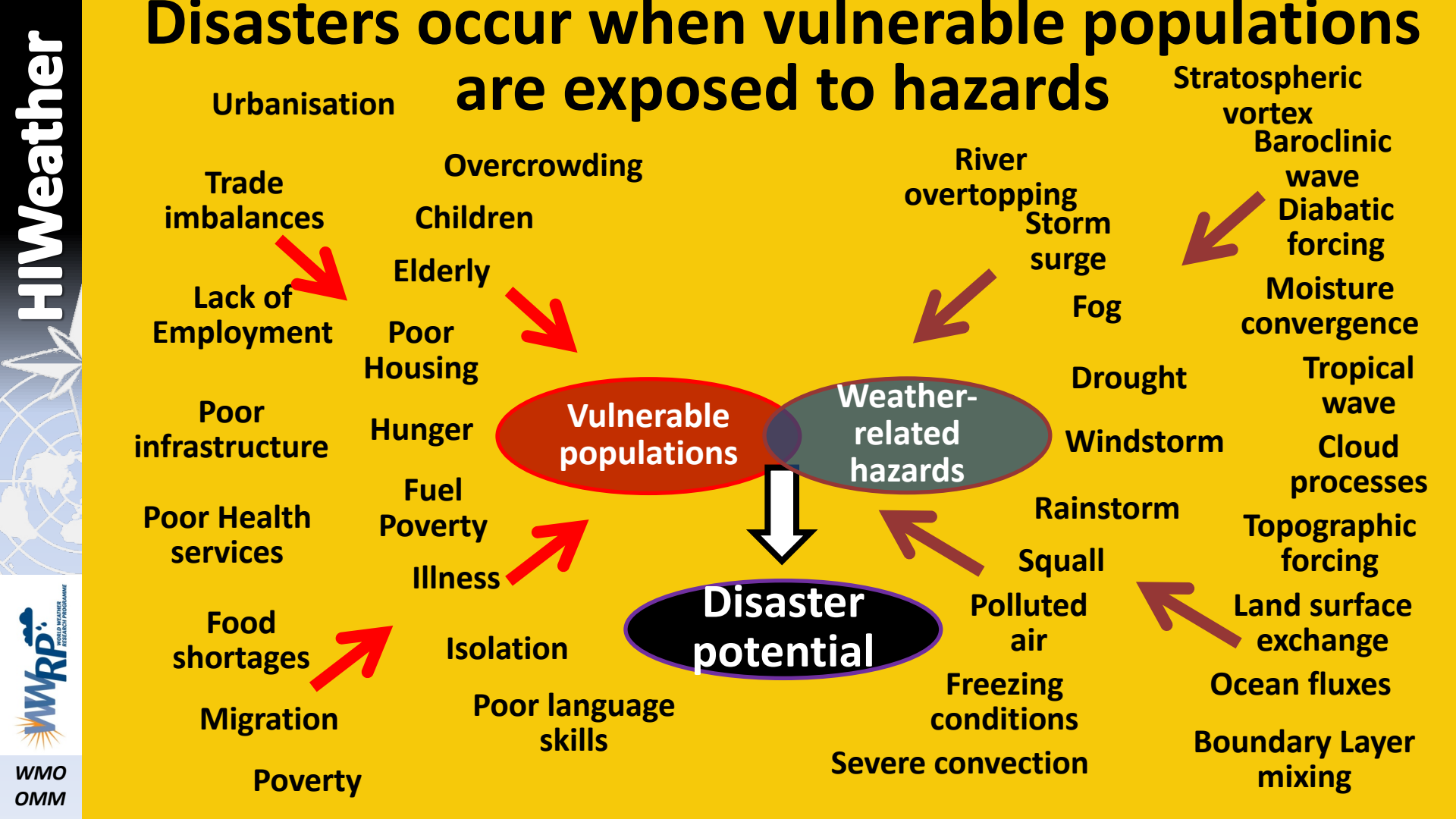
Context

In 2017, despite dramatic improvements in *weather forecasts*, *communication technology* and *civil protection procedures*,

weather-related disasters

- Killed about ten thousand people
- Affected nearly one hundred million people
- Caused more than three hundred billion dollars of damage

Disasters occur when vulnerable populations are exposed to hazards



Prediction enables:

- Reduce hazard
  - Climate change mitigation & Land use change
  - Temporary pollutant reduction
- Reduce exposure
  - Land zoning & Engineering
  - Temporary Evacuation &/or Protection
- Reduce vulnerability
  - Building resilience & insurance
  - Temporary survival resources: personal/communal

Designing a warning chain

1. Map risk
2. Co-design & quantify feasible risk mitigations
3. Co-design & model feasible warning chain
4. Co-implement

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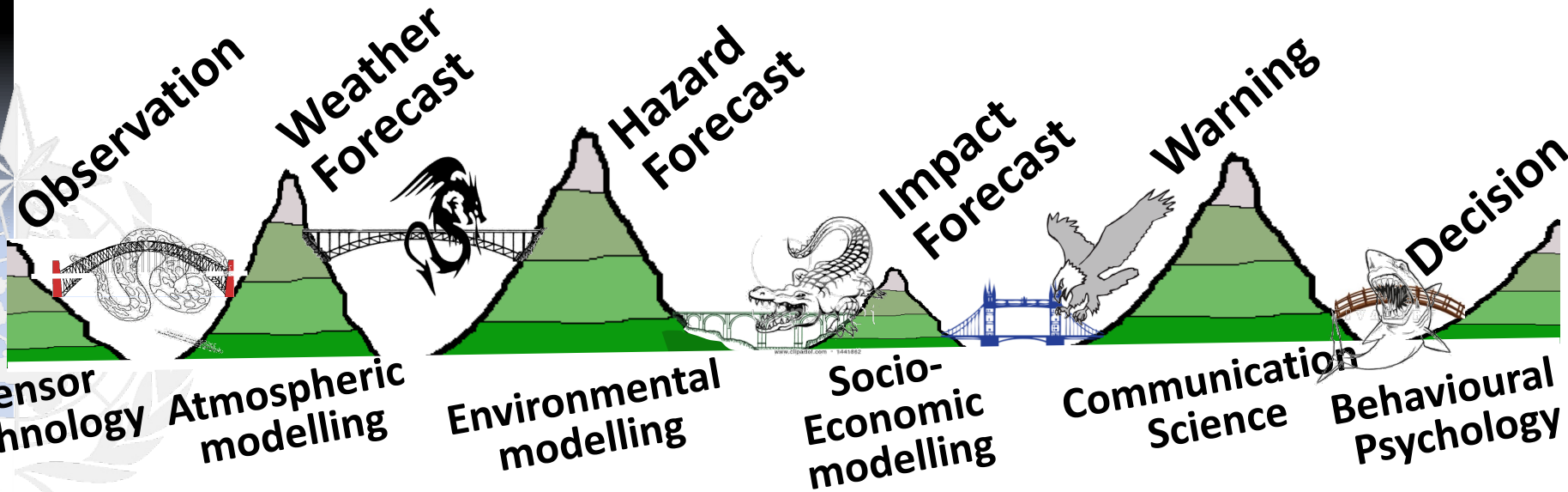
Conceptual Warning Process:

the 5 valleys of death



Bridges represent inter-disciplinary &/or inter-agency communication

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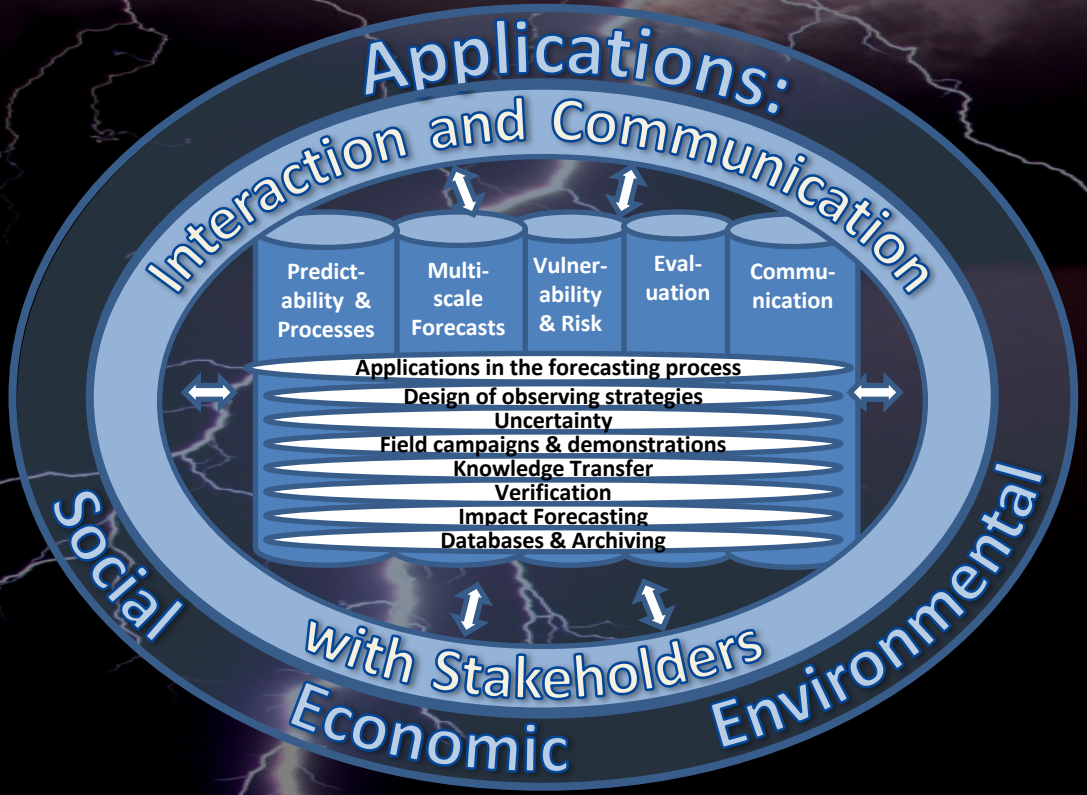
What is HIWeather's contribution?



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Progress in observing

- Advances in satellite EO of composition, precipitation, surface features
- Advances in ground-based radar & its processing
- Use of “unconventional observations” from low cost stations, vehicles and phones, and from social media

Progress in km-scale weather prediction

- Prediction of convective and topographically-controlled weather with km-scale models
- Multi-scale initialisation with hybrid variational/ensemble data assimilation
- Km-scale ensembles: using downscaling, initial & model perturbations, multi-physics and multi-model approaches
- Understanding of small scale error growth processes through field experiments like NAWDEX

Progress in Hazard Prediction

- Large domain distributed hydrological models
- Surface water flood forecasting
- Variable grid ocean wave and surge models with nearshore physics
- Integrated air quality/weather km-scale prediction models
- Integrated weather/ocean/hydrological km-scale prediction models

Progress in impact prediction

- Evidence for benefit of impact-based and probabilistic warnings
- Benchmarking and inter-comparison of impact models
- Toolkit of impact forecasting methods
- Global impact/risk initiatives

Progress in communication

- Use of behavioural science in designing warning communications
- Reinforcement of warning message through multiple channels
- Review of warning communication methods
- Review of post-event reports on warning response

Demonstrating & Measuring progress

- Demonstrations & Field Experiments: HIGHWAY, SWIFT, RELAMPAGO, SURF, SCMREX, MOUNTAOM, ICE-POP18, VORTEX/PECAN, NAWDEX
- Neighbourhood metrics for spatially complex variables
- User-relevant metrics
- Evaluating the warnings value chain
- Measuring warnings with unconventional data

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- **Summary:**
  - Weather-related disasters cause death & destruction around the world
  - Advances in weather forecasting enable early warnings to mitigate these impacts
  - HIWeather is targeting weak points in warning capability to build increased disaster resilience

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