



ASSESSING THE RESILIENCE OF AN EPR&R SYSTEM FOR RADIOLOGICAL EVENTS TO WARTIME

Thomas Makumbi, Stella Möhrle, Sadeeb Simon Ottenburger

Karlsruhe Institute of Technology (KIT)



Introduction



- Wartime radiological emergencies pose significant risks to human health & safety;
 - Infrastructure disruption & degradation.
 - Mobility constraints (active combat, landmines).
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- Protective measures necessary to minimize exposure & damage (sheltering, evacuation, iodine tablets).

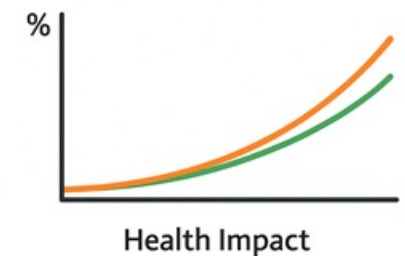




Aim



- RRADEW WP2 aims to make resilience tangible through simulation based assessment of preparedness measures (e.g. shelters, measurement devices) on specific resilience indicators (health impact, well-being).
- KIT has two digital simulation tools to quantify resilience of an EPR&R system to wartime radiological emergency (FRAMESS & JRODOS).
- Modelling will focus on civilian behaviour & community resilience. Simulations to be performed for different war scenarios, source term & weather data.



Site identification

- Use case is Kharkiv region of Ukraine.
- Site corresponds to location of Kharkiv CHPP.
- Site cleared for project implementation after EIA.
- Site close to Kharkiv city.





Scenario definition I



- Radiological part of the wartime scenarios were obtained from RRADEW WP1; (JRODOS)
- Missile strike on an active reactor (A).
- Missile strike on reactor in cold shutdown (B).
- Missile strike on spent fuel storage facility (C).

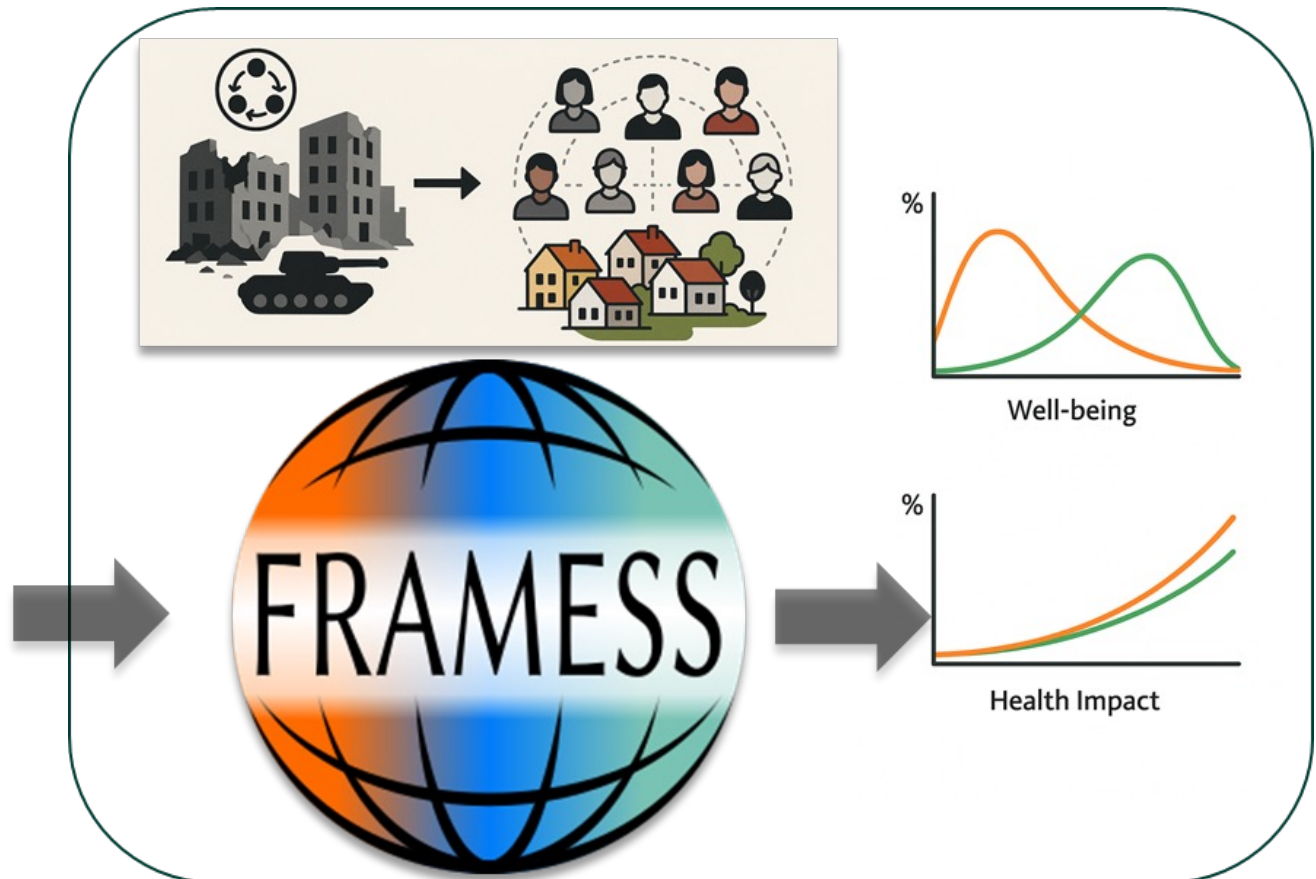
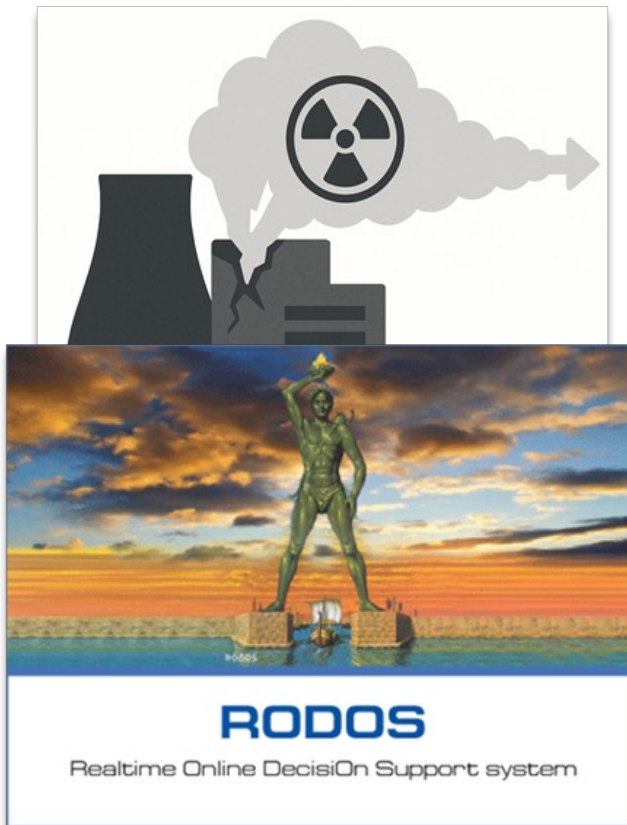


Scenario definition II

- Non-radiological wartime scenarios; (FRAMESS)
- Damaged transportation networks
- Mines
- Shelters, hospitals destroyed
- Energy- and communication



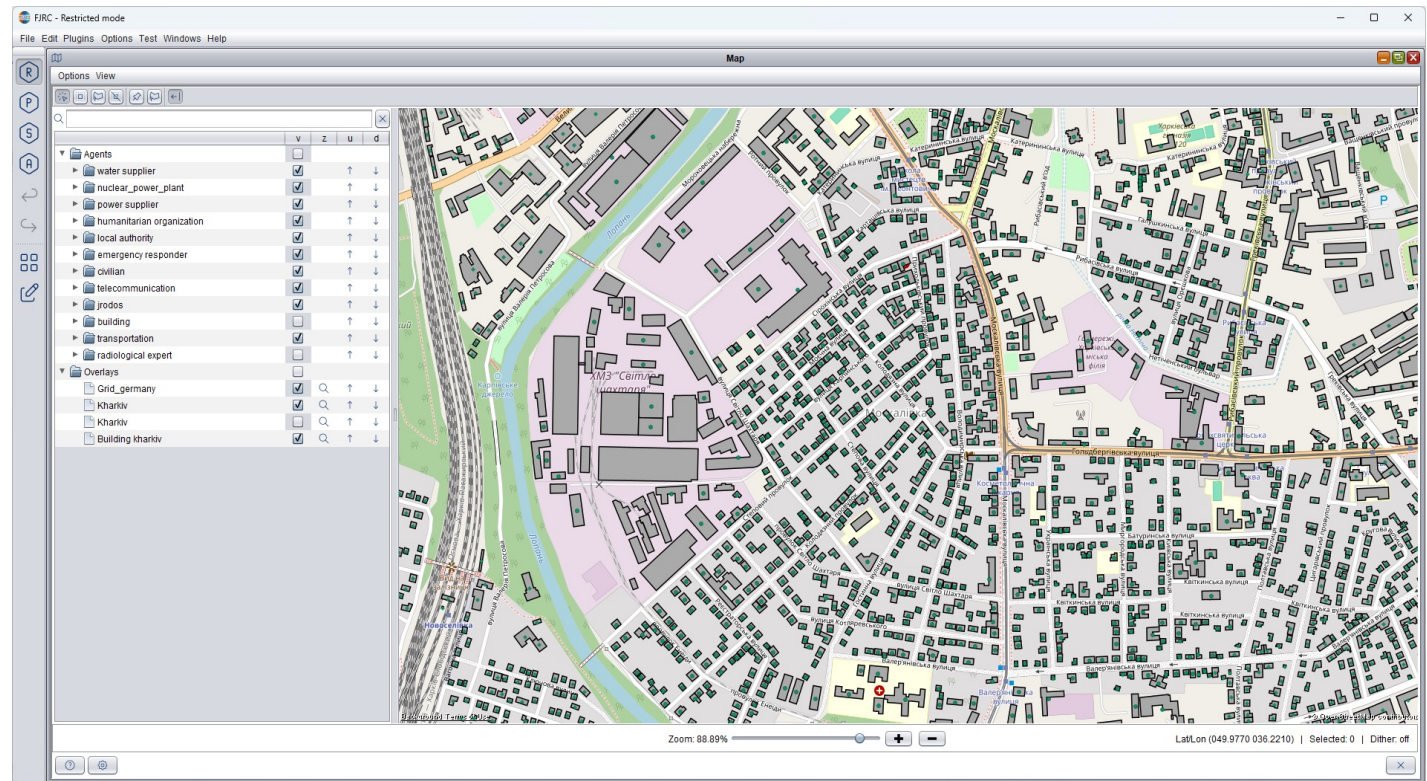
Resilience Assessment Framework



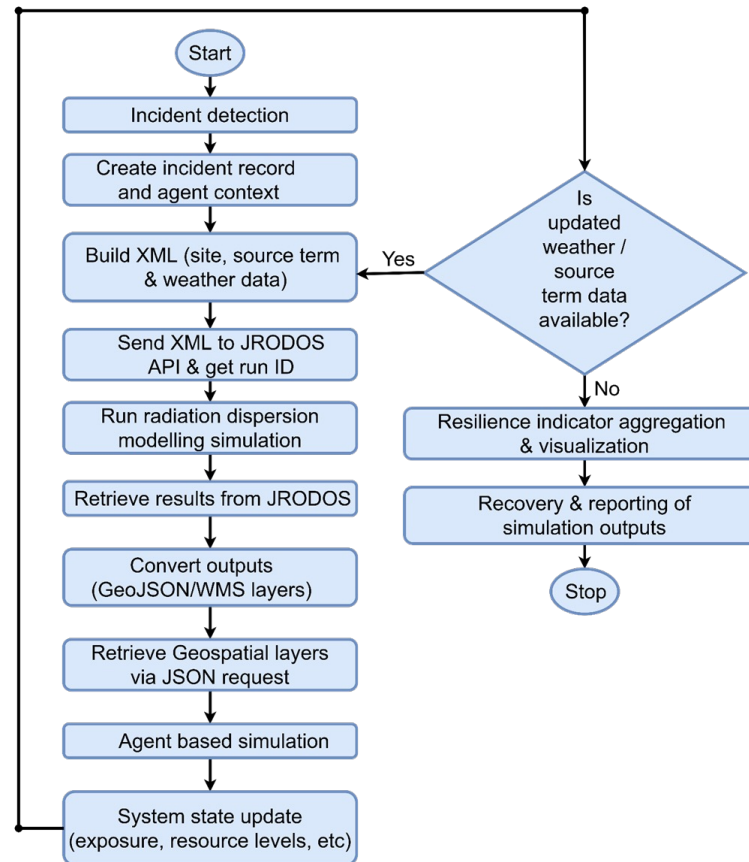
Preparedness measures vs cost

Measures	Costs
Shelters	Low
Measurement devices	Low-High
Iodine tablets	Low-High
JRODOS	Medium-High
Drone technology	Medium-High

- Population
- Source term
- Agents & attributes
- Buildings
- Infrastructure

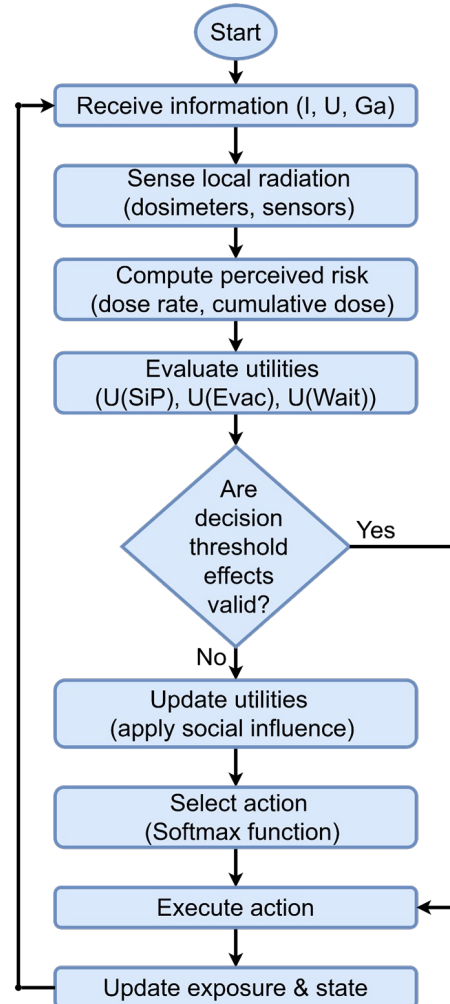


Simulation run

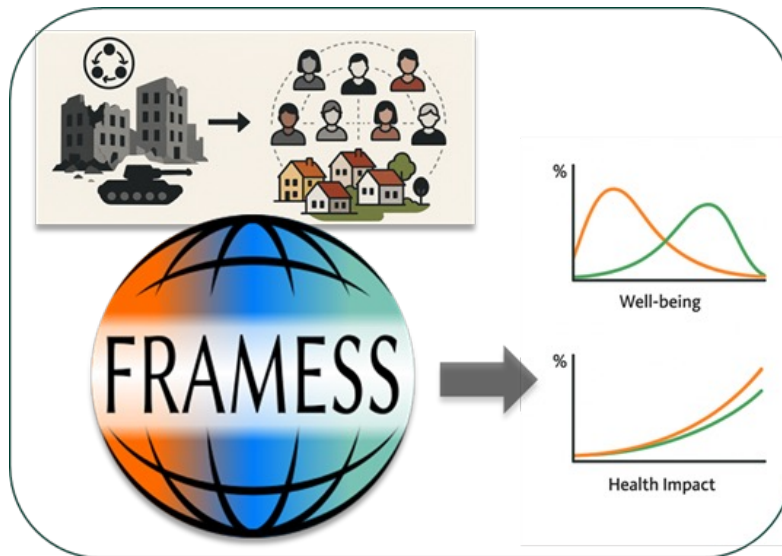




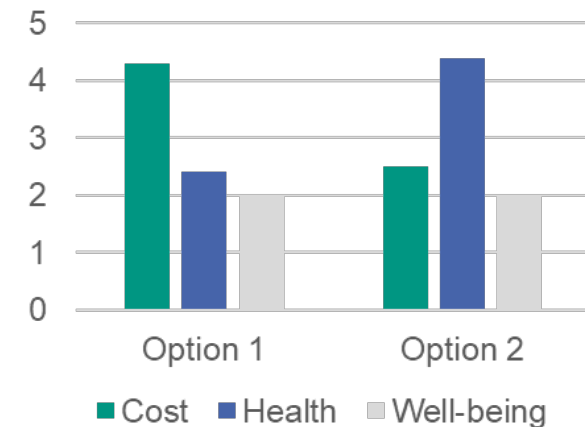
Decision rules: Modelling civilian behavior



Multi-Criteria Decision Analysis (MCDA)



MCDA



Infrastructural measures (Resources: Distribution, Sizes, Location...):

Option 1: Shelter, Measurement Devices, Iodine, basic services ...

Option 2: Shelter, Measurement Devices, Iodine, basic services ...



Conclusion



- Resilience Assessment Framework is available at KIT.
- Framework can be used to analyse & enhance the resilience of an EPR&R system due to radiological emergency in wartime.
- Challenge is lack of data & uncertainty in civilian behaviour models.
- Framework can be adapted to any scenarios with good data.
- Future work will focus on AI powered system optimization.

