WORLD BANK GROUP

Impact Forecast and Warning Services

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GFDRR
Global Facility for Disaster Reduction and Recovery

APEC Climate Symposium 2014
Managing Climate Extremes and Hydrologic Disasters: Scientific Prediction and Emergency Preparedness

Outline

1. Good Forecast, Bad Outcome

1. Coping Mechanisms to Reduce Disasters

1. Not What the Weather will be, but What the Weather will do

2. Developing Impact Forecast and Warning Services

1. Summary

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Focus on…

Understanding what causes hazards to become human disasters

Explore through a series of case studies
and
new warning concepts

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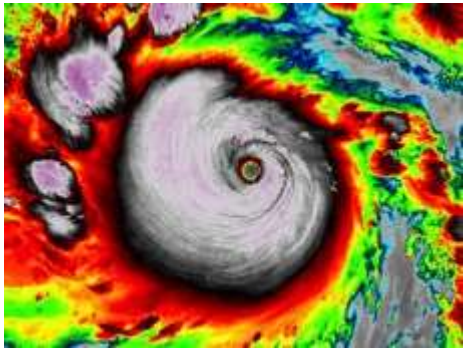
GOOD FORECAST, BAD OUTCOME

Case Study – Philippines

Event: TC Haiyan (Yolande)
Place: Philippines
Date: 3-11 Nov 2013

Synopsis:

Category 5 TC. Intensity forecast well in advance by PAGASA – Warnings issued. Evacuation orders given.



As of Jan 14, 2014, confirmed deaths: 6,201; injured: 28,626; 16 million affected, economic losses exceed US$2 billion…

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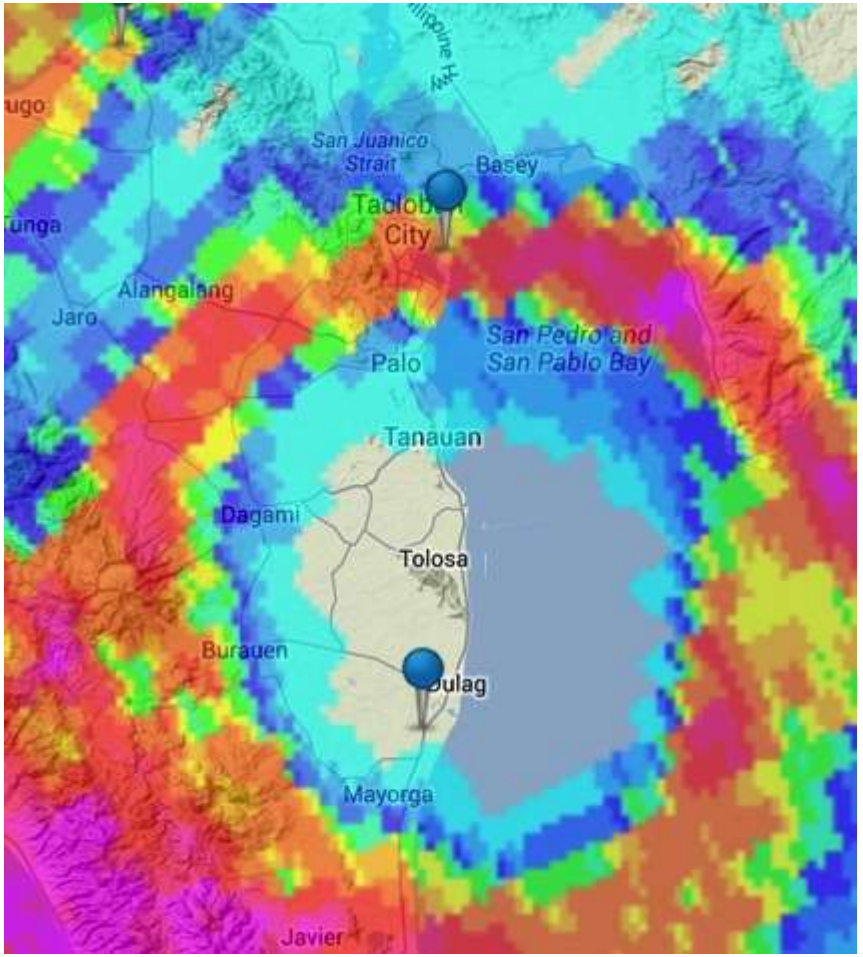
What worked, what didn't?

1. Good track and intensity forecasts well in advance
2. Warnings issued at provincial level
3. Government was engaged and committed
4. Coordination at local level ok
5. NDRRMC embeds PAGASA staff (2 days before landfall)
6. Good policies and laws guide DRM and PAGASA
7. Good observing network
8. First responders in place in advance



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1. Warnings not understood; did not trigger life saving actions
2. Risk of storm surge not understood or underestimated
3. Inundation distance 1-2 km; people needed several hours in poor weather conditions to evacuate – many didn't
4. Emergency preparedness is decentralized – Local Gov. Units receive same info., but act differently
5. Bulletins were made manually and prone to errors and delays
6. Weather models and other hazard models not coupled

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7. Lack of scientific and technical capacity to translate hazard information into impacts – therefore, impacts underestimated
8. Lack of appreciation and utilization of available hazard maps at local level for extremely severe storm surge resulted in evacuation to unsafe shelters that got destroyed
9. Inconsistency in interpretation of information from different sources delivered through multiple channels contributed to public and responder confusion

Case Study – India

Event: Flooding
Place: Uttarakhand, India
Date: 15-17 June 2013

Synopsis:

June 2013, a multi-day convective storm caused devastating floods and landslides. 375% of normal monsoon rainfall fell between 14 and 17 June.

Over 5700 fatalities, 4,200 villages were affected

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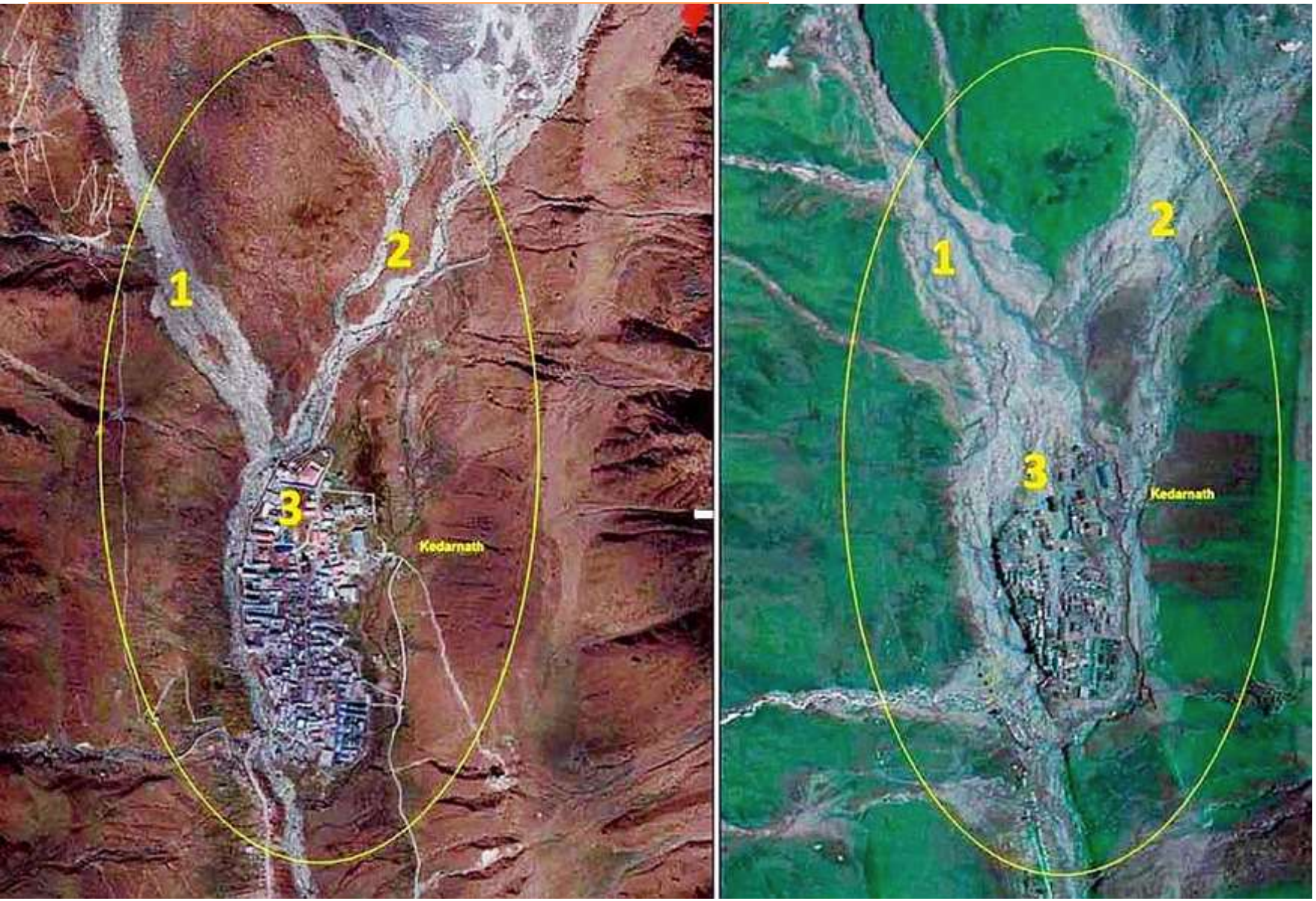
Kedarnarth before and after flood



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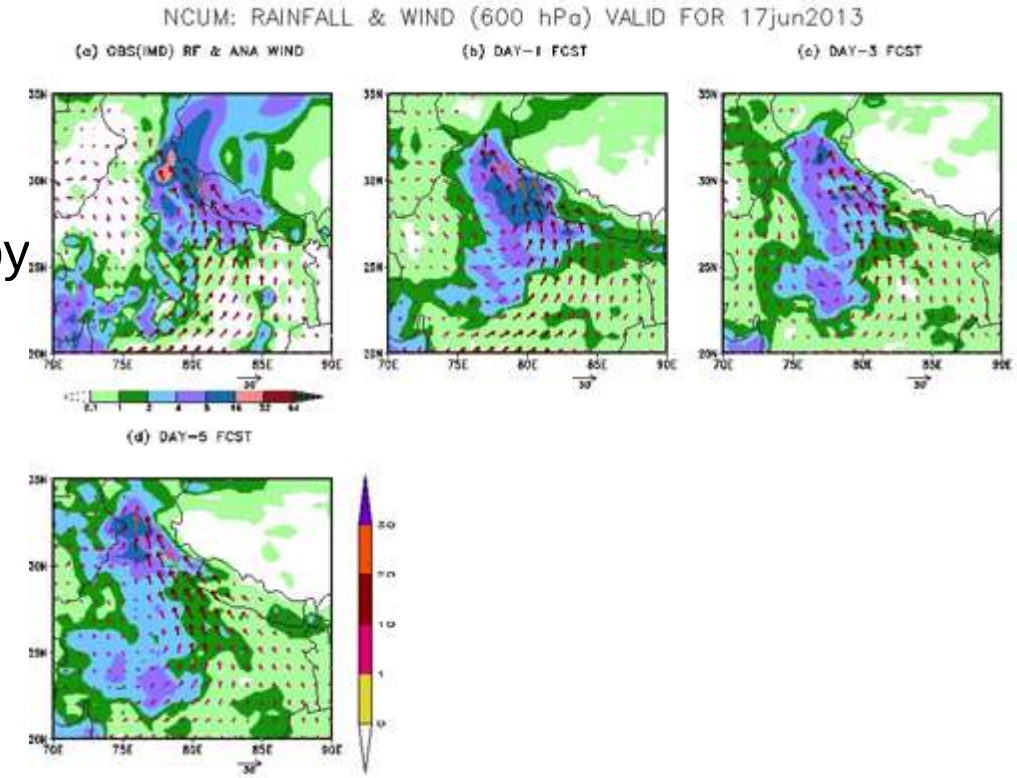
What worked, what didn't?

1. Good Weather forecasts of heavy rainfall three days ahead of event
2. Weather warnings issued by Indian Met Department
3. Media coverage of threat
4. Satellite remote sensing information available



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"We get a copy of the IMD bulletin but action has to be taken by state government only. They put out bulletin (this time) and said "very heavy rain". What does "heavy rain" mean? "Very heavy rain" means very heavy rain. But it doesn't mean that in such a short time so much rain" – Vice Chair, NDMA, India

1. Warning information was not fully understood by Government of Uttarakhand DM – Unable to interpret "heavy rainfall for entire state" into effective impacts
2. Local preparedness for this magnitude of hazard inadequate
3. Late response resulting in additional hazards to responders during rescue operations
4. Poor communication between central government IMD and State DM

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5. Weather models and other hazard models not coupled
6. Lack of scientific and technical capacity to translate hazard information into impacts – therefore, impacts underestimated
7. Inadequate communication channels, which failed during the event
8. Lack of appreciation and utilization of available hazard maps at local level
9. Inadequate observations to forecast events on scale required by Gov. of Uttarakhand

Case Study – China

Event: TC Fitow
Place: Shanghai, China
Date: 6-11 Oct 2013

Synopsis:
TC Fitow began to impact the Chinese mainland on October 6, 2013 causing significant damage and disruption.

Between 20:00 on October 7 and 14:00 on October 8th, Shanghai received total precipitation of 156mm, which is the most rainfall in 18 hours recorded since 1961.

97 roads & 900 communities were flooded with many underground parking facilities and cars damaged. Overflowing rivers flooded four districts. By October 11, there were over 1.2 million people directly impacted with one reported death; and nearly 28,000,000 hectares of farmland was flooded. The direct economic loss is estimated at 890 million RMB. In Zheijang Province, seven deaths were reported and the direct economic loss is estimated at over US$5 Billion.

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What worked, what didn't?

1. Good weather forecasts of TC
2. Highly developed multi hazard warning system for shanghai
3. Well prepared emergency management and first responders
4. Good public communication using multiple channels
5. Good rules and regulations for warnings and response
6. Good Standard Operating Procedures
7. Over 18 million alerted

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1. Warnings issued based solely on weather criteria
2. Resulting high level of alert issued at wrong time – during morning rush hour
3. Warnings "too late" for adequate emergency response
4. Many people trapped on roads
5. Local regulations did not permit children to voluntary stay home from school based on lower level of warning (do now)

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6. Inadequate translation of hazard information into impacts
7. Lack of access to sectorial data – transport authority, roads, schools, etc. – to determine impacts

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COPING MECHANISMS TO REDUCE DISASTERS

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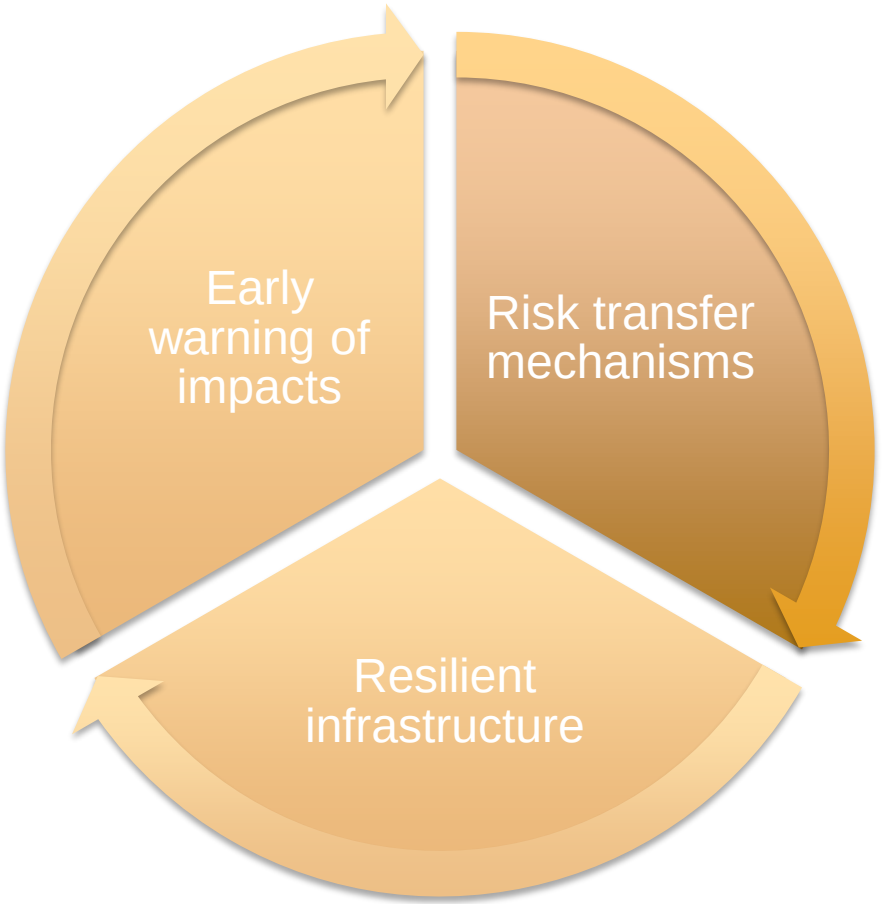
Three interrelated activities…

People have time to seek shelter



Losses are quickly compensated

People and property are protected

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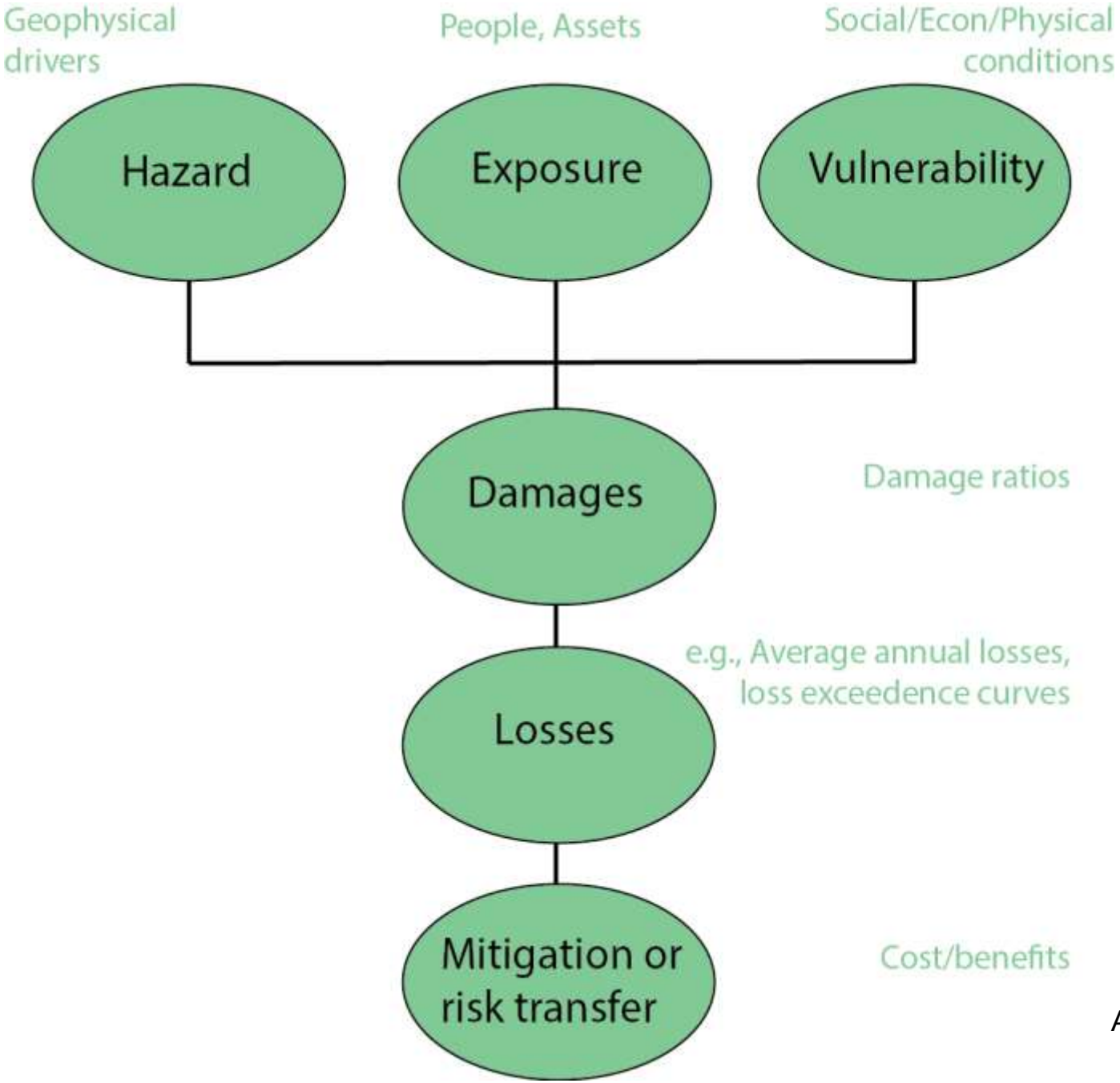

After Deichmann et al. 2011

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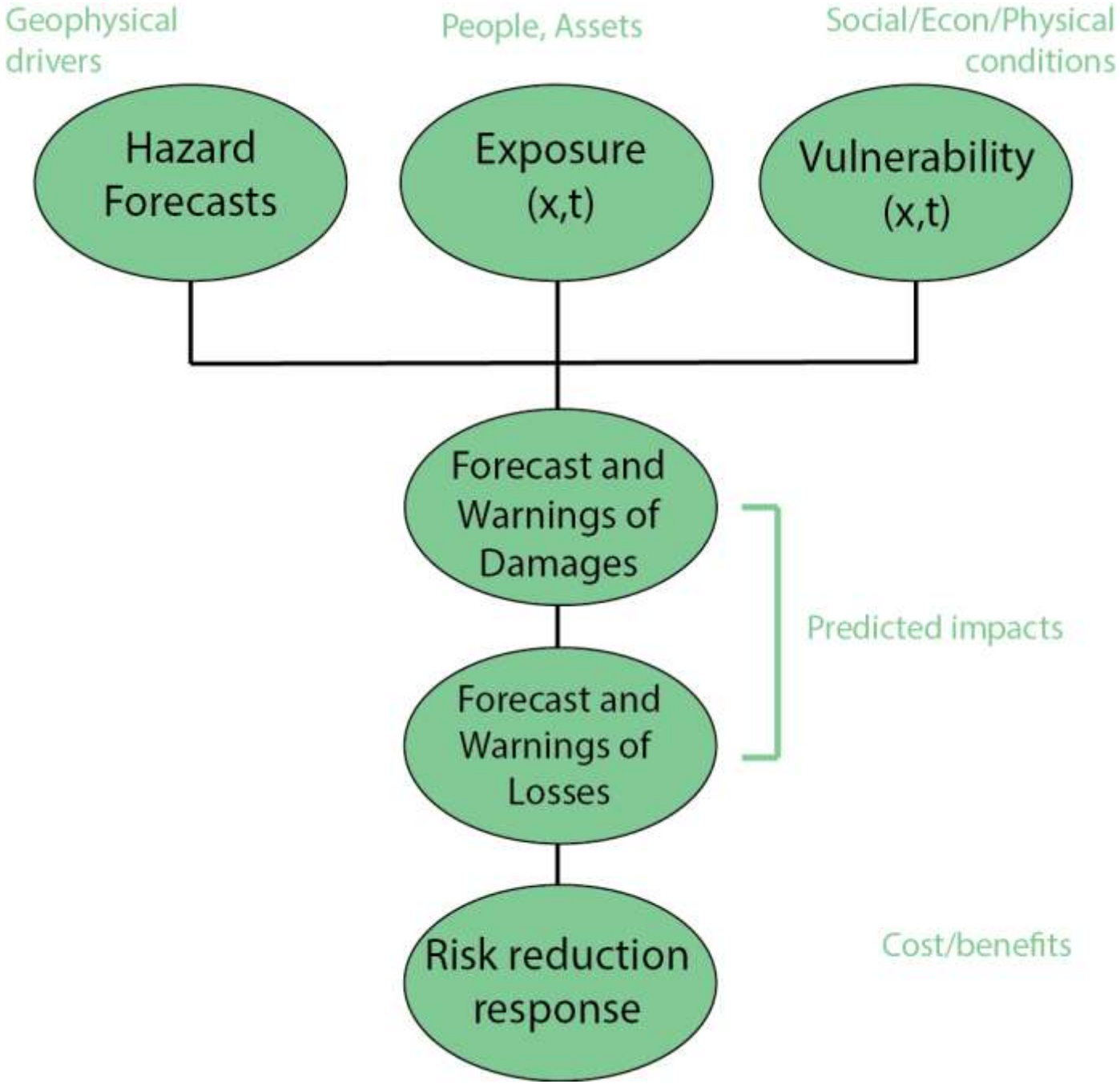

NOT WHAT THE WEATHER WILL BE, BUT WHAT THE WEATHER WILL DO

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Hazards, Vulnerability Assessments, Exposure

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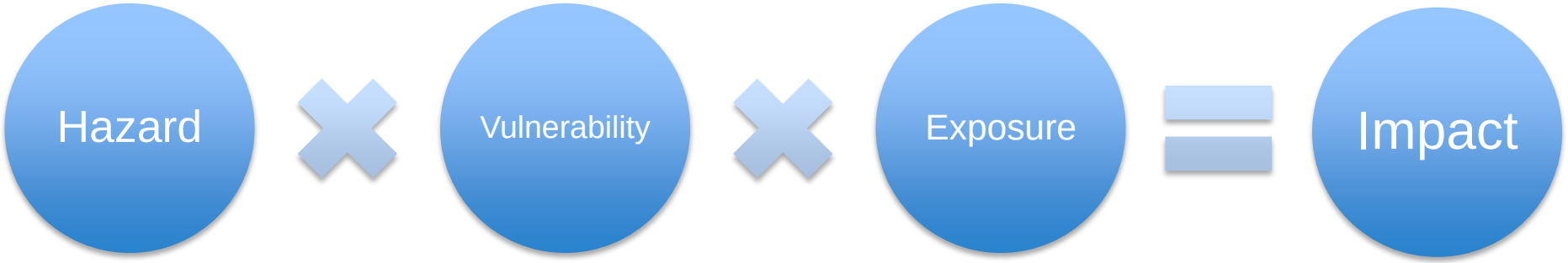
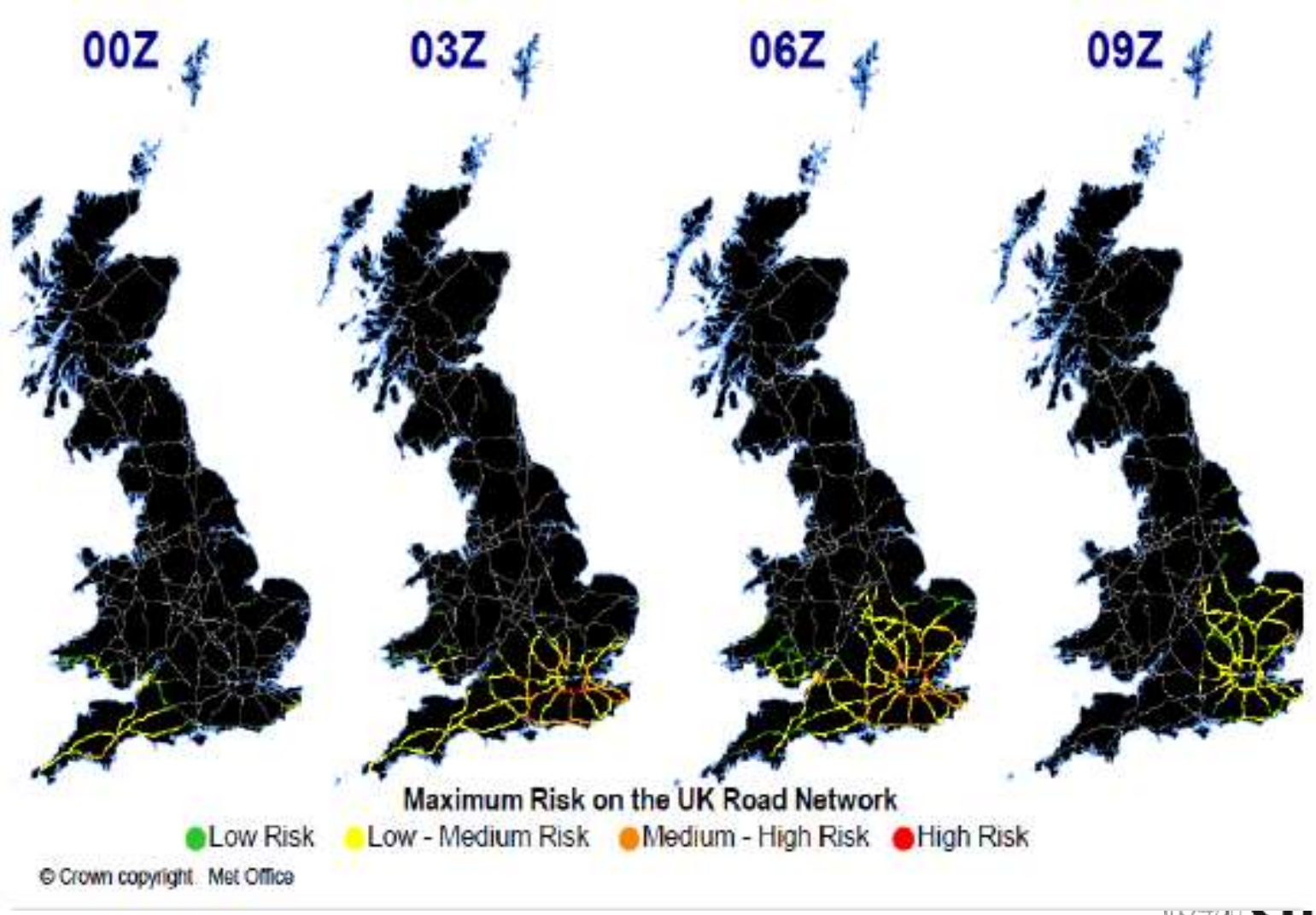
Impact forecasts



The risk associated with the hydrometeorological hazard depends on knowing how that hazard impacts human beings, their livelihoods, and assets due to their vulnerability (susceptibility of exposed elements) and exposure (who and what may be impacted)

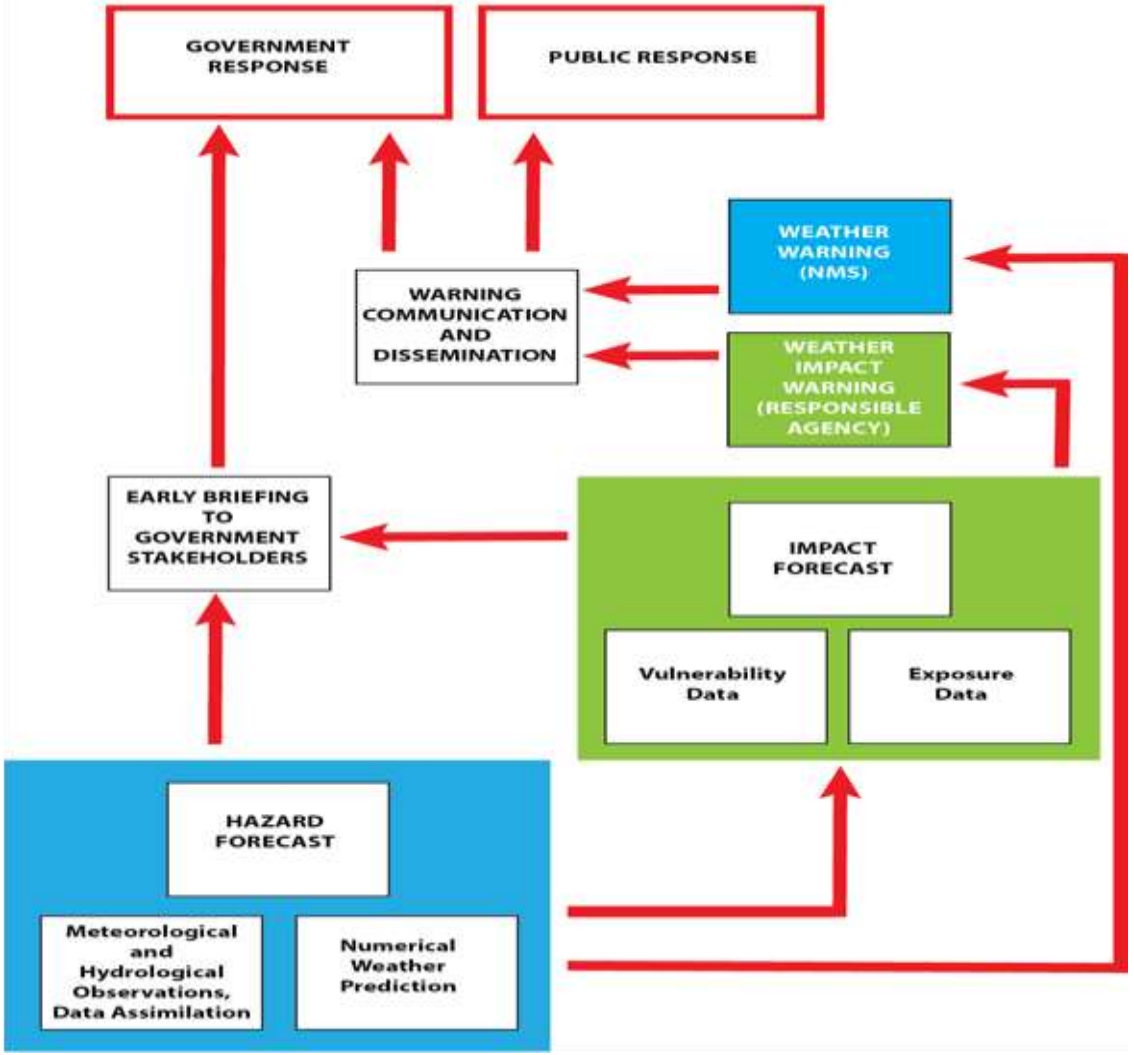
Example of Impact Forecast from UK (Met Office)

Forecast of Risk of Overturning Vehicles – due to high winds. Note highest impacts (in red do not coincide with highest winds)



Conceptual Paradigm

Information flow from basic met/hydro forecasting to impact forecasting to early briefing and warning to action



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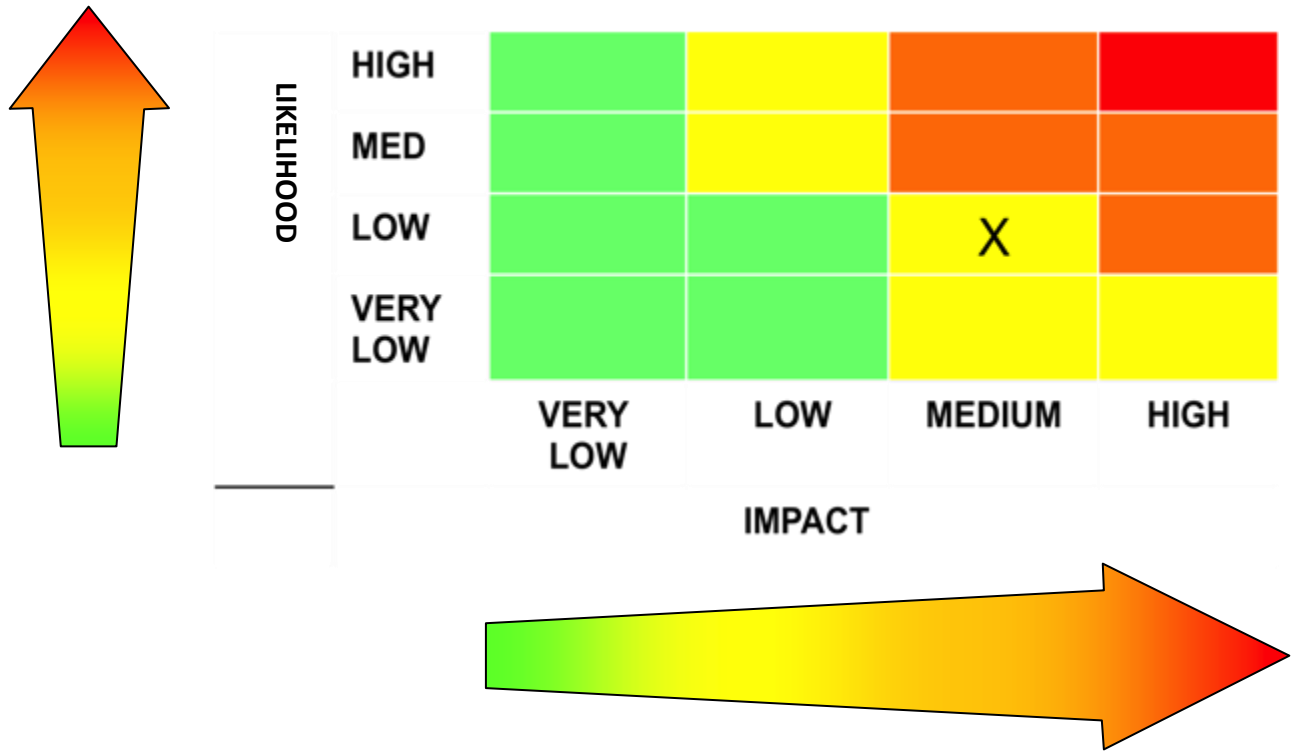
Operational Application



Risk Matrix – A color is assigned to a warning based on the a combination of potential impact and likelihood (Source: Met Office)

Applied to TC Fitow

Hazard Warning

- Yellow alert issued at 21:52 Oct 7th

- take preventative measures - emergency services be prepared

(No emergency action is taken)

Impact Warning

- Orange or Red alert issued at 21:52 Oct 7th – due to severe disruption of traffic and risk to safety of drivers and passengers due to flooding during tomorrow's rush hour

- Take emergency action now to prevent high impact by closing roads liable to flooding and rerouting traffic, issuing alerts to public to stay home

Benefits of an impact warning service

Impact forecasts and warnings relay a message of greater relevance to enable those at risk to take appropriate actions in order to mitigate the overall adverse effects of hydrometeorological hazards.

DEVELOPING IMPACT FORECAST AND WARNING SERVICES

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New kinds of Partnerships

Development of Information and Services

- Common criteria for impact forecasts, risk transfer, and resilient infrastructure
- Shared data among warning services, planning & construction, and insurance
- Advances in telecommunications (esp. Smart Phones) will improve exposure data and facilitate feedback between users and service providers

Summary

- Issues for impact forecasting varied and complex: require planning on many levels, and are not an easy option, but ease of understanding of users is significant
- Effective partnerships (NMHSs, DRM, Media, other government departments, and users) essential for acquiring relevant data and going the last mile
  - Harness diverse capability and deliver holistic approach to managing risks and impacts
  - Training of NMHSs and partners (especially emergency response) staff
- Public engagement

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