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Using GIS as a Tool for Mitigating Geologic Hazards and Managing Natural Disasters



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Introduction

GIS is a versatile tool that has widespread application before, during, and after catastrophic geologic events. This research project analyzes results from multiple recently published case studies each corresponding to a point along the crisis response timeline.

The versatility also surpasses just natural disasters. GIS can be used in humanitarian disasters, and human focused crisis such as in a search and rescue operation.

The timeline has been split into the periods: before, during, and after. The majority of use for GIS is used before a crisis, as seen in the disaster cycle figure. This project hopes to reveal that GIS should not be limited to just before a disaster, but during and after as well.

Before the Disaster

Planning for various geologic crises is critical, as demonstrated by Tran and others (2009). Where local knowledge is used for risk assessment maps in two communities of the Thua Thien Hue Province, Vietnam.

In the disaster timeline, planning and preparation are the most common point where GIS is used. However, GIS can be used for far more than just before the disaster.

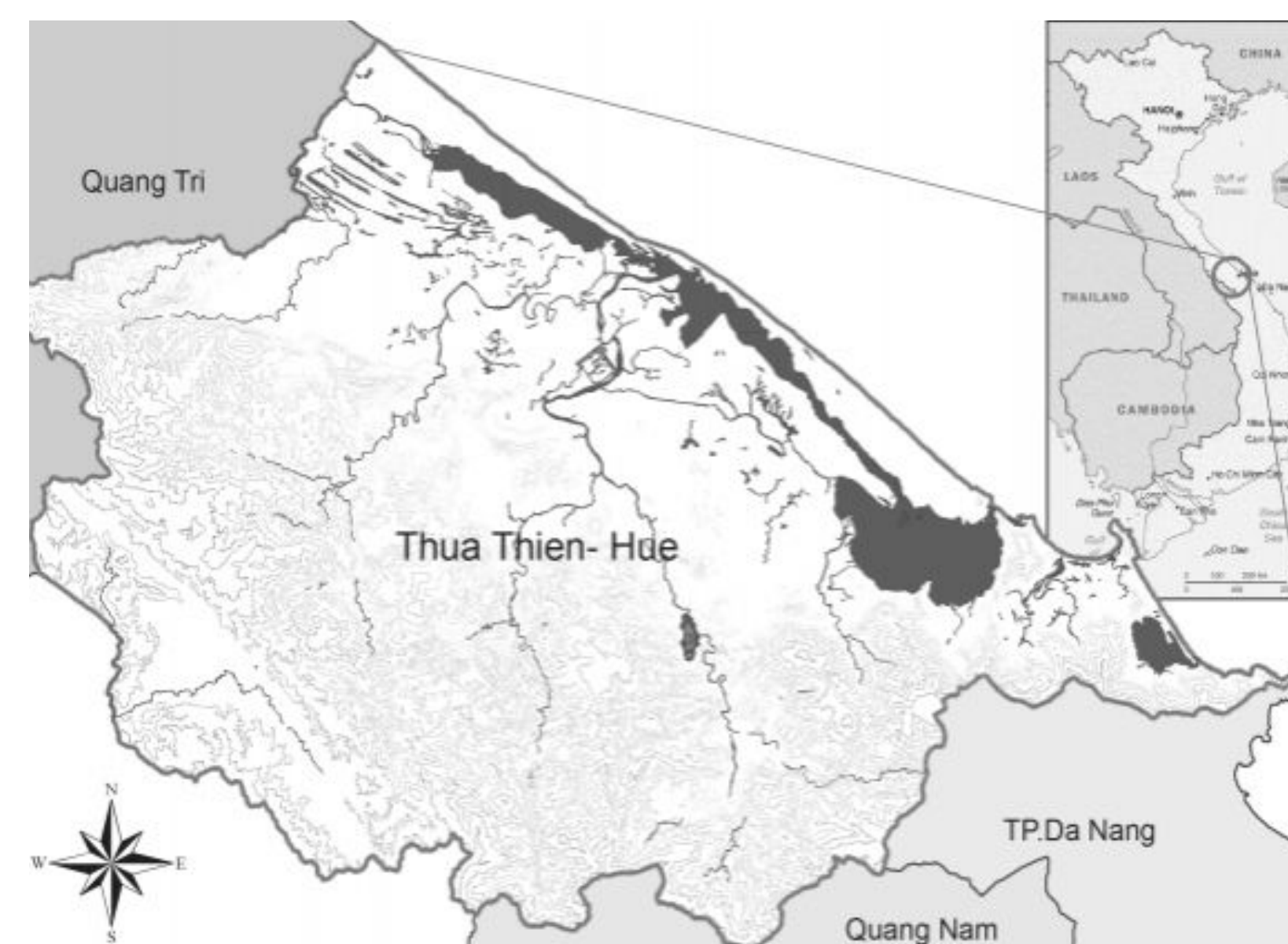
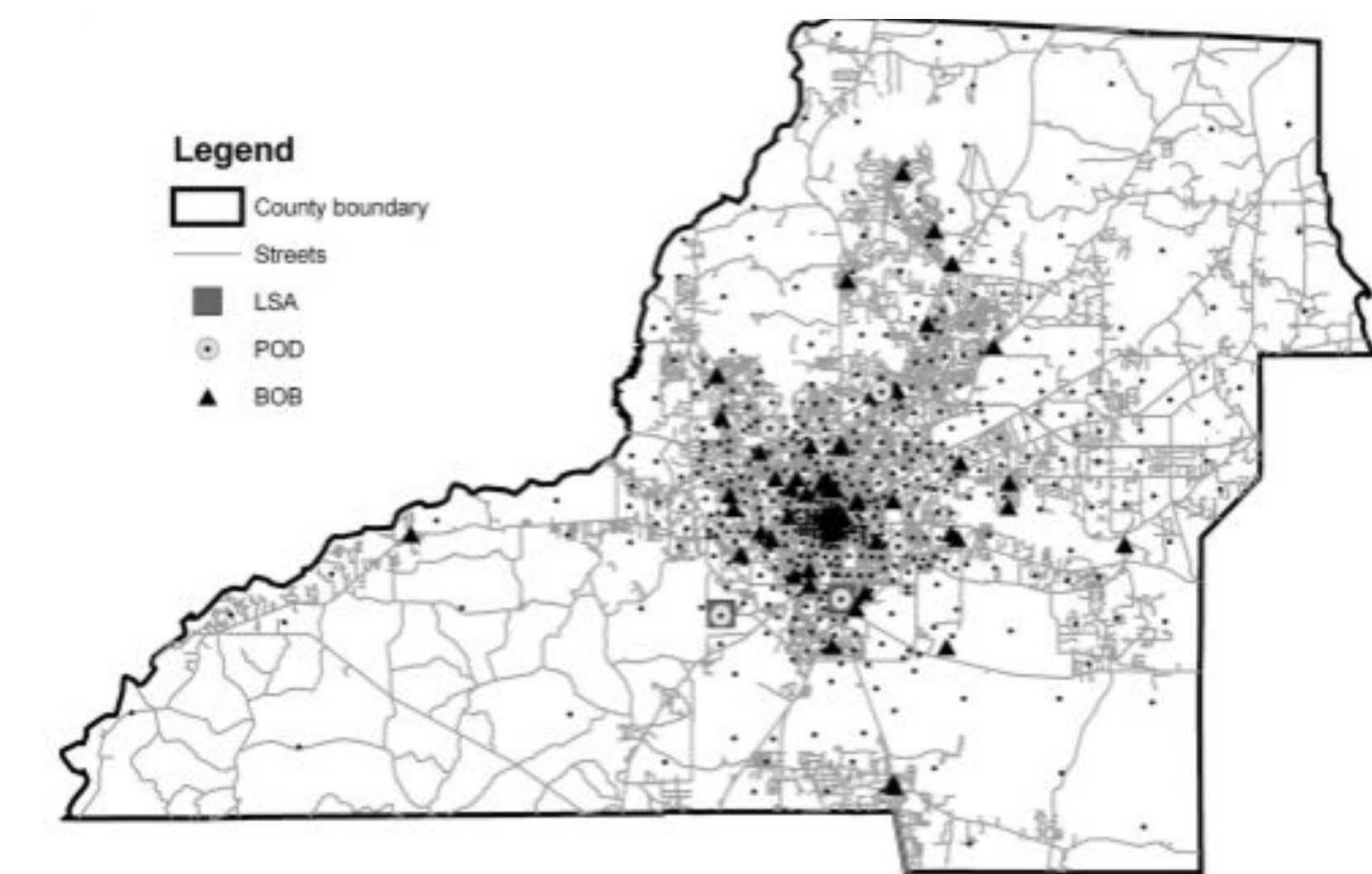


Figure 2: Map of Thua Thien Hue Province, Vietnam via Tran, P et al. (2009)

After the Disaster

Using Leon County, Florida as a study area, Horner and Downs (figure 3) used GIS to create a distribution network for relief efforts in the event of a hurricane. The study shows how GIS can be used post-disaster. In this case, to create distribution networks for relief efforts, limited from any facilities that remained.



Source: Infrastructure locations obtained from the Leon County Sheriff's office and the Florida Division of Emergency Management.

Figure 3: Distribution infrastructure map via Horner, M, Downs, J (2010)

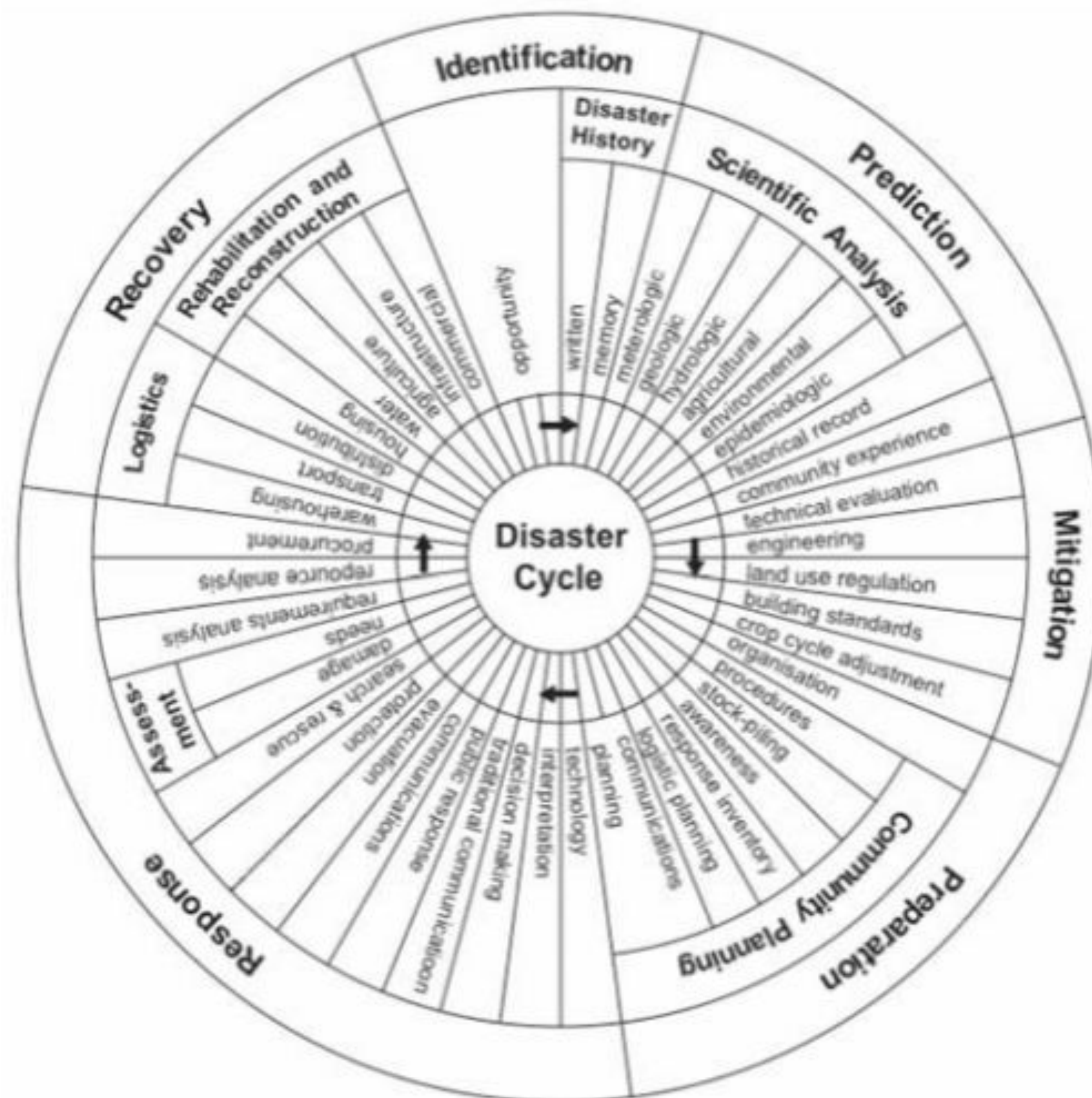


Figure 1: Disaster Timeline via Laefer, D et al. (2006)

During the Disaster

In a search and rescue operation, speed is key. A four step progression in a search and rescue operation can be used, as described by Pfau and Blanford (figure 2). In the aftermath of geologic crises, GIS can be deployed to help distribute and coordinate disaster relief efforts.



Disaster Cycle/Timeline*

- Before the disaster
Identification, prediction, Mitigation, Preparation
- During the disaster
Response
- After the disaster
Recovery, Identification

The use of GIS is primarily used before a disaster. However, this presentation put forth the versatility of GIS at other points in the disaster timeline.

*figure 1

During the Disaster, continued

The use of GIS also extends to Humanitarian disasters as seen in Troy et al (2018). Here Gis is used to aid in the tracking of people using mass crowdsourcing. This study was in response to the Syrian refugee crisis. Such technology can be used for distribution networks as well as seen in the following study (Horner and Dawn, 2010).

Conclusions

These studies demonstrate that GIS technologies are highly versatile before, during, and after geologic crisis events.

- **Before**, primarily being used for planning, mitigation and prediction.
- **During**, shown by search and rescue operations, and refugee crises.
- **After**, shown by post-disaster relief distribution networks.

The versatility GIS should not just be limited to before a crisis. It should be considered from all periods of the disaster timeline, and in its situational versatility not being limited to geologic crises. More effort should be given to use GIS in more than just earth science-centric situations.

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