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A Poisson-Based Exceedance Probability Model for Earthquake Occurrence Using PHIVOLCS Seismic Data

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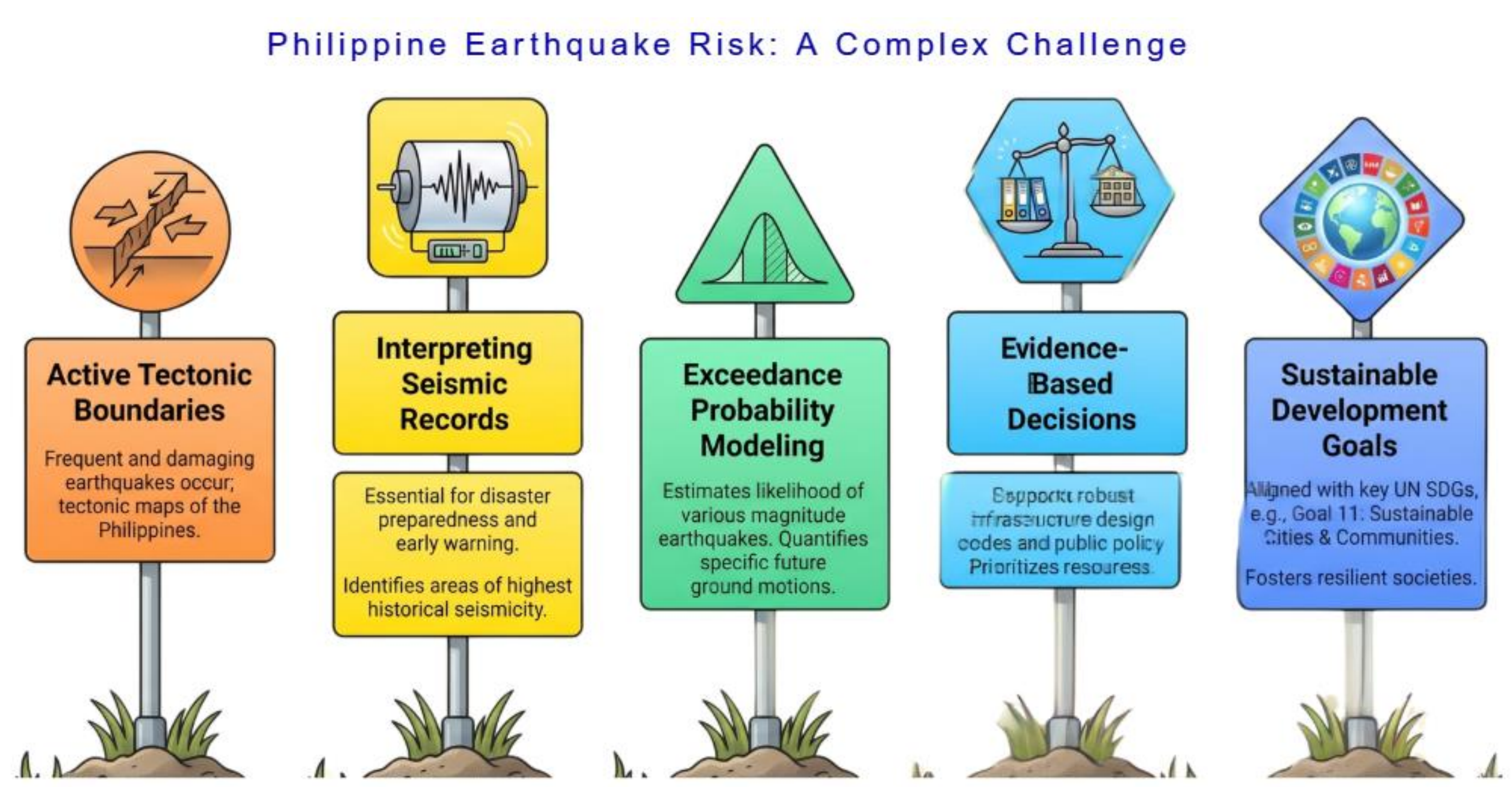
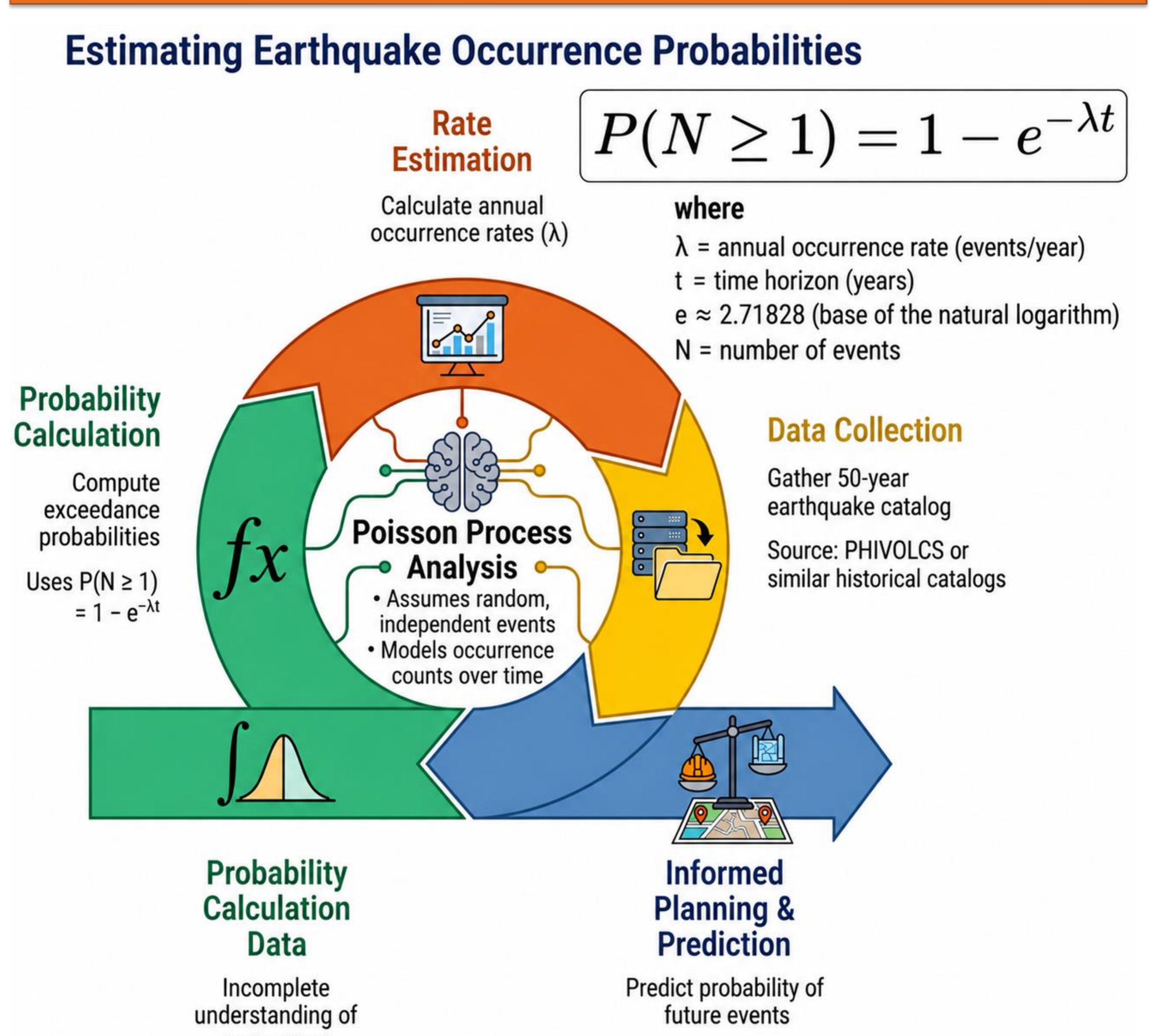
INTRODUCTION & AIM



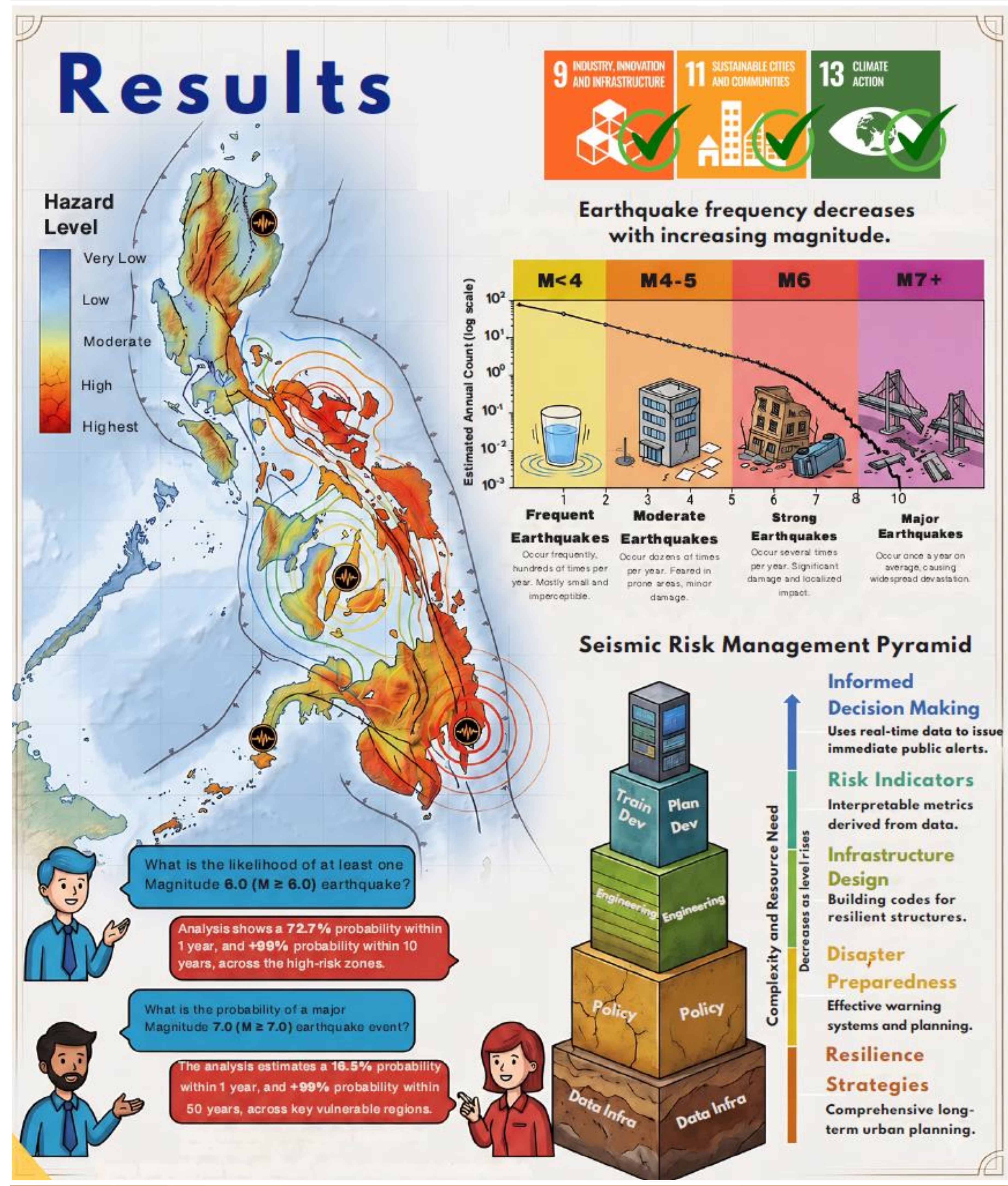
The complexity of earthquake risk in the Philippines by linking geological hazards, scientific analysis, probabilistic modeling, decision-making, and sustainable development. It highlights that the country's location along active tectonic boundaries increases exposure to frequent seismic events, while the interpretation of seismic records provides historical evidence for identifying high-risk areas and improving disaster preparedness. Exceedance probability modeling is used to estimate the likelihood and intensity of future ground motions, supporting risk assessment and engineering design. These scientific findings inform evidence-based decisions, such as infrastructure planning and public safety policies, which ultimately contribute to achieving resilient and sustainable communities aligned with broader development goals, particularly disaster risk reduction and sustainability.

METHOD



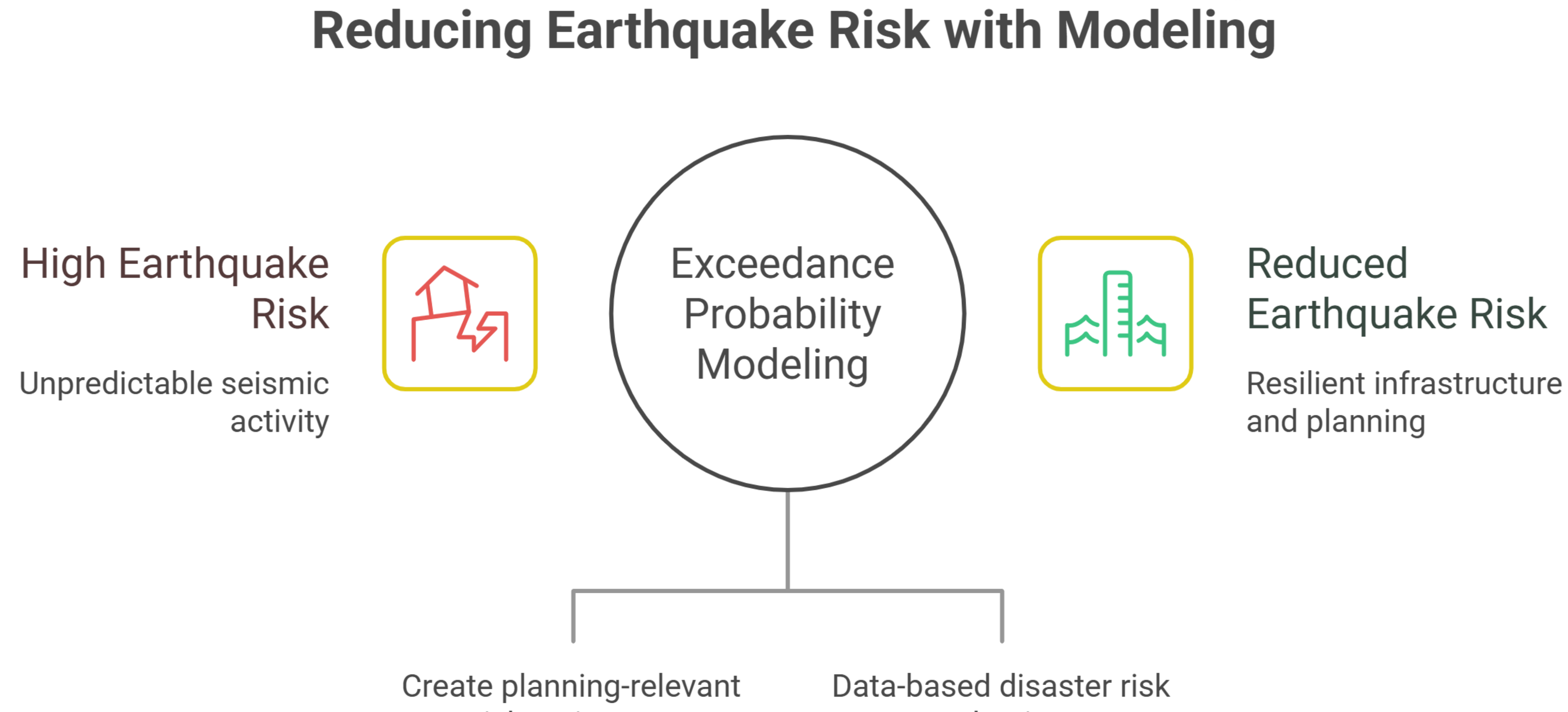
The estimation of earthquake occurrence probabilities using a Poisson process model, a statistical approach that assumes earthquakes occur randomly and independently over time. First, historical seismic data, such as a 50-year earthquake catalog from agencies like PHIVOLCS, are collected to identify past earthquake frequencies. From these records, the annual occurrence rate (λ) is estimated, representing the average number of earthquake events per year. The model then applies the Poisson probability equation to calculate the likelihood of at least one earthquake occurring within a specific time period (t): $P(N \geq 1) = 1 - e^{-\lambda t}$ where λ is the annual occurrence rate and t is the observation period in years. This probability calculation provides exceedance probabilities, helping estimate future seismic risk. The results support informed planning, disaster preparedness, infrastructure design, and evidence-based decision-making by quantifying the probability of future earthquake events.

RESULTS & DISCUSSION



CONCLUSION

Reducing Earthquake Risk with Modeling



FUTURE WORK / REFERENCES

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