Mulas Maurizio
mmulas@espol.edu.ec
FICT

Larreta Erwin
elarreta@espol.edu.ec
FICT

Menoscal Melanie
20240756@novaims.unl.pt
Nova University

Bravo Gianella
gmbravo@espol.edu.ec
FICT

Vaca Valeria
vpvaca@espol.edu.ec
FICT

Rosado Victoria
vrosado@espol.edu.ec
FICT

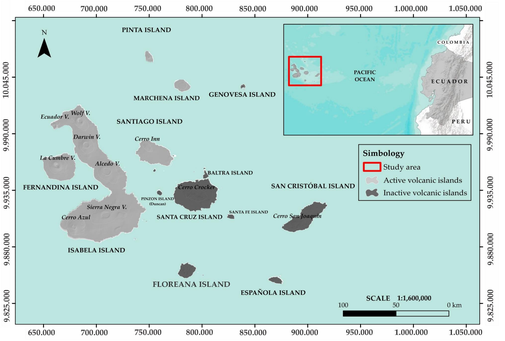
Capa Diego
dcapa@espol.edu.ec
FICT

Garces Daniel
ogarces@espol.edu.ec
FICT

DESIGN OF A GEOLOGICAL MULTIHAZARD FRAMEWORK ON VOLCANIC ISLANDS: CASE STUDY OF THE GALAPAGOS ISLANDS

PROBLEM

The Galápagos Islands face recurrent natural hazards such as volcanic eruptions, flooding, and seismic activity. **Climate change has intensified** certain climate-related natural hazards, **generating cascading effects** that indirectly affect the development of island. To address this problem a **methodological design based on historical records of hazards could be proposed**, obtaining a reference **diagram for decision-making in the face of multi-hazard events.**

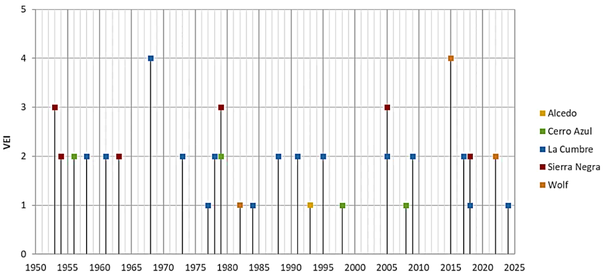


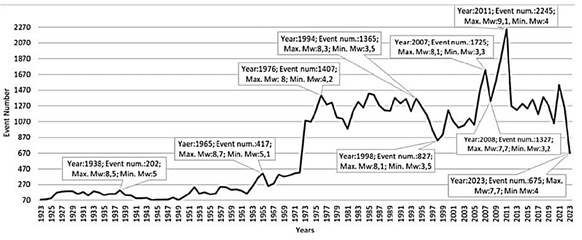
MAIN GOAL

The present work seeks to obtain a multi-hazard framework, considering their environmental parameters and socio-ecological hazards, through a multi-hazard framework diagram. This will allow for planning preventive measures against possible threats and minimizing response time to events during their development, with the aim of reducing impacts on the SES. This tool is designed for Ecuadorian government entities such as the Red Cross and ECU911, but it can be apply on similar worldwide environments.

METHODOLOGY

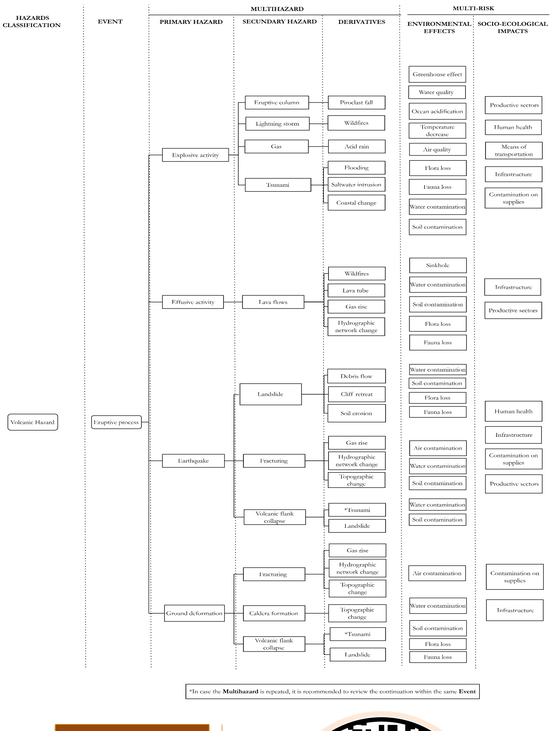
1. **Historical data collection** — Collection of historical data on geological events impacting the Galapagos archipelago.
2. **Identification of triggered threats** — Primary and secondary hazards and their related triggering events were identifying.
3. **Description of SEE and ecosystem services** — The Galapagos SES and its ecosystem service was analyzed to understand the relationship between productive sectors and their environment to identified the ecosystem services that could be affected by a natural event and how could be affected.
4. **Elaboration of the multi-hazard framework diagram** — The multi-hazard framework is designed to systematize all potential hazards that could affect simultaneously Galapagos islands.
5. **Enviromental and socio-ecological impacts** — Each event and their related hazard are correlate with environmental and socio-ecological impacts affecting natural resources and the productive sectors of the population.





RESULTS

The geological framework is a useful tool for volcanic hazard assessment and implementation of mitigation strategies. **The established methodology has allowed us to identify the hazards that most significantly affect the islands and the potential derivative hazards that generate environmental and socio-ecological impacts**. Three natural hazards categories were considered: volcanic, geodynamic, and hydrometeorological. For each hazard category, a driving event **was identified** that produces **"primary hazards"**, which in turn triggers **"secondary hazards"** and **"derivatives"**.
These can cause environmental effects and thus endanger various SES.



CONCLUSIONS

In this study, potential natural hazards that may occur on the Galápagos Islands were analyzed. The relationship with the SES allows us to understand how their ecosystem services are compromised, leading to a limitation of resources for the island inhabitants.
The use of multi-hazard framework in the study of the Galápagos Islands, has been crucial for identifying and analyzing the complex effects of eruptive episodes.

ACKNOWLEDGEMENTS

We acknowledge the support of the Galapagos National Park (PNG), Charles Darwin Foundation (CDF), the Consejo de Gobierno de Regimen Especial de Galapagos (CGREG), the Municipality of Santa Cruz, and the Local Government of Santa Rosa, in Santa Cruz. As part of the ClimRed Project, we also are thankful for the administrative support of the CIP-RRD – ESPOL.

Scan the QR code and access the content