



IMPACT-MAP

A gHM Visualization Tool for Analyzing Anthropogenic Stress in the Philippines

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ABSTRACT

The rapid growth of human activities has led to significant alterations in terrestrial landscapes, resulting in deforestation and reduced biodiversity. To address these pressing issues, researchers require accessible tools to analyze and visualize anthropogenic impacts effectively. However, existing datasets, such as the Global Human Modification (gHM) dataset, present technical barriers that hinder their widespread utilization. This study introduces Impact-Map, a web application that uses the Google Earth Engine JavaScript API to provide researchers with a user-friendly interface for real-time computations and visualizations of the gHM dataset in the Philippines. Impact-Map empowers users to generate average gHM values and gHM distributions for specific areas using drawing tools, search functionality, and CSV imports. Developed using HTML, JavaScript, and various libraries, the application incorporates server-side processing through the Express framework and Google Earth Engine API, ensuring scalability and efficient handling of concurrent requests. The gHM layers are served as XYZ tiles from a Google Cloud bucket, enabling access to temporal and spatial data on anthropogenic stressors. Impact-Map underwent usability testing using the System Usability Scale, achieving an excellent score of 82.7 from a group of 30 students and researchers specializing in ecology, wildlife, and forestry. This high usability score demonstrates Impact-Map's potential to enhance research efficiency and data comprehension in the field of human modification studies. By providing an accessible platform, Impact-Map contributes to the development of informed conservation strategies and a deeper understanding of anthropogenic impacts on the environment.

PROBLEM STATEMENT

The Global Human Modification (gHM) dataset is a valuable dataset that quantifies the extent of human modification on Earth's terrestrial lands. However, despite its importance in understanding anthropogenic stress, the dataset remains underutilized due to the lack of user-friendly applications that make it accessible to a wide audience. Researchers, policymakers, and the public often find it challenging to access and analyze complex datasets such as the gHM dataset, as it requires coding skills and knowledge of Google Earth Engine (GEE) or a powerful computer for utilizing Geographic Information Systems. This technical barrier hinders the widespread use of this crucial information, limiting our understanding of human impacts on the environment. To bridge this gap, this study focuses on developing Impact-Map, a highly usable web application that simplifies geospatial analysis, decreases technical barriers, and enables users to explore the gHM dataset easily.

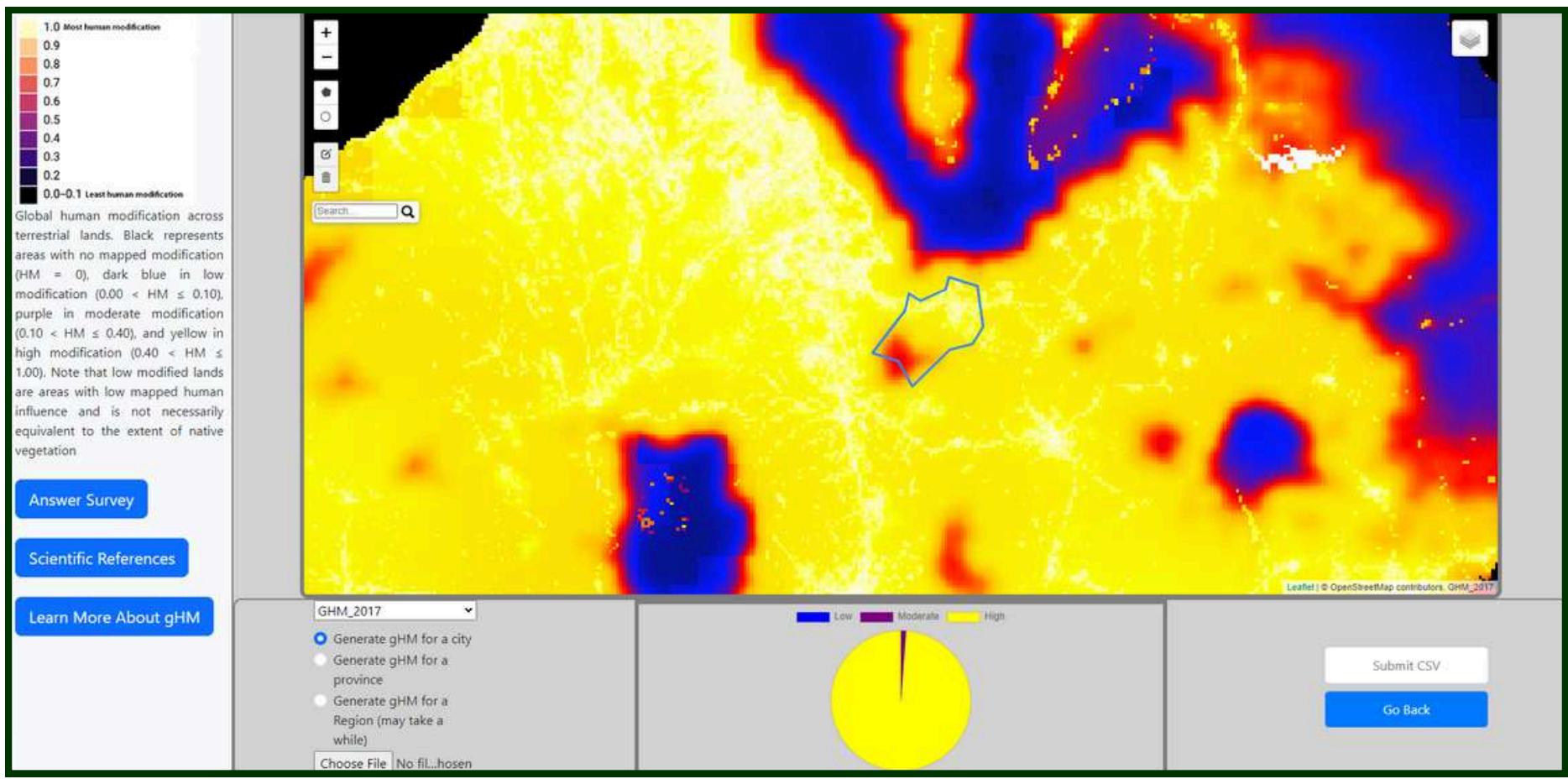
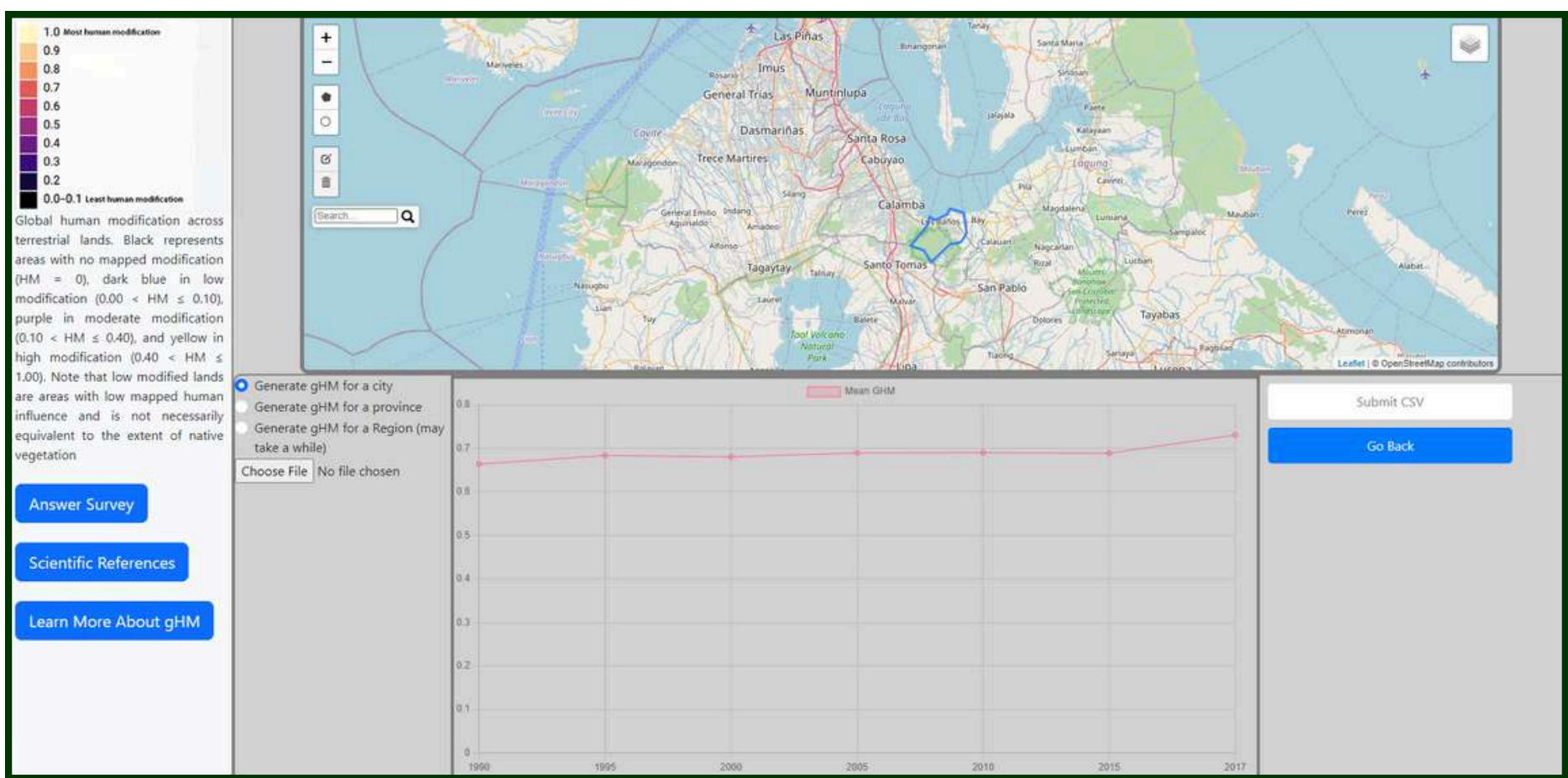
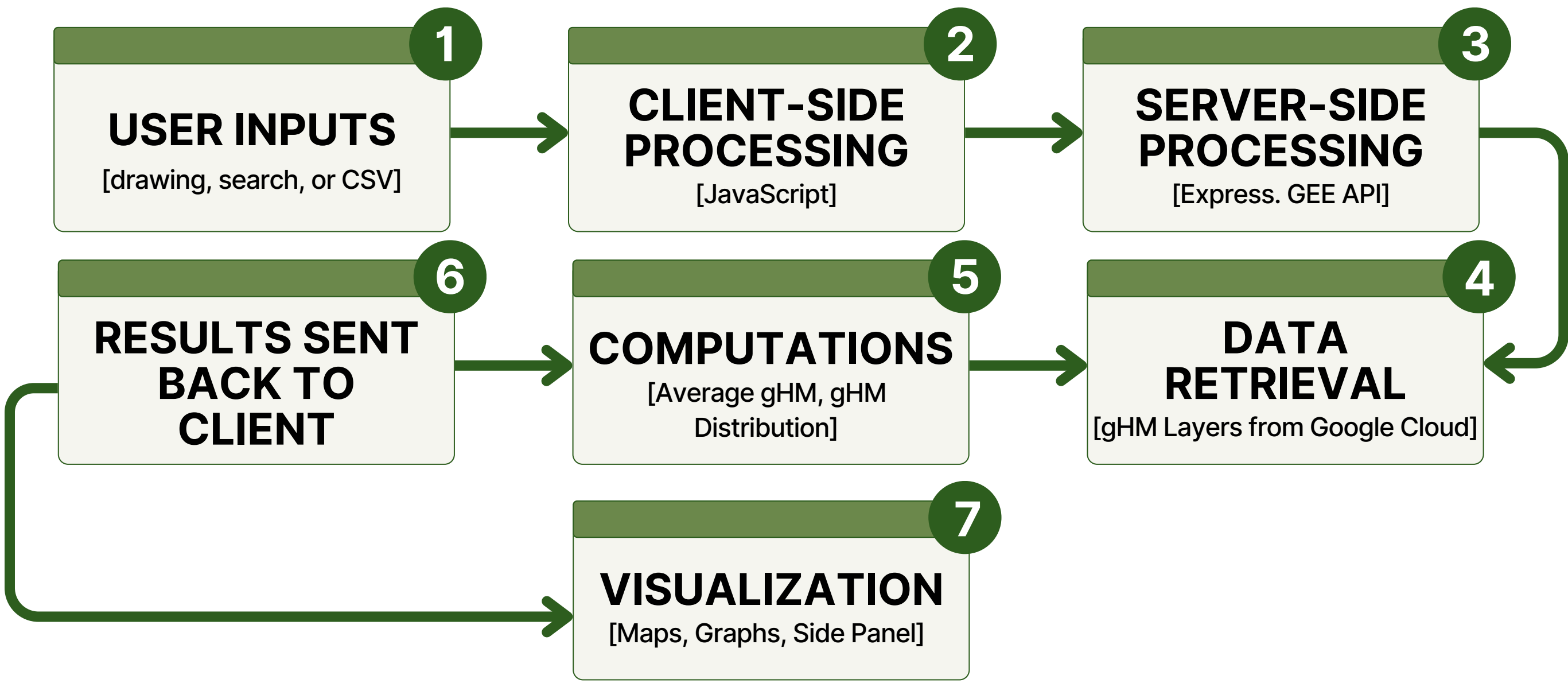
OBJECTIVES

1. Create a usable system for analyzing and visualizing the gHM dataset.
2. Develop tools and features for visualization and analysis.
3. Serve the gHM dataset and layers from a cloud server, ensuring access to temporal and spatial data.
4. Use Google Earth Engine's cloud computing platform dynamically through user inputs.

METHODOLOGY

- APIs and technologies: Google Earth Engine API, Leaflet, Google Cloud Platform, Render, JavaScript, HTML, GeoJSONs, ChartJS, QGIS.
- Features: Landing page, single-page web app, average gHM generation, gHM distribution generation, layer viewing, graphs, sidepanel.
- Computations based on formulas from Kennedy et al. (2019) and Theobald et al. (2020).

HOW IMPACT-MAP FUNCTIONS?



WEB-APP SCREENSHOTS

Generated Global Human Modification (gHM) Average for the municipality of Los Baños, Laguna over a period of 27 years (1990 - 2017), mapped onto OpenStreet Map.

Generated Global Human Modification (gHM) Percentage for the municipality of Los Baños, Laguna for the year 2017, mapped onto GHM_2017.

RESULTS AND DISCUSSION

- Successfully developed Impact-Map using HTML, JavaScript, and multiple libraries.
- Utilized Express framework and Google Earth Engine API for server-side processing.
- Generated XYZ tiles from gHM dataset and served them from a Google Cloud bucket.
- Deployed the web app on Render for broader public access.
- Achieved an excellent average System Usability Scale (SUS) score of 82.7 from 30 participants (students and researchers in ecology, wildlife, and forestry).

CONCLUSION

- Impact-Map provides a platform for analyzing and visualizing the gHM dataset in the Philippines.
- It empowers researchers to study anthropogenic impacts efficiently, contributing to informed conservation strategies.
- The web app achieved high usability.

