

Computing Climate risks Indicators using Google Earth Engine

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Introduction

The past decade has seen rapid and unprecedented climate changes, such as global warming, deforestation, rising sea levels, and alterations to rainfall. These changes have raised questions about the long-term survival and equilibrium of the ecosystem and require new measures to ensure a sustainable living space. Changes in land usage, emissions of greenhouse gases, aerosols, and chemicals, and the planetary energy balance have all contributed to the current climate change. Available predictive models project a continuation of human-induced climate change, with the global average temperature expected to rise further by 5°C by the end of the twenty-first century. Therefore, the issue must be addressed by monitoring these changes and computing the risk indicators. Continuous monitoring of climate risk is necessary to identify any shifts or trends in expert opinion over time in areas of uncertainty. This would provide actions to lower and control such risks at a better scientific foundation. In this blog post, we will explore how Google Earth Engine can be used to assess the risk of climate change.

Climate risk Indicators

Climate risk indicators are measurements that aid in our comprehension of the possible effects of climate change on several facets of society, such as the environment, public health, and the economy. With the help of these indicators, it is possible to create efficient plans for reducing the effects of climate change and preparing for its consequences. Some common climate risk indicators include:

- Flood
- Drought
- Heatwave

- Landslide

These climate risk indicators can give information at many scales, ranging from local to global. This enables decision-makers to customize their responses according to various locations and industries' unique requirements and challenges. At the same time, indicators may be used by national and international policymakers to monitor the achievement of climate goals and provide guidance for the creation of laws and regulations that promote climate action.

Google Earth Engine

Google Earth Engine is an effective tool for analyzing and visualizing large amounts of geographical data. It is a cloud-based platform created by Google that gives users access to a significant collection of satellite images and other geographic data and several tools for processing and analyzing this data. This comprises machine learning methods for categorization and prediction and image processing tools like filters and spectral indices. In addition to predicting future shifts and repercussions, these techniques may be used to spot patterns and trends in geographical data.

The capacity of Google Earth Engine to swiftly and effectively analyze enormous volumes of data is one of its main advantages. Utilizing the company's cloud computing infrastructure enables clients to view and analyze data without downloading it to their computer, making this feasible. This can help one save a lot of time and money, especially when working with complicated and massive datasets. The capacity of Google Earth Engine to include various geographical data types is another crucial aspect. This contains, among other things, meteorological information, topography maps, and satellite photography. Users may get a more thorough knowledge of intricate environmental events such as changing land cover, forest loss, and the impact of climate change by merging these various data sources.

Google Earth Engine for Climate Risk Assessment

In order to create efficient methods to reduce these risks, it is necessary to evaluate the possible threats related to climate change. Climate risk indicators may be calculated using Google Earth Engine, which offers a potent tool for doing so. These indicators can be used to estimate and evaluate future climate change effects.

Specifying the Study Area and Time Period:

The first step in utilizing Google Earth Engine to compute climate risk indicators is to specify the research region and time period. This could require selecting on a specific area or place and stating the time frame for which climatic data is needed. Google Earth Engine gives users access to a variety of climatic and remote sensing data that may be utilized to specify the research region and time frame.

Accessing and Preprocessing the Data: After determining the research region and time period, the following step is to use Google Earth Engine to retrieve the necessary climatic data. This comprises information from weather stations, satellites, and climate models. These data sources may be accessed and processed using Google Earth Engine user-friendly interface. To make the data ready for analysis, preprocessing may be necessary. Filtering out insignificant information, eliminating outliers, and normalizing the data to maintain consistency across multiple data sources may be required.

Computing Climate Risk Indicators: Climate risk indicators may be calculated using Google Earth Engine once the data has been preprocessed. The frequency of extreme weather occurrences, the number of days that a specific temperature is exceeded, and the variation in precipitation over time are just a few examples of the many distinct climate hazards that may be calculated using the Google Earth Engine. These markers can be used to pinpoint geographic locations that are particularly susceptible to the effects of climate change. These hazards can then be combined with population data and land cover to analyze the exposure and compute the vulnerability to determine climate risk.

Analyzing and Visualizing the Results: After calculating the climate risk indicators, the data may be analyzed to determine the regions most susceptible to climate change's effects. In order to do this, it may be necessary to recognize regions vulnerable to extreme weather conditions such as flooding, drought, or other natural disasters or regions that are going through significant changes in temperature or precipitation. To better explain the possible effects of climate change to stakeholders, the data can be visualized using Google Earth Engine visualization tools, such as maps, charts, or graphs.

Benefits of using Google Earth Engine for computing climate risk indicators

Using Google Earth Engine to compute climate risk indicators has various advantages:

Large number of Datasets: Google Earth Engine gives users access to a wide range of geographic data sets, including those concerning the environment, land use, and biological diversity. This simplifies the computation of climate risk indicators and the comparison of findings across different places and time periods.

Scalability: Google Earth Engine is a cloud-based platform that can compute climate risk indicators over enormous areas and over lengthy periods of time. This enables identifying patterns and developing long-term climate adaptation and mitigation plans easier.

Open source: Google Earth Engine is an open platform, which means that the data and technologies used to calculate climate risk indicators are available to the public. This simplifies governments, non-governmental organizations, and corporations interacting and exchanging data and outcomes.

Visualizing tools: Google Earth Engine contains several tools for visualizing geographical data, such as maps, graphs, and animations. This makes communicating climate risk indicators' results to a wide variety of audiences simpler.

Limitations and challenges

While there are many benefits to using Google Earth Engine for computing climate risk indicators, some challenges should be considered. These challenges include:

Data quality: The quality of the data used to compute climate risk indicators can significantly impact the accuracy of the results. It is important to ensure that the data being used is reliable and up-to-date, and that any uncertainties or limitations are clearly communicated.

Technical expertise: Google Earth Engine requires a certain level of technical expertise in order to use it effectively. This can be a barrier for some users, particularly those who are not familiar with coding or data analysis.

Interpretation: Climate risk indicators are complex metrics that can be difficult to interpret, particularly for non-experts. It is important to ensure that the results of climate risk indicators are communicated in a way that is understandable and actionable.

Conclusion

The current study would help to mitigate the risk of climate change. Using Google Earth Engine can effectively monitor these changes across various spatiotemporal scales. This study aims to develop estimates for various essential indicators for determining policy, including those related to excessive flood, drought, heat waves and landslides. The indicators are then paired with exposure and vulnerability measurements to climate threats relevant to the national and local levels at different time frames.

Google Earth Engine has been used to analyze the spatiotemporal pattern of these hazards from a national to local scale. To analyze the vulnerability, various indicators have been quantified and then normalized to develop a vulnerability index. The tool may assist government organizations and other decision-makers in determining their response to climate-related risks and increasing the effectiveness of their adaptation plans at national and sub-national levels.