



Using Blender and Geographic Information Systems (GIS) to Create 3D Landscapes and Model Extreme Climate Events



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Introduction

Climate change is one of society's most pressing problems and the way the issue is visualized is a precursor to how people understand and respond to it. Statistical facts and scientific papers play an important role in stating what is actually happening, however, this can be further complimented by having a visual aid that is engaging, especially in Western societies where the impacts of climate change are not as directly experienced in comparison to other parts of the world.

The rate of global sea level rise is accelerating: it has more than doubled from 1.4 millimeters per year throughout most of the twentieth century to 3.6 millimeters per year from 2006–2015 (Lindsey). Further, extreme weather events have become more frequent. Of the 126 rainfall or flooding events studied by Carbon Brief, 56% found human activity had made the event more likely or more severe (Carbon Brief).

Blender is a 3D creation suite that allows for modeling, animation, simulation, composing, and video editing. Geographic information systems (GIS) consists of software that can analyze and output geographic data. The two are used in conjunction to create 3D landscapes on a webpage that can display climate alterations when engaged with.

Method

Creating Terrain:

With the BlenderGIS Addon, a Basemap is loaded (from Google satellite data) which is chosen using coordinate points. BlenderGIS manages in priority the Coordinate Reference Systems (CRS) of the scene's origin and updates the corresponding longitude/latitude if it can do the math (Domlysz). Next elevation is added, using shuttle radar topography mission data (STRM) that enhances the area to provide more complete digital elevation data which is complimented with geometry such as buildings, waterways, and highways by importing OpenStreetMap (OSM) data.

Animating Water Levels:

A cube shape is then created to replicate water within the natural landscape which is enhanced through texture editing. To display the water level rising, keyframes in Blender are used to move the cube's location along the z-axis across different points of time. Using general sea level rise and flood level data in meters, an animation of the water's movement and interaction with the terrain/landscape is created.

Webpage:

A webpage is created using HTML and GitHub that displays the 3D visualization of the terrain and information about climate change events related to water. Using interactive sliders, the audience can move the water levels and see accurate changes in real-time. The web pages also have an Augmented Reality feature in which the 3D terrain can be viewed through a mobile phone's camera, allowing users to have a closer look at the impact on buildings.

Results:

Howth, Ireland

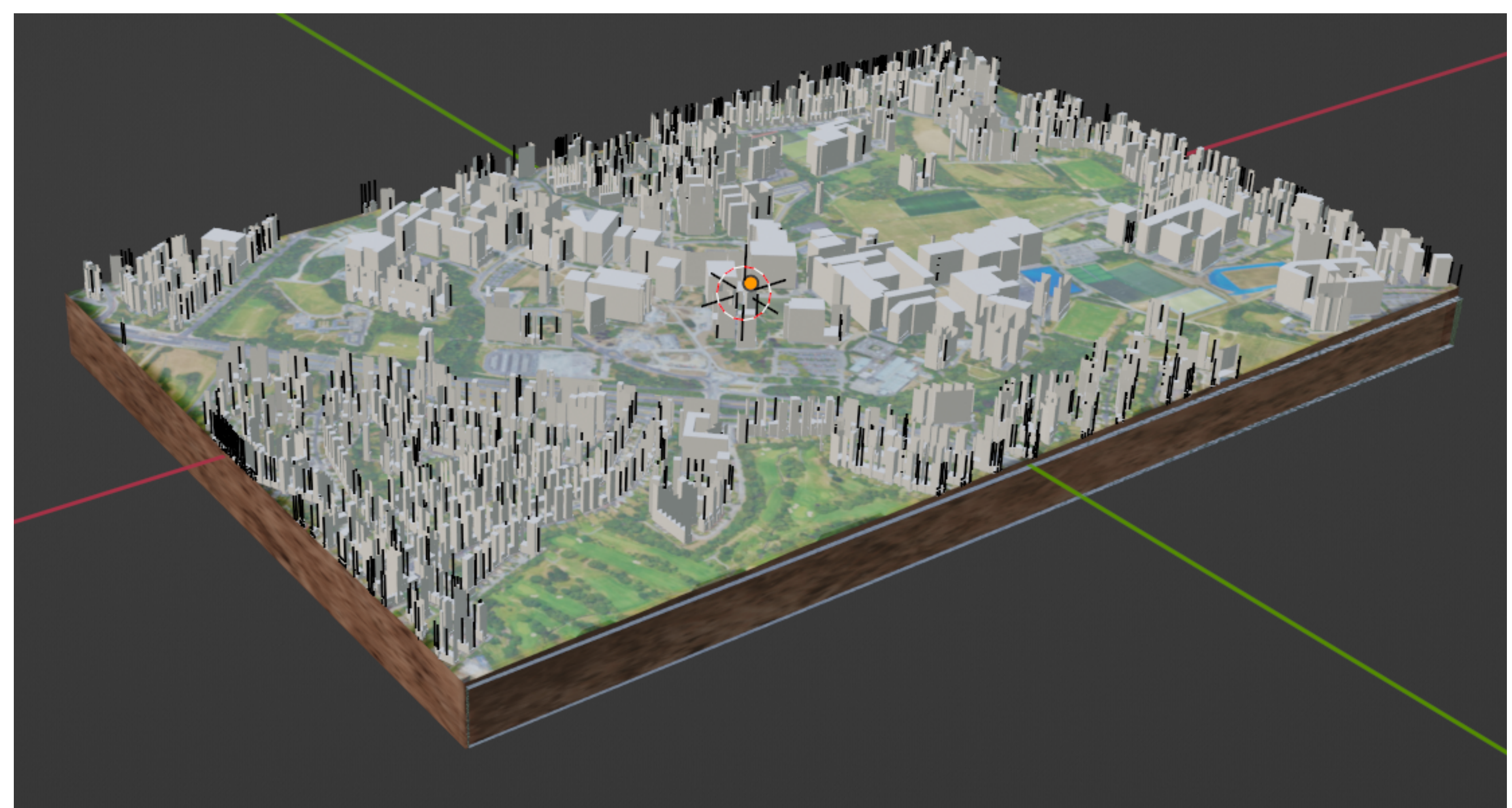
Hunza Valley, Pakistan.

UCD



Discussion

In this study, the ways in which heavy abstract ideas such as climate change from the scientific and engineering community can be communicated to citizens and policymakers were explored. It is vital to put into perspective the facts of sea level rise and extreme weather events such as flooding in a manner that is visualizing and engaging to enact change. It is easy for the Western world to believe that the implications of these changes exist outside of them and the use of augmented reality can put into perspective what is occurring in their community or in another parts of the world. It is vital to have the tools accessible for science communicators to do this through open-source software such as Blender, OSM, and GitHub.



3D Landscape of UCD Campus in Blender

References

- Carbon Brief. (2022, August 5). *Mapped: How climate change affects extreme weather around the world*. CarbonBrief.
- Domlysz. (n.d.). *Georeferencing management*. GitHub
- Lindsey, R (n.d.). *Climate change: Global sea level*. NOAA Climate.gov