‘Life in Rubber Boots’

Projecting the Effects of Global Warming on Sea Level Rise by the year 2100

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ABSTRACT

Because of Global Warming, the sea level will rise between 0,26 m and 1,1 m by the year 2100. This places coastal countries and low-lying islands at risk. With the help of Geoinformation Systems (GIS), e.g. calculation and analysis of where those places will be flooded and how much, we visualize the minimum and maximum calculations in an interactive StoryMap. Asia is most at risk considering flooded area [km²]. Regrading percentages it is South America.

MOTIVATION

According to the IPCC report of 2019, the sea level will rise between 0,26 m and 1,1 m until the year 2100 because of Global Warming [1]. These circumstances place coastal areas at a growing danger as ecosystems are inevitable to be lost because of sea-level rise [2].

We wanted to create an interactive StoryMap that is available to everyone and has interactive options to inform people about Sea Level Rise (SLR), by calculating and visualizing how far inland the water would rise in both of these extreme value scenarios.

OBJECTIVES

Various objectives needed to be met in order to achieve the desired results. These were calculating the area [km²] flooded and the percentages [%] of total land area inundated per continent for both scenarios, as well as visualizing the data in an appealing way.

Fig. 1: Visualized SLR for Great Britain and Northern Ireland. (Sources: [1], [3])

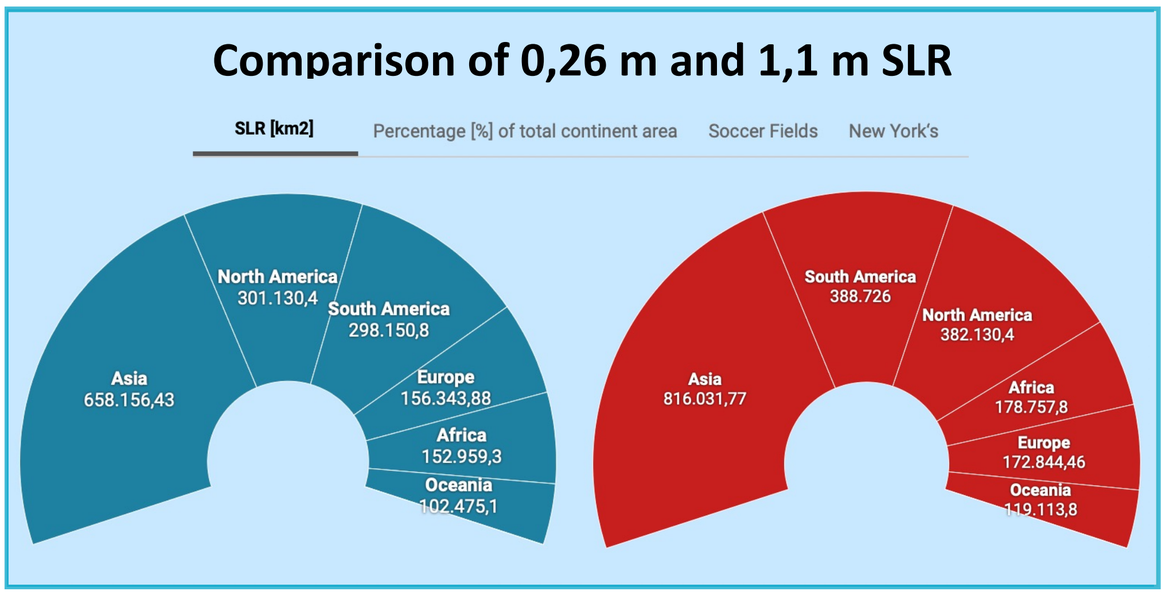

Fig. 3: Comparison of 0,26 m SLR (left) and 1,1 m SLR (right). Illustrated here are the total submerged areas [km²] for each continent. In the interactive diagrams in the StoryMap one can also choose to display “Percentage [%] of total continent area”, “Soccer Fields”, and “New York’s”.

DATA

We accomplished our project with the following three datasets:

1. Min. and max. calculated SLR for 2100 [1] and
2. Digital Elevation Models (DEMs) derived from satellite images of the Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010), with a spatial resolution of 1 km [4].
3. Land and Coastline Layer from naturalearthdata.com

WORKFLOW

The final analysis steps were realized with different softwares:

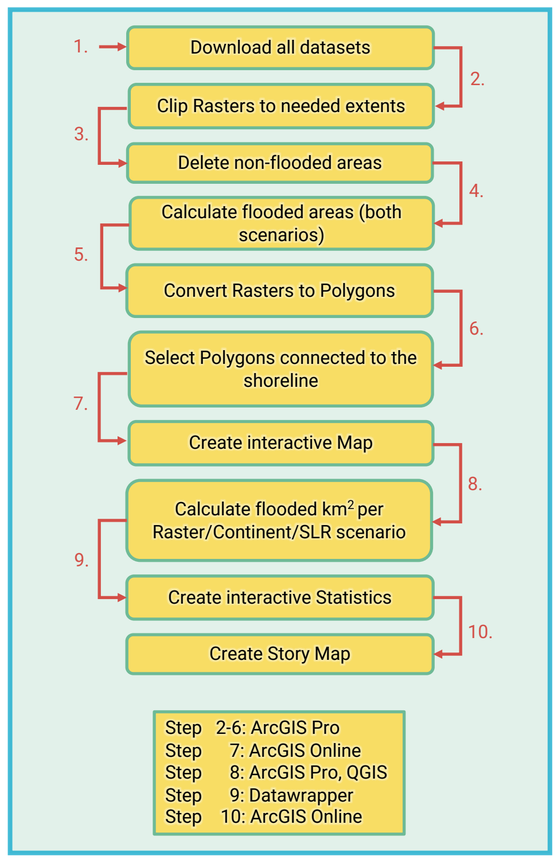

Fig. 2: Workflow to achieve the objectives. (Source: own illustration)

RESULTS

Approximately 390,000 km² more are flooded in the max. than in the min. scenario, looking at the whole world. Asia is most affected in both, regarding the total submerged area, Oceania least. The highest percentages compared to the total continent size are found for South America with 1,7 % in case of 0,26 m and 2,2 % for 1,1 m SLR. Here, least affected is Africa having 0,5 % in the low and 0,6 % in the high scenario flooded.

CONCLUSION

In summary, even though only small percentages of the continents are inundated, these are still high numbers when looking at km². Regarding total area flooded, Asia is most at risk, in terms of percentages it is South America. However, with a spatial resolution of 1 km of the DEMs, the result is not as accurate as one might wish for an important and current topic like this.

One thing that stands out is that the most affected regions of each continent are in close proximity to the Northern Hemispheric Oceans. In contrast, the least affected parts are facing the southern ones or are located closer to the North Pole.

FURTHER RESEARCH

In the future it is important to determine the number of people that live in the as flooded calculated areas now and in 2100, using population statistics. Besides human lives, flora and fauna will also be affected.

IMPRINT

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KEYWORDS

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LINK

https://arcg.is/W4HjG

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