Sea level rise (SLR) is one of the most major and apparent repercussions of climate change. According to the Intergovernmental Panel on Climate Change (IPCC), global mean sea level (GMSL) would increase by 0.26 to 0.77 meters by 2100, depending on the emissions scenario and uncertainties in the physical processes of ice-sheet dynamics and ocean circulation. (IPCC, 2019). This rise in sea level is already affecting low-lying coastal communities, causing increasing floods, coastal erosion, and storm surges, with serious economic, social, and environmental repercussions. (Nicholls et al., 2018).

The economic repercussions of SLR are enormous, and they will continue to grow as sea levels rise. The costs of coastal damages and adaptation measures might reach hundreds of billions of dollars per year by 2100, depending on the severity of SLR and the success of adaptation efforts. (Hallegatte et al., 2013). Coastal damages include direct expenses like as property damage, infrastructure damage, and land loss, as well as indirect costs such as business disruption, lower property prices, and lost tourism revenue. Adaptation expenses include beach replenishment, coastal protection measures like seawalls and levees, and controlled retreat.

As the repercussions of SLR become more apparent, it is becoming more critical to investigate the net optimum value (NPV) of coastal damages and adaptation costs. The net present value (NPV) gives a quantifiable approximation of the benefits and costs of adaptation initiatives, allowing policymakers to evaluate the feasibility and efficiency of various adaptation options. However, depending on the socioeconomic scenario and climatic prediction adopted, the impact of SLR and the cost of adaptation strategies might vary dramatically. Other factors, like as land subsidence, changes in storm patterns, and human adaption responses, can all contribute to the uncertainty in SLR forecasts, in addition to uncertainties in the fundamental processes of ice-sheet dynamics and ocean circulation.

When assessing the impact of SLR and adaptation methods, numerous sources of uncertainty must be addressed. These include uncertainties in the physical processes of ice-sheet dynamics and ocean circulation, as well as the Shared socioeconomic pathways (SSPs) and Representative Concentration Pathways (RCPs). To address these uncertainties, many SSP-RCP scenarios, spanning from low-emission, sustainable development scenarios to high-emission, business-as-usual scenarios, have been produced. To analyse the spectrum of probable future SLR consequences and adaptation costs, we will focus on four SSP-RCP scenarios: ssp1-rcp2.6, ssp2-rcp4.5, ssp4-rcp6.0, and ssp5-rcp8.5.

The ssp1-rcp2.6 scenario depicts a low-emission, sustainable development path in which global greenhouse gas (GHG) emissions peak about 2020 and then quickly fall. This scenario anticipates major advancements in energy efficiency, renewable energy, and carbon capture and storage technologies. As a result, global mean temperature rise is expected to be less than 2°C by 2100, with SLR expected to be approximately 0.26 meters (O'Neill et al., 2016).

The ssp2-rcp4.5 scenario depicts a medium-emission route, with global GHG emissions peaking about 2040 and subsequently declining. This scenario assumes a moderate degree of advancement in energy efficiency and renewable energy technology. Global mean temperature rise is expected to be approximately 2°C by 2100, with SLR estimated to be around 0.42 meters. (Clark et al., 2011).

The ssp4-rcp6.0 scenario depicts a high-emission pathway in which global GHG emissions continue to climb throughout the century until peaking about 2080 and then declining. This scenario implies that energy efficiency and renewable energy technology will increase only slowly. Global mean temperature rise is expected to be roughly 2.7°C by 2100, with SLR expected to be around 0.55 meters. (Clarke et al., 2011).

The ssp5-rcp8.5 scenario depicts an extremely high-emission path in which global GHG emissions continue to climb throughout the century. This scenario implies that there will be little to no progress in energy efficiency or renewable energy technology, and that fossil fuels will continue to dominate the energy mix. Global mean temperature rise is expected to be roughly 4.3°C by 2100, with SLR estimated to be around 0.85 meters. (Clarke et al., 2011).

These many SSP-RCP scenarios depict a spectrum of conceivable futures that might arise because of various governmental actions and socioeconomic circumstances. They do, however, emphasize the significance of lowering GHG emissions and implementing appropriate adaptation strategies to mitigate the effects of SLR.

The goal of this article is to examine the impact of SLR and adaptation strategies under various SSP-RCP scenarios, as well as to classify the NPV of coastal damages and adaptation costs into high-end and low-end categories. This will be accomplished using a feature engineering technique to identify the most relevant characteristics that contribute to the NPV of coastal damages and adaptation costs under various SSP-RCP scenarios. We will also examine the NPV's sensitivity to various assumptions and uncertainties in the models utilized.

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