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# Plausible hybrid-infrastructure alternatives for enhancing climate resilience of coastal communities – a case of megacity of Mumbai, India

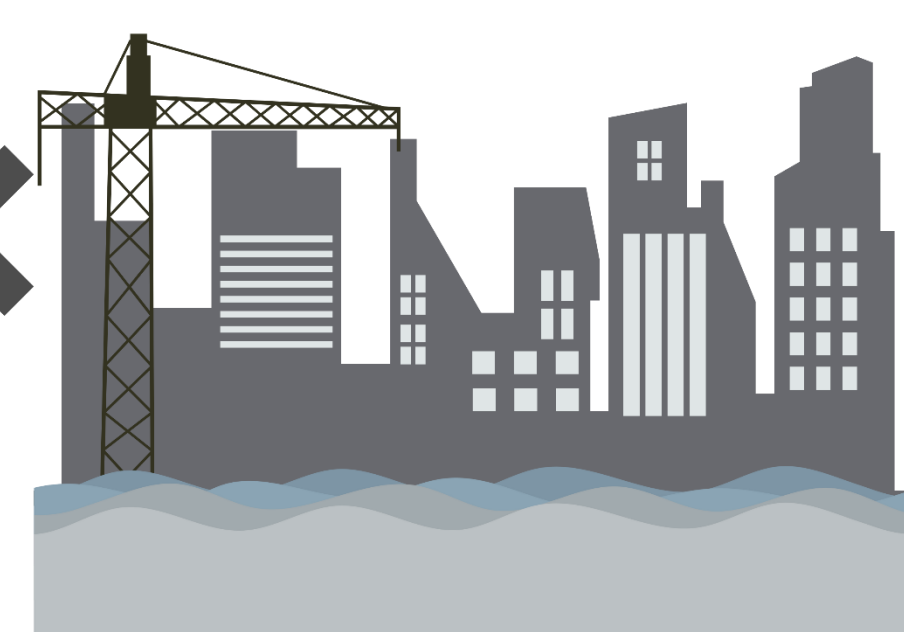
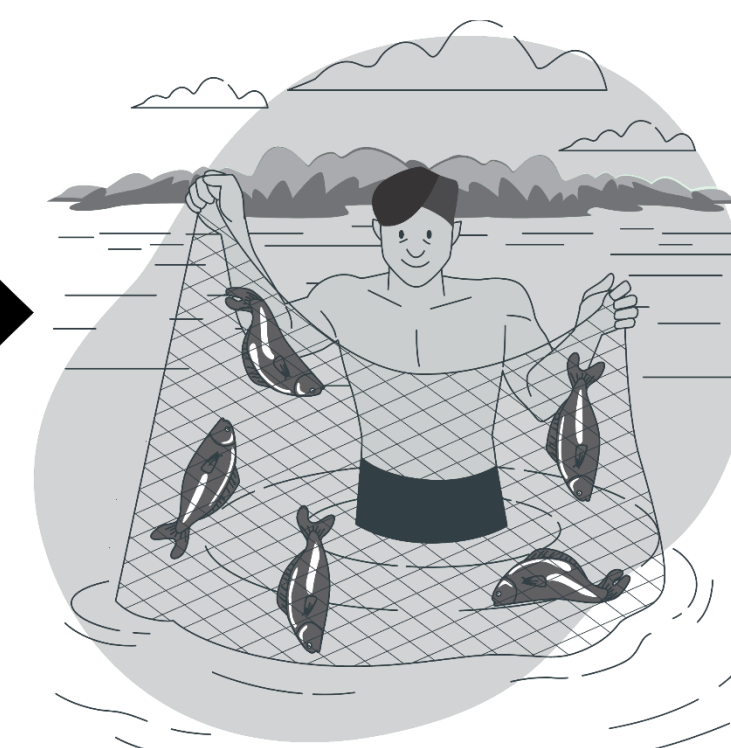
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## 1. Introduction

- Coastal ecosystems are the **most threatened ecosystems** in the world due to anthropogenic impact.
- In case of megacity of Mumbai, **unplanned urbanization, overburdened drainage, poor waste management** destroys habitats, pollute surroundings, erode buffer zones, disrupt natural processes, and amplify vulnerability to climate change, culminating in **coastal degradation**.



Natural Hazards

Multi-dimensional vulnerability

Infrastructure Development

## 2. Objectives

- To Assess Resilience of existing coastal Infrastructure in multi- hazard environment along the coasts of Mumbai through data driven multi-criteria index - **CIRI**
- To identify optimal hotspots to propose **plausible hybrid infrastructure alternatives** - combination of grey-green infrastructure

## 3. Study Area

- Mumbai is an island megacity facing Arabian sea along the west coast of India built on reclaimed land
- Largest population exposed to coastal flooding – estimated at 2,787,000 currently, and projected to increase to more than 11 million people exposed by 2070.
- Complex urban coastal area where all the classic geomorphological features and urban signatures are present

## 4. Hybrid Infrastructure

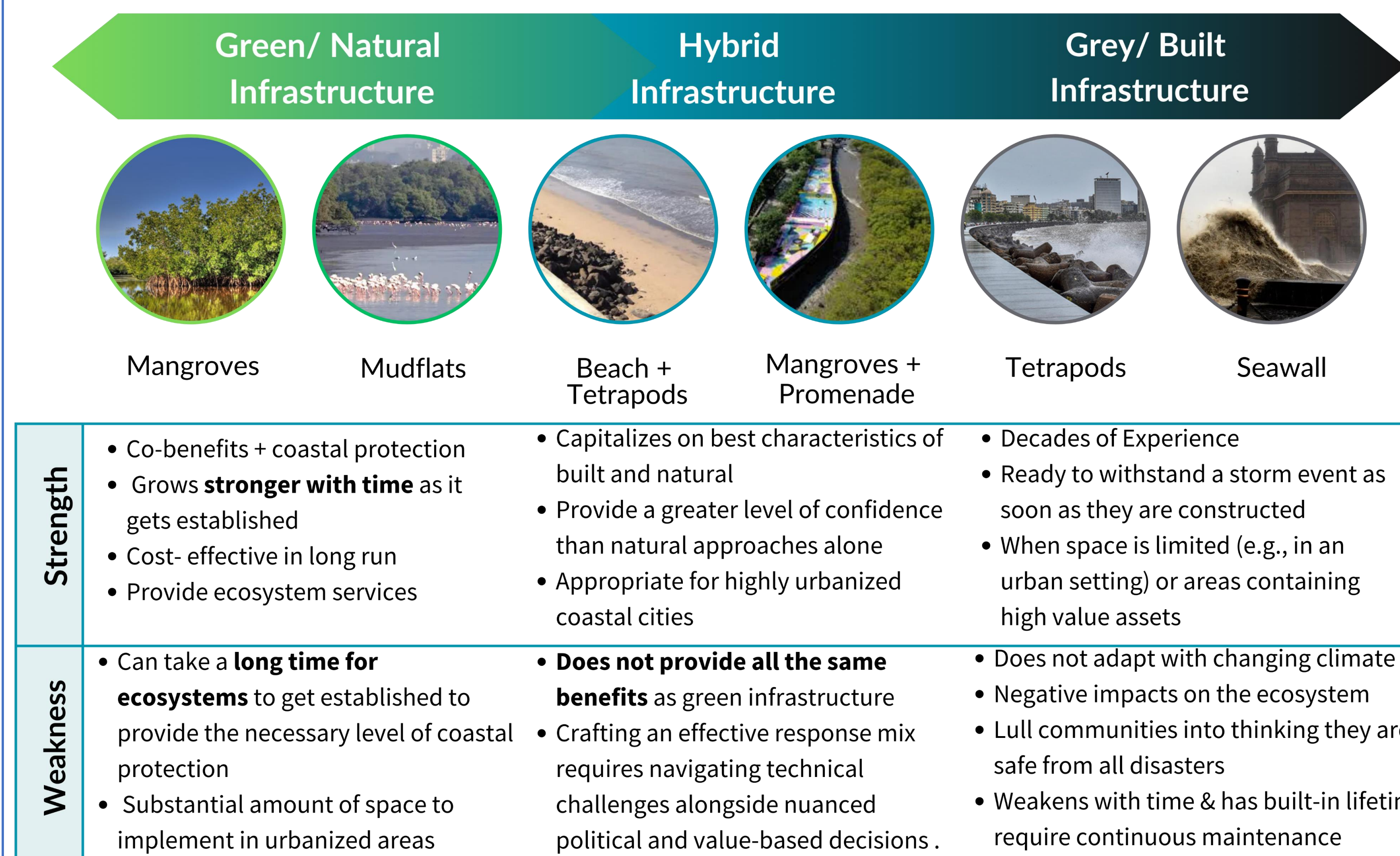
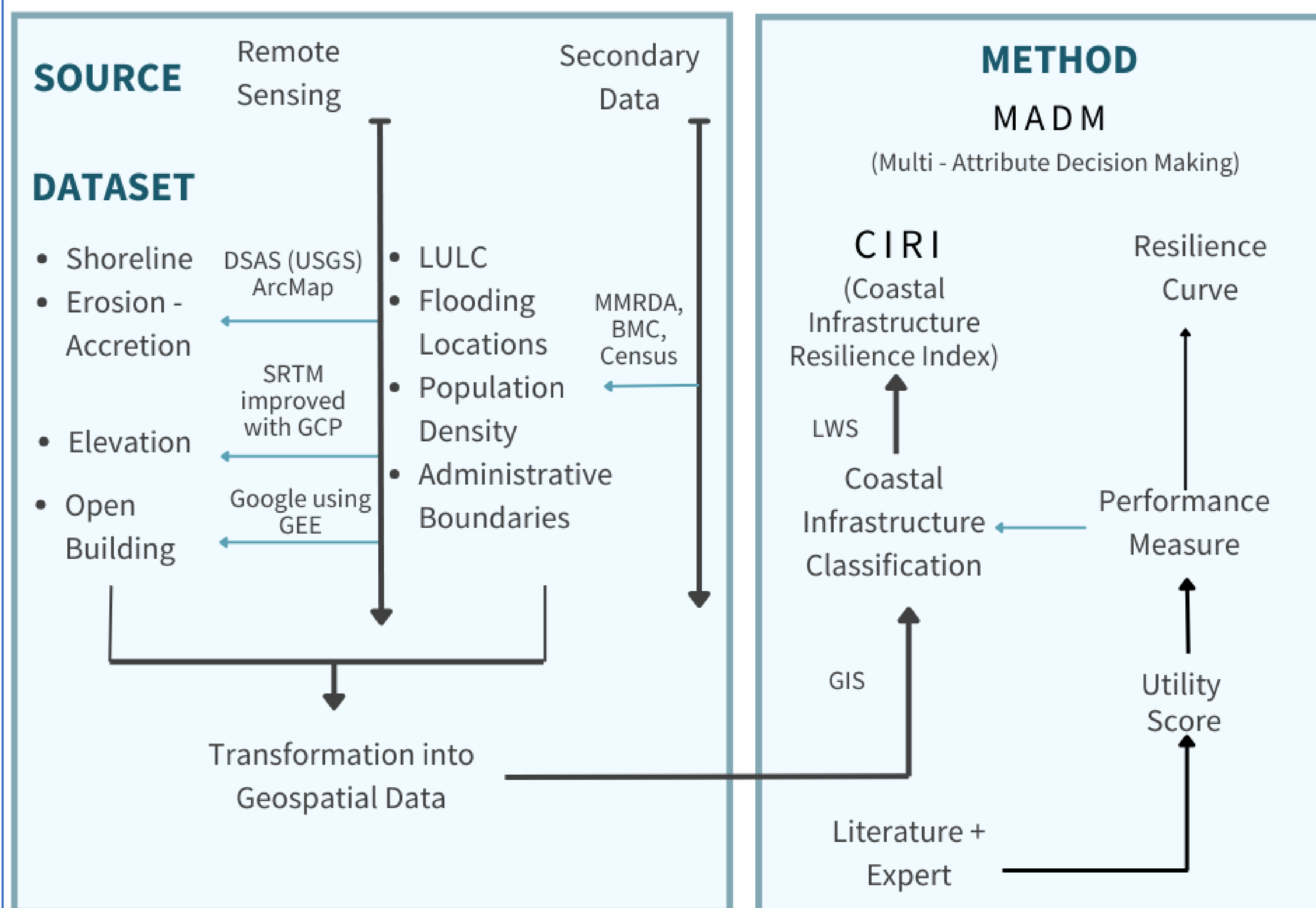


Figure 2 Strength and weakness of various coastal infrastructure

## 5. Methodological Framework



## 6. Infrastructure Classification and Performance Measure

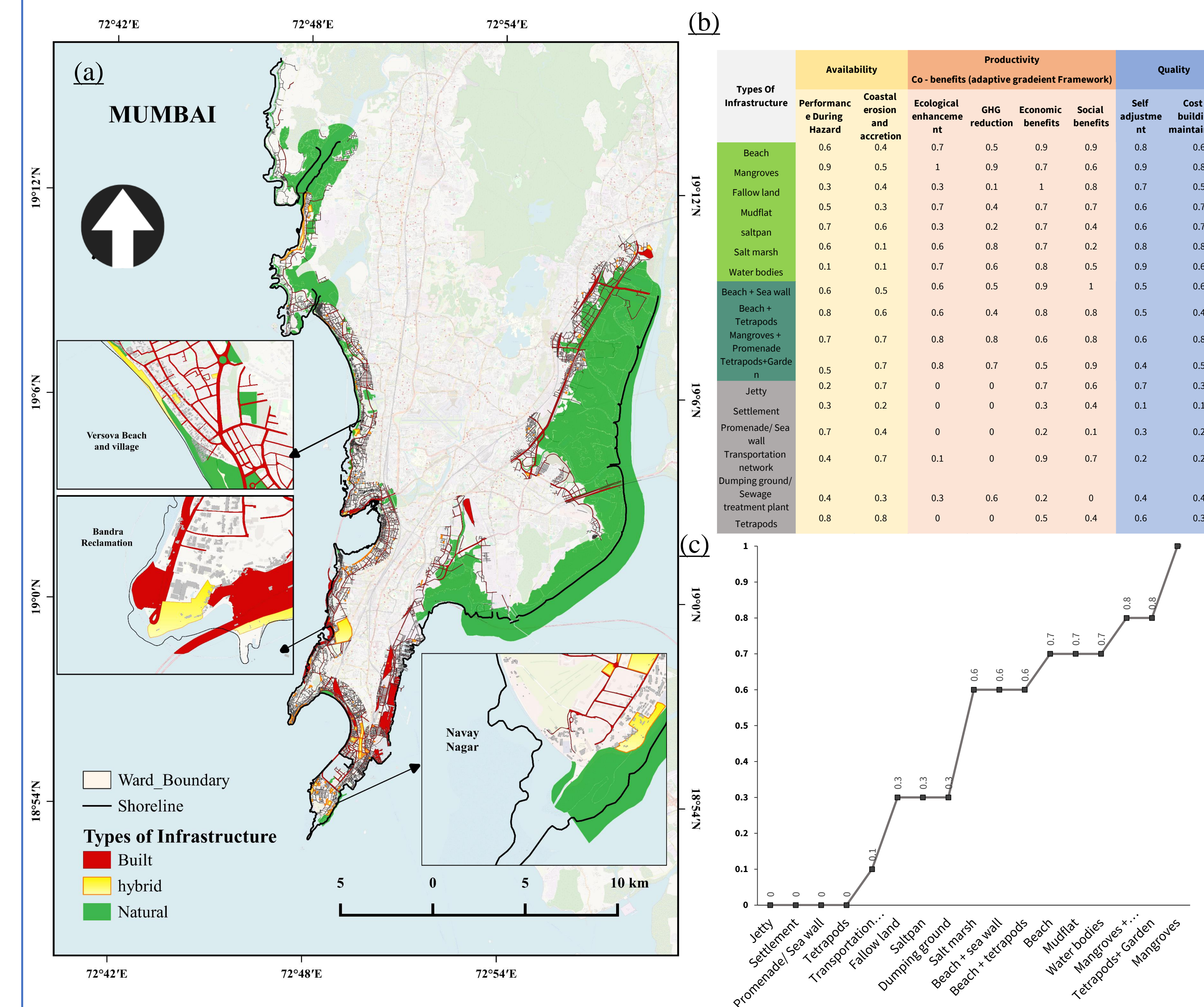


Figure 3 (a) Coastal infrastructure classification of Mumbai, India (b) Utility scores of natural, hybrid and grey infrastructure based on availability, productivity and quality. (c) Utility Function for coastal features

## 7. Way Forward

- Creating data driven multi-criteria index with expert system analysis for multi-hazard environment.
- To identify optimal hotspots to propose **plausible hybrid infrastructure alternatives** based on adaptive gradient framework.
- Developing Science Policy Instrument for Coastal Planners

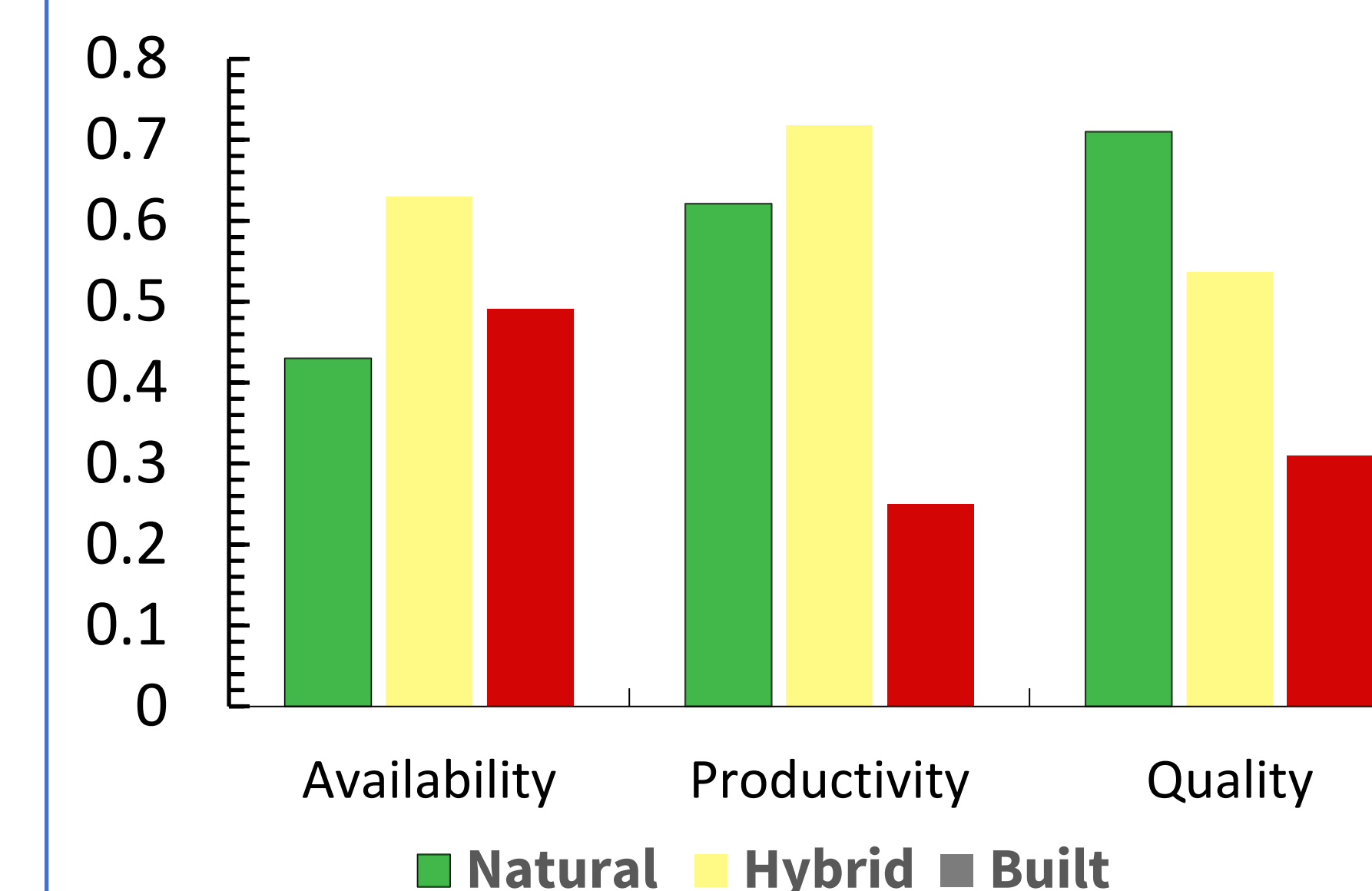


Figure 4 Performance Measure of various coastal Infrastructure