



**UN's SUSTAINABLE  
DEVELOPMENT GOAL  
12 RESPONSIBLE  
CONSUMPTION &  
PRODUCTION**

Ensure sustainable  
consumption and production  
patterns

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TERI-SRC Bangalore

# SCP Framework for Affordable and Climate Resilient Building Construction and Materials

*Start up Research and Way Forward*



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## The challenge of construction sector

By 2030, it is expected that 40% of India's population will be living in urban areas that shall contribute to 75% of India's GDP. Construction industry contributes to about 7% of India's GDP. Construction and related manufacturing activities contribute about 25% of nation's carbon emissions.

Government of India, has unveiled sustainable development urban strategies for the next 2 decades. The challenge is about ensuring sustainable development while taking advantage of economic growth that results from rapid urbanization in the country.

In order to reduce or lower the impact of construction sector on environment, it is important that the sector identifies and adopts sustainable construction materials, techniques and practices which result in sustainable operation and production.

Improved energy and resource efficiency in buildings, infrastructure and manufacturing processes, using alternate sustainable materials have high potential in reducing the environment impact of construction sector.

**S**ustainable construction refers to the process of creating buildings and infrastructure that is responsible to the environment and resource efficient throughout its life cycle.



## UNEP for Global Action on Sustainable Consumption and Production

One of the definitions of SCP as per UNEP publication is “*The use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations*”.

Sustainable Buildings and Construction (SBC) is a thematic area under the overarching programme. One of sub programme area under the SBC theme is to “Establish, promote, and enable conditions for sustainable building and construction policies”. Another very relevant programme area is to reduce climate impact and strengthen climate resilience of the building and construction sector. Through the support of this program, buildings can improve the social, economic and environmental performance of regions, cities and nations.

### About the Project

The research project carried out encompasses the above programme areas in the context of affordable and social housing. Affordable housing built with climate resilient features is one of the priority concerns in South Asian region. Climate vulnerabilities such as Extreme hot/extreme cold days, floods, landslides and sea level rise are features that the future housing projects need to integrate. At the same time, depletion of natural resources for construction of built environment pose challenge for innovation of building materials based upon the concept of sustainable consumption and production. Hence, the project focused on, developing SCP framework for affordable and climate resilient building materials. In South Asia, the Himalayan region is highly prone to disasters due to geological reasons as well as the stress posed by a growing population and exploitation of natural resources. Rapid and unplanned growth of construction activities without following prescribed norms and guidelines adversely affects the fragile Himalayan region.

The process followed in the project, involved stakeholder engagements starting from household owners, architects, builders, Government departments and manufacturers of building materials who supply material for construction in the Himalayan regions, to understand the sustainability attributes of materials at production level and consumption level. This was followed by developing a framework for Sustainable Construction and Production of building materials, evaluating Sustainability Index of a few building materials and understanding the existing policy gaps in implementing sustainable, affordable and climate resilient construction in the Himalayan region of South Asia.

## Main Objective

To develop a SCP framework for affordable and climate resilient building materials and technologies of the Himalayan Region in South Asia.

## Specific Objectives

- ◆ Current practices of consumption and production of building materials in the Himalayan region.
- ◆ Inventory of building materials for wall, roofing, flooring and doors/windows.
- ◆ SCP Framework for building materials using multiple attributes under the main themes - affordability, eco friendliness, climate resilience and social aspects.
- ◆ Analytical tool to calculate the sustainability index of materials.
- ◆ Sustainability index of few materials .
- ◆ Policy and institutional mechanisms, identify gaps if any and give recommendations.

## Study Area



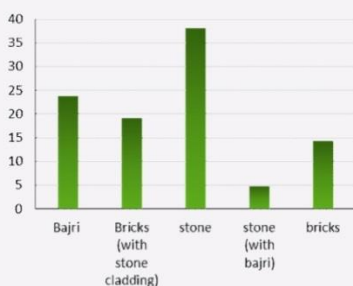


### Inventory of Building Materials formed after the study

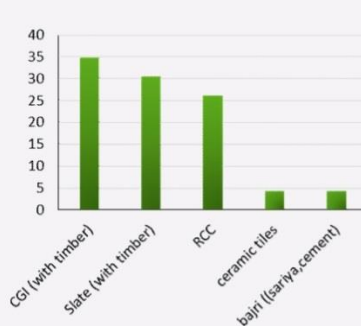
Wall	Roofing	Flooring	Door/Window
Stones	CGI sheet	Mud (with timber)	Timber
Brick	Slate (with timber)	Cement	PVC
Bajri	RCC	Mud	Aluminium Frame
AAC blocks	Ceramic tiles	Brick	
Concrete core with EPS	Gypsum Board with light gauge steel	Stone	
Fly ash lime bricks	Timber	RCC	
Rubble filler blocks	Stone and mud	Ceramic tiles	
Bamboocrete	Slate and mud		
FRC (Fibre Reinforced Concrete)	Hollow core		
Concrete	Micro concrete roofing (MCR)		
Slate	Cement		
Compressed earth stabilised block	Clay tile		
Hollow concrete blocks	Bamboo mats		
	Fibre Cement Board		

### Analysis of Field Visits

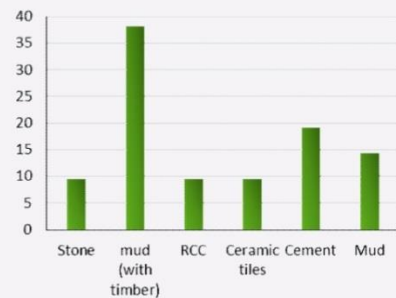
Type Of Walling Materials Used



Type of Roofing Material Used



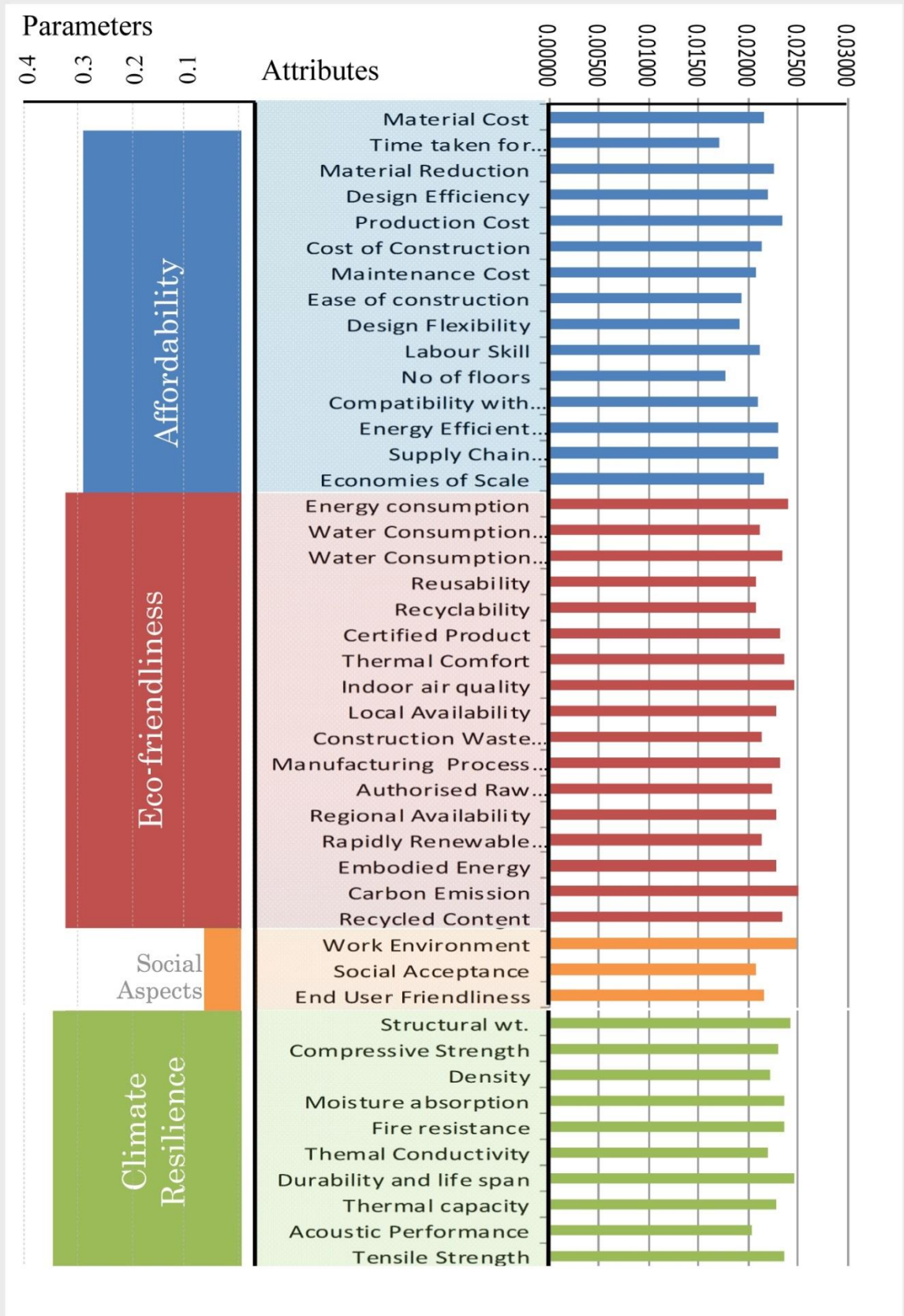
Type of Flooring Material Used



**SCP Framework: List of attributes under the parameters- affordability, eco-friendliness, climate resilience and social aspects**

	CONSUMPTION	PRODUCTION
Affordability	Material Cost Maintenance cost Cost of construction Ease of construction Design Flexibility Labour skill Speed of construction Material reduction Restriction on number of floors Compatibility with support systems Design efficiency	Production Cost Energy Efficient Manufacturing Practices Supply chain management Economies of Scale
Eco-friendliness	Certified product Energy Efficiency Thermal comfort Indoor air quality Local availability Water consumption Reusability Recyclability Construction waste management	Manufacturing Process Certification Certified Product Embodied Energy Authorised Raw Material Extraction Recycled Content Regional Availability Rapidly Renewable Material Water Consumption Carbon Emission
Social Aspects	Social acceptance End user Friendliness	Social acceptance Work Environment
Climate resilience	Reduced Weight Tensile Strength Compressive Strength Density Moisture Resistance Fire Resistance Thermal Capacity Thermal Conductivity Acoustic Performance Durability and life span	Reduced Weight Tensile Strength Compressive Strength Density Moisture Resistance Fire Resistance Thermal Capacity Thermal Conductivity Acoustic Performance Durability and life span

## Weightages of Parameters and Attributes







## Way Forward

The project created a framework to calculate Sustainability Index of building materials based upon the SCP concept for Low Cost Climate Resilient construction in the Himalayan Regions of South Asia. The framework has been created with interventions of stakeholders from the specific study region. In order to replicate the proposed SCP framework for low cost climate resilient construction in other parts of World, Asia, India, it is required to carry out studies to understand the replicability and adaptability of the framework for different region specific building materials.

It is also important to integrate the SCP framework in the existing building regulations for on ground implementation of sustainable and climate resilient construction.

For wide scale replication and use of the concept of Sustainability Index of building materials based upon the concept of SCP, it is important to create tools for designers and decision makers, to assist in calculation of Sustainability Index of various building materials.

Along with the tool, it is also important to create study modules with academic institutes to integrate SCP framework, its concepts and calculations to increase capacity of young designers in selecting sustainable construction materials and techniques.