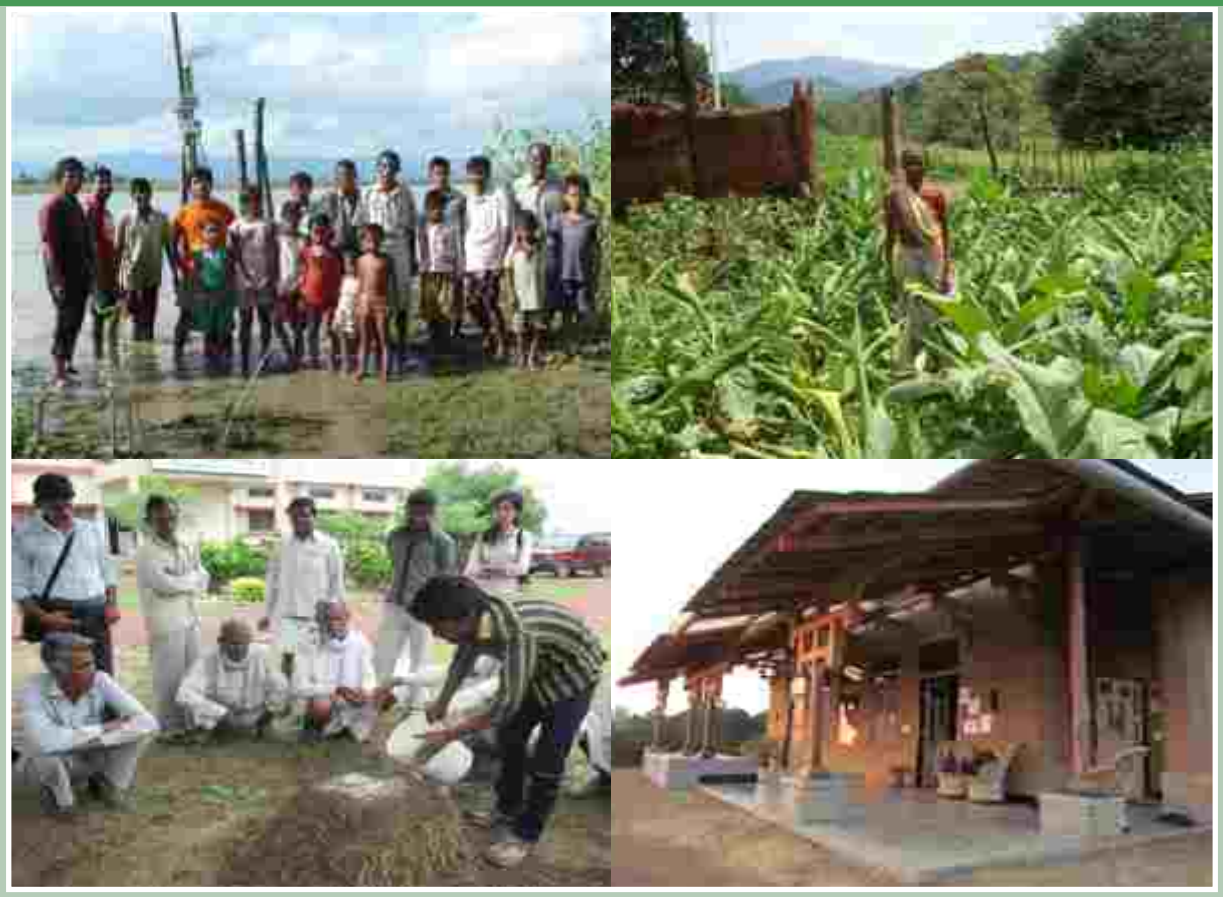
CASE STUDIES

CLIMATE ADAPTIVE PRACTICES GRASSROOTS INITIATIVES



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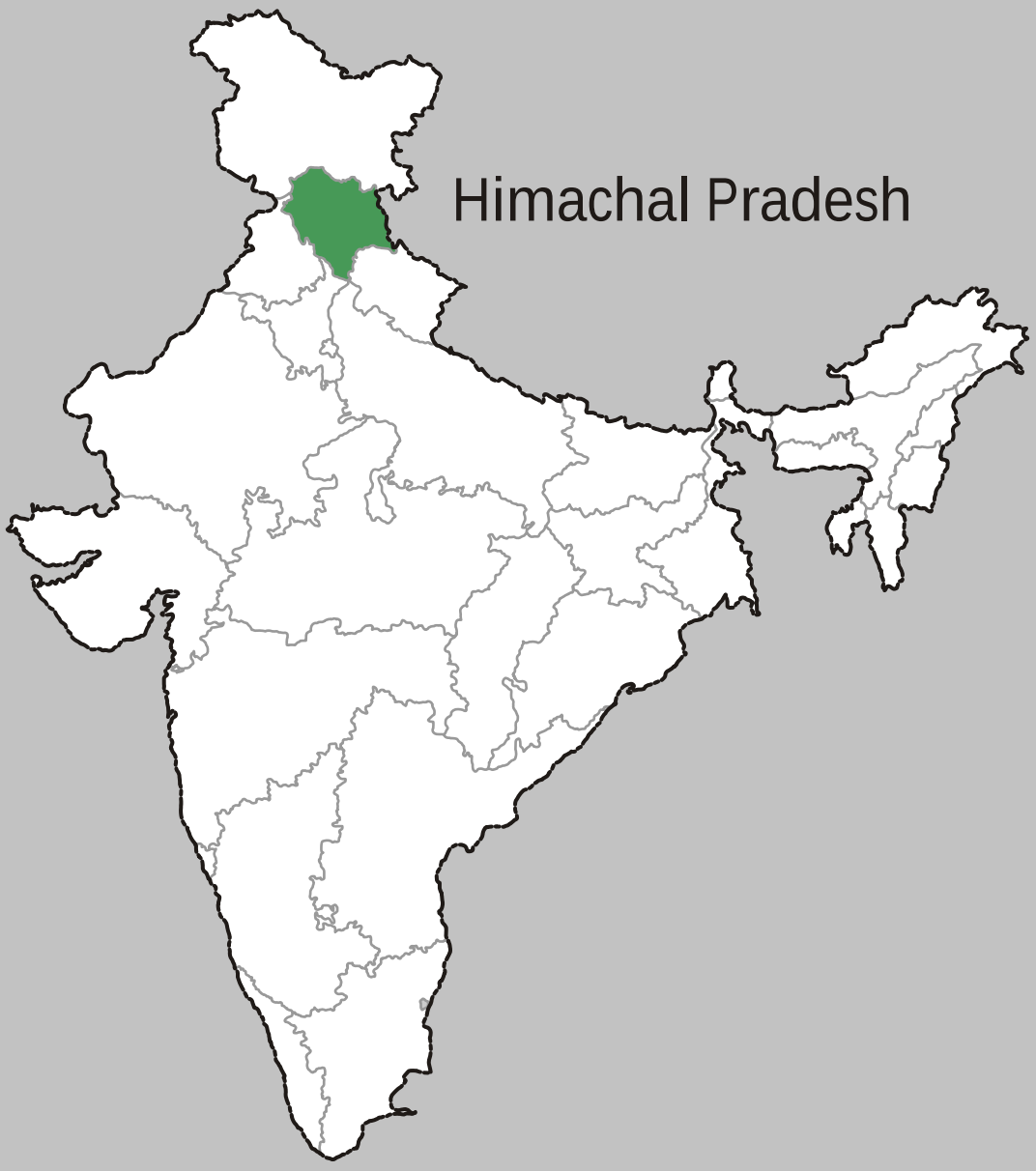
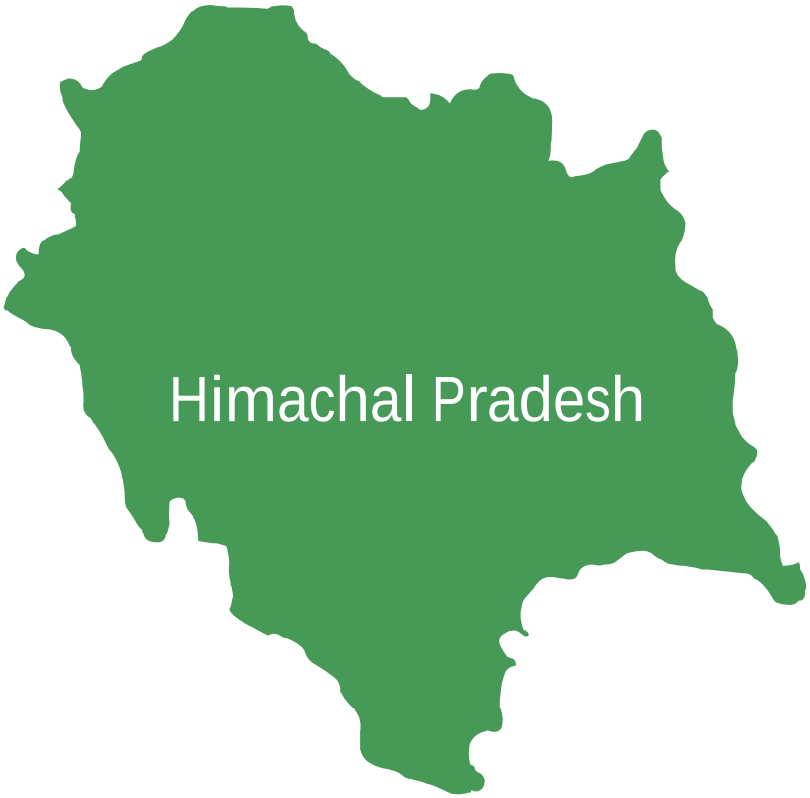


Population	As per 2011 census, Himachal Pradesh has a total population of 6,856,509.[1] It ranks 21st in terms of population in India.
Climate	The state experiences three seasons: Summer, Winter and rainy season.[2]
Climate Vulnerabilities	Changing weather pattern, rising temperature, recession of glaciers, extreme rain events, landslides, cloudbursts, flash floods
Average Annual Rainfall	1142.1 millimetre[3]
Economy	Agriculture is the main source of income and employment in Himachal. Over 93% of the population in Himachal depends directly upon agriculture which provides direct employment to 71% of its people.

[1] *2011 Census of India.*

[2] *"Climate of Himachal Pradesh". himachalpradesh.us.*

[3] *District-wise monthly rainfall data from 2004-2010 for the whole of India by Indian Meteorological department from www.indiaportal.org*



Himachal Pradesh, situated in the western Himalayas, is a state in Northern India. Himachal Pradesh is famous for its abundant natural beauty; a land of hill stations, dense forest ranges, deep valleys, snow - capped mountain ranges, serene and cool environment. Agriculture contributes nearly 45% to the net state domestic product. It is the main source of income as well as employment in Himachal. About 93% of the state population depends directly upon agriculture. The Himalayan ecosystem is fragile and diverse. It includes over 51 million people who practice hill agriculture and remains vulnerable. The Himalayan eco system is vulnerable and susceptible to the impacts and consequences of a) changes on account of natural causes, b) climate change and c) developmental paradigms of the modern society[1].

[1] *http://dst.gov.in/scientific-programme/NMSHE_June_2010.pdf*

Interweaving Traditional and Modern Architecture

Key Messages:

- Construction activities in disaster prone area need to follow precautionary pathways.
- Local wisdom and locally available material can be used for building modern and yet environmental friendly houses.
- Mud architecture provide enhanced value to local resources for climate mitigation, if taken to scale and talent promoting differentiated value of asset.

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1. Context

1.1. Need:

The Kangra district of Himachal Pradesh lies on the southern spur of Dauladhar Range of the Himalayas.

Deforestation, unscientific road construction, terracing, water intensive agricultural practices, and encroachment on steep hill slopes are some of the anthropogenic factors that have contributed towards increased intensity and frequency of landslides. Experts point out that unscientific land use and unplanned expansion of urban areas is also overloading and destabilising the slopes in the towns and cities such as Shimla, Kangra. Overloaded slopes may initially cause only minor landslides, but at later stage could trigger larger landslides.

Construction activities in such disaster prone area need to follow some precautionary pathways. However, the recent trends in the construction industry have resulted in massive construction of concrete infrastructure in the Himalayan region. These concrete buildings are not in terms with nature's law. Such excessive cement burdens on the soft and susceptible nature of the Himalayan mountains can be dangerous and have chances to lead to man-made catastrophes. Also, the present design and planning of concrete structures are usually hazardous with respect to its utility of natural light, energy and insulation available.

1.2. Response:

Di Di, a lady of foreign origin in her eighties, has been residing in Sidhbari village of Kangra district for over 20 years. She has built a number of beautiful and practical mud brick houses and structures. Her approach to construction involves utilisation of locally available materials to reduce carbon footprint. She also seeks to learn from vernacular architecture and improve on it, by incorporating some improved design features and materials that are appropriate. For example as Dharamsala is in an earthquake zone, she includes vertical steel reinforcing rods in the structure and these are connected to a

reinforced concrete beam at lintel level. She assesses the details in terms of selecting the materials, house plan, etc. to optimise the use of nature's resources in a non-exploitative manner. She has also built a hospital and a couple of schools, all of them in the local Kangra style. Di Di believes that a building designed with due consideration towards climate, topography, standards and adequate details outlives any other building designed casually with just other building material. She incorporates concerns towards the issues of climate change, sustainability, and carbon foot prints; her methods of cycling and reusing her knowledge of traditional, local crafts and earth buildings all form an integral part in her design ideology. After decades of practicing in Himachal, her projects have become inspiring examples of mud and earth construction in contemporary architecture.[1]

Building and designing materials using local wisdom and locally available material for building modern and yet environmental friendly houses

2. Objectives

- Optimise use of easily available, local resources, materials and skills to design houses with natural temperature moderation to reduce the usage of air conditioners and heater.
- Integrate disaster management perspective in construction practices.
- Ensure involvement of local stakeholders rather than promoting commercial gains from the construction practices.

3. Approach

Primary design principles include response to climate as contextual to every project. Houses constructed with such mud architecture are custom based. The projects are chosen on the basis of value by the customer. Mud architecture practiced by Di Di Contractor is not easy on pockets. Mud architecture amounts to one-third of the cost of conventional concrete architecture, but the labour costs of building mud houses is higher than conventional buildings; not only because it needs specific skills, but primarily as an acknowledgement to the value of labour. The choice of material for house is basically done keeping in mind the question of 'who's going to benefit' and the carbon costs of the material. The mud available on site is used for the construction of walls. Mud, which is a material with less carbon footprint and its potential of going back as nutrients, makes it a good choice for sustainable building practices. The stones used for construction are gathered from the nearby available water source 'khud', which has deposits of stones required for construction. The mud house with modern amenities is constructed with local material and local labourers; after analysing the following factors:

- carbon costs of material.
- energy saving design of the house.

4. Key Stakeholders

- Local people: Customers who prefer a mud house because of its environmental friendly nature and also locals, who are involved in buying and transporting local materials like slate- stone used for roofs of the houses, extensively available in Dharamshala.
- Labourers: The labour cost of the mud architecture is much higher than concrete

[1] *http://www.osdesign.org/uploads/2/1/4/5/21456262/osdg.a.o.traditional_manifestations_-_didi_contractor.pdf*

architecture. The materials used for construction does not include chemicals like cement and thereby, reduces any risk to health of the labourers.

- Di Di Contractor and her team: The Contractor, along with a foreman and an intern support and learn from Di Di's planning, design and construction of mud houses.

5. Key Components

Mud architecture cannot be constructed throughout the year, it is aligned with the seasonal cycle. The house is designed in a manner to maximise the use of natural light and heat. Emphasis is laid to save energy by utilising natural forms of energy and for this a detailed analysis is carried out for every attribute of the house; right from the placement of windows, and corners of the house. Paper and plastic materials like chips wrappers are used in partition walls as they are non-bio-degradable and help in insulation. The life span of the house is increased by placing earthquake bands at various levels. Research is still envisioned to use wood from trees like Pine tree, which have limited other uses. Di Di Contractor builds houses with a support of one to two interns usually, and everyone who comes to work under Di Di, then leverages these mud architecture movements ahead individually. However, because of the long periods involved in the entire process and lack of infrastructure; these trainings are usually few in numbers. She hopes to have a set-up, where she can train more people in mud architecture.

6. Outcomes and Impacts

There are many mud architecture constructions that one can see in the Kangra District at present. Di Di contractor has personally completed around 15 projects of mud construction. However, the number is still very less compared to the concrete construction in this area. The mud architecture showcases one of the best practices for climate resilient construction in the Himalayan region. Some significant impacts of mud architecture are:

An Institute built by Di Di contractor

- Use of natural based local materials for instance bricks, which are 'home' cooked than baked in industry and hence, reduce carbon costs to the environment.
- Ensures energy saving mechanisms, while designing and planning such houses.
- Reduces the impact of construction activities.
- Beneficial to the local labourers because of the recognised higher value of their work.

7. Lessons Learnt

- Construction in eco-fragile and disaster prone region requires following precautionary pathways for development which are in tune with local ecology.
- Building locally appropriate housing requires integration of traditional knowledge with new approaches to building.
- Translating this project to scale will require trained and skilled manpower and incorporation in change in mainstream thinking of development.