

# Transformations of Stone Dwellings in Khudargad, Chhattisgarh, India

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## Abstract

Vernacular Architecture of Chhattisgarh is driven by the availability of local materials and tribal lifestyles. They are built using traditional materials such as stone, mud, and timber. However, the influence of new construction materials and styles has led to a change in the traditional design methods and practices. Khudargad is a small village in the Raigarh district situated on hills surrounding the Mahanadi River. The vernacular style of the village is based on building with stone and mud. The present landscape of the village however has been altered.

The paper examines the reasons for the transformations of vernacular architecture of the dwellers of Khudargad, Chhattisgarh, India. The objective is to study planning, construction materials, and techniques along with infrastructure, and analyze the reasons for the transformations. The methodology includes an analysis of the dwelling units. The discussions and findings of the study reveal that the influence of the surrounding cities and the need for a more stable structure has dictated the transformations in the built environment. The changes in the built structure have made a difference in their lifestyles and have created job opportunities. The study concludes that there are negative impacts due to the transformation of built forms, and there is a need for regulations to conserve the culture and the vernacular characteristics of these villages.

**Keywords:** Chhattisgarh, Transformation, Vernacular Architecture

## Introduction

Vernacular architecture is built from the surrounding environment, creating a rhythm and communication between them. Recently, there have been transformations in vernacular architecture observed through the change in physical aspects following the changes in the social, cultural, economic, and political contexts (Pargunde & Desai, 2019). This calls for understanding and observations of vernacular architecture, adapting to the component of change and continuity. To govern these changes, it is *necessary* to understand the factors that mark the change versus the actual changes that take place (Vellinga & Asquith, 2006; Kotharkar & Deshpande, 2012; Tjahjono, 2019; Dayaratne, 2008).

## Chhattisgarh

India has diverse cultures and traditions which differ with the different tribes and regions. The impact of globalization and industrialization has brought along a great transformation which has also impacted the interior regions of the country. Chhattisgarh as a state was formed from Madhya Pradesh in the year 2000 and has a population of about 25.5 million as per the census 2011 of which 77% live in rural areas and account for 92% of the total tribal population dwelling there (Ministry of Home Affairs, 2011). The climate of Chhattisgarh is tropical, due to its

proximity to the Tropic of Cancer. The temperature in the state varies from 16°C to 43°C with a rainfall of around 990 - 1450 mm.

Despite being a state with a tribal majority, it has still undergone drastic transformations. The state is known not only as the rice bowl of India but also houses 15% of the total steel production of the country. The state is divided into 18 districts, of which the study will focus on villages of the Raigarh district. (Deloitte, 2012) As per the census, the type of household structure in the rural areas of the state is 21% permanent, 71% semi-permanent, and 8% temporary, whereas, in rural areas of the Raigarh district, the percentage of permanent, semi-permanent, and temporary structures are 18%, 76% and 5% respectively (Ministry of Home Affairs, 2011).

### **The Aims and Objectives**

The study aims to understand the transformations of buildings of Khudargad in terms of spatial planning, use of building material and construction techniques. The objective of the study is to analyse the existing vernacular form in Khudargad and identify the types of transformations in the vernacular buildings through their form, use of building materials and planning.

### **Research Methodology**

An observation survey was conducted, in which there were 5 stages of transformations observed in the village, with changes in materials, building construction, and spatial planning. The total number of houses in the village of Khudargad is 74, of which 50 samples were selected for documenting the transformation, with one-to-one closed-ended structured interviews conducted of a sample of 100 people. Most of them are residents of the houses surveyed. The percentage division of election of houses were based on a primary survey from different stages of transformations. They are: stage I- 35%, stage II- 35%, stage III-17, stage IV-10, stage V-3. The data was collected using a structured questionnaire recorded through google forms along with photographs and drawings. The interviews of the residents established the changes or transformations the building has gone through. The changes in the built structure were recorded, by mapping the use of material and construction technology used in the walls, floors, or roofs which have been transformed from their original vernacular form. The final stage was observed where the entire dwelling unit is transformed into a more modern residence, utilizing industrial materials and modern-day construction techniques.

The primary survey of the area for the selection of village to be studied in Raigarh district of Chhattisgarh displayed various changes in the built environment in Khudargad. These villages are well connected to the neighboring industries providing an opportunity for the villagers to procure cheaper material for construction.

### **Khudargad**

Khudargad is a village situated on a higher altitude, surrounded by a hard landscape, where the houses are built from stone procured from the mountain itself. The hill is surrounded by the Mahanadi on the one side and the crushers and limekilns on the other. There are no other activities on the hills apart from the village. There are few religious spaces around the village and the well-known Chandarhasini Temple is in close proximity to the village. Most of the villagers are farmers and others are labourers and daily wage workers, who work in the lime kilns and crushing factories situated within the region. The location of the village gives it easy access to the locally available stones, which was observed as the basic building material in the village. The village has its *kul devi* (sacred space) at the entrance of the village. The village is surrounded by large trees and rough terrain.



**Fig. 1:** Map showing the layout of the Khudargad Village  
Source: Google Maps

### The Architecture of Residences in Khudargad –



**Fig. 2:** Layout of the Khudargad Village  
Source: Author

The residences in Khudargad are scattered, with houses built on flat land in the village. All the houses are aligned to the road on both sides. Stone is locally available in the area and thus all the houses in the village were initially built of stone, finished with mud plaster and slurry. The houses are built with the animal shelter included with the residential premises. The houses were built for extended families and the expansions of the residences have taken place as the family grew. The houses have several rooms, a kitchen, and all the other utility spaces are performed in the central courtyard. The roofs of the residences are built of bamboo or timber structures covered with baked shingles. One of the houses had stone slates used as the roof covering but as there were not many examples, it may be assumed that baked clay shingles have been the vernacular roof coverings in the village. All the houses have defined boundaries. These boundaries are built of stone masonry and cover the entire plot area. Most of the boundaries are built to avoid the entry of wild animals from the surrounding areas.

## Traditional Residences in Khudargad

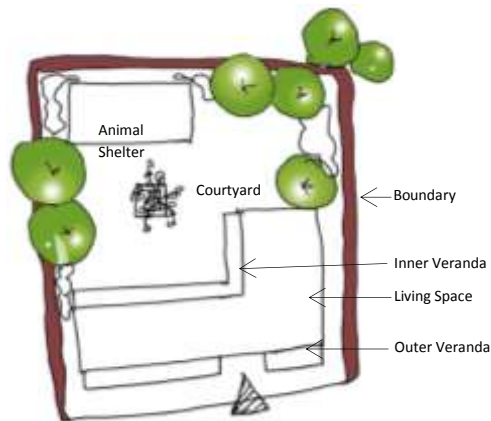
### Spatial Planning

The houses in Khudargad are either rectangular or L-shaped. A house consists of a central courtyard, 2-3 rooms, a kitchen, a sacred plan (Fig. 3) at the center of the courtyard. All houses in the village are single-story only with high roofs which help in the insulation of the interiors. The entrance has an *otla*: a front veranda and the veranda is not covered. There is an entrance that leads to the central courtyard around which the entire unit has been developed. There is a large attic in every house; these attics are utilized to store hay in winter and are left empty in the summer months. The attic has a dual function; one is storage and the other is to achieve stack ventilation. The houses in Khudargad are larger than all other villages in the district. The villagers built the houses from stone, as it is easily available.



**Fig. 3:** Front facade of a house at Khudargad

Source: author



**Fig. 4:** Typical floor layout

Source: author



**Fig. 5:** Top view of a typical residence at Khudargad

Source: author

## Walls

The walls are made of stone procured from the mountains nearby. All the internal and external walls are built of this locally sourced material. The walls are approximately 450-500mm thick and are plastered with mud and cow dung slurry. There is no opening on the exterior walls, though some houses have an opening on the internal walls. The thick walls allow less heat to penetrate through them. As Chhattisgarh has a hot and humid climate, the thick walls help to maintain an optimum temperature. The walls being finished with mud slurry helps to achieve a cooler interior temperature and is easy to apply. The boundary walls are prominent in all the residences. These walls are built of stone, through random rubble masonry (Fig. 7).



**Fig. 6:** Tulsi (Sacred plant) at the center of the house  
Source: author



**Fig. 7:** Boundary wall made of stone  
Source: author

## Flooring

Floors of the houses are made of mud and covered with cow dung slurry. The mud floor keeps the houses cool from the bottom. They need to be maintained at regular intervals, but as mud is easily available within the surroundings, it is not expensive. Few of the houses have *rangoli* (floor art with rice powder) adorned on the floor, which are usually made at festivals (Fig. 4), but few households make these every day. The *rangoli* is always applied after the application of cow dung slurry, as it helps to keep the insects away.



**Fig. 8:** Backside of a residence with exposed stone masonry  
Source: author



**Fig. 9:** Mud slurry being applied on the walls  
Source: author

### Roofing

The buildings have sloping roofs made of timber or bamboo covered with baked tiles. Although the availability of stone is in abundance, none of the houses use stone slates as roof coverings. The baked clay shingles are procured easily and are easy to replace. The attic space in the roof helps with stack ventilation. The height of the roof varies from 4.5m to 5m. The timber or bamboo used for the construction of the roof is procured from the surrounding forest areas.

### Doors and Windows



**Fig. 10:** Window opening to the courtyard  
Source: author

Wooden doors are used on the external wall, while most of the other accesses have no door. There are windows on the internal walls of few of the houses using wooden or bamboo frames, covered with bamboo vertical sections as grills.

### Transformation of Vernacular Houses

The recent developments in the economy have impacted largely upon the construction trend of the country. Urbanization and globalization have a strong impact upon the traditional and vernacular built environment. The developments initialized were catalyzed by the following.

- 1). Rural-urban migrations; the movement of residents from the rural area allowed them to explore better income options and exposed them to different construction methods and styles. The need to blend with the urban areas also has impacted the ongoing transformations.
- 2). An improved transportation system development leading to better connectivity via roads/ railways has led to an increase in the exchange of goods from different regions. This has led to providing a wide variety of options to the residents.
- 3). The information revolution, exposure to different places and traditions have encouraged people to adopt selective techniques, methods, and materials from them. This has eventually made communities and people adopt newer technologies and methods.
- 4). Change in attributes and values arising from the influence of foreign ideologies has led to changes in the traditions of the communities and the people. These factors have influenced the transformations of the vernacular, not as a whole settlement, but in parts. (Dayaratne, 2008)

In Khudargad, the transformations are clearly evident. The interviews of the residents, a sample of 50 households showed that the various factors encouraging the transformations in built form were influenced due to:

- 1). The introduction of Indra Gandhi Awas Yojna, a scheme by the Government of India which promises *pucca* houses to all in rural India.
- 2). Better connectivity and development of nearby towns giving easy availability of modern-day building material.
- 3). Few of the traditional materials used in construction required regular maintenance, ranging from 2 to 3 times a year or more. The need to reduce the investment of time and cost in maintaining the structure has encouraged the use of alternative materials. The developments in the surrounding areas has trained labourers from the village to use the newer materials.

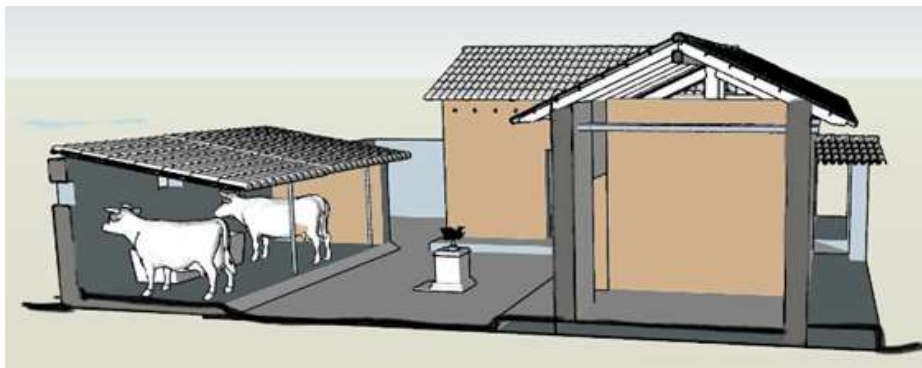
The transformation that has taken place in the village is not constant but varies. The changes have been taking place at different levels and places. This change has been recorded in five stages at Khudargad.

1. Stage I - Original vernacular form of the house.
2. Stage II – Insertion of doors and windows.
3. Stage III – Changes in building materials.
4. Stage IV - Introduction to basic infrastructure.
5. Stage V – The complete transformation.

The stages are visible in different parts of the structures in different houses. There is no similar transformation that has happened in any of the dwelling units. Hence, the stages are explored with different parts of the buildings in consideration.

#### **Stage I: The original form of the house**

The typical layout of a house in Khudargad has an outer veranda, the living space, an inner veranda, and a courtyard. An animal shelter is also present on the premises of residents, especially farmers. The house has all the activities held in the central courtyard. The house has no doors or windows, except the front door. There are only openings without any covers. The entire house is finished with mud and cow-dung slurry, for walls and floors. The roof is constructed of bamboo and timber finished with clay shingles.



**Fig. 11:** Section through the original form of the residence

Source: Authors

## Stage II – Insertion of Doors and Windows

The first stage of transformations observed widely in the village is the insertion of doors and windows in the house. The different rooms had wooden doors installed, and few of the houses have inserted windows in the interior veranda face. Batten doors are used at the entrance and the rooms. The doors are supported on hinges on wooden door frames. The doors are all single shutters.

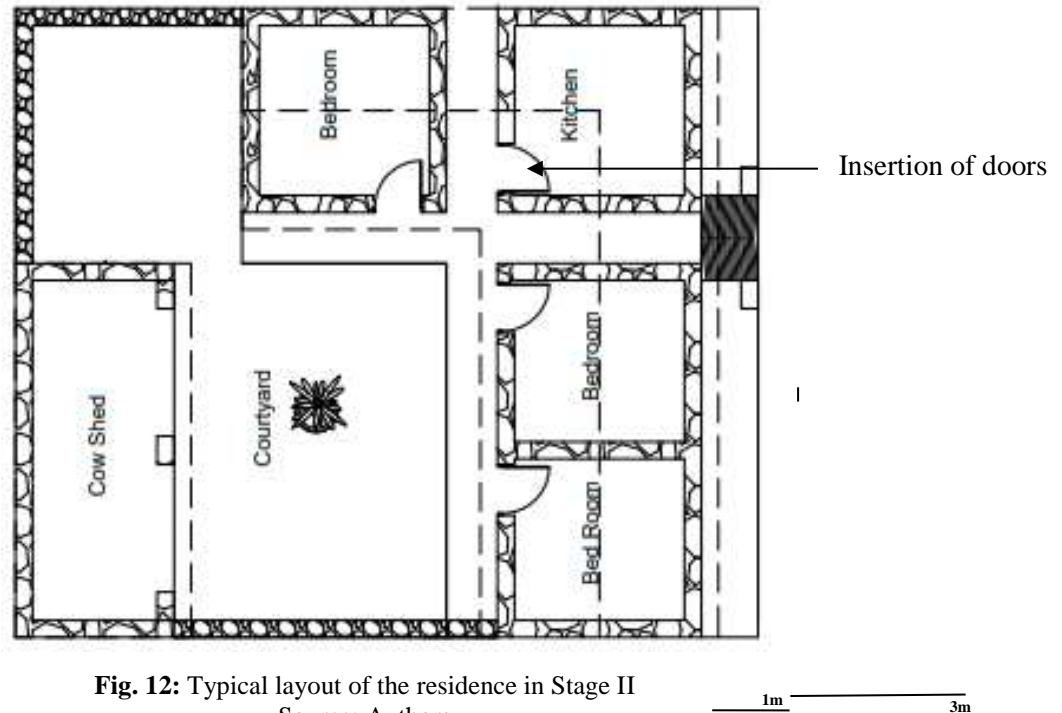


Fig. 12: Typical layout of the residence in Stage II

Source: Authors

## Stage III: Changes in materials

The changes in the materials of the houses have taken place in different parts of the residence, such as the floor, roof, and walls.

### a) Change in the flooring material

The initial flooring made of mud and cow dung slurry is replaced in almost 26% of the houses surveyed in Khudargad where the residents have adapted cement flooring instead of the traditional mud flooring. The cement flooring, however, is constructed still using a similar method to mud flooring. This change is adapted to reduce the maintenance of the mud floor which tends to wash away. Using cement flooring has reduced the time and labour invested in the maintenance.

### b) Change in the roofing material

The traditional style of building had the roof structure made of timber and bamboo; the newer material adapted by the resident of the village is GI pipes, which are used as a replacement for bamboo in the roof structure. Apart from the structure, there is no major change in the roof covering material. In houses where there is a complete transformation in the building, the roofs have become flat.

### c) Change in the wall material

The change in construction style of the houses to become *pucca* as per the Government of India's definition has changed the traditional mud wall building construction to brick walls. In a few of the houses, the brick wall is made using mud mortar and finished with mud plaster, whereas the others have used cement mortar and slurry.



### Stage IV – Introduction to the basic Infrastructure

The houses in the rural area initially were without any infrastructure pertaining to sanitation and water supply. In recent times, some government initiatives have encouraged the villagers and have provided an incentive to install water pipelines and toilets within their premises. Although nearly all the houses now have toilets installed, they are located away from the dwelling space mostly in the backyard. In most of the houses, the toilets are not visible easily, as the residents have placed them in a secluded area. All the toilets have been built with a flat roof.

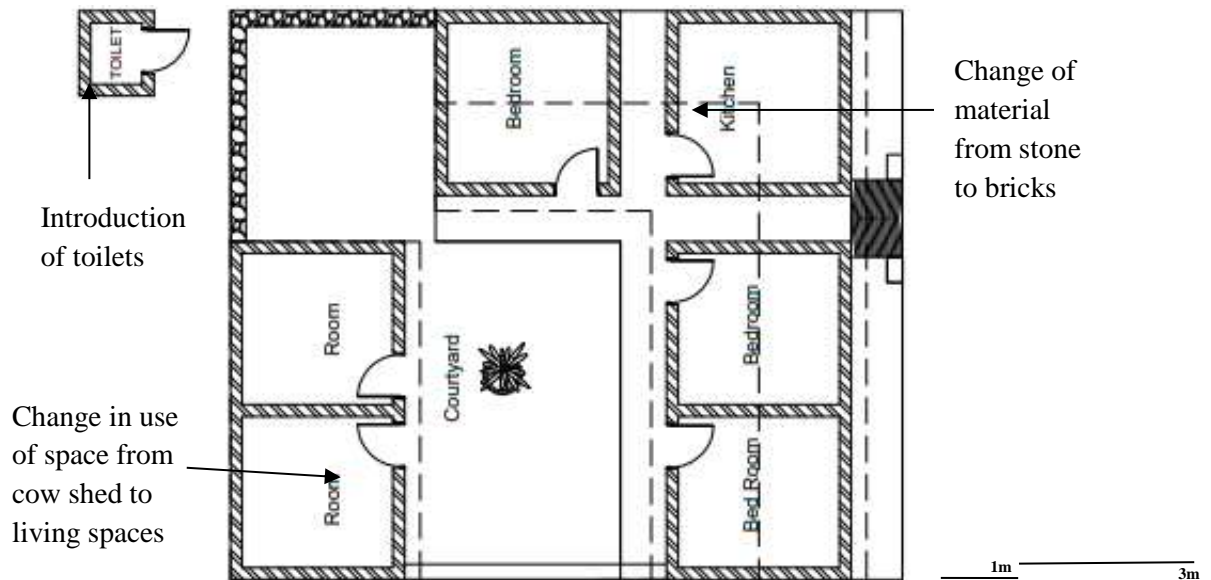


Fig. 13: Typical layout of the residence in Stage III & IV  
Source: Authors

### Stage V – Complete Transformation

The complete change in material, construction technique, and design of the residence is considered a complete transformation. In this type of transformation, the buildings have adapted RCC construction techniques along with brick walls and flat roofs.

Table 1. Stages of Transformation  
Source: Authors

	Stage I	Stage II	Stage III	Stage IV	Stage V
Settlement	Based on both sides of the central axis	Based on both sides of the central axis	Closing on the gaps between two sites	Compact clusters	Compact clusters
Spatial Planning	Living area and kitchen along with animal shelter	Living area and kitchen along with animal shelter	Living area and kitchen along with animal shelter	Living area and kitchen along with additional living spaces	Living area and kitchen along with additional living spaces
Floors	Mud flooring	Mud flooring	Cement flooring	Cement flooring	Cement flooring
Walls	Mud walls	Mud walls	Brick walls	Brick walls	Brick walls
Plaster	Mud plaster	Mud plaster	Mud plaster	Cement / Mud plaster	Cement Plaster
Columns/ Support structure	Bamboo/ Mud piers	Mud/ Brick Piers	Mud/ Brick Piers	RCC/ Brick piers	RCC/ Brick piers
Roof structure	Bamboo and timber	Bamboo and timber	Bamboo/ GI pipes and timber	Bamboo/ GI pipes and timber	Bamboo/ GI pipes and timber

Roof covering	Clay baked tiles	Clay baked tiles	Clay baked tiles	Clay baked tiles	RCC
Doors	No doors	wooden doors	wooden doors	wooden doors	wooden doors
Windows	No windows	No windows	No windows	No windows	No windows
Compound wall	Stonewall	Stonewall	Stonewall	Stonewall	Stonewall
Animal Shelter	Present	present	present	absent	absent

The various transformations observed is a resultant of many factors. These changes are taking place gradually and the residents of the village adapt to the newly built culture at their pace, due to which the the levels of changes differ. However, almost all the houses have undergone changes that lie in-between stage I-V. The materials used are easily accessible and available to the villagers. The transformation of residences is adapted positively by the dwellers as it reduces the constant need for maintenance of the structure. People in the village are still tied to their cultural and social norms and are indifferent to the changes in the built environment.

Transformation is a process which is inevitable. The nature of vernacular has always been of constant change and betterment. The changes are being adapted well by the people but the need to understand the sustainability of these transformations to be the 'new vernacular' exists. (Radivojević, et al., 2017; Özorhon, et al., 2020; Vandna, et al., 2015; Sarkar, 2017; Nair, et al., 2020; Vidya, et al., 2016-17)

## Conclusion

Transformations in vernacular architecture in the villages of Chhattisgarh are happening over a period, at a slow pace. The changes are initially in the use of modern-day materials and their construction techniques. These changes however are not very evident in the entire village as the acceptance for use of new materials needs to emerge amongst the dwellers. The transformations in Khudargad are classified into 5 stages, where stage I is the original form to stage V, where the buildings have completely been transformed in terms of their spatial planning, use of building materials, and roof forms. The transformations have also paved way for the introduction of better infrastructure to the residence, through the installation of direct water connections, and sanitation facilities. The introduction of new materials has also indirectly led to an opportunity for work within the village. The transformations in the vernacular form of the buildings have their own merits and demerits but the need for documenting these changes is crucial to reflect upon the effects of transformations on the resident's social, cultural, economical, and environmental needs and sustainability.

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