

Original Article

# Traditional Building Facade Characteristics and its Transformations in South Tamilnadu, India

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**Abstract** - The traditional neighbourhood appearances have been diminished by modifying external conventional building elements. The visual attributes and ideology like materials, decorations, texture, colours, openings and roofs have played a significant role in the South Tamilnadu region's traditional images for investigating this research work. The major objective focuses on visual elements that have regulated the quality, visual ideology, aesthetic appearance, and significance which impact the traditional building facades and their transformations. Understanding through various researchers, synthesis of theories, definitions of conventional building facades, and definitions of transformation of building facades are collected through several peer-reviewed articles in the first component of the paper. The second component of the research paper examines the evaluation of collection through secondary data of articles from various pioneers in visual element characteristics and their transformations over the years in the South Tamilnadu context. The research also analyses the samples of 30 traditional house facade transformation typologies using one case of primary data collected at Tirunelveli district, the South town of Tamilnadu, in the third component of the paper. Based on the secondary data, the results and discussions have been understandable in influencing and establishing traditional building facade parameters such as form, shape, scale, proportion, decoration, texture, materials, colour, roofs and parapets, openings, doors and windows. Hence, this research aims to find better urban designers and planners with specific procedures and recommendations for the preservation and further improvement in the development of traditional building facades.

**Keywords** - Facade visual facets, Visual elements, Transformations, Traditional building facade, Decoration and details.

## 1. Introduction

In general, people may initially notice the appearance of a building's facade, which is an essential element in constructing a structure that may follow the characteristics of historical, environmental, socioeconomic and technological [1]. When designing a building facade, certain significant aspects need to be considered, namely, durability, weather resistiveness, maintenance, attractive elevations, and an entire transformation to the context system of urban settlement [2].

Facade is treated as skin and face for the constructed building and performs certain meaningful aspects [3]. The past-constructed building facades are preferable when compared to the present [4]. Subsequently, building historical facades is essential due to the impact on district prestige. In addition, the characteristics of the building are an evaluation concern that impacts the quality of architecture and facade images [5].

Generally, various visual elements, namely openings, colours, shapes and architectural styles, have been utilized for evaluating traditional building facade images. This implicit

the building visual elements for the conventional building facade, which made an influence on the district and city images [6, 7].

## 2. Materials and Methods

### 2.1. Methodology

The methodology comprises the following components:

- Stage 1 :** Definitions of building facades, definitions of transformations in building facades, parameters of the visual aspects of facades, and the related theories were identified and listed from the journal articles and books of various pioneers in this field of research. The study selection criteria and the database search strategies were framed.
- Stage 2 :** Visual elements in building facades of traditional houses over the years of South Tamilnadu context were studied and focused on the secondary data of articles, journals and books of pioneers in the field of the study.
- Stage 3 :** Traditional house facade transformation typologies were analyzed and tabulated for 30



houses using primary data collected by the researcher in Tirunelveli district, South Tamilnadu, India, as a case study. The results were summarized, and the research gaps were identified.

**Stage 4 :** Future researchers have identified avenues for preserving and developing traditional building facades and their architectural continuum.

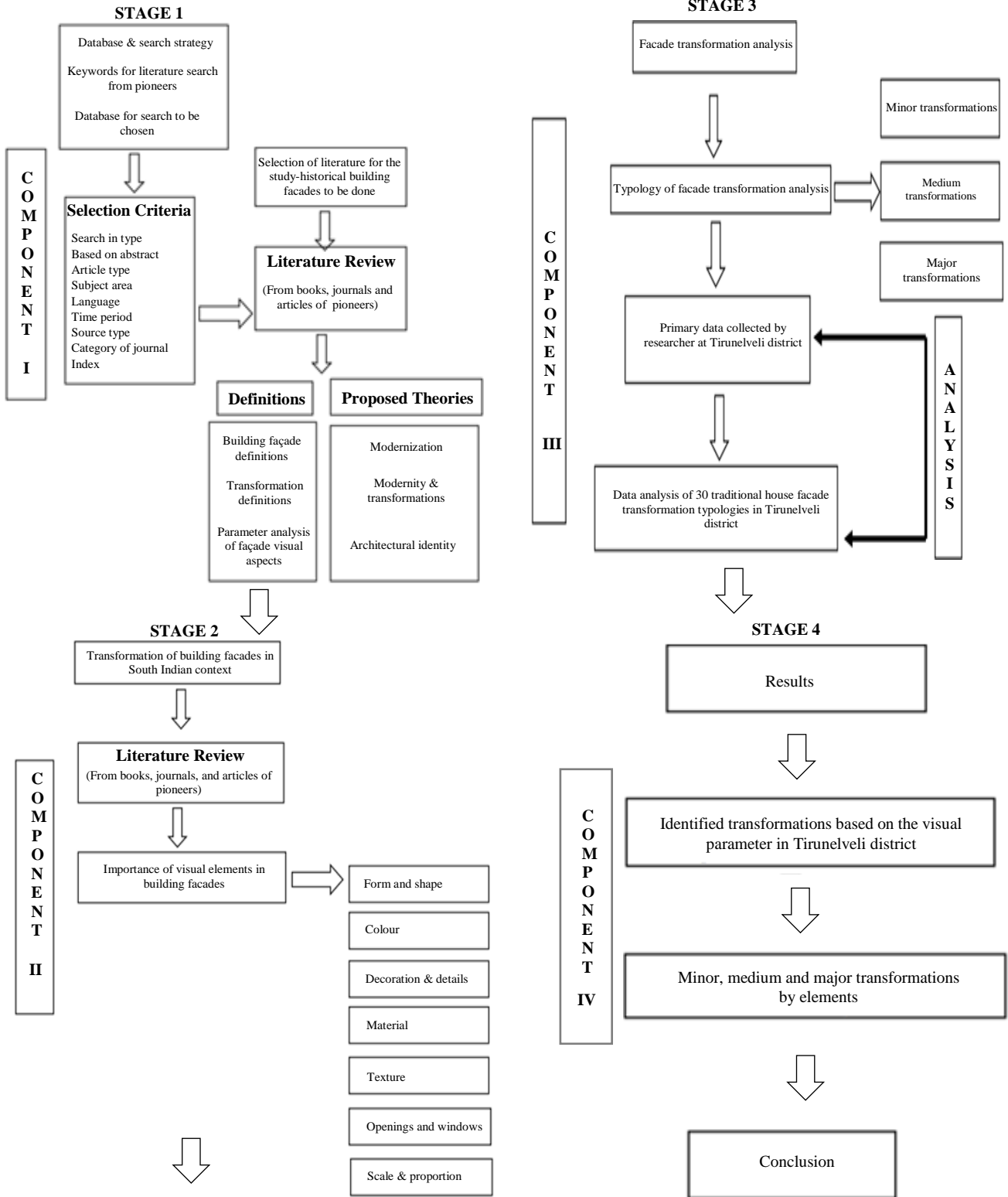


Fig. 1 A methodological flow of proposed analysis in traditional building facade transformations

**2.2. Databases and Search Strategy**

Studies to be included in the review were identified by searching the following databases: EBSCO, Google Scholar, Science Direct, Scopus, research papers, dissertations and others. Descriptions of the search options are provided in Table 1. All databases were searched using four keywords: Historical buildings, facades, transformations and visual elements.

**Table 1. Databases and search options**

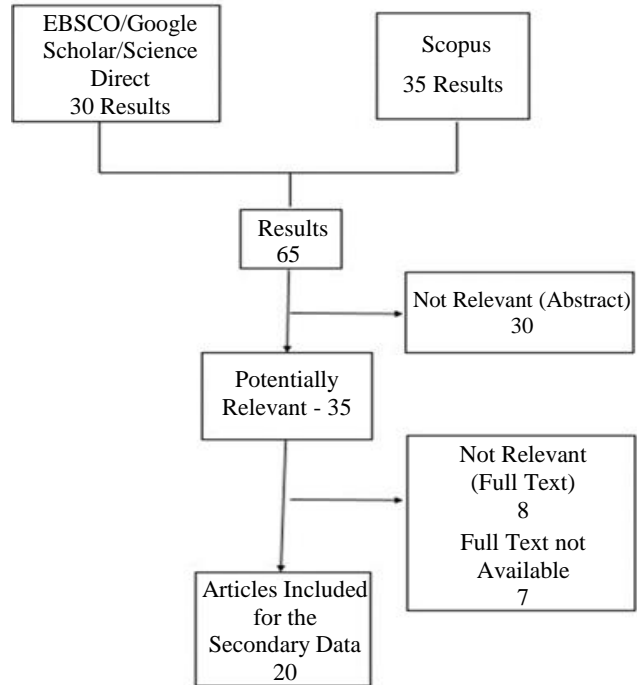
Database	Search Options
EBSCO, Google Scholar & Science Direct	<ul style="list-style-type: none"> <li>• Search in: Title; Author supplied keywords;</li> <li>• Abstract</li> <li>• Limit to peer-reviewed academic publications</li> <li>• Article type: Academic publication peer-reviewed</li> <li>• Source type: Academic journal</li> <li>• Category of journal: Open access</li> <li>• Time period : all years to 2020</li> <li>• Language: English</li> <li>• Indexing: Journals indexed in SJR Scimago Journal and Country rank website</li> </ul>
SCOPUS	<ul style="list-style-type: none"> <li>• Search in Article Title, Abstract, Keywords</li> <li>• Document type: Article</li> <li>• Source type: Journal</li> <li>• Subject area: Building facades, Historical, Traditional, transformations, visual elements, etc.</li> <li>• Data range: all years to 2020</li> <li>• Language: English</li> <li>• Indexing: Journals indexed in SJR Scimago Journal and Country rank website</li> </ul>

**2.3. Study Selection Criteria**

Several steps were taken to select relevant studies. Variations and combinations of search terms were also used to cover as many aspects of the focal research fields as possible. The titles and abstracts of the identified articles were screened for relevance. This process yielded 35 potentially relevant articles incorporated into the full-text search. The full text for 7 was unavailable, whereas the full text for the other 28 was thoroughly examined, removing eight non-relevant articles.

The review contained 20 articles at the end of the process. Figure 2 depicts the steps involved in the study selection process. Non-relevant articles were identified during the selection process, taking into account the purpose of this study. The studies solely focusing on kinetic facades, adaptive facades, and facade systems in contemporary architecture were excluded. Papers focusing on innovative facade technologies and architectural facade modelling were also

rejected. Finally, articles on thermal analysis of building facades, energy and environmental performance, building performance simulation, and sustainable building facades were discarded. The search strategy and selection criteria in Table 1 resulted in 20 articles being considered for the study. (Table 2).



**Fig. 2 Steps of the study selection process**

**2.4. Characteristics of Studies Included in the Paper**

The names of the journals where the selected 20 articles were published are listed in Table 2. The majority of the studies included in the review were published in the Journal of Design and Built Environment, which was followed by “The International Journal of Architectural Research,” “Journal of Urban Design International,” and “Journal of Environment and Behavior”. There is a strong presence of Historical Building Facades in approximately 11 articles in 5 journals, from which significant articles cover broader topics such as visual elements, traditional architectural facades, and transformations. Other journals (each contributing one article) cover such problems as facade organization, building facade study, building conservation based on facade quality assessment, etc.

**3. Literature Review**

**3.1. Definitions for Traditional Building Facade**

The term “facade” means “face” or “front”, which is obtained from the French word facade and the front portion of the building structure is named as building facade [8]. The facade provides a basic concept of a building and an organization’s interior function [9, 10]. Making images and properties may be influenced more by several elements that

contribute to the personality of a building [11]. The aesthetical openings and windows that comprise the facade's visual elements are involved in the building's image. Geometric shapes that may be solid/transparent, material dominance, finishing type and method, and colour combination create a unique impression on the building image [11].

The two primary functions that can define a building facade are usage and the value of the structure, which assists in determining the structure quality and the worth of the building [3]. The value of a building's structure can be represented through the facade, which generates a relationship between the inside and the outside environments. Visual element architecture has influenced the building facade images, and facade may be determined by space scaling and building [12].

Some essential elements that have shaped the ideas of building facade are materials, colour, architectural style, perceived value, surfaces, lights and bulky visual shapes [13-16]. A few critical elements are utilized for shaping the building facade images, like curved lines and decorated articulation, texture, spotlessness, and ornament detail [17-19]. Traditional building facades showcase the skills and craftsmanship of local artisans and craftsmen. The intricate details, decorative elements, and handcrafted features demonstrate the mastery of construction techniques and the preservation of traditional knowledge.

Generally, the conventional building facades are rooted in history. They are often associated with specific time periods or architectural movements, delivering the importance of architectural history and culture through building facades. They often reflect the cultural identity and heritage of a community or region. Traditional building facades are valuable cultural assets that require preservation and conservation efforts. Implementing strategies for their protection ensures the continuation of architectural traditions and the preservation of cultural heritage.

### **3.2. Definition for Transformation in Building Facades**

In architecture, the object gets transformed by additive, substitutive or subtractive forms of building shape or volume. The functions have been modified based on time, adapted for recent uses, and reshaped concerning the part of its history. Old structures can be transformed for role or aesthetic purposes, representing enduring changes or reshaping. Due to complex issues, which include making cultural or historic buildings continuously appropriate for modern living, transformation goes beyond simple modifications in usage or form.

They include addition, intervention, and adaptability. Old structures can be renovated for function, aesthetics, or both. The building and its surroundings are changed to represent the new purpose whenever the building's previous

usage ends and the skin is unaffected. This results in a change to the building's original physical shape. It could involve removing current forms, adding new ones, or even making significant changes to the physical structure of buildings [20].

Traditional building facades often transform to meet contemporary society's evolving needs and demands. These transformations can involve integrating modern materials, technologies, and functional changes while respecting the original architectural style and preserving cultural heritage. Contemporary design trends and architectural movements can influence transformations in traditional building facades. Balancing modern aesthetics and functionality with the existing conventional character can result in a unique fusion of old and new elements, showcasing the evolution of architectural styles.

### **3.3. Parameter Analysis of Facade Visual Aspects**

The sensory value of architectural features such as decorations significantly influences building facades [19, 21]. Building facades get segregated based on ornament and decoration, in which various scales are available, and facade visual appearance directly influences the building [17].

Significant research has been carried out in classifying building elements of traditional building facade that plays a vital role in determining the complexity of architectural form, representing general enclosure, symmetry, repetition, similarity and the building element orientation, which have influenced major characteristic in building facade design [22, 23]. Similarly, the window characteristic proportions include window counts and position on the wall, the window projection and its relationship among solid areas that provide coherence over the building facade and building opening placement [24].

### **3.4. Theories**

#### **3.4.1. Modernization Theory and Transformations**

Habermas discusses modernisation theory and analyses and evaluates modern forms of social life. Modernity is not merely a historical era that mentions the significance of particular historical procedures like culture, psychology, society, and politics [25]. The situation development is not required for modern experiences due to the situation generally impacting pressure and explosion, which has been urged and provides the solution to any critical concerns [26].

Therefore, modernity has many faces, which might be the fusion of modern and historical cultural elements, or it may be redrafted based on the contemporary society infrastructure. This may provide quotation form and even present the reasoning for the existing civilization manifestations. As a result, Habermas's theory of modernization has utilized modernity as a paradigm for social changes, isolating modernity from its benefits [26].

This modernity sequence has been clarified, while the degree of change of the study relies upon syntax analysis. Thus, the potential change values are summarized into five major categories.

- No change - The sources are copied with no changes of elements.
- Minor changes - There are specific changes done in the system elements
- Adaptations - Combining the sources with recent elements
- Significant changes - The associated system has been modified
- Total changes - Complete modification of the system based on rules and regulations

### 3.4.2. Architectural Identity

One of the significant concepts in the modern period is identity, which has become a common topic in this present architecture analysis [27]. Identity is an essential source of architecture, and most architects have progressively identified the significance of symbolism and importance in architecture, particularly for creating their local individuality [28].

Moreover, Colquhoun examines architecture as a linguistic with a particular set of historical elements in the context of individual historical thought. The overall strategy of architectural identity might be stated based on the previous studies. The expressional power of creating integration and differentiation among multiple societies is considered architectural identity. This essential element connects authenticity to the individuals from their lifestyle roots. It is a continuous process encompassing cultural diversity, privacy and continuity [29].

Various Indian researchers have analyzed the visual aspects of facade transformations and corresponding theories for form, shape, colour, material, texture, decoration, details, roofs, parapets, openings, and windows, which is more evident in Southern parts of Tamilnadu, India where it is rich in its heritage, facade and reflects the ethnicity, culture, and heritage value of the city. Thus, the research paper focuses on visual elements of building facades and its analysis of transformations over the years in South Tamilnadu, India and its importance in shaping the city's image.

## 4. Transformation of Building Facades - South Indian Context

Qualitative-based approaches in evaluating the facades of traditional buildings and their transformations in the South Indian context of visual elements in building facades were studied through the secondary data of articles from many journals, books, research papers, etc., of various pioneers in this field of research.

The research focuses on the synthesis and compiling of the following features of various pioneers in this field of study:

- Predominant facade characterizations as well as its transformation typologies.
- Approaches of the visual elements and the quality of the building facade.
- Visual aspects related to theories on building facades and transformations

### 4.1. Visual Element's Significance in Building Facades

#### 4.1.1. Form and Shape Influencing Building Facades

The form is a significant and valuable element in the building facade. Baper and Hassan discuss the building characteristics of identified records as a substantial facade component. Jalali et al. discussed the element influencing the building facade [30, 31]. According to the individual's perspective, form is considered an essential and most required element for building a facade, as shown in Figure 3.

The form and shape of a facade can contribute to its uniqueness, character, and harmony with the surrounding environment or architectural style. The form and shape of the facade should respond to the site's characteristics, such as neighbouring buildings, topography, climate, and cultural context. When the infrastructure increases, complexity in form-associated variables improves the gratification senses but increases the complexity and chaos as variables related to shapes.

In the case of a decrease in infrastructure, the excitement sense grows, and some aspects, like sloped roofs, pitched roofs, etc., have been utilized for evaluating the identified facade shape factor, as shown in Figure 4. Certain essential elements need to be considered, whether the facade may be geometric or non-geometric and the building in that area contains characteristics of traditional architecture. The most critical factor in the degree of complexity of building facades is repetition rhythm [32].



Fig. 3 Form of building facade - Chettinad house at Karaikudi, Tamilnadu



**Fig. 4** The shape of the building facade – Thanjavur house, South Tamilnadu



**Fig. 5** Color of building facade – Kanyakumari, South Tamilnadu

#### 4.1.2. Color Significance in Building Facades

Colour is essential in traditional building facades and is often influenced by cultural, historical, and contextual factors. Colours can be used strategically to emphasize certain architectural elements or create a visual hierarchy on the facade. Bold or contrasting colours may be applied to decorative pieces, entrances, or essential features to draw attention and create a focal point.

L. Garcia, J.Hernández, and F. Ayuga have reported that divergence in building appearance and its surroundings are the major issues concerning colour. In the rural landscape, the evaluation of buildings' visual impact is done through the colour of the building. Colour is an essential factor influencing the design in form and texture [25].

MJ. Montero-Parejo et al. have illustrated that an appropriate colour for the building facade is consistently a better-rated solution and determined that facade colour is an essential element in improving building visual integration in rural environments, as shown in Figure 5 [33]. Building facades in Tamilnadu, known for its agricultural wealth and green fields, highlight colours for primary individuals residing there. The choice of colours can significantly impact the overall aesthetics and visual appeal of the surroundings.

Colourful buildings amidst lush green landscapes can create a vibrant and picturesque environment. Using colour on building facades is one way to provide visual comfort. The colours on the building's facade reflect the area's traditional architecture and connect strongly to its surroundings. In traditional architecture, certain colours may be associated with specific cultural traditions, beliefs, or rituals that reflect a particular area's regional identity and practices.

The colour choices for the traditional facades often consider the surrounding environment and the overall visual harmony within the neighbourhood or cityscape. The colours may complement or contrast the natural or built surroundings, creating a cohesive and aesthetically pleasing streetscape.

#### 4.1.3. Decoration & Details Significance in Building Facades

Decoration and details in traditional building facades contribute to the overall aesthetic appeal of the building, adding beauty, richness, and a sense of craftsmanship. These decorative elements can include ornate carvings, intricate patterns, mouldings, and other embellishments that enhance the visual experience of the facade.

Evaluation of the building facade is considered an essential optical element for decorations and details. Baper and Hassan discussed facade decorations as a visual element which has generated highly effective architectural details and significant and leading factors influencing architectural identity and continuity [25]. One of the significance of building facade and essential representation of its culture is architectural detail, as shown in Figure 6 [34]. Architectural features increase the building's form complexity, uniqueness, and variety and provide opening visual isolation by representing these details to analyze the viewer's attention.



**Fig. 6** Decorations in building facade – Tirunelveli Agraharam house, South Tamilnadu



**Fig. 7 Decorations and details in building facade – Tirunelveli Agrapharam house, South Tamilnadu**



**Fig. 8 Materials in building facade – Traditional mud house of South Tamilnadu**

Additionally, decorations and proportions are emphasized as highly beneficial elements of historical images in cities, as shown in Figure 7 [35]. Subsequently, the type and amount of decorations utilized on facades can significantly impact this field. Decoration and details can help distinguish and identify different architectural styles or periods. They represent a place’s historical, religious, or cultural heritage, reflecting the community’s values, beliefs, and traditions or era in which the building was constructed.

**4.1.4. Materials Significance in Building Facades**

Materials are one of the significant urban and rural building facade visual elements that can be estimated by urban and rural space users and can significantly impact the urban and rural traditional image formations [30]. Materials in traditional building facades contribute to the building’s overall character and visual appeal. Different materials possess distinct textures, colours, and patterns that can convey a specific architectural style or period. They impact the structural integrity and longevity of the facade. Traditional buildings were often constructed using locally available materials that were well-suited to the climate and environmental conditions of the region. They carry cultural and historical significance, which reflects the traditions, craftsmanship, and building practices of a specific culture or era, as seen in Figure 8.

**4.1.5. Texture Significance in Building Facades**

One of the essential and practical visual elements is texture, which is highly significant in influencing aesthetic preferences and is a primary variable influencing the facade design, as shown in Figure 9 [25]. According to building facade quality, texture is equally important to other visual elements in people’s perceptions. It is also helpful to determine the facade quality, as shown in Figure 9.

Layer density in the facades is represented as texture and its hardness and softness, as well as layers’ similarity and contrasts in the views. Texture can emulate historical building techniques or evoke a specific cultural heritage. It helps preserve and celebrate the architectural traditions and identity of a place. Texture adds visual interest and depth to a building facade. It creates a play of light and shadow, enhancing the overall appearance of the structure.

Intricate textures can evoke a sense of craftsmanship and attention to detail, capturing the eye of passersby. Traditional building facades with varied textures invite touch and exploration, providing a sensory experience for those interacting with the building. The tactile quality can enhance the connection between people and their built environment. Texture can emphasize the materiality of the building. Traditional facades often utilize locally available materials such as stone, brick, or wood, and the texture can showcase the unique qualities of these materials [25].



**Fig. 9 Texture in building facade – Traditional facade of Karaikudi Chettinad house of South Tamilnadu**

#### 4.1.6. Roofs and Parapets Significance in Building Facades

The roof is the factor that influences the urban building facade quality. Roofs and parapets play significant roles in traditional building facades, contributing to the architecture's functional and aesthetic aspects. They contribute to the overall architectural character of traditional buildings, reflecting the regional or historical styles prevalent in a particular area [36].

Further to the wall materials, the roof shape is considered a factor in comparison between buildings, as shown in Figure 10. The relationship between the roof line of the owner's installation and their neighbour's construction is crucial in determining the privacy facade's level. Traditional facades often have well-defined rooflines and parapets that provide balance and proportion to the overall composition. Similarly, the parapet height is essential for building roof protection from visual penetration as an outlet [37].

Parapet design features are significant characteristics of building facades based on the appropriate value of the factors divided into two categories: flush and projection. The parapet material and its types can affect the facade visual elements of the historical building, as shown in Figures 10 and 11. They incorporate decorative elements, such as roof finials, cresting, or ornamental parapets that convey cultural, religious, or social symbolism [37].



Fig. 10 Roofs and parapets in building facade - Chettinad house at Karaikudi, Tamilnadu



Fig. 11 Roofs and parapets in building facade – traditional homes from South Tamilnadu

#### 4.1.7. Openings and Windows Significance in Building Facades

In traditional building facades, the essential factors in the appearance of the openings are doors, windows, and various openings that contribute to functionality and design aspects [38-40].

Windows and doors perform as a fundamental component in facade architecture and accomplish the building's eye, as seen in Figure 12. Doors are crafted with intricate designs and ornamentation, reflecting the cultural and historical context of the building. They may feature decorative carvings, mouldings, arches, or unique patterns, showcasing the craftsmanship and artistic expression of the era [22].

Traditional facades consider the placement and size of doors and windows to optimize views, enhance the building's relationship with its context, and maintain visual harmony with other architectural elements such as columns and decorative motifs. People's perspectives about building facades in urban and rural areas have influenced the visual elements through the size of the number of doors and windows, as seen in Figure 13 [36].

Baper and Hassan discussed architectural identity continuity by considering opening as an essential shaping of visual elements.

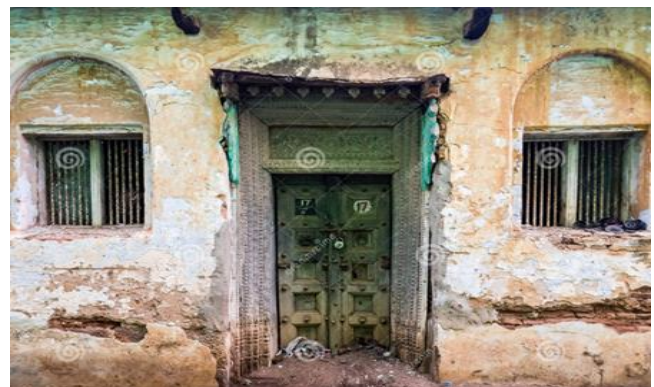


Fig. 12 Beautifully carved door and windows in building facade - traditional house at South Tamilnadu



Fig. 13 Doors and windows of building facade – traditional Agraharam house at Nagercoil district



Window elements include size, form, dimensionality, placement to the level of vision, placement in the facade line, window area ratio for the facade, protecting iron components, glazing type, and direction about opening portion that opens up frequently in front of the visual penetration as seen in Figures 12 and 13 [37]. In certain cultures, doors may be adorned with symbols or motifs with cultural, religious, or superstitious significance.

#### 4.1.8. Scale and Proportion Significance in Building Facades

The scale and proportions are visual elements that leverage by evaluating the building facade nativity, contributing to their overall aesthetic appeal and harmony [36]. The traditional image intensity of a building facade is determined through building scale, proportions, and dimensions. This has assisted in considering efficient parameters for shaping the symbols of architectural buildings [25]. To evaluate this aspect, it is possible to assess the main building proportion and the appropriate coordination for the different features of the facade, as seen in Figure 14.

The scale of elements on a facade, such as windows, doors, columns, and decorative details, should be appropriately sized concerning the overall size of the building. The focus on building ratio depends on the observer's perspective and the significant factors like height and width. Traditional architecture often follows established proportional systems, such as the Golden Ratio or classical orders, to ensure a visually pleasing result. These systems guide the sizing and positioning of elements, creating a sense of balance, symmetry, and rhythm

#### 4.2. Traditional House Facade Transformations of South Tamilnadu

Traditional house facade transformations are vital in preserving architectural heritage while accommodating contemporary design sensibilities. Understanding the impact and implications of facade transformations becomes critical in South Tamilnadu, where traditional houses have immense cultural, historical, and architectural significance reflecting the region's rich heritage.



Fig. 14 Scale and proportion in building facade – Ganapathi Agraharam village in Thanjavur district

South Tamilnadu is renowned for its rich architectural heritage, encompassing diverse styles such as Chettinadu, Kanchipuram, Madurai, Tirunelveli, Thanjavur, and Kumbakonam. Traditional houses in these regions often feature distinctive design elements like ornate woodwork, intricate carvings, and vibrant colours. Modern facade transformations can revitalize these traditional facades while preserving their unique characteristics, making them more functional, sustainable, and visually appealing. It also seeks to understand how the region's cultural context and architectural elements influence these transformations. This includes exploring different vibrant colours, materials and texture alterations, doors and window designs, roof modifications, adding or modifying architectural details, and additional secondary skin or cladding to the facade and front entryway transformations. By exploring these transformations, we better understand the balance between preserving traditional architectural heritage and embracing modern architectural aesthetics in facade transformations of traditional houses of South Tamilnadu. They impact the overall streetscape and neighbourhood character, contributing to the knowledge base surrounding preserving traditional architectural heritage and the evolution of conventional architecture in South Tamilnadu.

#### 4.3 Facade Transformation Typologies

Traditional facade transformations in South Tamilnadu encompass various typologies that preserve cultural heritage while incorporating modern design elements. The different floor and roof modifications changed how the street facades looked. Comparing the altered facades to the original structures made tracing the visual changes they produced simple. Generally, there are two primary classified facades:

1. Traditional modified facade: The authentic dwelling unit consisting of walls, roof, verandas, and windows has been changed based on client requirements by adding or removing original components concerning a brand-new commercial function.
2. Newly constructed facade: This facade is created as a novel building instead of adding or removing by not representing the original building facade characteristics.

Three significant components of the wall are considered to comprehend the insights into the metamorphosis of the facade. The major facade elements are doors, verandas, roofs and windows, whereas the transformation of a building facade can be characterized as:

- Addition of floors, modifying or demolishing the walls, ceilings and parapets, doors, windows and openings
- Addition of secondary building skin, compound wall, sunshade or double skin, as well as wall panel
- Add or transform the building materials, textures, colour, form and shape, scale and proportion, decoration and details

- Adding external elements such as a terrace canopy and stairs
- Transformation of building skin from residential to commercial use

Transformation typology has been classified into three categories given below:

#### 4.3.1. Typology of Transforming Minor Facade

This typology frequently involves ornamental modification and doesn't require demolition of the visual elements of the building facade.



Fig. 15 Transformation of minor building facade

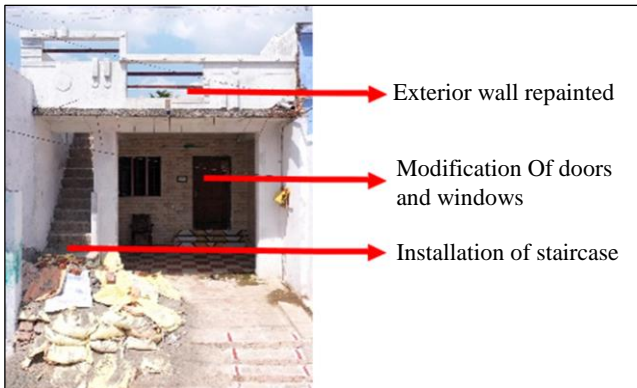


Fig. 16 Transformation of medium building facade

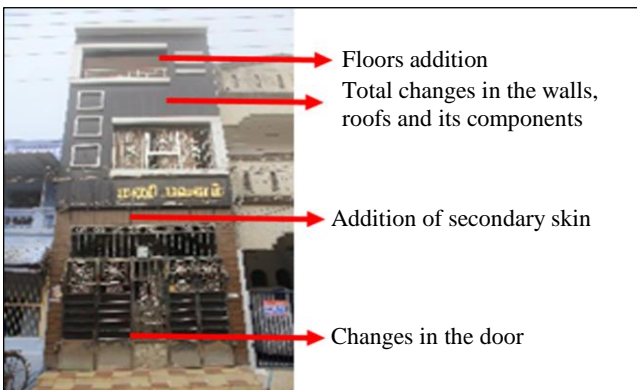


Fig. 17 Transformation of primary building facade

The basic process involved the addition of a name board, terrace canopy, etc. Moreover, the building's secondary skin's materials are modified, but the entire facade is not covered.

#### 4.3.2. Typology of Transforming Medium Facade

When a modification is accomplished through door and window position modification, mounting stairs, roof and secondary skin is done after several instances revealed by observers. This modification is done so that one side portion of the facade can be presented as a completely new appearance.

#### 4.3.3. Typology of Transforming Major Facade

Several old buildings exhibit changes in practically every facade component, such as the walls, windows, roofs, and the number of floor levels. This kind of modification generally results in complete building modification by demolishing the existing wall, door, and opening, considered a significant facade transformation.

## 5. Study Area

Thirty traditional house facade samples, located inside Tirunelveli, a South town of Tamilnadu, India, are chosen as the subject of this research's observation and interviews, as seen in Figures 20 and 21. Tirunelveli is known for its rich cultural heritage, religious traditions, traditional buildings, and historic and architectural significance. The city showcases architectural styles, including Dravidian, Islamic, and Colonial influences.

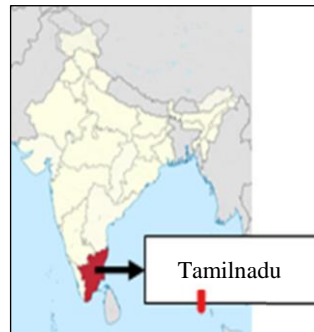


Fig. 18 India map showing Tamilnadu

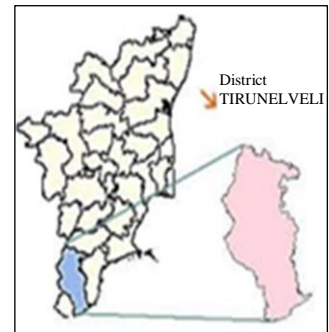


Fig. 19 Tamilnadu map showing Tirunelveli district



Fig. 20 Map showing Tirunelveli district

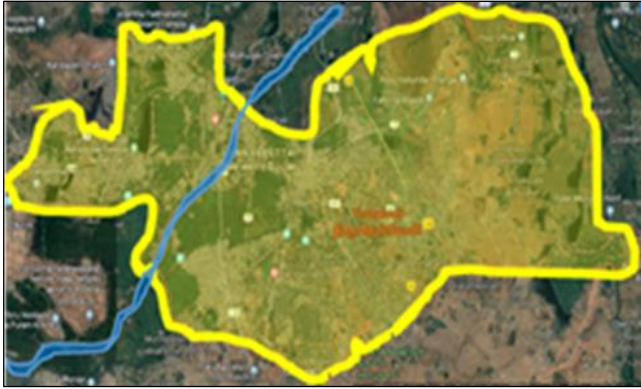


Fig. 21 Map showing Tirunelveli town

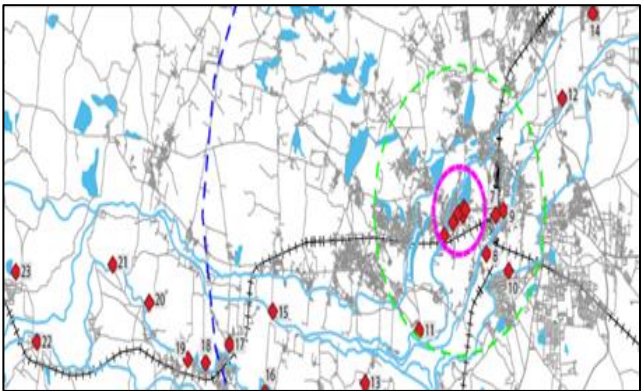


Fig. 22 Map showing samples of traditional houses located inside Tirunelveli district

The traditional houses inside the Tirunelveli district are usually located near the temples and have a distinct architectural style. It's known for its traditional architecture, as seen in Figure 22.

These are characterized by their old-style houses, narrow streets, and a serene atmosphere. They reflect the history and cultural significance of the particular Brahmin community in Tirunelveli.

### 5.1. Traditional Building Facade Elements of Tirunelveli District

Tirunelveli, a city in Tamilnadu, India, has many traditional facade elements that showcase architectural styles influenced by the region's rich cultural heritage. Some key factors that can be found on conventional building facades in Tirunelveli include Terracotta tiles, Wooden carvings, intricate designs featuring floral motifs, geometric patterns, and mythological figures seen on door frames, window shutters and pillars, Jali work, Stucco ornamentation on walls and arches, Colorful frescoes, Ornate balconies with intricate railings.

These traditional facade elements reflect Tirunelveli's architectural heritage and contribute to the city's unique charm and cultural identity.

### 5.2. Traditional House Facade Transformations in Tirunelveli District

The transformation of a traditional house facade in Tirunelveli district necessitates a delicate balance between preserving architectural and historical significance and incorporating modern elements. It involves renovating, restoring, and adapting historic buildings while maintaining their traditional aesthetics. The transformations focus on restoring traditional buildings original architectural features, such as intricate carvings, decorative elements, doors and windows, traditional roof designs, balconies and verandahs. It aims to preserve the cultural heritage associated with Tirunelveli district's traditional buildings. For example, religious motifs, traditional symbols, and regional architectural styles are carefully retained or replicated during the transformation process.

Using traditional materials is integral to preserving the authenticity of conventional facades. Upgrading the facades with traditional-style doors or ornamental archways can enhance the facade's appeal and showcase the architectural heritage of the traditional houses. Repainting the exterior in standard colours and finishes preserves the architecture's authenticity.

## 6. Analysis & Results

### 6.1. Analysis of Individual House Facade Transformations and Visual Parameter Transformations in Tirunelveli District

Based on the primary data collected by the researcher through observations and interviews inside the Tirunelveli district, a case chosen in South Tamilnadu analyzes how traditional house facade elements have transformed from their original form. The changes are then classified into three categories, minor, medium, or significant, using a scoring method. These modifications could essentially be an addition or subtraction to the facade elements.

The researcher used a scoring method to assess each type of facade modification based on the visual element parameters gathered from 30 traditional house facade samples selected inside the Tirunelveli district. The following types of transformations in the facades are identified for this assessment: the addition of floors, modification in the building walls, doors, windows, roofs, and parapets, the addition of colours, decorations or details, transformation in the form, shape, scale and proportion, modification in the building skin from residential to commercial, installation of name boards, addition of secondary skin, transformation in the building materials and textures, addition of exterior elements like stairs or steps. Figure 23 depicts the percentage of analysis of individual facade transformations based on visual parameters such as form and shape, colour, decoration and details, materials and texture, roofs and parapets, openings and windows, scale, and proportion.

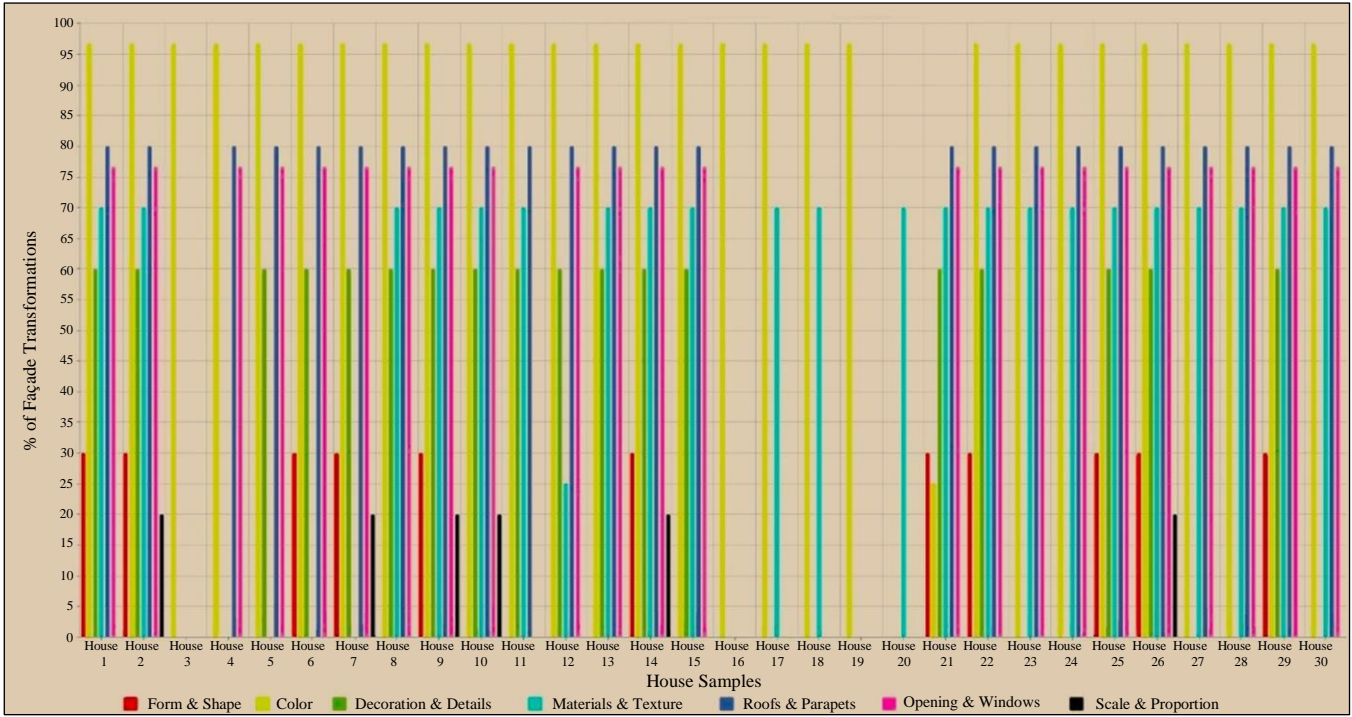


Fig. 23 Percentage of visual parameter transformations based on the analysis of individual house facades (30 samples)

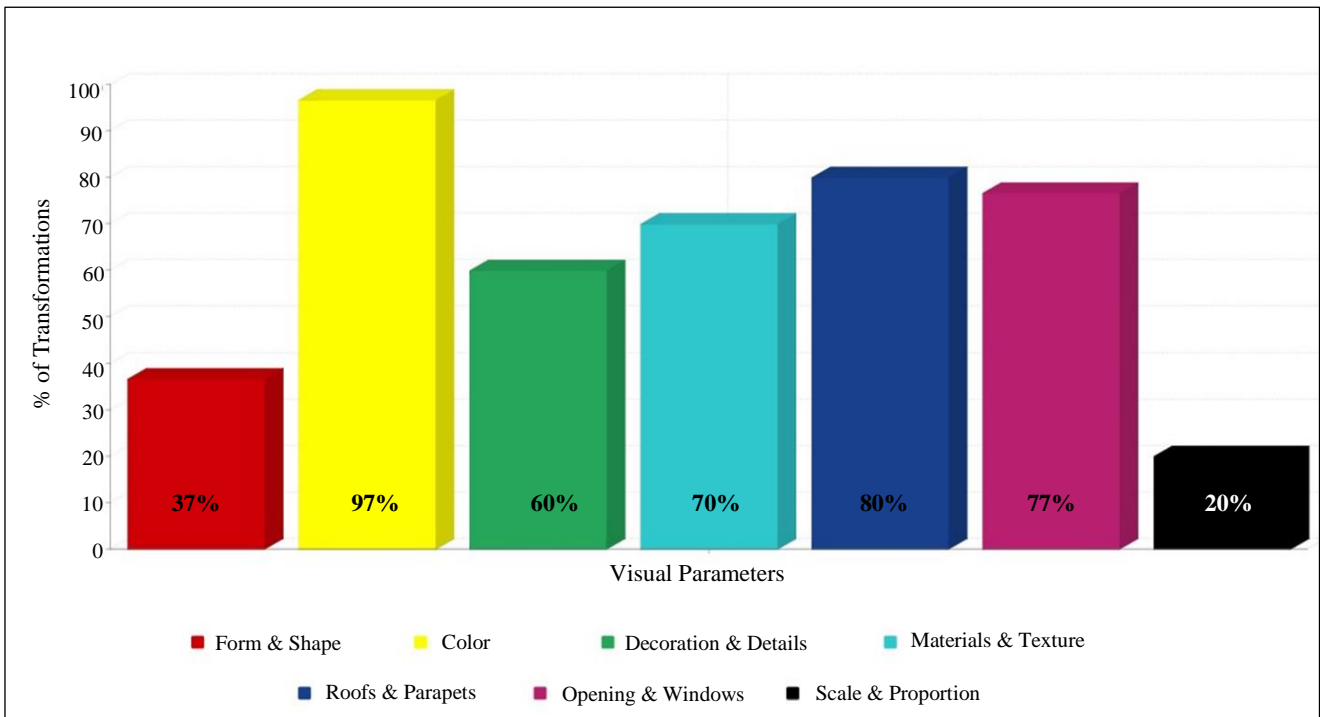


Fig. 24 Percentage of individual visual parameter transformations based on the analysis of house facades (30 samples)

The samples of facade transformation typologies and their analysis based on the visual parameters are listed in Tables 3 and 4.

Based on the analysis of 30 pieces of house facades, the percentage of individual visible parameter transformations

shows that form and shape have transformed at 37%, colour has transformed at 97%, followed by roofs and parapets at 80%, openings and windows at 77%, materials and texture at 70%, decoration and details at 60%, and scale and proportion at 20% as seen in Figure 24.

**6.2. Results of Identified Transformations Based on the Visual Parameters in Tirunelveli District**

The percentage of the identified transformations for 30 samples based on the visual parameters are shown in Figure 25, where the analysis produced the following results:

**6.2.1. Form and Shape**

The findings from the 30 samples show that the identified transformations within this parameter include modification or demolition of building walls, doors, and openings (12%) and that in a few houses, thinnai was enclosed with grills and walls for safety and security, parking space usage, and other space expansions. Transformation of the building’s form and shape accounts for 6%, with the entire facade elevation transformation from traditional to modern, and modification of the building skin from residential to commercial (3%) with one part of the building’s function transformed to commercial use.

Addition of exterior elements such as terrace canopy, stairs or compound wall (3%) where modern facilities are seen with an accumulation of compound wall with brick wall and grilled entrance gate and external staircase outside, installation of name boards (2%) seen adding to the commercial space in front, and addition of secondary building skin, sunshade or double skin or wall panel (9%) (Figure 25).

**6.2.2. Color**

The results of the 30 samples show that the identified transformations within this parameter include adding or modifying colours to the facade or repainting of facades (15%), which is seen in most traditional houses (Figure 25).

**6.2.3. Decoration and Details**

According to the findings from the 30 samples, the identified transformations within this parameter include the addition of decoration and details (7%), with few houses having ornamentation and detailing of floral motifs in the parapet wall and drop walls in the balconies (Figure 25).

**6.2.4. Materials and Texture**

The results of the 30 samples show that the identified transformations within this parameter include changes in the building materials and textures of doors, windows, roofs and parapets (11%), which are visible in only a few houses. (Figure 25).

**6.2.5. Roofs and Parapets**

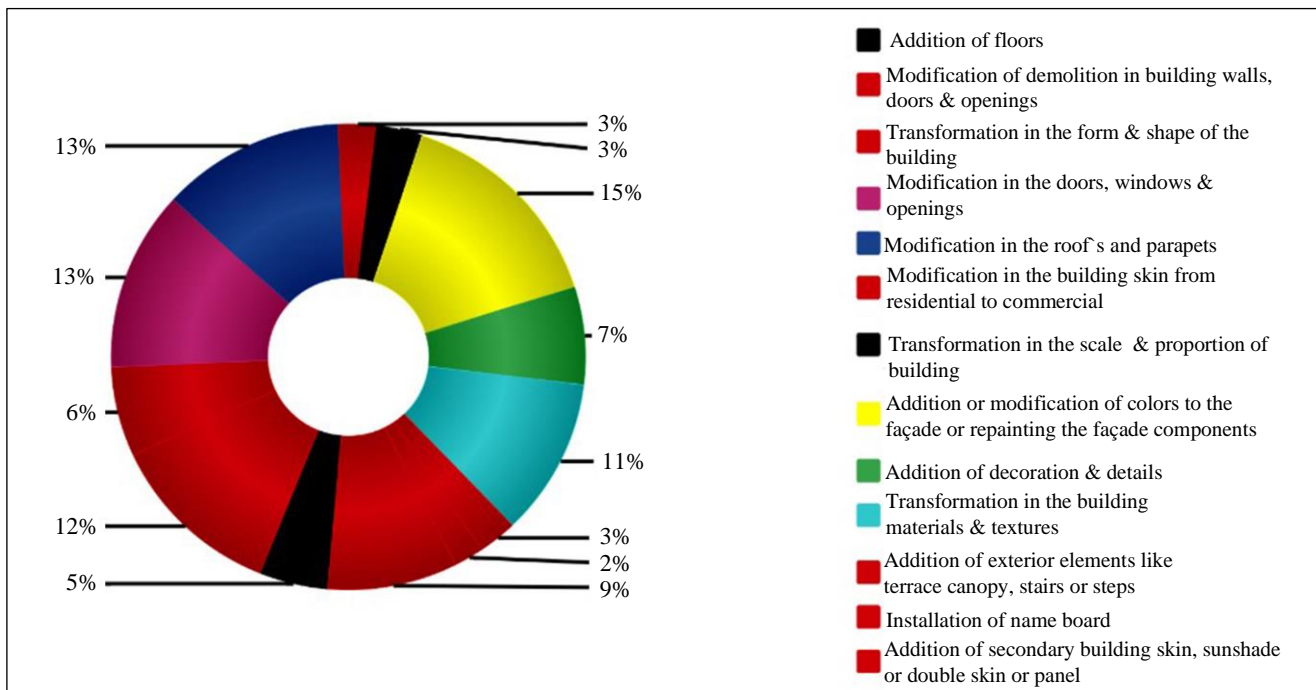
According to the results of the 30 samples, the identified transformations within this parameter include changes to the roofs and parapets (13%) from sloped roof tile to asbestos sheet or flat concrete roof (Figure 25).

**6.2.6. Openings and Windows**

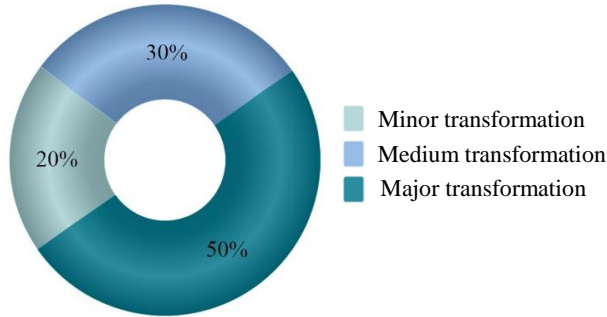
The results of the 30 samples show that the identified transformations within this parameter include modifications to the doors, windows, and openings (13%), with the majority of the spaces closed with mosquito mesh and only a few of the door and window typologies replaced with glazed or grilled types (Figure 25).

**6.2.7. Scale and Proportion**

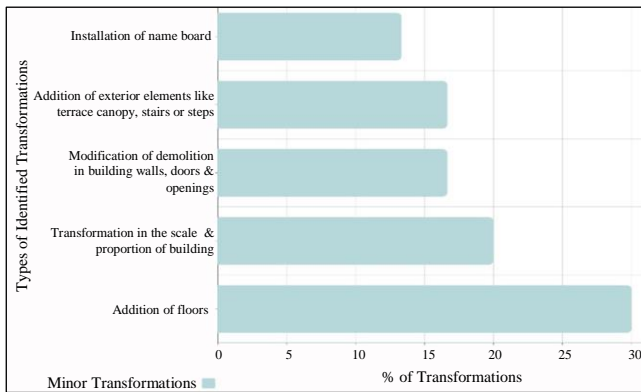
The results of the 30 samples show that the identified transformations within this parameter include floor additions (5%) and changes in the scale and proportion of the building (3%) that are seen in a few houses (Figure 25).



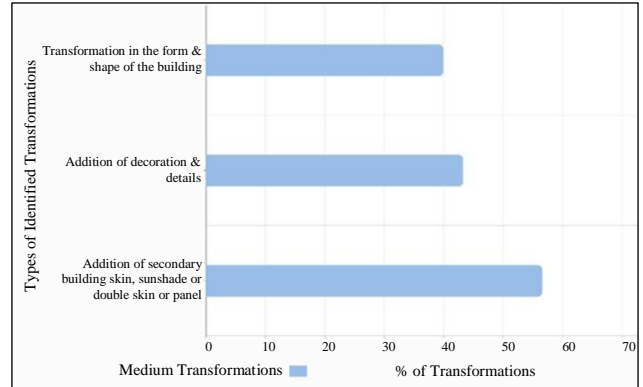
**Fig. 25 Percentage of the identified facade transformations based on the visual parameters**



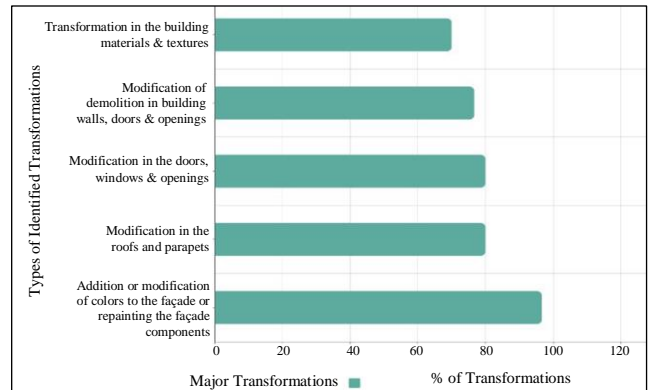
**Fig. 26 Percentage of minor, medium, and significant facade transformation**



**Fig. 27 Percentage of minor facade transformation by elements**



**Fig. 28 Percentage of medium facade transformation by elements**



**Fig. 29 Percentage of major facade transformation by elements**

### 6.3. Minor, Medium and Major Transformations by Elements

Based on visual parameters, the minor, medium, and significant transformations for the 30 samples show that the minor transformation accounts for 20%, the medium transformation accounts for 30%, and the major transformation accounts for 50%, as shown in Figure 26.

#### 6.3.1. Minor Transformations

In the Tirunelveli district, minor facade transformation amounts to 20% of the total 30 samples (Figure 26). The most frequent change found in this typology includes the installation of name boards, which accounts for 13%; the addition of exterior elements like terrace canopy, stairs or compound walls 17%; modification in the building skin from residential to commercial, accounts for 17%, the addition of floors for 30% and transformation in the scale and proportion of the building 20% as seen in Figure 27.

#### 6.3.2. Medium Transformations

Medium facade transformations in the Tirunelveli district house facades account for 30% of the total 30 samples (Figure 26). Transformations within this category include changes to the form and shape of the building 40%, the addition of decoration and detail 43% such as those seen in parapets, balconies, and so on, as well as the addition of a secondary building skin, sunshade and double skin of 57% as shown in Figure 28.

#### 6.3.3. Major Transformations

In the case of significant facade transformations, 50% of the total samples have transformed, as shown in Figure 26, which includes the transformation in the building materials and textures of 70%, modification or demolition in the building walls, doors and openings of 77% replacing them with a completely new facade design, modification of windows, doors and openings of 80%, modification in the roofs and parapet shapes and designs of about 80% from traditional to modern, addition or modification of colours to the facade or repainting of about 97% as seen in Figure 29.

## 7. Conclusion

The results of this study, conducted by a researcher in the Tirunelveli district, show the percentage analysis of minor, medium, and significant facade transformations of each element based on visual parameters. The major facade transformations are seen in the colour of the house facades, which is about 97%, followed by roofs and parapets transformations at 80%, openings and window transformations at 77%, and materials and texture transformations at 70%.

Future urban design and planning should consider traditional areas as critical aspects of a city's identity. A district is one of the foundations that significantly affects the quality of a city's image.

As a result, Lynch's theory of city image is supported by the identification of the elements and traits of traditional building facades by a powerful image. This study offers suggestions for urban planners, designers, and architects who may want to preserve traditional building facades. Therefore, enhancing the perception of facades in conventional buildings is necessary to encourage tourism growth.

Keeping traditional facades is important for maintaining cultural heritage, historical identity, and architectural legacy. Traditional building facades reflect a community or region's cultural identity and values. Preserving these facades ensures the continuation of cultural heritage and provides a tangible link to the past for future generations.

Based on the literature study from many authors, the most crucial visual components in portraying photos of traditional building facades are form & shape, decoration & details, colour and material, roofs, parapets, doors, windows and openings. Accordingly, a gap in research prevents the researcher from learning exactly about ethnicity and culture that affect assessments.

This is a question for future research. Future studies can focus on a few areas to fill in the gaps left by our researcher, who was restricted only to the visual elements of the traditional building facades. These include the effects of sociocultural factors over physical facade elements, the levels of visual privacy inside social relationships, the

interconnection of spatial planning and facade design to generate privacy, issues with modernizing local identity, and identity transformation.

Hence, advanced research can also be done to assess how technology affects the visual privacy of facades. This paper bridged the gap between architectural design and the evaluations of traditional building facades, a significant challenge in contemporary urban design.

Moreover, urban planners should consider form and shape, modern and traditional design coordination, colour and materials as essential factors in determining the city's image in the future. Traditional buildings contribute to the sense of place and community identity. They also hold a historical significance due to their association with important events, individuals, or social movements. Preserving these facades allows us to connect with the past and learn from history.

In conclusion, keeping traditional building facades is critical for safeguarding cultural heritage, honouring architectural legacy, preserving a sense of place, and enhancing aesthetics and visual appeal.

Overall, the visual elements of building facades in South Tamilnadu have evolved to embrace a blend of traditional and modern design elements. The transformation of building facades in the South Indian context reflects a balance between preserving cultural heritage and embracing modernity.

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## Appendix

**Table 2. Details of the selected 20 articles included in this paper**

Sl. No.	Name of the Journal	Number of Articles	Name of the Articles
1	Journal of History, Culture and Art Research	1	<ul style="list-style-type: none"> <li>Geometric Design in Islamic Architecture: Examination of Tessellation Configurations in Mosques</li> </ul>
2	Journal of Environmental Psychology	2	<ul style="list-style-type: none"> <li>Design Review and Public Preferences: Effects of Geographical Location, Public Consensus, Sensation Seeking, and Architectural Style</li> <li>Architecture and Engineering Students Evaluations of House Facades: Preference, Complexity and Impressiveness</li> </ul>
3	Journal of Emerging Trends in Educational Research and Policy Studies	1	<ul style="list-style-type: none"> <li>Character-Extinction of Yoruba Architecture: An Overview of Facades of Residential Buildings in South Western Nigeria</li> </ul>
4	Journal of Design and Built Environment	3	<ul style="list-style-type: none"> <li>Influence of Building Facade Visual Elements on Its Historical Image: Case of Kuala Lumpur City, Malaysia</li> <li>Public Evaluation of Historical Building Facades in the Vicinity of Dataran Merdeka, Kualalampur</li> <li>Contribution of Building Facades to Attractive Streetscapes : Study of Two Main Streets in Kualalumpur City</li> </ul>
5	Archnet-IJAR: International Journal of Architectural Research	2	<ul style="list-style-type: none"> <li>Architectonics - A System of Exploring Architectural Forms in Spatial Categories</li> <li>Identity in Transitional Context: Open-Ended Local Architecture in Saudi Arabia</li> </ul>
6	Journal of Architectural and Planning Research	1	<ul style="list-style-type: none"> <li>Urban Complexity: Toward the Measurement of the Physical Complexity of Streetscapes</li> </ul>
7	Journal of Engineering and Applied Sciences	1	<ul style="list-style-type: none"> <li>The Influence of Modernity on Kurdish Architectural Identity</li> </ul>
8	Journal of Environment and Behavior	2	<ul style="list-style-type: none"> <li>Affective Quality Attributed to Environments: A Factor Analysis Study</li> <li>Urban Design Aesthetics: The Evaluative Qualities of Building Exteriors</li> </ul>
9	Journal of Asian Architecture and Building Engineering	1	<ul style="list-style-type: none"> <li>Transformation of Residential Units into Commercial Spaces in the Central Business District of Dares Salaam, Tanzania</li> </ul>
10	Journal of Urban Design International	2	<ul style="list-style-type: none"> <li>An Evaluation of the Elements and Characteristics of Historical Building Facades in the Context of Malaysia.</li> <li>Visual Evaluation of Urban Streetscapes: How Do Public Preferences Reconcile with those Experts Hold?</li> </ul>
11	American Transactions on Engineering & Applied Sciences	1	<ul style="list-style-type: none"> <li>Factors Affecting the Continuity of Architectural Identity</li> </ul>
12	Environmental Engineering & Management Journal	1	<ul style="list-style-type: none"> <li>Visual Impact Assessment of Colour and Scale of Buildings on the Rural Landscape</li> </ul>

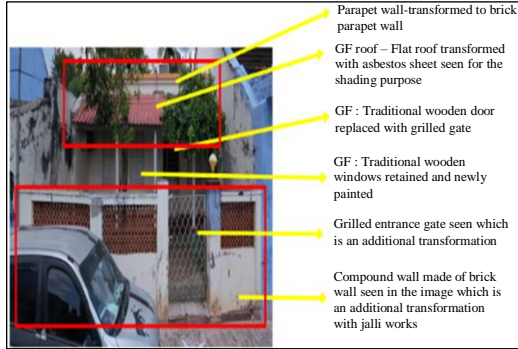
13	Sustainability	1	<ul style="list-style-type: none"> <li>Analysis of Facade Colour and Cost to Improve Visual Integration of Buildings in the Rural Environment</li> </ul>
14	International Journal of Humanities and Social Sciences	1	<ul style="list-style-type: none"> <li>Building Facade Study in Lahijan City, Iran: The Impact of Facade's Visual Elements on Historical Image</li> </ul>

Table 3. Samples of traditional facade transformation typologies based on visual facade parameters

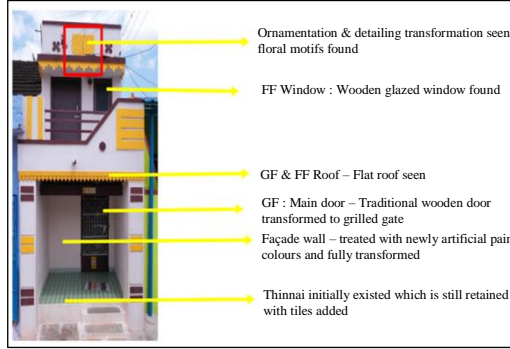
Sl. No.	Houses	Visual Façade Parameters								Identified Transformations										Transformation Topology				
		Form and Shape	Color	Decoration & Details	Materials & Texture	Roofs & Parapets	Openings & Windows	Scale & Proportion	Addition of Floors	Modification of Demolition in Building Walls, Doors & Openings	Transformation in the Form & Shape of Building	Modification in the Doors, Windows & Parapets	Modification in the Roofs and Parapets	Modification in the Building Skin from Residential to Commercial	Transformation in the Scale & Proportion of Building	Addition or Modification of Colors to the Façade or Repairing the Façade Components	Addition of Decoration & Details	Transformation in the Building Materials & Textures	Addition of Exterior Elements like Terrace Canopy, Stairs or Steps	Installation of Name Board	Addition of Secondary Building Skin, Sunshade or Double Skin or Panel	Minor Transformation	Medium Transformation	Major Transformation
01	1 (Refer Fig. 30)	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓	✓	✓		✓				✓
02	2 (Refer Fig. 30)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓				✓
03	3 (Refer Fig. 30)		✓												✓							✓		
04	4 (Refer Fig. 30)		✓			✓			✓	✓	✓	✓			✓						✓		✓	
05	5 (Refer Fig. 30)		✓	✓		✓			✓	✓	✓	✓			✓						✓		✓	
06	6 (Refer Fig. 30)	✓	✓	✓		✓			✓	✓	✓	✓			✓	✓	✓	✓		✓				✓
07	7 (Refer Fig. 30)	✓	✓	✓		✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓					✓
08	8 (Refer Fig. 30)		✓	✓	✓	✓			✓	✓	✓	✓			✓	✓	✓	✓		✓				✓
09	9 (Refer Fig. 30)	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓				✓
10	10 (Refer Fig. 30)		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓				✓
11	11 (Refer Fig. 30)		✓	✓	✓	✓					✓	✓			✓		✓					✓		✓
12	12 (Refer Fig. 30)		✓	✓		✓					✓	✓			✓						✓		✓	
13	13 (Refer Fig. 30)		✓	✓	✓	✓			✓	✓	✓	✓			✓						✓		✓	
14	14 (Refer Fig. 30)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓				✓
15	15 (Refer Fig. 30)		✓	✓	✓	✓			✓	✓	✓	✓			✓	✓	✓	✓				✓		✓
16	16 (Refer Fig. 30)		✓												✓						✓			✓
17	17 (Refer Fig. 30)		✓		✓							✓			✓		✓				✓			✓
18	18 (Refer Fig. 30)		✓		✓							✓			✓		✓				✓			✓
19	19 (Refer Fig. 30)		✓												✓						✓			✓
20	20 (Refer Fig. 30)				✓										✓					✓		✓		✓
21	21 (Refer Fig. 30)	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓	✓	✓	✓				✓
22	22 (Refer Fig. 30)	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓				✓
23	23 (Refer Fig. 30)		✓		✓	✓			✓	✓	✓	✓			✓		✓				✓			✓
24	24 (Refer Fig. 30)		✓		✓	✓			✓	✓	✓	✓	✓		✓		✓	✓	✓	✓				✓
25	25 (Refer Fig. 30)	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓	✓	✓	✓				✓
26	26 (Refer Fig. 30)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓				✓
27	27 (Refer Fig. 30)		✓		✓	✓			✓	✓	✓	✓			✓		✓				✓			✓
28	28 (Refer Fig. 30)		✓		✓	✓			✓	✓	✓	✓			✓		✓				✓			✓
29	29 (Refer Fig. 30)	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓				✓
30	30 (Refer Fig. 30)		✓		✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓				✓
Total No. of Houses		11	29	18	22	24	23	06	10	22	13	24	25	05	06	29	13	21	05	04	17	06	09	15

(Source: Researcher's documentation at Tirunelveli district)

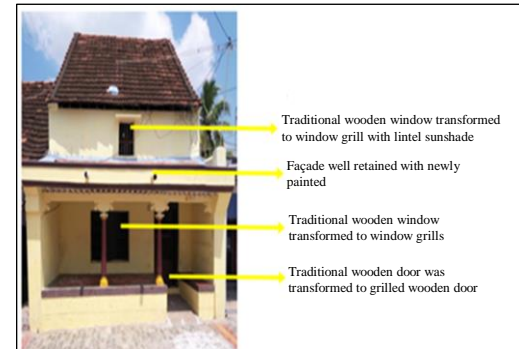
**Table 4. Tabulation of image analysis of 30 samples of traditional facade transformations inside Tirunelveli district**



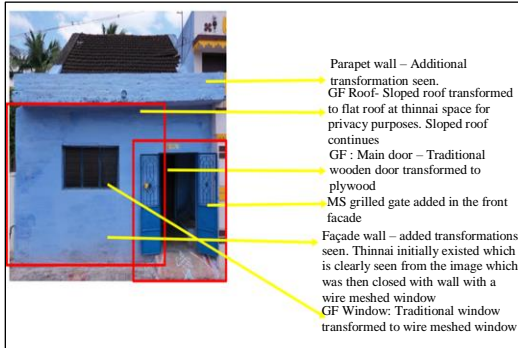
**Fig. 30 Sample 1 house facade**



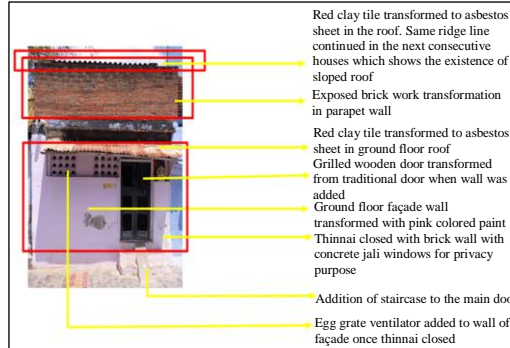
**Fig. 31 Sample 2 house facade**



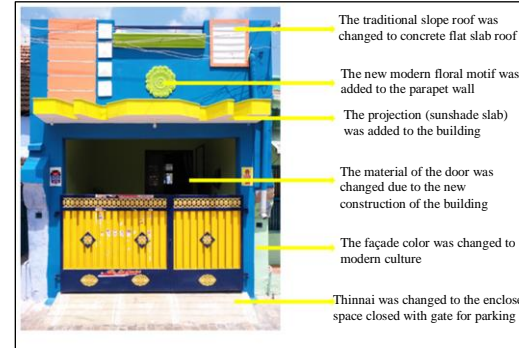
**Fig. 32 Sample 3 house facade**



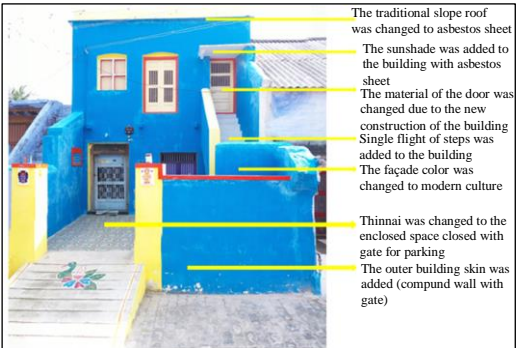
**Fig. 33 Sample 4 house facade**



**Fig. 34 Sample 5 house facade**



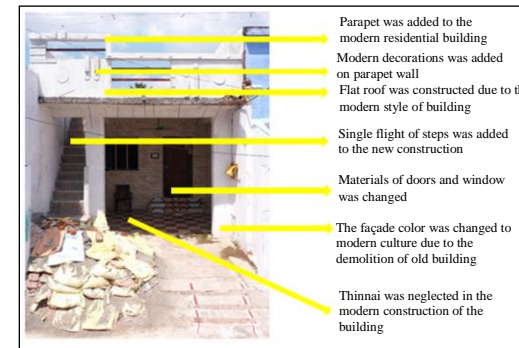
**Fig. 35 Sample 6 house facade**



**Fig. 36 Sample 7 house facade**



**Fig. 37 Sample 8 house facade**



**Fig. 38 Sample 9 house facade**



Fig. 39 Sample 10 house facade

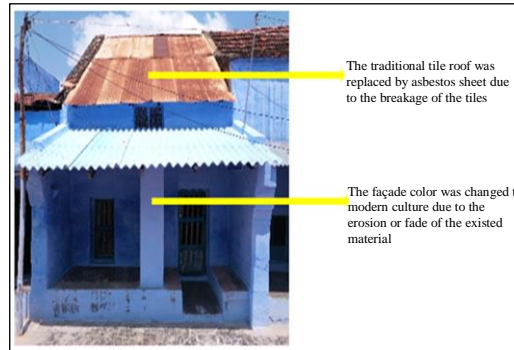


Fig. 40 Sample 11 house facade

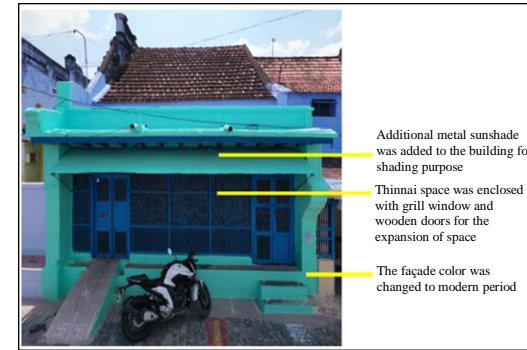


Fig. 41 Sample 12 house facade



Fig. 42 Sample 13 house facade

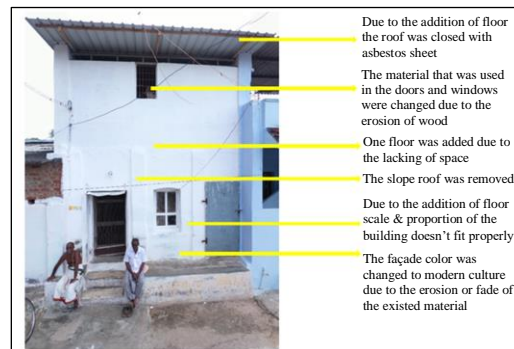


Fig. 43 Sample 14 house facade

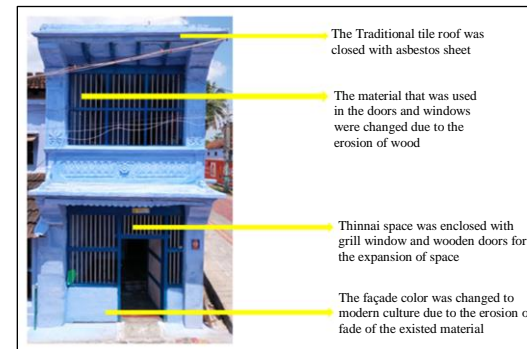


Fig. 44 Sample 15 house facade



Fig. 45 Sample 16 house facade

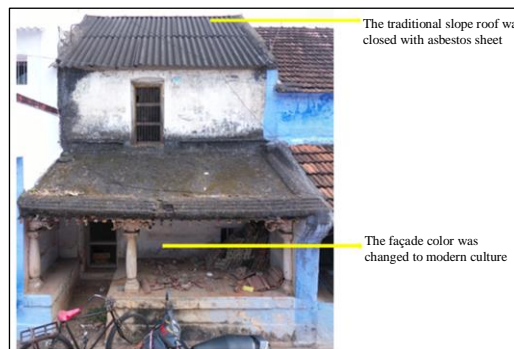


Fig. 46 Sample 17 house facade

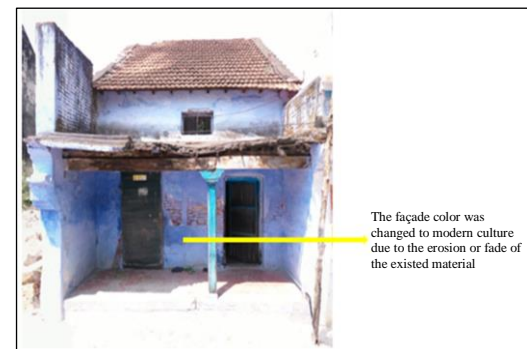


Fig. 47 Sample 18 house facade

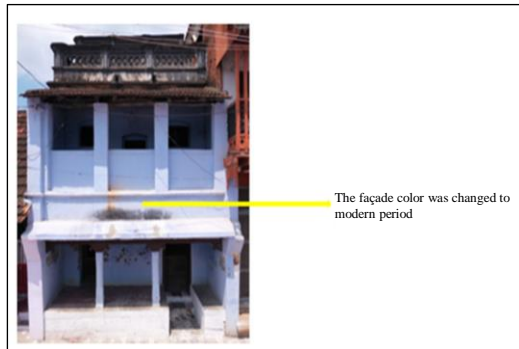


Fig. 48 Sample 19 house facade

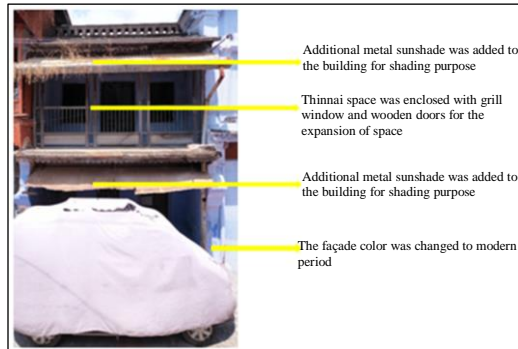


Fig. 49 Sample 20 house facade

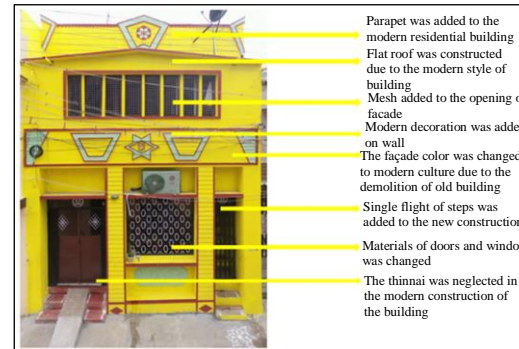


Fig. 50 Sample 21 house facade



Fig. 51 Sample 22 house facade

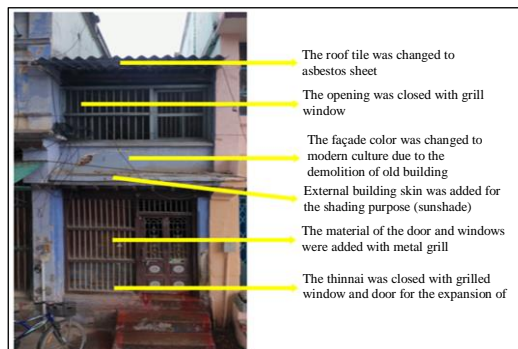


Fig. 52 Sample 23 house facade

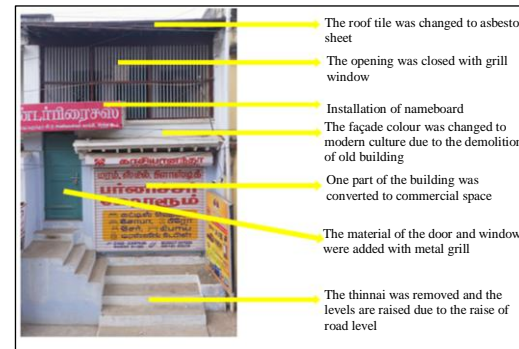


Fig. 53 Sample 24 house facade

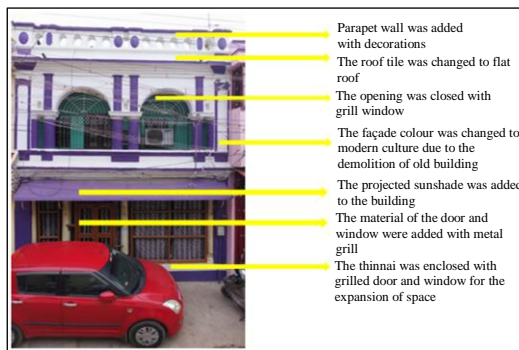


Fig. 54 Sample 25 house facade

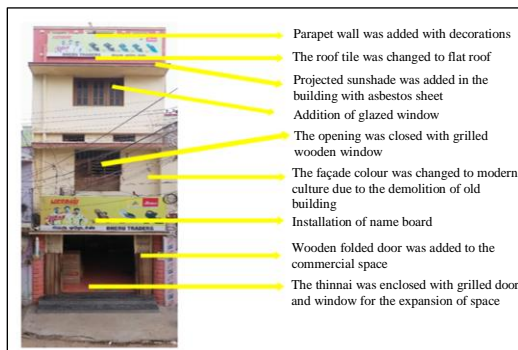


Fig. 55 Sample 26 house facade

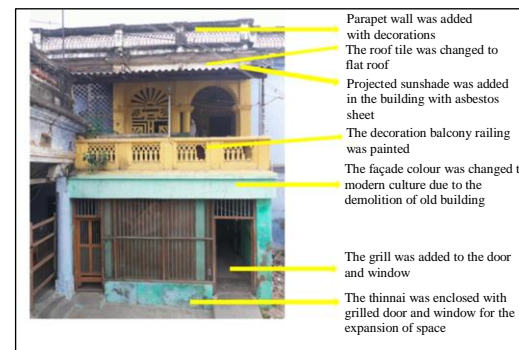
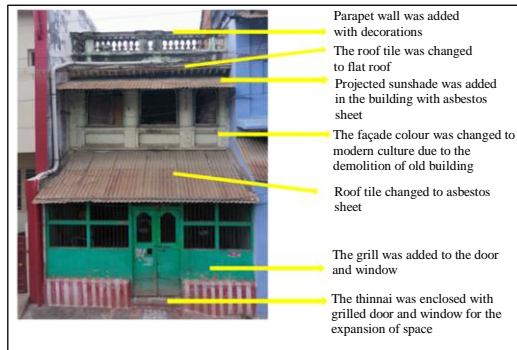
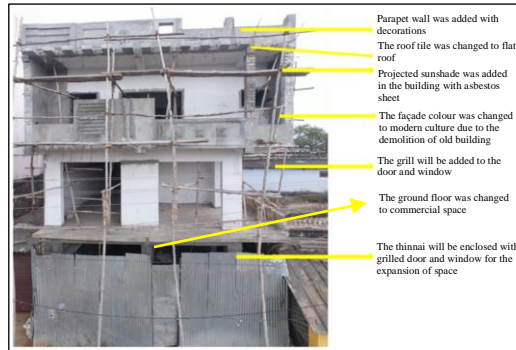


Fig. 56 Sample 27 house facade

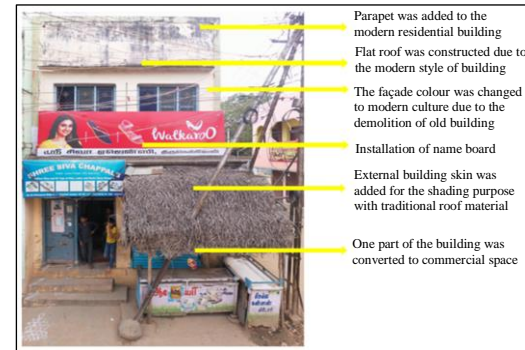


**Fig. 57 Sample 28 house facade**

(Source: Researcher's documentation at Tirunelveli district)



**Fig. 58 Sample 29 house facade**



**Fig. 59 Sample 30 house facade**