

Classification of Regulated Urban Residential Stock: A Case of Urban Hamirpur

Aniket Sharma¹ and Vandna Sharma²

^{1,2}Department of Architecture, National Institute of Technology Hamirpur
E-mail: ¹aniket@nith.ac.in, ²vandna@nith.ac.in

Abstract—Due to influx of people from rural areas to urban, there has been an increase in urbanization rate globally leading to stress over all physical infrastructure including housing. The demand for housing is ever rising due to this influx and more and more of houses are being built to cater to the needs for which the developed is controlled through development plan and its building regulations. However, it is often important to study such regulated residential stock for varied research works for which the classification of the developed stock shall be known. This paper outline a methodology for classification of such residential stock in the urban context which is based on the use of primary as well as secondary data.

1. INTRODUCTION

As per IEA 2015, In India the building sector consume 41% (highest) of total final energy consumption [1]. The annual electricity consumption per rural and urban electrified household in India is approximately 750 kWh and 1450 kWh respectively [1]. Dascalaki et al. [2] through the study for energy performance classification of Hellenic residential stock highlighted that the existing residential stock must be classified based on secondary data, as the classification results in appropriate stratification for energy use. It has also been seconded by Theodoridou, Papadopoulou & Hegger [3]. Therefore in order to study the residential building for any research work including energy efficiency, there is need to study the energy consumption pattern in detail for which their detailed behaviour as per classification shall be known. This paper outline a methodology for classification of regulated residential stock in the urban context which is based on the use of primary as well as secondary data.

2. METHODOLOGY

Classification of residential buildings has been done for regulated buildings of the study area using secondary data available with census of India 2011 [4] which is available for usage, condition, predominant material use, ownership size and number of rooms, source of lighting and assets available. However, town planning department gives permission to one complete building proposal on a plot having restriction for number of households/units and height to total building proposal. Hence, primary data is collected for number of

storey & number of households and plot sizes for classification of the residential stock.

3. ABOUT THE STUDY AREA

Hamirpur is a hill town of the same named district Hamirpur of Himachal Pradesh. The district is smallest in size having an area of 1118 sq. km has highest density of 407 people per sq. km whereas the state has average density of 123 people per sq. km [5]. The district has a total population of 454768 persons living in 105519 households of which 31430 (6.91%) persons live in 7404 (7.02%) urban households. The climate of Hamirpur town is composite as per national classification [6]. There are four urban centers in the district namely Hamirpur, Bhota, Sujampur and Nadaun of which Hamirpur has been regulated through development plan [7] enforced since 1998 whereas other three are included recently in 2014.

4. RESIDENTIAL STOCK

The area of the urban/municipal limit is 5.24 sq. km and has 4350 households [4], whereas planning area under enforced development plan [7] is 33.20 sq. km and has 9737 households [4], [7]. The various characteristics of housing are discussed in the section ahead. As per study area, the classification of residential buildings will be limited to Town Planning regulated area that includes urban (municipal) limits of Hamirpur town and surrounding 81 villages.

5. CLASSIFICATION OF RESIDENTIAL STOCK

The classification of residential stock has been done using primary as well as secondary data, as explained below:

5.1 Classification as per Census of India 2011

As per census of India 2011 [4], there are total 20642 census houses in urban area of Hamirpur out of which 17110 (83%) houses are occupied (refer Figure 1).

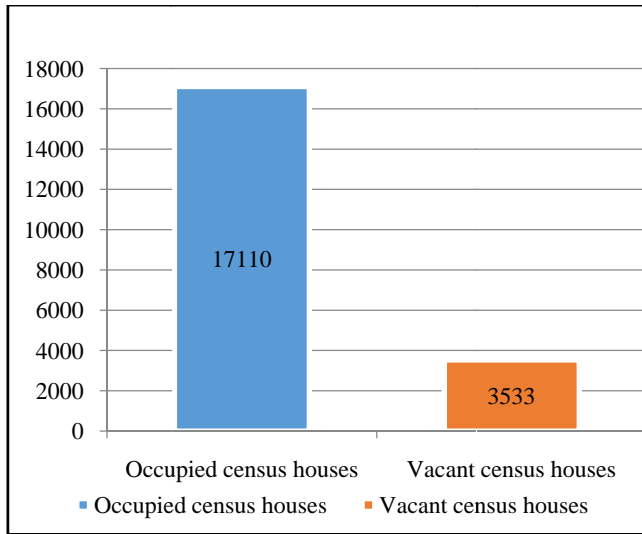


Figure 1: Occupancy of census houses

Further, these occupied census houses includes other buildings like workshops, factories; hotel, lodge; residential cum other buildings; schools, colleges; hospitals, dispensaries; place of worship and residential or partially residential buildings out of which 9737 (9474 and 263) houses are completely or partially residential houses and are called households (refer Figure 2).

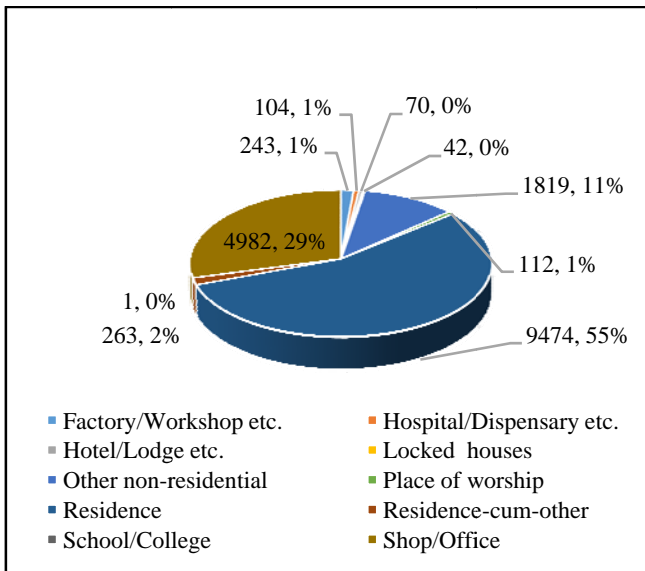


Figure 2: Various uses of households

There are a total of 9737 households in Town Planning area Hamirpur of which 4350 households (44.7% of total) households are in urban area. Further, 7984 (82%) households are in good condition. Also, 6152 (63%), 3249 (33%) and 336 (4%) houses are owned, rented and other households respectively. The household size is mainly 3 to 5 persons (64%) followed by 6-8 persons (14%), 2 persons (11%), 1 person 516 (7%) and 9 persons and above (4%) respectively

(refer Figure 3). The most common room sizes are two rooms (25%), three rooms (19%), four rooms (18%), six rooms (15%), one room (13%), five rooms (9%) and no exclusive room in 1% households respectively (refer Figure 4).

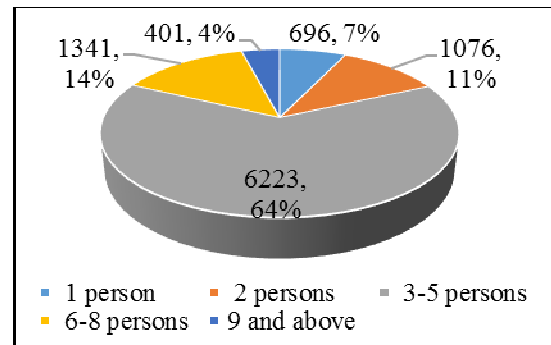


Figure 3: Household size

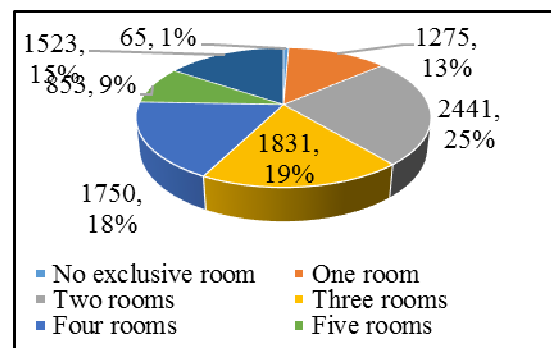


Figure 4: Number of dwelling rooms

Predominant material use in construction of the households is shown in Figure 5, Figure 6 and Figure 7 for floor material, roof material and wall material respectively.

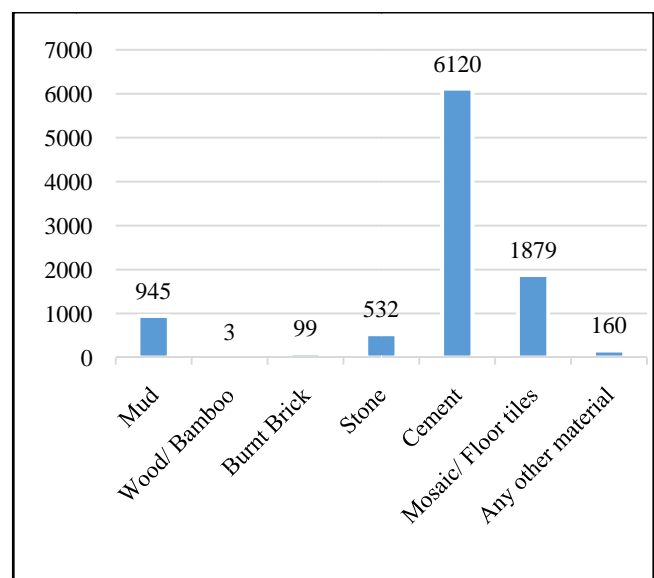


Figure 5: Material of floor

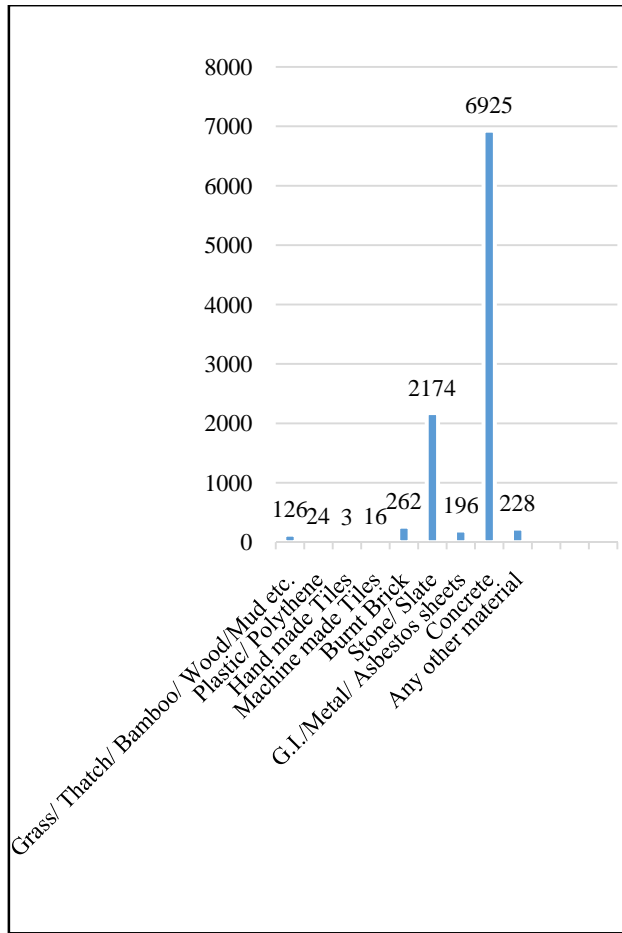


Figure 6: Material of roof

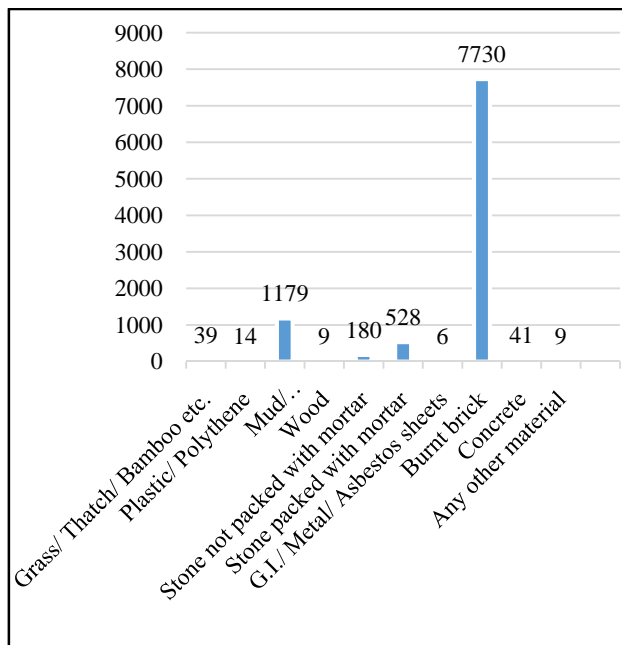


Figure 7: Material of wall

5.2 Classification using town planning and primary data

It is found from above data that the secondary data is available for each household including regulated and non-regulated households and data ahead of 1998 is not available separately, as classification based on age of building is not done in available secondary data. Moreover, the buildings under the scope of this study is limited to regulated residential buildings developed under present development plan which is enforced 1998 onwards. Also, the permission under the development plan are given for one complete building proposal which is submitted by owner of the plot and it may have one or more households under one complete building at various levels as permitted under the regulations. Therefore, the data available with secondary source, as mentioned above, will not be suitable for this study. Hence, data regarding constructed residential buildings under the present development plan are collected from Town and Country Planning Department (TCPD) local office at Hamirpur. It is found that there are total 252 number building constructed in the study area during 1998-2014.

It was found that there are three types of residential development- individual plotted houses on individual plots-174 no. (69%), plotted housing colony for HIG (High Income Group) by Himachal Pradesh Urban Development Authority (HIMUDA) - 72 no. (29%) and apartment blocks developed by private developers & for Government residential colonies- 4 no. blocks (2%). It is found that the apartment building blocks are very less of total percentage and hence, are not considered for this study (as mentioned in scope of the study) and only plotted development such as individual plotted houses (single or multifamily) and plotted housing colony will be considered for this study. It is found from the secondary data collected from Town and Country Planning Department (TCPD) at Hamirpur that the constructed regulated houses are regulated through plot sizes, setback conditions, height of proposed building and number of units (households) developed in one house as per plot size and hence, classification for plot sizes and number of storey and families/households is considered for this study. It is seen that there is a difference in the proposal permission given by Town & Country Planning Department and on site construction. The permission given by department is initially valid for a period of 3 years and that can be extended further without submitting fresh proposal, and hence, usually permission for maximum built up area and number of storey is taken by owner whereas fewer storey are constructed on site. Hence, the secondary data given by town planning may not be accurate in terms of number of storey and number of households and hence, is collected using survey method from all 252 regulated houses of the study area.

5.2.1 Plot Sizes

As per enforced regulation, the residential buildings are classified based on plot sizes of ranges 120-150 m², 151-250

m², 251-500 m² & above 500 m² which are categorized as semi-detached, detached house-I, detached house-II and detached house-III respectively for which ground coverage, floor area ratio and setback conditions are given. Secondary data is taken for plot sizes and computed in Table 1

Table 1: Plot sizes of survey houses

Household type	Row house	Semi detached	Detached house-I	Detached house-II	Detached house-III
Planning area- Hamirpur	0	72	101	62	17

It is also found that the semidetached houses are developed by HIMUDA for plotted housing colony having HIG houses (28.57%) whereas all other proposal for individual plotted houses on individual plot has been developed as detached houses (71.42%) only. Hence, both semidetached and detached houses are considered for further classification.

5.2.2 Number of storey and families/households

As found above that the residential development is done either by individuals on individual plots or by HIMUDA as plotted housing colony and hence, separate data is collected for both the categories and presented below.

Detached plotted houses (individual plotted houses on individual plots)

Secondary data from the department for permitted number of storey & families/households is presented at Table 2.

Table 2: Number of storey and families/households permitted by TCPD Hamirpur

Number of family Number of storey	Single	Two	Three	Four	Five	Six	6+	Total
G	58	0	0	0	0	0	0	58
G+1	19	24	0	0	0	0	0	43
G+2	0	12	58	9	0	0	0	79
G+3	0	0	0	30	30	12	0	72
Total	77	36	58	39	30	12	0	252

Primary data using survey, was collected from all 252 houses of the study area. The data obtained from the collected data is presented at Table 3.

Table 3: Number of storey and families/households in constructed houses

Number of family Number of storey	Singl e	Two	Three	Fou r	Fiv e	Six	Abov e Six	Tota l
G	67	6	0	0	0	0	0	73
G+1	36	49	7	6	0	0	0	98
G+2	5	18	30	7	0	0	0	60
G+3	0	0	0	5	10	6	0	21
Total	108	73	37	18	10	6	0	252

It is seen from Table 2 and Table 3 that more number of houses with lesser storey are built than the permission given. Hence, data of Table 3 is taken for further study.

Semidetached houses (in plotted housing colony-HIMUDA)

As mentioned, these houses are developed by HIMUDA and hence, there is no change in Number of storey & families/households for the permission given and actual construction. The data is presented at Table 4.

Table 4: Number of storey & families/households permitted by TCPD Hamirpur and constructed as semidetached houses

Number of family Number of storey	Singl e	Tw o	Thre e	Fou r	Fiv e	Si x	Abov e Six	Tota l
G	72	0	0	0	0	0	0	72
G+1	0	0	0	0	0	0	0	0
G+2	0	0	0	0	0	0	0	0
G+3	0	0	0	0	0	0	0	0
Total	72	0	0	0	0	0	0	72

6. CONCLUSION

It is seen that the classification of stock shall not be done based on the secondary data only but shall also be reinforced with the observations and the primary data collection. The classification obtained from the Census of India is based on household, whereas the residential stock in urban areas based on the plot size, number of families and number of storey due to the nature of regulatory authority i.e. Town and Country Planning Department of the study area. More over the classification also helpful in further research to study the effectiveness of residential buildings developed under present building regulations.

REFERENCES

- [1] India Energy Outlook - World Energy Outlook Special Report 2015., available online at : https://www.iea.org/publications/freepublications/publication/IndiaEnergyOutlook_WEO2015.pdf
- [2] Dascalaki, Elena G., et al. "Building typologies as a tool for assessing the energy performance of residential buildings–A case study for the Hellenic building stock." *Energy and Buildings* 43.12 (2011): 3400-3409.
- [3] Theodoridou, Ifigeneia, Agis M. Papadopoulos, and Manfred Hegger. "A typological classification of the Greek residential building stock." *Energy and Buildings* 43.10 (2011): 2779-2787.
- [4]. Registrar General. " Houselisting and Housing Census Data - 2011 - Census of India" . New Delhi: Government of India (2011).
- [5] Pradesh, Himachal, "Economics and Statistics Department- Statistical outline of Himachal Pradesh", 2015-2016, Shimla. (2015).
- [6] Bureau of Indian Standards, "SP 7:2005 National building code of India" New Delhi, Government of India (2005).
- [7] Pradesh, Himachal, "Town & Country Planning Department- Development Plan Hamirpur", Shimla (1998).