Evaluation of User experience for Physical infrastructure in Relocation Project Under BSUP Scheme in Lucknow City

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Abstract

Introduction of various schemes and programmes, over past two decades highlights the thrust of government for provision of affordable housing in India. These schemes were introduced to cater the housing demand and improve basic services, provide tenure security, upgrade existing infrastructure, and create new housing units with a vision of creating a ‘Slum Free India’. It was initiated by introducing the Indra Awas Yojana in 1990 which was applicable to rural India, later by introduction of Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in the year 2005, the focus shifted to urban areas.

JNNURM was carried out under two sub-heads Basic Service to Urban Poor (BSUP) and Integrated Housing and Slum Development Programme (IHSDP) for provision of 1.5 million houses for urban poor in 63 selected cities during 2005-2012. Lucknow city, selected as one of the mission cities was benefitted under the programme through the execution of 7 projects in 23 different areas, providing 5570 housing units along with basic services. The projects include three types of development- in-situ, relocation, and in-situ redevelopment. The paper investigates the status of physical infrastructure – water supply, sanitation, solid waste management and electricity along with the satisfaction level of beneficiaries in relocation projects. The study is carried out using an observation tool and structured interview questionnaire with beneficiaries. The findings of the paper highlight the issues related to maintenance and operation of these services and focuses on need for inclusive development in these projects.

Keywords: BSUP, Sanitation, Solid Waste Management, Affordable housing.

1. Introduction

BSUP, one of the two sub-missions of JNNURM was introduced in December of 2005 by the Ministry of Urban Development, for provision of shelter along with basic services to the urban poor. The scheme ensures overall development of urban poor by provision of essential elements listed as follows:

1. Secured tenure
2. Improved housing at affordable price
3. Physical infrastructure: water supply, sanitation, electricity, solid waste management, etc.
4. Developing social infrastructure: health, education, and security [1]

The scheme duration initially was seven years (till 2012) which was later extended till March 2017. National steering group was formulated, to select the participating cities based on parameters such as population, historic relevance, religious importance, and tourism, as listed below.

Table 1: BSUP categories of cities

| Category (Census 2001 population) | Number |
|-----------------------------------|--------|
| A Cities with a population of more than 4 million | 07 |
| B Cities with a population of 1 million to 4 million | 28 |
| C Selected Cities (of religious/historical and tourist importance) | 28 |
The objective was to provide formal housing to those living in slums and in congested neighborhood, with poor water supply and sanitation. The scheme provided incremental upgradation of slums through In-situ, relocation, and in-situ redevelopment projects. The financing of the mission was provided in the form of grants, divided between central and state/ULB’s/other implementing agencies with a ratio varying from 50-50 respectively in case of million plus cities to 80-20 respectively in other selected cities [1]

1.1. BSUP in Lucknow

Lucknow city, selected as one of 63 cities under BSUP scheme, was benefitted with 5570 houses built under three different project formats – Relocation, In-situ and In-situ redevelopment. The construction started in 2007 and continued till 2015 in few projects. There are total 13 in-situ, 9 relocation and 1 in-situ redevelopment project in Lucknow. In-situ development includes upgrading and improvements of existing housing and infrastructure. In-situ redevelopment at Nishatganj, where existing slum area is redeveloped in G+3 housing and slum dwellers having land patta were benefitted. Relocation projects are built as public housing with G+3 or G+2 buildings, with houses having carpet area of almost 25sqm.

Fig 1: Map showing locations of BSUP projects in Lucknow City.
Table 2: BSUP projects in Lucknow City

| Area                        | Houses | Total | Development Type | Developer Organisation                          |
|-----------------------------|--------|-------|------------------|-----------------------------------------------|
| Para                        | 504    | 1488  | Relocation       | Uttar Pradesh Avas Vikas                       |
| Kharika, Telibagh           | 312    |       |                  | Parishad (UPAVP)                               |
| Semra Gauri,                | 288    |       |                  |                                               |
| Haibat Mau Maveya           | 384    |       |                  |                                               |
| Amausi                      | 506    | 593   | In-Situ          | Uttar Pradesh Project Corporation Ltd. (UPPCL) |
| Gadarian Purwa              | 26     |       |                  |                                               |
| Chandan                     | 30     |       |                  |                                               |
| Chaudhry Purwa, Dewa        | 31     |       |                  |                                               |
| Kila Mohammadi, Aorangabad  | 44     | 364   | In-Situ          | UPPCL                                         |
| Raja Bijli Pasi             | 75     |       |                  |                                               |
| Sugamau                     | 72     |       |                  |                                               |
| Jarhara                     | 97     |       |                  |                                               |
| Rahimabad                   | 76     |       |                  |                                               |
| Bhakti Kher                 | 60     | 181   | In-Situ          | UPPCL                                         |
| Rahim Nagar                 | 75     |       |                  |                                               |
| Munshi Kher                 | 29     |       |                  |                                               |
| Behsa, Amausi               | 17     |       |                  |                                               |
| Chak Mallauri, Chintat      | 336    | 336   | Relocation       | UPPCL                                         |
| Umrao Hata, Nishatganj      | 176    | 176   | In-Situ Redevelopment | UPPCL                                      |
| Rashmi Khand, Sharda Nagar  | 80     | 2432  | Relocation       | Lucknow Development Authority (LDA)             |
| Sector -H, Vasant Kunj      | 896    |       |                  |                                               |
| Sector -P, Vasant Kunj      | 1184   |       |                  |                                               |
| Bhadruk                     | 272    |       |                  |                                               |
|                             |        | 5570  |                  |                                               |

2. Methodology

The study is conducted in two interrelated stages. The first stage is conduction and analysis of observation survey for availability and condition of various services in the projects. The survey was carried out using a toolkit for physical survey of the various BSUP projects in Lucknow City. It examines the present situation of the 9 relocation projects in terms of its physical infrastructure –

- Water supply
- Sanitation
- Solid waste management
- Electricity

The survey was based on following parameter and sub parameters –

Table 3: Parameters for observation survey

| Sr. No | Parameter   | Sub Parameter                  |
|--------|-------------|--------------------------------|
| 1      | Water Supply| Piped Connection               |
|        |             | Boring                         |
|        |             | Community connection           |
| 2      | Sanitation  | Piped Outlet                   |
|        |             | Soak Pit                       |
|        |             | Surface Drains                 |
|        |             | Rainwater Collection           |
| 3      | Solid Waste | Municipal bins                 |
| 4      | Electricity | Metered Connection             |
|        |             | Distribution lines             |
The stage two of the survey is based on the user satisfaction and their feedback on these services. One to one structured interview is conducted using closed ended questionnaire. The questionnaire is developed using a 5-point Likert scale ranging from very dissatisfied to very satisfied to record the level of satisfaction of the beneficiaries. The parameters for the questionnaire are selected from literature study of various neighbourhood level post occupancy evaluation. These parameters are further verified through observation survey to develop the questionnaire in indigenous method. The table enlists various parameters and sub parameters used:

Table 4: Parameters to evaluate status of physical infrastructure post occupancy.

| Sr.No | Physical Infrastructure Parameters | Sub Parameters | References |
|-------|-----------------------------------|----------------|------------|
| 1     | Water                             | Supply system  | [2] [3] [4] [5] [6] |
|       |                                   | Supply Duration|             |
|       |                                   | Quality        |             |
|       |                                   | Storage        |             |
|       |                                   | Recycle        |             |
|       |                                   | Bills          |             |
| 2     | Solid Waste                       | Collection system | [2] [4] [6] |
|       |                                   | Access to communal waste point |         |
|       |                                   | Cleanliness of communal waste point |       |
|       |                                   | Recycle        |             |
| 3     | Sewerage and Drainage             | Sewerage system | [4] [6] |
|       |                                   | Drainage system |             |
|       |                                   | Rainwater collection and recycle |        |
| 4     | Electricity                       | Supply duration | [5] [6] |
|       |                                   | Bills          |             |

A sample size is determined at confidence level of 95% and confidence level of 4.6. A total of 400 samples are collected distributed randomly across all 9 relocation projects. The findings were interpreted using frequency distribution technique for which the various recommendations are suggested.

3. Relocation projects – BSUP Lucknow City

There are 9 relocation projects in Lucknow City. Under this arrangement the people living in slums and squatter settlements are relocated to public housing projects built under the scheme. The location of these projects as seen in the map above is on the periphery, away from city centre. Under BSUP, Lucknow is benefitted with 5570 houses, of which 76 % is built under relocation project. The distribution of the same is shown in the table below:

Table 5: Enlists the projects in BSUP and the number of houses built in each project.

| Project Type | Relocation | In-Situ | In-Situ Redevelopment |
|--------------|------------|---------|-----------------------|
| Houses       | 4256       | 1138    | 176                   |
| Percentage   | 76.4       | 20.4    | 3.2                   |

The projects have buildings of G+2/ G+3 with 4 units on each floor. In terms of basic infrastructure, projects have paved access lanes having width ranging from 3m to 4.5m, open areas for parks, tap connection for water supply, open drains for drainage and manholes for sewage management. The projects at Hairbat Mau and Para are also provided with fixed dome biogas digester for production of energy and compost from sewage. There is no specific provision for solid waste management, parking, informal workspace and daily in any of the project, which has led to encroachment of access lanes and open areas for different activities.
3.1. Observation survey at Relocation Projects

Observation survey was conducted to understand the feasibility of projects in terms of their locations and examine the onsite reality (strength and weakness) of the projects in terms of present condition of infrastructure provided. It also helped to identify gaps and lags in infrastructure provided as per guidelines. Further, the survey also helped to select the indigenous parameters suited to study user satisfaction of affordable housing.

Table 6: Observation survey

| Attributes          | Sub- Attributes          | Observations       | Relocation (%) |
|---------------------|--------------------------|--------------------|----------------|
| Water Supply        | Piped Connection         | Household          | 100            |
|                     | Boring                   | Project (Jal)      | 100            |
|                     |                          | Individual         | 0              |
|                     | Community supply (Jal Nigam) | Tap                | 0              |
|                     |                          | Overhead           | 100            |
|                     |                          | Hand pump          | 22             |
| Sanitation          | Piped Outlet             | Community/         | 100            |
|                     |                          | Municipal          | 0              |
|                     | Soak Pit                 |                   | 100            |
|                     | Surface Drains           | Open               | 100            |
|                     |                          | Covered            | 0              |
|                     | Rainwater Collection     |                   | 0              |
| Solid Waste         | Municipal Bins           |                   | 11             |
| Electricity         | Metered Connection       |                   | 100            |
|                     | Community Distribution Lines | Overhead      | 100            |
|                     |                          | Underground        | 0              |

3.1.1 Water Supply

The water supply to all the 9 projects under relocation have overhead tank and piped water connection through Jal nigam, 2 of the projects also have community hand pumps installed. There is a provision of overhead water storage in a 200 lts. water tank.

![Fig 2 (a) Overhead water tank and Pumphouse at Para (b) Piped connection in the bathroom (c) Piped connection in the kitchen](image)

3.1.2 Sanitation

The wastewater and sewage discharge from the houses in the project are channelized through piped outlets to manholes and are further connected to community septic tank or biogas digester. In present state, lack of periodic maintenance and cleaning has led to overflow of sewage from the septic tanks. Even outlet connection of biogas digester is not complete till date leading to overflow of sewage. The surface drains are choked with waste over the period have been damaged badly.
3.1.3 Solid Waste Management

Except in the project at Para there are no municipal bins in any of the projects. Open areas and streets are used to dump daily waste, creating piles of waste all over in the project. There is no mechanism for door-to-door waste collection.

3.1.4 Electricity

The projects have overhead distribution lines and all the houses have metered connections. The transformer is placed in open and there is no substation in any of the project.

4. Post Occupancy Survey

The satisfaction level of the occupants was measured through the survey. The one-to-one survey was conducted to fill the survey form. Total of 400 survey form were collected from 9 different projects. The project wise surveys done is enlisted in table below:
4.1 Demographic Study

Almost 65% of the interviewees belonged to an age group of 30 to 49. The household size for more than 90% sample is either 4 or more than 4. In some cases, the household size even reached 8. The male female ratio among the interviewees was almost 3:2.

4.2 Water Supply

The satisfaction level of the resident’s post occupancy of the projects with respect to water is analyzed based on following sub parameters:

4.2.1 Duration of Water supply

It is observed that most of the residents in the relocation projects are either very satisfied or satisfied with the duration of water supply. The water in these projects is supplied by Jal Nigam Lucknow and all the houses have tap connection.

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**Table 7: Survey samples from each project**

| Sl.No. | Area                        | Total no. of Houses | No. of Surveys done |
|--------|-----------------------------|---------------------|---------------------|
| 1      | Para                        | 504                 | 38                  |
| 2      | Kharika, Telibagh           | 312                 | 38                  |
| 3      | Semra Gauri                 | 288                 | 36                  |
| 4      | Haiwat Mau Mawaia           | 384                 | 36                  |
| 5      | Chak Malhauri, Chinhat      | 336                 | 31                  |
| 6      | Rashmi Khand                | 80                  | 38                  |
| 7      | Sector -H, Vasant Kunj      | 896                 | 69                  |
| 8      | Sector -T, Vasant Kunj      | 1184                | 76                  |
| 9      | Bhadruk                     | 272                 | 38                  |
|        |                              | **4256**            | **400**             |

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**Fig 6:** (a) Age group of the sample survey (b) Household size (c) Gender ratio

**Fig 7:** User satisfaction with the duration of water supply in relocation projects
4.2.2 Pressure of water supply

The pressure of water supply is well accepted with majority of residents being satisfied or very satisfied. All the projects are equipped with water tanks and the supply is through taps in individual houses.

![Fig 8: User satisfaction with the pressure of water supply in relocation projects](image)

4.2.3 Quality of water supply

The quality of water supplied is very satisfactory for majority of the residents across all relocation projects. Even though the projects are placed at different parts of the cities, almost all projects have satisfactory quality of water provided. Few residents dissatisfied or very dissatisfied with the quality of water complain of the water supplied as muddy or unclean.

![Fig 9: User satisfaction with the quality of water supply in relocation projects](image)

4.2.4 Storage system of water in the building

The storage of water in relocation projects is done in overhead water tanks, the capacity of these tanks are 200ltrs which are sufficient for a small household but residents with a large family size find the storage capacity deficit.

![Fig 10: User satisfaction w.r.t the storage of water in relocation projects](image)
4.3 Sanitation

Sanitation has been a consistence issue with all the projects. The observation survey displayed the condition of sewer and open drains, which were overflowing and contaminated with solid waste. The post occupancy evaluation of affordable housing has been analysed based on following sub parameters:

4.3.1 Type of Sewage system

All the projects are provided with manholes for channelling sewage to the main line. But the internal lines are yet not connected to main lines in most of the projects. Few of the project are also provided with fixed dome biogas digester, which are not functional. Irregular maintenance and cleaning have left manholes overflowing, creating an unhygienic living condition in the project. Due to such conditions majority of residents are very dissatisfied with the types of sewage system.

![Fig 11: User satisfaction w.r.t type of sewage system in relocation projects](image)

4.3.2 Cleanliness of the sewage system

Almost all residents in the projects are highly dissatisfied with the cleanliness of the sewage systems. In most of the projects soak pits are overflowing making the surroundings unhygienic to live and susceptible to diseases. There is no provision of regular maintenance and cleaning of the soak pits.

![Fig 12: User satisfaction w.r.t the cleanliness of the sewage system in relocation projects](image)

4.3.3 Cleanliness of surface drain

The surface drains in all the projects are overflowing and chocked with garbage. Residents highlighted that the frequency of the drain cleaning is very low. In few of the project's residents had to get it cleaned at their own expense despite making various complaints. This has resulted in high dissatisfaction level for the same among the residents.
4.4 Solid waste management

The solid waste management systems in projects are poorly executed and managed. Most of the projects have dump yard either inside them or just outside the gate. The solid waste management systems have been analysed based on following sub parameters:

4.4.1 Waste collection system

The residents are dependent on municipality for collection and disposal of waste. But there is no provision of door-to-door collection and segregation in the projects. Residents of most of the projects are in habit of throwing the thrash within the premise, which has created piles of garbage within the project. Residents of Kharika project have developed a collection system at their own expense, but the scenario is worse in rest of the projects. This has resulted in high dissatisfaction level among the residents.
4.4.2 Frequency of waste collection

The collection of garbage in most of the facilities are irregular and not functioning well. Hence majority of the residents are very dissatisfied with the frequency of waste collection.

![Frequency of waste collection](image1)

Fig 15: User satisfaction w.r.t the frequency of waste collection in relocation projects

4.4.3 Accessibility of communal waste point

The communal waste point and municipal bins are placed away from almost all the relocation projects. Due to this the residents have started to throw away the garbage in the open areas available in the site. Only in Para project the municipal bin is place inside the premise. Hence most residents are very dissatisfied with accessibility of common waste point.

![Accessibility of communal waste point](image2)

Fig 16: User satisfaction w.r.t the accessibility of communal waste point in relocation projects

4.4.4 Overall cleanliness of the project

The overall cleanliness of the project is very poor, creating unhygienic living environment. All the project has garbage thrown around at every corner, the areas around the building are filled with overflowing drains and garbage. The open areas and parks are also used as dumping ground by the residents. Almost all residents are very dissatisfied with the overall cleanliness of the projects.
4.5 Electricity

4.5.1 Supply of electricity

Majority of the residents are satisfied with the electricity supply, but few of them are dissatisfied as the electricity has either been disconnected or not functioning well.

4.5.2 Electricity bill amount

Most of the residents are very satisfied with the bill amount. Few of the residents have complaints for their bill, which as per them is not being rectified by the officials.
5. Conclusion

The survey indicates that most of the residents are satisfied with the water supply. Although the capacity of storage tanks should be increased to 500lts, referring to the average family size to further improve the satisfaction level. Further the survey indicates that most of the residents are very dissatisfied with the sanitation arrangements in the projects. Lack of main line connection and irregular cleaning & maintenance of sewer lines have further worsened the situation. There is a need to make policy level intervention to check the collection and usage of revolving funds. (Revolving fund to be procured by State Level Nodal Agency from the project implementing agencies for operation and maintenance). Further, project level organization should be formulated having members from both residents and state level agencies for ensuring regular maintenance. Further a mechanism should be devised for making the developing agencies liable for operation and maintenance of the project for a stipulated period after completion and handover of the project. There is also a need to create awareness among the residents through cleanliness and self-hygiene drives.

The residents are very dissatisfied with the solid waste management of the projects. There is a need to create multiple communal waste segregation point within the campus. Community level organization should be formulated, and NGOs should be invited to teach and work with them on various assignments such as recycling and segregation of waste. After a formal training, residents can be employed in segregation and recycling of waste. This can also act as revenue generation model and further improve the feasibility of the affordable projects. Inclusion of informal workspaces, dedicated parking space and small commercial area in planning and designing of project can eliminate problems related to encroachments and spill over of waste on streets and open areas. Further a dedicated task force should be formulated to keep a continuous track on progress of project and project completion certificate should only be provided after detailed inspection of all the works.

There is a need of designing the policies and programmes in a sustainable manner which aims at improving the living condition of urban poor and not just add mere roof over their head. It is high time to realize that urban poor are integral part of our society and form important base in development of our country.

References

[1] MoHUPA, "Modified guideline BSUP- JNNURM," Government of India, 2009.
[2] M. Behloul, "POST OCCUPANCY EVALUATION OF FIVE STOREY WALK UP DWELLINGS: THE CASE OF FOUR MASS HOUSING ESTATES IN ALGIERS," Sheffield, 1991.
[3] D. BIJOUX, K. S. SMITH and K. LIETZ, "THE IMPORTANCE OF URBAN NEIGHBOURHOODS: MEASURING," Ecocity World Summit 2008 Proceedings, 2008.
[4] M. Bonaiuto, F. Fornara and M. Bonnes, "Indexes of perceived residential environment quality and neighbourhood attachment in urban environments: a confirmation study on the city of Rome," Landscape and Urban Planning, pp. 41-52, 2003.
[5] J. A. Ziama and B. Li, "Residents Post-Occupancy Evaluation of Social Housing in Liberia," Journal of Building Construction and Planning Research, pp. 1-22, 2018.
[6] A. O. Ilesanmi, "Post-occupancy evaluation and residents’ satisfaction with public housing in Lagos, Nigeria," Journal of Building Appraisal, vol. 6, no. 2, pp. 153-169, 2010.
[7] MoHUPA, "Affordable Housing for All," Government of India, 2008.
[8] IBEF, "Affordable Housing in India: Budding, Expanding, Compelling," IBEF, 2012.
[9] MoHUPA, "Affordable Housing in Partnership- Scheme Guidelines," Government of India, 2013.
[10] MoHUPA, "Amendment in carpet Area for MIG in CLSS, PMAY," Government of India, Delhi, 2018.
[11] MoHUPA, "BSUP: State wise Report for latest Progress at Project & City Level- Monitoring Report," Government of India, New Delhi, 2019.
[12] Ministry of Home Affairs, "http://censusindia.gov.in/" 2011. [Online]. Available: http://censusindia.gov.in/2011census/ChattisgarhA.html. [Accessed 03 Feb 2020].
[13] Youth for Unity and Voluntary Action and Indian Housing Federation, "Housing Needs of the Urban Poor in Nagpur - Assessing the Applicability of the PMAY, Housing for All Mission," Youth for Unity and Voluntary
[14] Deloitte, "Mainstreaming Affordable Housing," Deloitte, 2016.

[15] Office of the Registrar General & Census Commissioner, India, "Primary Census Abstract for Slum," Government of India, New Delhi, 2013.

[16] M. Berry, "Why is it important to boost the supply of affordable housing in Australia—and how can we do it?," *Urban Policy and Research*, pp. 413-435, 2003.

[17] G. Bhan, G. Anand and S. Harish, "Policy approaches to affordable housing in urban India - problems and possibilities," Indian Institute for Human Settlements, Bangalore, 2014.

[18] K. P. Bhattacharya, Affordable Housing and Infrastructure in India, Reliance Publishing House, 1998.

[19] A. Sivam and S. Karuppannan, "Role of state and market in housing delivery for low-income groups in India," *Journal of Housing and the Built Environment*, pp. 69-88, 2002.