

# RURAL HOUSING

## SKILL TRANSFER AND THE MILESTONES FOR SCALING-UP: THE CASE OF SUSTAINABLE RURAL DWELLING UNITS (SRDU) IN ETHIOPIA

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### Abstract

It is a glaring fact that the Ethiopian rural population, about 80% of the estimated eighty million people, is living in housing units that are substandard and inadequate. This dire situation calls for an immediate intervention for systematic improvement. However, the issue of rural housing is largely neglected by both academics and policy makers. Observing this gap a research project was initiated at the Housing Chair of the Ethiopian Institute of Architecture, Building construction and City development (EiABC). This essay discusses the research project, which is entitled "Sustainable Rural Dwelling Unit" (SRDU). The focus of the research is on developing, constructing and disseminating improved housing units using alternative building materials and construction techniques. The essay discusses the hands-on research and its implementation with emphasis on strategies for capacity building, scaling-up and scaling-out. More often than not projects are prone to remain as one-time interventions short of dissemination. Transferring skill is relatively easier than fostering innovation getting it accepted by the wider population. Achieving scale may take a long period of time and a careful, culturally adjusted strategy. So far the findings of the research indicate that giving hands-on training to farmers, recruited from different parts of the project area, is one of the key methods for scaling-up.

### 1. Project background

The Sustainable Rural Dwelling Unit (SRDU) research series is initiated and coordinated by the Housing Chair of the Ethiopian Institute of Architecture, Building construction and City development (EiABC). It was started in October 2010 and is still ongoing. The project is supported by the Arthur Waser Foundation of Switzerland and facilitated by the ETH-Zurich North-South Centre. The research project has also local partners, namely: the Bete-Guraghe Cultural Centre (BGCC), the Guraghe Administration Zone and Wolkite University. BGCC is a voluntary association established by Guraghe people to promote the Guraghe culture, while the Guraghe Administration zone is the highest political authority of the area in which the research is located.

The project has three phases: Phase- 1 deals with the documentation and study of the existing rural housing

(vernacular architecture) and the construction of SRDU-I, Phase-2 deals with the construction of SRDU-II, and Phase -3 deals with the up-scaling and out-scaling of the SRDUs. As of now SRDU-I is completed (see Fig. 1) and SRDU-II is under construction while SRDU-III is just launched.

### 2. Location of project

The research area is located in Gubrie, Guraghe Zone. It is 175 kms from Addis Ababa and 15 kms from Wolkite, the capital of the Guraghe Zone. Guraghe zone is one of the 13 zones of Southern Nation's Nationalities and Peoples, Regional State (SNNPRS) (See Fig.2). The Guraghe zone extends from 7.76°–8.45° north latitude and 37.45°–38.71° east longitude. It is structured into thirteen Woredas, and three regional administrations located in the towns of Wolkite, Butajira and Gubrie. The zone contains 437 rural Kebeles (municipal units) and fifteen urban centers. According to the Central Statistical Agency (2007) the total population of Guraghe zone is 1,280,484. It shares 8.5 percent of the southern region population i.e. 15,042,531. The total land area of Guraghe zone is 5,932 square kilometers. The zone is among the densely populated areas of southern region. According to finance and economy development bureau statistical abstract and Central Statistics Agency (2007) the average population of Guraghe zone is 216 persons per km<sup>2</sup>, which is almost two times that of the southern region average density (136 persons per km<sup>2</sup>).



Fig.1: The completed SRDU

Gubrie town, in which the research project is located, has a population of about 5000. Gubrie is expected to grow fast as many facilities are either under construction or are planned to be constructed soon. For example, the Wolkite University is being constructed. A referral hospital and the Guraghe cultural centre will follow suite. These complex facilities will definitely attract a large number of migrants, which will eventually demand housing. As in the rest of the Guraghe area the livelihood of the Gubrie population is based on the Ensete (false banana) culture.

### 3. Research objective

The research aims to contribute towards the improvement of the rural housing in Ethiopia. It seeks to draw lessons from the vernacular architecture of a rural area and incorporate it into improved rural housing. The focus of the research is on capacity building through hands-on training on a one-to-one construction of housing units. The typical Guraghe traditional house or vernacular architecture is one-roomed space built of wood and mud wall and straw roof. Those who can afford usually build separate houses for livestock and guests. Otherwise, the one-roomed house accommodates both animals and humans. They live together with sometimes wooden partition in-between. The space has a small window or none at all. As a result it is dark and lacking ventilation. The smoke from the hearth, placed at the centre of the room, though important to kill insects, usually affects the health of the eyes and lungs of its inhabitants. Despite these disadvantages, however, the Guraghe vernacular architecture boasts a sturdy construction and unique character. Particularly, the central umbrella-like wooden structure that supports the roof is one of the main elements that express the Guraghe culture.

The Guraghes are fond of their traditional house type. But these days, not only, for lack of wood and straw but also because of the ease of maintenance and speed of construction, many locals who can afford it decide to build tin-roofed rectangular houses, *which they also consider to be 'modern'*. Therefore, it is increasingly becoming common to see tin-roofed houses side by side with the traditional houses (See Fig.3).

The traditional house is good in protecting heat and cold while the reverse is true for the tin-roofed house. The traditional house also expresses the identity of the Guraghe people, for example the umbrella-structured central pole, expresses the oneness of the family and the responsibility of the household head in supporting it. On the other hand, the modern house is advantageous considering the availability of materials and speeds of construction, though it lacks identity and is not comfortable. Hence, the objective of the SRDU research has been to design and implement housing types that include both the advantages of the traditional house and the so called modern house while simultaneously maintaining the Guraghe identity.

### 4. The research process

**Data collection:** The research started by collecting data on the vernacular architecture of the Guraghe zone. The survey was conducted in four settlements namely: Gassore or Chancho, Ewan, Yerugeta, and Gubrie. The settlements were selected after days of reconnaissance by two student apprentices in consultation with the Guraghe Zonal Administration. 13 Master students and 33 undergraduate students of EiABC were subsequently involved in data gathering. The undergraduate and master students were deployed in Gubrie in the third week of November 2010 and second week of Jan-

Fig.2: Map showing the location of SNNPRS (Southern Nations, Nationalities and People's Regional State), where the Guraghe Zone is located

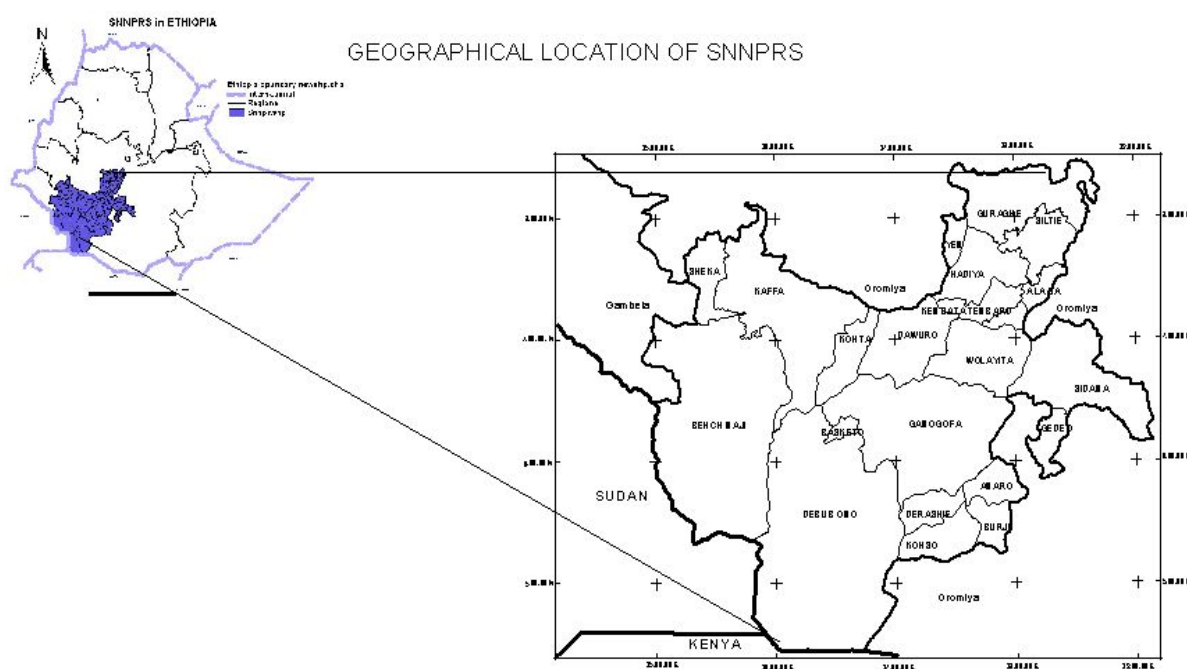




Fig.3 Showing "modern" tin-roofed house and traditional Guraghe houses

uary 2011, respectively. Based on the findings of the data collection, alternative improved housing types and settlements were designed.

### 5. Housing Design:

Parallel to the work of the students the SRDU's core research team has been continuously engaged in analyzing the data gathered. Informed by the findings of the study on the vernacular architecture the research team has thus far developed two housing types. The new designs included separate living and dining area, kitchen, bedrooms and barn. A provision was also made for toilet, shower and storage areas. Different kinds of material testing were carried out in order to decide the appropriate type of building material and construction technique. A structural analysis was also carried. Accordingly, a test was done to investigate the compressive strength capacity of the earth blocks which are used for wall construction. The results have shown that the blocks have sufficient compressive strength. As a result, sun-dried soil blocks and bamboo were used for walls and roof respectively while the umbrella type structure central pole is maintained for cultural reasons. To enhance the lateral stability and earthquake resistance of the building; bamboo studs which connect the foundation with the wall were introduced.

### 6. Local participation in the project design and implementation:

From the outset it was understood that participation and partnership are crucial, not only in developing a sense of belongingness, but also for the future continuity of the project. From the very beginning 13 local farmers were recruited to participate in the research not only as trainees but also as insiders giving constant feedback to the research. In addition to the farmer trainees, key stakeholder meetings have been held at critical stages of the research and its implementation. The stakeholder meetings include discussion with the Bete Guraghe Cultural Centre (BGCC), the Guraghe development Association, Federal and local politicians, representatives from the ministry for Urban develop-

ment and Construction, the ministry of Education, and elders and prominent people of the Gurghe Zone.

Capacity building and the first milestone in the process of scaling-up: Through the instrumentality of the Guraghe Zone administration and Bete-Guraghe cultural Centre, as stated earlier, 13 trainees were recruited from 10 Woredas of the Guraghe Zone. The local trainees were recruited from the different Woredas with the vision that they would train more people upon their return. Further, a cross-cultural transfer of knowledge and skill is achieved by involving four roof makers from Chenchu area (500 kms from Addis Ababa) to provide hands-on training on the technique of bamboo construction.

By June 2011, 75% of the construction of the first housing unit (SRDU-I) was completed. Following this, since the remaining task was not that big, 10 out of the total 12 local trainees were temporarily sent back home. Just before they returned, on September 2011, a small event was organized whereby each of the trainees received three different-sized metal moulds and a manual prepared in the local language, Amharic (See.Fig.4). The metal moulds are necessary for molding the soil blocks used for the construction of walls while the manual describes the step-by-step construction of the housing unit. The purpose for the issuance of the moulds and the manual was to encourage the trainees for them to start implementing what they have been learning. They were advised to just try to construct some structure in their localities using the SRDU building materials and construction technique. At this stage emphasis was not put in replicating the SRDU in its totality, as the trainees had only passed through the first round of training.

Interestingly, in a period of six months, four of the trainees managed to produce hundreds of soil blocks while one of them constructed a toilet using the SRDU technique (See Fig.5). This was the first milestone in the process of scaling-up. It indicated that the trainees had taken the idea of the research seriously and that they are committed to scaling it up as far as possible.

As of January 2012 all the trainees had returned back to the Gubrie research site and they are constructing SRDU-II. SRDU-II is a circular housing proto-type as opposed to SRDU-I, which was rectangular. The wisdom of changing

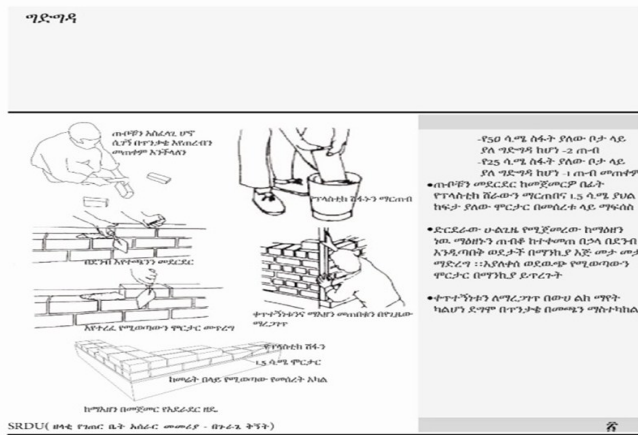


Fig.4: Sample page of SRDU construction manual in Amharic (local language)

the form of the original SRDU is to show the local people and the trainees that it is possible to have various options using the same materials and construction technique. While undertaking SRDU-II the third stage of the SRDU research series is now launched under the title “Contextualization of vocational training for the building sector in Ethiopia”, hereafter, SRDU-III. SRDU-III focuses on consolidating and enhancing the key issues of capacity building, scaling-out and the scaling-up process initiated in SRDU-I and II. The envisioned strategies and further milestones are discussed below.

### Enhancing Capacity building

In view of the widespread desire to consolidate and enhance the process of capacity building, with the ultimate goal of scaling-up and scaling-out the SRDUs, the concept of a ‘capacity building pyramid’ was introduced. The capacity building pyramid includes the components of PhD researches and curriculum development for a local university and TVET (Technical Vocational and Education Training). The capacity building pyramid is envisioned to function in a cascading knowledge-transfer with the following actors from top to bottom:

1. Professors from SingCoRe (Construction Research at the Singapore ETH Centre) and EiABC (Ethiopian Institute for Architecture, Building construction and City development)
2. PhD candidates from ETH-Zurich and EiABC
3. Trainees from Wolkite University
4. Trainees from Wolkite TVET
5. Local semi-skilled or non-skilled trainees

The professors and a PhD candidate from SingCoRe are involved for specialized inputs and experience sharing.

The key strategy of the capacity building pyramid is the development of curricula that is informed by the PhD researches, mentioned above item 2. The PhD researchers, three in number, are further expected to transfer skill through practical experiments involving trainees. The curricula are sought to be developed both at the Wolkite University and TVET levels. The objective is that at the end of

SRDU-III, the university and TVET trainees would continue to give training to the local farmers, using the newly developed curricula, and thus becoming part of the mainstream academic training system.

### The challenge of scaling out and scaling up in Ethiopia

Ethiopia comprises a wide range of cultural, lingual and climatic diversity. The country is divided into nine administrative regional states and two chartered cities (Addis Ababa and Diredawa) each with its own distinctive culture and language. More than 80 languages are spoken in the country by more than 80 ethnic groups. Based on elevation, the climate is divided into three zones, namely: Dega (Cool zone), Woinadega (Subtropical zone) and Kolla (Tropical zone).

The diversity of the country may pose great challenge in out-scaling the findings of the SRDU research to other parts of the country. The climatic and cultural diversity calls for a specific substantive approach for each locality. In other words one-to-one replication of a housing unit, developed for the Guraghe region, may not be possible in other regions. The availability of building materials, cultural outlook and local temperature and rainfall will call for a corresponding construction technique, using different materials for different house form. Cognizant of these the SRDU research will focus on developing application methodologies and generic strategies that could be applicable, and easily adaptable if and when necessary, for each region.

So far the lessons learned from SRDU-I and II could be summarized below:

1. Studying both the existing vernacular architecture of the locality and the current trend of house construction. The purpose, here, is to learn the prospects and challenges of each type of construction.
2. Incorporating the lessons learned in studying the vernacular architecture into a new house typology, in this case SRDU-I and II.
3. Kick-start the first milestone in the scaling-up and scaling-out continuum by recruiting local trainees and giving them hands-on training while constructing the new housing types. This will also give a preliminary input as to how the local trainees perceive the whole construction process and skill transfer.

The next steps for scaling-out, which are envisioned to be part of SRDU-III are:

4. Develop curricula for a university and TVET college located in a specific region
5. In addition to the local workers, include trainees from both the local university and TVET, while constructing a housing type



Fig.5: Toilet constructed by the one of the SRDU trainees as seen in the picture

6. Test and implement the developed curricula and integrate it in the mainstream academic training given to university and TVET students

In short, the above steps could be summarized into three main components:

- Study of vernacular architecture
- Construct a housing unit (prototype) exploring alternative materials and construction techniques while kick starting the process of scaling-out
- Develop curriculum to “mainstream” research findings

**Up-Scaling:** One of the main objective of the research is to disseminate the SRDU findings on alternative materials and construction techniques and thereby multiplying/up-scaling the housing typologies and/or their components at a larger scale of a rural settlement or emerging town. The main strategy planned for up-scaling the finding of the SRDUs is through entrepreneurship. Graduates who have completed the SRDU curricula are expected to organize themselves into co-operatives and business entities. The purpose of these business entities would be to create small scale industries in order to produce the components of the housing units. Therefore, the SRDU curricula should incorporate entrepreneurship modules that should be given in collaboration to entrepreneurship experts and experienced business men.

The basis for the functioning of the small scale industries would be the scientific outputs of the research. The basic knowledge of the building materials and tested construction techniques will be the input for the small-scale industries. The industries are thus expected to produce rationalized building elements for the larger population that will eventually result in the construction of large scale housing and settlements.

## Conclusion

The research project seeks to scale-up and scale-out the findings of the research mainly through the process that can be summarized as:

1. The creation of context-based innovative building materials and construction techniques
2. Skill transfer through capacity building pyramid
3. Entrepreneurship

The strategies to implement this process are:

1. The study of the existing vernacular architecture of the specific locality in order to come-up with context-informed alternative housing type
2. Development of a hands-on practical curriculum that involves all levels of education starting from the university level up to the local unskilled workers in a cascading fashion. Here, skill transfer is not imagined as linear but rather interactive and circular in such a way that each actor is ready to be informed and is in a learning mode. Here, the involvement of local construction companies and the public sector would be crucial not only in transferring their expertise, but also in the formation of new businesses by graduates as indicated below.
3. The graduates of the trainees are expected to get organized into co-operatives/business entities creating market for the production of the alternative building materials and construction techniques.

In a relatively short time two types of context-based alternative houses were implemented by means of SRDU-I and II. In the course of implementation the important actors in the capacity building pyramid became actively involved, including the staff of Wolkite University and TVET graduates. Thus far, the result with regard to scaling-out is that the trainees have managed to produce soil blocks and a toilet in their respective localities. With the implementation of SRDU-III, it is hoped that, more milestones will be achieved, especially in the scaling-up dimension, through the ongoing learning process of this progressive, participatory and practical type of academic research.

## Abbreviations

|            |                                                                                                                                                |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| ETH-Zurich | Eidgenoessische Technische Hochschule Zurich                                                                                                   |
| SingCoRe   | Construction Research Singapore - Chair of Architecture and Construction of the Future Cities Laboratory at the Singapore ETH Centre (FCL/SEC) |
| SNNPRS     | (Southern Nations, Nationalities and People's Regional State),                                                                                 |
| SRDU       | Sustainable Rural Dwelling Unit                                                                                                                |
| TVET       | Technical and Vocational Education and Training                                                                                                |