A case study of a community center project based on appropriate technology as a community capacity building of underdeveloped country

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ABSTRACT
This study is a case study on community center planning in Gondrapa Village of Mymensingh City, Bangladesh, where the urban poor are densely populated. The goals of the plan are to build the capacity of the community, improve the local sanitation level, improve gender equality, and create a more sustainable urban environment. Particularly, this project was judged that the process of project planning and construction through participatory design and implementation with local residents contributed to enhance the local residents’ pride and the consciousness of the residents themselves.

1. Introduction

In order to respond to rapidly changing city growth, UN-Habitat wants to manage cities by looking at cities as concepts of settlement space from a subjective viewpoint of production and consumption. UN-Habitat also emphasizes high-speed urbanization, global environmental crisis consciousness, the gap between rich and poor, urban and rural disparity, urban development and regeneration, urban planning and implementation. It has expanded the problem of urbanization not only to architecture but also to environmental, social and economic aspects and emphasizes a regional approach. The 2015 UN SDGs aimed to create a comprehensive, safe, sustainable urban and human living environment that resolves disparities and conflicts between tiers, regions and races.

Recently, the international community has continued its efforts to eradicate poverty in low-developed countries, create a closer interchange among countries and expand citizens’ participation. This has led to the emergence of research on appropriate technologies to support the development of the ability of poor users, and to create new opportunities based on them, as a solution to international social problems. Appropriate technology requires architectural technology based on the characteristics and capabilities of the local area, but the existing architectural aid system lacks understanding of local materials and technologies.

This research considers the community center project, applies appropriate technology aiming at improving capacity building and hygiene levels of an urban poor community within an underdeveloped state, improves gender equality awareness and considers the process of realizing appropriate technology.

2. Theory of appropriate technology

A discussion of appropriate technology begins with the definition of the term “intermediate technology” from the book Small is Beautiful written by the economist E. F. Schumacher in the 1960s. Intermediate technology is said to be located between super technology and raw technology as “technology by the masses.” It is popular and rustic technology, which means that materials and capital can be supplied and demanded locally, emphasizing that it is a technology that aims to actively participate at the regional level in production activities. On the other hand, when interpreting this meaning in another way, it is widely used as the term “appropriate technology” in view of being able to evoke terminological diversion (Lee and Lee 2016).

After all, appropriate technology is technology that helps to develop the capabilities of the poor and to create new opportunities based on it; that is to say, it is designed to adapt to the environment of the poor. It means technology that enables them to continue activities to increase their income by providing goods and services necessary for daily living. Appropriate technology is technology that minimizes damage to the environment and other people by using the technology to emphasize human progress, not technology advancement. In particular, appropriate technology tries to solve problems that could never be resolved using gloomy, advanced technologies in poor countries (Mun and Hwang 2012). The term appropriate technology is defined as follows; the general definition is very diverse (Kim 2011).

- Use at low cost
- Utilize materials available locally

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Create employment by utilizing local technology and labor.
The size of the product must be adequate and the method of use must be simple.
It must be able to be used without knowledge of a specific field.
It must be able to be created for themselves.
Draw people’s cooperative work and contribute to the development of the local community.
Utilize renewable energy resources.
People using the technology must be able to understand the technology.
Be able to change according to the situation.
Does not include intellectual property rights, consulting fees, import duties, etc.
Match the culture and interests of local people.

In terms of industry, technology and materials, the above 12 types of conditions can be categorized into six: feasibility, sustainability, convenience, diversity, regionality and environment (Table 1).

3. Process of community center project

Site selection

The target area was Gondrampa Village in Mymensingh City, located in the northern part of the Dhaka division, where the urban poor are densely populated in the area subject to the new master plan, and the population of the town is 2,715 people. Most of the population of the town maintains its livelihood through daily labor, and this daily labor become extremely impoverished when the labor is seriously affected by a period of non-utilization of the annual labor force. As a result, the area has difficulty withdrawing from long term poverty. Under such circumstances, local government support is very poor, and the basic sanitation environment is bad. In that area, some ethnic groups are mobilized and the village community organization is relatively active. The unification and integration of the community was identified as one of main issues (Table 2).

Project goals and main strategies

This project was promoted with the following goals. First, this project aimed to strengthen the capacity of urban poor communities through securing community space. In the case of developing countries and under-developed countries, as the urbanization is rapid and the settlement systems become unstable, the slum areas are produced widely. Although community activities are active, a public forum for that community space is often very short. Second, it aimed to improve the community’s hygiene level. For slum areas around large cities, basic water and sanitation systems are poor and are very susceptible to disease, so it is urgent to secure basic hygiene levels. Third, it aimed to improve gender equality awareness at the regional level through the expansion of sanitation facilities. In the case of slum areas, due to poor hygiene levels, women are exposed to the outside, causing social consciousness to deteriorate or causing unprotected criminal circumstances. Finally, it aimed to create a sustainable urban environment. In consideration of the ripple effect of the surroundings and the post-management of buildings, this project sought for a scheme that could match the level of technology

| Categories   | Criteria          |
|--------------|-------------------|
| Industrial   | Feasibility       |
| Sustainable  |                   |
| Technological| Convenience       |
| Diversity    |                   |
| Material     | Regionality       |
|              | Environment       |

Table 1. Categories of appropriate technology.

| Location | Gondrampa, Mymensingh City, Bangladesh |
|----------|---------------------------------------|
| Site Area| 128 m²                                |
| Issues   | - Suburban slum area densely populated |
|          | - Lack of public and community facilities |
|          | - Poor sanitation and water pollution |

Table 2. Site overview.
and labor of the area, and accordingly, introduction of appropriate technology was considered.

In addition, according to the above objectives, a community center plan was prepared and cooperation with diverse entities was carried out to secure the site, plan, design and construct. Gondrapa Village has four ethnic groups with a total population of 2,715 people, and there are many community-based groups active in the area, so about 41% of the village population (1,045 people of total 1,111 people, 94.1% are women in the vulnerable strata) are actively participating M organization which was the most representative community-based organization (CBO). The M organization is co-chaired by six leaders who work with international NGOs like UN-Habitat to provide villagers with income growth, educational services etc. Recently, elementary schools have been opened to promote basic education for children in the village. M organization owned a small site of 128 square meters in the town, but concrete business plans and execution budgets were not prepared. M organization showed a very favorable position to the proposal of the community center project, and actively opened various opinions on detailed programs, proposals and construction methods through consultation (Table 3).

Meanwhile, in connection with the introduction of the appropriate technology scheduled from the beginning, the university’s sustainable laboratory participated for the implementation of the appropriate technology method considering the level of construction labor technology within the region, durable construction methods and techniques utilizing available and utilizable materials were discussed and grown. The program consulted by architectural company, university’s sustainable laboratory, CBO combines the village community office to maintain and operate it as the space for women and children who are vulnerable people in the town. A community center was planned to operate for the CBO office, educational institutions including classrooms and reading rooms for young children not supported by formal education. The basic design plan initially prepared according to the planning of sanitation facilities consisting of water supply facilities, toilets and bathing facilities for the safety and hygiene of women in a certain area is as follows (Figure 2).

4. Design development and construction

After the basic design plan was confirmed, a design workshop was held in which three experts from the project team, CBO, residents and local government entities participated together. The first workshop was held for cooperative and sustainable construction through user participation. The second workshop was heading to make a detailed design of the center by experts. The third workshop was for the residents’ maintenance of community center (Figure 3).

| Table 3. 1st planning summary and basic design. |
|----------------------------------------------|
| Site Area | 128.0㎡ |
| Floor Area | 120.9㎡ |
| Coverage Ratio | 47.4% |
| FAR | 94.50% |
| Program | 1st Floor |
|  | Community | 25.7 |
|  | Sanitation | 35.0 |
| 2nd Floor | Library | 19.6 |
|  | Classroom | 21.8 |
|  | Etc | 18.8 |
In the first workshop on space composition and the sustainable construction method, the placement and scale of the space were determined. The project team made two proposals with an alley and courtyard as their central concepts, and selected a fair type preference, which is highly utilized in multiple gatherings and event spaces in the community. In the arrangement of the detailed space, the community office, the bathing facility and the educational facility were adjusted to reflect the needs and culture of the residents. The community conference room is located in the first floor where contact with residents occurs easily and several groups such as M organization organize various programs such as basic economic education, hygiene education and civil society education for the residents. In the case of a sanitary facility, the scale of the bathing space for women and children who are socially vulnerable is applied at 150 percent compared to men, reflecting the direction of the toilet, the type of toilet, bath action etc (Table 4).

Educational facilities are planned according to the necessity of the classroom and after school learning space in classrooms and libraries, but make maximum use of the limited area by creating a mezzanine space utilizing bamboo. The University’s sustainable laboratory and international NGO can provide local residents with profit by their participating in the production and use of compressed interlocking earth blocks (CIEB) as an environmentally friendly material to minimize energy use in natural drying, and an adopted construction method using wood and bamboo produced locally (Figure 4).

The second workshop was to combine of the CIEB block and tree fittings, to join waterproofing and utilize the bamboo for courtyard roof,

Table 4. Final program after workshops.

| Program     | 1st Floor | 2nd Floor |
|-------------|-----------|-----------|
| Site Area   | 128.0㎡    | 127.1㎡    |
| Floor Area  | 127.1㎡    | 10.7      |
| Coverage Ratio | 57.1%   | 23.2      |
| FAR         | 99.30%    | 10.7      |

Figure 3. Final design and plan.

Figure 4. Design and field workshops.
classroom mezzanine, library bookcase. Local materials were for excellent utilization and on-site construction for natural light. In the third and last workshop, the management staffs and organization that ensures the community center is not dedicated privately as a common space, in order to ensure sustainable operation of the community center (Figure 5).

5. Conclusion

During a period of design and construction we could find three issues through this project. First, this project applied appropriate technology for sustainable management. Community center must secure community office, library for young children and sanitation facilities for women. Mixture of CIEB and bamboo were optimal alternative for residents because materials are available locally and construction methods are manageable by themselves. Second, this project aims to collaborative design and construction process. The four times workshops consist of design and construction also which included sanitation, governance and economy education. All those program was heading for enhancing community capacity for low-income and less-educated people. Third, this project showed a model of role allocation of each participant. There were four sectors which were university’s research lab, architectural company, NGO and CBO. University’s lab and architectural company led design and construction and NGO held workshops and proceeded approval process. CBO was a active negotiator between professionals and residents. It is judged that appropriate technology, collaborative process and participants’ cooperation are key factors of completion of this project.

Acronym

SDGs Sustainable Development Goals
CBO Community-Based Organization
NGO Non-Governmental Organization
CIEB Compressed Interlocking Earth Blocks

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