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HOUSING PROBLEMS IN DEVELOPING COUNTRIES

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INDIGENOUS DEVELOPMENT AND HOUSING

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Development Workshop

1. Introduction:

The housing problem in many Third World countries is part of general development problems and should be seen as such. Thus the seriousness of urban housing conditions largely results from a policy that encourages mass rural migration to a few urban centres. Similarly, a dependence on expensive, imported, advanced technologies results in comparatively few, and often inappropriate, houses being constructed; the use of these technologies absorbs a large portion of the housing budget. Third World countries should place much greater emphasis on two major areas. Firstly, they should vigorously pursue a policy of developing their rural areas and small supporting towns. Secondly, they should develop their indigenous natural and human resources as far as possible to meet their needs. This twin effort would greatly ease the housing problem as well as result in many more houses being built appropriate to local conditions.

To suggest how such a policy can be practically implemented this paper presents two case studies and a final section on Housing, illustrating a housing scheme that uses indigenous resources.

The three sections of the paper are:

1. Indigenous Building in Regional Development.- the case of the Selseleh Integrated Development Project, Luristan, Iran.
2. Research and Development on Indigenous Resources - case of the "Building Workshop", Yazd, Iran.
3. Housing.

2.0 Indigenous Building in Regional Development

The common situation in Third World countries is of a few, increasingly unmanageable major cities concentrating investment, services and labour to the impoverishment of the rural areas. National development plans should place an emphasis on rectifying these imbalances between town and country by the development of the rural areas, their villages and service towns, leading as far as possible to self-reliant regional groupings.

In the process of developing the necessary infrastructure for such a policy to be carried out, a considerable amount of building must be done. In most official rural development projects, the physical services and infrastructural networks are planned in centralised offices by people who have little knowledge of the socio-environmental conditions of the field area. Often the same building designs are applied to all regions. This approach results in the buildings being alien to the local environment, and almost invariably reduces their effectiveness and usability.

An effective strategy for meeting shelter needs requires a comprehensive, integrated and grass roots effort. From our experience, particularly while working for the Selseleh Integrated Development Project, we have found that action needs to be taken on several inter-related levels. First, through research, experimentation and development of the local building resources, coupled with an understanding of the human and natural resources of the area, one can learn the advantages and shortcomings of the area, and hence, how to build with what is locally available. Secondly, the training of local builders develops a cadre capable of implementing most building projects with less reliance on professionals and external contractors. This team can be backed by improved and stimulated local building industries, such as quality controlled mud-brick yards and brick, tile and lime kilns. The import of both human and material resources from outside the region are thus decreased. Local income producing activities are increased.

The construction of essential buildings such as schools, clinics and public baths in a way that demonstrates the use of indigenous technologies, serves to train the local builders, provides much needed services in the region, and stimulates the local populace to improve and build their own homes in a way more in keeping with their needs and abilities. Underlying these actions comes the realisation that the local people, builders and others, are often both the best sources of information and the most effective implementors. Professionals from other areas and with different experiences can best act as temporary catalysts.

Finally, within the context of regional development, the major settlements in the region should be planned so that their growth and the facilities that they provide are a reflection of the requirements of the region as a whole, encouraging the balanced development of villages and towns.

The following case studies are examples of projects carried out by the building section of the Selseleh Integrated Development Project (S.I.D.P.) (Tir 2535-Shahrivar 2537). S.I.D.P. is an experimental pilot project investigating and carrying out appropriate endogenous rural development policies.

The integrated approach to rural development taken by the S.I.D.P. has manifested itself in activities in the fields of education, health, agriculture and physical services. The main bias of the development project is educational and the four activities mentioned above are introduced into the region through education, so that while the immediate needs in the four fields of activity are being met, the local population are at the same time being trained in those fields. This will enable them to carry on the development work themselves without having to rely on external aid. This is the endogenous approach to development.

2.1 Building Projects

The provision of basic services and infrastructural installations such as roads, water supply, rural clinics, public

baths, schools, etc., should be an integral part of the development process. The most important aspect of this activity is not merely the creation of physical structures, but the way they are created (i.e. the process), and the nature of the activities which these structures envelop (i.e. the function). The public buildings built in Selseleh fell into two categories: projects financed directly by the central Government, and those arranged by the Selseleh Development Project.

Normally, Government financed projects can only be built by officially recognised, usually city-based contractors and their standard designs specify the use of manufactured and often imported materials such as steel and cement. Thus the construction budget would largely go to city contractors and materials merchants. Moreover, the designs, materials and the construction techniques are alien to the social, cultural and environmental conditions of the village. The local population are left with a structure which they cannot easily repair and maintain themselves nor use as a model for their own houses, since the structure is too expensive and technically complex. This method of provision of public facilities increases the dependence of the rural population upon the city and the central Government.

On the other hand, local builders with little training and supervision are capable of meeting nearly all the building requirements of their region. Also, the indigenous materials and techniques that have developed over centuries to suit the particular socio-cultural and environmental characteristics of their locality, if used, would reduce the reliance upon the city and increase the benefits of the investment for the area for which it was designated.

In the case of S.I.D.P., the official organisations responsible for the Government projects were requested to devolve their implementation to the project. Thus we were able to use local builders to implement the buildings, which were redesigned to suit local social and climatic conditions. A systematic approach was taken in the design of community buildings so that the plan could be adapted to each village's particular needs and available resources, as well as to allow for expansion with increasing population. Local materials and technologies were used and in some cases improved upon. Through the construction process, local builders were trained in improved indigenous techniques, and in this way it was ensured that the majority of the Government budget for the projects went to the local community. Also, using this method we were able to build much more economically, thus providing more facilities than those prescribed by the allocated budget. For example, a budget was given for a two classroom extension to an existing village school. The existing school was found to be dark and in a state of semi-collapse. We planned a four classroom school, with an office and washrooms, and were able to build it using the budget for the two classrooms.

S.I.D.P. building projects were built in partnership with the village. The villagers generally requested the facility, provided the site, the unskilled labour and some of the materials, whilst the project provided the design, the skilled labour and other materials. Designs were developed in con-

sultation with the users. Thus the people participated in both the decision-making and implementation. Without the involvement of the communities concerned, development work will become both authoritarian and ineffective. The baths, health houses and some village schools are examples of S.I.D.P. financed projects. The health houses and the schools envelop the activities initiated by the project; the Frontline Health Workers, trained by the project, operate from the health houses; likewise, public literacy classes for adults and children are held in the schools.

3. Builders Workshop

A workshop for upgrading the skills of rural builders was organised by the authors in conjunction with the Selseleh Integrated Development Project in the spring of 1977. The workshop was carried out in Yazd in south central Iran, an area of advanced indigenous building techniques. Builders from villages in Luristan province, Iran, participated in the two month programme. They were involved in experimenting with improvements to their local materials and building technologies. Experience was shared between workshop participants, who included village builders, architects and master builders from other regions of Iran. Solutions to village settlement problems were arrived at through discussion, then tested in the field.

There were two closely inter-related aims: firstly, to develop indigenous building methods through the pooled knowledge and participation of the village builders; secondly, to train these builders in practical and organisational skills so that they were equipped to meet most rural shelter needs without dependence on city-based contractors, engineers and building materials.

Methodology:

The workshop methodology adopted was: learning through discussion, through practise and through experimentation. For example, discussion on building methods, design and drawing principles was introduced by asking each participant to draw their own houses and discuss its advantages and disadvantages. From these discussions village housing and detailed building problems were identified and drawing skills were developed.

Each aspect of building construction, from different types of soils and foundations to walls and roofs were discussed in turn. On each subject the participants contributed their experiences and optimum solutions were agreed upon. Each building solution was tried out in practise in a yard set aside for such testing. At the same time, experiments were carried out on local materials like timber, stone and mud-brick. Soils were tested using simple sedimentation techniques that could be mastered by any local builder. Stabilisers for mud-brick and renders for improving earth walls against rain and wind weathering were developed for local soil types.

In the evening, literacy classes were conducted for the largely illiterate village builders. The workshop demonstrated the importance of basic literacy to the builders by relating it to

their work. By gearing a literacy programme directly to the problems of reading plans and keeping their own building records, builders developed a keen interest in becoming literate.

The following subjects were covered:

- a. Problems and potentials of indigenous building and general village development:
 - problems of rural underdevelopment
 - potentials for small-scale village industrialisation using local resources
 - rural shelter and village settlement problems
 - the role of the village builder as a development cadre.
- b. Basic design principles:
 - site planning and orientation
 - relationship of spaces and elements within a building.
- c. Reading drawings and laying out of buildings.
- d. Foundations:
 - for differing soil and site conditions
 - differing building requirements.
- e. Walls:

Mud, mud-brick, fired-brick, stone, and mud-brick and fired-brick combinations. For each type of wall the costs, structural, physical and climatic properties were compared. Builders learned the best methods for compacting mud, making mud-brick, fired-brick, types of mortar, required wall thicknesses, brick laying methods, etc.
- f. Timber roofs:

Timber roof types in Iran and other countries, new alternative timber roof types and timber trusses. Through construction and experimentation each type was evaluated.
- g. Vault and dome roofs:

The most widely applicable vault and dome types were selected. Builders learned how to construct these types, the variations of wall thicknesses according to roof span, arch construction, roof span to vault and dome curve ratios, the physical, structural and climatic properties of vault and dome.
- h. Earthquake resistant building:

This was a general theme throughout the workshop, on all levels from foundations to roofing. Simple design features which could be incorporated into rural buildings were developed and tested in the workshop. For example, specially designed foundations, proper masonry bonding and reinforced tie beams for roofs.

Finally, the aim of the workshop was to develop an educational methodology that barely literate builders could use to educate themselves and improve their indigenous methods. This methodology, based on problem identification and problem solving by sharing knowledge through the processes of discussion, practice and experimentation, proved successful within the workshop.

4.0 Housing

Regional development that decentralises population centres and therefore also housing demand, coupled with the development of indigenous human and natural resources as described in the previous sections, would go a long way to alleviate housing problems in Third World countries.

Land prices for housing would be significantly lower when demand is spread in many small settlements rather than highly concentrated in a few cities. Local builders could be trained in greater numbers and more quickly to build houses using improved local methods than if they were to be trained for complicated, imported, highly technical methods of construction. Maximising the use of local technologies and resources in low cost housing would result in low cost houses whose construction process would also be free of delays in delivery that dependence on importing materials often cause.

Cheaper land, the greater availability of builders, building materials and use of local construction methods will mean that more people can directly meet their own housing needs. Government will be free to concentrate its limited personnel and funds in the tasks that are beyond the individual's ability. These are:

- 1) A legal, administrative and financial structure that guarantees and facilitates the individual's easy accessibility to cheap land, building skills and materials. For example, loans to small-scale building materials industries, builders co-operatives, etc.
- 2) Site infrastructure preparation, such as levelling, roads, water supply and waste disposal.
- 3) Construction of housing units for those who cannot be involved in organising their own house building such as factory workers in a new settlement.

4.1 The Courtyard House: Design and Construction

The most predominant feature of the indigenous Middle Eastern settlement is the courtyard house form. This pattern of clustered inward looking units reflects not only the family's requirements for privacy, but also the settlement's response to a frequently harsh external environment. Unlike the outward looking European house, designed for a temperate climate and the Western family unit, the Middle Eastern house turns its back on the extreme climate and focuses upon a peaceful private courtyard with its naturally moderated microclimate.

The rooms are built around a walled courtyard and open onto it. This courtyard helps protect the rooms from the occasional dust storms and the severely cold winter winds. In the warm summer days it acts as a well to trap cool nighttime air and retain it throughout most of the day.

Thick walls isolate the interiors from the extremes of heat and cold. The thermal properties of the masonry walls store daytime heat from the sun and radiate into the room interiors at night. The predominant south orientation of buildings means that the low winter sun can penetrate and warm the in-

terior of the house. Avans also facing south provide warm protected outdoor activity spaces in the cold winter months, and shaded spaces in the summer.

The indigenous process of construction for low-income families consists of first building a wall around the plot, and then gradually adding rooms around as the need arises with the increase in family members, and as money becomes available. In some cases, the house will grow up to two stories above the courtyard.

With increasing urbanisation in the Third World, unfortunately, many countries are importing high-rise solutions in an attempt to meet the demand for high density housing. High-rise becomes a major feature in many Third World countries just at a time when the West is beginning to realise the damaging social effects of living in such buildings, the high energy requirements and the costs to keep them even minimally comfortable.

Meanwhile, the indigenous courtyard house cluster is ignored though it is able to achieve high densities equivalent to maximum standards set in many European cities, while still providing private open space for each family and direct contact with the community at street level.

Contemporary housing should grow out of an understanding of not only the indigenous courtyard model but also the structure of the neighbourhood and its pattern of closed and open spaces.

Vault and Dome Technology

Vault and dome roofing is an indigenous technology with particular potential for low-cost housing in many regions of the Third World. The vault and dome system evolved centuries ago in countries like Iran where the arid climate and growing population made roof spanning materials like timber and reeds scarce. Today, in a world where industrialised and often imported materials such as steel and concrete become more and more expensive, and also suffer periodic shortages, there exists a potential for developing indigenous vault and dome technologies to meet today's low-cost housing needs.

Local builders in much of Iran are familiar with vault and dome construction which is one of the most advanced indigenous building technologies. Apprentice builders can master the basic techniques after only short training periods.

Indigenous environmental technologies of natural cooling and heating have long been employed to provide comfortable environments in the traditional house. Today modern building depends upon energy consuming mechanical systems to make them mainly habitable. Features of the indigenous house such as wind catchers, evaporative coolers, and the use of masonry's heat capacity in external walls can all be developed in contemporary shelter to create comfortable environments.

Using indigenous materials, economies can be made in both cost and energy terms. For example, stabilised mud-bricks, use of site soils with the addition of small amounts of

either bitumen, lime or cement, can be produced for $\frac{1}{3}$ to $\frac{1}{4}$ the cost of conventional fired bricks. Even more are the energy savings in the production of the materials and construction using indigenous methods. A three bedroom 100m^2 house built of brick and steel will consume over 50,000 kilowatt hours of energy in its production and construction. A similar house built from local mud-brick will consume only about 6,000 kilowatt hours of energy during production and construction.

4.3 Housing Scheme

The housing scheme illustrated here follows the approach taken in this paper. Prototype units have been built and tested.

The houses could be built by individuals, a co-operative, or by the government. The prototype units used bitumen stabilised, sun-dried mud-brick to provide a cheap yet moisture resistant wall. Only vaults were used to simplify construction as domes require comparatively more work. A basement provides not only a cool extra room but could also provide most of the earth for the bricks. Two long vaults cover four units and the rooms are designed so that the vaults counteract their thrusts against each other, minimising wall thicknesses. Wall materials are minimised and useful interior space increased by providing frequent arched wall niches that can be used as cupboards or sitting enclosures. The clustered layout yields densities of approximately 400 persons per hectare. The compact design results in a minimum of external wall exposed to the sun and weathering in general. The clustering around courtyards provides cool external spaces. Furthermore, the clustering of several houses around a public space from which cars are excluded provides a safe open space that is yet private to that particular cluster. Such groupings of several houses as distinct units could make the organisation of construction simpler. Each group of houses could be the direct responsibility of a small co-operative of owner-builders as a sub-division of the overall construction organisation. After occupation, the groupings could continue to act as maintenance and administrative units. Each dwelling can be subdivided into two flats in response to changing family or ownership patterns.

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* All the above publications on Indigenous Building are authored by F. Afshar, A. Cain, M. Daraie and J. Norton.

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PLANNING AND BUILDING PROJECTS

All projects develop upon indigenous building and planning methods and are directed toward the rational use and improvement of these systems in each region concerned.

1. Design & building of a Mud-Brick House using vault and dome techniques, Gournā, Egypt, 1973
2. Projects in association with Professor Hassan Fathy, Egypt and Oman, 1973
3. Delhi low cost housing competition - awarded Third Prize, 1973
4. "Ideas in Low Cost Housing", Indian competition, awarded Mention, January 1975
5. "The Upgrading and Extension of Nizwa and Buraimi Town Centres" - preliminary planning study for the Government of Oman, 1974

Architectural and Planning work for the Selseleh Integrated Development Project:

6. Master Plan of Alashtar, Luristan, Iran and implementation of scheme
7. Hamaam (Public Bath) in Niazabad village in Luristan, Iran to serve a region of several villages. A self-help project using brick vault and dome construction
8. Prototype Solar Hamaams (public baths) built in several villages, i.e. Serab Said Ali & Daratang in Luristan, Iran. Built with village participation, of brick vault construction, and designed to be heated by locally assembled solar collectors and a back-up boiler
9. Centres for Collective Promotion -incorporating facilities of rural health centre-clinic, literacy training programme, and agricultural station. Built in various villages in Selseleh region
10. Community & Educational buildings -kindergarten, secondary schools, training school, crafts and small industries workshops
11. Low Cost Housing for Teachers
12. Guest House/Meeting House for S.I.D.P. Project at Serab Amir. Built of stone and roofed in timber
13. Construction of Brick and Lime Kilns