

A black and white photograph showing a person in a striped shirt and dark pants working on a tiled roof. The person is crouched, reaching up towards the tiles. The roof is made of dark, overlapping tiles. A large, light-colored structural beam or pipe runs diagonally across the upper part of the image. In the background, another person is visible on a different part of the roof. The sky is bright and overexposed.

**DEVELOPMENT WORKSHOP**  
exhibition on  
**Indigenous Building**  
**and the Third World**



## **"INDIGENOUS BUILDING AND THE THIRD WORLD."**

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**DEVELOPMENT WORKSHOP**  
**On Indigenous Building Methods in the Third World.**

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## **DEVELOPMENT WORKSHOP** exhibition on **Indigenous Building and the Third World**

The potentials of indigenous planning and building methods have been neglected in most Third World Countries. They have been replaced by western methods that are often inappropriate to local conditions and needs. The visible material success of the industrialised world has made it the obvious model for Third World Countries. The very terms Developing and Developed countries suggest that the latter is a superior model that the former should aspire towards. We prefer the independent term 'the Third World' because we believe more appropriate models could be developed from the indigenous methods within the Third World Countries themselves.

Such indigenous methods are most evident in the villages, the traditional city quarters and the more recent 'squatter' settlements. The architecture of these indigenous settlements have evolved over thousands of years. They reflect a country's accumulated expertise on how to build appropriately to the local social, economic, environmental and cultural conditions. Furthermore, the majority of people live in these settlements. Thus the approach to both understanding shelter needs and improving them in a Third World Country is through first understanding and developing the indigenous methods reflected in these settlements.

Allan Cain, Farroukh Afshar, John Norton, Mohammad-Reza Daraie  
the DEVELOPMENT WORKSHOP

# INDIGENOUS BUILDING and the Third World

## Indigenous systems

By 'indigenous systems' we mean those systems that are traditional to a country. A 'system' can be simply defined as a 'set of related parts', denoting 'organisation'. Many traditions, far from being backward or illogical as often supposed, do in fact have an underlying rationale or 'system' which is closely related or 'indigenous' to their particular region.

The potentials of indigenous systems have been neglected in most Third World countries. Instead they have been replaced by Western methods often inappropriate to local conditions and needs – physical, economic, social, cultural and aesthetic. The visible material success of the Western industrialized world has made it the obvious model for Third World countries. The very term 'developing countries' implies a correlative 'developed' world which would act as an ideal. Over the years, the values, objectives and methods of the West have been adopted by the other countries through a combination of imposition and emulation. The British model of parliamentary government has been implanted intact into countries with very different indigenous political organisations. Western medical methods have been unquestioningly applied, often to the complete neglect of long-practiced local methods of healing.

Today there is a growing awareness that such literal transference of methods rarely works. Nor is it adequate to start with basically Western objectives and methods and then modify them to local conditions: The Third World has very different social, cultural and economic bases (and in most cases, different physical environments as well).

Furthermore, in the global context of political economy, the Third World is now in a very different position from that in which the Western World developed, when it had the rest of the world to draw its resources from. Yet today the Western world itself is beginning to have grave doubts about the validity of its own socio-economic models. Profligate consumption of energy and resources has precipitated the energy crisis and aggravated a major economic recession. Over-specialisation and institutionalisation have taken control out of the hands of the majority of the population and left them alienated. Moreover, at

the time that the Western world was developing, it was concurrently shaping the socio-economic systems of the rest of the world, often to its own advantage and to the detriment of the country in which it was acting. Much of what is considered 'modern' today in a developing country was fathered by this shaping process and continues to work to the detriment of the country. However, amongst the many inappropriate imported models, those indigenous systems that were through neglect least affected by this shaping process may now paradoxically have the most to teach us. Many of the indigenous systems remain relevant to local needs, are based on low and local use of energy and resources, and work in harmony with the natural environment.

For an example that illustrates the above points, let us consider housing. An old Arab saying loosely translates as 'The day you stop building your house you will die'. This is not some mystical quote but factually reflects the indigenous system of housing. In Salala, Southern Oman, the occupant of an old town house, whose family had lived there for generations, described to us how his house had been built. The house had started as one room on the plot of land and had gradually been added to as family size and fortunes increased, until it reached its present three-storey courtyard shape. And today on the top floor yet another room had been built, and a second room, still in timber and corrugated iron, was soon to be converted into more permanent materials so as to house a new arrival in the family. In the recently allotted plots in the town the same process could be observed. The new arrivals lived in a tent whilst building their first limestone room; the longer established homeowners had already inscribed a courtyard on the ground floor and were making further additions.

Thus, to paraphrase John Turner's words<sup>1</sup>, the indigenous system of housing is one in which it is very much a process, intimately related to the users' needs and finances, and very much in the users' control. The idea of housing being the production and distribution of a number of units by the government or a private institution to a passive, recipient population is one of the misleading models set up by Western countries. Today, with chronic and increasing

housing shortages in the wealthiest industrialized nations, people like John Turner are saying that the idea of housing as a 'product' is unworkable. Instead they are turning to the housing 'processes' found in the indigenous systems of the Third World to draw lessons for their own countries. Meanwhile in developing countries housing as a product continues to be sold as the most modern idea, along with a whole range of other dubious ideas on design, construction and building types. Thus as Western architects begin to realise the damaging social costs of high-rise apartment living, they become a major feature in many Third World countries.

The successful selling of Western ideas depends on the assumption fostered in people in developing countries that Western methods are superior to their own. Perhaps the most insidious effect has been their loss of self-respect and identity. In Oman, when we asked a ten year old school boy (with just two years formal schooling) to draw his own flat-roofed mud-brick, courtyard house, he drew us a pitched-roof Western bungalow with a front garden. He drew his family and himself in shirts and trousers, although in reality he was still dressed in the traditional galabeya.

The situation, however, can be reversed. Another owner-occupation of a mud-brick and palm-stem house in Oman told us he would like to live in a concrete house, indicating a bunker-like room near him. But after he had taken us through his own house and explained the rationale behind the use of the different materials and rooms and how they performed in his environment, he changed his mind about the concrete room. He preferred his own house, but asked if the permanence of the materials could be improved.

It is often the educated professionals and policy-makers of Third World countries who are the most convinced of the superiority of models offered by the Western countries. Their training and education is too frequently limited to these Western models. Since the majority of their people are still operating within indigenous systems, it is the professionals who are alienated in their outlook and in what they can offer. A re-evaluation of their own countries' indigenous systems would not only help these professionals regain their self-respect and identity, but also

realign them with their own people and equip them better to be of service. In China, medical professionals seriously re-evaluated the ancient indigenous system of acupuncture, so that today it largely replaces Western anaesthetics. The Ujamaa village council of Tanzania was derived from the indigenous tribal organisation and it now forms a basic political unit of the country.

## The indigenous built environment

By 'the indigenous built environment' we mean the built-environment of the rural areas, the older traditional sections of the cities, and to an extent the unofficial settlements (such as squatter settlements) of the newly urbanising areas in the Third World. It is in these areas that the traditional methods of building and design are most apparent. That they are often also the most run-down areas is more to do with wider economic conditions such as overcrowding, poverty and neglect than with the traditional methods themselves.

## Housing

In his book *House, form and culture*<sup>2</sup>, Amos Rappaport writes: –

All housing needs to achieve four objectives in order to be successful.

1. It needs to be socially and culturally valid (here traditional housing possibly works best).
  2. It should be sufficiently economical to ensure that the greatest number can afford it (in primitive contexts most, if not all, people have houses).
  3. It should ensure the maintenance of health of the occupants (in relation to climate, traditional housing succeeds; in relation to sanitation and parasites, it usually fails).
  4. There should be a minimum of maintenance over the life of the building.
- Traditional housing may, therefore, be much more acceptable – if not, in fact, desirable – than has been assumed, and housing attitudes should be adjusted accordingly. At the very least this offers a fruitful field for research.

Whether one agrees with Rappaport's objectives or not, they act as a useful set of criteria against which one can assess indigenous building. Unfortunately indigenous building has inspired formalistic mimicry more often than serious assessment. For example, in Sudan the conically roofed, mud-and-thatch family-house cluster is

recreated in concrete and brick, with a back yard, and laid out in straight rows as a low-cost housing scheme (see *Pseudo vernacular*). The indigenous social and cultural validity is lost in the transition of form from the family cluster to the rigid layout. The change of materials decreases the climatic performance of the new house and increases its costs beyond the range of most Sudanese. It also places the building of the house out of the owners' control. On the other hand, the materials are more permanent, require less maintenance and harbour fewer insects and parasites. However, these latter improvements could have been gained without losing the more fundamental advantages of the traditional example, if the approach had been to work from a thorough understanding of the indigenous system. (For problems of permanence and insects, see *Sundried mud brick I & II* and *Palm fronds as a building material*).

#### Rural development

The lessons that can be derived from the indigenous built environment can be applied not only to housing, but also to more specialised buildings such as schools, workshops, markets, and public baths, and also to infrastructural design, such as layout, and access for people and services.

Probably the clearest example of this potential remains Hassan Fathy's Gourni village, which was built in the late 40's.<sup>4</sup>

The village, near Luxor, Egypt, is built entirely of sun-dried mud brick, and the whole design from housing to communal buildings and layout is based on traditional concepts. Perhaps more importantly, Professor Fathy worked out an economic and organisational base, so that the production in the village derived from local crafts and local organisational patterns. The achievements and failures of Gourni deserve a thorough assessment.

A quarter century later, Fathy's approach is of increasing relevance as rural development becomes more of a priority. To quote Barbara Ward<sup>5</sup>:

If de-centralised operations are to be supported, as the Chinese have shown, then development must be concentrated on the village, the market centre and the intermediate town. To prevent people from leaving the villages only to become unemployed in the big cities, intermediate centres are needed, with local storage units, and co-operatives, local banks and light industry, local family clinics, schools and health services.

Different versions of the development outlined in the quote have been put into operation in several Third World countries. An example from a village settlement in Oman serves to illustrate the pitfalls found in a too-simplistic approach. In this case

little attention was paid to upgrading existing buildings. The new buildings – hospital, school, and mayor's house – were located some distance away from the traditional centre, which they rivalled rather than complemented. The new building reflected the 'professionalism' of the city architects and contractors, a foreign firm. Neither in materials, layout nor design were they appropriate to the local environment – both physically and socially. For example, in the hospital the patients complained about the glare and heat in the rooms, which was caused by the layout, the huge windows (see *Openings*) and the concrete block walls (see *mud bricks*). The heat gain was even beyond the capacity of air-conditioning, which was in any case an extra expense. Furthermore, by representing progress, the new buildings encouraged in the minds of the local populace ideas of what an appropriate building should be, and by implication denigrated the indigenous buildings. The only part the local population played in the development was through the few who gained temporary unskilled employment during the construction period. In the years to come the net effect could be the creation of a new settlement around the new centre, physically apart from, and alien in materials and form to, the indigenous buildings, life-style and culture of the people and the physical environment. The traditional settlement, being officially ignored, would be allowed to decay into a slum while still housing a large section of the indigenous population.

If, however, the indigenous built environment had first been understood, if local materials and technologies had been used to the maximum (improved where necessary), and if local builders (perhaps a co-operative) had been in control of the building, there would have been a much greater and lasting benefit to the community. Government investment for the project would have gone directly into the community, and a local building industry could have been revived, capable of developing the local built environment in a self-sufficient way.

#### The urban environment

It has been argued by Koenigsberger and others that indigenous methods of building are of limited potential, since they are mostly found in rural areas while the main problems for Third World countries are urban.<sup>6</sup>

This is true to a point, but not to the extent sometimes put forward. First, to refer back to Barbara Ward's statement that 'development must be concentrated on the village . . . to stop

migration from the countryside to the cities', increasingly rural development is seen to be the solution to urban pressures. Secondly, there are many developing countries that do have long urban traditions. Many old city centres, such as those in Isfahan, Cairo and Delhi are examples of indigenous urban building methods. Up to now, cultural pride and the tourist industry have done more to preserve such old city centres than any belief in their relevance for today. Essential as preservation is, it can imply a museum-piece view, branding such areas as fossilised relics of the past. However, far from being relics, these old quarters should be studied from a number of aspects; in aesthetic terms: the sense of scale and proportion, vistas, and the juxtaposition of open and closed spaces; in climatically functional terms: the shaded streets, orientation according to the sun's angle, and the beneficial air-movement generated by the street layout; or more fundamentally in terms of socio-economic organisation: with lively and sociable communities operating with economic efficiency.

The fact that many Third World countries may not have an urban tradition does not exclude the possibility that lessons could be learned from a neighbouring country with similar environmental, social or economic conditions, and which does have an urban tradition. The urban traditions of Egypt or Iran could for instance be more relevant than the garden-city concepts of Britain to countries like Oman.

Finally, even in an urban environment, rural-based indigenous systems of building, social organisation and values in general often seem to work. In his recent study of a squatter settlement in Lusaka, Zambia, Richard Martin showed how the indigenous rural methods of building, social clustering, and communal organisation are adding up to more successful settlements than those officially laid out and run by government bureaucracies applying alien methods.<sup>7</sup>

#### Conclusions

Let us summarise why we believe Third World countries should thoroughly re-evaluate their indigenous systems.

Firstly, while the policies of many Third World governments still emulate Western values and techniques, the daily life of most of their citizens still lie predominately in indigenous systems. Understanding and expanding the potentials of these systems to meet contemporary needs would enable development to be more appropriate and acceptable to the majority of the people.

Secondly, most Third World

countries are also at a stage in which their comparatively limited resources are being exhausted by the many demands placed on them. This is within an international context, with governments

becoming increasingly aware of the finite nature of the world's resources, and in which the costs of imported goods are rapidly rising. Indigenous systems represent hundreds of years of accumulated expertise on how to employ what is locally available to meet local needs economically – in monetary, energy, and resource terms. To realise this potential would give Third World countries greater self-sufficiency. In today's world such an approach to planning is perhaps the most realistic.

<sup>1</sup>J. Turner & R. Tschert: *Freedom to build* (Macmillan, 1973).

<sup>2</sup>In India for example, 89% of rural and 44% of urban buildings are made of mud, sun-dried bricks, stone, bamboo, or reeds, 9% of rural and 52% of urban housing are made of fired bricks. Only 2% of rural and 5% of urban houses are made of materials such as finished timber, metal sheets, cement, etc. (*Seminar Journal on Mass Housing* 1974).

<sup>3</sup>A. Rappaport: *House, form and culture* (Prentice Hall, 1969).

<sup>4</sup>H. Fathy: *Architecture for the poor* (Chicago University Press, 1973).

<sup>5</sup>B. Ward: 'The triple crises' in *RIBA Journal* 12/74.

<sup>6</sup>Koenigsberger, Ingersoll, Mayhew, Szokoley: *Manual of tropical housing and building* (Longmans, 1973).

<sup>7</sup>R. Fonseca: 'Old Delhi' in *Shelter and society*, ed. Paul Oliver G. Blake & R. Lawless: 'Continuity & change – Tlemcen' in *AAQ* vol.6, 74.

<sup>8</sup>R. Martin: 'The art and architecture of underdevelopment' in *AD* 10/74.

# Industrialised Building / Indigenous Building

**THE CONSTRUCTION INDUSTRY** plays a significant part in international trade.

**"In construction developing countries are heavily dependent on imports of materials, components, plant equipment, skilled man-power and managerial staff."**

(*'Construction Industry - UNIDO Monograph 2'*, 1969)

Conversely the Construction Industry in many Industrialised countries is becoming increasingly dependant on contracts from Third World Countries.

Construction is also a major source of employment and investment within the Third World.

**"In most countries construction represents between 45% to 60% of all fixed capital formation."**  
(*op. cit.*)

**INDUSTRIALISED BUILDING** relies on imported machinery, materials, skills and is commonly manifested in High-Rise Buildings and Large-scale Housing Projects.

It presents itself as a way of meeting shelter needs economically. However capital invested in imports can be capital lost to the country. If costs incurred in installing infra-structure, plant and equipment are considered the shelter unit resulting from industrialised building can prove expensive. A highly mechanised construction industry by reducing labour needs can cause unemployment. A machine produced house is often inappropriate to local social and environmental conditions.

**"Industrialised housing techniques have been tried by less developed nations with small success and sometimes near disaster. Where labour is available— the handicraft product is cheaper, more expandable and more realistic."**  
(C. Abrams - leading authority on Housing for Developing Countries and U.N. consultant)



Architectural Press, London 1974

**HIGH RISE** buildings are justified on grounds that savings on land are achieved by greater densities and costs cut by using modern construction methods.

**"Several recent studies show that building densities are approximately the same for multi-storey towers as they are for three and four storey buildings."**  
(S. Angel & S. Benjamin - Urban and Regional Studies Faculty, Asian Institute of Technology, Bangkok, Thailand)

**"Building costs per square foot rise from \$20 to \$36 as building height increases."**  
(American Study by C. Alexander & S. Ishakawa & Colleagues - the Oregon Experiment - N.Y. Oxford University Press 1974)

**"Maintenance costs per dwelling unit in 1970 were £8.39 for low buildings and £21.35 for towers."**  
(Scottish Study by P. Jephcott, H. Robinson, 'Homes in High Flats: Human Problems involved in Multi-Storey Housing', University of Glasgow, 1971)

**"It is almost heresy to call attention to the defects of the tall building: the dubious economy of vertical transportation — the waste of cubage in the unused sections of elevator shafts — the shutting out of sunlight and air and the intensification of congestion on the streets."**  
(Lewis Mumford, *Brown Decades*, Dover Publication 1931)

Thus Industrialised Building and the High Rise have proved problematic and expensive even in industrialised countries where supporting skills and services have been long established. In Third World Countries where the skills and services have to be developed from scratch, the problems are compounded and costs are much higher.

## INVESTMENT IN PEOPLE

**"Average calorie intake of a population stands out as the most important factor in raising productivity. A 1% increase in calories is accompanied by a 2.27% increase in economic productivity."**  
(International Labour Organisation study)

**LARGE SCALE HOUSING PROJECTS** are built in the belief that repetition of units, bulk buying of materials, etc., save on costs. However, administration and organisation costs during construction, and management and maintenance costs after construction can make such projects expensive.

**"In Venezuela, self reliant (owner - small builder) housing cost 4,200 bolivars, per unit; (contractor built) 4 storey low quality construction cost 10,200 per unit; and 15 storey low quality construction cost 16,000 per unit."**  
(R. Jones - Transport, Urban Design and Housing - the Brookings Institution, Washington, D.C. 1969)

**"Projects built by big contractors generate less low-income employment than would be demanded through support for traditional systems. They increase the maldistribution of income between regions and accelerate rural-urban migration."**  
(J. Turner - U.N. Housing Consultant in Latin America)

**THE INDIGENOUS BUILDING INDUSTRY** is labour intensive, based on skills of local builders and craftsmen and local resources. Its common manifestation is low-rise, small-scale, informally organised shelter.

Capital invested in this indigenous industry would have a maximum regenerating effect - directly increasing employment and income, raising living standards, and developing local skills and resources.

**"Traditional housing may be much more acceptable if not in fact desirable than has been assumed, and housing attitudes in developing countries should be adjusted accordingly"**  
(A. Rappaport, *'House, Form and Culture'*, Prentice Hall Inc. 1969)

## Labour Intensive Building

Some large scale construction is undeniable necessary. However, much of this can be divided into a series of smaller operations and implemented in a labour-intensive way. Investment thus goes directly as income to the unskilled (most impoverished) sections of the population.



# The Development Workshop

## THE WORKSHOP

The Development Workshop is made up of a group of architects and researchers from a number of countries. They work collectively on the research and development of indigenous methods of planning and building. They have been involved in projects in Egypt, Sudan, Oman, India, Turkey, Iran, and various other countries. Research and development work is carried out into methods which remain in the hands of Third World communities.

Education is a primary motive. Workshops have been conducted with builders and young trainees in rural communities in order to develop upon existing skills and methods; and with university students to equip them to be of more use to the majorities in the Third World. Educational materials in the form of publications, exhibitions and films are being prepared.

The promotion of co-operative development of local building and small-scale industries is another aim of the Workshop.

The Members of the Workshop are now working as Architects and Planners for the Selseleh Regional Development Project in Luristan, Iran.

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## ACKNOWLEDGEMENTS

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To Hassan Fathy, with whom we have worked in the past and remains a source of encouragement to us all.

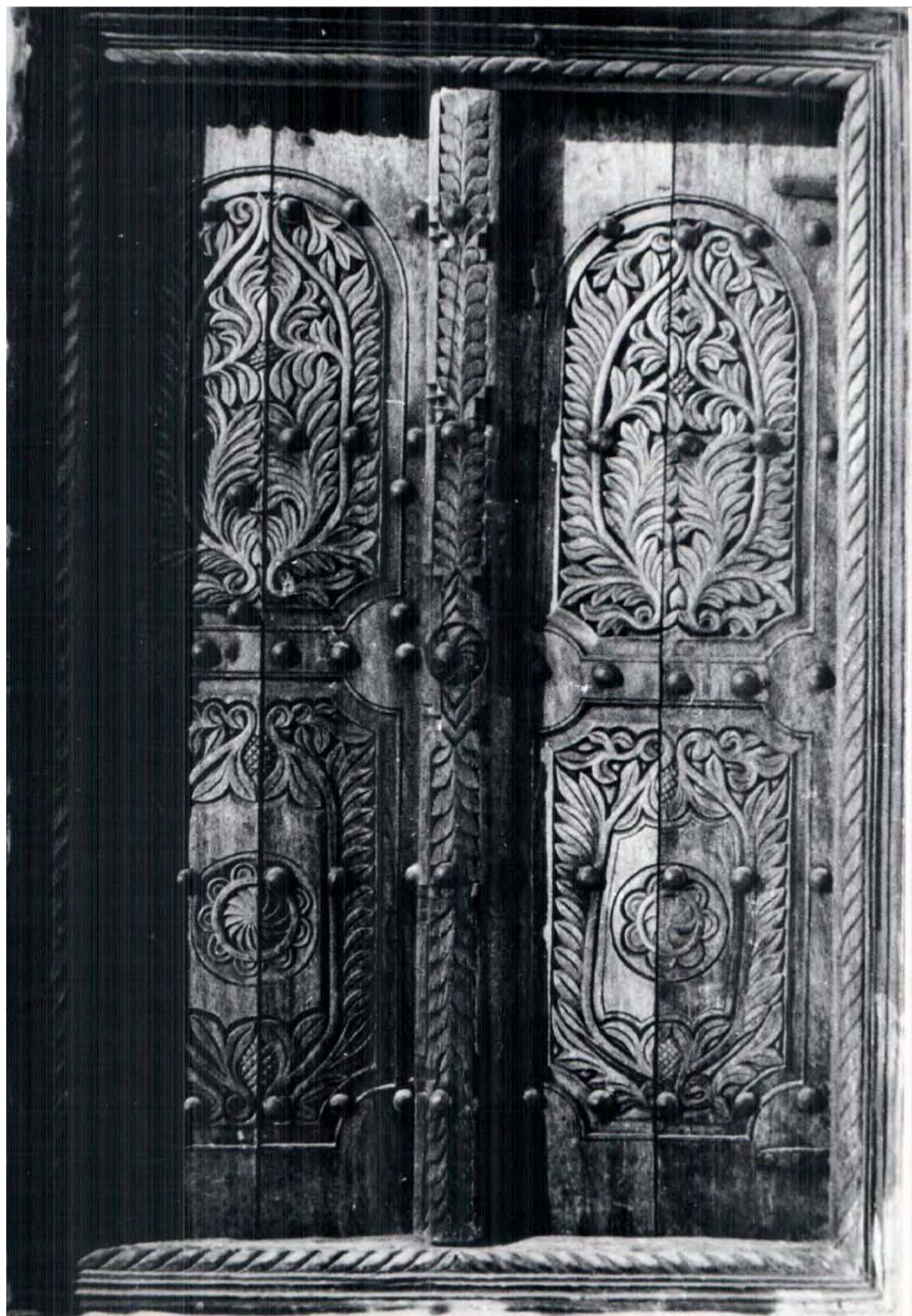
To Omar el Farouk, Jocelyn Leveaux and Wendy Etchells who worked with us in Egypt and Omar later in Oman.

To the Architectural Association, London; Intermediate Technology Development Group, London; Architectural Design Magazine; Ecologist Magazine; Ekistics Magazine and to the Centre for Endogenous Development Studies, who have supported our work in many ways.

Our thanks to the traditional and village builders who have taught us so much: Muallem Ala-el-Din and Hagag, Mud brick Vault and Dome builders from Nubia, Egypt; Habib, Palm Stem builder from Seeb, Oman; Ustads Mashalla and Husain, Vault and Dome masons from Yazd, Iran; and Mehmar Adel, Builder from Alashtar, Luristan, Iran.

Thanks to Razmik Arzooian for his help during the preparation of this exhibition.





# Creativity and Control



Wood Craftsman, Nepal

## COMMUNITY CONTROL AND INDIVIDUAL CREATIVITY

Control, participation, creativity and culture emerge more easily in an operation that uses local resources, is labour-intensive, is on a small scale, and has continuity with local traditions.

In a large-scale, mechanised situation the builder is reduced to an operator of a machine and has less creative control over what he is producing. The resulting buildings express a uniform machine culture.

Indigenous building processes support a whole range of small trades and craft industries. These are by their nature small scale and dispersed throughout the community. A high level of artistic work is often attained, which can rarely be surpassed by industrialised methods. Investment in indigenous building helps revitalise creativity latent in workers and craftsmen, and means that control of the industry as well as its products remains in the hands of the community.

Mosque in Sur, Oman



Document Workshop 1970

# Images and Distortions

## OMAN, IRAN



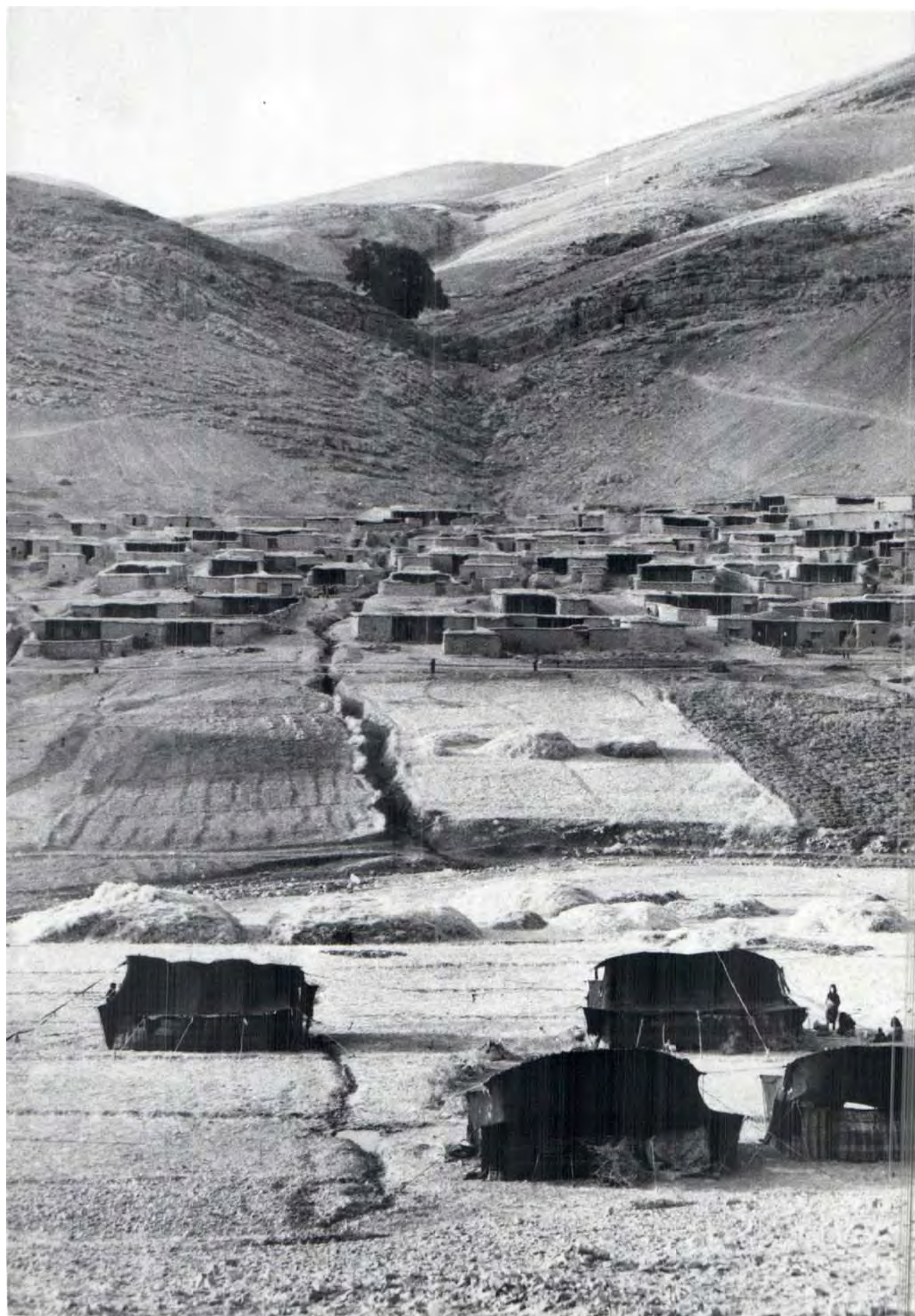
Misleading images distort a person's view of reality. A school book that shows a western house and associates it with prosperity can persuade a child that that type of shelter is appropriate to his environment. Buildings modelled on the international urban image of glass, steel and concrete can undermine people's belief in the potentials of their own indigenous building methods. Such images instill inferiority, manufacture unnecessary wants and make individual expression a distortion of culture.

A five year old kindergarten child from a regional town in Luristan, Iran, draws his house modelled on the European type pitch roof he sees in his picture books and school texts. Buildings in his region are almost all flat roofed. From this early age, his mind's image of his environment is separate from his reality.

In Oman, a ten year old school boy (with just two years of formal schooling) was asked to draw his own flat-roofed mud brick courtyard house. He drew a pitched-roof western bungalow with a front garden. He also drew his family and himself in shirts and trousers, although in reality he always dressed in the traditional "galabeya".



A villager from a rural mountain settlement in Luristan, Iran, drew this picture of his village and environment. He expresses not only the village cluster but its nomadic counterpart in the tent settlement. The activities of herding, agriculture and hunting which are basic to the village economy are also illustrated.





Wooden frames and strips of goat hair cloth

The traditional shelter is built and can be modified to suit the changing needs of climate and occupants. In recent buildings the house is too rigid to do this. Heaters or coolers have to be added to adapt the climate, and increases in family size require changing houses. The 'modern' value of flexibility is more inherent in traditional shelters than in 'modern' buildings.



Reed screens for walls of tent.

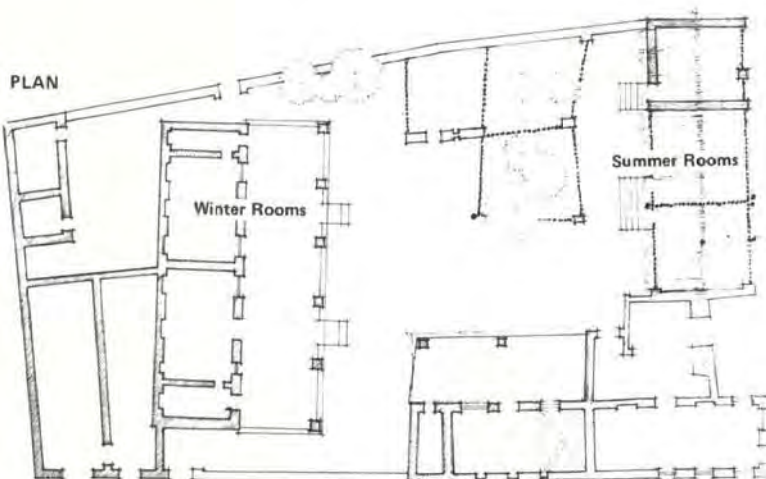
## Responsiveness IRAN, OMAN

### THE NOMAD

Nomadic dwellings require that, with a minimum of materials, a maximum of mobility and adaptability are possible.

#### LURI NOMADS' TENTS:

Every element is designed to be dismantled, rolled up and put on a donkey when the family moves. The timber framework is made of inter-locking uprights and ridge poles of one to five metres lengths. The roof cloth is of goats hair woven in long one metre wide strips sewn together. In rain the goats hair shrinks making the roof impervious. The walls are reed-mat screens 1.5 metres high, also woven together with goats hair. In summer the screens allow ventilation. In winter the screens are removed and the more dense roof cloth is let down to the ground. As the nomad usually moves to wherever winters are not too severe this modification is sufficient.



### THE SEDENTARY DWELLER.

#### NORTHERN OMAN COAST

A sedentary population have to meet their changing needs whilst staying in one place. In the example here, the house is divided into summer and winter rooms. The summer rooms are built of palm-stem screen walls facing the day sea-breeze. They are cool (and well ventilated) in the hot-humid summers and also allow breeze through into the courtyard. In addition multi directional windcatchers introduce both land and sea-breezes from higher up into the rooms. In autumn the windcatchers are dismantled or closed and extra screens placed along the summer rooms to stop breeze entering. The mud-brick winter rooms provide better insulation against the cold. The courtyard arrangement allows for rooms to be added with increase in family size.

### SECTION



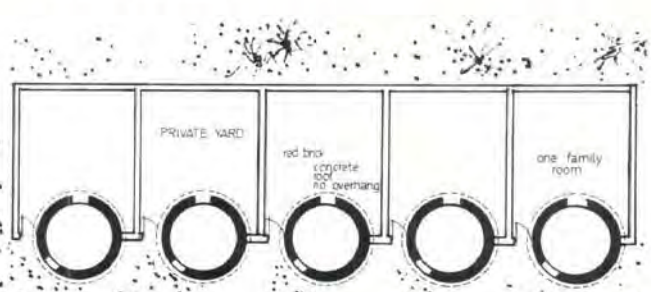
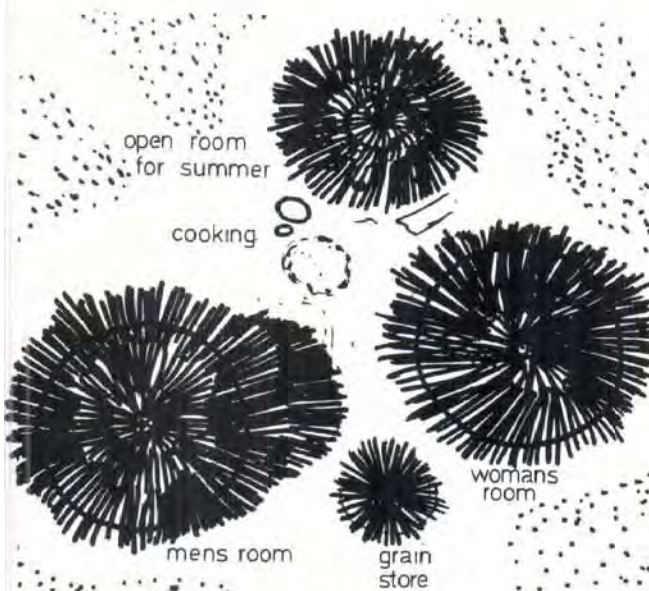
# Pseudo Vernacular SIIRAN



Indigenous housing in Sudan (plan below)



Low cost housing in Sudan. It follows the traditional in only a formalistic way. (plan below)



The illustrations juxtapose a formalistic low-cost housing scheme and the traditional Sudanese round house which inspired it. There are similarities in appearance, but the low cost housing scheme shows a lack of understanding of the original on three basic levels.

Firstly, instead of the family cluster, there is a row of attached units with rigidly defined backyards.

Secondly, in the indigenous house, local materials and particularly the overhanging roof are used to moderate climate; while the low-cost house, with its conical reinforced concrete roof ignored the overhang, leaving the walls exposed to the heat of the sun, and is built of materials which readily transmit this heat to the interior.

Finally the cost of using concrete and even fired brick preclude the use of the new house as a model for housing the majority.

Such attempts to mimic the indigenous form without an understanding of how it works are all too common.



# Regional Development

## Luristan, IRAN

### On DEVELOPMENT

The rural regions of the Third World which contain the majority of the world's population, are often neglected in favour of centralisation of capital and industry in the relatively few urban centres. This uneven development causes a large proportion of the rural population to migrate to the cities in search of jobs. As this kind of industrialisation has been unable to employ the massive labour force thus created, most of them are absorbed unproductively in the tertiary sector.

A policy of decentralisation is required to maximise employment generating activities in the rural areas. For this to be economically possible, an emphasis should be given to small-scale, labour intensive industries and services that develop on locally available resources and meet local needs. Then, the population can be productively employed in their own regions and a necessary degree of regional self reliance is achieved. The answer to the urban crisis is to be found in developing the rural areas.

### SELSELEH, Luristan, Iran

Selseleh is a high basin, ringed by the Zagros range of mountains in Luristan, western Iran. It has an agro-pastoral population of about 40,000. In the past the region was comparatively isolated and the population lived within nomadic tribal units.

The settlements along the foothills are predominantly based on animal husbandry. The villages within the basin are primarily agricultural.

With the opening up of the region, a seasonal migration of an increasing number of people who go to work in Tehran and other large cities has occurred. One of the major aims of the regional development policy is to create productive employment within the region, for this section of the population.

# Regional Development

## Selseleh, IRAN



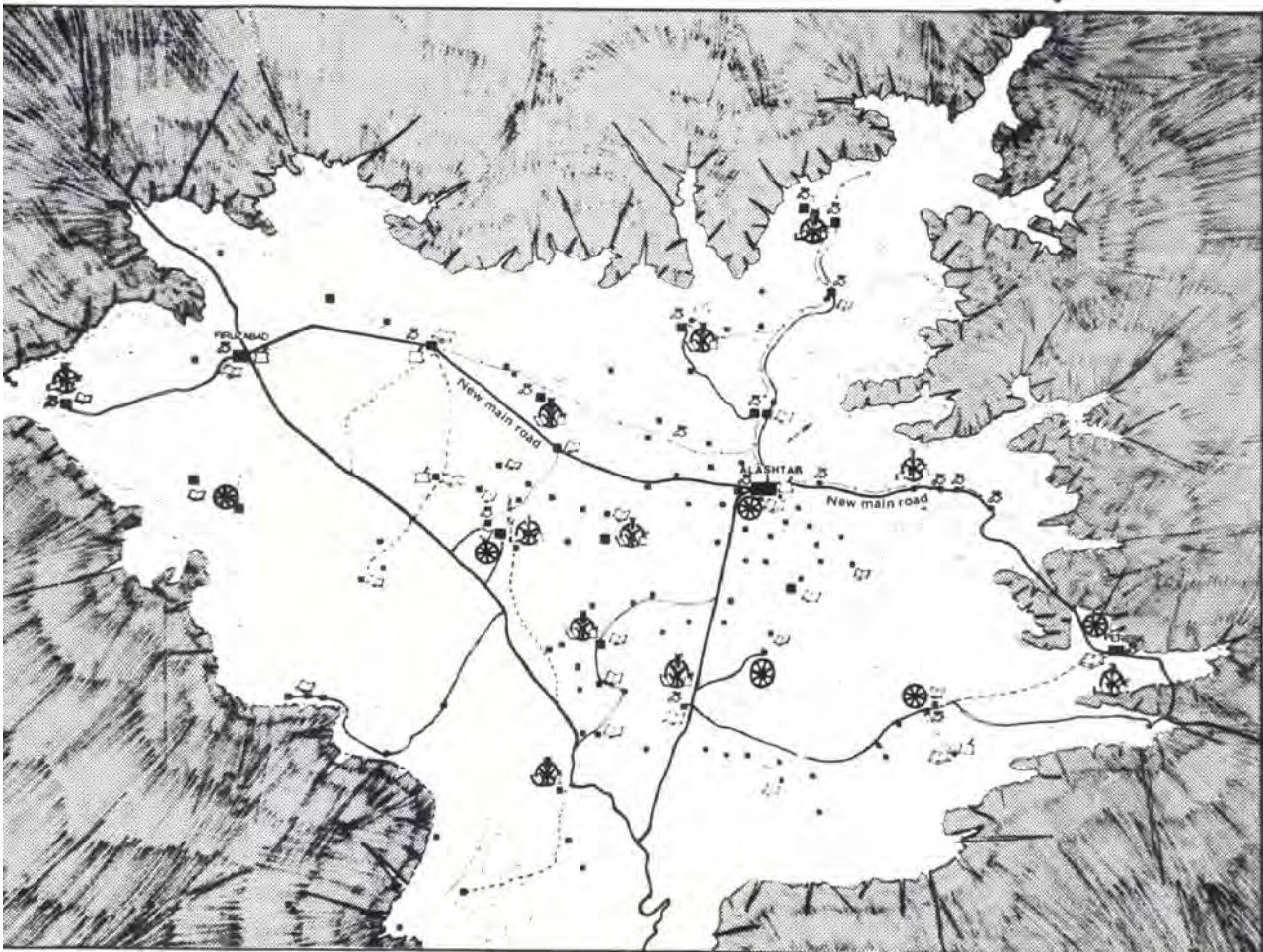
Selseleh Regional Development Project is an integrated experimental project which aims to internalise the development process by training the local people to meet their own needs through the use of local resources.

Ninety volunteers have been chosen from the villages within the region and are given a broad training in agriculture, education and health. After the completion of their training they will return to the villages where they will work together with the people of their area (in promoting its development). SRDP also provides financial and technical assistance to encourage local communities to participate in small-scale industrial, infrastructural and services projects like kilns, roads, water supply, baths, etc.

Facilities within Selseleh Region before advent of Development Project



Planned Development of Productive potential and Infrastructure



Productive Industries

Centre for Collective Promotion  
( health, agriculture & education )



Agricultural Extension Service



Health Service/clinic



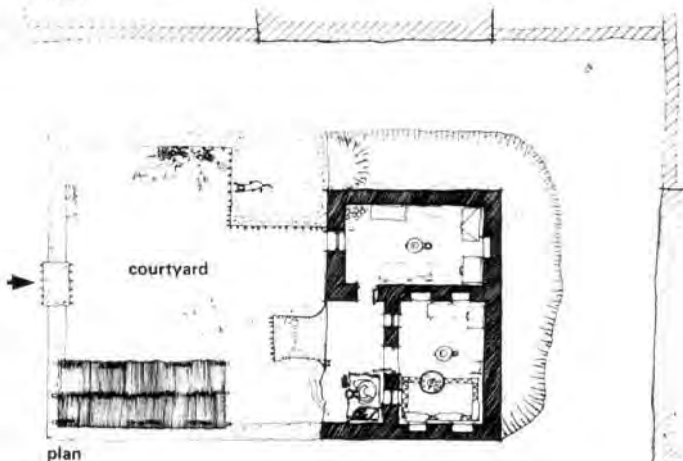
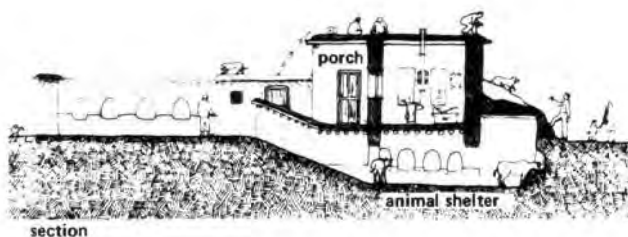
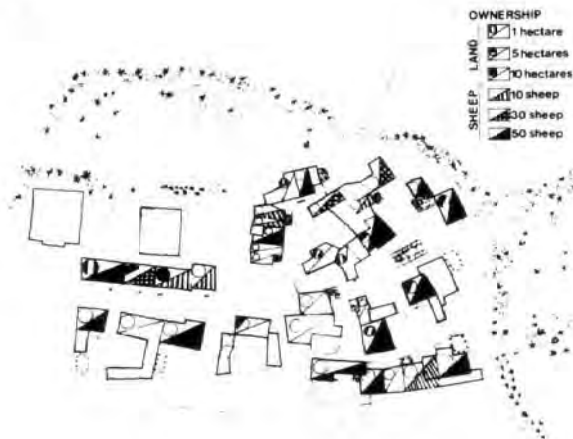
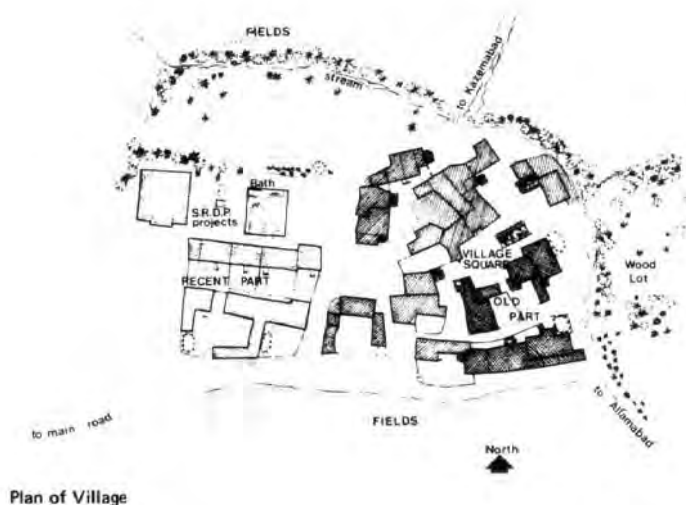
Water Supply Project



Education

# The Village

## Luristan, IRAN



SETTLEMENT PATTERN

Niazabad: typical plains settlement and having a population of approximately 300.

The village started as a small cluster by the stream on the south-east corner and extended westwards. The recent houses are built in rows. The houses face south providing blank walls to the cold north winds. The settlement is also bounded to the north and east by trees giving additional protection. A wood-lot provides fuel and timber for building.

Most of the land is owned by four related households. Some families own large numbers of sheep but most rely on share-cropping and seasonal manual work in the cities. Usually the wealthier can be noted by their large courtyards while poorer families' houses open directly on to a public space.



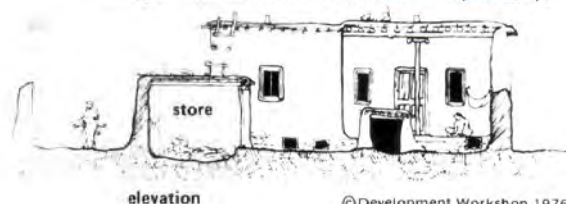
HOUSE FORM

For much of the year people spend their time on their roofs, or in thatched shelters or tents in their courtyards or in the fields. Rooms are used for privacy or warmth in the severe winter. Houses have a deep porch leading into one or two rooms. If there are two rooms one is used for entertaining and the other by the family. The animal shelters underneath can be bigger than the house itself, sometimes accommodating large numbers of sheep, cows, mules and donkeys. Feeding troughs are built into the walls.

### VILLAGE NEEDS

The village can be improved by various methods. Paving of muddy streets, better renders for mud walls, high level windows for lighting and ventilation, separate entrances for animals, and hygienic kitchens and latrines can improve the health situation. A water pump and a public bath have been provided, the latter also serving nearby villages.

Productive employment in the region would help the villagers implement many of the above independently.



# Village Development NEPAL, OMAN, IRAN, EGYPT

Small scale village industrialisation can form the basis of rural development.



Pottery



Woodworking Shop

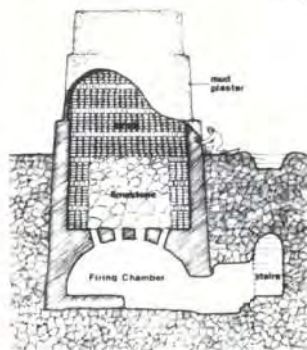


Roof tile making



Weaving

Designs for Selseleh Development Project. Luristan, Iran.



Design for a kiln



Plan of Village Development Centre.



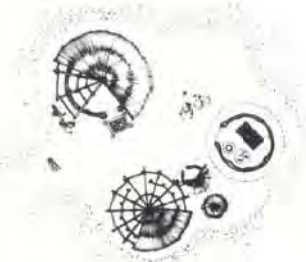
Section A-A



East Elevation  
Design for weaving training centre.

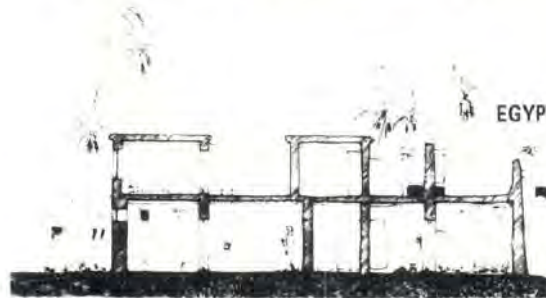
© Development Workshop 1976

# Village Housing



SUDAN

The Sudanese round house cluster reflects the social family grouping. Thatch is an excellent roofing material against rain and is a good heat insulator. Buildings, particularly store houses are often raised to prevent flooding damage and to protect against insects and animals. The easily constructed houses also reflect the shifting type of agricultural economy. Settlements are normally scattered.



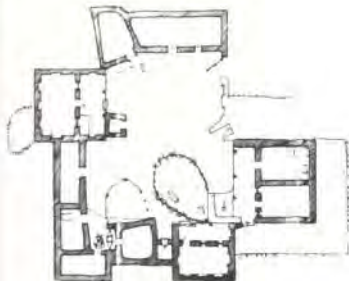
EGYPT

The house is one of several that opens out from a cul-de-sac. The Mastaba, the traditional outside seat, forms an alcove off the street. The lower floor has an entertaining room, kitchen, store and small garden. Bedrooms are upstairs, each with its own patio. The house is of mud brick with mud and timber roof.



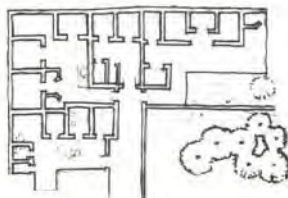
OMAN

Palm frond stem house suited to the hot humid climate, allowing ventilation, shade and reduction of glare. Since the material is cheap, houses can be extended easily. Three generations are accommodated in separate parts of the house. Double thickness walls are used for bedrooms, and single panels for day rooms adjoined by shaded open sitting areas.



LURISTAN, IRAN

The extended family grouping is expressed by a cluster of individual household units, facing inwards onto a common courtyard. Animals are kept beneath the house, and the roof is used for storage of grains and fodder. This tightly grouped extended house is surrounded by open agricultural land. The pattern is a social reflection and partly for protection of possessions and animals.



ZARAND, IRAN

Typical of Hot-Dry areas, the compact village exposes few walls to the sun. Houses are made of mud-brick, a good thermal insulant, with vault and dome roofs, as timber is scarce. The southerly living rooms open onto a deep porch ('aiyon'). Kitchens, latrines and store are around the courtyard. Some houses have water channels running through; others use a public washing area.



NEPAL

The house illustrated is a recent owner-built house on reclaimed jungle land in a new settlement area of Southern Nepal. Wood, bamboo and thatch are the indigenous building materials. The house is elevated and open to catch cooling breezes in the hot humid summer. A meeting place is cleared in the front of the house and a smaller kitchen yard is situated at the back. Animal shelters and stores are built nearby. The house is often located within the garden plot.

# Urban Planning



Sur, Oman

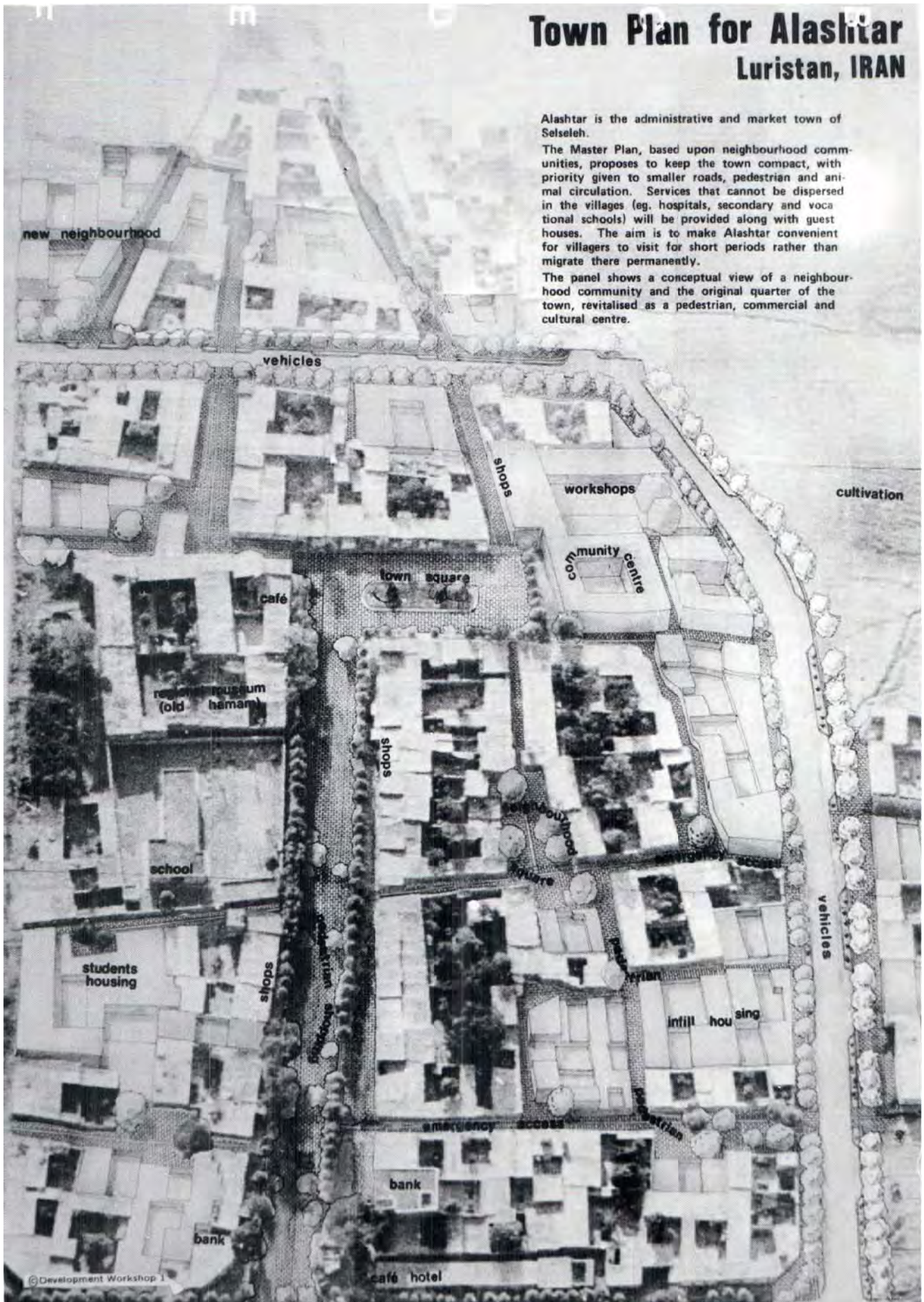
# Town Plan for Alashtar

## Luristan, IRAN

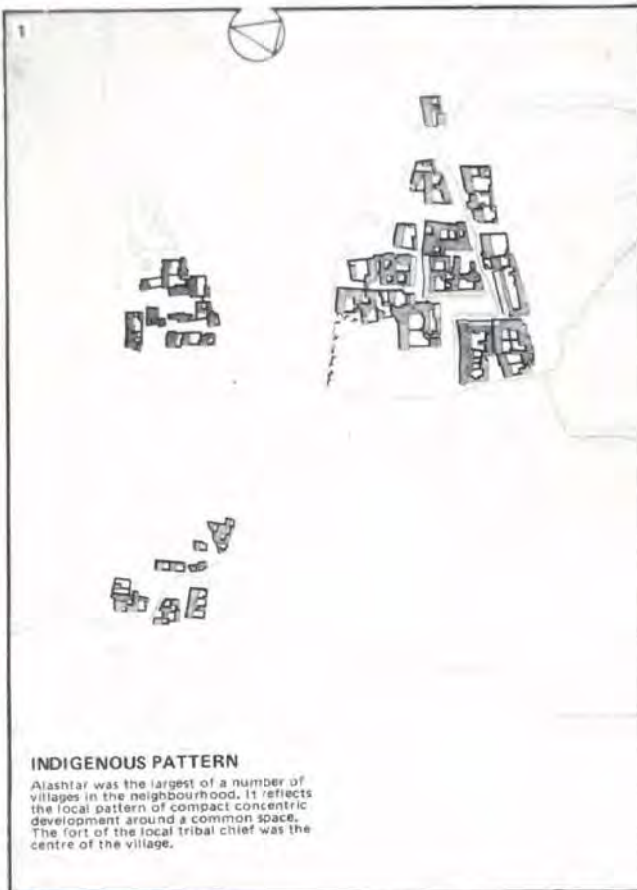
Alashtar is the administrative and market town of Selseleh.

The Master Plan, based upon neighbourhood communities, proposes to keep the town compact, with priority given to smaller roads, pedestrian and animal circulation. Services that cannot be dispersed in the villages (eg. hospitals, secondary and vocational schools) will be provided along with guest houses. The aim is to make Alashtar convenient for villagers to visit for short periods rather than migrate there permanently.

The panel shows a conceptual view of a neighbourhood community and the original quarter of the town, revitalised as a pedestrian, commercial and cultural centre.

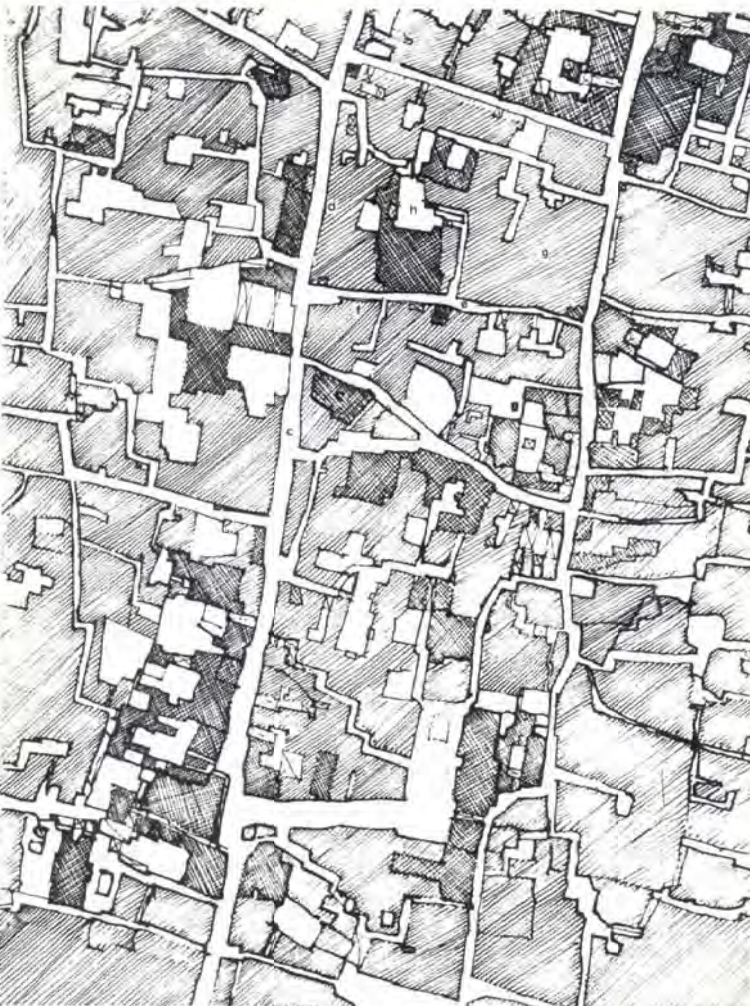


# Town Plan for Alashtar Luristan. IRAN



# Urban Planning

## Old Cairo, EGYPT

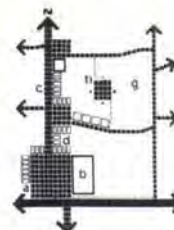


### OLD CITY CENTRES

Old cities were of a manageable size and functioned well. Even today the traditional areas in cities such as Cairo, Yazd and Delhi hold many lessons for urban planning in the Third World. Superficially they are in bad condition because of the poverty of their inhabitants, intense overcrowding and official neglect. Detailed examination however, shows a layout of streets and blocks that are based on sound local, economic, social and environmental considerations. Solutions for accommodating dense populations without resorting to high-rise towers have evolved. Although ringed by endless urban expansion and ignored by economic planners, these old quarters still support a wide range of commercial and small-scale industrial activity, employing significant sectors of the labour force and housing many of poorer classes. These areas should be carefully studied and improved, and new areas should be built that develop on the lessons learned in the indigenous city centres.

### CAIRO

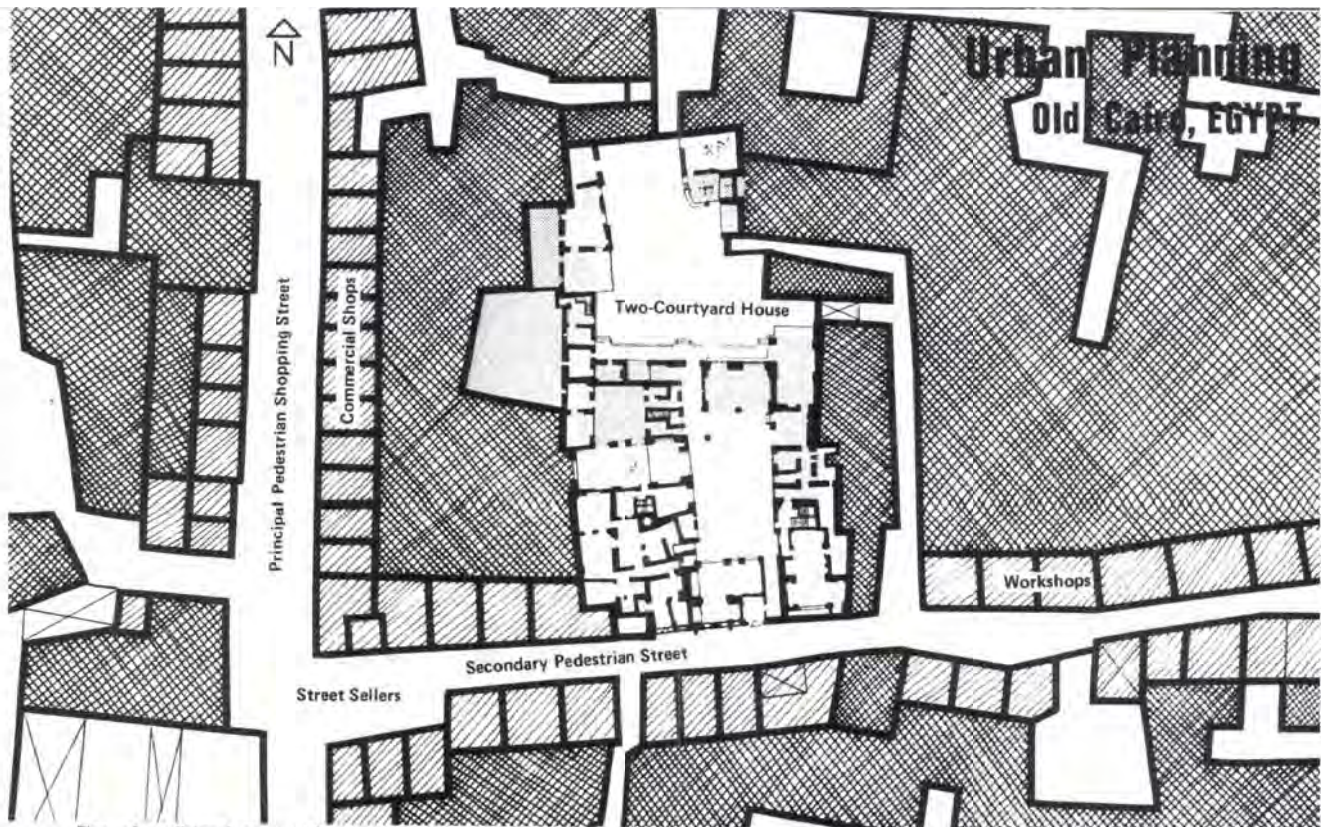
The old quarter of Cairo remains today a vital and productive sector of the city. Though containing a population well above the optimum and showing the effects of over taxation of municipal services it still illustrates the principals of the indigenous city.



Schematic Plan of Old Cairo

- a) Municipal Square
- b) Public Buildings
- c) Pedestrian Shopping Street
- d) Shops
- e) Secondary Pedestrian Streets
- f) Workshops
- g) Residential Area
- h) Private Courtyard

©Development Workshop 1976



Plan of traditional courtyard house showing hierarchy of neighbouring streets.

#### HIERARCHY OF FUNCTIONS

From the municipal cultural square bounded by one of the principal mosques and the university, run wide north-south commercial streets. These streets are largely pedestrian and contain a variety of shops and community buildings. Narrow east-west streets off the principal route contain workshops and specialist trades. Intersections open into small squares accommodating street sellers and temporary stands. Residential areas are off the narrow streets behind the workshops.

#### ENVIRONMENTAL PLANNING

The pattern and hierarchy of streets also have an environmental rationale. North-south streets can be wide and still be kept shaded by surrounding buildings. East-west streets running parallel to the path of the sun, in order to remain shaded must be narrow, bending, and often contain overhangs. In a dense settlement ventilation is important. The northern prevailing winds follow the commercial streets until the streets widen out at intersections. A drop in pressure results and air is thus drawn down the narrow side streets by suction.

Pressure differentials which induce air movement, are created between warm open spaces, squares and courtyards and cooler shaded smaller passageways and openings.

Within houses having two courtyards ventilation is created by convection. Air moves from cooler, small shaded courtyards to warmer sunny open courtyards having lighter lower pressured air.

Environmental, social, and economic factors work in harmony to produce the characteristic pattern of the indigenous city.



Wide north-south commercial streets

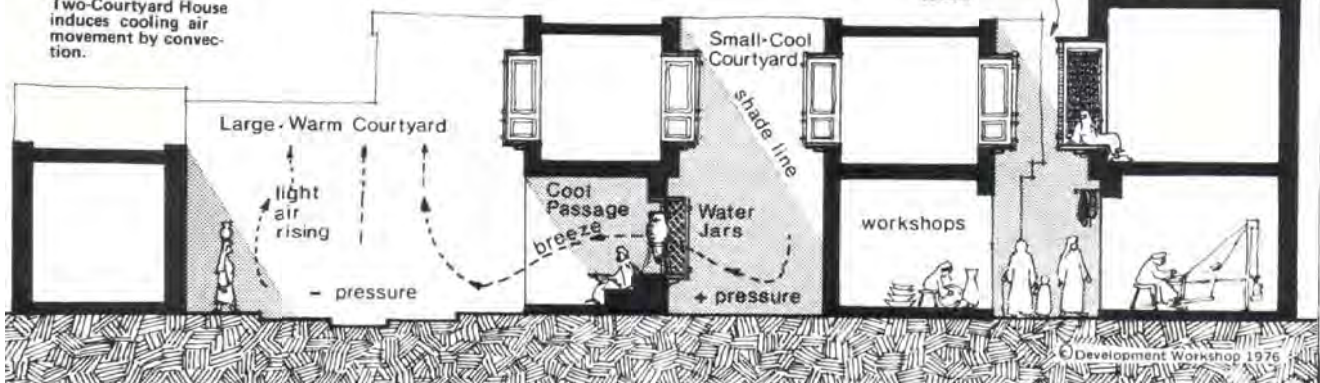


Narrow shaded east-west streets into residential areas.



Courtyards are green and quiet, against the busy streets.

Two-Courtyard House induces cooling air movement by convection.



# Town Plan for Alashtar

## Luristan, IRAN

The improvement of the streets and alleyways can be achieved simply, to meet the needs of the largely pedestrian population.



Broad Streets



Muddy Alleyways

EXISTING



EXISTING

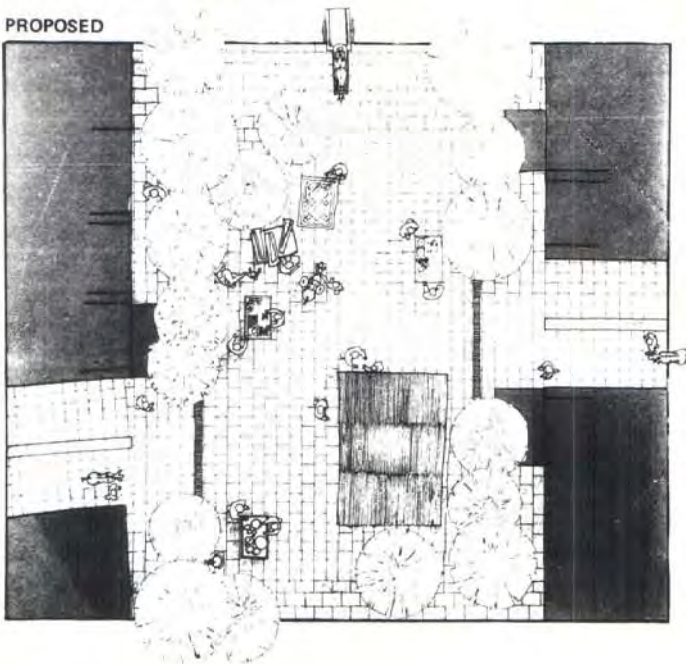


Pedestrianised main shopping area

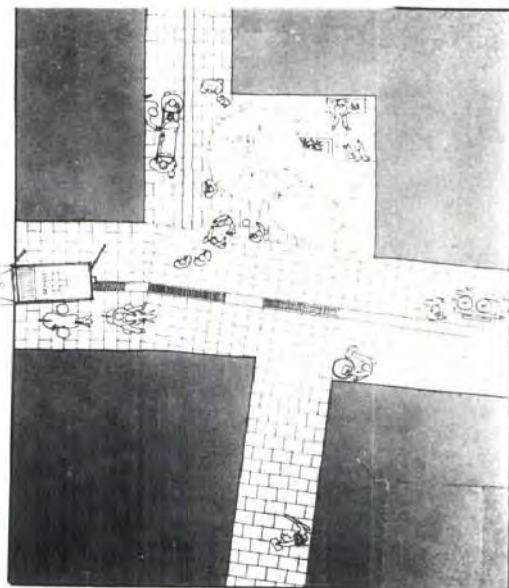


Paved alleyways and neighbourhood squares, allowing emergency vehicle access.

PROPOSED



PROPOSED



# Squatter Housing TURKEY, OMAN, PAKISTAN

## THE PROBLEM:

Lack of employment, infrastructure and services in rural areas cause mass migration into the cities where the migrant (often landless peasants) hopes to find work. For example: 70% of the population of Ankara fall within this category. Such rapid urbanisation upsets the regional balance of population: it robs the rural areas of many potentially productive workers, while exerting pressure on already overtaxed urban structures. This situation cannot be resolved without redirecting investment from urban centres into the rural sector in order to create a more equitable distribution of income and employment opportunities.

In the city, the migrants, with the help of relatives, neighbours and fellow villagers, find available building sites, preferably near places of work, or in the peripheral area of the city. Initially their dwellings are small and usually, the minimum necessary to establish a claim to the site. Their houses grow in accordance with the income and the needs of their families.

Indigenous rural methods are applied by the migrants to their new surroundings: settlement patterns sometimes reflect village clusters; rural organisational methods operate in informal community administration. In the construction of their dwellings, the squatters make use of their rural building skills and technologies. They also, independently develop new technologies suited to the city environment, such as producing materials from urban wastes and recycling used building materials.



Squatters build on sites rejected by both government and commercial developers. The peripheral settlements have a distinctive rural atmosphere. (Ankara, Turkey)



Dwellings start as basic temporary shelters (Salala, Oman (left)) and develop to substantial buildings (Ankara, Turkey (right))



As the income of the family increases the dwelling is expanded and improved (Salala, Oman).



Squatters use traditional technologies (windcatcher on a squatter house in Karachi, Pakistan (left)) and also develop new methods of utilising urban waste (cheap building blocks made of cinders from boilers, lime, and little cement. Ankara, Turkey (right))



Comparatively cheap government low-cost housing neglects socio/environmental requirements while still being too expensive to meet demand.

## AN APPROACH TO THE PROBLEM

The official governmental approach has usually been to provide low-cost housing for squatters. In almost all cases these have proved socially and environmentally unsuitable and far too expensive to be produced in sufficient quantities.

Squatters have demonstrated their ability to meet their basic shelter needs. Governments could, by providing the communities with security of tenure, financial and technical assistance help to improve their housing, infrastructure and public services. The financial aid could be in the form of long-term, low-interest loans. Construction materials, technicians and professionals could also be provided to aid the skilled personnel and the organisational networks existing in the community, to implement the work in accordance with the community's needs.



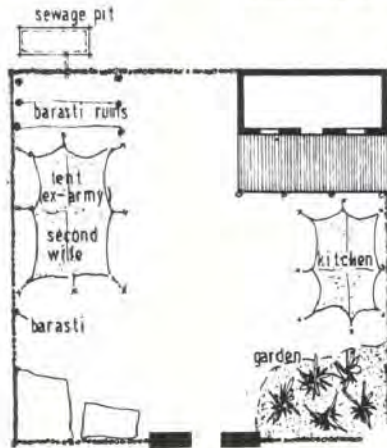
Repetitive, more expensive, official low-cost housing blocks in background. Established squatter housing of high quality in foreground (Ankara, Turkey).

© Development Workshop 1976

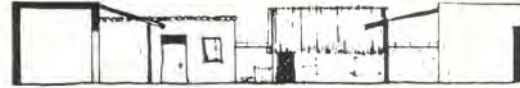
# Squatter Housing and the Courtyard Plan

## OMAN

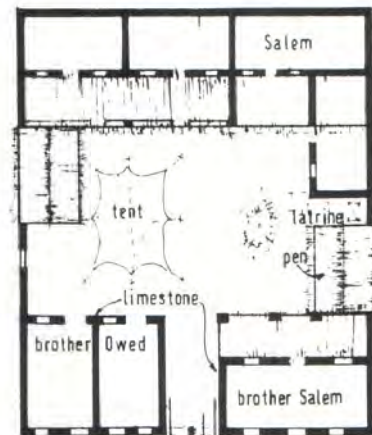
Based on a survey carried out by the authors in Salala, Oman, in 1973.



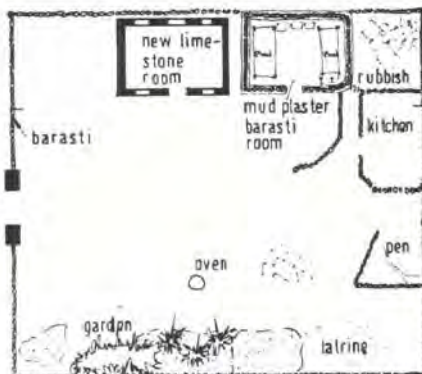
A low income family would first establish a perimeter wall and install a temporary shelter. This may be a tent or a palm frond stem room.



The courtyard house which is a traditional house form, is particularly suited to hot climatic regions. Despite economic changes that have affected family structures, the flexibility, pattern of growth and the forms of the courtyard house remain socially and environmentally relevant. It began as a response to the organisation of the extended family which was, and still is, the basic social and economic unit (in many developing countries). The elder male member was the family head in social as well as economic matters. Junior members in the extended family were economically dependant upon the family head and lived with him in the courtyard house.

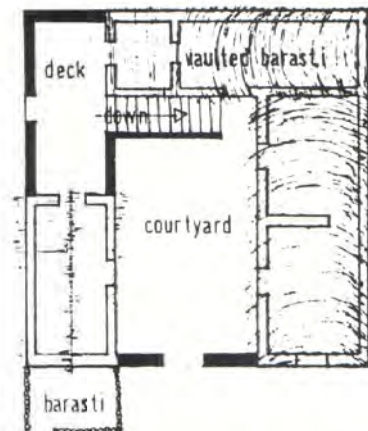


When more money is available, the temporary rooms are replaced, using a more durable material such as limestone, with a view to supporting a second floor in the future.

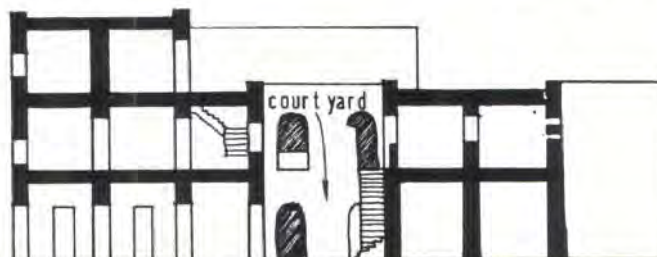


The palm frond stem room is later plastered with mud to form a more permanent shelter.

Today the patriarchal economic structure of the extended family is being undermined by the weakening of traditional sources of income. Money is in the hands of young workers who were juniors in the old hierarchy. These younger family members often choose to live independently. Despite these changes, their new houses follow the traditional pattern, developing into the courtyard form. This is illustrated in a squatter settlement in a newly urbanising part of Salala town in Oman.



Once the ground floor rooms are completed in load bearing materials, rooms are built following the same pattern on the first floor. (2 storey house in limestone with vaulted 'barasti' roofing.)



The house thus grows in a spiral manner until a substantial house develops. (3 storey limestone house in old town centre of Salala)

# Low-Cost Housing INDIA

Mass housing programmes often employing industrialised methods of construction are too expensive to provide the shelter needs of the majority of people in many Third World Countries. Low cost housing projects could be integrated with self-help, site and service, and improvement schemes, so that investment in housing is made available to more people. In cases where the provision of housing is essential, it should draw from the accumulated expertise on how to build appropriately and economically, that is reflected in indigenous housing.

Award Winning Scheme for housing competition (Delhi, India) which invited ideas for alternatives in low cost housing.

SUN PATH DIAGRAM

| Eq. Gm. | South-east angle | Height from ground | Day Month | Height from ground | Wind | Sun | Critical Times | Wall openings |
|---------|------------------|--------------------|-----------|--------------------|------|-----|----------------|---------------|
| Jan     |                  |                    | W N       |                    |      | S   |                | S             |
| Feb     |                  |                    | W N       |                    |      | S   |                | S             |
| Mar     |                  |                    | W N       |                    |      | S   |                |               |
| Apr     |                  |                    | W N       |                    |      |     |                |               |
| May     |                  |                    | W N       |                    |      | EW  |                |               |
| June    |                  |                    | WE        | WN                 | EW   |     | NS             |               |
| July    |                  |                    | EW        | NE                 | EW   |     | NS             |               |
| Aug     |                  |                    | WE        | NE                 | EW   |     | NS             |               |
| Sept    |                  |                    | W NE      |                    | EW   |     |                |               |
| Oct     |                  |                    | W N       |                    |      | S   |                | S             |
| Nov     |                  |                    | W N       |                    |      | S   |                | S             |
| Dec     |                  |                    | W N       |                    |      | S   |                | S             |

CLIMATIC DATA CHART

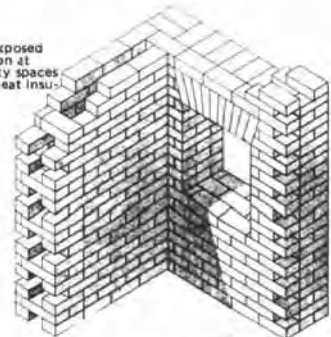
Copyright: Urban Conditions, Ministry of Housing, Delhi

ENVIRONMENTAL DESIGN considerations are inherent in the indigenous settlement pattern and house form. These can be analysed using tools such as climatic charts and on the site test equipment.



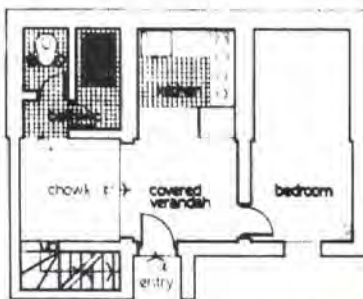
SUN PATH DIAGRAM

East and west walls exposed to direct solar radiation at most times, have cavity spaces which increase their heat insulation value.

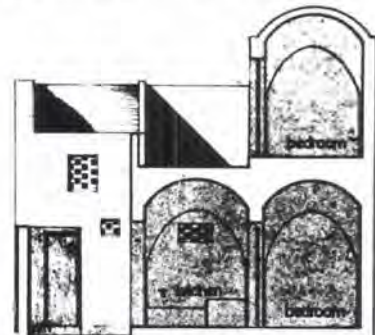


North and south walls solid masonry. South walls retain solar radiation which is most direct in winter and provide a heat bank for warming the interior on cold nights.

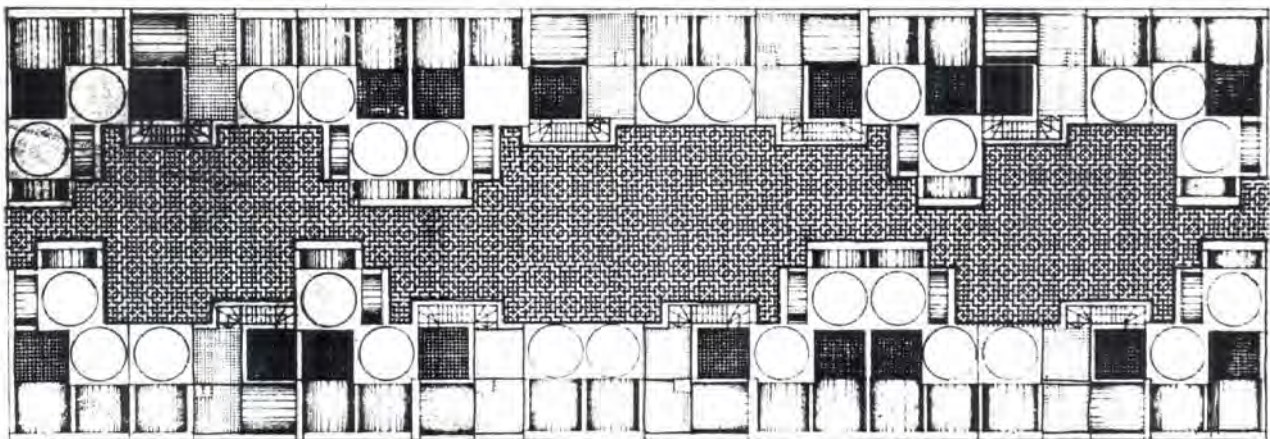
Window openings on the north and south walls only. South windows allow the low angled winter sun to enter the house but restrict high angled summer sun. North window accepts the cool night-time breezes.



COURTYARD HOUSE unit is geared to extension with family growth.



MUD BRICK VAULT AND DOME roofing solutions have potential for development in countries where roof spanning materials such as timber are in short supply and steel and concrete are too expensive.



CLUSTER PLAN - inward looking neighbourhood cluster, responding to social and environmental patterns.

COURTYARDS of various sizes heat up at different rates, inducing ventilation by convection.



# Community Building IRAN



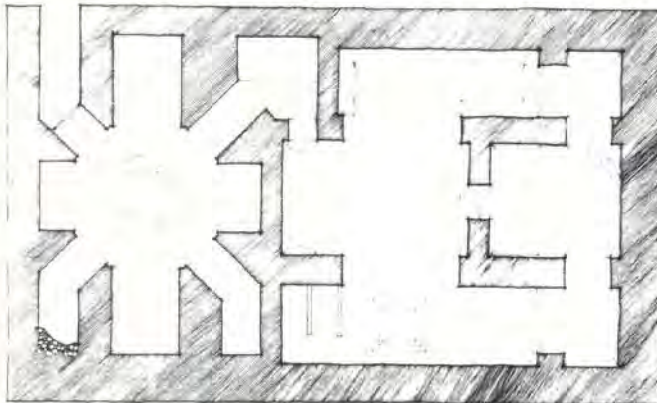
## COMMUNITY BUILDING

Indigenous housing involves the whole family in the building process. Similarly, a community shares in both the decision making and building process and use of indigenous community building. Such participation is a positive force that still operates in many Third World Societies; a force that the West, having lost, is now trying to regain. An example of a community building is the 'Hamam' (public bath).

If it is built by a contractor and placed in the community, potential for encouraging collective effort is lost. If the design is a row of shower cubicles facing a corridor then its traditional function of people socialising while using it, is also lost. Such buildings should be constructed with the help of the community, and their design should develop on an understanding of how the traditional design relates to their social use.

## INDIGENOUS PUBLIC HEALTH

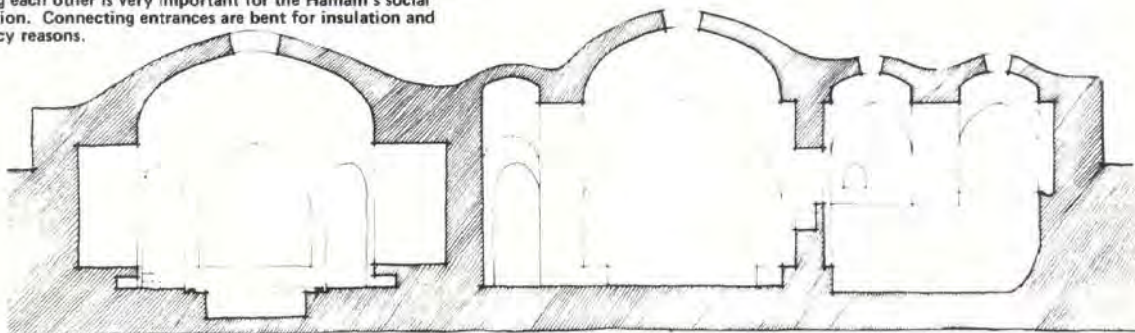
The Hamam (public bath) as a social and health institution has long played an important role in villages and towns of Iran. People come together in the Hamam to bathe, massage, shave and chat at leisure. The presence of a Hamam makes personal hygiene much easier.



Raised entrance and the domes over the changing and bathing rooms are the only visible part of many traditional baths. Baths are below ground level for insulation and to allow water supply to flow by gravity.

## DESIGN: THE TRADITIONAL HAMAM

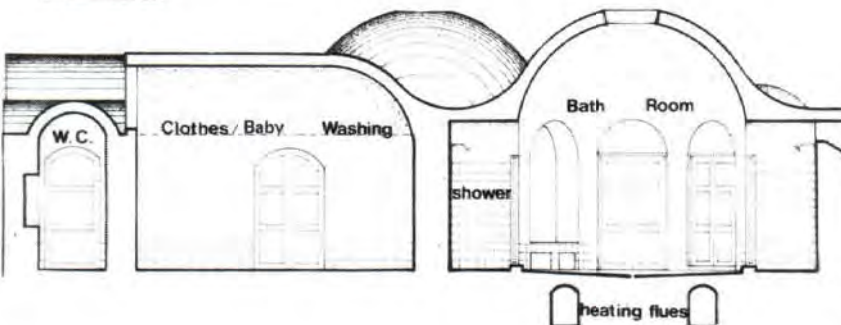
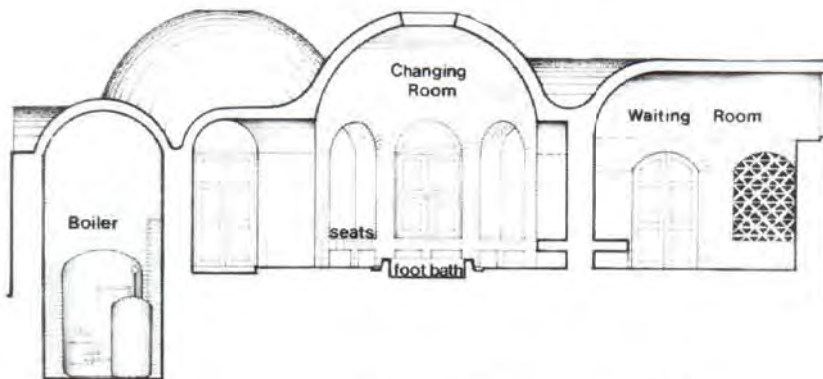
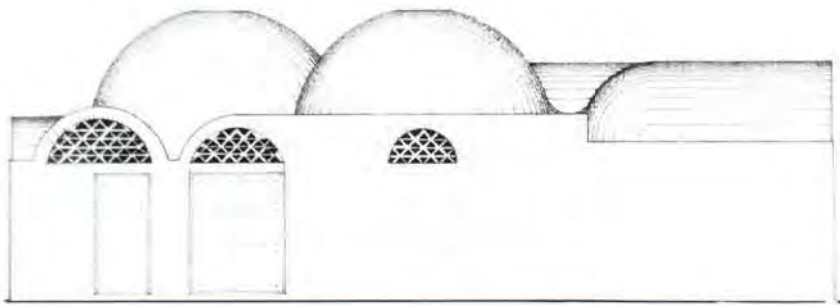
A Hamam has a minimum of two rooms. The first is a changing room, where people sit on raised slabs in niches around the walls, facing each other and a central pool, which acts as a foot bath. The second is the large bath room which has similar raised seating slabs round the walls, a communal hot bath pool and a rinsing pool. This partly open plan arrangement with people facing each other is very important for the Hamam's social function. Connecting entrances are bent for insulation and privacy reasons.



TRADITIONAL BATH IN ALASHTAR, LURISTAN, IRAN

# Community Building

## Niazabad Hamam



Ustad Mashalla

### DESIGN: THE NIAZABAD HAMAM

We designed the Niazabad Hamam from a study of similar traditional ones in the area. Shower cubicles were used since the communal bath pool is prohibited now for health reasons. However, by using the traditional vault and dome with the resulting circular geometry of the internal spaces the socialising potential of the Hamam was kept. Functions still occur round the walls facing into the centre, although in the bath room the functions have been inverted. Shower cubicles are in niches and seating slabs and rinsing pool in the centre.



Ustad Muslin

# Community Building

## Niazabad Hamam

Skilled labour and materials were provided by the Selseleh Project, whilst the village donated land and nine workers daily. The village divided itself into six sections based on extended family groupings — each group responsible for providing an equal number of workers. Each family would either provide a work-

er in rotation or pay for one, or if too poor for either, be covered by the extended family grouping. This was the system used during harvesting and other times when the village had to organise for a collective effort.



Villagers working on the bath



Vault construction over clothes/baby washroom



Dome being built over bathroom



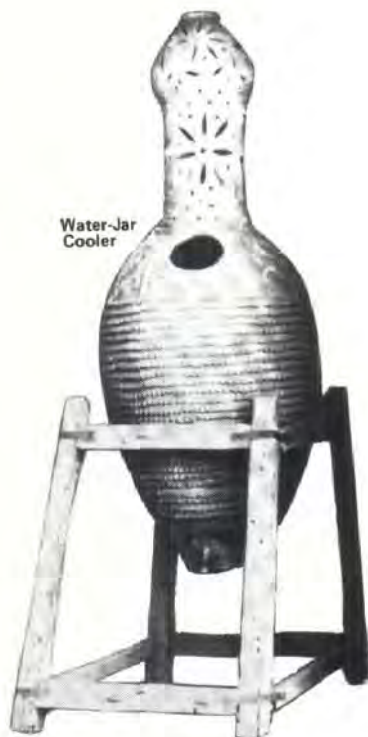
One dome nearing completion. The arches to support the second dome can be seen behind the vaults in the foreground.

# Environmental Design

## EGYPT, OMAN, PAKISTAN

Extremes of climate and the need for thermal comfort are common to many Third World regions. Ingenious, indigenous solutions making use of local micro-climatic features have been developed to meet this problem. They do not resort to expensive and high energy consuming mechanical devices. Windows have been designed to combine the functions of view, internal privacy, air-ventilation and filtering the sun's glare. The windcatch tower is found in innumerable shapes and sizes from North Africa, through the Middle East to the Sind Region of Pakistan. Its design often closely follows aero-dynamic principals in order to draw cool, clean air found well above ground level, down into the living spaces of the house. Ingenious coolers, using free energy released through evaporation are combined with windcatches or with other specially designed openings to cool rooms, cool drinking water and preserve food.

Such indigenous technologies, researched and developed, could be most relevant with today's pressure on world energy sources.



Water-Jar Cooler



Mushrabeya Lattice Screen, Cairo



Palm stem screen wall, Oman

Windcatchers, Sind, Pakistan



# Openings

## OMAN, EGYPT



Exterior view of palm frond stem screen.  
The interior appears to be totally dark giving privacy (Oman)



Interior view of palm frond stem screen filtering external brightness.



Exterior view of Mushrabeya screen (Cairo)



Interior view of Mushrabeya screen



Palm frond stem detail. A smooth transition between light and dark is achieved by the curved section of the material.

### WINDOW OPENINGS

The window is normally required to provide light, ventilation, and a comfortable view of the exterior, but without the loss of privacy. In areas of intense sunlight, the reduction of external glare must be added. The modern glass window developed for temperate climates fails to meet these requirements in hot countries. The indigenous lattice screen on the other hand was developed to suit these conditions.

### FUNCTION OF THE SCREEN

The lattice screen provides a baffle between the interior and exterior. The screen when viewed from inside appears as a silhouette against the bright outside. The screen provides a dark surface for the eye to rest upon when the external conditions are too bright. As the light outside diminishes the eye finds it more comfortable to focus on objects beyond the screen and the image of the lattice becomes less a barrier. Visual privacy is provided to the occupant within, since the interior appears to be darker than the brightly lit external surface of the screen.

Visual comfort is greater if the elements of the lattice screen are rounded, softening the otherwise sharp contrast between dark and light, by providing a gradation of shadow. The curved section also moderates light entering the room; when the sun is brightest and highest in the sky light rays are deflected and dispersed by the rounded screen surfaces before they enter the room. When the



Detail of Mushrabeya screen. Wooden pieces are rounded by lathe.

sun is lower in the sky and less intense it will strike the lattice obliquely and penetrate through the voids into the room. Whilst providing privacy, a comfortable view and a moderated light level, the screen also allows cooling breezes to enter the room. Such screens are often employed as complete walls.

### THE MUSHRABEYA

In Cairo, Egypt, "Mushrabeya" screens are made with many tiny round pieces of lathed wood, assembled in complex patterns. In the hot dry climate of Egypt the sky is usually a dark blue, while reflected light makes the ground brighter. The screens respond to this by having a denser lattice pattern at the bottom than at the top. The outside can therefore be viewed through the graded screen without strain.

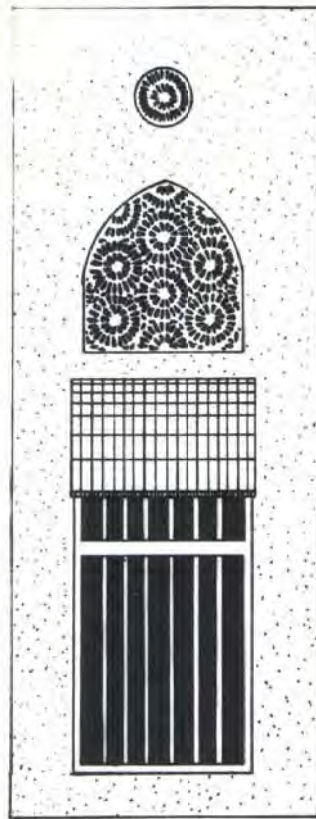
### THE PALM FROND STEM SCREEN

In Northern Oman, palm frond stems are bound together to achieve a similar sort of screen, though not as technologically complex as the Mushrabeya. Unlike Egypt, Oman has a humid climate, which demands that the screen provides a visual barrier against the bright sky, as well as the light reflected from the ground. Gaps left in the screen at a low level allow air movement into the house and provide a view out when sitting, as is customary, on the floor.

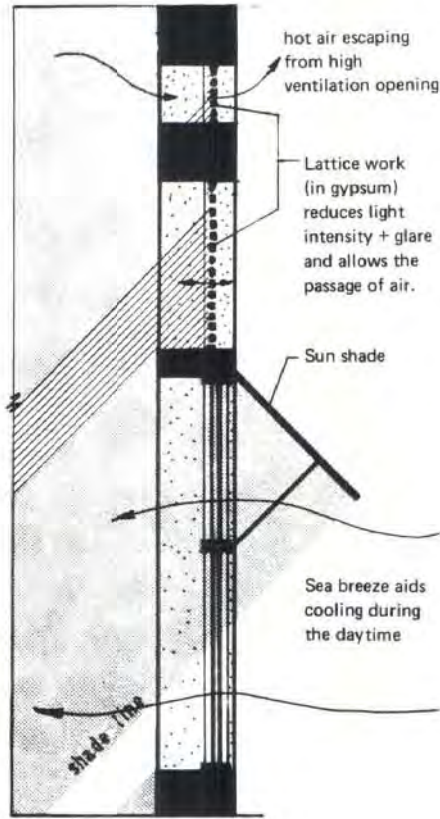
Both the Mushrabeya and the palm stem screen have developed in response to particular climates and social needs.

# Window Openings

## OMAN



Elevation



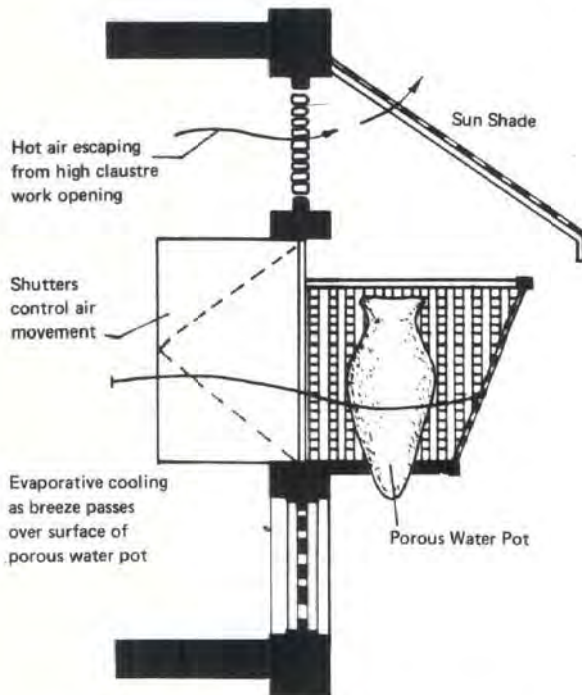
Section

Window system in Mutrah Oman, showing multi-level openings, each designed for particular climatic considerations.

A development of the window as an illumination and ventilation screen is the multi-level window opening. Each function of the window has a specially designed opening, tuned to micro-climatic considerations. Large openings or screens are protected by sun shades. High level lattices allow in light and breezes, but cut down bright sky radiation. Small openings at ceiling level allow the escape of hot light air which normally accumulates in the upper reaches of the room.

Window mounted cooling units employing the evaporative properties of unglazed earthenware pots are sometimes used to condition breezes passing into rooms.

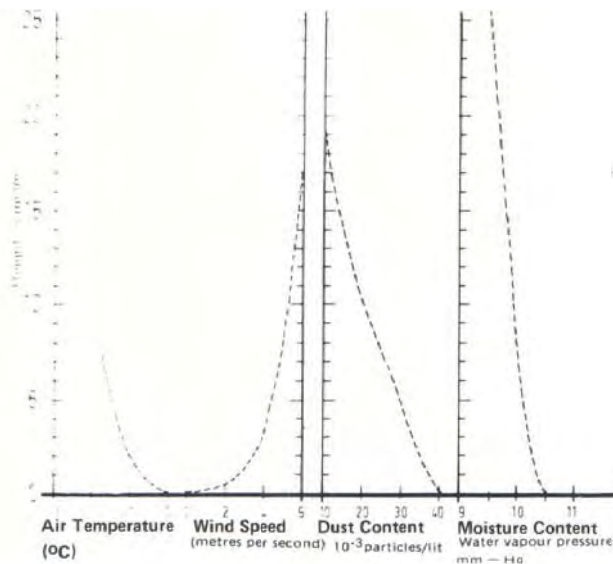
The wealth of experience and innovation built into the indigenous environment is all too often ignored by modern designers working with similar problems.



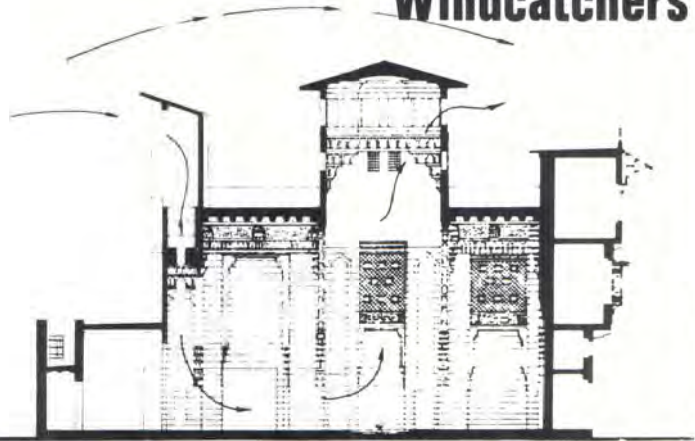
Water jar coolers make use of free energies to cool air before it enters the room.



Window mounted evaporative cooler in Muscat, Oman



## Windcatchers



single direction windcatcher. Ka Mohib al Din, Cairo, Egypt.

### THE WINDCATCHER

The windcatcher is a natural cooling system found in indigenous house forms in areas from the Sind Region of Pakistan, through Iran and Arabia, to Egypt and North Africa. Its design varies according to climatic conditions. Windcatchers are advantageous in hot regions where air movement provides cooling, since air passing over the skin helps a body to lose heat through evaporation. The tower of the windcatcher projects above the rooftops to enable it to 'catch' cooler denser air from the higher unobstructed air stream, and channel it down into the rooms below.

varying number of small shafts leading from each opening, permitting greater air movement from one direction and less from another. It is often necessary to close the windcatcher during the winter, when temperatures are low enough not to require additional cooling from air movement. This is usually done with wooden panels covering the shafts. A simpler solution is used in the cloth windcatchers of the Northern Oman Coast. The walls and divisions of the shafts are made of sack cloth suspended from a simple wooden framework; in winter this cloth is removed and the base of the tower covered with matting.

### PERFORMANCE

Windcatchers do not work purely through the wind's ability to force its way into the house. The house and the windcatcher act together to provide a natural self regulating thermostat based on air pressure differentials. If the interior has cool high pressure air, this stops the outside warm low pressure air from entering the building. When the interior warms up, the situation is reversed and the now cooler exterior air is allowed in. It is also essential that the windcatcher has an air outlet on the leeward side of the building. Wind passing over this outlet creates a suction effect which helps to draw air through the building.

### VARIETY OF TYPES

Single directional windcatchers face towards the most favourable breeze, as in Egypt, where they receive cool air off the Nile and the Mediterranean to the North, at the same time turning away from the hot dusty desert winds from the other direction. Multi directional windcatchers present openings in all directions to catch the slightest air movement from any angle. A horizontal section through one of the simpler types shows an 'X' configuration, dividing up the tower into four equal triangular shafts. These are most common in coastal regions such as along the Indian Ocean and Gulf coasts, where they make use of the day time on shore and night time off shore breezes. More complicated sections are found in central Iran, where large towers, whilst having openings on all sides, have a



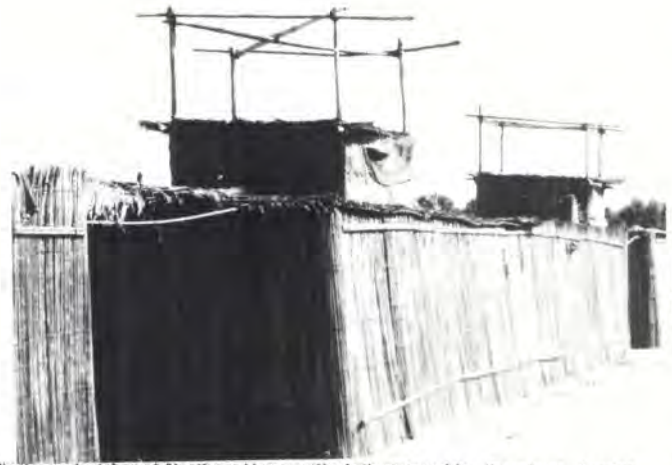
Looking up the shafts of a multi directional windcatcher with 'X' pattern divisions



Looking up the tower of a multiple shaft windcatcher in Yazd, Iran. More shafts lead to openings on a particular side to allow increased air movement from a specific direction.



Elaborate windcatchers in Yazd, Iran, with multiple shafts.

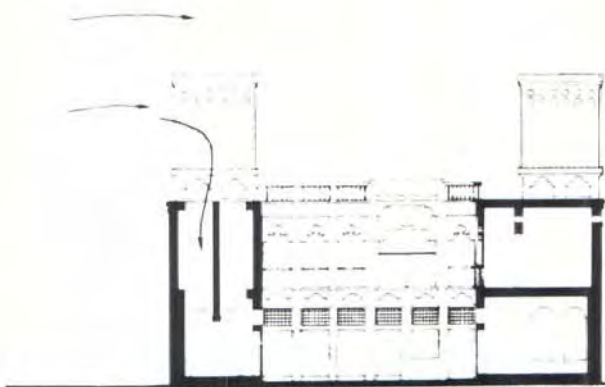


Cloth windcatcher of Northern Oman with cloth removed for the winter, leaving only the supporting framework.

© Development Workshop 1976

# Windcatchers

EGYPT, PAKISTAN  
IRAN, DUBAI, OMAN



Multi directional windcatcher. Courtyard house. Dubai



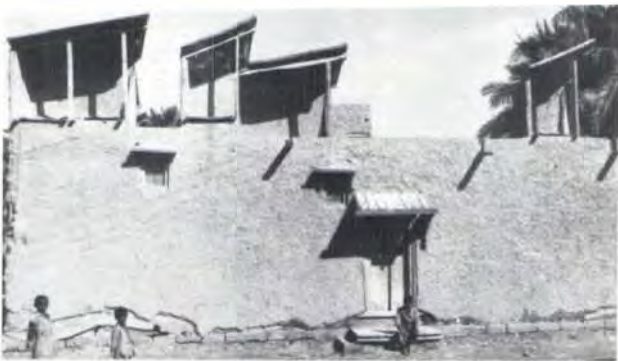
Cloth multi directional windcatcher. Beach house. Batinah Coast, Oman  
Wind direction reverses at night.



Single directional windcatcher in Cairo, Egypt.



Six windcatchers used to cool an underground water cistern in Yazd, Iran.



Single orientation windcatcher in Sind, Pakistan with wide angle of wind acceptance.



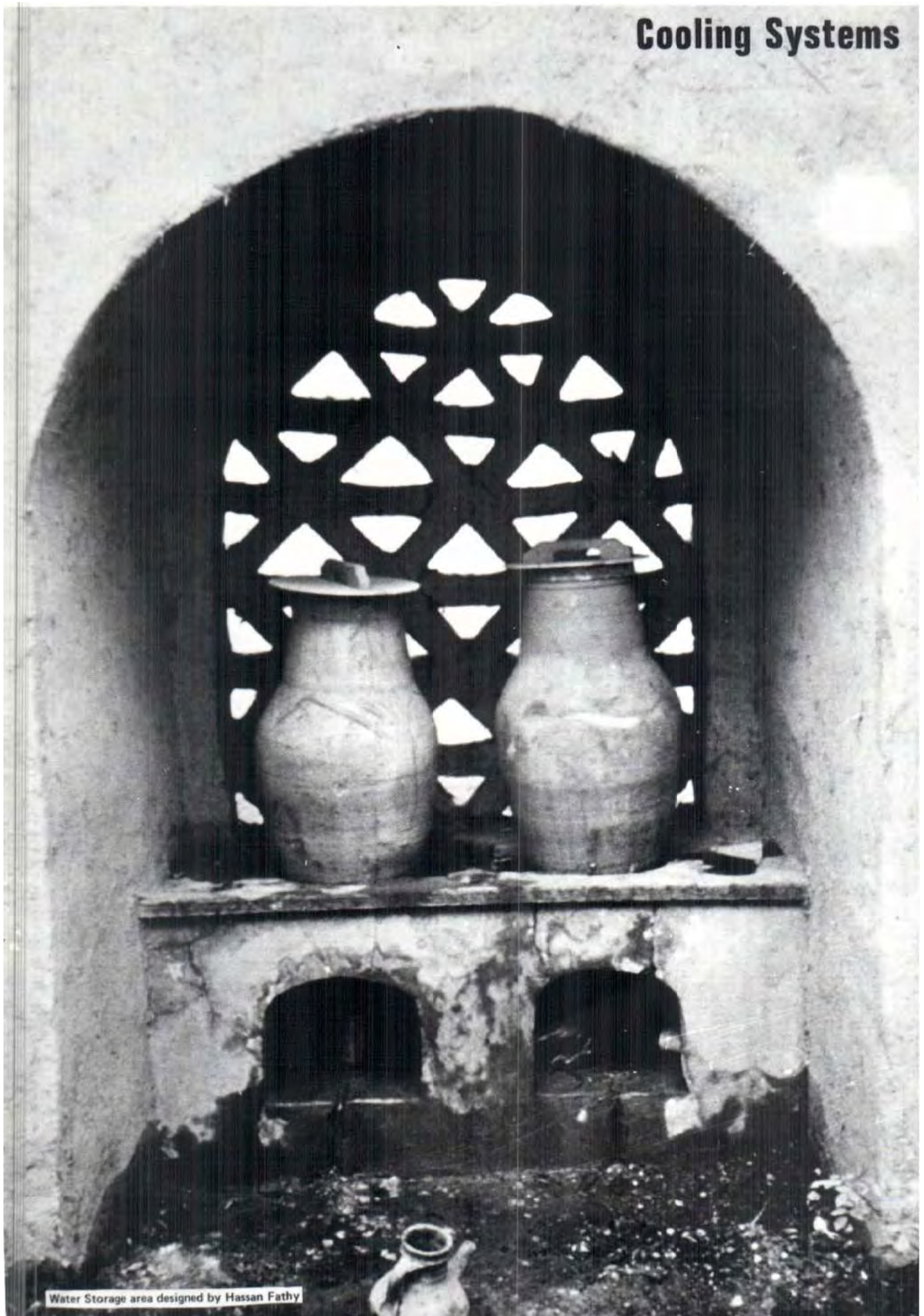
Multi directional cloth windcatchers on the Batinah Coast, Oman.

© Development Workshop 1976



Multi directional windcatcher in Dubai, with ornate decoration and four triangular internal shafts.

## Cooling Systems



Water Storage area designed by Hassan Fathy

# Cooling Systems

## EGYPT, INDIA

### WATER JAR COOLERS

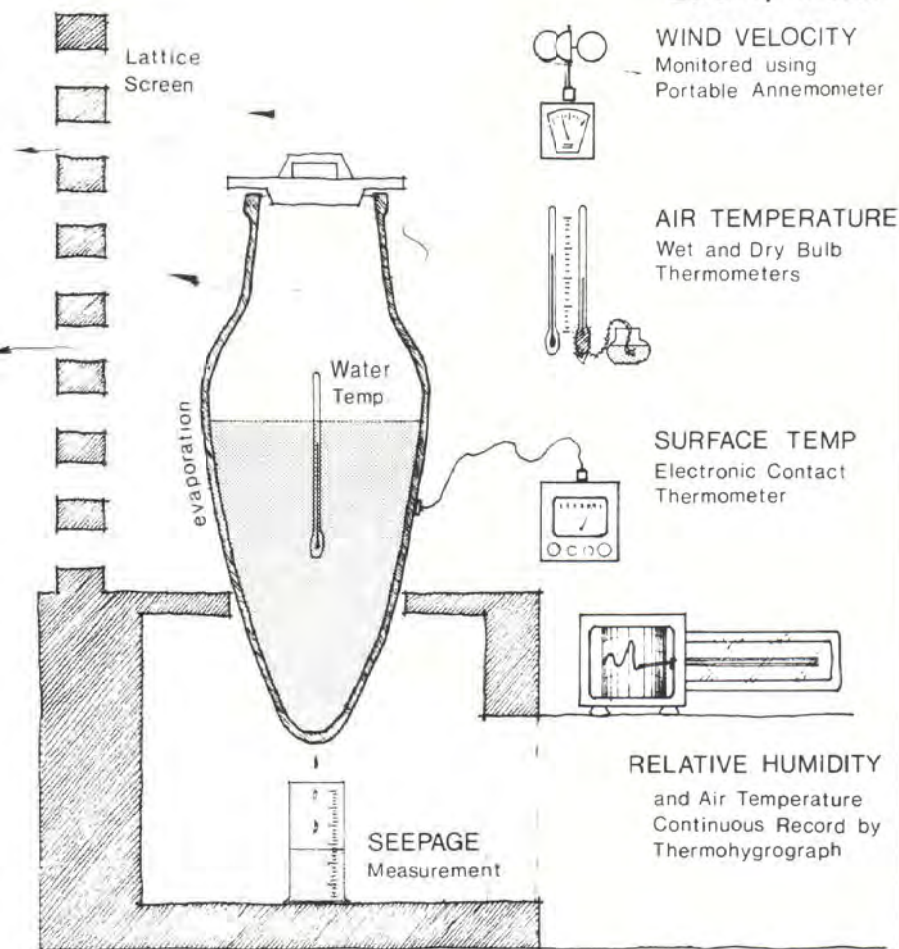
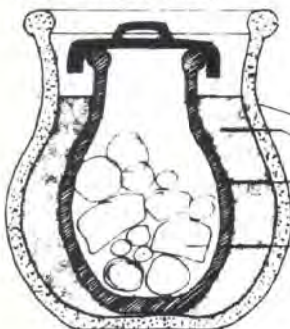
Evaporation is used as a free source of cooling energy in many hot countries.

Indigenous solutions for water and air cooling, and food preservation have been developed. Earthenware water cooling jars are left unglazed so that water can seep through and evaporate from the outer surface. When placed in a breeze, these jars become air coolers. The jar's filtering action helps to clean water for drinking.

### MECHANICAL VS. INDIGENOUS

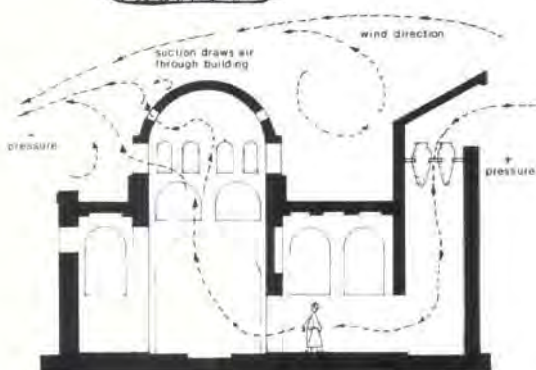
Tests show that a cooling jar can produce approximately 200 Watts of free cooling energy per hour. Mechanical coolers require 70% of their cooling output in electrical energy. Mechanical air conditioning sometimes produces great temperature differences between the inside and outside of buildings and even between upper and lower levels within rooms. This can produce mild shock on entry, and is physiologically unhealthy for old people and young children. The indigenous system on the other hand naturally regulates itself in response to local climatic conditions.

### FOOD COOLER (India)



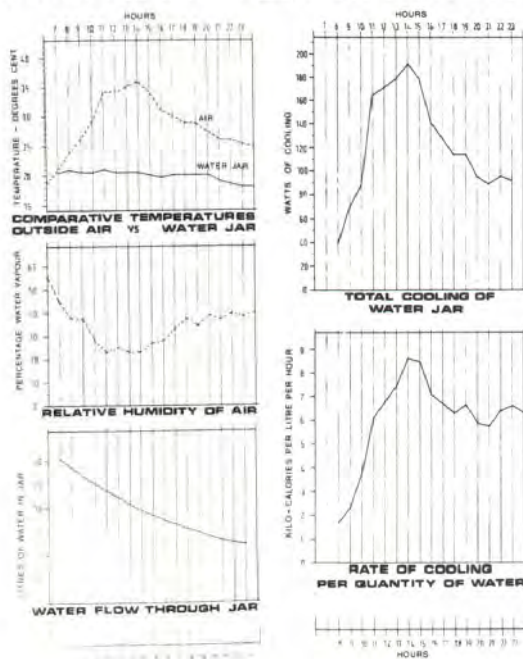
Based on experiments carried out by authors in Upper Egypt. (1973)

### MAZIARA WATER JAR TESTING METHOD

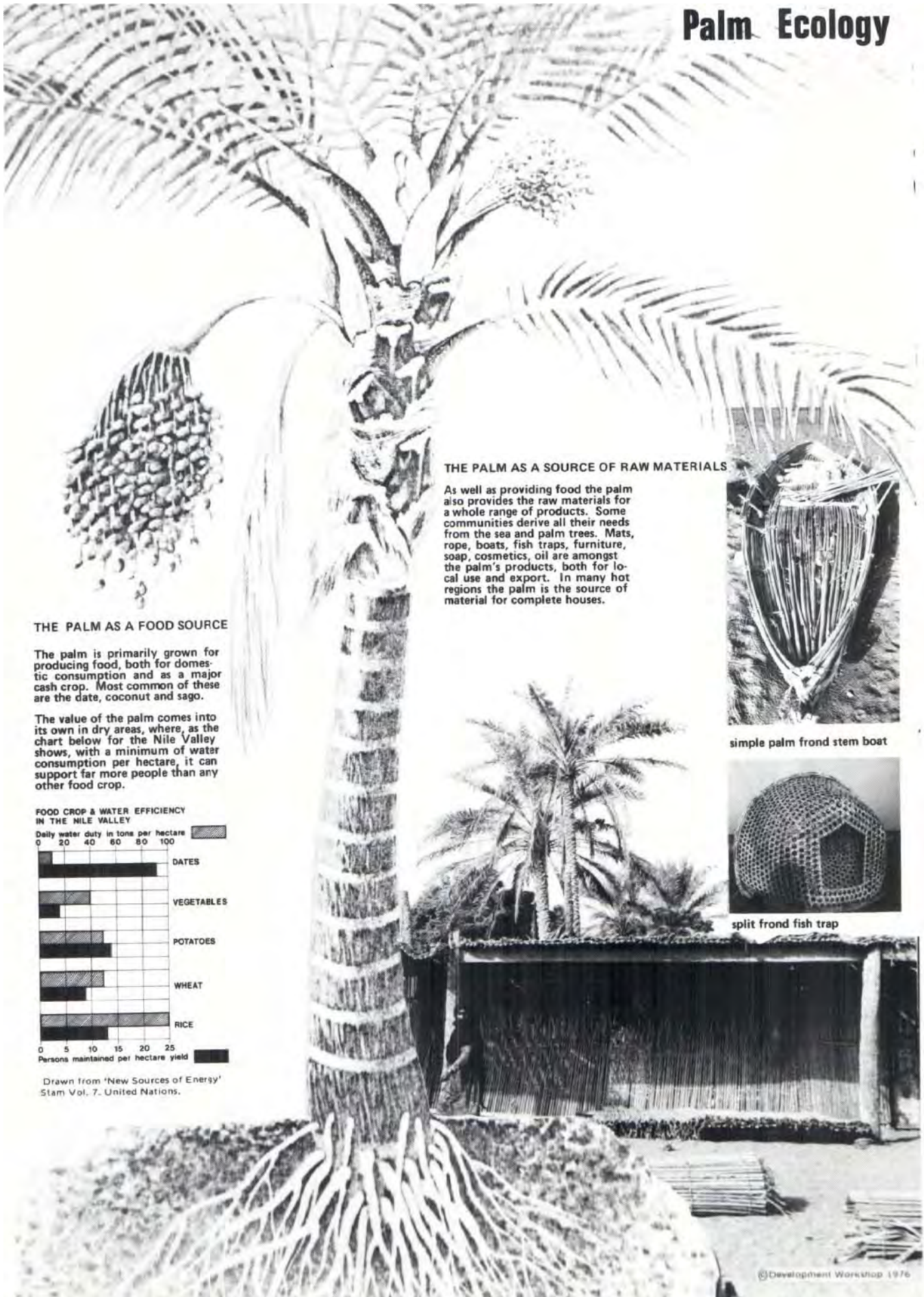


### WIND-CATCHER WITH COOLING JARS

Air is cooled as it passes over evaporative cooling jars.



# Palm Ecology



## THE PALM AS A SOURCE OF RAW MATERIALS

As well as providing food the palm also provides the raw materials for a whole range of products. Some communities derive all their needs from the sea and palm trees. Mats, rope, boats, fish traps, furniture, soap, cosmetics, oil are amongst the palm's products, both for local use and export. In many hot regions the palm is the source of material for complete houses.



simple palm frond stem boat

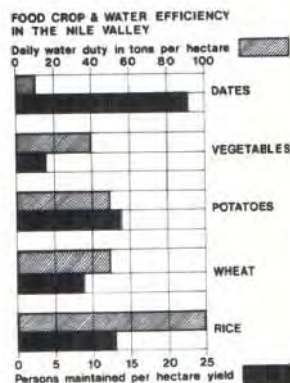


split frond fish trap

## THE PALM AS A FOOD SOURCE

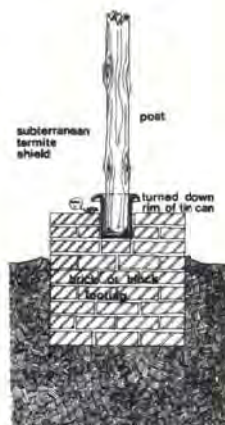
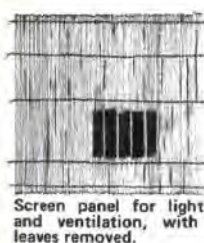
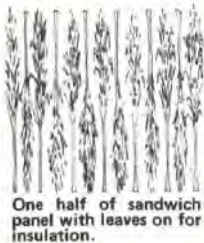
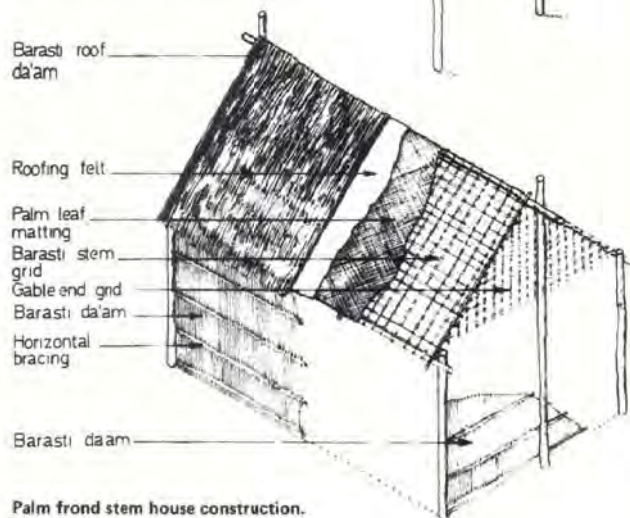
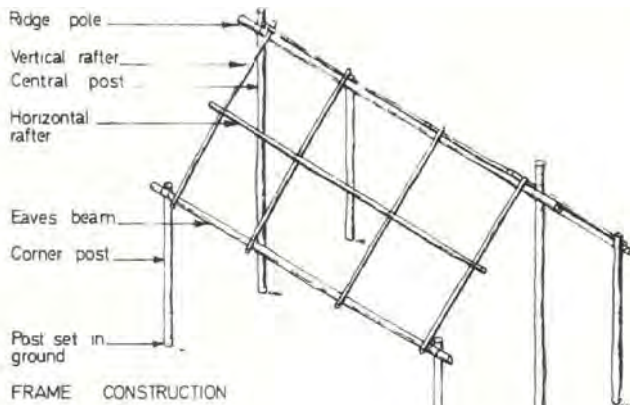
The palm is primarily grown for producing food, both for domestic consumption and as a major cash crop. Most common of these are the date, coconut and sago.

The value of the palm comes into its own in dry areas, where, as the chart below for the Nile Valley shows, with a minimum of water consumption per hectare, it can support far more people than any other food crop.



Drawn from 'New Sources of Energy' 51am Vol. 7. United Nations.

# Palm Building OMAN



Termite shield. Subterranean termites cannot climb past down turned sections of metal.



Houses built completely with palm stems. Rolled panels are for use when required.

## PALM BUILDING

In Oman complete houses are built using palm frond stems on a timber framework, bound with string. The resulting houses are ideal for the hot humid coastal climate. Termite attack reduces the life of the material, but isolation from the ground, using termite shields, largely overcomes this. Risk of fire is also great, but mud plaster or fire resistant paint reduces the danger, and can be used in kitchens, isolating them from the rest of the house. Tests of the material's physical properties have been conducted to find ways of improving and increasing its use.



Tensioning framework for palm frond house.



Wet palm stems being tested for compression.

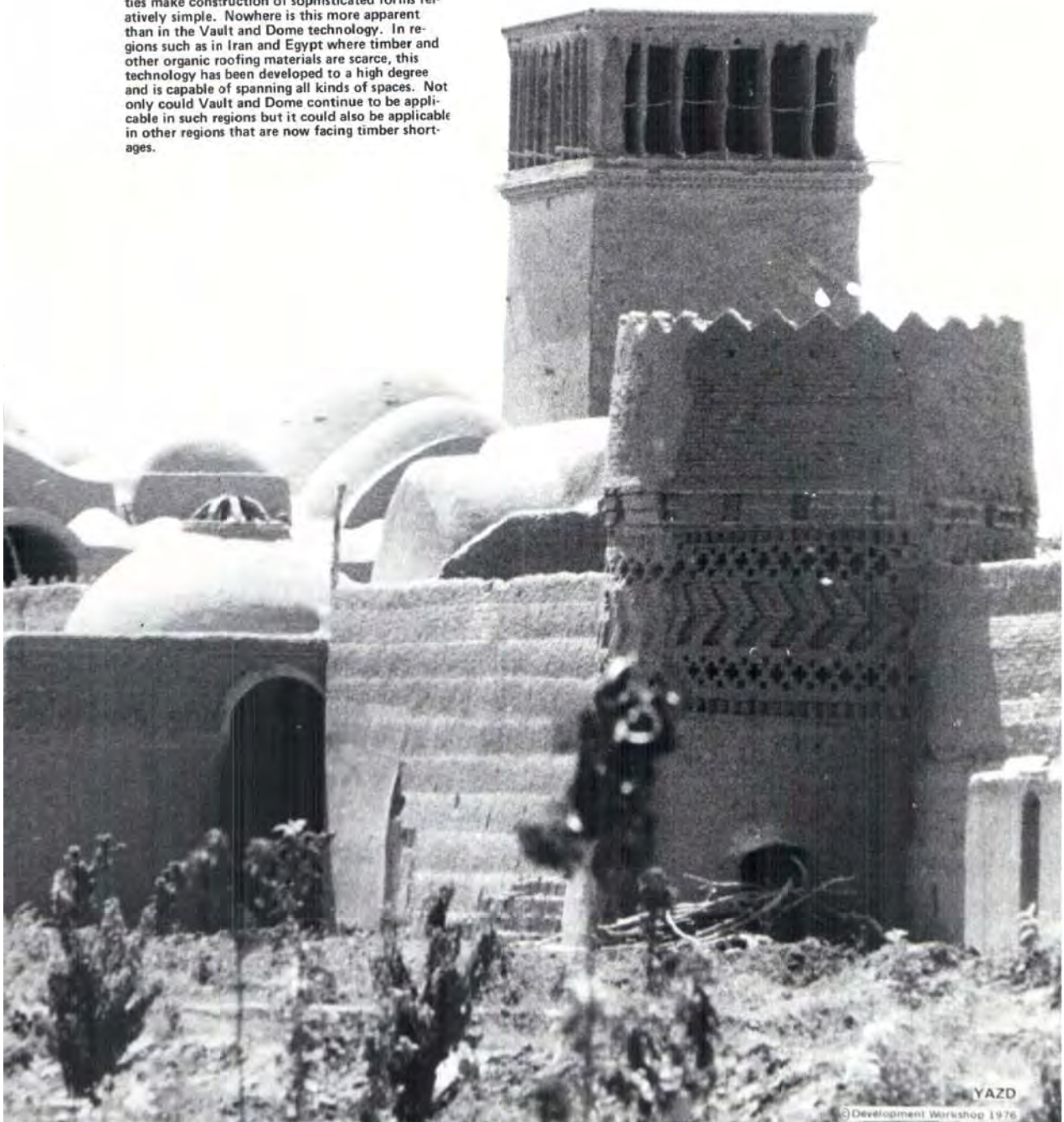


Stems being fire tested. Mud plaster or fire resistant paint reduce the risk of burning.

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# Mud Brick Vault and Dome

Sun-dried mud-brick is probably the most widely available and commonly used building material in the Third World. With the adoption of European materials and models of architecture, mud-brick has been excluded from use in the modern sector of the building industry. The material has been labeled as a sign of underdevelopment and its potentials ignored. Mud-brick's basic economy is undeniable. It is an ideal material in hot regions, being an excellent heat insulator. Its plastic qualities make construction of sophisticated forms relatively simple. Nowhere is this more apparent than in the Vault and Dome technology. In regions such as in Iran and Egypt where timber and other organic roofing materials are scarce, this technology has been developed to a high degree and is capable of spanning all kinds of spaces. Not only could Vault and Dome continue to be applicable in such regions but it could also be applicable in other regions that are now facing timber shortages.



YAZD

© Development Workshop 1976



# Sun-Dried Mud-Brick

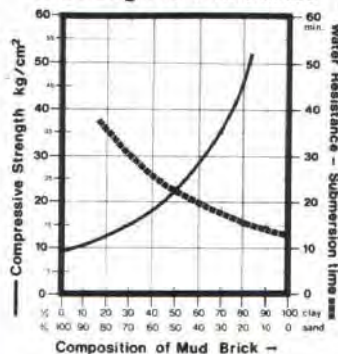
## EGYPT, OMAN, IRAN

### BRICK MAKING

Mud brick's greatest advantage is its cheapness and availability. The cost of brick is largely due to the amount of labour put into its production. A team of three men can make 2000 or 3000 bricks a day using the traditional hand mould. More mechanised forms of production though standardising quality and brick size have rarely matched the traditional method in cheapness and quantity produced.



### Mud Brick Strength & Resistance



Testing soils to determine composition and suitability for mudbrick making.

### STRENGTHS

Soils, the basic ingredients of mud brick, vary in their suitability for brick production. The inorganic parts of soil can be graded as to particle size, ranging from gravel, through sand and silt to the finest, which is clay. In brick making all organic (living) matter such as humus must be excluded as well as any traces of gravel.

In the soils used for brick making sand provides resistance to abrasion and water, while clay provides structural strength. By mixing various pro-

portions of sand and clay the brick can be engineered to suit a particular building or structural requirement.

Sun dried mud brick has been most commonly used for load bearing structures. The brick itself has strength in compression but not in bending or tension. Thick walls result, but the cheapness of the material means that the cost of construction remains minimal.



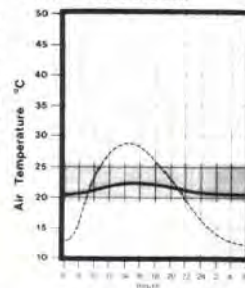
### CLIMATIC PERFORMANCE

Partly due to the thickness of mud walls and partly because of mud's low thermal conductivity rooms built of mud are known to be much cooler in hot areas than those made of any other material. Mud walls and roofs effectively insulate room interiors from the external extremes of heat and cold. Similar rooms of concrete tend to heat up excessively due to solar radiation and will require expensive mechanical air conditioning to achieve comfortable conditions within.

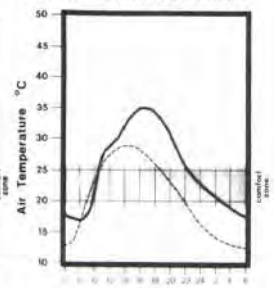
### IMPROVEMENTS

Mud brick's real shortcoming is its need for periodic maintenance. If exposed to weathering or rain, mud walls must be rendered every few years. There are a range of good traditional rendering materials including vegetable extracts, certain refined clays, burnt lime and cinder ash compounds, most of which increase the walls' life span many years. Experiments have also been done and new rendering materials produced. The bricks may be stabilised by adding straw to the mix or small quantities of lime, cement or bitumen, in order to make them stronger or more resistant to damage.

### Climatic Performance Mud Brick Room



### Prefab Concrete Room



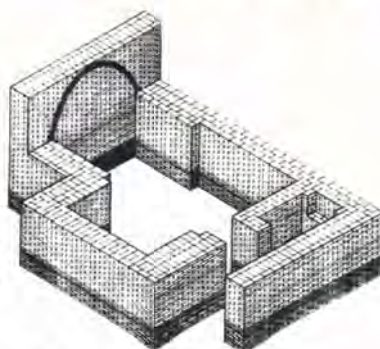
### Improved rendering for mud wall



# Mud-Brick Vault and Dome EGYPT



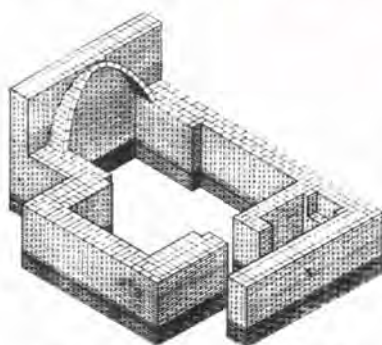
Foundations in impervious material such as fired brick or stone.



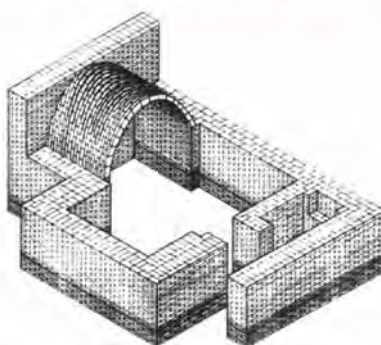
Walls built up to the level of the spring points of the vaults. End wall built up for vault to lean on. Inverted catenary form traced on end wall.

Sequential series of drawings illustrating the process of construction of an experimental housing unit built in Upper Egypt. It employs a traditional Nubian mud-brick vault and dome roofing system. Note that no wooden formwork is required.

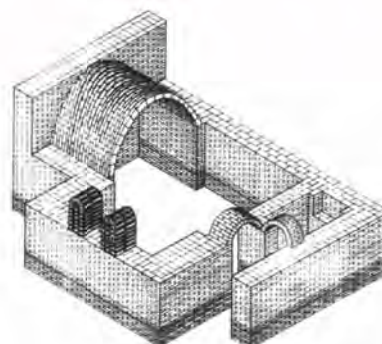
There are a wide variety of vault and dome systems in countries like Egypt and Iran, each suited to particular building needs.



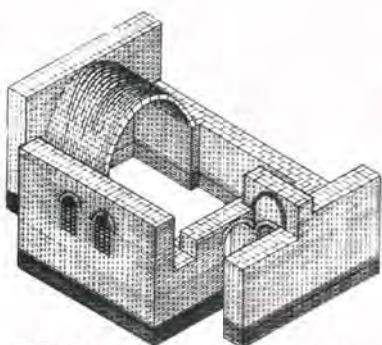
Vault building with courses leaning towards end wall so that no form work or shuttering is needed.



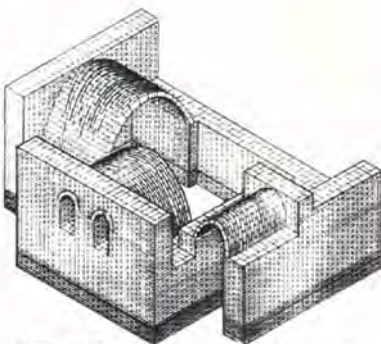
Vault is completed; each course of bricks is less inclined, until vault is flush with side walls.



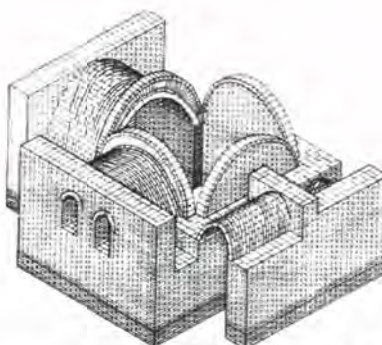
Window openings built up with dry brick - no mortar.



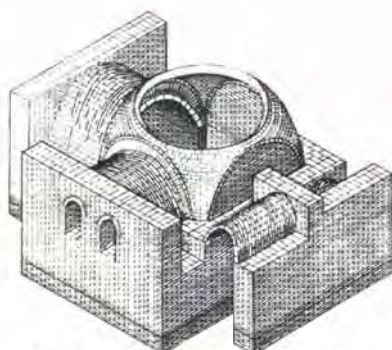
Walls built up. Arches built over dry brick in windows.



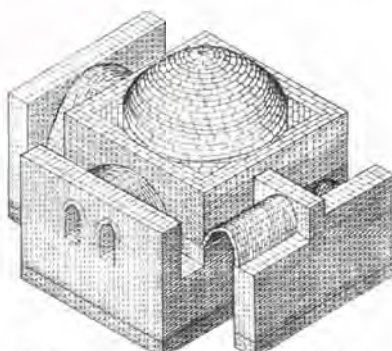
Small vault built in same way as large ones. Loose bricks removed from window openings.



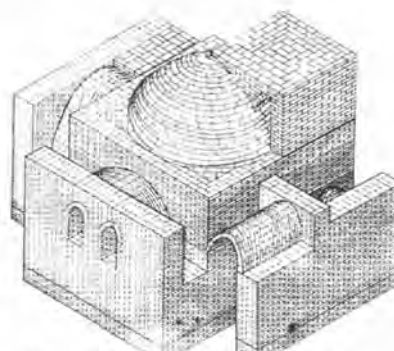
Circular arches built over vaults to form a base for the dome.



Pendentives completed, forming continuous course from which dome can be completed.



Brick courses of dome incline increasingly until dome is finished.



Vaults and domes can be flattened easily to allow for building of other floors above.

©Development Workshop 1976

# Mud Brick Vault and Dome

## EGYPT, OMAN, IRAN



Construction of the traditional flat roof becomes a problem when timber is expensive or unavailable.



Reinforced concrete roofs are a solution, though very expensive.



Vault and dome construction can provide inexpensive roofing.

### ROOFING

Vault and dome roofing has evolved in areas where conditions are such that timber or other roof spanning materials are in short supply or too expensive.

In areas such as those in Egypt and Iran, the hot dry climate has for centuries dictated the use of mud brick as the sole building material. The use of mud brick's compressive properties in vault and dome roofing has developed to an advanced technology.

### THE STRUCTURE

One particular roofing method, the traditional Egyptian vault, follows a geometry similar to an inverted catenary. The catenary is the pure tension curve that a chain or rope takes when it is allowed to hang free, suspended by its ends. Thus an inverted catenary shaped vault of mud brick is always in compression and is one of the most efficient forms possible.

The particular adhesiveness between mud brick and mud mortar combined with the indigenous method of building vaults and domes makes a supporting formwork, which is essential in European vault building, unnecessary. Vaults are built so that courses of brick are sloped and lean into the end wall which supports the vault while it is being built. Such vaults can carry loads immediately after being constructed. Egyptian domes are usually semi-circular, the geometry, and the slope and placement of the bricks being determined by a string with one end anchored at the centre of the circle, and the other end tracing out the arc of the dome. The dome, like the vault, is built without any supporting formwork.

### LOW COST HOUSING

The vault and dome roofing solution could find a place in the low cost housing programmes of countries which already have a tradition of this kind of building. Too often, all the investment for new building goes into mechanical capital intensive methods. As a result highly skilled traditional masons find no market for their trade. New apprentices are not being trained. Before such skills are lost they must be reassessed and developed. The material's wide availability makes it possible for a building industry incorporating mud brick technology to operate in a decentralised, self-reliant way, as there is no need to import materials or equipment from outside.

The feasibility for the use of vault and dome roofing should be explored in other Third World Countries where environmental and economic conditions are appropriate and modern roofing techniques are proving too expensive.

